THE SUBMARINE REVIEW

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EDITOR'S COMMENTS

Several of the excellent presentations at the two Naval Submarine League symposia this year are featured in this issue for the benefit of those who could not attend, and for those who did and have asked for the information to use in their conversations and speeches. Each of the five given here address a different facet of the problems facing the submarine community today.

COMSUBLANT, Vice Admiral George Emery, provided an overview to the Annual Symposium in June while John Birkler of RAND presented the results of the SecDef-ordered study on the submarine industrial base issue. Rear Admiral John Mitchell, then Director of Strategic Systems Programs, gave an SLBM status report and his views on the issues being faced by the strategic submarine force. The latter part of his talk contained what may be new information to many and is published here. Rear Admiral Marc Pelaez, the Chief of Naval Research, keynoted the Technology Symposium with a wake-up call to the submarine community about the funds available and what has to be done with them. Finally, Richard Compton-Hall, recently retired as Director of the Royal Navy Submarine Museum, offered some wide-ranging western experience to a mythical nation interested in starting an effective submarine force.

A pair of articles about the early days of U.S. submarining should be of great interest to all history buffs. More importantly, they are recommended to those just getting started in the submarine business for the insight they can gain. Captain Harry Caldwell has put together a concise piece on John Holland's success in building the U.S. Navy's first submarine. The author is the expert on this subject since his father was the first commanding officer. Dr. George Weickhardt offers us a well researched article, similarly very familiar to him, about the career of Admiral Nimitz as a young submarine officer before World War I. Dr. Weickhardt's father served with Admiral Nimitz putting SNAPPER (SS 16) in commission in 1910.

Of more current interest is Commander Sam Tangredi's first part of a two-installment article about the place of the Secretary of the Navy in the evolution of submarines. He makes the point that a SecNav can use his position to be an *advocate* and a *shield* for the service as well as a *translator* for the President.

Two other articles discuss developments over the last few decades in order to focus on submarine capabilities that are, or could be, of great use in the near future. Dr. Brad Becken, of Raytheon, but of long previous naval experience, summarizes the history of submarine underwater communications and raises the issue of its further development. Lieutenant Commander Sean Filipowski, a submarine-trained officer now serving as a cryptologist, recounts the participation of submarines in the Korean War of the early 1950s and shows how submarine surveillance came to be so fully accepted by theater commanders.

The unique relationship of submarine and intelligence is expanded further in Captain Bill Manthorpe's review of Ultra in the Pacific. The review itself is recommended for what it says about both the development of tactical intelligence from raw material, and the use of it by successful commanders. This is one of those instances in which the review is more instructive than the book.

Two continuing series in **THE SUBMARINE REVIEW** are ably represented in this issue. The Submarine Bibliography project is well served with a pair of contributions which provide excellent listings of foreign language books and articles. For action there are not many sea stories that can top the account of TANG's Fifth Patrol. Since the boat was lost, we have used Roscoe's U.S. Submarine Operations in World War II for our commemoration of that battle 50 years ago, rather than an actual patrol report.

Jim Hay

FROM THE PRESIDENT

The 1995 Submarine Technology Symposium will be conducted on May 10, 11 and 12 at The Johns Hopkins University Applied Physics Laboratory. The classified (SECRET/NOFORN) forum will examine a full range of emerging technologies that have the potential to be adopted by the Submarine Force. We will look at all Navy technologies, without regard to intended platform, and at the technologies under development at the Advanced Research Projects Agency and in other services. We will explore the world of modeling, simulation and automation, and delve into adjunct and off-board systems. Acknowledg-

ing the fact that we (the good old USA) do not have a lock on advanced technology, the Symposium will review promising developments from overseas. The Call for Papers is on the street; prospects for an exciting meeting are great.

Traditionally, the exploitation of advanced technology has been good for the Submarine Force. Although initially embraced with some reluctance, the success of nuclear power confirmed the vision of its proponents. Science, meanwhile, has brought us power densities and extended core life beyond our wildest expectations. The solid rocket motor, accurate and reliable guidance, and precision navigation gave us the Fleet Ballistic Missile System. Stealth technologies have reduced radiated signatures to an undetectable whisper. And the computer allowed us to advance from the hand-held *Is-Was* to the wondrous combat control systems in the fleet today. But I have had a glimpse of the future, and it gets even better!

I was privileged recently with a walk through SEAWOLF (SSN 21) from bow acoustic array to shaft seal. The final hull sections had been joined, major equipments were in place, and the mass of metal was taking on the character of a real submarine. The torpedo room is cavernous. Standing in the midst of the space, one could visualize the ship forward-deployed, loaded with Tomahawk Land Attack Cruise Missiles, ready to launch, with a significant element of surprise, a strike against enemy command and control nodes, air defenses, and power grid, in response to direction from a Joint Task Force Commander. Just sitting on the blocks in the construction hall, the ship exudes awesome warfighting capability. I envy the youngsters who will take her to sea.

My *back-to-the-future* experience included an exciting look at the AN/BSY-2 Submarine Combat System, Serial 001, under test, prior to delivery to the shipyard. The displays and controls reflect the considerable attention devoted to operability from early in the design phase, right to the present. The SEAWOLF crew is training on the system, putting real world flesh on a very powerful skeleton, and providing feedback to the engineers. The built-in capabilities represent everything you ever wanted in a combat system, and were afraid to ask. The fleet is in for a pleasant surprise.

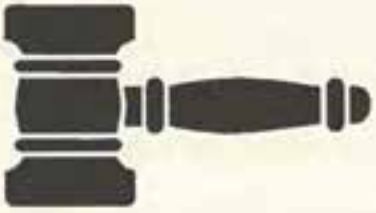
My exposure to the AN/BQG-5 Wide Aperture Array Passive Ranging System was similarly exciting and took me back to USS BARB (SSN 596) and our primitive, but effective, 1966 era

prototype PUFFS. Talk about Yugo vs. Countach! With additional experience and some tweaks to the operating guidelines, we should have a true littoral warfare detection and fire control system. Don't leave home without one!

The paperless ship is upon us! The Interactive Electronic Technical Manual takes all of the heavy, burdensome, perishable, unmanageable in any sea state, of dubious ACN and page change validity, and space-consuming paper volumes, and reduces them to 3.5" floppy disks. The technician, armed with his own disk with A and C School notes superimposed on the text, carries a laptop to the scene of the problem and follows the electronic trouble shooting guide to resolution. Need to issue a change to the manual? Mail new disks to the fleet—throw away superseded disk. Training systems are now using the same format.

Add the new Photonic Mast System and high data rate Ku band satellite communications and imagery, stuff it into the New Attack SSN and we will have a weapon system with warfighting capability and survivability unmatched by any other platform. The submarine building program needs our support! It is time to dispel the myth that the *submarine share* of the Ship Construction, Navy (SCN) budget is fixed by historical perspective. Where is that written? We have a story that justifies a larger share of the pie! And maybe the SCN pie itself should increase relative to other appropriations. After all, this is the Navy, and we are talking about ships. Take off the gloves, men. It's a jungle out there! The Marquis of Queensbury rules are N/A. Support your local neighborhood submarine!

Bud Kauderer



REMARKS TO THE NSL ANNUAL SYMPOSIUM

by VADM George W. Emery, USN
COMSUBLANT
15 June 1994

Admiral Trost, Admiral Long, Admiral Kauderer, distinguished guests, members of the Naval Submarine League, ladies and gentlemen, good afternoon. It's a pleasure for me to be here today and share with you an overview of the Submarine Force as well as some particulars associated with the Atlantic Fleet.

On Monday I attended an interesting luncheon here in Washington organized by Dr. Jackie Davis, president of National Security Planning Associates, Inc. Jackie has put together an Undersea Warfare Seminar—a series of luncheon and breakfast round table discussions with a pretty impressive list of participants and speakers. The group includes analysts and policy experts from several key Washington staffs such as senior Congressional staffers like Steve Saulnier, Paul Walker, and John Lilley; OSD officials including Clark Murdock and Larry Smith; Secretary Dalton, Mr. Danzig and Nora Slatkin from SECNAV's Office, JCS and Navy flag officers, and other prominent minds such as Ron O'Rourke from the Congressional Research Service, Admiral Bud Edney, now working on Defense Department roles and missions, Dr. Gordon Adams from OMB, Ambassador Linton Brooks from CNA and Dr. David Chu, now of RAND. Either Jackie or Admiral Bill Smith serve as the discussion moderators. This seminar is meeting through the summer for the purpose of building a consensus within these organizations about **the Submarine Force, why we need it, and what it should look like in the future.**

Monday's speaker was CINCLANTFLT, Admiral Hank Mauz. It may surprise some of you, but Admiral Mauz, a surface warrior, not only agreed to give his views of the "submarine as an enabling force in joint and combined operations", but he did so very positively and very convincingly. Not that he pounded on the podium that we needed 100 SSNs, which would have made some of you old warriors happy, I'm sure, but he is a strong supporter and knows first hand how much we contribute to the fleet.

I know that I don't have to convince this audience of the value

of submarines. But I do sense some very understandable wringing of hands, and *woe is me* or *the sky is falling* attitudes among some people in the submarine community now that ASW is not the Navy's number one priority. I prefer a more upbeat outlook. We may not be number one on everybody's list today, and during the next day and a half you'll be brought up to speed on several key issues that must be resolved, but the reality is that **highly capable, nuclear powered submarines will continue to play a vital role in national defense.** The Navy, as the enabling force for sustained power projection ashore, will always need the ability to take command over, on and under the seas. It takes the complete spectrum of capabilities the Navy possesses to do that: air power, surface ships, submarines and landing forces. We can't do without any of these elements.

Just like the period after World War II, when the submarine force adapted and branched out into new areas, the submarine force today is adapting to changing times, and it's doing so rather well. The end of the Cold War allowed us to shift our emphasis to littoral warfare, while still maintaining our open-ocean ASW prowess. The way we employ submarines today is a direct correlation to the changed security environment, **not the false belief that we no longer have a mission so we better go out and find one.** So to me, it's natural and logical—based on the current threat, the Navy doesn't need as many submarines as it once did (nor as many people, ships, airplanes, Marines or bases, for that matter), and other warfares have somewhat higher priority at present. However, it is up to us, active and retired submariners and concerned citizens, to be sure the Navy and nation preserve the right amount and right kind of capability to ensure our successors aren't caught short some time in the future.

What is the right number of submarines for the future? I think the jury is still out, but for now we're planning for 55 SSNs and 18 SSBNs in 1999. The Secretary of Defense has stated a long term goal of about 45 beyond FY 1999.

I can inform you that today's Submarine Force is as capable and ready as it has ever been. In the Atlantic Fleet we have 55 SSNs, 44 of which are command operationally ready, which means not in some sort of depot availability, 26 of which are underway. Sixteen of these 26 are deployed to the Caribbean, the Mediterranean or the North Atlantic. Of those 44 submarines, only one is rated C-3 overall in readiness, i.e., not fully combat

ready, because it is undergoing post-construction shakedown. And, our SSBNs continue their superb record of exceptional readiness on deterrent patrol just as they have for over 30 years.

And speaking of SSBNs, the last of the *41 for Freedom* has completed patrol. VALLEJO will offload her strategic missiles by next week and join STONEWALL JACKSON and SIMON BOLIVAR in the deactivation process by the end of the fiscal year. Squadron 16 will be decommissioned on 25 June. Currently there are 14 Tridents in commission with the 15th, RHODE ISLAND, to join us at Newport on 9 July. Admiral Chiles will bring you up to speed on the strategic side of the house tomorrow, so I'll leave further discussion of the SSBN force to him.

One of the questions posed at the luncheon on Monday was about the roles SSNs play in theater contingency planning. The answer is SSNs are included in contingency plans in all mission areas where they have capability—intelligence gathering, providing indications and warning, ASW, ASUW, strike warfare, special warfare, mine warfare and forward presence. And today's SSNs are fulfilling these missions as fully integrated members of the fleet and we're learning more and more every day through our exercises and deployments with battle groups and joint task forces. A few examples from current or recent operations will help you visualize the variety and depth of submarine involvement in our contingency plans.

If you had asked me how many SSNs were assigned to LANTFLEET battle groups a couple of months ago, I would have answered two. With the evolution of the Joint Task Force (JTF), concept, the right answer today is three, at least for the next three battle groups deploying to the Mediterranean Sea, each of which will include a large deck amphibious ship as the centerpiece of an Amphibious Ready Group (ARG). We have assigned the third SSN to the battle group as an integral part of that ARG. USS BOISE is the first LANT SSN to be assigned as the ARG's SSN for deployment. BOISE will deploy with USS NASSAU as part of the EISENHOWER JTF, which also includes the submarines USS SPRINGFIELD and USS ANNAPOLIS. The ARG SSN will undergo the same pre-deployment training sequence as the CVBG SSNs beginning about six months before deployment. The next two battle groups will also include three SSNs each—USS KEY WEST, USS MONTPELIER, and USS BATFISH with the THEODORE ROOSEVELT JTF; and USS OKLAHOMA CITY,

USS HAMPTON, and USS FINBACK with the AMERICA JTF. To assist the NASSAU ARG commander with employing the SSN, a submarine qualified Lieutenant has been permanently assigned to the PHIBGRU TWO staff. And he is in addition to the assignment of Commander Tom Fursman, former CO of SUNFISH, to Rear Admiral Gehman's staff on EISENHOWER. With Hank Mauz's support, the Atlantic Fleet policy is now to assign a post-SSN skipper to each BG staff to provide the sort of professional expertise the task force commander needs to safely and effectively employ his assigned submarines.

Extensive intelligence collection operations also continue. Notable examples include operations under NATO operational control in the Adriatic region (which you'll hear more about later in this symposium when Commanders Tom O'Connor and Bill Ostendorff, Commanding Officers of SCRANTON and NORFOLK, brief you on their recent Med experience), and Caribbean operations including counter-drug operations under the tactical control of CJTF-4.

Exercise Agile Provider conducted in April and May 1994 included four SSNs and Special Forces from the Army, Navy, Marines, and Air Force. Submarine personnel were provided to the Joint Special Operations Task Force Commander at Camp Lejeune, and tactical control of USS L. MENDEL RIVERS was shifted there for the duration of the exercise. RIVERS conducted a wide variety of special warfare missions using her dry deck shelter capability. USS TREPANG and USS MINNEAPOLIS-ST. PAUL operated under the tactical command of COMCARGRU-EIGHT, conducting special warfare, strike and anti-diesel SS tasking. And finally, USS MONTPELIER operated as an opposition force submarine, simulating a diesel SSN, under the tactical control of CTF-88 (an exercise director under USACOM J-7).

Exercise Arctic Express—a Joint Allied field training exercise with units from Denmark, the United Kingdom, the Netherlands, Norway, and the United States, which was conducted in March of this year in conjunction with a Norwegian national maritime exercise—included the first shift of tactical command of a U.S. SSN to Norway. To ensure safety we sent an experienced officer from our staff to assist the Norwegian submarine operating authority during the exercise.

You have noted in my description of these exercises the two

terms *tactical control* and *tactical command*. To refresh your memory, tactical control includes assigning tasks and directing the tactical employment of the assigned SSN, including rules of engagement. Tactical command, which also includes tactical control, adds responsibility for preventing mutual interference and water space management (ASW weapons control). Our goal is to give the task force commander either tactical control or command, whichever makes sense in the eyes of the task force commander and the fleet.

I also want to say a few words about the *forward presence* mission. The role of our Navy today is to operate forward supporting a strategy of partnership, conflict prevention and should crises occur, be ready for military action. Some people, including some Navy flag officers, tend to think submarines play little in the *forward presence* mission, presumably because they accomplish their warfare mission submerged and are therefore not visible. To disabuse that notion I like to point out that our submarines annually make about 200 port visits to 50 nations around the world. Last year, in addition to port visits, the Submarine Force invested over 200 SSN-days in bilateral or multi-lateral exercises world wide, and that doesn't include numerous short duration exercises or *passexes*. So far in this quarter alone Atlantic submarines have presented a very visible presence in foreign ports totaling in excess of 180 days. WHALE in Wilhelmshaven, Germany; BOSTON in Souda Bay, Crete; SAN JUAN in Tromso, Norway; CINCINNATI in Toulon, France; and NARWHAL in Hafia, Israel are just a few examples of our visibility to our allies and potential troublemakers alike. And these visits never fail to impress those visited, among them the Presidents of Italy and Cypress and the Norwegian CNO, all of whom, by the way, we took to sea.

And ask Mike Barr about the deterrence effect of the *forward presence* submarines in the Pacific theater. Do you think Iran or Iraq failed to notice ASHEVILLE's recent visit to Bahrain? Last year the commander of naval forces in CENTCOM, Vice Admiral Doug Katz, said that the SSN has done "more to open doors and gain access than any other ship that has come to the AOR". So, the bottom line is that submarines are making a visible forward presence around the world as a routine part of doing business.

Strike warfare is another area where there is a lack of knowledge about why it's important to have that capability on subma-

rines. Clearly, the need for stand-off strike missions is driven by our desire to minimize risk to sailors; don't risk human life if there's another way to do the same job. There are several reasons why we need strike capability on SSNs:

- First, submarines comprise almost one-third of the Navy's combatant ships and carry a significant fraction of the available weapons. In a typical battle group deployed to the Mediterranean, deployed SSNs may represent half of the Tomahawk missile-capable ships and half the required theater Tomahawk inventory. We can't afford to exclude one-third of our combat ships from being able to strike targets ashore.

- Secondly, SSNs do not require air cover from the battle group, which makes them a great force multiplier for the strike planner in determining the best launch position for his units.

- Third, having strike capability on SSNs can free up space in missile magazines on surface ships for more anti-air, anti-surface, or theater ballistic missile defense weapons. This gives the theater CINCs and task force commanders more flexibility to meet all their requirements.

- Fourth, SSNs will often be first on scene before we have complete control of the surface and air space. They provide the capability for enabling strikes against key targets which could threaten other units of the battle group.

- And finally, there is what I call *risk-free SSN delivery*, which is something I don't think we talk about enough. Few Third World nations have any significant ASW capability against our SSNs. That gives us the option of using SSNs for strikes with little risk of counter-attack.

What about a *blue water contingency* mission, you ask. Does it still exist? The answer is an emphatic "Yes!" The lessons of the U-boat campaigns of World Wars I and II are still valid, and we cannot allow any nation to interrupt the free movement of men and supplies across the world's oceans. While I truly hope that

democratic reforms will succeed in Russia, and I firmly believe that they have no intention of combat with the West, the fact of the matter is Russia is the only country in the world today with a submarine force **sufficiently large** and **sufficiently capable** to challenge this country's security interests. Submarine construction in Russia continues, and the Northern Fleet, particularly its submarine force, is receiving very high priority within their military. Should this force align itself with one or more Third World nations to challenge U.S. naval forces in the open ocean or the littoral, the U.S. Submarine Force must be able to deal with the problem. The acoustic advantage that we once enjoyed over the Russian submarine force has steadily declined until today it is uncomfortably small, essentially at parity.

There is a slide I like to use in briefings for visitors from Washington. It shows a comparison of detection ranges from the Cold War days, represented by the distance from the Washington Monument to the Beltway, to the present, represented by the distance from the Monument to the Capitol building. Clearly an order of magnitude difference. While some say we don't need SEAWOLF because it is a Cold War weapon, the fact is we do need ships with SEAWOLF stealth and improved sensors in the fleet now.

In looking ahead to the future, what are the preferred characteristics we need for our submarines in littoral operations? Our current SSNs are doing a very credible job in that environment today, and will for many years to come. But we can, and must, do better. Our biggest needs for improvement to the 688 Class, which will make up the bulk of our force well into the next century, are better mine detection systems and enhanced special warfare capability. Major General Harry Jenkins, the Marine Corps general who heads the Expeditionary Warfare Division (N85) in OPNAV, has put together a proposed plan for the Navy's unmanned underwater vehicle (UUV) programs. In the proposed plan, the highest priority in UUVs is for a near term (less than four years) interim mine reconnaissance system launched from a SSN.

In the special warfare area, we're making plans to add dry deck shelter (DDS) and Advanced SEAL Delivery System (ASDS) host capability to selected 688 Class SSNs to replace our retiring DDS submarines.

In addition to improving the 688 Class, we are also looking to

design the new attack submarine with many improvements to enhance its capability in the littoral enhancement:

- First, stealth is a must, including acoustic, magnetic visual, and radio frequency. In the acoustic area, we must maintain at least the same level of stealth as SEAWOLF. In the other areas, we need to improve on both the 688 Class and SEAWOLF stealth.

- Second, we need improved ship control to permit an expanded operating envelope in shallow water, such as provided by employing split stern planes to minimize depth excursions from control surface casualties.

- Third, we need operational improvements such as fully integrated command and control systems to provide seamless connectivity to joint and combined (allied or coalition) task forces and improved and reliable night periscope capability.

- And finally, we need special warfare improvements including DDS and ASDS capability, a quiet hovering system and a reconfigurable torpedo room to permit the delivery and extraction of more than a handful of special forces.

Speaking of communications, let me mention a test we conducted last month on USS ALBANY using a commercial super high frequency satellite. This was a capability demonstration of a joint venture between GTE and General Dynamics, Electric Boat Division. A one-of-a-kind 12.5 inch dish antenna was placed in a BRD-7 size submarine radome and tested both in port and at sea. The preliminary results of the test show that data rates up to 64 kilobits per second were achieved. The functional capabilities demonstrated included transfer of very large data files (10 megabytes), STU-III encrypted voice, encrypted electronic mail through a PC-based computer workstation, the transfer of freeze-frame periscope images, live periscope video, and live teleconferencing (at video rates somewhat less than full motion 30 frames per second). I'm not sure I'm ready for live teleconferencing! This test will help us determine the way ahead in trying to solve our challenges in submarine communications. In another commu-

nications *first*, this week we are deploying the first SSN with an operational extremely high frequency system.

I recognize that a large part of the Submarine Force's perception problem is a historical lack of knowledge of submarine capabilities and operations by non-submariners, and we're working hard to overcome that. We're taking a much more proactive approach to educate key decision-makers through demonstrations, underway embarkations, ship tours and briefings. Admiral Chiles, when he was SUBLANT, developed a *regional crisis demonstration* in which a pierside submarine crew acts out what they do at sea, working for a battle group commander, in a simulated crisis situation in the littoral. The demo takes about four hours and involves SEALs and much of the crew, but those Congressmen, staffers and Defense Department officials who have attended get an incredibly clear picture of what it would be like at sea and on station.

We have been moderately successful in getting members of Congress and Congressional staff members to sea or to visit us in port. Since this time last year, in SUBLANT, we have hosted over 336 VIPs including 47 members of Congress, 72 Congressional staff members, and 35 from OSD and JCS staffs. We've conducted 10 underway embarkations in SSNs, another 20 embarkations on Trident SSBNs, and 11 regional crises demonstrations. Rear Admiral Bob Natter, Chief of Legislative Affairs, has been extremely responsive to our initiatives to get our story into the halls of Congress and he and Tom Ryan and Ted Sheafer have been carrying that message door-to-door in the Congressional office buildings.

We have also targeted various media including 20 underway and 35 in-port media visits in SUBLANT in the last six months alone. In addition, we're taking the Submarine Force to the public. To date this year we have completed 11 visits where crew members have traveled to the ship's namesake city or state, and another five underway embarkations by civic groups on their namesake submarines. I have also started a submarine community newsletter, published by my staff, with inputs from the force world-wide to help keep our talented, young and impressionable officers well informed of our activities and initiatives.

And speaking of young officers, let me talk a moment about the health of our personnel world. In a nutshell enlisted retention in the Submarine Force is on par with the rest of the Navy and is

currently sufficient to support the force, but junior officer retention is of concern. In the long term, we need 38 percent retention (three of every eight wardroom junior officers) to adequately fill our department head requirements. It is barely 30 percent today. Although we can deal with this number over the next year or so because of a slight excess of junior officers in the force, I worry that we must find a way to turn that trend in the not too distant future. This fact was influential in the decision to publish a quarterly community newsletter to be sure our junior officers acquire a broader perspective of what is going on within the Submarine Force and the Navy.

Although we're working hard to get the word out, I still need your help. Particularly you retired submariners. We're spread a little thinner than in years past. In 1980 there were nine submarine three-stars; today, operationally, I'm it; and George Sterner is holding the fort at NAVSEA. The lack of three-star submarine representation, particularly here in Washington, makes it difficult to clearly air our views and concerns. So, the active participation of people like you in this audience is sorely needed. Let me add that we do have help coming. Two other three-stars await the confirmation process—Archie Clemens to SEVENTHFLT and Skip Bowman to BUPERS.

Let me close by reiterating that you should still be very proud of the Submarine Force. Although there remain many hurdles ahead to clear, the force remains ready, well trained, and in great demand. We still attract the best sailors in the Navy and we still are providing visible career opportunities. Although we are getting smaller, the future remains bright and there are exciting days ahead. I cannot envision a day when this country will not need a strong and capable Submarine Force. So let's work together to make sure we keep one!

Thank you. ■

THE U.S. SUBMARINE PRODUCTION BASE
An Analysis of Cost, Schedule, and Risk for Selected Force Structures

The Executive Summary
A Study by the National Defense Research Institute of RAND
by John Birkler, John Schank, Giles Smith, Fred Timson, Michael Mattock, and Malcolm MacKinnon

[Editor's Note: At the Annual Symposium in June, Mr. John Birkler of RAND presented the results of a study requested in January by the Office of the Under Secretary of Defense for Acquisition. This Executive Summary of the team's report is the published version of that symposium presentation.]

The current program of attack submarine production is coming to an end. After decades of building three or more submarines annually, there have been no construction starts since 1991. It is generally believed that the current fleet of Los Angeles Class attack submarine is big enough to meet U.S. security needs for many years. Superficially, it may seem appropriate, especially given budgetary constraints, to suspend submarine production for a period of time.

At some point in the future, however, it will be necessary to build more submarines to replace the Los Angeles Class ships as they age and can no longer be operated at high standards of safety and reliability. Initiating such a construction program from scratch will involve serious challenges. Nuclear submarines are among the most complex structures built by man. Not only must they survive and function under water for long periods of time in a hostile environment, they contain a nuclear reactor in immediate proximity to the crew. Despite these challenges, U.S. nuclear submarines have demonstrated their reliability in diverse conflict situations while maintaining a very good safety record over the years. That history can be credited in large part to the highly skilled submarine design, engineering, and construction workforce, both in the shipyards and at the factories of critical-component vendors.

The most recently started submarine is now three years into construction. Shipyard workers and vendors of components

needed only in the initial phase of construction are already dispersing or preparing to exit the business. More will leave as time goes on and the industry shuts down in phases. If more submarines are not started soon, then rebuilding the workforce, reopening the shipyard facilities, and reestablishing the vendor base could be very costly and time consuming. Reconstitution could also compromise the reliability and safety of submarines constructed before today's high standards are reattained.

The purpose of this study was to determine the practicality of extending the current gap between submarine starts, given the time required to restart; estimate the money likely to be saved, given the offsetting costs of shutdown and restart; and characterize the largely unquantifiable risks involved in a reconstitution strategy. Our conclusions are as follows:

- It takes so long to restart production after shutdown that construction of the next class of submarines must be started by around 2001 if fleet sizes that the government judges consistent with anticipated national security needs are to be sustained.
- For the longest gaps feasible, the discounted stream of costs required to sustain the Submarine Force to 2030 results in savings of less than $1 billion compared to the cost of a more continuous program. That is well within the margin of error with which we can now project such costs.
- Given the difficulties and challenges involved in restarting submarine production from scratch, our cost estimates for restart may be too low and our schedule estimates too optimistic. Further risks related to nuclear licensing and environmental and safety concerns may jeopardize the success of the nuclear submarine program.
- Considering the limited savings realizable and the substantial risks incurred in extended-gap scenarios, we recommend that construction of additional submarines be started soon. Specifically, we recommend that the third Seawolf Class sub, now planned for a 1996 start, be funded, and that the Navy proceed with plans for beginning a new class of submarines in the late 1990s.

In arriving at these conclusions, we drew on quantitative data and qualitative information from private- and public-sector shipyards and vendors, relevant components of the U.S. Navy and the Office of the Secretary of Defense, and foreign governments

with shutdown experience. Sources included persons with varying perspectives on the seriousness of the delays, costs, and risks associated with a production gap. We reviewed all data critically, made adjustments where we believed it appropriate, and built and ran models to draw inferences where the nature of the data permitted it. We determined how stopping and restarting production affects shipyard and vendor costs and schedules and how decisions about future fleet size and production rate affect the production gaps feasible. These results were then combined to yield discounted cost streams for sustaining the submarine production base under a strategy of continued production and under various gapping strategies. We accounted for the costs of producing, operating, and maintaining the Submarine Force until 2030, when the Los Angeles Class subs will all have been retired. The results of the analyses underlying our principal conclusions are as follows.

Shipyard Effects

If submarine production is to be suspended for a period of years, substantial sums will have to be expended to shut down shipyard activities and facilities and do so in a manner that preserves tooling and information that might facilitate restart. Then, the yard and its production lines will have to maintained in working order during the gap. Additional expenses will be incurred in reopening facilities and rebuilding the workforce at the end of the gap. These workforce expenses dominate the total (for an illustrative case, see Figure S.1). Costs of rebuilding the workforce include those of hiring and training new workers, plus those arising from inefficiencies in producing early submarines, as the workforce will then have more workers at lower levels of productivity than it will later. We found that submarine production restart costs can be reduced if shipyards remain active with aircraft carrier construction or with submarine overhauls. (Currently, the latter are performed in Navy shipyards.)

The longer the production gap, the more skilled workers will be permanently lost from the industrial base, and the longer it will take to produce the first submarine and to ramp production up to the desired rate. If workers can be retained through other shipyard activities, these delays can be reduced. For example, whereas it would take over 10 years after contract award to deliver the first submarine starting from a residual skilled workforce of

250, it would take only 6 years if 1000 skilled workers could be retained.

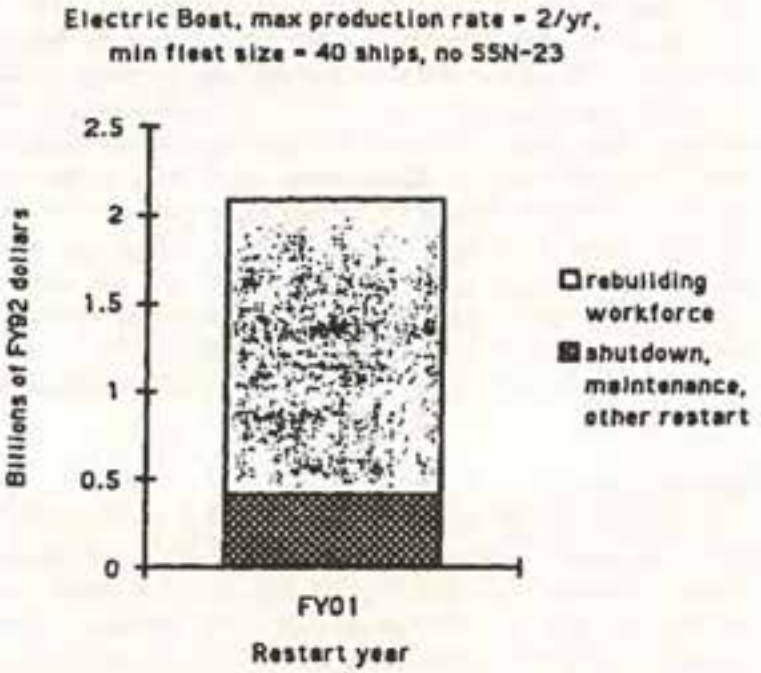


Figure S.1. Total Cost to Shut Down, Maintain, and Restart a Shipyard

Vendor Effects

Shipyards buy or receive through the government many submarine components—nuclear and non-nuclear—produced by outside suppliers. To be ready for installation at the correct point in submarine construction, work on some key nuclear components must begin well in advance (see Figure S.2[1]). Current work will keep nuclear-system vendors busy for the next two or three years (assuming a new aircraft carrier is built). Design work has already begun on the longest-lead components for a new attack submarine. Unless there is a lengthy production gap, it would not be practical to shut down the suppliers of such components.

[1] The times given in the figure assume an active industrial base; required lead times could be longer following an extended production gap.

Neither is it necessary to shut down the sole remaining U.S. producer of naval reactor cores, as that firm is engaged in producing cores to refuel aircraft carriers and the Trident missile carrying submarines. Shutting the remaining nuclear vendors down for several years would result in hundreds of millions of dollars in reconstitution costs, assuming reconstitution will be feasible.

Figure S.2. SSN-21 Shipyard Need Dates and Design and Manufacturing Spans for Selected Nuclear Components

The nuclear vendor base is small, but there are on the order of 1000 suppliers of non-nuclear submarine-specific components. For the most part, supply of these components could be quickly resumed once demand for them is renewed following a production gap. A small fraction, however, require special skills or technologies that may be difficult to recover should the firms producing them go out of business during a gap. For these cases, comprising at least a few products and at most a few dozen, reconstitution costs could amount to $.5 billion.

If submarine orders are delayed, the government could take a variety of actions that could help void the need to reconstitute the nuclear and non-nuclear vendor bases. Such measures include funding the production of items in advance of need, paying the firms to develop and prototype advanced methods to manufacture the needed components, or allocating other Navy work to those firms. Each of these measures has its drawbacks. But whatever

is chosen, it must be done soon, as critical non-nuclear suppliers may otherwise begin to go out of business within the next year.

Effects of Fleet Size and Production Rate on Delivery Gap

We have referred to the *production gap* that began in 1991 and will extend until construction on the next submarine starts. Since fleet size effects are determined by time of sub entry into the force, we now refer to the *delivery gap*, or time between delivery of the last sub now under construction and the next one.

Fleet size, maximum sustained production rate, and delivery gap are all interrelated. The implications for gap length cannot be understood without understanding the constraints that production rate places on fleet size. Estimates of future required attack sub fleet size range roughly from 40 to 60. Given the rate at which submarines will be retired in the future, a production rate of one submarine per year following a 1998 restart cannot even sustain a fleet size of 30 (see Figure S.3).[2]

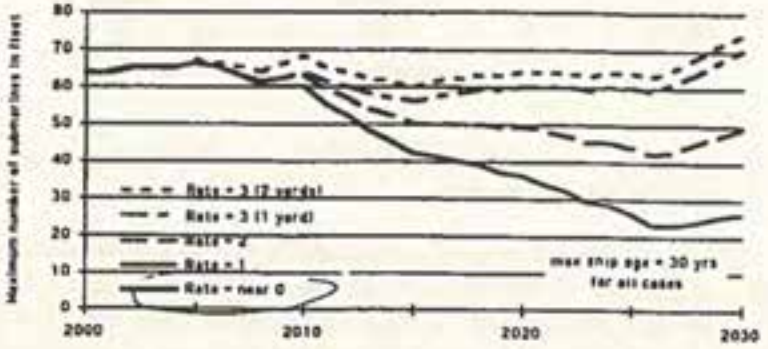


Figure S.3. Production Rate Influence the Fleet Size That Can Be Sustained

Two per year will sustain 40 but not 50; it takes three per year to sustain 60. If the service lives of the more recently built submarines could be extended from a maximum of 30 years to 35 years, the fleet size sustainable at a given production rate would increase.

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[2] In steady state, one new submarine per year could sustain a fleet of 30 subs with 30 year lives. However, submarines of the Los Angeles Class were built at an average of three per year and will be decommissioned at least as rapidly. At a production rate of one per year and a retirement rate of three per year, the fleet will shrink until all current ships are decommissioned (in 2027).

A fleet size of 50, for example, could then be sustained at two new submarines per year. *However, extending the lives of nuclear submarines is not a trivial task.* Much additional technical study and analysis of cost and military effectiveness is required before a decision could be made to implement it.

Figure S.4 shows the latest possible delivery date for the next submarine if various fleet sizes are to be maintained at a maximum production rate of two or three ships per year from a single shipyard, with a maximum ship life of 30 or 35 years. For many practical combinations of production rate, fleet size, and service life, it is not possible to extend a delivery gap beyond 2005. (Such combinations are represented by the blank triangles in Figure S.4.) Maximum gaps are to 2010 if a 40 sub fleet is to be sustained and to 2007 if a 50 sub fleet is the objective. Given the inefficiencies of restart, such gaps mean that construction of the next submarine must start by 2001 at the latest.

Latest Year to Deliver Next Submarine

for Max Age of 30/35		Production Rate 2 per yr	Production Rate 3 per yr
To Sustain a Fleet Size of	40	2005 / 2010	2010 / 2010
	50	/ 2005	2006 / 2007
	60	/	/ 2004

No 3rd Seawolf; blank triangle indicates delivery needed earlier than is feasible.

Figure S.4. No Matter the Scenario, Restart Cannot Be Long Delayed

For each of the maximum gaps shown in Figure S.4, it is possible to define a corresponding minimum gap as a baseline against which the savings of an extended gap can be compared. For example, as the figure shows, if an eventual fleet size of 40 is to

be sustained at a maximum production rate of two ships year, the delivery gaps must end in 2005 or 2010. The gap from delivery of the last ship currently under construction, scheduled for 1998, is then seven years in the 30 year case and 12 in the 35 year (for the latter, see the lower bar in Figure S.5). The minimum gap achievable in either case entails initiating construction of a Seawolf Class submarine in 1996. The Seawolf's delivery date of 2002 would then result in a four year delivery gap, followed by a three year gap (upper bars in Figure S.5).

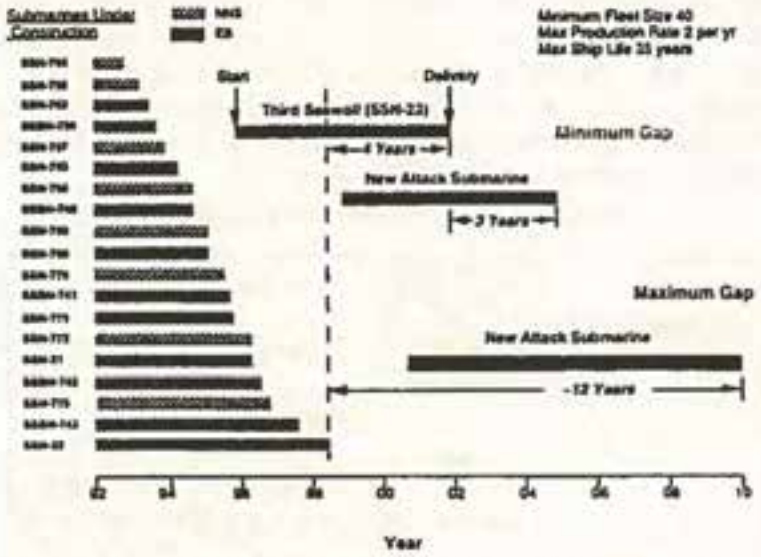

Figure S.5. Gapping and Restarting Relations Between Minimum and Maximum Gap Strategies

Gap Savings

Assuming the current submarine service life, the maximum gap strategy saves about $700 millon (net present value) relative to the minimum gap case; for the 35 year option, roughly $200 million (see Figure S.6). These savings take into account all costs related to production restart, construction, and fleet operations and maintenance through 2030. The savings for both cases are much smaller than the uncertainty to which our projections are subject and the $2 billion savings achievable through extending ship life by five years.

Figure S.6. Long-Term Cost Differences Between Minimum and Maximum Gaps Are Small

When production rate of three ships per year is allowed, extending the gap does not always result in savings, but the difference is, in all cases we examined, less than $1 billion. Life extension, on the other hand, results in savings ranging from about $1 billion to about $2.5 billion, depending on the case.

Gaps Risks and Constraints

The modest savings from extending the production and delivery gaps are achieved at a substantial increase in program risk. Some of this risk arises from the inherent uncertainty in making any kind of cost or schedule estimate for an action that has no real analogue: No dormant industries have experienced production restarts recently. Also, we have made no allowance for problem resolution in our estimates, although British experience indicates that it would be challenging to produce submarines that integrate new technologies developed during the gap years.

Other risks relate to more specific infrastructure failures that could substantially postpone or even jeopardize a restart program's successful completion. For some of the longer gap scenarios, for example, submarine design and development skills may atrophy, further lengthening the production phase. It is uncertain whether construction management, technical, and trade skills can be reconstituted at any reasonable price; once firms and individuals leave the industry, it may not be possible to lure them back.

Nuclear licenses and environmental permits may be lost if production is suspended; restoring them in the current urban locations of the shipyards could be characterized conservatively as a serious political challenge. If restarting production at a lower skill level results in an eventual accident, particularly one involving a nuclear reactor, the ship's crew and everyone else in the vicinity could be endangered, and public pressure could halt submarine construction and curtail operations indefinitely.

Gapping production also constrains the fleet sizes and production rates that can be chosen. World events may lead to a decision that a fleet size of 60 is needed to assure national security. Such a fleet size cannot be sustained if construction on the next submarine is not initiated before 2000. Even for a 50 ship fleet, delaying the next submarine start to 2000 or beyond would require a production rate greater than two per year, and the same would be true of a 40 ship fleet if the current 30 year lifespan is retained. It is uncertain whether submarine production at three per year would be viewed as affordable, and such a program would produce a full fleet of 30 year lifespan submarines in less than 20 years, resulting in another production gap in the 2030s.

Recommendations

Given the limited savings achievable through gapping production and the substantial risks incurred, we recommend employing a *minimum gap* strategy that entails constructing the next Seawolf Class submarine beginning in 1996, to be followed by the first attack submarine of a new design beginning around 1998. We also recommend that the Navy examine carefully the feasibility of extending the life of the more recently built attack submarines.■

THE FUTURE OF STRATEGIC SYSTEMS

by RADM John Mitchell, USN(Ret.)
Former Director
Strategic Systems Programs

[Editor's Note: This is an abridged version of the presentation given by RADM Mitchell at the Annual Symposium in June.]

I will try to phrase for you what, in my opinion, are the near term choices that we are facing in strategic weapons systems, and indeed in questions about the strategic posture of the nation in the out years. There is an ongoing Nuclear Posture Review which is in its third or fourth manifestation for those of us who watch that sort of thing professionally. There are expectations that it will provide some guidance for us toward the latter part of this year. My remarks reflect what I think the issues are that we dealt with in that Nuclear Posture Review and not necessarily what the Nuclear Posture Review will produce as answers.

The most immediate issue is D-5 missile procurement. We have been in continuous production of Trident II D-5 missiles since 1987. We are now at the point where we know we are approaching the end of production and the question is precisely when to end it. The clear issue is the size of the missile inventory we wish to acquire, because that inventory will have to sustain the weapons system for the foreseeable future. The Trident class submarine has a design service life of 30 years. Most of us know, or suspect, that the actual service life will be extended beyond that. We are building 18 submarines at a rate of one a year. That says you will have an SSBN force in being, since the last submarine will be delivered in 1998, for another 40-45 years. Will we procure weapons systems assets that we can use to manage and support the role of the SSBNs over the long term?

That is a question that will be resolved on the playing fields of the Navy Comptroller and all of the parts of the United States Congress. It is a drama that has been played over the last couple of years with a great deal of fervor. This year I am pleased to report the Congressional support we've had for the 1995 budget has been very large. However, the issue of termination of procurement has continued, and it is yet to be decided when we do stop - 1996, 1997, or 1998. Part of the key to this decision is the

service life of the weapon system we are protecting. There is a direct relationship between the number of missile assets procured and our ability to sustain the reliability performance of the system over the long term, and provide for its flexibility.

It's easy to identify the day when you do not buy another missile. But there are some things you have to do immediately after that that are not quite so obvious. One of the things we did in the Trident II D-5 program to save money along the way was to procure the missile in a way that allowed us to combine utilization of spare parts with the production of missiles to support both operating forces and the production line from one common pool. As a result, we did not procure specific missile spares to support the population over the long term. **At the time we close the missile production line we then also have to decide on the missile spare inventory of piece parts, like rocket motors, electronic components, etc.** What is that one-time buy that we will make of those last assets that provide us the flexibility to extend the utility of the missile assets over the long term? That is another one we are playing out in the Comptroller's process and is another that unfortunately involves large sums of money. It is directly related to the third item.

When the D-5 missile goes out of production, there will be no ballistic missile production in the United States. The industry that supports us in many cases is common to other industries, so we know how to make semiconductors, aluminum air frames and that sort of thing. But there are some things that are, in fact, unique. The most obvious is the large solid rocket motor production business. That is an industry that is unique to the ballistic missile field. It is not common to space assets because they are typically liquid fueled or designed to a much less severe design set of characteristics. The point I would make in that area is that design differences are extremely important. It makes a big difference whether you are designing a rocket motor that you will expend in a year or two, or a solid rocket motor that you expect to sustain for 30 years and then wish to use with confidence. Those are two entirely different design philosophies, leading to two entirely different production complexes. Therefore, it's somewhat simplistic when people wish to be able to say that as long as we have the space program we will have a ballistic missile industrial base. I'm afraid the details don't support that.

The whole series of arguments about what is the ballistic

missile industrial base must note which parts are unique, which parts are not, and what approaches are needed to allow us to sustain that ballistic missile industrial capacity over some period of time. That will be the third question that very naturally evolves from the first two.

As you choose to stop buying the missiles, as you choose to buy spares, you must also establish the degree and manner you wish to support sustainment of any form of the industrial base. Why do we wish to sustain the industrial base? Because it's not at all clear that the world is going to remain fixed and is going to match our assumptions of the out-years. If the assumptions are such that we have only 10 Trident submarines carrying D-5s and that's sufficient; then the currently planned missile inventory fits the service life. If there's some uncertainty about that, and you wish to hedge a bet; if you wish to avoid the cost of a missile development program or reestablishment of a missile industrial base, then there may be some things to do for the next 5 or 10 years. What you're really hedging is the cost and development risk of reestablishing the line.

Those are the issues immediately before us in the area of the D-5 procurement.

The next issue concerns our plans for Trident I C-4 in the Pacific. This system has been in service for about 15 years; we designed it for 10. We feel comfortable saying this system probably has a predictable service life in the range of 20-25 years. One of the difficulties you have here is reaching an agreement on the meaning of *useful service life*. It isn't simply the ability to sustain the system in performance. Many times the system performance doesn't change; what changes is the predictability of the cost of sustaining it. What does it cost you on an annual basis and how predictable is your cost for sustaining that system in operable service? When do you start to lose confidence in it? When do you start, in your mind and in the minds of the people around you, assuming that now the system is not performing, is not reliable as it was and you start treating the system differently because of your perception of it. All of those things play in the term *service life*; it is not a simple thing at all. The question that we will have to deal with in the near term is what is, in fact, the correct definition of *useful service life* of Trident I C-4 missile. The dialogue for that process is not underway in a clear manner yet. But when you have decided what the *useful*

service life is you have to decide if you meet it.

There are a number of choices available to us right now that deal with that *service life* question. One is to choose, for financial reasons, to cease providing financial support to the system and terminate its utility prior to the end of that *useful service life*. That's an economic choice that could be made. If one chose not to continue to spend money on the weapons systems on the Trident submarines in the Pacific, you could in fact choose, by the financial process alone, to terminate the system prior to the end of it's *useful service life*. Another approach is to decide to predictably increase that service life. Is there a way to invest money wisely now in developing alternative methods to evaluate *service life* that allows us to extend that *service life* in predictable 5 or 10 year increments? Not to commit to a definite number, but embark on a program that says, let's go buy 5 years at a time. And do that with confidence. You invest now for the purpose and intent of deliberately sustaining that service life in measurable increments. The third choice is to make a deliberate attempt to do a one time extension. The way we design and support ballistic missiles is relatively simple. We go through a very extensive development program. We conduct a great deal of destructive tests in the process. We arrive at a design, we build on that design and we run the entire operational support structure with the intent of sustaining the missile inside that design disclosure that we have invested in and understand. What happens, of course, is that the missile, by age and other things, wishes to move itself away from that design disclosure package over time. That's called aging. If you ask us to deliberately extend the service life of the missile for some period of time, we will tell you that we want to bring the missile back into that design disclosure package that we invested in and understand. So you now embark on programs that provides replacement components that correspond back to the original design disclosure package in which you have confidence, and can state how long it will last.

So that's really three discreet choices that exist on how one treats the Trident I C-4 weapon system. Do we choose for simple financial reasons not to use the service life that's there? Do we embark on a deliberate program to sustain pieces of service life in predictable hunks? Do we make a one time commitment to buy another 20 years of service life? These are the choices that will be facing us over the next three to four years in the question

of the Trident I submarine force in the Pacific.

There is no new data. We have costed them, invested in them, understand them, made viewgraphs of them, and everything we can think of. The choices exist. They are well described. Now, simply, the choices must be made.

Immediately following that series of choices will come the issue of support and sustainment for the Trident II D-5 force. The Trident D-5 force was designed to for at least a 25 year *service life*. Do you choose to simply sustain the force to look as exactly as it is for 25 years? That's one investment policy you could follow. You could invest funding simply for the purpose of keeping the system exactly like it is for 25 years. However, if you wish to have the choice of modernizing that force at some time, changing what it does in characteristics, increasing its flexibility, extending its *service life* in a predictable way, then you also have to sustain the industrial and technical capacity to do so. That is, knowingly sustain your ability to modernize that force. Twenty-five years is an extremely long time to keep a weapon system exactly the same. We have never done that in the strategic force structure of our nation. If you look at the B-52s in the aircraft world or look at the missile systems, we always do something to them at the 10 or 12 or 15 year point. We don't keep things exactly the same for 25 years. If you wish to have the option to modernize that force in some way, it requires a deliberate decision. There are specific technical capabilities and specific R&D investments that must be made to preserve that choice for you.

One of the things that we would recommend exploring is an increase in the flexibility of the force. When we designed these systems, they were designed for a single purpose in a very clearly described world. They are probably the most highly optimized weapons systems designed anywhere. They do one set of things in an extremely well defined manner and do it extremely well. But should we wish to change the flexibility of this system? We designed the systems to operate with very specific manning levels, specific readiness states, very specific missions. If you wish to deliberately expand the flexibility of the force you have to make investments to do that. Most of us believe there is a great deal of flexibility inherent in the strategic weapons systems. If there is, in fact, a valid or legitimate requirement now or in the future where they can be applied in some other manner, then exploiting

that inherent flexibility in this very large capital investment is something that has to be done deliberately.

You have to go through a need definition process and then determine what else can be done with ballistic missile technology. Now I'm not talking necessarily about SLBMs as they currently exist. We have taken ballistic missile technology and applied it uniquely to the strategic world in probably the most optimized way ever. We have taken a general purpose capability to fly with great accuracy from one point to another without any man intervention in between (that's what a ballistic missile does); and we have taken those technologies and optimized them for use in the strategic mission over time. Yet we could take that technology and apply it to the different warfare missions of the future. You have seen presentations given over the last couple of years that identify some of the ways to do that. We think that is a choice that needs to be looked at deliberately. Do we wish to exploit ballistic missile technology and can we do that and have that process assist in the sustainment of the SLBM force.

As we have dealt with this question over the last few years, we have reconfirmed that there are some technical differences between our strategic forces and the general purpose warfare systems with which people are more familiar. Our systems do not adapt easily to the changing need for states of readiness like tanks and aircraft. We wrote down very precisely what the states of readiness are which we wish the strategic weapons systems to have and sustain. These systems attain their maximum level of readiness instantly and stay that way. These weapons systems are sustained, at the system level, to be readily useable and are deployed and utilized every day of their life while on patrol. The weapon system is designed that way. There are no other states for which it is designed. That is a very specific design process with a very specific set of outcomes. That means that if you choose to use that type of weapon system for something else, you'll find that we very cleverly designed it not to do that, or made it hard to do that. So if there are different states of alertness, or readiness, that are now appropriate in the world, and that are different from what we did in the past, we need to recognize that this weapons system can't get there by accident. It has to get there in a specific way by defining these states and recognizing that we must in fact redesign at the system level so that it can be continue in those states for a long time.

These systems are designed to be dealt with as nuclear weapons systems on a routine basis. We handle and move nuclear weapons and deploy them in an active way every single day. It is not an occasional event. It is not a contingency capability. It is the absolutely routine way of life for these strategic weapon systems. That brings itself to bear in every thing there is to do with the design and maintenance of the weapon systems. The command and control, the handling, the readiness and reliability of the system, and the detailed flight reliability system is intertwined in the nuclear weapons safety and reliability process. Safety, surety and command and control of nuclear weapons are drivers, and are integrated in the nuclear strategic weapons systems. It is not something that can be disregarded. There are no other states that it can be applied to.

If you wish to have predictable and safe operation of these systems in the future, then the decisions on how they are to be sustained must be done with objective and factual data. That seems a perfectly obvious statement to make. I have been in Washington since 1981. I have been going through the Navy/DoD-/Congressional budget process for almost 15 years. I find that every so often it is appropriate to write that on a viewgraph and state it again, because I find that a number in the decision making processes wish to do it on some other basis. Their expectations and desires for success many times require them to use something other than objective and factual data. The commitment that we at SP have made all through the years is not to make the decisions, but to ensure that we make available objective and factual data that is clear and understood. We endeavor to assume that these decisions are made properly. If you go back and look at the last points, you will find why that is so critically important to us. People that are not familiar with these systems need to be reminded that these systems, everything about them, are part of a nuclear safety assured world everyday and they are operated at their maximum state of readiness for their entire service life. I believe these are unique and quite different from any other weapons systems with which people deal. ■

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 content of articles is of first importance in their selection for the REVIEW. Editing of articles for clarity may be necessary, since important ideas should be readily understood by the readers of the REVIEW.

A stipend of up to $200.00 will be paid for each major article published. Annually, three articles are selected for special recognition and an honorarium of up to $400.00 will be awarded to the authors. **Articles accepted for publication in the REVIEW become the property of the Naval Submarine League.** The views expressed by the authors are their own and are not to be construed to be those of the Naval Submarine League. In those instances where the NSL has taken and published an official position or view, specific reference to that fact will accompany the article.

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

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KEYNOTE ADDRESS

by RADM M.Y.E. Pelaez, USN
Chief of Naval Research
Submarine Technology Symposium
May 11, 1994

The world has changed and is continuing to change even as I speak. Like many others species, we in the submarine business will either adapt or perish. I am here today to challenge you to change your paradigms, refocus your outlooks, and to be bold and innovative in your thinking and actions. If you don't, many of you will not be present at the symposium held 5 years from now—and I am saying this as a friend, a submariner, and ASW advocate—but the situation is serious and I think we need to be as honest as possible with each other and to work together to ensure our Navy has the technology and forces it needs to prevail in the future.

Until now, the Submarine Force has always been up at the front of the pack—the clear Navy leader in innovation and the application of technology. As a result, today's submarines are the very hallmark of twentieth century technology; capable of high speeds, long endurance, and of striking suddenly from a position of stealth with an impressive variety of modern weaponry. Today I'm concerned that we are falling into a reactionary, vice pro-active, mode of thinking—letting events and changes drive us—instead of us driving the changes with new and innovative thinking. Instead of leading, we are in danger of falling behind and we need to do something about it right now, before we are completely overtaken by events.

You all know that the budget pressures on the Navy are very severe. The demands of potential regional conflicts dictate that we maintain strong presence and power projection forces centered on carrier battle groups. The cost of modernization and recapitalization of these forces leaves little left over for the rest of the Navy, including submarines and ASW. There is essentially no flexibility left in the procurement accounts.

This is the every day reality faced by Navy planners. Many in the submarine community have not felt the full impact of this as they have been living on previously authorized work. In 1992, the Defense backlog was about $241 billion. Today that backlog stands at about $116 billion and is still shrinking. We have not

yet reached an equilibrium level. Let me frame the problem from a Navy viewpoint. In 1990, the Assistant Secretary of the Navy (RD&A), as the Navy's procurement executive, had about $43 billion in his procurement and R&D accounts—$35 billion for procurement alone. In 1993, **all of DoD** had $43 billion in its procurement accounts.

As a result, the Navy is being forced to make very difficult decisions that require the sacrifice of current force structure and capability to allow for some degree of modernization and recapitalization. All this while sustaining the readiness of today's forces in an operational environment whose tempo has not substantially lessened, even with the end of the Cold War. Some of these decisions will have a direct impact on our submarine and ASW programs.

Funding for ASW programs has taken major hits and has been significantly reduced from levels expected even a few years ago.

- Priority has been reduced significantly—there is little advocacy in the Pentagon or Congress.
- The submarine threat to our forces is not perceived as credible.
- There is a "What have you done for me today?" attitude.
- Many people discount the diesel-electric threat due to the training and material conditions of potential third world and regional adversaries.

Few people are worried about the potential threat posed by the large, modern, in-being Russian submarine force.

- Intentions, not capabilities, are being stressed when ASW budgets are being considered.
- The fact remains that Russia is maintaining a large force of modern submarines at a time when we are rapidly downsizing our submarine and other ASW forces.
- Some analysts believe the Russians will construct and deploy even more modern submarines with greatly improved quieting features and new, more powerful weapons.
- While the current political situation favors the "intention" point of view, the situation is still volatile and could change almost overnight.
- Since our submarine and ASW force structure is being reduced, we need to ensure that the forces we retain are as

modern and technologically capable as possible. This is a job for all of us.

Funding and support for submarine programs has also been under considerable pressure. We are not purchasing new SSNs at a rate necessary to sustain the present or projected force size. Purchases of equipment, torpedoes, towed arrays, etc., are tailing off rapidly. The problem is driven by decision makers who are unsure of SSN roles in future littoral warfare scenarios.

- The net result is a much smaller submarine force, down to the 40–50 level and perhaps even lower.

It is unlikely that either the funding situation or the perception of need for ASW and submarine forces is likely to change in the foreseeable future.

You have heard this before and I don't think the prognosis will change no matter what our personal views and wishes may be, so we will have to figure out how to retain as much ASW and submarine capability as we can, while maintaining the ability to surge or expand if we have to within the funding constraints we are presented with. This isn't an easy task.

Indeed the very title of this symposium, "Submarine Technology," illustrates the difficulty we will have in changing our ways of thought because we really should be focusing on **submarine capabilities**—not individual technologies—for it is these capabilities or their lack that will determine whether or not submarines remain viable players in the future—capabilities which transcend the sum of their individual component technologies through innovative combinations and employment concepts.

Affordability Initiatives

Affordability is always a major issue when resources are scarce. Like it or not, we must develop platforms, systems, and technologies which are affordable in terms of what the Navy can pay. If we do not, we simply won't have the new systems we need to modernize our forces or the wherewithal to maintain a force structure of sufficient size to meet our needs. This is a real challenge to our ingenuity and resourcefulness.

To meet it, both we and you need to change the way we do business. For our part, I believe the Navy needs to **buy systems that rely more heavily on COTS** (commercial-off-the-shelf)

equipment and to use **MILSPECs for procurements only where commercial standards are either non-existent or clearly inadequate to meet our needs.** While some progress has been made in this area, much, much more remains to be done. We need to change our mindsets about the way we specify things and do business.

- We also need to look at simplifying the contracting process. The Vice President and the Secretary of Defense clearly have the right idea here. While many of our current practices were brought about to solve particular problems or to achieve particular social goals— and may be admirable when taken individually— collectively they stifle the procurement process and greatly increase the time and cost of doing business, often with no real effect on the resultant product. This subject is before the Congress now and I hope we will see some reform before much more time passes.
- We need to **look harder at cost and manufacturability issues early in the R&D process.** I have instructed my staff to do so and we have reorganized to foster a more vertically integrated effort and to help eliminate any artificial barriers which may have grown up over the years.
- We need to look at the whole process of life-cycle maintenance in a COTS environment and one in which the pact of technological change is still accelerating, and we need to plan for its equipment replacement and modernization at the outset of any development.
- We need to attain the necessary degree of reliability, provide for supply support, and plan for replacement in a COTS environment. This may require increased redundancy or higher levels of sparing or different concepts of maintenance, but going the COTS route still may be cheaper than going with a full-up MILSPEC procurement. My point here is that both you and we must be ready to look at alternative means of getting the job done which are cheaper and more cost effective.

You need to look hard at your programs to survive these difficult times. It requires boldness and imagination to convert submarine and ASW-related technologies for use in commercial applications. Let me give you some examples of what I mean:

- Fiber optic sensors might have use in *smart* buildings and structures.
- UUV technology might find application in remote environmental measurements.
- Acoustic processing and miniaturized sensors might be helpful in medical imaging and diagnostic applications.
- Advanced signal processing technologies might lead to improved methods for polygraph detectors and medical scanning technologies.
- In some areas such as C^3 and computers, transition to civilian applications will be relatively easy. In others, such as construction of quiet submarine propellers and pressure hulls, it will be more difficult. In the former, we have transitioned from an era where defense was the primary driver and customer to an era where defense takes only a small part of the output and certainly does not drive the mass market in any meaningful sense. In the latter, we may be the only game in town.
- You also need to take full advantage of the opportunities offered by initiatives such as the Dual-Use and Technology Reinvestment Programs that can help ease the transition to a world with a lower level of funding for defense purposes. But these programs, helpful as they may be, will not substitute for your own efforts and ingenuity in attacking the problem.

I also recognize that decreases in procurement money means that less will be available for IRAD in submarine and other areas which are unique and critical to the Navy. We will do our best within our available resources to help maintain a critical mass in those areas which are truly Navy unique and for which there are no ready civilian applications.

There are some other things that you must do as well. First, get your overhead costs down—we need to get more product for the money.

- This is the 90s. Glitz is out—solid, affordable systems that make significant improvements to long-term Fleet capability are in.
- In short, it is no longer business as usual and we will have to adapt, and I am speaking to those of you from the in-house laboratory community as well.

I really don't have any pat answers or sure-fire prescriptions for success except to say that we need to be flexible, innovative, and cooperative—in-house laboratories and industry and academia—industry players between themselves through teaming or other arrangements to provide a full spectrum response when each player only maintains in-depth expertise in limited areas—and through the frank and open discussion of our mutual problems and requirements.

We need to be innovative in the operational area as well. During the Cold War, our attack submarine force was our most important open ocean warfighting capability and provided the foundation for the sea control necessary to both reinforce our allies and counter Soviet submarines and surface ships, including holding parts of their seaborne deterrent forces at risk.

Today the Navy doctrine espoused in ...From The Sea requires the development of Naval Expeditionary Forces shaped for joint operations, operating forward from the sea, and tailored for national needs. Battlespace dominance; power projection; command, control, and surveillance; and force sustainment are the key operational capabilities necessary to successfully execute this doctrine. I believe our SSNs can make a valuable contribution to the attainment of all these capabilities, even force sustainment.

- The modern SSN is perhaps the ultimate instrument of surface and subsurface battlespace dominance. Striking without warning with either torpedoes or missiles, it has the capability to clear the ocean areas in advance of other battle group, amphibious, and logistic support forces.
- The advent of precision guided missiles such as the Tomahawk give it an impressive conventional power projection capability to complement the strategic nuclear capability inherent in our SSBNs. The ability to lie undetected off enemy coasts and to strike key installations successfully with little or no prior warning is a most valuable commodity. Future improvements to our submarine launched missiles will make them even more accurate and lethal than they are today.
- Surveillance missions requiring stealth, endurance, and a high degree of professional skill have long been the hallmark of our submarine force. SSNs are the ideal platforms for such missions, being virtually undetectable and yet possessing the endurance, equipment, and trained professionals necessary to carry out these demanding missions successfully, as they have done so often in the past.

While some pundits have questioned the value represented by our modern SSNs in regional warfare scenarios, it is clear that today's submarines are critical to our ability to dominate the littoral battlespace. Their operations can facilitate the follow-on entry of joint forces including surface combatant and amphibious landing forces. Just some of their impressive capabilities include:

- Inherent stealth
- The ability to arrive early, with or without notice—depending on the message we wish to send—and to stay late
- Sudden and unexpected strike
- Relative invulnerability to current third world ASW
- Anti-surface warfare, anti-shipping warfare, and power projection
- Covert I&W
- Covert insertion and extraction of Special Forces Personnel

Submarines represent an unknown quantity in the problems that must be considered by potential adversaries.

- Are they there or not?
- Are my surface and merchant ships safe from attack if I sail them?
- Are my communications and air surveillance networks being monitored?
- How much information is my opponent getting?
- Even though there is nothing on the horizon, are my key facilities safe from cruise missile attack?

These and many other questions like them cause great uneasiness, and, by their very nature, help deter aggressive actions counter to our interests and do so without placing our valuable surface and air platforms at undue risk to air or missile attack.

Limited Horizons

In considering the successes of the past and present submarine capabilities, we need to be very careful not to limit our horizons unnecessarily as we think about the future. We are currently in a transition period between an age where manufacturing capability dominated warfare, and an age where real time information of the battle situation will be a dominant, if not *the* most dominant factor. As the battleship dominated naval warfare in World War I, the aircraft carrier in World War II, and the nuclear submarine in the Cold War—all part of the age of manufacturing—what will be the dominant

naval platform of the information age? Given its stealth, relative invulnerability to conventional attack, and impressive surveillance and strike capabilities, the nuclear submarine could well be this platform. But this is certainly not clear at this time, and I challenge you to apply your imagination to look at the means which will be required for the submarine to continue its dominant role into the future.

We in the Office of Naval Research are searching hard ourselves to determine those new technological developments that will truly make a difference to the future success of our naval forces—technologies that will serve our forces well in a future where a high premium is placed on real-time information of the enemy and a clear picture of the battlefield which eliminates the fog of war.

Some areas we believe will be important include:

- Time Critical Strike: the ability to attack targets when windows of opportunity are brief. These targets can be either fixed or mobile, but success requires real-time surveillance, targeting, mission planning, strike, and battle damage assessment capabilities. Obviously, real-time connectivity between the surveiller and the shooter is a must.
- Information Dominance: basically this requires that our warfighters make better decisions more rapidly than their adversaries. Automated, intelligent decision aids will assist our forces and serve as repositories of warfighting knowledge.
- Environmental Dominance: this is essentially ownership of the battlespace environment so that we can exploit it to its full potential while denying the enemy its use.

The real question is what role can submarines play in these and other areas? Will they prove as flexible, useful, and dominant in the future as they are now? It is a challenge for all of us to determine how they best fit into the future of warfare.

There are lots of possibilities. They are limited only by our own imagination and willingness to innovate and try new concepts.

- We need to think now about better ways of doing the littoral mission—if we had some of the items previously noted, how would we use them? What tactics would we employ?
- What other changes could be made to enhance our capabilities?
- What new ideas and concepts should we be including in this year's war games? How can we best show the value of the significant submarine contribution to battlespace dominance in the littoral warfare scenario?

- And speaking in regard to war games, we really need to put our best foot forward there. War games offer the opportunity to try out new technologies and operational concepts and to obtain some idea of their value to fighting forces before we go to the expense of developing and fielding a system. They are great to look at large numbers of *what ifs*.
- They also serve to educate the players and the senior officials who review their results on the exceptional value represented by the modern SSN across a wide variety of potential mission scenarios and applications, including those associated with operations in the littoral regions of the world, so we really need to work hard to do a good job in the games.

My main concern is not about the value of our SSNs or the great contribution they can make to meeting our warfare goals and objectives, but rather:

- Will there be enough of them?
- If Russian intentions change, can we support the Battle Groups, seek out and destroy opposing SSNs **before** they become a threat to our replenishment and logistic forces, and hold a portion of their seaborne nuclear deterrent force at risk—all at the same time?

I am also concerned because of the cutbacks that have occurred in other supporting forces such as the Undersea Surveillance System and ASW aircraft squadrons. ASW is a team sport and reductions in these areas will limit our capability to respond as successfully as we have done in the past.

The questions I just posed and many other issues require serious thought and an open mind. We in the Submarine Force need to build upon the truly impressive successes we have achieved over the past 40 years and to move forth in to the future with confidence in our ships, ourselves, and our ability to carry out our mission in the changing world of the future. We need to be flexible, adaptable, and ready to meet the challenges of a changing world.

We need to develop new paradigms both ashore and at sea to seize the opportunities afforded us. I am not saying this will be easy—change is difficult—but it offers opportunity and challenge as well as the pain of adjusting to a new environment.

New ideas, tactics, and equipment will be required to carry out these demanding tasks. For example, joint operations will require a

greater degree of connectivity than we in the submarine business have been used to in the past. This may require:

- SHF/EHF satellite links
- Greater use of imagery
- Real time communications
- New types of antennas

Another example is the total combat system engineering of a submarine. In the past one contractor developed the sonar, another the fire control system, another the hull design, and yet another the propulsion plant—and the ship was often built by still another party. The result was sometimes a collection of components optimized at the system level, but, which taken together, may not have optimized the capability of the submarine as a whole. Would it be possible to have a single integrated design and construction process that truly integrates the combat system with the hull envelope and the propulsion plant in an optimum manner?

Other equipment and design innovations might also prove useful:

- Non-lethal disabling devices for use against surface ships
- UUVs/UAVs to extend surveillance and targeting capabilities
- Off-board mine detection sensors
- Low-cost, deployable sensors and arrays that could be monitored from standoff distances while providing 24-hour coverage of areas of interest
- Half-length torpedoes with the same characteristics as the MK 48 ADCAP to provide more total firepower in the same torpedo room footprint—could we use MK 50s as submarine launched ASW weapons? What would be the advantages and disadvantages of such a course of action?

In summary, I challenge you to be bold and to be innovative, for if you are not, you will surely be gone. Thank you. ■

WATCHING THE REAR-VIEW MIRROR

by CDR Richard Compton-Hall MBE, RN(Ret.)

[This summary contains a tidier and slightly expanded version of Commander Compton-Hall's presentation to the Annual Symposium in June. He spoke as a talk given, supposedly, to the fictional Ruritanean Navy on 15 June 1994.]

Thank you very much for inviting Eve and myself to this symposium, and for your hospitality. It is a great honour to be asked again after the passing of four years—and rather more than four million calories.

In order to avoid your shooting the pianist outright, or my ending up in the Tower of London, I ask you to pretend that I am now talking to the fictional Ruritanean Navy who are trying to learn the lessons of history before creating a new submarine force.

The Ruritaneans agree with me, it seems, that history is only another word for experience—and that anybody who disregards experience is standing into danger.

But the West (I tell them) tends to relegate history to academics, forgetting that it could be a strong tool when persuading the money men to provide what is needed for effective submarine forces in a cold financial climate.

For a start, we can briefly review history-experience in just four areas—public relations, the acquisition of weapon systems and vehicles, intruder operations, and personnel.

Public Relations

Submariners are not, by nature, good PR merchants. There are reasons for this, secrecy being foremost; but, historically, there is more behind their PR ineptness.

At the turn of the century British *submarine torpedo boats* were not welcomed to the magnificent fleets that had won and held the British Empire—simply because they threatened the very existence of big ships. Submarines were therefore labelled underwater, underhand and "damned un-English weapons". Submariners looked like "unwashed chauffeurs". Submarining was no occupation for a gentleman. The Controller of the Navy recommended that "all submarine crews captured in wartime should be hanged as pirates". The officers striding the spotless quarterdecks of

battleships and cruisers looked down upon the grubby little *submergibles*—both literally and figuratively.

Things were not much different in the United States Navy. John Holland complained that the Navy did not favour his submarine designs because they had "no deck to strut upon". The admirals refused to believe that submarines were realistic weapons of war; and American shipbuilders preferred surface vessels because there was more profit in them.

The result of general disdain was that submariners withdrew into what were virtually private navies; and they had something suspiciously like a chip on their shoulders. Why, otherwise, does the U.S. Navy demand that the word is pronounced submarjners to ensure there is no confusion with subordinate mariners?

For many years few admirals knew what submarines could or could not do; and, despite their performance in two world wars, a lack of adequate communications with head office was evident in both the U.S. and British navies—arguably until at least the 1950s. Traditional privacy has weighed heavily against promoting the submarine cause publicly.

It may be said that PR has improved since the introduction of nuclear power. Maybe, but I agree with the British House of Commons Defence Committee who were moved to remark three years ago:

> "The Submarine Service is an elite and somewhat self-contained world; as a result submarines can be misunderstood, underestimated or neglected. We consider that one priority task for Flag Officer Submarines and for the Ministry of Defence is to look at ways of increasing professional, parliamentary and public understanding of the Submarine Service."

Amen to that. How can that understanding, on which so much depends, be duly increased? A couple of ways, in addition to formal publications, come to mind:

- Teach officers how to deal actively or even proactively, rather than defensively, with the media. It is most unlikely that any real secrets will be given away.
- Promote submarine *faction*. Tom Clancy was a good friend to submariners with his Hunt for Red October: the book did more

for PR than a host of factual articles in The Washington Post or the London Times. One of my own books, Submarine versus Submarine, sold very well—not for the facts in the first part but for imagined events in the second.

My personal history-experience suggests that folk at all levels will listen to submariners more readily if they are candid—if they admit that submarines cannot do everything. This can be done with light humor, while fully recognizing the parts played by other forces.

In any case, submarine wares have usually been advertised in the wrong way. In the 1960s I was tasked to write down all the things a submarine could do. I remember listing 12 functions—and they got us nowhere in the Admiralty. I made a similar mistake in a recent paper for the Defence Committee: I wrote it back to front—citing submarine advantages foremost instead of spelling out defence requirements and then concluding that submarine systems were the best for meeting certain of them. At least the latter approach would have appeared objective!

Throughout, though, there is one expression which merits wider circulation; in times of fragile peace submarines, uniquely, can sit on a potential enemy's doorstep **without provocation**.

Acquisition/Procurement

History-experience tells that, except under the stimulus of war or intense international competition, it takes, on average, 12 long years to get a good idea translated into hardware. Then it takes about three years for operators at sea to learn how to use the new equipment. Sometimes the process takes even longer. For example, I believe that the Mark 48 torpedo program was initiated in November 1956—production began in 1972, 16 years from conception to multiple birth. ADCAP status was demanded in 1975 and was in place for five percent of the weapons in 1986, 11 years for the advanced capability.

When a major item, an entire submarine perhaps, is finally at sea it will be expected to last for about 20 years to amortise the capital cost acceptably.

Unfortunately, planners are apt to forget this historically lengthy time-scale. That leads to asking for material which will suit today or tomorrow, but not the quite distant era when it will actually be in use. Space may well be left for future improve-

ments but, all the same, planning vision is too often restricted to the visible horizon.

The moral seems to be that if Ruritania is going to move forward it should do so with long strides.

There is another historical criticism that can be levelled at past planning—albeit with a handful of honourable exceptions such as Polaris. More often than not a Western navy has first conceived a new submarine and devised characteristics which can be achieved fairly soon; next it has asked the ordnance experts what weapons it could provide within the vehicle's imposed limitations; and sometimes only then has it really thought about the kind of enemy it might engage.

Logically, this process is in reverse order. An enemy's technological characteristics which will need to be opposed—all those years ahead—should surely be extrapolated first. Then a weapon system must be devised to cater for them, without discouraging lateral thinking, and only then should a decision be made about the kind of vehicle needed to carry the weaponry. How else can a navy justify, rationally and convincingly, a certain speed or diving depth or whatever—or, indeed, a submarine at all?

The Royal Navy has just been obliged to decommission its four brand new and outstandingly well armed Upholder Class SSKs, mainly because the SSKs were looking for a need (in changed circumstances) instead of there being a need looking for them.

Incidentally, it is impossible to predict who a future enemy will be, but that does not matter if efforts are directed at forecasting the future technology which anyone may possess. Of course, when an enemy is eventually identified it will be necessary to enter the numbers game.

One advantage, at the outset, of guesstimating future enemy technology is that the ball is in the government's court. If government can be persuaded to announce the capabilities of an unknown future enemy (with advice from the navy, intelligence and crystal-ball gazers) the development of systems to counter them should follow without undue hindrance. Government cannot reasonably say, as, in effect, it does now, "No, admiral, that new submarine is too expensive; you must choose something cheaper". There are very few weaponry examples in the past, save for SLBMs, where the first ball has been put where it belongs—on the government's side of the net.

In any event the words of Admiral Eli T. Reich deserve to be

writ large: "There is a tendency to forget that, in the end, it all comes down to placing an ordnance package alongside the other fellow...and making sure it explodes." The final words a reminder that wholly realistic (admittedly expensive) and random tests of weaponry have too often been woefully lacking. History tells us that it is a false economy to forgo them.

On a related subject, are Ruritaneans convinced that they want just one general purpose type of SSN which can, in theory, perform all tasks? Are they sure that they will not—inevitably in vain—try to cover all possibilities instead of shooting for carefully judged probabilities? Is there not some merit in having smaller (preferably air-independent) boats—equivalent to surface frigates and sneak craft—for inshore and intruder operations? SSNs can undeniably work in shallow, confined waters; but their capabilities are largely wasted there, and these very valuable assets can be at undue risk—especially from buried mines, whatever mine-detection devices such as robots are available. Smaller and less vulnerable vehicles, perhaps built of special materials, would be more suitable, more economical and safer.

Intruder Operations

The last thought leads to intruder operations and the complaint of President Woodrow Wilson, speaking of German U-boats in 1917: "I despair of hunting hornets all over the farm when I know where their nest is". Mini-subs, transported by their big sisters, are ideal for dealing with nests.

Midget submarines, exemplified by British X-craft in World War II, are strategic weapon systems. They are not simply scaled-down, and hence less effective, versions of standard tactical boats. History proves their worth, yet Western defences against midgets have been dangerously neglected since the war. I know of only one firm (outside Sweden where small submarine incursions have been frequent) which is committing itself wholeheartedly to the specific threat, and that firm is not, I think, working directly for the U.S or British navies.

Historically, witness the attack in 1943 on the giant German battleship TIRPITZ, holed up in a Norwegian fjord where no ordinary units could reach her. Two four-man X-craft penetrated the lair, and TIRPITZ never went to sea operationally again. Capital ships of the British Home Fleet and two American battleships, which had all been standing guard lest TIRPITZ

emerge to savage Russian convoys, were thereby released for active duties—a strategic result.

Witness the Italian raid by three so-called human torpedoes on Alexandria in 1941 when six brave men crippled the battleships VALIANT and QUEEN ELIZABETH—the dominance of British over Italian naval power in the Mediterranean was toppled at a stroke. That was a strategic triumph, not a tactical skirmish.

Witness the cutting, by X-craft, of Japanese seabed telephone cables in 1945—the Japanese were forced to revert to radio communications which were thereupon intercepted by ULTRA—again a strategic consequence.

Witness the flocks of new midgets acquired, or being acquired by Russian, North Korea, Iran, Libya, Pakistan and, probably soon, China. Iraq is probably also back in the market after (allegedly) being frustrated in 1988-90. We have to remember that nowadays midgets could carry strategic weapons including primitive nuclear devices—it is highly desirable to learn the capabilities of modern mini-monsters.

There is arguably a case for *proper* midgets, in addition to wet Swimmer Delivery Vehicles reconsidered for the USN and RN. The title of an article of mine for USNIP, written in 1961, has been revived in a 1994 issue of **THE SUBMARINE REVIEW**, *Bring Back the Midgets*—so perhaps thoughts are turning again to those inexpensive strategic tools. I hope so.

Personnel

Finally, history-experience tells us a lot about submarine people. These deserve a separate discussion; but, for the moment, the Ruritaneans might like to consider two topical matters of concern to Western navies—women and gays in submarines.

If the question of introducing women into submarines is put to the Ruritanean Navy, as it has been to the British, it is well to remember that morale is historically the key to success; and comradeship is the key to morale.

Women have no place in the kind of comradeship that submarine crews depend upon—more's the pity, but it is a fact. Nor do overt gays. Nevertheless, there have always been homosexuals at sea. Winston Churchill, First Sea Lord in 1939, recalled that the Royal Navy's traditions were founded on "Rum, buggery and the lash". Homosexuals were punished (we now believe unjustly) when their activities became known; but, although it smacks of

hypocrisy, if they stayed in the closet there was no evident harm to a crew's comradeship and hence morale.

It is irrelevant that women or gays are competent at their jobs, as they may be in surface ships. Submarine crews are historically special; and if submariners are accused of being macho and chauvinistic, so be it.

A senior British submarine officer was recently asked why he did not want women in submarines. Backed into a corner by the Press, he offered the excuse that their hips were too big for the hatches. I think there is a more compelling reason for excluding women than that.

Conclusion

In short, there is reason to think that U.S. and British navies are not putting history-experience to good use. Some planning and some arguments appear to be back to front or not expressed as persuasively as they could be with the help of history. The Ruritaneans may feel they could do better.

Meanwhile, at a time when politicians are leading the public to believe that the threat of major war has disappeared and that forces can be diminished dramatically, I suggest that one especially significant historical lesson should be underlined: **it is capabilities, not currently perceived intentions, which count when estimating a threat.** ■

[Editor's Note: Richard Compton-Hall, a submariner, author and historian, retired at the end of July after service as Director of the Royal Navy Submarine Museum at Gosport for some 20 years.]

SECNAVs AND SUBMARINES
Part 1: The Evolving Role of the Secretary of the Navy

by CDR Sam J. Tangredi, USN

[Editor's Note: This history of the role of the SECNAV in building and maintaining the submarine force breaks naturally into two parts. The first is a discussion of the evolving nature of the role and the relationship of the Secretary of the Navy to the President and Congress. The second part is an historical survey of views and actions of individual Secretaries concerning the Submarine Force. Commander Tangredi currently serves as Special Assistant and Speechwriter to Secretary Dalton. The views expressed are his own and do not necessarily reflect the official position of the Department of Defense.]

The Paradox

The role of the Secretary of the Navy in creating and sustaining America's submarine force is, paradoxically, both historically *obvious* and historically *underrated*.

It is obvious because until the National Security Act of 1947, the Secretary of the Navy (SECNAV) was the President's primary advisor and the principle decision-maker on all naval matters. Although plans for the acquisition and utilization of submarines were subject to Presidential discretion and Congressional politics, once taken they were—in effect—the sole province of their executive agent, the Secretary the Navy.

As appropriate to this position as executive agent, acquisition of the Navy's first submarine was initiated by an advertisement signed by Secretary William C. Whitney on November 26, 1887 soliciting plans for a "Submarine Torpedo Boat for the United States Navy."[1] Despite the lack of an acceptable response to the first advertisement, it was the persistent influence of subsequent SECNAVs that maintained Congressional support for future submarine construction.

This influence may be less apparent today due to the supervisory authority of the Secretary of Defense, and particularly in the light of recent legislation increasing the bureaucratic power of the Undersecretary of Defense (Acquisition & Technology). Acquisition decisions are clearly not the sole province of any Service Secretary. Likewise, the actual practical extent of SECNAV

influence has always varied, dependent on the personalities and preferences of the individuals appointed as SECNAV and SECDEF.

However, in accordance with Title 10 U.S. Code—the legislation governing defense organization—the Secretary of the Navy is still the official directed to "conduct all the affairs of the Department of the Navy, including recruiting, organizing, supplying, equipping, training, mobilizing and demobilizing".

The SECNAV is also responsible for "the construction, outfitting, and repair of naval ships, equipment and facilities" and the "formulation and implementation of policies and programs that are consistent with the national security policies and objectives established by the President and Secretary of Defense". Decisions concerning the construction and manning of the Submarine Force fall under both categories.

That is the *obvious* part. The *underrated* part is the fact that most modern histories of submarine development pay relatively scant attention to the SECNAV's actual role in fashioning the force.

Misinterpretations

There are several possible reasons for this oversight.

First, naval historians have naturally concentrated on the actions of uniformed officers and sailors (quite reasonably, since they constitute the Navy) or on the evolution of maritime technology. In the case of recent submarine histories, most have concentrated on actual submarine **design** rather than the policy requirements that caused their construction.[2]

Secondly, interpretations of history are often influenced by contemporary issues and—quite frankly—the overall, historical power of the SECNAV is often interpreted in light of his present statutory role.

Third, the overwhelming personality of the late Admiral Rickover—and his effective history/publicity campaigns—tended to crowd out public attention to the SECNAVs' role in the recent history of submarines.

Whatever the cause, the bottom line is that the Secretaries of the Navy are the forgotten figures in the history of an *often silent* Service. This oversight has prevented a thorough understanding of the continuing evolution of the United States Navy, and the purpose of this article is to prompt a greater discussion of the

SECNAV's past, current and future role in building the Submarine Force.

The Role

While the responsibilities of the Secretary of the Navy may have changed by statute, that does not mean that the role has lost its influence or desirability. The Secretary of the Navy, like his counterparts, operates at the edge of government where policy merges with politics, and where position and title does not always result in effectiveness and power. Independence does not appear to have been a sole prerequisite for a strong Navy, for there have been many SECNAVs prior to 1947 who presided over a less-than-powerful fleet. On the other hand, commitment to jointness and centralization would seem no more likely a guarantee of stable force structure.

The truth seems to be that the statutory power as described in Title 10 does not quite cover the full spectrum of the SECNAV's role, a spectrum that includes such alternating duties as **translator, advocate,** and **shield.**

The Secretary of the Navy is foremost the **representative** of the President and the Secretary of Defense **to** the Navy and the Marine Corps. As an appointed official, the Secretary *interprets* and *translates* the policy objectives of the presidential administration as they affect the Naval Service, and ensures that the Navy and Marine Corps are so organized as to carry them out.

Prior to World War Two, this duty included giving actual orders to the commanders of operational forces on behalf of the President. Today it is confined to the organization, acquisition and training of forces that are employment by other officials, namely the unified military CINCs. Yet, arguably, modern warfare is a *come as you are* affair; decisions involving organization have the greatest influence on potential employment. The role of the SECNAV is to ensure that naval forces are organized in a way that suits the President's conception of how they should be employed.

Depending on the personalities involved, the SECNAV's involvement in the actual formulation of national security policies can expand or contract. It is difficult, however, for the President and SECDEF to set out policies affecting naval forces without at least nominal participation by the official bearing the title of **Secretary of the Navy;** for public appearance if nothing more.

This allows the SECNAV to carry out his *duty* as **advocate**, as representative for the Naval Service to SECDEF, President, and perhaps even more importantly, Congress. As civilian leader of the Naval Service, the SECNAV has a clear incentive to ensure that his organization remains strong and effective and that the President is continually reminded of its importance. He also has a clear incentive to ensure that the Naval Service has strategies, plans and doctrines suitable to its effective employment and integration with other tools of national policy. To maintain an effective organization, he must continual *educate* the President and SECDEF concerning the status, capabilities and potential of naval forces. Likewise, the SECNAV is expected to carry the weight of Congressional relations concerning naval matters. In this role, he becomes a prime salesman of both presidential policies and Service priorities. But like many quality salesmen, he also becomes a transmission belt for the demands of his customers, i.e., Congress and the American people. In matters concerning budget and organization, the Secretary of the Navy has great potential to become a tool of Congress in encouraging presidential administrations to reconsider their policies. This is one of the prime reason why Congress has not, thus far, made a concerted effort to eliminate Service Secretaries. Service Secretaries have been too valuable as a feedback loop between President, Congress and the Naval Service.

Finally, if policies are deemed to be in disarray, the Naval Service appears ineffective, or Congressional relations demand placating actions, the Secretary has the *duty* to be a **shield** for President, SECDEF, or the Naval Service. In extreme cases, this may result in his firing or resignation.

Corrections

Identifying causes that lead historians to underrate the role of the Secretary of the Navy would seem merely an academic enterprise if it were not for the fact that history is our prime tool in judging the organizational effectiveness of the Navy and Marine Corps. To ignore the historical role of the SECNAV because today's statutory position is more confining than in the past misses the point that effectiveness in the above described *duties* may have little to do with strictly delineated roles and missions.

This misinterpretation of the historic powers of the SECNAV is a bit like comparing the effect of newspapers on public opinion

in today's era of television (and other electronic media) with the power of newspapers in the years before radio, and concluding that newspapers and magazines are no longer important. Clearly newspapers can no longer launch wars as they could in the 1890s (whether television has that power today—as in the case of Somalia, for example—can be debated). However, as those who work within the Capitol Beltway will attest, print media still retains considerable influence over policy makers. The President may not begin a new policy initiative just because of support by a Washington Post editorial. But he does gage the cumulative effect of such editorials on public support when deciding to continue to pursue a controversial policy.

In analogous fashion, a modern Secretary of the Navy may no longer have the exclusive power to initiate the development of a new weapons system...to launch a newly designed submarine class, for example. But, on the other hand, it is unlikely that a newly designed submarine class would ever be approved by the Secretary of Defense, the President, or Congress if the Secretary of the Navy was dead set against it. And it is unlikely that support for such a program would be generated within the Office of the Secretary of Defense without considerable SECNAV encouragement and personal involvement in the competition for funds. To ignore this aspect of the Secretary's evolving role misses the considerable power that office retains.

Likewise to ignore the potential for SECNAV influence on submarine development because there are a number of other powerful personalities involved misses the Secretary's position as both ultimate arbitrator and final *bottleneck* for the naval bureaucratic establishment. Although Admiral Rickover proved a genius at overcoming such constraints in making his lasting imprint on the modern submarine force, the *kindly old gentleman* was simply not the sole player in the political process of submarine development. Congressional support for a Nuclear Navy was routinely buttressed by the testimony of SECNAVs and CNOs. And it was a SECNAV—after acquiring considerable Presidential influence—who caused Admiral Rickover's final retirement.[3]

The Realities

As important as it is to recognize that the Secretary of the Navy has had and still has an critical role, it is likewise important to recognize the realities of his position. The Secretary of the Navy

is a political appointee who serves solely at the pleasure of the President without statutory safeguards concerning the permanence of his appointment. If a President wants to fire a SECNAV for telling him *the harsh truth*, he certainly can—and instantaneously, truth notwithstanding.

Likewise, no set of qualifications are mandated for the job; there is no *PQS* for SECNAV.[4] The sole requirement is that Congress votes to confirm the President's appointment. The fact that our current Secretary, John H. Dalton is a Naval Academy grad, former active-duty and reserve Naval officer, and a submarine veteran may have played a role in gaining Senate confirmation, and is the source of considerable pride for members of the Naval Service. But none of these qualification are mandated by law, and most previous Secretaries have not been as initially familiar with the Navy or Marine Corps.

On occasion—but less so in modern days—the President has acted as his own Secretary of the Navy, relegating his appointees to figureheads. Both Theodore Roosevelt and Franklin D. Roosevelt had served as Assistant Secretary of the Navy prior to becoming President; both tended to think of the Navy as *their department* even while in the White House. Theodore Roosevelt, with six SECNAVs in eight years, made the most detailed administrative decisions. This prompted even the great strategist Alfred Thayer Mahan to quip "that he should think the Presidency enough of a full-time job without trying to be Secretary of the Navy as well."[5] But, in fighting a major war, FDR perfected the President's "commander-in-chief" role.[6] Both even preempted the SECNAV's privilege of selecting names for new ships.

Recent President's may have taken a less direct role, but this slack has certainly been taken up by the Secretary of Defense. Whether or not SECNAVs become *figureheads* of the Secretary of the Defense appears dependent on a variety of factors. Historically, Secretaries of Defense have attempted to influence the President's choice of candidate for SECNAV, yet rarely are they obviously successful.

The final reality is that the impact of SECNAV on the actual running of the Navy and Marine Corps can be as much or as little as he may choose. President Nixon is said to have remarked about one candidate for SECNAV, "It's a job anyone can do, and he can't do any harm over there."[7] Former Secretary Lehman writes that he was frequently asked, "The Chief of Naval Opera-

tions really runs the Navy. Why do you want to be the Secretary of the Navy?"[8] But as history indicates, both of these statements are far from the complete truth.

[To be continued...]

REFERENCES

1. A copy of this advertisement, with additional specifications, appears in Annual Report of the Secretary of the Navy For the Year 1887 (Washington, DC: GPO, 1887), pp. 273-276. The author recognizes that earlier submarines may have performed wartime service for the United States (and Confederate States), however none of them could be considered U.S. Navy submarines.

2. Exceptions to this oversight in acknowledging that SECNAVs may have been involved are Gary E. Weir's Building American Submarines, 1914-1940 (Washington, DC: Naval Historical Center, 1991) and Forged in War: The Naval Industrial Complex and American Submarine Construction, 1940-1961 (Washington, DC: Naval Historical Center, 1993), and Norman Friedman's forthcoming two-volume U.S. Submarines: An Illustrated Design History (Annapolis, MD: Naval Institute Press, 1995). However, neither of these authors focus extensively on the SECNAV.

3. The best description of this event is by its instigator; see John F. Lehman, Command of the Seas (New York: Charles Scribner's Sons, 1988), pp. 1-38. For description of a previous unsuccessful attempt by Secretary of the Navy Paul Nitze in 1967, see Norman Polmar and Thomas B. Allen, Rickover: Controversy and Genius (New York: Simon and Schuster, 1982), pp. 17-18.

4. Outside of the nuclear power program, Personnel Qualification Standards (PQS) are the Navy's standardized method of qualifying watchstanders for duty on ships and in selected shore duties.

5. Robert Albion, Makers of Naval Policy 1798-1947 (Annapolis, MD: Naval Institute Press, 1980), p. 212.

6. Ibid.

7. Quoted in Lehman, pg. 105.

8. Ibid.

THE HOLLAND VI—AN AMERICAN PIONEER

by CAPT H.H. Caldwell, USN(Ret.)

[Ed. Note: Captain Caldwell is a retired submarine officer who commanded SPIKEFISH and SubDiv 22. His father was the commissioning CO of HOLLAND and therefore the U.S. Navy's first submarine skipper.]

U.S. Submarine Torpedo Boat HOLLAND (SS 1) was the Navy's first commissioned submarine and thus the forerunner of today's submarine fleet. She was designed in 1890 by John P. Holland, an inventor and self-taught engineer who had emigrated from Ireland some 25 years earlier. Built under his supervision at the Crescent Shipyard in Elizabethport, New Jersey, the HOLLAND VI as she was known, was launched on 17 May 1897, and christened HOLLAND by Mrs. Lewis Nixon, wife of the shipyard's owner.

HOLLAND was not the world's first submarine—submersible vehicles had been the subject of much thought and experimentation over the preceding 150 years, with varying degrees of success. During the American Revolution, in an effort to break the British blockade of New York harbor, Sergeant Ezra Lee maneuvered the TURTLE, a one-man, human-powered submarine designed and built by David Bushnell, down the bay and attempted to affix an explosive device to the bottom of a blockading British warship. Thwarted by the ship's copper sheathing, Lee nonetheless alarmed the British enough to cause the withdrawal of the blockading ship. At the start of the 19th century prolific inventor Robert Fulton built his version of a submarine, but was unable to sell it either at home or abroad. Sixty years later during the Civil War the Confederates, whose key port of Charleston, South Carolina was blockaded by Union warships, developed a screw-driven cigar shaped submersible, the HUNLEY, which towed a floating charge of explosive at the end of a long line. Attacks were consummated by diving under the target and dragging the explosive charge (fitted with a contact exploder) into the side of the target. Powered by eight men turning cranks, CSS HUNLEY set off one evening to attack a blockading sloop-of-war near the harbor's mouth. The attack was successful, and to HUNLEY goes the honor of being the first submarine to destroy an enemy ship. Jubilation over HUNLEY's success was tempered by the fact that

the explosion which sank USS HOUSATONIC also destroyed HUNLEY. The submarine sank on several previous occasions during trials and training, killing a total of 35 crew members. The South, desperately short of able-bodied men, could not afford this weapon system.

Interest in submarines increased during the second half of the 19th century as technological improvements in metallurgy, electrical engineering, internal combustion engines and weaponry offered answers to vexing questions about suitable material for hulls and appurtenances, efficient propulsion and effective armament. France and Spain were early developers of submersibles, with Sweden and Italy also producing designs. Notably absent from the submarine sweepstakes was the British Navy, which, possessing the world's most powerful fleet, could see no sense in fostering a weapon which if successful might render its proud warships obsolete.

John P. Holland, encouraged by Irish nationalists seeking a weapon to cripple the British Navy, designed and built four submarines between 1875, when he arrived from Ireland, and 1888 when he first sought to interest the United States Navy in his design for a submarine torpedo boat. The surge of enthusiasm for submarines which developed on both sides of the Atlantic attracted the attention of the press and stimulated wide public interest. Periodicals and daily newspapers printed articles that read like science fiction; Jules Verne's Twenty Thousand Leagues Under the Sea was much discussed; profound papers were presented at the U.S. Naval War College.

In response to U.S. Navy solicitations for submarine boat designs, John Holland had submitted his plans for submarines on three previous occasions. In each competitive review his design won; however, in one instance Congress failed to appropriate money for construction and in the other cases the funds appropriated were diverted by the Navy Department to help pay for the completion of surface ships then under construction. The life of the impecunious inventor was filled with frustration. Finally, in 1895, the Holland Torpedo Boat Company was awarded a contract for $200,000 to build a submarine to be called PLUNGER. Unfortunately, as its construction progressed it was increasingly evident that many of the specifications insisted upon by the Navy were impractical and could not be met. As a result, work on John Holland's fifth submarine languished.

In 1896 the Holland Torpedo Boat Company bit the bullet and decided to invest its own capital in the construction of a submarine of new improved design which would bring together all of John Holland's most up-to-date ideas. As a private endeavor, design and construction of the HOLLAND VI would not be impeded by Navy generated change requests or the need to meet unrealistic government specifications. John Holland was delighted, and the new boat quickly took shape on the building ways.

As designed and constructed, HOLLAND was 53 feet long with a maximum diameter of 10-1/4 feet and a submerged displacement of 74 tons. In the fully surfaced condition she drew about 8-1/2 feet and displaced about 64 tons. HOLLAND's sleek lines were drawn by her designer in conscious imitation of the porpoise, and every effort was made to enhance submerged performance. As a result, when operating on the surface HOLLAND VI lay low in the water, provided very little topside deck space and scant protection from the sea for personnel on deck.

The HOLLAND VI was powered on the surface by a 45 horsepower gasoline engine which drove her single three bladed propeller, producing a top speed of eight knots. Sixty lead acid cells made up the storage battery which provided power for a maximum speed of five knots during submerged operations. The engine, motor and tailshaft were connected through friction clutches to permit the motor, when driven by the gasoline engine as a generator, to recharge the storage battery. HOLLAND VI was fitted with a double rudder, and courses were steered with reference to a heavily compensated magnetic compass. For submerged operations, the main ballast tanks were flooded to approach neutral buoyancy, then the submarine pushed ahead on battery power and applied dive angles to the diving rudders to force the boat down to the desired operating depth. The boat was so ballasted that even with the ballast tanks full of water she carried about 100 pounds of positive buoyancy. This safety feature insured that she would rise to the surface in case a casualty caused by a loss of propulsion power. Compressed air at 2000 pounds per square inch was stored in four steel bottles and used to empty the ballast tanks, operate the rudder and diving planes, discharge weapons and replenish the boat's atmosphere during protracted periods of submergence.

HOLLAND VI was designed to be a warship, with much of the

limited interior space dedicated to weapons. These included a single 18 inch diameter torpedo tube (containing a Whitehead torpedo) mounted in the bow on the ship's horizontal axis. Also installed in HOLLAND VI's bow was a Zalinsky dynamite gun, an eight inch pneumatic tube mounted on the centerline above the torpedo tube, fixed in train and permanently elevated approximately 15 degrees. It was built to lob an explosive charge for a distance of up to a 1000 yards. Initially HOLLAND VI carried a second dynamite gun pointed aft. This was removed before the boat was sold to the Navy, as its potential military value did not justify the space and weight required.

After launching and fitting out at Lewis Nixon's shipyard in Elizabethport, HOLLAND VI was moved to a ship basin at Perth Amboy, New Jersey where preliminary static test dives could be made. On 17 March 1989 the HOLLAND VI, escorted by a tug, proceeded down the Raritan River for her initial submerged run in Raritan Bay. This was a success, but a few days later while operating submerged south of Staten Island, HOLLAND VI ran into a mud bank off Tottenville, New York. The boat was unharmed, but difficulties in steering and the sluggish performance of the magnetic compass were highlighted as problems. Further operational trials were conducted during the spring, including one before a Navy inspection team, whose recommendations led to the scheduling of more trials. In November 1898 a Navy Board of Inspection headed by Captain R.D. ("Fighting Bob") Evans witnessed sea trials conducted in New York harbor along the Brooklyn shore. While the trials were generally successful, recurrent problems with steering control were noted by the Board, which recommended that the Navy not acquire the HOLLAND VI until successful completion of still more trials.

This was discouraging to the inventor, to the builders and to those who had invested in the Holland Torpedo Boat Company. For 10 years John Holland had tried to interest the U.S. Navy in the submarine torpedo boat as an implement of war. His efforts were thwarted repeatedly by an entrenched military and civilian bureaucracy which begrudged the diversion of funds from major warships. The potential for stealth and for underwater exploration offered by submersible boats had long intrigued farsighted people in both Europe and America, as advancements in technology made such craft seem more and more feasible. However, such visionaries were rare in the upper echelons of the Navy, which was still

struggling to throw off post-Civil War doldrums.

Following the Navy trials in November 1898, HOLLAND VI entered a nearby shipyard in the Bronx for extensive alterations which included rebuilding the stern to position the propeller forward of the horizontal and vertical rudders, removal of the after dynamite gun and improvements to the steering and diving controls. After work was completed in the spring of 1898, HOLLAND VI was towed to Peconic Bay at the east end of Long Island, where a base was established at New Suffolk, New York to support operations in the quiet, sheltered waters of the bay. This change of venue was the result of one or two near catastrophes resulting from efforts to operate submerged in the crowded shipping lanes of New York harbor.

Much of the spring and summer of 1899 was spend conducting surfaced and submerged training operations in preparation for more Navy trials. These finally took place on 6 November 1899 in Little Peconic Bay before a Navy Board of Inspection consisting of five officers led by Rear Admiral Frederick Rodgers. HOLLAND VI performed to the full satisfaction of the Board, and was immediately offered for sale to the Navy for $160,000.

Within the Navy, opposition remained strong to spending money on a craft whose wartime potential appeared so limited. Accordingly, the Holland Torpedo Boat Company concluded it would be expedient to sent the submarine to Washington for demonstrations before various members of Congress and other officials in support of the company's lobbying activities. After a leisurely journey which included an inland passage across New Jersey on the Delaware and Raritan Canal, down the Delaware River, through the Chesapeake and Delaware Canal into Chesapeake Bay and up the Potomac River, HOLLAND moored at the Washington Navy Yard on Christmas Eve, 1899.

As soon as test ranges were established in the Potomac River, HOLLAND was ready to display her unique capabilities. Both the general public and the national press were much taken by the drama of the submarine. Crowds of people thronged to view the boat and to talk to members of the crew, whose adventures under the ocean in a sealed tin can seemed outrageously risky. The thought that this tiny boat might actually be able to sink a capital ship engaged the imagination of the country. It was David and Goliath all over again, and nearly everyone was cheering for David.

Several underway demonstrations were conducted in March and April 1900, but perhaps the most important of these occurred on 14 March when Admiral George Dewey and his staff, members of both the House and Senate Naval Affairs Committees, and the Assistant Secretary of the Navy sailed down the Potomac in the yacht JOSEPHINE and the naval gunboat SYLPH to watch HOLLAND perform. Admiral Dewey's flag secretary, Lieutenant Harry H. Caldwell (later to become the submarine's first Navy skipper), was embarked in HOLLAND, having received permission to observe the operation of the boat from within. The boat and its crew flawlessly performed the routines of diving, running submerged, firing a torpedo and surfacing; favorably impressing the distinguished spectators. The Spanish-American War was recent history, and its recollection caused many of the officials to ponder on what might have been if Spain had possessed and deployed such a weapon. Later, Admiral Dewey would state in testimony before the House Committee on Naval Affairs that if the Spanish squadron at Manila Bay had included two such craft his fleet would have been in an untenable position.

HOLLAND VI was purchased by the U.S. Navy on 11 April 1900, the date since celebrated as the birthday of the Submarine Force. The purchase contract also called for construction of an additional submarine of *improved design*, and for training a Navy crew. HOLLAND arrived at the Naval Torpedo Station at Newport, Rhode Island on 24 June 1900 and was officially delivered to the Officer-in-Charge by Captain Frank T. Cable, the civilian trial crew skipper.

June 1900 was an important month in the early history of American submarine development. Not only did the Navy take possession of its first submarine, but Congress during the same month appropriated funds for construction of a class of five improved Holland type submarines.

These events marked the peak of John Holland's distinguished career as a submarine designer and builder. It had taken 25 years of painfully slow progress for him to translate his vision of a practical undersea boat into reality. A persistent man with a dream, John Holland never lost sight of it, or lost faith in his ability to achieve it. A capable engineer, he was quick to recognize the value of new technology as it evolved and to adapt it to his purpose. He early noted the potential of the internal combustion engine for surface propulsion, coupled with a storage

battery for use submerged, over existing steam system designs.

Unfortunately, Holland was not a particularly astute business man. In 1893 he had formed the John P. Holland Torpedo Boat Company with himself as Manager, issuing stock to raise money. Five years later when HOLLAND VI showed its potential he found he had lost control of the company and with it his patents. In the epochal month of June 1900 incident to a company reorganization, he was demoted from General Manager to Chief Engineer. Thereafter John Holland's influence in the company dwindled, while the company focused on marketing its proven design around the world.

HOLLAND VI stands as a monument to its creator's depth of vision, perseverance and engineering acumen. The submarine of today bears an uncanny resemblance to his HOLLAND VI. The hull shape based on a body of rotation, single screw, minimal superstructure, diving procedure philosophy and weapons systems (including missile tubes) are examples of features command on HOLLAND VI and SEAWOLF. John Holland would have applauded the advent of nuclear power, that major technical advance which sundered the submarine's ties to the ocean surface. If he had lived long enough he might have invented it. ■

USS DRUM (SSN 677)
INACTIVATION CEREMONY

The ceremony will occur in mid-Spring 1995 at Naval Submarine Base, San Diego, CA.

Former crew members desiring an invitation should contact USS DRUM deactivation coordinators:

LT Christopher Nelli or MS1(SS) Bruce Drawdy
(619) 553-8884/5/6 or DSN: 553-8884/5/6
or write to
USS DRUM (SSN 677), FPO AP 96663-2357

NIMITZ AS A SUBMARINER

by George D. Weickhardt

In July 1908 Ensign Chester W. Nimitz ran USS DECATUR aground near the mouth of the Batangas River in the Philippines. A general court martial convened on USS DENVER at Cavite found him guilty of neglect of duty as Commanding Officer of DECATUR.* The court limited his sentence to a "public reprimand" but relieved him of his command. On his return to the United States his duty assignment was to the submarine service.

Although young Nimitz initially regarded submarine duty with reluctance, he quickly recognized the future potential of undersea warfare and over the next four years became one of the most experienced and knowledgeable submarine officers in the fleet. He also became an important advocate of the submarine. Nimitz's experiences as a submarine commander have received only passing attention by his biographers but this aspect of his early naval service deserves further examination if only to consider what bearing it may have had on his future military career and on his role in the submarine campaign against Japan in World War II.

Nimitz reported for instruction in submarine duty at Newport, Rhode Island, in January 1909. When he first stepped aboard USS PLUNGER (SS 2) as her Commanding Officer on May 3, that gasoline powered monster purportedly struck him as a cross between a Jules Verne fantasy and a humpbacked whale. In the aftermath of his unfortunate experience at Batangas he no doubt thought that some senior officer had decreed "give PLUNGER to Nimitz". At that time *pigboat* duty was considered a hardship that scarcely served to advance one's career. Submarines of that day undoubtedly posed a greater danger to their own crews than they did to a potential enemy. It may have been of some consolation to Nimitz that he was also designated Commander of the First Submarine Torpedo Flotilla. Flying the burgee of Submarine Flotilla Commander, PLUNGER was in fact Nimitz's first flagship, although the only other unit of the flotilla was the old, iron-screw steamer, USS NINA, which served as tender and tug.

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* *[Editor's Note: The author supplied a number of specific references with his manuscript. **THE SUBMARINE REVIEW** will gladly provide individual references in answer to specific questions.]*

PLUNGER was built by the Crescent Shipyard, Elizabethport, New Jersey, sub-contractor for the Holland Torpedo Boat Company. She was the first of seven submarines commissioned in 1903 of which HOLLAND (SS 1) was the prototype. PLUNGER had a length of 64 feet, displaced 107 tons when not submerged and was designed to dive to a depth of 150 feet. On the surface her gasoline engines gave her a top speed of about 8 knots. Her speed was considerably less when submerged and running on electric motors powered by a bank of Exide batteries. PLUNGER was equipped with one 18 inch torpedo tube and could carry five torpedoes. Living space, as in the other boats of that day and age, was exceedingly cramped, usually wet, poorly ventilated and always stank of gasoline.

PLUNGER had been recently repaired at the Norfolk Navy Yard because the deck around her hatch was leaking badly. The boat arrived at Newport under tow by NINA on the very day that Nimitz assumed command. (Submarines, as a rule, at that time were towed when they had to venture out to sea for any distance.) PLUNGER's crew of ten petty officers under the command of Ensign Prentiss P. Bassett welcomed Nimitz aboard. Another Ensign, Alfred H. Miles, remained with PLUNGER to help familiarize the new commanding officer with the vessel.

Next day, May 4, Nimitz, underway for the first time with his new command, headed out to sea and ordered a dive. The cruising bridge was secured, the ballast tanks trimmed and eventually PLUNGER submerged. The boat completed a seven-mile run at a depth of 15 to 30 feet in 1 hour 30 minutes. Satisfied with this performance Nimitz returned to the Newport Torpedo Station.

A few days later, while moored at the Torpedo Station, PLUNGER was rocked by an explosion of gases in the Forward Battery Compartment. The explosion demolished the deck torpedo skid and damaged one of the torpedoes, but no one was hurt and PLUNGER remained afloat. In a series of dives which followed necessary repairs, the longest was a submerged run of 13 miles in 2 hours 10 minutes.

On May 28 PLUNGER proceeded to the torpedo range in Narragansett Bay. The first torpedo PLUNGER fired promptly sank to the bottom but was readily located and retrieved by a diver. Of two torpedoes fired in June 1, one performed well, the other was lost.

On June 27, Miles was detached, leaving Nimitz on his own. The installation of a signal bell on PLUNGER's deck during the ensuring week led to a further mishap which could have been quite serious. Submarine bells were sounded by boats cruising in formation while submerged to avoid colliding with one another. After testing the bell, Nimitz ordered PLUNGER to the surface and ran afoul of a tow line between a tug and its barges. The tow line carried away PLUNGER's periscope. Nimitz nevertheless was able to bring the boat to the surface. There was no other damage and the periscope was soon repaired.

In September PLUNGER was towed to Oyster Bay, Long Island, and from there proceeded under her own power to the North River. She moored at the 79th Street wharf after taking part with the Second Submarine Flotilla in the Hudson-Fulton celebration (appropriately enough since Fulton had once designed and built a primitive submarine). The Second Flotilla consisted of VIPER (SS 10), CUTTLEFISH (SS 11), and TARANTULA (SS 12), the only other submarines operating on the east coast at that time. These three B-Class boats were much newer and of more advanced construction than PLUNGER, which as the oldest of the A-Class, was in fact the most antiquated submarine still on active duty with the Navy. Early in October PLUNGER, accompanied by CUTTLEFISH, cruised upriver as far as Poughkeepsie. Upon their return to the New York Navy Yard the boats prepared to depart for Charleston, South Carolina.

On October 22 TARANTULA, VIPER and PLUNGER were all taken in tow in a column astern by USS CASTINE, an old gunboat recently recommissioned as submarine tender. On the following day this procession encountered heavy seas. The tow line parted between TARANTULA and VIPER, whereupon VIPER attempted to tow PLUNGER. When VIPER's engines failed, PLUNGER, with engines reversed, towed VIPER by the stern throughout the night. Early next morning CASTINE took VIPER and PLUNGER in tow once again and brought the two boats to a safe anchorage in Hampton Roads. In November PLUNGER was placed in reserve at the Charleston Navy Yard. Soon thereafter Nimitz received a new command.

In November 1909 five new submarines had been added to the fleet: STINGRAY (SS 13), TARPON (SS 14), BONITA (SS 15), NARWHAL (SS 17 and GRAYLING (SS 18). A sixth, SNAPPER (SS 16) was nearing completion. These boats became the

Third Submarine Division, under Lieutenant Donald C. Bingham as Division Commander.

Nimitz assumed command of USS SNAPPER at Boston on February 2, 1910 and put this boat into commission as her first commanding officer. To Nimitz, now a full Lieutenant, submarine duty must have looked much brighter. SNAPPER, the Navy's newest submarine, was almost twice the size of PLUNGER. Having a much greater fuel capacity, she was able to cruise greater distances under her own power. But the gasoline engines, which in 1910 still powered all of the Navy's submarines, continued to create many problems. Nimitz described the hazards which became particularly troublesome during rough weather when it was necessary to make surface runs with hatches battened down. There were numerous instances in which men on watch in the engine room lost consciousness from inhaling gasoline fumes. On other occasions a victim of *gasoline jags* developed unpredictably violent behavior and had to be forcibly restrained by other crewmen.

Soon after Nimitz assumed command of SNAPPER the tender NINA was lost in a gale. An old three-masted bark, USS SEVERN, was then refitted and brought into service as tender for the Third Submarine Division. SEVERN, not having power for independent movement, had to be towed about from port to port or from anchorage to anchorage by CASTINE. The tenders operated out of Newport in the summer months and during the winter accompanied the submarines to Chesapeake Bay.

In June 1910 SEVERN was towed from Boston across Massachusetts Bay to an anchorage just off Provincetown where SNAPPER rendezvoused with her sister ships. There during simulated torpedo attacks by SNAPPER and BONITA, BONITA rammed CASTINE amidships. While BONITA was apparently not damaged, CASTINE had to be beached on Cape Cod to keep her from sinking. Fortunately for him, Nimitz was not directly involved. Bingham dispatched SNAPPER to Boston to transport a higher ranking officer to Provincetown to conduct an investigation of the collision. Nimitz referred to the ramming as an example of the capability of submarines to inflict serious damage on an enemy ship even after expending all torpedoes.

As winter approached, the submarines headed for Chesapeake Bay in division column, SEVERN under tow by the refloated and repaired CASTINE. Unlike PLUNGER, the new boats of the

Third Division could cruise on the surface in the open ocean under their own power.

On October 14 SEVERN anchored in Hampton Roads. SNAPPER, BONITA, TARPON and STINGRAY soon moored alongside. Early on the morning of October 18 SNAPPER got underway. The events of that day were entered in the log as follows:

> Weather fair: At 8 50 A.M. while proceeding up the Elizabeth River to gasoline dock ran aground on sand bank at edge of channel. At time of going aground was running soundings, and at dead slow speed; tide was high and still flooding. No damage resulted from grounding. Floated by Navy yard tug at 7 45 P.M., proceeded to gasoline dock and moored alongside at 8 30 P.M.

No doubt Nimitz remained as imperturbable as usual during the long hours that SNAPPER was stranded while he waited for the next flood tide. But certainly he relived his experience three years earlier with USS DECATUR. Would he now face a second court martial? Would he again be relieved of his command? Would this new embarrassment put an end to his career? Apparently no investigation was ever made. Perhaps the submarine was still considered so cumbersome and inherently unsafe that a grounding was no reason to question the competence of her commanding officer. In fact, a few months later Nimitz was given command of an even more modern submarine, USS NARWHAL (SS 17).

Although she was put into commission somewhat in advance of SNAPPER, NARWHAL was the first of the D-Class submarines, somewhat larger than SNAPPER and with an even greater cruising radius. The Third Submarine Division had also been enlarged recently when the newly commissioned USS SALMON (SS 19) was added to Bingham's command.

During the winter months the Third Division remained in Chesapeake Bay. At the Norfolk Navy Yard, the crew of NARWHAL was kept busy overhauling engines, pumps, valves, etc. With the customary spring migration in 1911, NARWHAL headed north again with the other boats, SEVERN under tow by CASTINE.

On the torpedo firing range in Narragansett Bay that summer, NARWHAL's performance was highly proficient. The Division's

submarine bells also passed their tests, NARWHAL exchanging underwater signals with SALMON and GRAYLING. Maneuvers off Provincetown were conducted without incident.

At Newport Torpedo Station on October 10, 1911 Nimitz assumed command of the Third Submarine Division relieving Lieutenant Bingham. The Division pennant was transferred from GRAYLING to NARWHAL.

During the southbound cruise in November, Nimitz on the cruising bridge of NARWHAL, leading the Division, proudly passed in review with units of the Atlantic Fleet before President Taft on the deck of USS MAYFLOWER in the North River.

Following his arrival at the Norfolk Navy Yard later that month Lieutenant Nimitz was ordered to report to the Fore River Shipbuilding Company, Quincy, Massachusetts for duty in connection with the fitting out of the Navy's newest submarine, USS SKIPJACK (SS 24). SKIPJACK, renamed E 1, and STURGEON, renamed E 2, were both commissioned at Boston on February 14, 1912. *[Editor's Note: On 17 November 1911, the names of all U.S. submarines, active or under construction, were changed to alpha-numerics by class.]* Nimitz assumed command of E 1 and Ensign Clarence N. Hinkamp assumed command of E 2. These were the first American submarines to be powered by diesel engines. This significant technical advance doubled the cruising radius of the submarine. Diesel fuel oil was far less volatile, less toxic, less expensive and much easier to handle.

Diesel powered submarines in the Royal Navy were already in service at that time. The Germans had experimented with diesel power for years, but it was not until 1913 that the diesel powered U 19 was added to the Kaiser's Navy. Prior to that time German submarine engines had used paraffin oil, a fuel somewhat similar to kerosene.

On February 20, 1912 E 1 and E 2 departed Boston for Hampton Roads, there to join up with the reorganized Atlantic Submarine Flotilla. Nimitz was given command of the Second Group, which included the two E-Class boats, D 1 (ex-NARWHAL), D 2 (ex-GRAYLING) and D 3 (ex-SALMON). USS TONOPAH, a converted coast defense monitor, was added to the group as submarine tender.

An incident several weeks later led Nimitz to jump into the frigid water of Chesapeake Bay. The official account of the incident on March 20, 1912 deserves to be quoted:

While this ship (USS TONOPAH) was at anchor in Hampton Roads, Virginia, W.J. Walsh, Fireman Second Class, was accidentally knocked overboard while hooking on the steam launch, preparatory to hoisting. A strong tide was running and Walsh, who could not swim, was being rapidly carried away from the ship. Lieutenant C.W. Nimitz, U.S. Navy, who was standing on the quarterdeck at the time, immediately jumped overboard and went to Walsh's assistance, but had considerable difficulty in supporting him on account of Walsh's struggling and interfering with his movements. L.G. Kaufman, Machinist's Mate Second Class, was standing in the starboard gangway at the time Walsh fell overboard. He immediately ran for a life buoy which he carried all the way aft and threw to the men in the water. The tide had already carried them so far that they were unable to reach the buoy, so Kaufman jumped overboard and swam with the buoy to Lieutenant Nimitz's assistance. With this assistance Walsh was kept afloat until all were picked up by the USS NORTH CAROLINA's steam launch which was passing at the time. When picked up, Lieutenant Nimitz and Walsh were exhausted, and if it had not been for Kaufman's assistance would probably not have been able to keep afloat.

On May 17, 1912 Nimitz was given command of the entire Atlantic Submarine Flotilla consisting of four C-Class, three D-Class and the two E-Class boats with the tenders CASTINE, SEVERN and TONOPAH. He turned over command of E 1 to Lieutenant (jg) Claudius Hyatt and made USS CASTINE his flagship. As flotilla commander Nimitz directed the installation of a Sperry gyrocompass in E 1. The magnetic compass with which submarines had been equipped up to that time had been completely unreliable in submerged cruising. With the introduction of the gyroscopic compass Nimitz became a pioneer in underwater navigation. He also experimented with submerged radio transmission.

With the introduction of the diesel engine and the gyroscopic compass, the submarine became capable for the first time of sustained blue water operations. Nimitz was one of the first to see

and publicize the significance of this development. In an article,[1] Nimitz argued that submarines were no longer limited to harbor and coast defense. The author foresaw the military value of "sea-keeping" diesel powered submarines operating in isolation or in groups independently of surface ships. He argued that submarines and surface vessels each had a separate and distinct value in naval operations. Anticipating the necessity of crash dives, he decried the delays attendant in unrigging the cruising bridges to "trim down" prior to submerging and recommended removal of this feature. He also urged establishing submarine bases in Hawaii and Guam.

On March 29, 1913 Nimitz inspected this flotilla for the last time. It was a sad day. He was leaving the submarine service of which he had grown exceptionally proud. But looking forward to marriage and shore duty, he was to be detached on the following day. After a period of leave and because of his knowledge of diesel power he was ordered to report for duty in the Bureau of Steam Engineering in Washington, DC. But his association with the submarine service was by no means at an end.

During World War I Nimitz served as a Lieutenant Commander in USS CHICAGO as Aide and later as Chief of Staff to Captain Samuel S. Robison, Commander, Atlantic Submarine Force. As a Commander, Nimitz served as senior member on the Board of Submarine Design from October 1918 to May 1919. In 1920 he established the Submarine Base at Pearl Harbor and served as its first Commanding Officer. As Captain he commanded Submarine Division 20 in 1929.

By good fortune the submarine base which Nimitz had commissioned was practically undamaged by the Japanese attack on Pearl Harbor in 1941. Millions of gallons of diesel oil were undisturbed and a number of torpedoes remained intact. There at the base aboard USS GRAYLING (SS 209), the second submarine of that name, Admiral Nimitz on December 31, 1941 raised his flag and assumed command of what was to become the largest naval force ever assembled, the U.S. Pacific Fleet. Nimitz was also to preside over the U.S. submarine campaign against Japan, the most successful in naval history.

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[1] Nimitz, C.W.: "Military Value and Tactics of Modern Submarines", United States Naval Institute Proceedings, 38: 1195-1211, December, 1912.

There is little doubt that Ensign Nimitz was displeased, even chagrined, when he was ordered to *pigboat* duty in 1909. His reluctance obviously stemmed from the reputation submarines had at the time as hardship duty. He was also just emerging from the shadow of a court martial conviction and had every reason to consider submarine duty as part of his punishment. He continued to be plagued with mishaps to ships he commanded, first with PLUNGER, then with SNAPPER. These mishaps certainly did not enhance his image as a promising young naval officer destined for high command. Wisely, he did not manifest his displeasure but accepted the challenges, overcame a discouraging and almost comical string of accidents and by his zeal and talent won the confidence of his superiors as an innovator and leader as well as the admiration of his men for his courage and devotion to their welfare. Within the course of four years he rose from a disgraced destroyer commander to the commanding officer of a flotilla of nine submarines. His early career is an object lesson in how a young naval officer can rededicate himself to overcome the shadow of early mistakes. Had a more stringent policy been applied to the shortcomings of this junior officer, his naval career might well have been prematurely ended. Young Nimitz began to see his assignment to submarines not as punishment but as an opportunity. Technical improvements soon gave submarines the capability for independent operations in mid-ocean and Nimitz early saw the significance of this development for future naval operations. He became a recognized authority on submarines and a prophet of the future. ■

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U.S. SUBMARINE OPERATIONS DURING THE KOREAN WAR

by LCDR Sean R. Filipowski, USN

[Editor's Note: LCDR Filipowski served aboard USS NATHANAEL GREENE (SSBN 636)(Blue) for four SSBN Deterrent patrols. He was redesignated as a Cryptologist in mid 1986 and deployed aboard USS BUFFALO (SSN 715), USS HAWKBILL (SSN 666), USS LOS ANGELES (SSN 688), and USS HADDO (SSN 604). LCDR Filipowski graduated from the Naval War College in June 1994, and reported to Commander Carrier Group 7 for duty.]

The Korean War was fought from 25 June 1950 to 27 July 1953. The United States Navy, especially surface and air forces, played a much publicized, significant role in determining the outcome of the war. The public is largely unaware, however, of the Submarine Force's participation in the Korean War. Although seldom appearing in the headlines, United States submarines performed an important and vital function in the war even though it was relatively minor in determining the war's outcome. The significance of the Submarine Force's Korean War experience, however, was that it prepared the Force for its role in the Cold War and reconfirmed its value to the national security of the United States.

Following World War II, congressionally mandated reductions and reshaping of the United States military reduced the Submarine Force from the hundreds to 72 active submarines by 1950. Of these, approximately 30 were based in the Pacific.

As in World War II, the primary warfare mission of the Submarine Force in 1950 was anti-shipping. However, some submarines had been modified to perform specific missions including; troop and cargo carrier, polar picket, oiler, and guided missile launcher. In addition, the submarine was beginning to be used in an anti-submarine warfare (ASW) role to further enhance ASW capabilities against a rapidly expanding Soviet Submarine Force.

Before the war, Commander-in-Chief U.S. Pacific Fleet (CINCPACFLT) maintained a forward deployed task group of four submarines and one submarine rescue vessel in the Western Pacific (WESTPAC) on a rotating basis. Deployments lasted approximately six months. The submarines and rescue vessel

comprised Commander Submarine Task Group (COMSUBGRU) WESTPAC (TG 70.9.). Its mission was to provide ASW training services to units of the Seventh Fleet and Commander Naval Forces Far East(COMNAVFE). The Task Group Commander was a Pacific Fleet submarine division commander who filled the billet for two to three months at a time. Well into the war, on 15 April 1951, COMNAVFE assumed operational control of COMSUBGRU WESTPAC and on 1 November 1951, the designation for the submarines changed to CTG 57.6.

When war began, the four submarines deployed to WESTPAC (CATFISH, CABEZON, REMORA and SEGUNDO) were spread throughout the region; located in the Philippines, near Hong Kong, and in Yokosuka; and the submarine rescue vessel GREENLET was in Guam. On 1 July 1950, COMSEVENTHFLT ordered all submarines and GREENLET to Yokosuka. Yokosuka possessed excellent naval facilities and served as the major operating base for WESTPAC submarines throughout the war.

The role the Submarine Force would play in the war was unclear, however. Within a few weeks of the commencement of hostilities, United Nations Forces had established sea control around the Korean Peninsula, cutting the seaborne links between North Korea and the Soviet Union and Communist China. Enemy supplies arrived from overland routes. It was all too apparent that the Submarine Force would probably not be needed to conduct unrestricted submarine warfare as it had in World War II.

In the Eastern Pacific, CINCPACFLT ordered the deployment of five submarines from the West Coast to Pearl Harbor. Fearing possible Soviet naval involvement in the war, CINCPACFLT was preparing to handle all contingencies. When immediate participation by the Soviets did not materialize, CINCPACFLT rescinded the deployment order. However, upon a request from the Marines, the troop transport submarine PERCH was sent to Yokosuka in anticipation of supporting raiding operations. Additionally, CINCPACFLT sent PICKEREL to augment COMSUBGRU WESTPAC.

In the Atlantic, several submarines were forward deployed to the North Atlantic to monitor Soviet naval and air activity in the Barents Strait and the Greenland, Iceland, United Kingdom (GIUK) gap, and provide indications and warnings information. Similar deployments were conducted by Pacific Fleet submarines in the Bering Sea, during summer months only, for the duration

of the war. Soviet potential for involvement was a concern throughout the war.

Back at Yokosuka, PICKEREL arrived in mid-July and relieved CABEZON. On 18 and 19 July 1950 respectively, CATFISH and PICKEREL deployed from Yokosuka and made the first submarine war patrols of the Korean War. Augmenting surface and air units of the Seventh Fleet, their mission was to conduct reconnaissance of the China coast and appraise COMSEVENTHFLT of any communist threat to Formosa, significant changes in the pattern and volume of coastal traffic, and of any large movement of seaborne traffic in the area. These patrols were terminated on 30 July due to poor communications connectivity with the submarines and the determination that surface and air units could better provide the information desired.

At the beginning of the war, communications to and from submarines on patrol were seriously hampered by the lack of a separate submarine broadcast and the saturation of existing fleet broadcasts. Although interim measures were put into effect to minimize this problem, it was far from optimal. It was not until 1 October 1952 that a WESTPAC VLF transmitter and submarine communications center, for a separate submarine broadcast, was established at COMSUBGRU WESTPAC at Yokosuka. This finally improved submarine communications.

On 23 July 1950, REMORA deployed to the La Perouse Strait to conduct a reconnaissance war patrol. The La Perouse Strait was of strategic significance because all Soviet seaborne traffic, both warships and merchant vessels, transited the strait enroute to, or from, the Soviet naval base and shipping facilities located at Vladivostok, in the Sea of Japan. Some Chinese ships transited the strait as well. The patrol marked the first of 31 conducted in the area during the Korean War.[1] This became the mainstay for submarine operations thereafter.

The nature of the war in Korea quickly relegated the role of the Submarine Force to essentially that of a *threat in being*.[2] The primary function of the COMSUBGRU WESTPAC submarines

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[1] CINCPACFLT Interim Evaluation Report Number Six, Chapter 6, Submarine Operations,p. 6-22.

[2] Ibid p. 6-22.

were reconnaissance war patrols and ASW training services. Employment of the submarines evolved into a routine of maintaining one submarine on patrol and one in upkeep. Two submarines provided tame submarine services to ASW Forces and Hunter/Killer Groups. The ASW training was considered especially important because of the potential threat posed by the large number of Soviet submarines based at nearby Vladivostok, and the possibility of them entering the war.

As these operations dragged on along the periphery of the Korean War, a sense of frustration permeated the Submarine Force. It was best summarized by Rear Admiral William D. Irvin, USN(Ret.), who had been a staff officer for Commander Submarine Force U.S. Pacific Fleet (COMSUBPAC) Staff during the Korean War. When asked about the role of the Submarine Force in the war, he said:

> The Chief of Staff cautioned that the Submarine Force should sit back quietly and say nothing and do nothing—obviously there was nothing for the Submarine Force to do during the Korean War. I said, "This is crazy. We sit back and say nothing and do nothing and watch all the resources being poured into this Korean Conflict that will have to be taken from our already shrunken force and they will take it from the plush and those that are not needed. Now, if you take the attitude that you're not going to participate, it won't be five minutes before the powers that be will strip you of your forces and give it to the others that are actively engaged."
>
> Here we were just sitting on the line and starving fast. I begged to be allowed to go to Tokyo and perhaps explore and find somebody who would be amenable to using a submarine for anything. If we could just get them into action, perhaps something would develop. So I went to Tokyo and I don't know if I was particularly successful but we did get a few submarines into the act. The submarines were sent up the coast doing some observing, watching some coast lines, etc. We tried getting the amphibious forces into some acts of landing but it wasn't very successful. The general attitude that prevailed was that this was the war that didn't need any submarines and to go mind your own business. So I came back to Pearl pretty much

discouraged and sat moping because I couldn't see that there was any future in this outfit at all. We were getting nowhere on the minuscule things like the GUPPY SS and air warning types. The Regulus wasn't getting anywhere because there wasn't any support for it from the air boys — in fact, they were doing their damndest to kill it. I could see little or no hope for the Submarine Force in its present mood and present mode.[3]

Despite these feelings, and the minimal involvement of the Submarine Force in the war, its covert operating capability proved its value.

On 14 August 1950, PICKEREL deployed from Yokosuka to conduct a close-in photo-reconnaissance war patrol of the East Korean coast North of Wonson. PICKEREL's mission was to obtain periscope photography of potential landing sites for an amphibious operation being planned for PERCH. The PICKEREL patrol marked the first venture of an American submarine into the waters of an armed enemy since the conclusion of World War II. While conducting the patrol, PICKEREL sometimes came within 100 yards of the Korean coast. The photographs provided by PICKEREL proved invaluable for determining the landing location. In addition, PICKEREL brought back vital information on the location of minefields in the area. On 1 October 1950, PERCH earned the distinction of conducting the only designated submarine combat patrol of the Korean War.[4] Armed with PICKEREL's photographs and a detachment of Britain's Royal Marine Commandos, PERCH deployed to an area off the East Korean coast near Wonson to covertly deploy the commandos. Their mission was to destroy a vital North Korean railway installation, thereby cutting an escape route to, and a supply route from, North Korea. The destruction of the installation was important due to the rapid advance of United Nations Forces following the Inchon landings. PERCH executed its mission as

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[3] U.S. Naval Institute Oral History of Rear Admiral William D. Irvin, USN(Ret.) dated 7 September 1978.

[4] CINCPACFLT Interim Evaluation Report Number Six, Chapter 6, Submarine Operations, p. 6-22.

planned. The commandos encountered enemy resistance but were successful in destroying a railroad culvert and mining two railroad tunnels. Subsequent information revealed the destruction of one of the tunnels.

After the PICKEREL-PERCH patrols, no further submarine war patrols were conducted against the Korean coast due to the large proliferation of mines.

PICKEREL did, however, conduct another unique patrol. Deployed on 14 September 1950, PICKEREL executed a Sea of Japan-La Perouse Strait patrol in support of the Inchon landings. Operating near the Soviet naval base at Vladivostok, their primary mission was to provide indications and warnings information on Soviet warship movements toward Korea, possibly in reaction to the landings or other offensive operations. On 26 September 1950 PICKEREL sighted several Soviet submarines heading south in the general direction of United Nations Forces conducting offensive operations off the Korean east coast. Withdrawing from the vicinity of the sighting, PICKEREL transmitted a contact report to alert the United Nations Forces. It was later evaluated, however, that the Soviet submarines were enroute to Vladivostok. PICKEREL also reported on other suspicious Soviet activity during its war patrol.

SCABBARDFISH conducted the only other unique patrol in December 1952. Deployed to the South China coast, SCABBARDFISH conducted a reconnaissance war patrol to monitor and provide indications and warnings information on possible hostile Communist China ship movements.

La Perouse Strait war patrols were the operational mainstay of the Submarine Force during the war. They were conducted to maintain covert surveillance of, and provide indications and warning information on, Soviet and Communist China warships, and the volume of their merchant vessels, transiting the strait. In addition, they monitored Soviet Air activity. Patrols lasted 30 to 45 days.

The patrols uniquely and significantly contributed to the overall intelligence picture of the war by collecting tactical, operational, and strategic intelligence information not available by other means. This supplemented intelligence acquired via other sources. The covert operating capability of the submarine allowed for not only the monitoring for possible hostile intentions, but enabled the collection of vital photographic and acoustic intelligence, and

operating procedures, of Soviet and Chinese ships.

Patrols in this area were conducted continuously from July 1950 through the end of the war, and were continued after it. However, due to severe winter weather conditions, and the lack of credible shipping during this period, the patrols were usually suspended for the duration of the winter.

The following is a quoted excerpt from a submarine war patrol instruction that details a La Perouse Strait war patrol.

> a. Routing - (SS) depart Yokosuka...and proceed without escort in...accordance with Submarine Notice via East Coast of Honshu and Tsugaru Strait to patrol area. Make transit of Tsugaru Strait on the surface during darkness to avoid detection. Be alert for floating mines. ...
> b. Patrol Area - Two joint zones have been established. ... Joint zones V and VI do not include any waters within twelve miles of USSR controlled territory. ... Patrol of Joint Zones V and VI will be conducted East or West of the restricted area (due to mining). Passage between area V and VI will be made only on the surface, using only the U.S. swept channel given above, due to the possibility of the presence of submarine mines. ...
> c. Conduct of Patrol - (SS) will conduct a reconnaissance patrol within the limits of Joint Zones described above. An undetected surveillance will be maintained in the vicinity of the La Perouse Strait. The prevalence of fishing vessels in the swept channel between Joint Zones V and VI, and in Joint Zone VI, may prevent an undetected surveillance in Joint Zone VI. If this is the case, and unless directed otherwise and at the discretion of the (SS), conduct patrol remaining in Joint Zone V. Commencing as soon as practicable, a record of the seaborne traffic in the area will be maintained. Endeavor to obtain periscope photographs of Russian shipping. The prime consideration in selecting photographic ranges is the necessity to remain undetected. Attention is invited to the fact that in periscope photography with the Mark IV camera, an average merchant ship substantially fills the camera field in high power at a range of 1500 yards; a closer range therefore in unnecessary except under very poor visibility conditions. All shipping in La Perouse Strait has been lighted at night. Patrol in the

area will be conducted submerged during daylight, unless in the opinion of the Commanding Officer, visibility conditions will permit undetected surface running. It must be assumed that the USSR is aware of a submarine patrol being maintained near La Perouse Strait, therefore keep in mind the possibility of attack by (a) Submarine, (b) Aircraft, (c) Patrol Craft. At all times remain at least twelve miles from Russian occupied territory. Except under the most unusual conditions, this Operation Order should not be violated to secure intelligence information. ...

The importance of radio silence on a reconnaissance patrol is stressed. Carefully consider the value of the information to higher command before breaking radio silence while in the patrol area. You are directed to report immediately, however

a. Abnormal variation in pattern or volume of shipping.
b. Departure from use of normal running lights by USSR shipping.
c. A contact report.
d. Any indication of hostile action against the United States or friendly nations.
e. Any emergency necessitating early departure from station requiring Submarine Notice. ...

By the end of the Korean War, 28 submarines and 4 submarine rescue vessels had deployed to WESTPAC in support of the war. Not a single submarine was lost or damaged due to enemy action. By the conclusion of the war, the United States had increased its Submarine Force to 110 submarines, 38 more than they had in 1950. The number of submarines in WESTPAC also increased from four to six. The increases stemmed in part from the role the Submarine Force played in the Korean War and the blossoming of the Cold War

Although it entered the Korean War as a minor actor, in an unclear role, the Submarine Force ended the war as a rising star—a proven asset to the national security of the United States. What caused this? First, the Submarine Force made vital and extremely valuable intelligence contributions to not only the Korean War but the fledgling Cold War effort as well. It emerged from the war with a preeminence in covert intelligence surveillance and reconnaissance operations that equaled its World War II counter-

parts' anti-shipping role. Both of which were extremely important in maintaining the national security of the United States. Secondly, submarine crews gained valuable experience while conducting covert wartime reconnaissance patrols and operating in extremely cold weather conditions. This helped identify operational and material shortcomings (communications connectivity, periscope head window fogging, camera deficiencies, torpedo and mine deficiencies, and habitability considerations) that enhanced submarine design considerations and the operating procedures of the Submarine Force. Both factors, when combined with the advent of the submarine ASW mission, nuclear power, and the Polaris program, secured the viability of the Submarine Force for years to come. ■

**** IN REMEMBRANCE ****

Lieutenant Commander James W. Ahern, USN(Ret.)

Commander Lionel J. Goulet, USN(Ret.)

Rear Admiral Frederick Gunn, USN(Ret.)

Rear Admiral Karl G. Hensel, USN(Ret.)

Captain George H. Laird, Jr., USN(Ret.)

Rear Admiral William T. Nelson, USN)Ret.)

Rear Admiral Murray J. Tichenor, USN(Ret.)

Rear Admiral Carl Tiedman, USN(Ret.)

UNDERWATER ACOUSTIC COMMUNICATIONS IS THERE A ROLE?

by CDR Bradford A. Becken, USN(Ret.)

[Editor's Note: Dr. Becken graduated from the Naval Academy in the class of 1947. Following PG School at Monterey and UCLA, he became an Engineering Duty Officer (Elex). Thereafter, his naval assignments were all related to ASW, sonar and undersea warfare. Upon retirement, he joined Raytheon Company, Submarine Signal Division, where he has been Head of Engineering and Director of Technology. Dr. Becken is a Past Chairman of the ADPA Undersea Warfare Systems Division, and is currently a member of the Advisory Council to the NSIA Undersea Warfare Executive Committee.]

Fifty years have elapsed since the invention of the UQC underwater telephone. In comparison with the operational enhancements made in other fields, submarine tactical acoustic communication capabilities, at least as measured by installed operational equipments, have not improved significantly in the interim. The word *tactical* is stressed, meaning two-way communications between ships and submarines, not *bell-ringer* one-way systems, which require the called submarine to come to periscope depth to communicate using electromagnetic communication links, or special purpose strategic communications systems which have received some limited use in the past.

The lack of progress might be explained by a number of factors. Certainly in the early days the intractability and complexity of the acoustic medium presented an obstacle. However, enough has been learned about the medium so that excuse can no longer be used legitimately. There also have been periods where the desire for absolute stealth has been paramount and to radiate any energy was anathema to the submarine community. On the other hand, there are some who might argue that Murphy's Law (if something can go wrong, it will) was responsible for the lack of progress in the past. No matter in which direction the reader's personal preferences might lean, a review of the history of developments in this field contains some valuable lessons, which might be applicable to other development programs in the future. In addition, now that the submarine community has *come out of the closet* and there is greater emphasis being placed on electro-

magnetic communications and on new satellite antennas, it might be timely to reevaluate the potential contribution of acoustic communications to today's tactical solutions. First, I will provide some history and a view of lessons learned and then conclude with arguments in support of a reexamination of the potential contributions of acoustic communications to improved submarine/battle group tactical operations. My list of lessons learned include the following:

1. Never base a system design upon some hypothetical scenario as to how the system will be employed when in fleet use.
2. Make certain that a system design is not tuned to one particular operating environment. The corollary is that there really are differences between the Atlantic and the Pacific!
3. Without prototypes to evaluate, no matter how imperfect, the operating forces have difficulty in defining their operational requirements.
4. When introducing a new capability to the fleet, keep it simple. It is better to solve a problem in small, sequential steps rather than in a single giant leap.
5. A successful program requires a clearly identified program sponsor with a broadly recognized need and reasonable continuity in project management.
6. If you want to communicate using acoustics, you have to make a noise!

Prior to the invention of the UQC-1 underwater telephone, acoustic communications between ships and submarines either did not take place at all or was limited to Morse Code by on-off keying with installed searchlight active sonars. In fact, the Submarine Signal Company, where *submarine* referred to *underwater* not a *submersible ship*, was founded in 1901 before the discovery of radio because of the invention by Elisha Gray of an underwater bell which could be controlled by an electromagnet. The bell was used both as a navigational aid and as an early means of communications between ships and submarines. In fact Dr. Reginald Fessenden, the famous physicist, was hired by the Submarine Signal Company to invent a device which could overcome the very slow communication rates of the underwater bell. The Fessenden Oscillator was the result, useful for communications, but more importantly, the basis for the invention of the fathometer™.

As the significance of transmission frequency upon range became better understood during the 1950s, a lower frequency version of the UQC, the WQC-2, was developed. To my knowledge, all ASW ships and all submarines are equipped with the WQC-2, which includes the higher frequency UQC band for communication to other ships, such as NATO forces, for example, all of which have a UQC capability.

The search for better acoustic communications capability received impetus during the middle 1950s because of the planned introduction of SUBROC, the submarine launched, long range nuclear depth bomb. The problem then, which reoccurred during the later attempts to develop a submarine launched ASW standoff weapon, was that the ability to fire a weapon at long ranges had outstripped the fleet's ability to generate accurate fire control solutions at those same ranges. While SUBROC's large warhead lessened to some degree the fire control accuracy requirements, passive sonar, bearings only, fire control solutions of that day were insufficient to support SUBROC. During this same period, propagation research under the long range active detection (LORAD) program at the Navy Electronics Laboratory (NEL) in San Diego was producing very long ranges using low frequency, 1.5 kHz, FM and pseudo random noise (PRN) transmissions. At that time, just about all active sonars employed CW waveforms and the signal processing benefits of large time/bandwidth products were just beginning to be appreciated. From this work stemmed the concept of secure submarine communications (SESCO).

The idea behind SESCO was very straightforward. The only problems were that it required submarine tactics at variance with the way their commanders had been trained to operate and, in addition, it had a few technical flaws. The operational concept was that two submarines would operate in consort. If the range and bearing between them could be established with reasonable accuracy, then their individual bearings to the same target would permit a triangulation fire control solution to support SUBROC. The SESCO concept was based upon a very long PRN code of 2^{32} bits, good for the duration of a patrol, in that it would not repeat itself over that period. Each submarine left port with PRN clocks synchronized to a radio standard. In fact it was sufficiently difficult in those days with the technology available, that the PRN clocks were removed from the systems and carried to a central location on a tender, for example, in order to complete the lock.

With each system having identical generators, it was possible to determine range between submarines by establishing the time interval by cross correlation between the receipt of signal and the occurrence of a correlation spike. Communication information was encoded by superimposing four frequencies on a 2 kHz bandwidth.

These were the days before *fly-before-buy* as it is known today and acoustic modems were specified, prior to operational testing, as part of the BQQ-1 sonar systems slated for what became the Permit Class SSN. In addition, 20 independent SESCOs, BQC-2s were procured for older submarines, nuclear and non-nuclear. The newer submarines would use the BQS-6 array and transmitters while the independent SESCOs were to have their own deck-mounted array.

The initial systems, which were of the BQC-2 variety, were tested in about 1960 with very unhappy results. In order to minimize the time to synchronize and the length of the transmission, the tactical concept assumed that each submarine would follow a prescribed track. This was the first fatal flaw. Submarine commanding officers do not follow prescribed tracks. They did not then and they probably would not want to now. Once a target was detected by one submarine, his inclination was to investigate first and communicate second. By the time he did decide to pass on information about his contact, he had moved from the predicted position he would have occupied had he followed the prescribed track. Accordingly, his consort, if he did detect that a transmission had occurred, was not able to correlate quickly because the transmitting submarine was not at the range expected. The transmitting submarine, on the other hand, since he received no reply, assumed that his message had not been received because the transmitting source level was too low and, accordingly, raised his transmitter power. The receiving submarine, having by now obtained synchronization and wanting to reply, would lower his transmit source level because the received signal would appear so strong. Naturally, the original transmitting unit would fail to hear the reply, etc., etc. While all of these attempts to communicate were transpiring, the target would counterdetect the transmissions with the result that the system failed miserably.

Post exercise analysis identified two of the three causes that were responsible for the failure. The first is the number one lesson learned which was previously listed. It is impractical for

a system designer to base his concept upon an approach which constrains a tactical commander unrealistically. Some might argue that the constraint was not unrealistic in that the potential benefits outweighed the limitations. Let's face it. Our submarine Navy owes its success in large measure to innovative, independently thinking commanding officers. To expect them to operate counter to their natural instincts without extensive reindoctrination was not reasonable. The broader lesson learned is that we should design robust systems which do not rely upon some special tactic or operational approach, since it is never possible to predict the operational situation which the system will face eventually when in the hands of the operating forces.

The second system flaw was not as obvious as the first. SESCO was designed as a cryptographically **secure**, not a **covert** system. It was believed, however, that covertness would not be compromised if source levels used were the minimum necessary to establish contact and if transmissions were short. In addition, the PRN code was expected to provide some degree of covertness because of bandwidth, and the code was only known to the message addressee. The factor which was overlooked was transmit directivity. The array used with the BQC-2 was a sparsely filled, truncated cone of transducer elements with no baffling. As such, its directivity was poor and its sidelobes were high. Accordingly, any other listener, even if off the acoustic transmission axis, could detect the presence of the transmission, if not the intelligence. This constituted an unacceptable liability. It was some time before the third system flaw was appreciated and I will delay that explanation to the appropriate time in the narrative.

It was at about this time that I became involved in the program in a small way. I was assigned at NEL as the LORAD project officer, when it became apparent that array directivity was a problem. Since the SESCO concept had derived from the work at NEL, there was a natural desire to make the system work. We believed that at least a few BQC-2s should be installed with better arrays in operating submarines. An array concept was defined based upon the use of a ceramic transmit cylinder positioned at the focal point of a parabolic compliant tube reflector. The idea was to install the arrays in the bow buoyancy compartment of Guppy diesel electric submarines using a *monkey legs* mechanical train system to provide plus or minus 120 degree azimuthal coverage and the largest practical aperture for maximum directivity. The

laboratory went to the Bureau of Ships (BUSHIPS), after obtaining the agreement of the local submarine division commander to install the systems in the four submarines of his division with help from the local submarine tender, and offered to build the arrays and install the systems at no cost to the Bureau. It seemed like an offer too good to refuse and an excellent opportunity for the fleet to obtain some hands-on operating experience with some fairly advanced equipment. Unfortunately, for reasons which I will explain, the BUSHIPS project manager could not see his way clear to turn over four of the 20 unused SESCO equipments for installation, and thus, a valuable opportunity to obtain practical operating experience was lost.

What influenced his decision was the appearance of a new communication modem called SPUME, which had been developed at the Marine Physical Laboratory of Scripps under Office of Naval Research sponsorship. Dr. F. Noel Spiess, the Director of MPL was not only a first class scientist and engineer, he was also a World War II submariner and maintained a very active role in the Naval Reserve. As a trained submariner, he was worried about covertness. His concept was based upon the transmission of a short burst of multiple tones. The presence or absence of specific frequencies would represent the intelligence. Since the transmissions would be short, about 100 milliseconds, they would not be likely to alert either a passive scanning sonar such as the BQR-2 or a mechanically trained passive system credited, at that time, to the Soviets. When NEL appeared on the scene requesting four BQC-2s, the BUSHIPS project manager was preparing a plan for a comparative evaluation of SESCO and SPUME. The evaluation would take place in six months and would settle, once and for all, which of the two communication concepts should be implemented in the fleet. Installing four SESCOs in the Pacific would just confuse the issue, in his opinion. The evaluation did take place, not in six months but in two years. It was unsuccessful for the same three reasons noted earlier, two of which I have discussed and the one I have yet to describe. The opportunity to give the fleet some capability with which to experiment, even if limited, was lost and the BQC-2s were consigned to Mechanicsburg and presumably became scrap.

The third reason for failure of the earlier SESCO tests as well as the more recent SESCO/SPUME evaluation was environment related and due to the, at the time, poorly understood phenomenon of multi-paths. As noted earlier, underwater sound propagation is

complex due to refraction and reflection effects. Sound originating at a source does not necessarily reach the receiver at the same time when the sound paths are of varying length. This multipath effect can be divided into two classes, depending upon path length differences. Refraction effects under certain conditions can lead to small path length differences, on the order of a wavelength. Thus a communication system which relied on fixed tones can experience dropouts due to path differences introducing a 180 degree phase reversal, and destructive interference. Major path length differences up to several seconds can occur between major propagation paths—direct, convergence zone, and bottom bounce. Accordingly the signal from longer transmission length pulses, such as used in SESCO, can be significantly distorted by the random addition of multiple signals over an extended time period. It was multi-paths, more than any single factor, that contributed to the SESCO/SPUME failure.

It is logical to ask why multi-path effects were not appreciated as a result of development testing which must have occurred prior to production. The answer is that there are regions in the ocean where multi-path effects are minimum, as for example, in the Pacific Hawaiian area where most of the LORAD and SESCO testing had occurred. However, the environmental conditions in the Atlantic, where the Submarine Development Group conducted operational testing, differed markedly from Hawaii and represented some of the worst multi-path conditions that might be found. The moral of the story is obvious. It is dangerous to assume that a system which performs well in some test environment will perform that same way across a broad spectrum of environments.

The whole sequence of events gave underwater acoustic communications a terrific black eye. Human nature being what it is, the pendulum swung violently from the *get equipment into the fleet* mode to *let's go back to basic research*. A period of relatively low level 6.2 exploratory development effort ensued for about ten years, during which a better understanding of the mechanisms involved in acoustic propagation and their effect on communications was developed. In my opinion, however, the pendulum swung far too far and the fleet went too long without the opportunity to experiment with acoustic communications even if the equipment available did not meet all of the operational requirements. The overreaction became so severe that for a time, the governing operational requirement specified absolute covertness, even with a hostile interceptor on the acoustic axis at a range

closer than the ship with whom it was desired to communicate. Patently, such a requirement defied the laws of physics and led to my somewhat tongue-in-cheek statement that in order to communicate with acoustics, you must make a noise.

By the 1970s enough progress had been made that the time appeared ripe to try again to produce some operational equipment. Experimental modems had been laboratory sea tested, sub-to-sub, sub-to-ship, which generated renewed confidence that the multipath problem could be solved and the Navy embarked upon the advanced development of a system called SAMAC, submarine acoustic modem and controller.

SAMAC reached the test and evaluation stage but was not accepted for fleet use. In my opinion there were two reasons for its lack of acceptance: cost and program sponsorship. Because the Navy technical community had been frustrated for so long in their attempts to provide the fleet with an effective acoustic communications systems, now given a new opportunity, they over-specified the requirements, calling for levels of automation which priced the system beyond that which the Navy could afford. This resulted in the fourth lesson learned—when introducing a new capability into the fleet, keep it simple.

The second problem and the fifth in the list of lessons learned is the one about the need for consistent program sponsorship. The old saying *it takes two to communicate* certainly applies in this case. An effective tactical acoustic communications capability requires the cooperative sponsorship of the air, surface and submarine ASW communities. An attempt was made during the 1970s to focus the attention of all involved parties by the creation of an integrated acoustic communication program (IACS) within the then Naval Electronics and Communications Command (NAVELEX). While NAVELEX could generate a plan, it never appeared possible to obtain a support consensus from the OPNAV program sponsors, at least support sufficient to generate needed program funding. While a recurring theme at industry briefings by OPNAV and fleet personnel for many years from analyses of fleet exercises had been the need for better acoustic communications, that perceived need has never resulted in consistent support from all the parties concerned. At the time that SAMAC was undergoing evaluation, I suspect that the submarine community's dedication to strategic ASW and concerns over Soviet submarine radiated noise quieting were responsible for the loss in interest in underwater acoustic communications.

Much has happened since the days of SAMAC and the IACS program. The emphasis upon strategic ASW by SSNs in Arctic waters had decreased dramatically. Littoral warfare is the major concern, including integration of the SSN into the battle force with an accompanying emphasis upon direct satellite communications between a submarine commanding officer and the battle force commander. There is an ever increasing demand for very wide communication bandwidths to enable the transmission of massive amounts of data and imagery. This demand has led to the search for a periscope mounted satellite dish antenna compatible with that need. It also would appear from the willingness of the submarine to use RF that earlier reservations about coming to periscope depth in order to communicate, with the potential loss of sonar contact being tracked, is no longer of particular concern. Superficially at least, it might appear that any acoustic communications capability has been left behind that which can be provided by RF.

Before anyone gives up on the need for acoustic communications however, several other factors should be considered. The emerging application of unmanned underwater vehicles (UUVs) is begging for a vehicle control and data transfer solution independent of an umbilical cord between the UUV and the submarine. Research in progress at the Woods Hole Oceanographic Institute and at Northeastern University suggests that underwater acoustic communication rates up to 20,000 bits per second may be possible using such techniques as adaptive equalization. Data compression algorithms, developed to support the needs of satellite imagery, have lessened bandwidth demands. Also, there still may be tactical situations where a submarine commander would like to avoid coming to periscope depth in order to communicate. With the ready availability of relatively inexpensive commercial off-the-shelf computers and signal processors, it may now be appropriate to revisit the potential of underwater acoustic communications links between ships and submarines and to treat this field more than just a source of lessons learned and examples of how not to run development programs in the future, but as a source of solutions to future submarine communication problems. ■

A FAREWELL TO SUBMARINE GROUP SIX

by CDR G.E. Hendrich, USN

After more than 34 years of service to the U.S. Navy and the nation, Submarine Group Six was deactivated on 3 September 1994 in ceremonies in Charleston, South Carolina. In the late 1970s and throughout the 1980s, Submarine Group Six was the largest submarine group in the U.S. Navy, with the operational responsibility for five submarine squadrons and more than 50 nuclear powered submarines, including both fleet ballistic missile, fast attack and one of the last diesel submarines in the U.S. Navy.

Submarine Group Six was originally established as Submarine Flotilla Two at Norfolk, Virginia on 1 March 1960 under the command of Captain J.W. Williams, USN. With headquarters on the submarine tender USS ORION (AS 18) in Norfolk, Submarine Flotilla Two was tasked with responsibility for submarine operations on the South Atlantic seaboard of the United States stretching from Key West, Florida northward to approximately Annapolis, Maryland, including the Gulf of Mexico. Submarine Flotilla Two initially included the surface and submarine units of Submarine Squadron Four in Charleston, Submarine Squadron Six in Norfolk, and Submarine Squadron 12 in Key West.

On 29 March 1960, Submarine Flotilla Two's responsibilities expanded to include the newly commissioned Polaris Missile Facility, Atlantic (POMFLANT) at the Naval Weapons Annex, Charleston. The mission of the Polaris Missile Facility was to provide missile maintenance and replenishment for the new fleet ballistic missile (FBM) submarines then coming into service. In August 1960, Submarine Flotilla Two moved to Charleston when headquarters were shifted to USS HOWARD W. GILMORE (AS 16). A new era of strategic deterrence began on 15 November 1960, when USS GEORGE WASHINGTON (SSBN 598) departed Charleston for the first operational SSBN deterrent patrol, carrying 16 tactical Polaris A-1 missiles, each with a 1200 nautical mile range.

Over the next several years, additional submarines, especially SSBNs, were added to Submarine Flotilla Two's growing responsibilities. On the first of April 1962, Submarine Flotilla Two was redesignated as Submarine Flotilla Six; then in February 1963, Submarine Flotilla Six assumed additional duties in support of the

FBM submarine program. These duties included the stateside off-crew training, personnel detailing, logistics and pre-deployment operations for the FBM submarines scheduled for the newly formed Submarines Squadrons 16 and 18. During 1963, five new FBM submarines of the Lafayette Class were commissioned and assigned to Submarine Flotilla Six in preparation for future transfer to Submarine Squadron 16. As the year 1963 ended, USS LAFAYETTE (SSBN 616) was loading missiles in preparation for her first patrol.

In January 1964, Submarine Flotilla Six shifted administrative headquarters to the Fleet Ballistic Missile Submarine Training Center in Charleston. During the remainder of 1964, 12 more new FBM submarines, including the SSBN 627 Class, reported to Submarine Flotilla Six for predeployment training. Because test firings for all new and post overhaul SSBNs were and still are conducted from the Atlantic Ocean near Port Canaveral, Florida, virtually every SSBN came under Submarine Flotilla/Group Six operational command while conducting these demonstration and shakedown operations (DASO) test firings.

On the first of August 1964, Submarine Squadron 18 was activated with headquarters in Charleston. Submarine Flotilla Six assumed additional duty as Commander of that Squadron until its Squadron Commander arrived on 16 November 1964. Also in 1964, USS POLLACK (SSN 603) and USS HADDO (SSN 604), newly constructed fast attack submarines, joined the Flotilla as the first nuclear powered fast attack units of Submarine Squadron Four.

1965 saw continued growth and expansion of Submarine Flotilla Six's responsibilities. During 1965, the first three of the Benjamin Franklin Class FBM submarines were commissioned and reported to Submarine Flotilla Six for predeployment training. Also during 1965 the FBM submarine tenders USS SIMON LAKE (AS 33) and USS CANOPUS (AS 34) reported to the Flotilla for shakedown. Upon completion of shakedown, USS SIMON LAKE joined Submarine Squadron 18.

Submarine Squadron 16, previously reporting directly to Commander, Submarine Force, U.S. Atlantic Fleet, was placed under the administrative control of Submarine Flotilla Six in August 1965. Then in September 1965,the Flotilla Commander moved from the Fleet Ballistic Missile Submarine Training Center to his new headquarters in Building 646 where headquarters remained until deactivation in September 1994.

Continued growth of responsibilities came with 1968. In early 1968, HMS RESOLUTION (SSBN 01), the first of the British SSBNs arrived in Charleston for loadout and DASO, followed by departure in March for the first British SSBN deterrent patrol. In May 1968, tragedy struck the Submarine Force when USS SCORPION (SSN 589), a Flotilla unit attached to Submarine Squadron Six in Norfolk, was lost at sea with all hands. In December 1968, USS WHALE (SSN 638), the first of the 637 Class nuclear powered fast attack submarines reported to Submarine Squadron Four.

As the new decade of the 70s dawned, modernization of ships and weapons systems became the focus, as the first of the nuclear submarines began overhauls and weapons conversions. In August of 1970, the first submerged launch of a Poseidon missile was successfully conducted from USS JAMES MADISON (SSBN 627). The firing was observed by a Soviet ship, LAPTEV, whose crew was unsuccessful in attempts to recover closure plate segments from the water after launch of the missile.

On 1 September 1972 the first torpedo Mk 48 Training Certification Program (TCP) team for the Submarine Force, U.S. Atlantic Fleet, was established at Submarine Flotilla Six. The team acted as professional and technical advisors to the Flotilla Commander and as instructors and coaches for ship's commanding officers, attack parties, and other weapons and sensor teams. Submarine Flotilla Six was redesignated in July 1973 as Submarine Group Six.

As the 70s drew to a close, new ships and weapons began to emerge. In January 1977, USS LOS ANGELES (SSN 688) completed her initial Mk 48 torpedo certification while assigned to the group and on 2 July 1979, Submarine Squadron 16 shifted from Rota, Spain to a new site at Kings Bay, Georgia in preparation for the new Trident SSBNs.

In 1979, additional growth in the SSN force resulted in forming the new fast attack Submarine Squadron Eight in Norfolk, Virginia, to supplement Submarine Squadron Six, thus bringing Submarine Group Six to five subordinate submarine squadrons.

Throughout the 1980s, Submarine Group Six was the largest submarine group in the U.S. Navy, and one of the largest in the world, including five submarine squadrons in three home ports with five submarine tenders, more than 50 submarines and more than 18,000 active duty members. In 1981, construction of an expanded off crew office and training space was completed as

Building 646 Annex was dedicated, more than doubling the training and off crew office space available for Submarine Group Six. This was necessary to keep pace with the growth of the Charleston submarine community to more than 12,000 active duty members. On November 11, 1981 the first of the new Trident submarines, USS OHIO (SSBN 726), was commissioned and placed under the operational command of Submarine Group Six.

In March of 1983, Submarine Group Six was awarded the first of two Meritorious Unit Commendations for significant contributions in resourcefully managing the largest submarine community in the U.S. Navy and in bringing the new Trident submarines successfully on line.

In September 1986 USS SAM RAYBURN (SSBN 635) completed a 12-1/2 month dismantlement availability at Charleston Naval Shipyard and commenced duties as the first moored training ship at the Charleston Naval Weapons Station.

Submarine Squadron 20 was established in 1988 in Kings Bay Georgia, as the first East Coast Trident submarine squadron, bringing Submarine Group Six to a peak of six subordinate submarine squadrons. This remained the situation for a year until the establishment of Submarine Group 10 in Kings Bay and the transfer of Submarine Squadron 20 to that Group.

The Fall of 1989 was disastrous as Hurricane Hugo hit Charleston on September 21, 1989. Submarine Group Six provided strong leadership in the organization of disaster assistance teams, working with home repair, distribution and Red Cross teams to provide around the clock recovery needs. In recognition of their actions well above and beyond the call of duty, personnel assigned to Submarine Group Six were awarded the Humanitarian Service Medal.

In August 1990 Submarine Group Six was awarded a second Meritorious Unit Commendation recognizing the significant contributions in bringing additional Trident SSBNs and the new D5 Trident missile on line.

The end of the Cold War and the necessary military downsizing that came with the 1990s resulted in a significant reduction in the Submarine Force, including plans to deactivate the remaining submarines of the original *41 for Freedom* and a major portion of the older SSNs. Submarine Group Six was also selected to be deactivated. In May 1992 Submarine Squadron 18 was deactivated and Submarine Group Six was notified that all SSBNs remaining in the group were to be accelerated in their deactivation process by

up to four years. In late 1992 Submarine Squadrons 6 and 8 in Norfolk, Virginia were transferred to Submarine Group Two in New London, thus beginning the downsizing and ultimate end of Submarine Group Six.

Submarine Squadron 16 was deactivated in June 1994, Submarine Group Six was deactivated on 3 September 1994, and Submarine Squadron 4 will be deactivated on 31 March 1995. Thus ends more than 34 years of service by Submarine Group Six and nearly half a century of submarines in Charleston at Submarine Squadron 4. ■

ROSTER OF COMMANDERS
SUBMARINE FLOTILLA/GROUP SIX

CAPT J.W. Williams, Jr.	1 March 1960 - 14 Jul 1961
CAPT G.G. Cole	14 Jul 1961 - 14 Jan 1963
CAPT W.F. Schlech, Jr.	14 Jan 1963 - 27 Aug 1964
RADM E. Loughlin	27 Aug 1964 - 24 Sep 1966
RADM D.G. Baer	24 Sep 1966 - 29 Oct 1967
RADM L.G. Bernard	30 Oct 1967 - 24 Jan 1969
RADM J.B. Osborn	25 Jan 1969 - 28 May 1970
RADM S.D. Cramer	28 May 1970 - 12 Jul 1972
RADM A.J. Whittle, Jr.	13 Jul 1972 - 27 Feb 1974
RADM A.L. Kelln	28 Feb 1974 - 27 Jun 1975
RADM S.J. Anderson	28 Jun 1975 - 15 Jun 1977
RADM H.S. Benton	16 Jun 1977 - 16 May 1979
RADM D.P. Hall	17 May 1979 - 16 Jul 1981
RADM A.J. Baciocco, Jr.	17 Jul 1981 - 05 Aug 1983
RADM S.G. Catola	06 Aug 1983 - 08 Aug 1985
RADM S.E. Bump	09 Aug 1985 - 30 Jun 1987
RADM W.A. Owens	30 Jun 1987 - 25 Jun 1988
RADM A.F. Campbell	25 Jun 1988 - 13 Jul 1990
RADM T.A. Meinicke	13 Jul 1990 - 25 Jan 1992
RADM T.J. Robertson	25 Jan 1992 - 03 Sep 1994

A CRUISE ON NEVADA

by CAPT James P. Ransom III, USN(Ret.)

You can go back home again—if you're very lucky. I was lucky. And home for me is the submarine service.

Our son Jim is XO of the Trident submarine NEVADA (Blue crew, if that makes any difference), and was thoughtful enough to invite his old man for a five day ride. (He gets his thoughtfulness from his mother, like most of his other fine qualities.)

In this case, *old man* means his father, not his skipper. The CO, John McMacken, needed no invitation. And I accepted on condition that the skipper understood that I would be in charge. No problem!

It was the best five days of my post-Navy retirement life. It gave me a singular opportunity to remember what it was like to be a submariner, to see what it's like today, and to glimpse what it will be in the future.

And this piece is mostly about submariners, not the boats themselves, for our most valuable and constant asset is the man, not the metal.

But first, the differences:

As a reminder of my *seniority*, I could find only one other person aboard who had served in diesel boats (and he was only two-thirds my age). I qualified in BASHAW. The lead auxiliaryman had served in several fine diesels, including DARTER and one or two B-Girls.

Another difference: space. Volume. Habitability. Accessibility. I mean, you could actually get to a hydraulic accumulator for maintenance without having to rip out four other systems.

Having never served on a SSBN (1 SSK, 4 SSNs for me), I had a baggage load of preconceived notions about ship's routine, most of which proved wrong, as preconceptions are wont to be.

(I'd like to say that I never even sailed on a SSBN, but truth be told, as a SUBPAC staffie I was once faced with the Hobson's choice of riding one for 30 hours or losing a month's submarine pay. Tough choice, but my practical left brain won out over my idealistic right brain, and I spent an overnight at sea adjacent to 16 SLBMs. They declined to award me the patrol pin.)

I anticipated five days on NEVADA steaming at minimum turns in large circles at a modest depth with a group of serious

people who did nothing but stand steady-steaming watches, eat, qualify, and read books. Well, that's an exaggeration, but not by much.

At any rate, since the ship was undergoing a training *mini-DASO*, with the training team (out of SP, and highly professional) and some of the Gold crew aboard, plus mids, plus staffies, plus reserves, plus another non-producing fellow traveler and myself, I found the ship out-SSNing most SSNs. Drills, surfacings, drills, dives, drills, snorkeling, and drills.

By drills, I mean not only for the weapons, ship-handling, and navigation teams for which the DASO is designed, but for every gang on the ship, and for the whole ship. Hand dives, fire, loss of power, jam dives, flank speed maneuvers, flooding (and EMBT blow). You name it—we did it. Hardly time for meals and movies, let alone sleep.

I attribute this regimen to an aggressive and self-confident CO (backed up by a like-minded XO, I might add) who commanded two 688s before NEVADA. It was a pleasure to observe his skill and leadership style.

The captain was typical of the one factor which I found unchanging from my days on the boats—the environment, the atmosphere, the ambience, the professionalism, the attitude, the camaraderie, the fellowship that is clearly a collective function of the people and their mission, and that still gives unique meaning to the word *shipmate*.

No one who has not gone to sea, particularly on a submarine, can understand or appreciate the bond which develops between men sharing a like experience of total inter-dependence. It is the reason that warriors become what they are, and is not easily explained to those outside the service.

The author, John Keegan, in his excellent book A History of Warfare, offers several descriptions of a soldier which I submit are applicable to the band of brothers who man our submarines:

> "As those who know soldiers as members of a military society recognize, such a society has a culture of its own akin to but different from the larger culture to which it belongs, operating by a different system of punishment and rewards—the punishments more peremptory, the rewards less monetary, often, indeed, purely symbolic or emotional—but deeply satisfying to its adherents.

"The warrior hero is admired by both sexes for running real risks; but the man of soldierly temperament—how blinkered social scientists are to the importance of temperament—will run risks whether admired by the outside world or not. It is the admiration of other soldiers that satisfies him—if he can win it; most soldiers are satisfied merely by the company of others, by a shared contempt for a softer world, by the liberation from narrow materiality brought by the camp and the line of march, by the rough comforts of the bivouac, by competition in endurance, by the prospect of le repos du guerrier among the waiting womenfolk.

"...the Roman professional soldier did not serve for the monetary rewards enlistment brought him. His values were those by which his fellows of the modern age continue to live: pride in a distinctive (and distinctively masculine) way of life, concern to enjoy the good opinion of comrades, satisfaction in the largely symbolic tokens of professional success, hope of promotion, expectation of a comfortable and honourable retirement."

Aside from the fact that one can't compare the relative comforts of a Trident submarine to the bivouac life of a Roman soldier, it takes only a few technical changes to rewrite the above to apply to sailors in general, and submariners in particular.

That's what I meant about remembering how it was and glimpsing how it will be. The technology changes. The boats change and improve. But the *sense of shipmate* that had underlain service in our earliest pioneer boats, in our World War II fleet boats, in our Cold War diesels and nuclear attacks, and in our strategic ships is a constant that I am grateful, if only for five days, to have felt again. ■

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This edition of the Submarine Bibliography offers two samples of the rich body of work available in languages other than English. **THE SUBMARINE REVIEW** is indebted to General Marc Menez and to Dick Boyle for their contributions.

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by Ingénier Général dIère Classe Marc Menez
French Navy (Ret.)

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REUNIONS

USS NARWHAL (SSN 671) and (SS 167) reunion will be held in Groton, CT from 29 July to 1 August 1995. Please contact:

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USS THOMAS JEFFERSON (SSBN 618) reunion will be held in Navarre Beach, FL, 22-26 February 1995. Please contact:

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into production as it was an unsecure system.

Sippican, under an SBIR contract, developed a fiber optic link to the buoy which provided the bandwidth necessary for encrypted communications. This development was incorporated into a submarine launched buoy by the Naval Undersea Warfare Center. This product did not go into production. However, the fiber optic link was later used to tether a floating camera to the submarine as part of the optronic mast development. This could provide the submarine with the ability to visually observe surface conditions while remaining at depth. Other uses could be made of this unique technology.

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ON PATROL FIFTY YEARS AGO

(Editor's Note: On October 24th, 1944 three U.S. submarines were lost—DARTER (SS 227), SHARK (SS 314), and TANG (SS 306). SHARK was probably sunk by a Japanese counter-attack after torpedoing a freighter. DARTER was stranded on Bombay Shoal off Palawan after torpedoing two Japanese cruisers, and was destroyed by gunfire from NAUTILUS. TANG was sunk by its own last torpedo during a Formosa Strait convoy battle on its fifth war patrol. This is the story of TANG's last patrol, as told in Theodore Roscoe's U.S. Submarine Operations in World War II. Copyright 1949. Reproduced by permission of the United States Naval Institute.)

USS TANG - Fifth War Patrol
24 September 1944 to 24 October 1944

One submarine that contributed Herculean support to the United States offensive was TANG (Commander R.H. O'Kane). By indirect (in the Philippines) contribution (cargo carriers sunk during previous patrols) she had helped bring about a raw material scarcity which resulted in a shortage of parts of *kamikaze* planes. More direct was the contribution of her October 1944 patrol in Formosa Strait—a patrol which went far to cut down the volume and the speed of Japanese reinforcements.

Commander O'Kane on the bridge, TANG set out from Pearl Harbor on September 24 to conduct her fifth war patrol in the southern reaches of the East China Sea; specifically, the reach between northwest Formosa and the China Coast. Here she would be on the inside of the Formosa Strait bottleneck, in that dangerous area which was hemmed by minefields to eastward and a hostile coast on the west. O'Kane was given the choice of making the long run down through the East China Sea alone, or joining a wolf-pack heading for a southern East China Sea area. O'Kane chose to go it alone.

TANG topped off at Midway on September 27, and neither the wolf-pack nor any submarine base heard from her or saw her thereafter. But the Japanese both heard from and saw her. First intimation that she was blockading their Formosa Strait traffic lane came on the night of October 10-11 when O'Kane and company

torpedoed and sank two heavily laden freighters. This was the beginning of a foray that was to be officially described as "the most successful patrol ever made by a U.S. submarine".

Following the action of October 11, the hunting slacked off, and TANG spent the next 12 days in routine search. Then, after a careful analysis of the shipping routes, O'Kane put a finger on the chart. TANG reached that point on October 23rd. And down the road as calculated came a convoy—three cargomen, a troop transport, a tanker or two and pugnacious escorts.

O'Kane decided to stop this convoy with a surface attack. And stop it he did. Driving TANG into the center of the formation, he unleased a series of ship-puncturing salvos that mangled the *marus* on all sides. Ensued a ferocious free-for-all—freighters blowing up, escorts dashing about in frenzy, the submarine weaving and dodging through a storm of bullets and shells. Looming up out of the battle smoke, the troop transport bore down on TANG to ram her under. Emergency speed and hard left rudder saved the submarine. Then she was boxed in with three burning vessels on one side, and a freighter, a medium transport and several infuriated destroyers charging in on the other. Holding the bridge, O'Kane swung the submarine to attack her attackers. A salvo tore into the freighter and disabled the transport. TANG's tubes were now empty, but O'Kane aimed her bow at the nearest destroyer and sent her charging at the DD. The bluff worked. Unwilling to risk a possible torpedoing, the destroyer veered away. As the night flared and shook with the din of gunfire and shell-bursts, TANG, her tubes unloaded, raced out through the cordon of escorts. Depth charges flailed the sea behind her. Unscathed, she reached quiet water and submerged.

O'Kane reported seven ships torpedoed in this battle. According to Japanese records, only three of these went to the bottom. The remaining four supposedly made port, but if they did so, it must have been the nearest port and not the destination intended. And while the residue of this convoy limped off into some backwater, TANG returned to the surface of Formosa Strait to intercept another.

On October 24, exactly 24 hours after her previous encounter, she picked up this second convoy, another heavily escorted herd of *marus* steaming south to reinforce the Imperial troops on Leyte. O'Kane could make out tankers with aircraft on their lengthy decks and troop transports loaded like camels, their fore and after

decks piled high with crated planes. Again O'Kane directed a surface approach. But this time as TANG closed in, she was detected before she reached attack position. Immediately the convoy's escorts swept the sea with random 5-inch and 40-mm fire. O'Kane held TANG on the surface, driving in. When the range was reduced to about 1,000 yards, O'Kane fired six torpedoes—two at a transport, two at a second transport, two at a nearby tanker. All torpedoes smashed home with a series of shattering blasts that tossed up clouds of fire and debris.

At once the night became livid with the glare of burning ships, spitting guns, larruping tracer and exploding shells. Milling convoy and attacking submarine were exposed in the hell-light as O'Kane maneuvered TANG for a shot at another target. A large transport and a tanker were astern of the submarine, and off the beam a destroyer was charging in at 30 knots. Two DEs rushed at TANG from the other side, and the three burning ships were directly off the bow. For the second time in 24 hours the submarine was boxed in. And again O'Kane's expert handling saved her from destruction by the enemy.

As on the previous night, he rang full speed ahead and sent TANG charging straight at her attackers. But this time the charge was no bluff. Closing the range, O'Kane fired three fast shots to clear the way. The first struck the tanker which promptly spewed a geyser of flame. The second hit the transport and stopped her dead in the water. The third struck the destroyer and stopped this foe with a thunderclap that shook TANG from stem to stern. Sprinting out through the gap, she dashed away from the Jap DEs. The night blazed and boomed in pandemonium astern. O'Kane held the submarine at safe distance while the last two torpedoes were loaded in the tubes.

Loaded into the tubes with these last two torpedoes was Fate, the one factor neither O'Kane, nor TANG's crew, nor TANG herself could dominate. What TANG, crew and O'Kane might have gone onto accomplish, had this factor taken a normal turn, can only be imagined in the light of what they had thus far achieved. Abbreviated as was TANG's fifth patrol, O'Kane and company had already scored the following:

Date	Name	Type	Tonnage
Oct. 10	Joshu Go	Cargo	1,658
Oct. 11	Oita Maru	Cargo	711
Oct. 23	Toun Maru	Cargo	1,915
Oct. 23	Wahatake Maru	Cargo	1,920
Oct. 23	Tatsufu Maru	Cargo	1,944
*Oct. 23	Kogen Maru	Cargo	6,600
*Oct. 25	Matsumoto Maru	Cargo	7,024

* Attacked before midnight, October 24th.

Now Fate was to cut down this fighting submarine at the very hour when she deserved the laurels of victory.

Loss of TANG

O'Kane picked the damaged troopship as the target for a parting salvo. Rushing this way and that, the convoy's rattled escorts gave the submarine an opening, and O'Kane sent her darting through the gap to attack the transport. The crippled vessel was a set-up—as O'Kane gave the order to fire, there was no intimation of impending disaster.

The first torpedo found its groove and ran straight for the mark, trailing its luminescent wake. The second torpedo—TANG's lookouts stared in cold shock! This torpedo swerved sharply to the left, porpoised and made a hairpin turn. A circular turn!

O'Kane shouted for emergency speed, and the rudder was immediately thrown over. Too late. Twenty seconds after firing, the terrible boomerang returned from the night and struck TANG in the stern. The blast flung O'Kane and his companions from the bridge. In the submarine's control room men were hurled against the bulkheads, a number suffering fractured arms or broken legs. Mortally stricken, TANG plunged 180 feet to the bottom. Her crew fought its way forward from the flooded after compartments.

Nine submariners had been blown from the bridge into the boiling sea. Three of this group managed to swim throughout the

night. One officer, who had escaped from the flooded conning tower, swam with them. O'Kane was among these four swimmers who were picked up by the Japanese the following morning.

The men trapped in the submarine looked Death squarely in the face. After code books and similar publications were burned, these crew members assembled at the escape hatch. Before the escape could be attempted, a Japanese A/S vessel roamed overhead and launched a depth-charge attack. Blast after blast hammered the sunken submarine, bruising her bow and starting a vicious electrical fire in the forward battery. To the men caught at sea bottom, this added torture of blinding smoke and heat seemed the final extremity. But they did not yield to despair and abject resignation. Thirteen of these submariners escaped from the forward compartment. By the time the last man squeezed into the escape hatch, the electrical fire was melting the paint on the bulkhead. Eight of the 13 escapees reached the surface alive. Five were able to swim until morning, when they were picked up.

TANG's nine survivors had to meet another ordeal after their escape from the sea. Aboard the destroyer escort which picked up the nine, there were Japanese survivors from the ships torpedoed by TANG. Blows, kicks and clubbings were dealt the American submariners until the punishment was almost beyond endurance. Yet the torment was suffered with stoicism and stamina.

> "When we realized that our clubbings and kickings were being administered by the burned, mutilated survivors of our own handiwork, we found we could take it with less prejudice."

In that statement Commander Richard H. O'Kane displayed a magnanimity and sense of justice that characterized him as a naval officer of extraordinary stature.

When TANG's survivors were recovered from Japanese prison camps at the end of the war, the Board of Awards and Review, Submarine Force, Pacific Fleet, recommended that Commander Richard H. O'Kane be awarded the Congressional Medal of Honor.

> *"For conspicuous gallantry and intrepidity in combat,* (reads the formal citation) *...at the risk of his life above and beyond the call of duty...*

This is a saga of one of the greatest submarine cruises of all time, the fifth and last war patrol of a fighting ship—the USS TANG—ably led by her illustrious, gallant and courageous commanding officer, and his crew of daring officers and men. During this unprecedented patrol, TANG conducted a series of history-making attacks against the enemy which proved to be of immeasurable assistance toward the Allied conquest of the Pacific..."

For contributing that assistance at the critical opening of the Philippines campaign, TANG was awarded her second Presidential Unit Citation. Although the shipping downed by her torpedoes in the Formosa Strait did not equal the massive tonnage sunk during her June-July patrol in the Yellow Sea, her single-handed blockade of the Formosa bottleneck was a strategic masterwork.

At the time TANG went down, only one other submarine, TAUTOG, had sunk as many Japanese ships. Only TAUTOG, fighting through to war's end, would sink more than TANG's 24. O'Kane's submarine also had served with outstanding success as a lifeguard, with 22 rescues to her credit. But one other submarine, TIGRONE, would top this rescue score.

Three warships in the United State Navy were twice awarded the Presidential Unit Citation. Two of the honored three were submarines—GUARDFISH (Commanders T.B. Klakring and N.G. Ward) and TANG (Commander R.H. O'Kane).

In Washington, DC, April 1946, President Truman presented the Congressional Medal of Honor to Commander O'Kane. ■

The Auburn University NROTC Unit has established the AU NROTC Alumni Association. All former graduates and staff of the unit can contact:

LT Thompson or LT Daves
William F. Nichols Center
Auburn University
Auburn, AL 36849-5512
(205) 844-4364

LETTERS

A THANK YOU

21 June 1994

Dear Naval Submarine League,

Thank you for all the information and pictures you sent me, it really helped to enhance my submarine report. I want to thank you for taking the time to answer my letter and sending me the information for my report back in April. You and your information helped me get an E on my report (which is like an A in my school). I have sent you a copy of my report and the grade sheet. Even if you don't read the report I want you to see what I could do with some of your informtion.

I want to thank you again for everything and I want to let you know that I really appreciate it.

Thanks and Sincerely,
Stephanie Gwyn Londo
Mrs. Lister's Grade Five

REMEMBERING HISTORY

29 June 1994

Commander Richard Compton-Hall, MBE, RN(Ret.) at the Twelfth Annual Naval Submarine League Symposium suggested that the lessons of the past not be forgotten. He further added that some of the current changes to Submarine Force tactics, strategy and employment philosophy may be seated in politics (my words) and consequently may not be sound submarine doctrine. As history has shown us all too often, what appears valid in theory and during peacetime can, and often does, lead to disaster in the hostile environment.

Take for example the following fundamental principles of submarine operations which were formulated as the result of war, not peace, experience:

"a. The submarine is, and must be, a lone weapon.

b. Her strategical value is immense, and out of all proportion to her cost and size.
c. Her tactical value is so small as to be almost negligible.
d. To all intents and purposes, she is limited to a single shot at the enemy. No worthwhile target will offer her a second chance of an attack.
e. Her endurance in war is greater than that of any other type of vessel.
f. She is very vulnerable to counter-measures."

These principles were not based on lessons from the Cold War or even World War II. They were based on the lessons of World War I. Even though 75 years have passed, these principles still convey a truth that must not be tossed carelessly aside. As so often happens in submarines with rules and procedures, these principles were written in the blood of the men that died.

Take for example the principle that the submarine must be a lone weapon. This principle was the result of several attempts to integrate submarines into battle groups in a hostile environment. Submarine identification and collisions soon became problems. First, there was no way to quickly determine if a submarine was friendly or hostile. Each time a submarine was detected, the fleet reacted defensively. With the problems we have recently had identifying our own forces on land and in the air, I dread to think of what may happen to our battle group submarines in a hostile underwater environment. What surface ship commanding officer today would risk his own ship on the chance that the submarine just detected within firing range was friendly? Second, there were multiple submarine collisions with maneuvering ships of the battle group and at least two submarines were lost in just one night. The result was that joint operations were quickly suspended. Even in the peacetime environment of today, submarine collisions with our own surface ships, as well as commercial ships, are a real concern and do happen.

Much has changed since 1919 and submarines have undergone technical changes unimaginable at that time. Submarine weapons, propulsion systems, underwater endurance, speed, and other advances have certainly changed the submarine but the basic tenants of the submarine and it's relationship with the ocean are still essentially the same. Some of the World War I principles have become more important and others less, but all should be

evaluated keeping in mind a hostile, not a peaceful, environment. For the sake of our submariners, we cannot afford to overlook the lessons of the past and blindly repeat the same tactical errors which caused the principles to be stated in the first place.

LCDR Henry G. Fishel, USN(Ret.)
8448 Porter Lane
Alexandria, VA 22308

SUBMARINE INSIGNIA

July 25, 1994

Submarine insignia collecting is another manifestation of my long time interest in submarines (since I served on PATRICK HENRY in the 60s and 70s). At latest count I have 464 submarine insignia, profile pins, and veterans pins. I welcome correspondence from other collectors.

Thank you for your kind attention.

Best Regards,
Lee Lacey
3501 Hyde Park Ave.
Muskogee, OK 74403

MEMBERSHIP STATUS

	Current	Last Review	Year Ago
Active Duty	870	882	954
Others	2705	2659	2716
Life	257	256	256
Student	24	24	28
Foreign	70	71	72
Honorary	21	23	19
Total	3947	3915	4045

IN THE NEWS

- Navy News & Undersea Technology, April 18

"*Ingalls Gets OK for Sub Work*

A U.S. shipyard could once again build diesel-electric submarines.

On April 7, the State Department approved an export license application from Ingalls Shipbuilding, Pascagoula, Mississippi to assemble diesel-electric submarines for export. The approval is a milestone in Ingalls' drive to overcome strong Navy resistance to the resumption of conventional submarine construction in the United States.

Ingalls will assemble the submarines from parts built in Germany by Howaldswerke-Deutche Werft (HDW) in Kiel. HDW is now part of the German Submarine Consortium, formed earlier this year with Thyssen Nordseewerke of Emden and Ingenieurkontor Lübeck."

- Defense Week, July 11

"*Independent Panel Offers New Attack Submarine Changes*

An independent review group the Navy chartered to assess its fledgling New Attack Submarine (NSSN) program has endorsed the preliminary design but proposed several broad changes, according to its internal report.

Changes include altering the combat system and program organization and accommodating tactical nuclear weapons and better stealthiness.

The Navy has not released the 21 page report. Defense Week obtained an unclassified version.

Retired Navy Admiral J. Guy Reynolds, who chaired what was billed an independent, nine member review group, concluded that the Navy's plans for a Seawolf successor are basically sound but need further modifications.

'The panel found that the NSSN program supports expected missions against the projected threat of the 21st century. Additionally, NSSN is consistent with the precepts of the bottom-up review,' the group said in the June 13 report.

The Reynolds group convened after a January 24 memorandum from then-Undersecretary John Deutch who requested an assess-

ment of whether the Navy's NSSN design was sufficient."

- Navy News & Undersea Technology, August 8

"*DAB Gives Centurion Green Light; SAC Shines Yellow*

There was reason for U.S. submarines to celebrate last week as the Defense Acquisition Board (DAB) approved a Milestone One decision for the New Attack Submarine, and set a date to begin construction.

The decision means the Navy can begin creating a detailed design for the ship, with a construction start date of fiscal year 1998. The decision also represents a vote of confidence in the program by senior Pentagon leaders.

While the DAB decision was a victory for the submarine community, across the Potomac the Senate Appropriations Committee demanded prudence on the project and fenced FY 1995 money on the program—known variously as the New Attack Submarine (NAS), the New SSN (NSSN) or by its original title of Centurion. For the committee, the caution is based on cost."

"**Committee demanded further studies**

Instead of voting its support for the NAS, the committee instead demanded another study of alternative submarine designs. 'The committee directs the Navy to consider an alternative to the new attack submarine program before going forward to Milestone Three,' the report said. The committee directed the Navy 'to withhold from obligating 50% of the FY 1995 new attack submarine funds until the review has been completed and a report on the review has been submitted to the congressional defense committees.'"

- Defense Week, August 15

"*Navy Chief Says a Big Nuclear Bill Is Coming Due*

Chief of Naval Operations Admiral Jeremy Boorda said last week the Navy will have a big bill to pay once senior Pentagon officials decide the fate of the nation's nuclear deterrence.

That's because the Navy's long range budget submitted to Defense Secretary William Perry for review in June supplied no money for modernization of the Trident submarine fleet, proposed killing the D-5 ICBM and would phase out older Trident subma-

rines that carry the C-4 missile.

Speaking to a group of defense reporters, Boorda said the Trident force future rests with the top level Nuclear Posture Review (NPR), an ongoing assessment of the nation's nuclear weapons needs.

The D-5 weapon is to be carried on at least 10 Tridents and the older C-4 missiles carried on eight Tridents. But the PR could end up tinkering with the submarine force mix. It will examine how many Tridents will be required to meet arms control agreements with the former Soviets. Thus, it will rule on whether to sanction or deny a long held Navy plan to fit the D-5 on older C-4 carrying Tridents."

- Defense News, August 15

"*Report Says U.S. Navy Will Lack Sub Funding*

The U.S. Navy will have a hard time finding enough funds to maintain a submarine force of 45 to 55 attack submarines after the turn of the century, even if the service limits the cost of the New Attack Submarine to $1.5 billion, according to a report by the Congressional Research Service.

Budget plans beyond 2000 appear insufficient to support a procurement rate of two New Attack Subs annually, according to the report, Navy New Attack Submarine Program: Is It Affordable?

A more modest rate of 1-1/2 submarines per year would be more realistic, but even this anticipates a 30 percent jump in the Navy's shipbuilding budget when full-rate production of the new submarine begins."

- Inside the Pentagon, August 18

"*Nuclear Posture Review Inclined to Rule Out Option for 10 Trident Subs*

The Pentagon's Nuclear Posture Review is inclined to rule out an option for 10 Trident submarines and is reportedly moving toward a 14 or 18 sub option, according to sources familiar with the latest iterations of the NPR. These options may involve a D-5 missile backfit of four boats. The 18 sub option would also maintain four boats with C-4 missiles, according to DOD sources. Sources cautioned that no final decisions have been made on the

NPR."

"For several weeks, Defense Department officials have been debating unresolved points of the NPR, but pressure is mounting to come up with a policy in time for President Clinton's upcoming summit with Russian President Boris Yeltsin. Sources suggested that the State Department, the National Security Council and the Arms Control and Disarmament Agency are looking for some kind of unilateral arms control initiative to offer the Russians. But these agencies are facing resistance from senior Pentagon officials who want to proceed cautiously. The Joint Staff reportedly favors maintaining more of a status quo for the moment, and completing the implementation of the START I and START II treaties before formulating a new initiative."

- Washington Post, August 22

"*Defense Memo Warns of Cuts in Programs*

The Pentagon's top leadership has ordered the military services to plan for the possible cancellation or delay of nearly every large new weapons system in the planning or development stages.

In a memorandum Thursday, Deputy Defense Secretary John M. Deutch asked the Army, Navy and Air Force to draw up specific alternatives for the major weapons programs planned by the services. The cost savings would pay for *improvements in other areas.*

Deutche's memo alarmed the military services and defense contractors, who said such cuts or delays could weaken the nation's defenses.

The memo, obtained by The Washington Post, was intended by Deutch to be a *huge wake-up call* to the military services that they will have to delay or eliminate hardware programs or face deep cuts in other areas, a Pentagon official said yesterday.

Deutch is 'telling people to take notice because we have very tough decisions coming,' the official said."

- Navy News & Undersea Technology, August 22

[Editor's Note: The following is extracted from the final issue of Navy News & Undersea Technology edited by Stan Zimmerman, who has covered submarine programs and problems for his newsletter. Stan is going on a sabbatical, and took the opportuni-

ty to express his opinions, and he stressed that these are opinions, and not objective reporting, about his beat.]

"For all of us, readers and writers alike, these past seven years have been a time of unimaginable change. As the first Western reporter to walk through the security gates of the Malachite submarine design bureau in 1992 in what is now St. Petersburg, I prompted the director's remark, 'Even James Bond couldn't get in here.' Then we sat down for an eight hour interview.

I watched British security agents snatch an anechoic tile from a London submarine symposium in 1988, and this year listened to industry reps explain how they could tailor such coatings for any customer at the same London symposium.

And what is most incredible for the period, I have seen the American submarine community hesitantly breach its *silent service* motto and begin a guarded discussion of its roles, means and methods.

It has been a period of enormous triumph and enormous disaster. The American submariners are poised to achieve a technological breakthrough in the SEAWOLF, a ship quieter at 25 knots than its predecessor was while tied to a pier. And I watched the naval aviation train wreck, jeopardizing the service's vaunted carriers with a failure to replace the A-6 in my lifetime.

Downsizing, reorganization, slashed procurement budgets, the decline and fall of the American shipbuilding industry, these have been grain for my mill. From my vantage, allow me a few predictions:

- Unless a shooting war looms in this decade, the aircraft carrier is doomed. Precision strike munitions like Tomahawk Block IV and the Tri-Service Land Attack Missile (or some variant) will force the carrier from the scene. Air defense can be addressed by Aegis-style combatants. The cost of carriers—pilot training, aircraft, ship's complement and construction costs—can be translated into thousands or even millions of unmanned weapons.

- Submarines are the future. Unless a non-acoustic means of detection is perfected, submarines will continue to enjoy the stealth benefits of undersea transit and station-keeping. Submarine design may well splinter into a variety of classes

including fast attack fighters, cruise missile carriers, undersea amphibious assault ships, strategic deterrence cruisers and intelligence gatherers. Multi-purpose submarines able to conduct all missions—à la Centurion—will be too expensive. Because of cost reasons and technological advances, none of these designs, except perhaps strategic deterrence ships, will demand fission power.

- Surface combatants are here to stay, but will demand a different form. They are required to guard the nucleus of seapower—amphibious assault and logistics support. Air and ballistic missile defense will be key, as will the age-old problem of mine clearance. But missile strikes will clear their air, neutralizing airfields and launch pads. Mine clearance will be conducted by remotely operated or autonomous undersea vehicles directed by submarines, or by manned mini-submersibles. Surface combatants will be little more than expendable radar platforms carrying extensive ordnance.

- The key to the future of naval combat is C4I—command-control-communications-computers-intelligence. Uninterrupted connectivity with satellites, aerial and shipborne sensors, and shoreside support is crucial. The Cold War paradigm for anti-submarine warfare will probably be revived in the next century for all sea warfare roles—unarmed sensor ships (T-AGOS style) combined with shoreside data processing will connect with the armed fleet to produce either sea denial or sea control. The days of an independent shipborne commander, even a CINC at sea calling the shots, are numbered. This will be a profound historical change.

These are bold projections from an unaccountable source headed for an overdue holiday. But warfare at sea is a technological exercise, combined with cunning. Japanese Zeros were unbeatable in 1942, unless they were on a deck as Commander Wade McClusky found near Midway Island. As much as I respect the contributions of technology, I pray the Navy will retain its respect for tactical cunning...an undefinable but absolute requirement for warriors."

■

ULTRA IN THE PACIFIC:
How Breaking Japanese Codes and Ciphers Affected Naval Operations Against Japan 1941-1945

by John Winton
Naval Institute Press
Annapolis, MD 1994

Reviewed by
CAPT William H.J. Manthorpe, Jr., USN(Ret.)

[Editor's Note: Captain Bill Manthorpe is a retired naval intelligence officer with a long and distinguished record of perceptive analysis. Following his retirement from active duty, he served as the civilian Deputy Director of Naval Intelligence.]

John Winton is a noted British maritime author who has written more than a score of fiction and non-fiction books on naval themes, most covering the British Navy in the 20th century. Two of his earlier books, however, were War in the Pacific: Pearl Harbor to Tokyo Bay and Ultra at Sea about the use of Ultra in the Battle of the Atlantic. Thus, he obviously has considerable knowledge of the strategy and operations of the U.S. Navy in the Pacific during World War II as well as an understanding of the origins and uses of the communications intelligence (COMINT) which was designated Ultra.

His list of sources for this book indicates that he has consulted Morrison, Potter and Roscoe when necessary to detail U.S. naval operations and shows that he has read Holmes, Layton, Pineau and Wenger for background on the collection, analysis and political-bureaucratic activities influencing the use of COMINT in the Pacific. He does not, however, list among his sources any interviews with those numerous persons still alive who were engaged in breaking Japanese codes and ciphers or who were the intelligence officers and planners benefiting from that work. Thus he neglected a number of primary sources. I have talked to a few of them in preparing this review and have used the background thus gained in assessing Winton's work.

Winton's unique contribution to the development of this book is having reviewed the vast store of Special Research documents

that have been deposited in the National Archives. Those documents include valuable records from U.S. Navy files such as; organizational histories of intelligence units, reports of conferences, inter-office memoranda as well as topical intelligence reports on the Japanese Navy and translations of Japanese messages. While original sources, it must be noted that the former materials probably contain a considerable amount of personal opinion and the latter are unevaluated information, not intelligence. Thus, while they are primary sources, they do not always provide reliable or definitive ground truth, and so, must be treated with care. More importantly, the archived documents also include the CinCPac periodic intelligence summaries sent to the fleet operational commanders on a routine basis providing analysis of current and expected Japanese force composition and movement based on COMINT and, often, marked Ultra. This is the information which was available to the planners and operators as the basis for their actions and, thus, should have been of great historical utility to the author.

Winton has intertwined the insights gained from his archival research with his own background knowledge and the information from his secondary sources to produce a very interesting and readable book. Nevertheless, I am informed that, because he did not talk to some of the available primary sources, he has misinterpreted some of that archival material and has perpetuated errors that have been made by past historians who did not have access to that material.

This is an acceptable book for the general reader interested in naval history because it does a considerable service by highlighting for that reader the important role of intelligence, especially COMINT, in facilitating U.S. Navy operational successes throughout the Pacific War. That topic has not received the emphasis it deserves in most past general histories. That is, mainly, because they were written when most of the information was still classified but, also, because they focused on the details of the operations themselves rather than the planning and force repositioning during the periods between them. It is my impression that Winton's errors are generally errors of detail or nuance which will not affect the overall impression or enjoyment that the general reader takes away from the book.

The book will, also, provide interesting weekend reading for the naval professional, but it is not a book which they will want

to add to their library and refer to again and again. It contains no important revelations, makes no significant corrections to past historical research and does not raise any issues that will cause continuing debate. Thus, it does not add appreciably to the background and knowledge that a professional student of the Pacific war already has.

This book was first published in Great Britain and has been picked up for distribution in the U.S. by the Naval Institute Press. It has not been re-edited for U.S. readers. That should have been evident to me from the spelling of *cyphers* on the title page. I didn't notice that, probably because I had seen it spelled *ciphers* on the dust jacket and the Institute's publicity. Anyway it did not become apparent until I was well into the book and began to check the jacket and title pages for an explanation as to why I was continuing to encounter the British spellings, syntax and usage that abound throughout the book. Those are not bothersome.

What is particularly annoying, however, is that the book contains no maps of the Pacific and no diagrams of the battles. I had to read it with my copy of Potter at my right hand. It seems to me that the general reader will be totally lost without those aids and naval professionals will want them to refresh their memories and to get the most out of Winton's descriptions. Another shortcoming that an editor might have insisted on fixing is the lack of footnotes. Winton lists his secondary sources and the original documents that he has reviewed in an appendix. Sometimes, in the text he cites the source of a statement. Yet, too often, it is difficult to tell whether a statement is fact, someone's recollection or Winton's opinion. This is especially troublesome in the case of hotly debated topics, for example Halsey's actions at Leyte Gulf. It is not clear that Winton's description and conclusions are his own, a critic's or the official verdict. Understandably, a page filled with superscript numbers would detract from the flow of the text. An editor could have suggested one of several techniques which would have let the book retain its very readable text that the general reader will enjoy but would have provided the documentation that a professional reader desires.

Winton starts his book by introducing Lieutenant Commander Joseph J. Rochefort, the head of the Combat Intelligence Center, the Pacific Fleet's COMINT Analysis Facility, and Lieutenant Commander Edwin T. Layton, CinCPacFlt's intelligence officer, as they brief Admiral Nimitz prior to the battle of Midway. He

then moves to the post-Midway briefing when Nimitz is quoted as stating that "This officer (Rochefort) deserves a major share of the credit for the victory at Midway". Winton asserts that Rochefort and his team "...had brought off what was arguably the greatest intelligence coup in all naval history...They also removed for ever any lingering doubts that Communications Intelligence...was a waste of time and effort."

He then moves back to the period of Pearl Harbor and "the understandable desire to hunt down those who were held to be to blame". His claims that "The truth was that there had been plenty of intelligence in the months before Pearl Harbor which, with hindsight, can clearly be shown to have revealed Japanese intentions. The failure, it if was a failure, was in evaluating that intelligence and thereafter promulgating it to the operational commanders in the Pacific." By that brief paragraph, Winton disposes of an issue which has been the subject of numerous books, articles and continuing debate. It is a subject which remains a core study of intelligence indications and warning and national and military decision making. The distribution of this book by the Naval Institute will assure that it gets into the hands of many professionals and students interested in those topics. They are likely to be jarred, as I was, by Winton's brief treatment and conclusion.

This reader wished that he had spent, perhaps, a page summarizing the various sides in that debate so that his readers could, at least, decide whether they agree with his conclusion, which is not universally accepted. For example, one of the issues in the debate over Pearl Harbor is the conspiracy theory that Churchill had the intelligence and did not pass it to Roosevelt. Some ten pages after his conclusions on Pearl Harbor, Winton discusses British exploitation of the Japanese codes prior to Pearl Harbor. In that discussion there seems to be a misinterpretation, on his part, of the extent to which the British COMINT organization was able to *read* vice *break* the Japanese JN-25 code and, specifically, which version of the code they were *reading*. Thus the reader gets the impression that Churchill could have had the information of Pearl Harbor and the conspiracy theory may be tenable. Yet, some pages later, the reader finds that Winton refers to a British intelligence officer in the Far East at that time who said that his reports of Japanese intentions and capabilities may not have even gotten up the line within the Admiralty, let alone to Churchill. Thus,

whether the British had the information or not, the conspiracy theory does not hold up.

But this is not a book or, even, a chapter on Pearl Harbor. The introductory chapter is one of the most important, however, for both the general reader and the professional. They should concentrate, because Winton's smooth and brisk writing style might cause them to miss some important lessons. For the general reader, his useful lesson is the difference between intelligence, communications intelligence (COMINT), radio intelligence (called signals intelligence—SIGINT—in the U.S.) and Ultra which was a marking for those intelligence materials containing COMINT based on analysis resulting from the breaking or partial breaking of certain Japanese codes. For the professional, his important lesson centers on the organization of the U.S. Navy's communications and intelligence efforts, the Washington bureaucratic politics that it created and the impact that politics had on operational success. Indeed, the book is a description of and tribute to *work-arounds* that were used to assure operational success. That is a lesson that naval professionals must learn from this and other histories or they will, again soon, learn it by experience. The potential for organizational and personal politics within intelligence and between intelligence and operations is increasing as we go through a period of reorganization and *right-sizing* that threatens the existence of organizations and the careers of people.

Following the introductory chapter, Winton proceeds chronologically through the Pacific War—Coral Sea, Midway, Guadalcanal, the Solomons, the Marianas, Leyte Gulf, Okinawa and Japan. In each case, he highlights the role that COMINT played or could not play in each battle. His discussion of the COMINT available and its use highlights that the job was not easy. There were many Japanese codes, intercepts often provided only partial or garbled text, the press of time frequently permitted only traffic analysis based on message externals, and direction finding accuracy varied widely. As a result, intensive efforts were required to generate information and considerable analysis and some inference were required to produce the intelligence that would be marked Ultra. It seems to me that it was not so much "breaking Japanese codes and ciphers" that "affected naval operations against Japan" as it was a Fleet Commander willing to rely on intelligence, excellent personal relationships up and across the Pacific Fleet intelligence chain of command, a bureaucratically courageous leader of the

intelligence production organization and a group of brilliant and incredibly hardworking analysts.

There is a chapter on the ambush of Admiral Yamamoto as he flew to the Solomons on an inspection trip. I find parts of the story of the approval chain for the operation to be a bit far-fetched. Nevertheless, lacking any footnotes or source citations, I will just have to continue to wonder about the decision making ability and security consciousness of the Secretary of the Navy who is said to have consulted "churchmen" before approving the operation.

There are also several chapters on the operations of the British Far Eastern Fleet in the Indian Ocean and southwest Pacific. Those are appropriate, given that the book was developed for British publication. The details were new history to me and helped to give balance to the impression that the naval war in the Pacific was, exclusively, an American war.

Of most interest to the readers of this review, there are also two chapters on the "Submarine War". For any professional reader, these chapters are the strength of the book. They clearly document the operational success that can come from the availability of good intelligence and a close and harmonious relationship between operators and intelligence personnel. Winton's account of the poor performance by U.S. submarine torpedoes, the difficulty in getting remedial action from the Washington bureaucrats and the role played by COMINT in finally provoking action is one of his better accounts. I am also informed by primary sources that it is the most complete, accurate and factual. In this case he apparently used one of his secondary sources to very good advantage.

Upon reading these chapters, I was stuck by an interesting characteristic of most naval histories. The names of flag officers in command of carrier and other surface task forces and task groups are always cited. The names of other surface force commanders are only cited when they are unusually colorful or successful, like *31 knot Burke*. The names of surface ship, even carrier or battleship, commanding officers are rarely given. But the names of submarine commanders are invariably given. Thus, in these chapters, the longtime members of the Naval Submarine League will find the names of those recipients of the Navy Cross and flag officers they came to admire as young officers. They will also find the names of other, just as heroic, who did not

achieve such distinction. One of those, Ralph Stiles, for example, was my first boss in the Navy and the man who gave me the job that set my course in intelligence.

These chapters also reveal the origin of the close, long standing and mutually beneficial relationship of the submarine and intelligence communities. It began on the initiative of Rochefort and Jasper Holmes, a submariner who worked with him, and it had the unspoken blessing of Layton and the submariner for whom he worked, Nimitz. Winton credits SIGINT, i.e., direction finding against Japanese submarine transmissions, with "the first ever sinking of a Japanese warship by a U.S. submarine", the I-173 by GUDGEON. He says that it was Ultra intelligence that provided the opportunity for the first submarine sinking of a Japanese carrier, CHUYO by SAILFISH. These successes in 1943 were the first of many opportunities for sinkings that the submarine community owed to the intelligence community during the war in the Pacific.

Following the war, the close relationship continued and the submarine community paid its debt in full by providing naval intelligence with a series of outstanding officers for leadership positions. One of the commanding officers who is cited as benefiting from intelligence for success in the war was Fritz Harlfinger who later served as DNI. Another Pacific submariner, winner of the Congressional Medal of Honor, Gene Fluckey, also served as DNI. The mutually beneficial relationship of the Submarine Force and Naval Intelligence continued throughout the Cold War by the submarine collection and intelligence analysis of valuable intelligence on the war plans and operational capabilities of the Soviet Navy. Based on their past relationships, it is certain that the two communities will continue to work together for mutually beneficial success in the new era of littoral naval warfare.

This is a good book, enjoyable to read and educational about naval warfare and intelligence. The Naval Institute Press was astute to recognize its value and correct in making it available to us. Nevertheless, it could have been so much better for both the general reader and professional if the Press had done some work on it. I recommend that members of the Naval Submarine League buy a copy for a quick read and then give it to their favorite teenager along with a copy of Potter to begin stimulating their interest in naval history, submarine warfare and intelligence. ■

MORE SUBMARINE SEA STORIES

[We routinely will publish short anecdotes of general interest to Members, as space and material permit. Members are encouraged to submit their anecdotes at any time; if not used in the ***SUBMARINE REVIEW****, they will be considered for use in the next issue of the NSL Fact and Sea Story Book.]*

The Good News and the Bad News

As with most SSNs in the mid 80s, we *combat loaded* our freezer before leaving Pearl Harbor for a deployment to WestPac and the Indian Ocean. Combat loading ensured the food would come out in the order we wanted to provide variety in our menu. Unbeknownst to all but the mess cooks, the sailors actually stacking things in the freezer detested Brussel sprouts, and so loaded them all the way in the back, figuring we'd never eat our way down to them.

Their ploy would have worked, except we got extended in the Indian Ocean.

As Commanding Officer, my first indication of trouble was, after being served Brussel sprouts for dinner, they showed up in our powdered egg omelets the next morning. Even that didn't alert me, I just figured the cooks were making use of everything leftover. However at lunch, when we were served deep fried Brussel sprouts, I started to suspect something was wrong, so called my Supply Officer in for a talk.

After some investigation, he came back with the good news and the bad news. The good news was—we had plenty of vegetables to make it through our two week extension. The bad news was—they were all Brussel sprouts. In retribution, I made the Supply Officer come to every meal for the next two weeks and eat one Brussel sprout.

Me? I have not eaten a single Brussel sprout since that deployment.

CAPT R.W. Rohm, USN(Ret.)

FISCAL 1995
DECOMMISSIONINGS

Canopus (AS-34)	11/94
Cincinnati (SSN 693)	1/95
Holland (AS 32)	1/95
Omaha (SSN 692)	2/95
Seahorse (SSN 669)	3/95
Drum (SSN 677)	6/95
Dixon (AS 37)	9/95
Ortolan (ASR 22)	9/95
Whale (SSN 638)	9/95
Bergall (SSN 667)	10/95
Gato (SSN 615)	10/95
Trepang (SSN 673)	10/95

(Specific dates for deactiviation/decommissioning were not available at time of printing.)

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