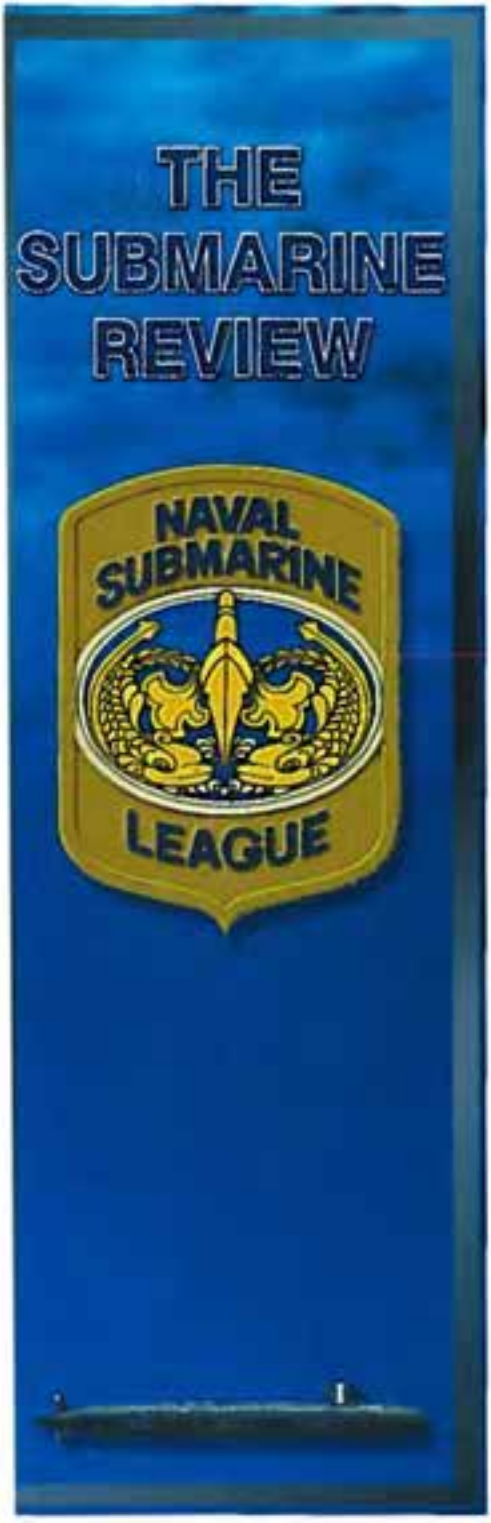

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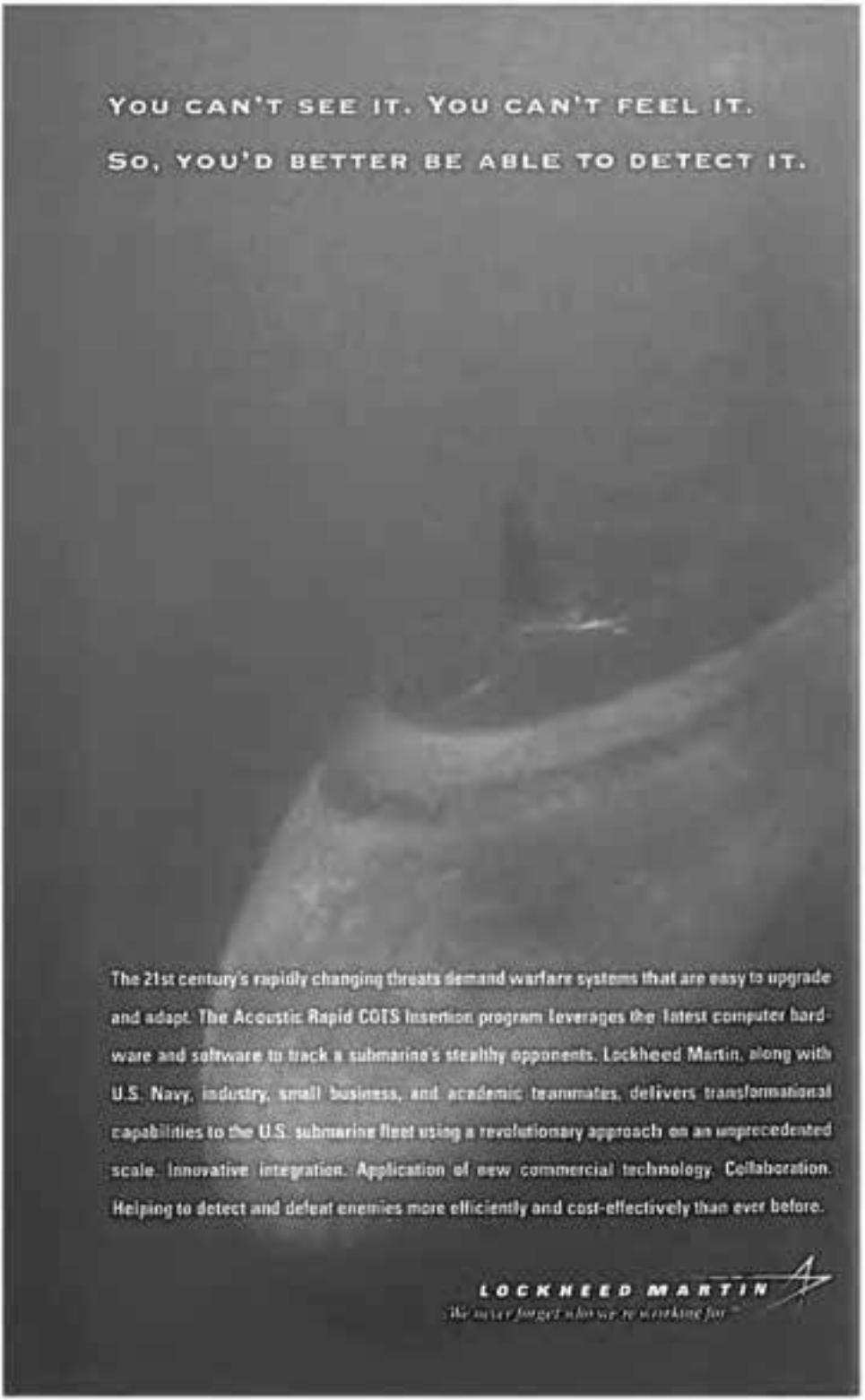
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LOCKHEED MARTIN

EDITOR'S COMMENTS

Each year the July issue of THE SUBMARINE REVIEW can provide our readers with a broad and deep survey of the *world according to submariners* from the rich source of information given in the presentations during the Leagues' twin symposiums in May and June. This year we have more than the usual to offer from those presentations. Added to those remarks from the policy makers themselves we have comments on subjects of current submarine interest from two very acute observers, a historical perspective from a veteran naval correspondent and an interesting view of another nation's submarine heritage and prospects.

Our lead piece in this issue is Dr. James Schlesinger's remarks at the christening of the third, and last, ship of the SEAWOLF class, USS JIMMY CARTER (SSN 23). Dr. Schlesinger is widely respected for his knowledge and, more importantly, understanding of large issues in the affairs of national security. Early in the Cold War he was involved in defense analysis at RAND Corporation and followed that with work in what became the Office of Management and Budget on Administration approval of the budgets for Defense and Atomic Energy. He has headed the Atomic Energy Commission, the CIA, the Defense Department and the Energy Department. He also has spoken pointedly on the importance of Sea Power to this nation, both in the past and in the present. His remarks at the christening are recommended to all, for his warmth and his perception.

From the May Submarine Technology Symposium at Johns Hopkins Applied Physics Laboratory we have the unclassified versions of the talks given by two of the leaders of the submarine community, Admiral Skip Bowman and Vice Admiral Kirk Donald both addressed the kinds of technology needed and being pursued. They voiced their views of the future in terms of broad aims for what submarines must accomplish and the necessary extension of current capabilities to meet that uncertain future. Several of the old hands at the SubTech Symposiums commented on those two presentations as being among the best of their kind given over the years for being useful to the technical/industrial members of the submarine community.

Our group of presentations from the League's Annual Symposium in June is headed by the Banquet Address by one of our World War II skippers, Rear Admiral Mike Rindskopf. With this year's Symposium honoring the Submarine Families it was most appropriate to visit Submarine Force history from WW II through the Cold War and acknowledge all which the families gave in support. An important part of the Symposium was the presentation by Mr Ron O'Rourke of the Congressional Reference Service of the Library of Congress. He spoke, of course, on the basis of personal reflection without any implication of endorsement of his remarks by those agencies. His reflections, however, are very well informed and most acute on naval issues. Mr. O'Rourke has spoken to the submarine community often in the past and his presentations have always been seen as objective, with the praise always muted and the criticism honestly offered. His words on this occasion were no exception. His views are worthy of note and his recommendations should be considered. A third Symposium presentation of more than specific submarine interest was given by Admiral Tom Fargo, Commander of US Forces in the Pacific. He offered a *tour of the horizon* of that area of the world which may well hold the future focus of our national security interests. His facts and his explanation of them provided some lessons even to those in the audience who thought they knew the area and its political, economic, and military situations. It was a highlight as well as a high point of the Symposium.

The article of historical perspective is by Frank Uhlig, the now retired long-time Editor of the Naval War College Review. The piece concerns the effect of submarines up to the end of World War ONE and his conclusions about WW I submarine *counter-force* and *counter-value* warfare efforts are both interesting and instructive. In addition, Captain Sam Tangredi, en route to duty in Athens as the Defense Attache, has put together a look at the history and current status of the Greek Navy's Submarine Force. In this day of proliferating modern diesel-electric submarines it is necessary for us to look carefully at the subject of small Submarine Forces to consider their potential impact on both national and international affairs. Enjoy your reading!

Jim Hay

FROM THE PRESIDENT

The 2004 Annual Symposium was a home run if measured by the number of column inches of press coverage. Five publications were represented at the event and reported on the proceedings. This year's agenda featured an outstanding report on the Virginia Submarine Story. General Dynamics Electric Boat and Northrop Grumman Newport News produced a 45 minute video that portrays the design/built process and the features incorporated in this first of a class of major combatants designed after the Cold War for the 21st Century missions. The Symposium agenda provided a high level of information exchange from the Submarine Force leadership, recognized the 2004 Fleet Awardees and an outstanding civilian for their contributions to the Force. The Submarine Family was honored as the 2004 Distinguished Submariner. The importance of increasing the acquisition rate of the Virginia Class to two per year was addressed from several vantage points. You can read several of the Symposium presentations in this issue. You can help us with the build rate issue by making your views known to your elected representatives.

The Fleet Award winners made us all proud – all were present or represented by a family member to receive their awards from Admiral Tom Fargo, our luncheon speaker. The names of the awardees are listed in this edition of the *Review*. At the banquet we honored The Submarine Family represented by eight wives of all submarine families that served in WWII, the Cold War and the Global War on Terror. Rear Admiral Mike Rindskopf was the banquet speaker reminding us of sacrifices and contributions of submarines in the last fifty years. Master Chief Lister's granddaughter, Sarah Haney, closed the event with a stirring rendition of "God Bless America .

At the Annual Business Meeting I reported the election of John O'Neill to our Board of Directors. Admiral DeMars reported that the Board appointed me to the Board for one year to continue as the NSL President. The annual audit confirmed moving the fiscal status into the black. A summary report is in this issue of the Review. A copy of the audit is available by asking the office. We continue to

improve the NSL online service. SAIC is working on a new website and a new on-line database. Both should be up and running in the next quarter to provide you with more information.

VADM George Emery's first year as our Chairman of the Submarine Technology Symposium (STS) was a resounding success. STS was a sellout and an outstanding event in all respects. Having our keynote speakers present throughout the three days provided comment from Navy and industry leadership at every session. Excellent papers and posters on a wide variety of topics were presented. The importance of communications at depth was a major focus at STS 2004 and will receive additional emphasis next year.

The NSL participated in the Third Annual Submarine History Symposium in cooperation with the Naval Historical Center, Navy Historical Foundation, U. S. Naval Institute, and Navy Memorial. This year we focused on the fiftieth anniversary of USS NAUTILUS (SSN 571). The Symposium featured VADM Ken Carr, a Nautilus plank owner, CAPT Jack Crawford, the assistant Project Manager of the S1T prototype, and Dr. Gary Weir, who reported on the difficulties encountered in building a nuclear powered ship.

I ask that you join Jan and me as we pray for the safety of our troops deployed around the world. I am honored to continue to represent you as President of the Naval Submarine League. Please recommend membership to your shipmates and friends and keep your email and home addresses up to date.

J. Guy Reynolds

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FEATURE

CHRISTENING OF THE JIMMY CARTER (SSN 23)

by the Honorable Dr. James Schlesinger

Dr. Schlesinger is an economist who served as Chairman/The Atomic Energy Commission and as the Director of the Central Intelligence Agency before being appointed as Secretary of Defense in 1973. During the Carter Administration he was Secretary of Energy.

President Carter, Mrs. Carter, Secretary England, Distinguished Guests, Ladies and Gentlemen:

We are gathered here today for this time-honored ceremony, over which Mrs. Carter will shortly preside—the christening of a powerful multi-mission combatant, which will be a needed constituent in the continued domination of the seas by the United States Navy. It represents another chapter in the long history of the U.S. Navy: from those early days of the republic, when the Navy sought to protect our shores from the powerful presence of the British fleet, reflected in the symbolic presence of USS CONSTITUTION in Boston Harbor some 60 miles north of here. From then it was on to Admiral Dewey's victory at Manila Bay, the need to protect the sea lanes in two world wars, the Battle of the Atlantic, the Inchon landing, and, most recently, Operation Iraqi Freedom.

(Please note, I have refrained from emphasizing the crucial role of the U.S. Navy in the late War Between the States—in fear of offending any Georgians who might be present. Still I suspect they would much prefer to be reminded of the naval triumphs of Admiral Farragut than General Sherman's March to the Sea.)

And, most momentous of all, that decisive, incredible, almost miraculous, victory at Midway, which not only turned the tide in the Pacific, but enabled us to proceed to victory in the European war. The foundation for D-day and the march to the Rhine was formed by the dive bombers from our carriers at Midway. Today, especially since the demise of the Soviet Union, we possess dominion over the seas.

The modern Navy has embraced the compelling necessity of ever-advancing technology. It is here before us, embodied in this nuclear-powered submarine equipped with stunningly accurate cruise missiles—and named for the 39th President of the United States. This is a new-generation USS SEAWOLF, and we may be confident, a vast advance beyond that USS SEAWOLF to which a young Naval Academy graduate, Lieutenant Carter, reported over half a century ago.

It was then that we saw the birth of the nuclear-powered submarine, in reality a new and quite different weapon-system. For, unlike its air-breathing predecessor, as President Eisenhower proudly observed, it could so effectively be hidden in the depths of the sea.

Today, of course, we live in a radically changed geopolitical context. The possibility of major-power confrontation has receded with the end of the Cold War. Yet, if the main risk has been reduced, the number of risks has multiplied. What we once could take for granted, the almost total invulnerability of the American mainland, is now gone. It ended with the deployment of ballistic missiles and nuclear warheads, but now more generally with weapons of mass destruction, terrorism, and the possibility of weapons of mass destruction in the hands of terrorists. Still, we must also understand clearly that terrorism itself is a reflection of and a bow to our continuing military dominance. Terrorism is "a weapon of the weak, reflecting the inability of those hostile to us to challenge us militarily.

We cannot allow that condition to change. We must retain our military preponderance, even as it drives hostile fanatics to employ this "weapon of the weak. We must recognize that terrorism will be with us for a long time, intermittently inflicting damage. It will continue as long as the civil war exists in the Islamic world, breeding as it does a hatred that cannot be appeased. Today we launch this embodiment of our continuing military preponderance—from which our hate-filled and desperate foes can only resort to terrorism.

Now let me talk about the man—and the statesman—for whom this powerful combatant is named. Jimmy Carter is the only graduate of the Naval Academy—and the only submariner—to become Commander in Chief. Indeed, he is the only submariner to become Commander in Chief, and thus it seems most appropriate that the

Naval combatant named for him should be a submarine. When he left that other SEAWOLF half a century ago, the young Lieutenant Carter may have believed he was done forever with wolves of the sea. Yet, now his name will be indelibly identified with them. And these powerful instruments of war will be part of a deterrent that maintains the peace—to which Jimmy Carter has devoted so much of his life to preserve.

In politics, he remains unique. Who else other than Jimmy Carter could observe the behavior of politicians with such detachment, if not irony? Who else but Jimmy Carter could participate in a softball game wearing a tee-shirt, emblazoned with the motto:

"A politician is always there
--when he needs you.

Jimmy Carter rose to the presidency in circumstances that were highly special—and likely not to be repeated. In the wake of Watergate and the view of foreign/defense policy that Vietnam had come to symbolize, Jimmy Carter was exactly what the American people wanted. He was distant from Washington. He was a man of good character. He believed that America had been hurt by this slippage from high standards. He was determined to restore moral virtue in the seats of power, or, as he put it, "to make government as good as the American people.

President Carter did not change; he remained wedded to his high principles. As public attitudes went through their normal volatile pattern, he was reluctant, to say the least, to abandon his compass. I am reminded of a story I once heard told by a Scots preacher:

> You know of that wee creature, the chameleon. You can throw it on a piece of green cloth, and it will turn green. You can throw it on a piece of brown cloth, and it will turn brown. And then somebody tried throwing it on a piece of Scotch plaid—and the poor little creature went bust trying to adapt.

Well that tells us a great deal about politics! Moral virtue may not be enough! To his great credit, President Carter would not acquiesce this interpretation of the nature of the modern presidency. I quote

from a recent article in the *Washington Post* by Professor Louis L. Gould of the University of Texas:

> The nature of the office itself and what it has become are partly the problem. Over the past 50 years, the institution of the presidency has evolved into a mixture of celebrity and continuous campaigning. Substantive policy has receded in significance; presidents are judged on how they perform before the media, whether they win a second term and what their approval ratings are. In this context, mastery of staged events and the capacity to please the public are what matter most.
>
> ...But, of course, the presidency is not just about glitz and the trappings of show business. At bottom, it is about policy, substantive issues and demanding choices.

Jimmy Carter thought the presidency was about the latter, the substantive issues... He was more or less indifferent to the former, the conviction that governance is public relations.

To his great credit and to his great cost, Jimmy Carter never devoted much time in kowtowing to the press. I can recall one day, as we crossed West Executive Avenue, as he ignored the chorus of questions shouted from the press corps, he whispered to me just one word: "vultures.

As President, Jimmy Carter was at his desk in his study off the Oval Office by 5:30 or 6:00 AM, reading and annotating policy papers sent by subordinates, who at that hour were still lolling around in bed. At the naming ceremony at the Pentagon in 1998, then Navy Secretary John Dalton put it very well: Jimmy Carter had been among an elite corps of officers, bright in the technical disciplines, "with a keen eye for detail and "a relentless work ethic. Every decision that came before him, he examined in excoriating detail.

I recall attending a meeting on automobile emissions control that the President held with the (then) four CEOs of the country's automobile manufacturers. They had brought along an engineering professor from the University of Michigan—just in case some

technical question might arise. The President made some high-level observations about the country needing to reduce air pollution and the need for cooperation from the automobile industry. He then, somewhat pointedly, asked the CEOs why they had chosen a less efficient converter than the Japanese industry had developed. At this point the CEOs, looking not too knowledgeable, turned to the Michigan professor and indicated he would explain. Before long, the discussion had become a highly technical one regarding the relative advantages of different converters between the President and the engineering professor, while the four CEOs, the Administrator of the Environmental Protection Agency, and I just sat there listening. It was typical of Jimmy Carter. There was no issue on which he did not do meticulous background research.

Such habits were natural to him. But they had strongly been reinforced by his work with Admiral Hyman Rickover, who, as Secretary Dalton put it, everyone "knows that he was demanding and unforgiving, to say the least. People who worked for Rick shared a special kind of pride—somewhat akin to those who had successfully survived a prisoner-of-war camp. I am, unquestionably, the only person in the world who can state that Rickover was his subordinate in three different jobs. That, at least, was the way it appeared on organization charts—something one should not necessarily believe. The reality was somewhat different. I also confess that I have not been here at this shipyard in Groton since my late wife christened the New York many years ago. At that time, I regaled the audience with a few Rickover stories, which pleased the audience more than it did the Admiral.

Perhaps I should remind you that the only reason that we today name submarines after people, like Jimmy Carter—or places—is the perceptiveness of Admiral Rickover. In the old days, the Navy, understandably if unimaginatively, named its submarines after fish—such as Albacore, Bluegill, Shad, Haddock, and Halibut—but also such obscure names as Clamagore, Snook or Wahoo. As Rick observed to me one day—with a touch of contempt for the woeful lack of political understanding on the part of the Navy—"Fish can't vote.

From Admiral Rickover, the President had learned that the earth's store of petroleum was sharply limited. The Admiral had, for

simplification, estimated that the total volume of oil in the earth's crust amounted to some 10 cubic miles. Pretty soon, the President had me estimating how much of that had been used up and how much remained to be used. It is an interesting and revealing point that in recent years, the oil industry has come to concede that the capacity to produce crude oil is limited, that the world will reach its peak production sometime in this half century, and that the late geologist King Hubbard was, indeed, correct in his analysis that was once derided by the industry.

Jimmy Carter had campaigned on America's energy vulnerability. He wanted to do something about it—to reduce our dependency on imported oil. Perhaps a less dedicated and less idealistic politician would have recognized that the public wanted to discuss, denounce OPEC, etc.—but not to pay any serious price, such as taxes, actually to reduce that dependency. Nonetheless, actions taken during his administration did reduce our dependency on foreign oil from nearly 50 percent to 30 percent. It has now come to be somewhat above 60 percent.

In his years as president, Jimmy Carter was a model of personal integrity. He exemplified a kind of selfless leadership—and paid scant attention to those calculations of small political advantage, when the nation's interests were at stake. Perhaps his greatest triumph was the Camp David Accord, which he personally and industriously negotiated. He was advised by some that he might be jeopardizing his personal and political prestige in a venture that not only could fail, but appeared likely to fail. To that argument, he was indifferent—given that there was an opportunity to advance the cause of reconciliation and peace.

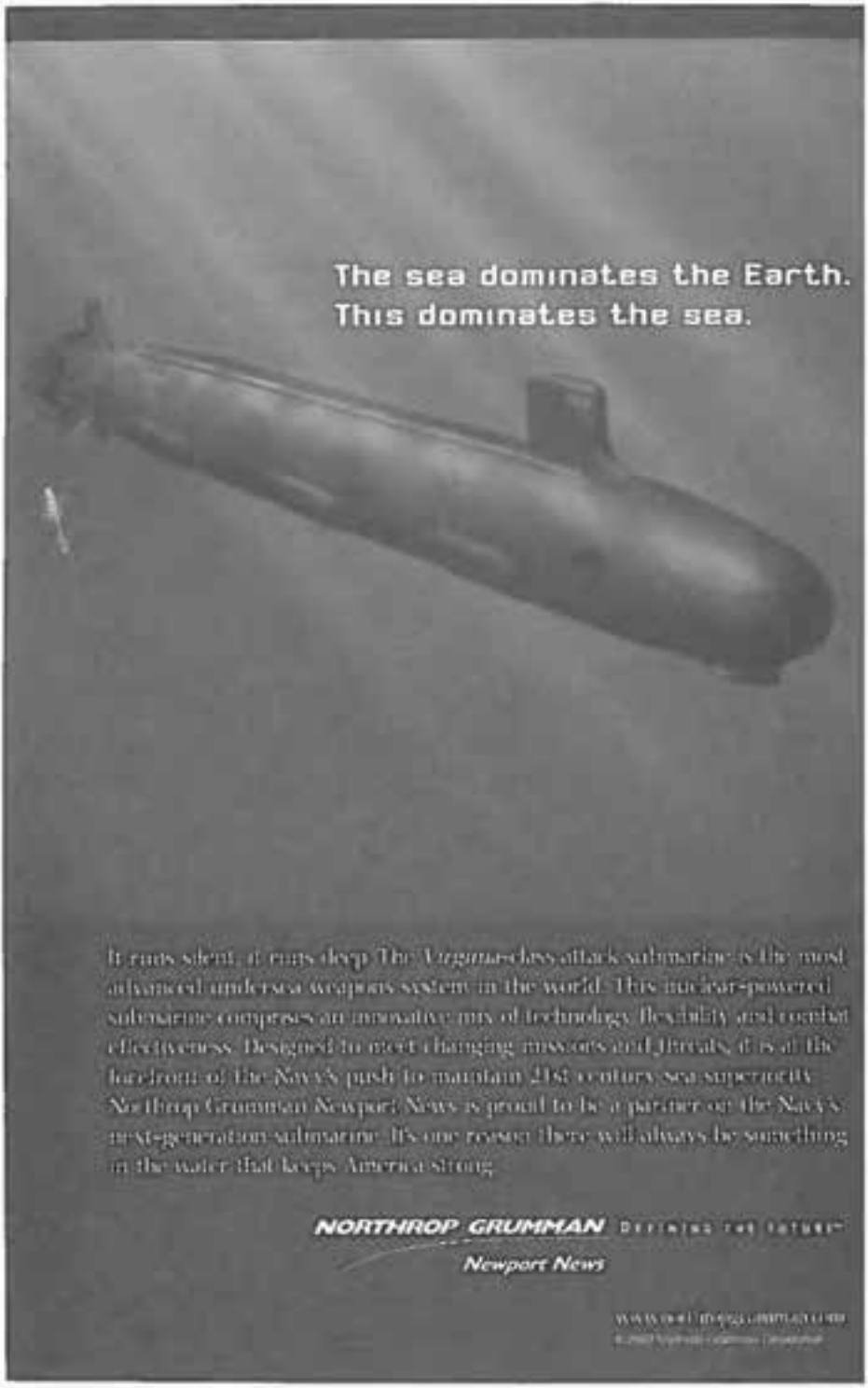
Equally revealing, in 1979, he was advised by some to take a far more punitive stance toward Iran after the seizure of the American Embassy. Had he done so, he might well have won re-election the following year, as the country rallied around the President in a moment of crisis. He declined to do so on the basis that such action would result in unnecessary casualties. In adversity, he displayed both dignity and grace.

Jimmy Carter left office with the same admirable traits that he brought to the office—thoughtful, hard working, attentive to detail, and—above all—altruistic. Since leaving office, he has been

recognized and praised throughout the world as a man of high principle—and for his humanitarian efforts, from the Habitat for Humanity to reducing disease in developing nations (the latest near triumph: the final eradication of Guinea worm disease in Africa). The Carter Center in Atlanta is dedicated not to the glorification of the past, but to the improvement of the future.

Mrs. Carter will shortly christen this submarine. It has been carefully constructed; its innumerable details carefully attended to; its hull is solid—like the man of integrity for whom it is named. It will soon become part of that formidable array of naval power that will help deter others—and thereby avoid future conflict among major powers.

Mr. President, Mrs. Carter, congratulations to you both on this splendid day! –and thank you for your service, your example, and your idealism.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It runs silent, it runs deep. The Virginia-class attack submarine is the most advanced undersea weapons system in the world. This nuclear-powered submarine comprises an innovative mix of technology, flexibility and combat effectiveness. Designed to meet changing missions and threats, it is at the forefront of the Navy's push to maintain 21st century sea superiority. Northrop Grumman Newport News is proud to be a partner on the Navy's next-generation submarine. It's one reason there will always be something in the water that keeps America strong.
NORTHROP GRUMMAN
Newport News

SUBMARINE TECHNOLOGY SYMPOSIUM

SUBMARINE TECHNOLOGY SYMPOSIUM
REMARKS BY
ADMIRAL F. L. "SKIP" BOWMAN, U.S. NAVY
DIRECTOR, NAVAL NUCLEAR PROPULSION
TUESDAY, 11 MAY 2004 — 0855

Let me begin by thanking the Naval Submarine League for putting this symposium together. This is a valuable opportunity for experts from all the key submarine technology disciplines to exchange ideas, not just with one another, but also with Fleet operators, resource sponsors, and intelligence experts. This kind of open exchange is crucial to the innovation that has shaped the history of our Submarine Force and is needed to drive its future.

With our Nation engaged in an ongoing war on terrorism, the theme of this year's symposium, "Development and Demonstration of Submarine Technology in Support of Fleet Operations, is on the mark. At the graduate level, we need to add a third *D* to accompany *development* and *demonstration*: we need to talk about *delivery*. All the development and demonstration in the world are pointless unless their product is actually *delivered* to our submarines. Perhaps you saw the recent Pentagon IG report, criticizing *all* of the services for failing to ensure that successful technology was transitioning to the acquisition stage.

Rather than wonder if the Submarine Force is part of the problem, let's just take the lesson learned on board: let's focus our efforts toward the *Big D*—let's *deliver*. After all, the Navy's need for new technology aboard our submarines has never been greater: our submariners on their attack submarines are being called to perform more, increasingly diverse missions than ever before, but with an ever-smaller Fleet.

Considering how our submarines are engaged throughout the world today, clearly they are a critical part of our Navy. They're at

sea *gaining and sustaining access, developing and sharing dominant knowledge*, and *deterring and dissuading* potential adversaries, while ready to *strike with surprise from close-in*. These submarine strategic concepts that we've been talking about for years flow from the capabilities provided by the stealth, endurance, agility, and firepower that only submarines combine to deliver *undersea superiority*.

And if we forsake undersea superiority, our Sea Shield is porous, making our Sea Base insecure. Without the Sea Base, there is no Sea Strike—and there is no *Seapower 21*. Our Submarine Force must *deliver* undersea superiority for *Seapower 21* to succeed.

Pertinent to this symposium, the undersea superiority our submarines so capably deliver *today* is not sufficient for the security environment of the *future*. The anti-access capabilities of potential adversaries are advancing day by day. The capabilities of our submarines must advance even faster to retain *total undersea dominance:* the ability to operate with total impunity against any adversary, anywhere, anytime.

But undersea dominance is not an option at any price. The CNO has correctly reminded us that budgets are tight and will remain so. Admiral Clark's Sea Enterprise initiative must find better return on investment so that the Navy can recapitalize and upgrade.

The participants in this forum—all of us here—have a part in Sea Enterprise: to deliver technology that increases the warfighting return on the Navy's submarine investment. As I see them, the most needed submarine technical achievements, starting with the near-term and moving forward, are:

- *High-bandwidth two-way communications* at tactically useful speeds and depths to allow plug-in to FORCENet.

- *Encapsulation* through use of a multimission module that allows inexpensive adaptation of existing weapons and UAVs in SSGNs and SSNs.

- An *advanced sail* for the VIRGINIA class to add payload volume and improve mission effectiveness.

- *Development, demonstration, and delivery* of the technologies (to include the all-electric submarine) that are needed to leverage today's SSN effectiveness and to make the next class of submarines enjoy improved payload fraction at reduced cost.

Let me elaborate on each of these.

In the past few years, we've taken a big leap forward in getting connected with the delivery of the High Data Rate Antenna—HDR. During this fall's SILENT HAMMER experiment, an HDR surrogate in USS GEORGIA (SSGN 729) will enable the SSGN to host a Joint Special Operations Task Force Commander in the onboard battle management center. That commander will have access to all the local high-data rate information at the speed it's generated ashore to give him the cohesive tactical picture he'll need.

But impressive as the High Data Rate antenna is, it won't cure the fact that today's submarine must still come to periscope depth and expose a mast to connect to FORCENet. Until signals can get out of the pressure hull, through 150 or more feet of ocean, and into the atmosphere—*and reverse the process for receipt onboard the submarine*—submarines cannot gain the full benefits of FORCENet.

More important than this: if the submarine isn't *plugged in*, then the battle force will lose out on the unique, invaluable products and services the submarine offers.

Fortunately, the FORCENet community understands this—they realize that fixing the undersea connectivity gap is in the best interests of the *entire* Navy, not just the Submarine Force. The CNO is leading the way here by pressing to demonstrate a candidate solution as part of the Navy's Undersea Dominance Sea Trial initiative.

This experiment will demonstrate *Seaweb*, a network of bottom-mounted nodes that can communicate acoustically until the signal reaches a surface-connected node that transmits over the airwaves. This gives the submarine continuous, albeit low-data-rate, communications at tactical speeds and depths over an area encompassing hundreds of square miles.

Seaweb is not a silver bullet, even if it succeeds beyond our greatest expectations, but it is *real* hardware on its way to operational testing. Success would be a big step toward allowing a submarine to stay deep, mobile, and stealthy *while* integrated with FORCENet. If we combine *Seaweb* with a system like the Brit's Remote Tethered Optical Fiber buoy—RTOF, also real hardware—we could have an even more effective, integrated solution.

We've talked about comms at speed and depth for years. Finally, we're in position to demonstrate *Seaweb*, then move into *acquisition—delivery*—to start breaking through the submarine comms barrier.

Cost-effective *encapsulation* is another key for improving the return on our submarine investment. We need inexpensive, generic encapsulation to allow us to put a broader range of arrows in our undersea warfare quiver at reasonable cost and without time-consuming development.

The SILENT HAMMER demonstration will show the feasibility and value of encapsulation with the launch of a SACS capsule (stealthy affordable capsule system) from a missile tube aboard USS GEORGIA. GEORGIA's battle management center will then receive real-time data from a manned aircraft with Predator sensors and communications links. These are the final steps before we bring all of the pieces together by encapsulating an actual payload and deploying it at sea.

John Butler is pursuing a technology demonstration in FY05 for an encapsulated sidewinder missile that would provide a submarine both anti-air and anti-small-boat-swarm capabilities. Once we've demonstrated this, we'll have opened the door to quickly and cost-effectively employ a range of off-the-shelf systems, including UAVs and ONR's affordable weapon.

We also need to broaden encapsulation to extend the submarine's *undersea* reach. We need to generically encapsulate large-diameter UUVs and undersea off-board sensors. These, too, need to be deployable—with minimal development time and cost—from the increased payload volume in SSGN and hopefully as a back fit in today's SSNs.

To bring these SSGN capabilities to our attack submarines, we need to develop—and *deliver*—the Advanced Sail. Traditionally,

adding anything to a submarine sail has been a painful exercise in tradeoffs and compromises: which existing mast, which existing capability, to give up. But by expanding the sail space of VIRGINIA, we could add the communication capabilities, like RTOF or Sea Web, *and* increase support for SOF *without* sacrificing any existing capabilities.

These changes alone would greatly enhance the submarine/SOF team. But the *volume* to support modular payloads like UAVs and UUVs—*that's* the better transformational opportunity. An SSN-SOF team that has continuous connectivity *and* organic UAV *and* short-range missile support would be a potent weapon in countering some of our more challenging asymmetrical threats.

The Advanced Sail may only be a first step toward increased payload modularity. Options for adding even more SSGN-like flexibility—such as a multimission module—to future VIRGINIA-class ships need to be developed quickly *and* affordably, too.

As we focus on *delivering* technologies in the *near* term, we also need to think to the future. Although sea trials for the first of the VIRGINIA class are just a number of weeks away, we need to be thinking already about the follow-on class. We'll deliver the last planned VIRGINIA around 2024. The design effort for the follow-on class needs to begin around 2010.

That means the critical HM&E technologies defining that ship will need to be *demonstrated* by 2010—just 6 years from now! When you consider the pace at which these technologies can advance, we already face, in my view, a very pressing schedule.

The need for this work to move ahead quickly was recently made even clearer by DARPA's look at future submarines. Though we have to maintain a healthy skepticism of even the most sincere paper studies, this DARPA preliminary work is really eye opening: it suggests that a few key advances over the next 6 years could dramatically reduce the size and cost of the submarine.

Foremost among these advances would be electric drive in the form of distributed propulsion. This concept, the subject of a paper presented here last year, replaces the centerline shaft and propulsor with multiple electric pumps that accelerate water through nozzles. Picture, if you will, mounting several high-power, trainable Jet Ski® drives external to the submarine hull.

Eliminating today's hull-penetrating shaft and the weight of the propulsor at the extreme end of the ship opens the door to using the back end of the ship for other purposes. One practical idea is to move the reactor plant all the way aft, eliminating a heavy shielded bulkhead. This starts a design cascade, where reduced weight leads to reduced non-payload volume and weight, which leads to reduced propulsion power requirements.

Other potential benefits of this concept might include:

- A main propulsion system that can be vectored to provide "turn-on-a-dime maneuverability. This is growing more important as our submarines increasingly operate in shallow, high-contact areas.

- And, obviously, the use of multiple electrical motors instead of the expensive reduction gear and propulsor. Using the larger, established industrial base that exists for electric motors would further reduce costs.

The core benefits of electric drive that got our interest years ago remain inherent in this concept:

- Replacing mechanical drive with an electrical system offers the opportunity for the next generation in stealth; and

- Going electric puts the full useful power of the reactor at the commanding officers' disposal for whatever application they need—propulsion or payload delivery.

Of course, distributed propulsion needs to get wet to prove its advantages in acoustic stealth, maneuvering, cost, and payload adaptability. Remember my sermon from last year— PowerPoint™ dreams and program manager's goals can never substitute for honest testing and analysis.

We must press hard on shortening the concept-to-delivery timeline from the historic 14 years. We must capitalize on advances in

design tools and take advantage of the streamlined acquisition process so that we can deliver the next generation in undersea capability as soon as possible.

Fortunately, Jay Cohen and Steve Johnson are already working on some of the enabling technologies, like power-dense motors and controllers and electric actuators. And ONR has a program to deliver a UUV that will demonstrate key attributes of distributed propulsion so we can quickly determine if we're on the right path.

As we sharpen our focus on a future electric drive, we should recognize that even *that* design would be a milestone, not the end goal. The first all-electric ship will drive the *next* phase of innovation, with ideas like:

- A nuclear power plant that uses direct energy conversion to change reactor heat to electricity without moving parts; and

- Electric weapons that would use a massive pulse of electrical energy to fire a laser or a projectile.

These are just the beginning of a development spiral we should pursue with vigor.

While I want us to have the future in mind, let me bring this discussion back to the present. Any vision for the future is merely a fantasy, unless we take the right steps *now*. We must stay on course to *deliver* real technology improvements. That direction has not changed, and for that reason everything I've said should have a familiar ring to it. Yes, you *are* experiencing deja vu all over again: I just gave you my "five gets talk. What we need to do is:

- Get connected to FORCENet with a near-term solution.

- Get payload by delivering encapsulation so that we can inexpensively, quickly adapt and deploy new weapons and sensors.

- Get modular at the next level in VIRGINIA by adding an Advanced Sail and, down the road, a multi-mission module.

- And *get electric* so that we can achieve reduced cost, improved payload fraction, and greater stealth in the next generation of submarines.

The fifth "get —*get real*—is another way of expressing the third *D* I added to this symposium: *deliver*. By focusing on *delivering* real capabilities to the Fleet, we'll keep our Submarine Force and Navy firmly grounded in reality. We'll force ourselves to move beyond PowerPoint™ fantasies of untested ideas and systems to the tough, real world of at-sea demonstration . . . and *delivery*.

I know many of you have watched the declining trends in our submarine R&D funding with the same concern that I have, and some may have begun to believe that our technology initiatives *are* just fantasies. But in recent weeks, it appears that advanced technology is a growth industry.

Just last Friday, the Senate Armed Services Committee voted to *authorize* $56 million *on top of* the President's budget proposal for design work on the VIRGINIA's multimission module. They also authorized another $10 million *on top of* the President's budget for the submarine payload and sensor program. Put this significant plus-up in the context of the Pentagon IG's criticism that we need greater emphasis on transferring technology to the warfighter, and my message is clear: we must *deliver* the real, affordable technologies that are close at hand.

These technologies—*Seaweb*, RTOF, encapsulated payloads, the advanced sail, and *even electric drive*—are not beyond our means, and we need to make the affordable investments *now* to make them happen. These are advances that will increase the warfighting return on the Navy's investment, not merely satisfy scientific curiosity.

So let's get moving! Let's press forward with shorter timelines to develop, demonstrate, and, most importantly, *deliver* technology for Fleet operations.

Thank you.

SUBMARINE TECHNOLOGY SYMPOSIUM
REMARKS BY
VADM KIRKLAND H. DONALD
COMMANDER, NAVAL SUBMARINE FORCES
12 MAY 2004

Thank you Admiral Emery, it is truly a pleasure to be here. And thanks to Admiral DeMars and the Naval Submarine League and Dr. Roca and the staff of Johns Hopkins Applied Physics Laboratory for organizing this event. This is my first opportunity to address this distinguished group as Commander Naval Submarine Forces at one of the most important forums I attend, whose importance grows every year. I am truly honored to be here. I am particularly pleased that I get to lead off a morning of presentations that will give you all a sense of what the Fleet is doing with your technology developments. There are two things I would like to talk about today. First, I want to bring you up to date on the changes that have taken place in the business of setting Fleet requirements. Then I will cover a few of my challenges for which you may be able to provide some help.

Those of you who follow *things Washington* know that the requirements process itself is in a constant state of flux as we find our way to a true capabilities based system. One that also recognizes the value of platform-based integration of those capabilities and a necessity for taking care of the less glamorous, but equally important, things that are essential to delivering true war fighting capabilities, things such as maintenance and integrated logistics support for systems we have already fielded. One of the most notable outcomes of this churn has been a shifting of responsibilities for requirements generation from Washington, DC toward the Fleet. Notice, I say *toward*; meaning we are engaged in a work in progress. We are seeking a balance of roles where the Fleet advocates have influence in those areas where they are truly authoritative such as current readiness, while our friends in Washington focus more on the longer-term requirements. With our burgeoning role in the requirements

process at Naval Submarine Forces, we are starting to look a little different in Norfolk.

Recently, during our Type Commander staff rationalization process, an effort designed to build the most efficient organizations at our TYCOMs, we have consolidated the bulk of the N8 organization at Naval Submarine Forces. Other warfare communities have also consolidated their requirements staff at the Norfolk based Type Commander. This provides better opportunities for collaboration across the warfare communities and, most importantly, with Fleet Forces Command. The single voice for undersea requirements, my N8 shop, led ably by Captain Brad Kratovil and Mr. John Moss, is focused in four specific areas: warfare development, articulation of requirements, programming, and assessments.

The current method used to identify needed capabilities is called the Naval Capabilities Development Process. It is an ongoing process that, not surprisingly, consists of functional areas similar to those in our N8 staff alignment. The process starts by assessing current capability gaps. We take an operational construct and game it against our current and projected capabilities. Through this process, we identify gaps in our capabilities that are catalogued by Mission Capability Packages or MCPs.

The result is a list of MCP gaps that focus the Fleet in generating requirements to close the gaps or enhance current capability. Fleet Forces Command validates the MCP gaps from an operational perspective by utilizing the Fleet Collaborative Teams. As one of the four Type Commanders, which includes Commander Network Warfare Command, we work closely with Fleet Forces Command to generate requirements, which fill the MCP gaps. The next step in the process is to develop solutions to the requirements. That may be done with innovative tactics, techniques, procedures or concepts of operation and will likely involve the science and technology community and industry. A venue for demonstration and experimentation is provided through our Sea Trial process.

The Navy Sea Trial process is a response to the fact that technology often emerges before a requirement is developed and institutionalizes a corporate mentality that some level of risk is acceptable and expected. Fleet Forces Command has overall responsibility for executing Sea Trial with support from the Naval

Warfare Development Center. Sea Trial initiatives can be submitted by any organization within the Navy and are vetted through the Operational Agents and Fleet Collaborative Teams I mentioned previously. An Executive Steering Group reviews the proposals and decides which initiatives will be funded from a pot of Sea Trial money. There are many possible venues to *trial* an initiative, however the most comprehensive is an experiment, where promising solutions can be tested in live conditions. Data collected during the experiment can be used to inform a decision about accelerating delivery of the tested system, returning it for further development, or scrapping it all together.

This year, there will be two experiments conducted exploring capability to enable assured access. The SILENT HAMMER scenario will investigate how networked Special Operations Forces sea based on the SSGN and operating inland can assure access for a larger follow-on ground force. UNDERSEA DOMINANCE will explore how to create a Sea Shield around naval forces in a conflict against a near peer competitor in the undersea environment. Our goal for the experiment is to develop a better sense of the unmanned vehicles, distributed sensors, communications networks, weapons and command structures required for future undersea warfare.

I want to come back and spend some time explaining the Fleet Collaborative Teams, because they are not only essential to the new capabilities based requirements process, they also demonstrate a new business model that leverages existing manpower. There are fifteen teams organized by functional area, and each team contains members, or subject matter experts, from all of the warfare areas. They are aligned under and tasked by the operational agents for the Sea Power 21 pillars, namely Second Fleet, Third Fleet, and Network Warfare Command. The teams meet virtually, either via email or video teleconference, to vet issues and provide recommendations. Some examples of how they are utilized include reviewing the MCP gaps, sea trial initiatives, and Fleet lessons learned. This allows an issue to quickly be vetted to a wide audience without having to maintain a standing organization.

I tell you all this to emphasize the importance of this forum. It gives us all an opportunity to synchronize our thinking, our planning, and, ultimately, our technology investments and products with the

requirements that are being generated by the Fleet operators. I just love the theme of this Symposium, "Developing and Demonstrating Submarine Technology in Support of Fleet Operations . I certainly hope that we will have the same *two-way* discussion between operators and industry that has been a mainstay of U.S. undersea warfare development for over 100 years. This active dialog has been instrumental in areas ranging from modern diesel propulsion for Fleet boats, to more effective and lethal torpedoes, increased undersea sensor capability, and revolutionary hull forms. I need to hear from technologists and industry as to the current technology vectors, the art of the possible, and how they are answering the fleet requirements. We need to tell you what we need from technology, what is working well, and what problems we are having. And you need to know how best to inject your ideas for technology solutions for Fleet problems.

In the very near future, we will publish a document further refining our strategic vision for the Submarine Force roles and missions in the Joint war fighting environment. This product has been a collaborative effort, born out of the work of our Future Studies Group. The Future Studies Group is a key element of our strategic planning process that includes members from OPNAV N77, Naval Submarine Forces, the Submarine Program Office, Submarine Development Squadron TWELVE, Naval Reactors, Strategic Systems Program, and industry. It has written concept statements on submarine payloads, intelligence, surveillance and reconnaissance and mine countermeasures which now help guide our investments in those areas. Also, it carried a lot of the intellectual water in creating our broad strategy: Submarines... The Road Ahead.

Today, they continue this effort, however they have also begun working with the acquisition community, the Fleet and N77 to help create bridges between near term programs and the future war fighting capabilities we seek in our vision.

There are four strategic concepts that frame our vision:

- Submarines must be able to penetrate anti-access defenses to prepare the battle space and neutralize barriers to Joint force access.

- Submarines must be able to develop and share knowledge about an adversary's capabilities, tactics, and operational patterns in a manner that is persistent, timely, non-provocative and resistant to an adversary's deception and denial attempts.

- The submarine must be able to strike rapidly with surprise utilizing an arsenal of kinetic weapons, Special Operations Forces, and information operations.

- The Submarine Force must be viewed by our adversaries as a deterrent; dissuading them from offensive actions against our forces.

These strategic concepts drive five technology vectors that should help guide your efforts. The vectors are:

- Payload
- Modularity
- Connectivity
- Automation
- Integrated electrical systems.

These vectors are intended to focus research and development efforts, requirements generation, programming, and acquisition.

As I was thinking about what to talk about today, I found myself looking over the agenda. I also happened to be pretty distracted that day as I pondered my growing *to-do* list of taskers, projects, initiatives, and the like that come at us from all directions. Before I knew it, my nuclear instincts overwhelmed me and I started auditing this agenda against my *to-do* list. As you would certainly hope, there was a good bit of intersection between our two lists, where your great work is whittling away at those key technology requirements I just reviewed. For example, there are several presentations that talk to enhancing the submarine's ability to maintain tactical control. Additionally, there are presentations about automation, training, and *getting electric*. This intersection suggests that past dialogues have

been successful in properly focusing research and development efforts.

However, because we are limited in time, I found some areas where I need help but we aren't going to have the opportunity to discuss in much detail. First, we aren't talking much about specific technology associated with unmanned vehicles. If you have followed the news lately, there is a great deal of chatter regarding unmanned vehicles and what they can provide and what we want them to do. There is a wide gap between the two, and you, in this room, hold a large part of the solution to bridging that gap. To be relevant in future Joint conflicts, the sphere of influence, or area of regard as defined by Secretary Stenbit yesterday, commanded by the submarine and its off board sensors must extend well beyond the current organic horizon and, in fact, must reach even further inland. There are some tough technical issues that need to be resolved if we are going to *get off board*, and in the case of UUVs, those issues include: navigational accuracy, power density, real-time communications links, vehicle autonomy, and cost.

A second *area of concern* is force protection. Following the suicide attack on USS COLE in 2000, force protection assumed an entirely different character. After a decade of taking down fences and opening up bases, we reversed that trend. Back up went the fences, up popped security checks at our gates, and patrol boats hit the water again. Following September 11, 2001, we accelerated our efforts. Our security posture is clearly visible and our folks are better trained and certainly more wary.

Next, we are making huge strides in the processing power, fidelity, and capabilities of our combat systems, but in many ways the processes that the operator has to perform have changed very little. Rather than expanding combat systems to present more information in more ways to potentially more operators, I need systems that correlate and integrate the available data across multiple sensors, perform the routine analysis, and then present the command team with a coherent, fused tactical picture. I don't expect to be able produce the same degree of precision for the underwater picture as a radar can above the water, but we should be able to build a system that can detect and track the easy contacts, and present what can be deduced about their position. This would allow a smaller number of

operators, who no longer have to concentrate on the background clutter, to focus on finding, tracking and targeting the difficult targets.

We are looking now at how we might best improve knowledge management in the control room. I see the control room of the future as a very small enclave of advisors and decision makers presented with just the information needed for any given situation at just the right time. It will be presented in a manner that can be quickly internalized, categorized, and transformed into knowledge. Since each person has a unique method that best fits his style of learning, the displays must also be flexible enough to support the specific person sitting in front of it. The control room party will be able to quickly recognize and adapt to changing situations and be able to reasonably predict future events based on their enhanced knowledge. Not only will our operators be more situationally aware and better prepared to deal with the uncertainties of the undersea battle space, we just might be able to reduce the manning on our ships.

Piloting in restricted water is an area where we currently throw too many people at what should be a relatively simple problem. Commercial mariners accomplish this task with 5 people. The procedures we use now require us to have a minimum of 19 people, all devoted to determining where the submarine is, and where it should go, and then getting it to where we want it to go. We are conducting an experiment on USS OKLAHOMA CITY and USS KEY WEST to see if we can reduce this number of people, still using current technology, to 14. It's working.

When we have a fully certified electronic navigation and charting system implemented on a boat, we should be able to reduce this to 9, because the electronic navigation system is able to present a complete, integrated picture of exactly where the submarine is, and where all the other ships are, without the need for any operator involvement.

Let's talk about training and I will start with my message—WE NEED TO DO BETTER. I am sure most of you remember the picture of (then) RADM Giambastiani showing the exponential growth in processing possible with a technology investment in Acoustic Rapid COTS. And we all know the results of one of the Navy's most successful investments in this technology. Our crews

today have in their hands an explosion of sensory and processing information unimaginable when many of us were in their shoes. And today it is not just in acoustics, but in imagery, weapons system, communications, networks, electronic surveillance, and the list goes on. Couple this with the ways our crews sense information from off board—unmanned vehicles, debarked SOF, unattended sensors and you have a confluence of data that gives tremendous ability to operate with speed, reach, capacity and persistence. But what have we done to facilitate and advance our crew's human capacity to match this technology? Rear Admiral Johnson, with his superb PowerPoint skills, showed a great slide yesterday that captured the very essence of the challenge: the gap that exists between our capability and our ability to wring every drop of war fighting readiness from that technology. Recently, I was in Groton and I saw the great things Arnie Lotring at the Submarine Learning Center and Don Gerry at the Submarine School are doing on the land based side of the training empire, and it is impressive, but—on board our ships we are not on such a firm foundation. Our crews are training the same way we were doing it decades ago, except now we build our lectures on Power Point. We need to get our training on the same business model we were on 10 years ago for sonar processing. Our training needs to unleash the capacity of our human capital like COTS unleashed the capacity of our sensors.

We recently took an initial step toward the future of integrated Naval training during the Multi-Battle Group Inport Exercise. Once the exercise control people flipped the *on* switch, the participants, including two submarines, had a hard time remembering that they were still inport because the feeds they were receiving closely mimicked a real operation. So why was an exercise of this scale just the beginning? First, the submarines couldn't participate from their own ships; they had to go to the trainer.

Second, if we wanted to do the same exercise today, we would have to rebuild the architecture. What we need is a standard protocol to interconnect all of our afloat and ashore training assets so that we can build virtual Expeditionary Strike Forces that can train in a more realistic and cost-effective manner.

This is not typically a forum where we talk about things as unimaginative as money, but I am going to risk it. It is early in the

day, and I might have a slight chance of keeping you awake in your seats. To get straight to the point, we are facing substantial fiscal challenges in future years and unless we want to be a significantly smaller, less capable Force, we have got to become more efficient at running our business. One virtual graphic should give you a sense of the challenge we are facing. Put a black line on the top for what we need to operate the Submarine Force based on last year's model. The next line is lower and is the current budget for fiscal year 2005. And if this virtual graphic doesn't get your attention, consider this profile does not take into account the full financial impact of an ongoing war, nor does it reflect a recapitalization plan that meets our needs for more, newer ships. And I am sure there are more issues out there that will challenge us. From where I sit, I can influence those curves most in two ways: maintenance and manpower.

In the area of maintenance, I will address two areas where we need help:

- Repair activity maintenance at the depot and intermediate level
- Crew preventative and corrective maintenance

At the repair activities, there is potential for gain if we improve the processes used so that they require less rework, less manpower, and less overhead. Portsmouth Naval Shipyard has demonstrated this in recently completed availabilities where they have come in under cost and schedule. This is an area with technology written all over it. And since we have only a few shipyards now, any improvements must be shared and implemented across the board to maximize our savings. Our shipyards have started this process and are on a positive slope toward shorter and more cost effective depot maintenance availabilities.

Turning to crew maintenance, the answer is quite simple: Less maintenance means I can focus my smart operators on doing just that: operating. I know that we can't just throw a magic switch and suddenly double the mean time between failures, but there are other ways to get at this problem. If you can build in cost effective redundancy that allows for graceful failure and give me reasonable assurance that I will maintain full capability until I return to port,

then I will do my repairs there. And maybe I don't fix it, but rather yank out the old one and throw in a brand new or refurbished unit. We have a model for this in the experimental Maintenance Free Operating Period configuration that our Lockheed Martin partners are testing on some of our ARCI equipped ships. This won't work across the board with our current submarine design, but we can implement where feasible now and make it a planning factor for the next submarine design. Considering that maintenance is the largest expense in submarine operations, any small percentage efficiency you can provide adds up to real money in a hurry.

The Chief of Naval Operations has tasked us to look hard at where we are expending our most valuable asset, our human capital. Do we have the right mix between Active Duty, Reserves, Government Service Civilian Personnel, Contactors, Officers and Enlisted? Are we recruiting the right people into the Navy and Submarine Force? Are we retaining the right submarine professionals for the future? As a general rule, we want to have: our Active Duty working in areas requiring military expertise; Reserves need to be where we need the Active Duty augmented for relatively short periods of time, specifically in times of conflict; our professional civilian work force should be accomplishing functions not inherently military in nature; and we should contract to the civilian industrial base for many of the non-governmental or non-military support functions and short-term projects. I want only the number of people, and the right mix of those people, I need to provide combat ready forces to the Combatant Commanders. We are going to be studying this over the next several months, and we are going to build a Human Capital Strategy that addresses these questions and issues.

Again, technology can be an enabler. The trivial *solution set* entails using technology to rid ourselves of mundane, repetitive work that can either be performed, eliminated or replaced with technology.

The more challenging solutions take this trivial solution further where we focus on improving the richness of the work experience for our 21st century Sailors, Reservists, civilians, and contractors, all knowledge workers in the finest sense, ensuring they are increasingly empowered as decision makers and thinkers.

The ship control party of USS VIRGINA really illustrates what I am talking about here. On a 688 submarine, we use a minimum of

5 people to drive the ship. There is the Diving Officer, Chief of the Watch, Helmsman, Planesman, and messenger. On VIRGINIA, it only takes a pilot and co-pilot. To make this possible, we had to completely redesign the ship control technology and process and then reevaluate the mix of people to perform these jobs. In the old model, we had a mix from the newest guy onboard through an experienced chief or officer and in the new model we will use two experienced enlisted, probably chiefs. Overall, we save three people per watch section for a total of nine, however the six remaining watchstanders will be senior, experienced and more valuable to the overall operation of the ship. Exactly the type of people we are going to need in the ever more advanced, complex, and demanding Force of the future.

If you don't already know it, this year is a very special year. It is what I call the "Year of the Submarine . It isn't official and you won't find it on any calendar or on any official correspondence, but all you have to do is look around to see the truth of it. Not since the mid 1990s have we had so many submarines being built, converted and delivered.

On May 22nd, Mrs. Linda Bowman, wife of Admiral Bowman, presided over the keel laying of USS NORTH CAROLINA as the ship's sponsor; a ship that at that time was 40% complete.

Just two weeks later, on June 5th, JIMMY CARTER was christened at Electric Boat by former First Lady Rosalyn Carter with its namesake, President Carter in attendance.

The following month, on July 31st, First Lady Laura Bush, the sponsor of TEXAS, will preside over the christening at Northrup Grumman Newport News Shipyard.

This summer, Captain Dave Kern and his crew will take VIRGINIA on her maiden voyage and will complete sea trials followed by its delivery to the Navy and commissioning.

And this winter, HAWAII, now 60% complete, will receive her second crew increment.

Not only are these five submarines well down the construction path, but six additional VIRGINIA class submarines are now under contract.

But this "Year of the Submarine is not all about SSNs. Three former TRIDENT SSBNs, OHIO, MICHIGAN, and FLORIDA, are

currently conducting refueling overhaul and SSGN conversion, perhaps the most transformational platform of our time. A fourth TRIDENT, USS GEORGIA, is currently conducting SSGN proof of concept demonstration and will be the focal point for the SILENT HAMMER Sea Trial experiment this fall before she transits to Norfolk Naval Shipyard to begin her conversion.

If all of these events were not enough, mark your calendar, as many of you will probably be participating in another momentous occasion on September 30, when we celebrate the 50th anniversary of USS NAUTILUS' commissioning in Groton.

All this is possible because of the good work all of you have done to continually improve undersea warfare. My heartfelt thanks to all of you for your efforts in keeping this the best Submarine Force in the best Navy in the world.

Thank you.

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SUBLEAGUE ANNUAL SYMPOSIUM

NAVAL SUBMARINE LEAGUE ANNUAL SYMPOSIUM BANQUET ADDRESS BY RADM MAURICE H. RINDSKOPF, USN(Ret) 10 JUNE 2004

Thank you, Admiral Reynolds, for that kind introduction. It's something that doesn't happen often these days–so I'll relish it while I can.

Congressman Bartlett, Admiral Bowman, distinguished guests, fellow submariners active and retired, enlisted and officer, Naval Submarine League supporters, and ladies:

The Naval Submarine League, just like every ship, has its plankowners, and I am one of them. I clearly recall meeting in the old sail loft in the gun factory in 1982 with about 100 young retired submariners. We, with considerable dialogue, established the league. I took the floor to offer a name that was unlike "The Navy League but my distinguished classmate Vice Admiral Phil Beshany won the day, and so was born the Naval Submarine League.

I have attended all but one of these symposia and had the honor of speaking at the 100th anniversary. My topic that day was *A Century of U.S. Navy Submarines* for which I was allotted 30 minutes. Later that year I was asked to write the chapter on World War II operations for the big blue cocktail table book *United States Submarines*. There I was constrained to 5000 words. Tonight I am representing *The Submarine Family* without any constraints. Never fear, however, I shall mind the clock.

By my unscientific count, there were 465 submariner commanding officers in World War II. A recent, perhaps less scientific tally, reveals that there are but 36 of us left–primarily from Naval Academy classes 1930 through 1939, and perhaps one or two of the reserves. So I thought that, before it is truly too late, you would enjoy hearing what it was like as I was growing up in the Force.

I was in the first Submarine School class in July 1940 that was shortened from six to three months, and included reserve officers.

We learned on diving trainers that were crude mechanical gadgets, practiced making approaches on an attack teacher in which the staff moved small ship models on an upper deck by hand, made escapes in the long gone 100-foot diving tower, and went to sea in R-boats, relics from World War I. Yet, we prospered and I qualified in September 1941. (Viewing the new training devices at the Submarine school a couple of weeks ago can only be called a revelation).

Little did I know that my reporting to DRUM on what then was Armistice day 1941, three weeks prior to Pearl Harbor Day, would shape my entire career, and that I would never forget my experience in her.

Today a frequently asked question is "Where were you on 9-11?" In my generation, the question was "Where were you when Pearl Harbor was attacked?

My wife and I were at the town dump in Kittery, Maine on that fateful Sunday morning when she heard the radio reports of the Japanese attack. DRUM's 3"/50 caliber gun became the air defense of the Portsmouth Naval shipyard. Which expected German bombers overhead any moment. I spent the next four days with my torpedo gang readying DRUM's MK XIV torpedoes as war shots and installing the secret but unpredictable exploder MK VI, an evolution never experienced by any of us. My wife's primary concern was that I was gone all that time without a change of skivvies.

Three months later DRUM reached Pearl Harbor, the first new construction ship of any kind to arrive after the attack, to mourn the many sunken ships and black oil everywhere. We were eager and ready to do battle with the enemy, but preparations for our first war patrol were interrupted by orders from COMINCH (in Washington) directing us to remove our torpedo reloads and load to capacity medical supplies and vitamin pills for the beleaguered Garrison at Corregidor. At Midway we were to join SS THOMAS JEFFERSON, an elderly merchantman, carrying ammunition, for the long voyage to Manila. Sadly, as task group 7.5.1 prepared to depart Midway, Corregidor fell and the Bataan death march followed. Our mission was cancelled and we returned to Pearl for our torpedoes.

Then, just prior to getting underway for that first patrol, we were ordered to remove our lifelines and stanchions because returning boats reported that Japanese Sampans were using grapnels to attempt

to *catch a submarine*. After transiting 3,800 miles to the Japanese empire, DRUM experienced a memorable first night in the area south of Toyko. Then we made our maiden night surface attack, without radar, resulting in the destruction of MIZUHO, a 9,000 ton seaplane tender, the largest ship sunk to that point in the war. But it was not easy. Several of our torpedoes failed to explode on point blank shots at a stopped escort (but more about that later). Close depth charges, in which the click of the exploder could clearly be heard before the main explosion, plagued us for 22 hours to the point that our battery approached exhaustion. Lieutenant Commander Bob Rice, our stellar commanding officer, bemoaned the possible loss of this new ship before it had exacted its full pound of flesh. Fortunately, we escaped to fight for more than three long years. And the ships cooks celebrated with midnight ham and eggs for all hands, but no brandy.

We did not realize until we returned to Pearl Harbor that we had been the subject of a radio broadcast to the allied troops by the infamous *Tokyo Rose*. A few hours before our attack on the MIZUHO, we had been forced down by a small plane overhead. Our skipper had decided to sleep on the bridge in area to ensure his being night adapted and available in an emergency. Unfortunately, the mattress on his bunk behind the bridge floated off when we dove–and it was clearly stenciled USS DRUM, that was the basis for Tokyo Rose's report and that was the skipper's last nap on the bridge.

I remember receiving messages with an *ultra* heading because they contained information from decoded Japanese traffic which led to the sinking of more than one ship.

That lets me tell one of my favorite sea stories. When I decrypted the first of those messages, I donned a yellow aloha shirt after which DRUM sank the advertised ship. On our next patrol, after refit at Pearl Harbor, a similar scenario unfolded except that on this attack every crew member donned his yellow Aloha shirt. That convinced me that leadership by example was the way to go. I used this story more than once when I was Officer in Charge of the Submarine School. Thus, it did not surprise me that even though the uniform for my farewell party was *Coat and Tie*, all hands were in yellow Aloha shirts–and they had one for me and my father.

Talking just once more about the unreliable MK XIV torpedo to an audience with experience in firing Tomahawk missiles which can be programmed to enter the left hand second floor window of the target at 500 miles, may seem incongruous. But, as author Clay Blair wrote in 1975, "Inadequate torpedoes lengthened the war by at least a year. I think I am qualified to talk on this subject because I fired 125 torpedoes as torpedo data computer operator or Commanding Officer. DRUM was on the firing line before anyone knew we had a problem, and was still there when it was finally corrected. However, in that sad 18 months, we experienced premature explosions when the torpedo armed at about 300 yards; torpedoes which broached and were sighted; torpedoes which actually bounced off a target, broke in half and sank without exploding; and unnumerable torpedoes which ran so deep that the magnetic trigger in the exploder failed to perform.

In spite of that litany of failure, one incident south of the Japanese Empire in October 1942 is worthy of some detail. This was an attack upon a medium unescorted merchantman, close in shore, where one of the two torpedoes fired at about 1,200 yards prematured, causing the target to turn away from the explosion. This gave DRUM a chance for an up-the-kilt shot of one more torpedo which blew off the target's stern at 3,000 yards.

I remember, too, during the time we spent operating out of Brisbane, Australia, in 1943 learning that our submarine losses were mounting, especially in the southwest Pacific. This brought home clearly that submarining was a dangerous business. It meant that every officer and man had to perform at the highest level if we were to survive but I saw no lessening of the fighting morale in DRUM, and survive we did; and here I am 60 years later, the last surviving officer in the commissioning wardroom, and her last surviving wartime skipper.

Of DRUM's original five officers, the third, Lieutenant Commander Manning Kimmel, the Admiral's eldest son, and the fifth officer, Lieutenant Commander John Harper, were later lost in ROBALO and SHARK II, respectively. I was number four, and fortunate, I guess, that I remained in DRUM. They, along with the 3,613 other submarine heroes, including 11 of my classmates, are memorialized on the Groton monument before which Sylvia and I

paid our respects a month ago.

My part at sea in the Cold War was brief but significant. In January 1949, the Chief of Naval Operations decreed that the primary mission of the Submarine Force would shift to antisubmarine warfare–submarine versus submarine. He directed both fleet commanders to assign one division primary responsibility in the development of tactics against another submarine. In that letter, he mentioned that Submarine Squadron Six in Panama had already reported progress. I had command of SEACAT there from 1947 until late 1949. We learned that making approaches on a submerged submarine was a real challenge considering the rudimentary sonar equipment, the inability to communicate effectively and securely submerged, and marginally capable torpedoes in our inventory. CINCLANTFLEET responded to the CNO by establishing Submarine Development Group Two in New London. After 50 years, that command has evolved into Submarine Development Squadron Twelve which has developed and sea-tested tactics not only in ASW but in every aspect of individual and joint submarine operations.

Many of you fought the Cold War against the Soviet Union, an enemy which would not admit that it could be outgunned by the United States in the quality of the nuclear submarines and missiles that it put to sea. You spent months at sea watching what the Soviets were doing in their bastion close to their homeland, and trailing them for days, even weeks, as they roamed the deep oceans. In spite of many serious incidents, never was a weapon fired in anger. By 1990, when the Berlin wall fell, that era had also passed and we realized that a *blue water* war was never to be repeated. But, in 1991, the Submarine Force became an instant offensive star by firing the first of many Tomahawk missiles into Iraq, where results are measured in hours rather than timed by a stopwatch. That stellar performance has continued as submarines contribute mightily to the war against terror.

Now, we welcome VIRGINIA and her sisters into the Force, they are designed to fight in the shallow littoral areas of the world, they are quieter, easily reconfigurable to alternative missions, more technically sophisticated, and more automated than any of their predecessors. They will confront and defeat the new quiet diesels in

the order of battle of too many countries. They will benefit from the collection efforts of JIMMY CARTER, launched within a week, unique amongst a long line of superb undersea craft.

But wait! The story is not complete without full recognition of what our loved ones at home have done in our behalf and in support of a grateful nation. In World War II, my wife waited about sixty days no fewer than 10 times for a packet of letters carefully sequenced. They were delivered by a postman who rang her doorbell, usually in his second delivery of the day. She has often told of the support the Armed Forces got from an entire nation; and how her male friends in New London would apologize for not being at sea by describing a physical disability which had them working at the Electric Boat company on the midnight shift.

During the Cold War and on to the present day, our submarine wives still man the home front with their children under conditions different from the dangers of World War II, but no less stressful. Yes, they now have email and I am sure even the five-year olds get on the computer regularly. Unlike World War II when there was no command support for the families, the Submarine Force today looks out for its own. I salute every submarine family here tonight and around the world. ***Bravo Zulu–Well Done.***

NAVAL SUBMARINE LEAGUE ANNUAL SYMPOSIUM REMARKS BY RONALD O'ROURKE JUNE 10, 2004

Mr. O'Rourke is a senior analyst with the Congressional Reference Service of the Library of Congress.

Thank you, Admiral, for the kind introduction. It's an honor to be here. As always, I should point out that these views are my own and not necessarily those of CRS or the Library of Congress.

Outline

- SSNs in planned size/structure of Navy
- SSN force-level goal and procurement rate
- SSNs and budgeting for ship acquisition
- UVs and SSN mission analysis
- Submarine R&D
- Elements of an integrated approach

As you can see, I want to discuss six points. Since I have only 30 minutes, I'll move through them fairly quickly.

My first point concerns the place of submarines in the planned size and structure of the Navy. Since early last year, we've been in a situation of uncertainty regarding the planned size and structure of the fleet. We don't seem to be on the 310-ship plan anymore,

because the Navy and DoD have launched studies that call into question key aspects of that plan, and because the Navy wants to build a large class of Littoral Combat Ships not included in that plan.

At the same time, the Secretary of Defense has explicitly declined to endorse the Navy's proposal for a 375-ship fleet—or any other new plan for the size and structure of the Navy. And the Navy itself is now hedging on the 375-ship figure, saying that it's only an approximate number, that the numbers of ships making up the 375 is subject to change, and that the 375 figure reflects traditional crewing and deployment concepts, rather than newer concepts such as Sea Swap.

This uncertainty over the planned size and structure of the Navy is convenient to some degree for Navy and DoD officials, because it permits them to talk about Navy programs without having to be too specific about their details. At the same time, however, the Navy and DoD recognize that this uncertainty makes it difficult for industry officials to make investment decisions that might be in the Navy's and DoD's interest in terms of constraining future procurement costs. And at some point, this uncertainty will make it harder for the Navy and DoD to do their own budget planning. Consequently, there are indications that the Navy and DoD plan to resolve, at least partially, the uncertainty over the future size and structure of the Navy either later this year or early next year.

In settling on a more clearly defined plan for the size and structure of the fleet, Navy and DoD officials will be conscious of certain things. One of these is the federal budget situation. The budget deficits now being projected are large enough that they may dampen down the rate of real growth in defense spending.

A second factor will be the Navy's current efficiency initiatives, which are intended to generate savings that can be applied to Navy investment programs. Although the services, as an incentive for generating savings, are supposed to be able to retain them for their own purposes, the potential need to fund increases in Army end strength, plus the potential additional costs for implementing the Army's new transformation plan, may result in pressure to effectively transfer some of the Navy's savings to the Army.

A third factor will be potential costs for new acquisition programs. One of these is the DD(X), where there are reasons to be

concerned that the unit procurement cost might turn out to be substantially higher than now estimated by the Navy. A second is the LCS program, whose total scope and cost at this point is still very open-ended. And a third are amphibious and maritime prepositioning ships for implementing the new sea basing concept. The potential costs of these ships, also, are unclear right now. Confronted with the uncertain costs of these programs, Navy and DoD officials may be hesitant to commit more than a certain amount of funding to other Navy programs, such as submarines.

And a fourth factor that Navy and DoD officials will be conscious of are new basing, crewing, and deployment concepts, like additional forward homeporting and Sea Swap, that can substantially reduce the amount of force structure needed to maintain a given number of ships in overseas operating areas.

These factors, taken together, suggest a potential for a new plan for the Navy that is perhaps not significantly larger than the old 310-ship plan, and possibly smaller than 300 ships. It has been reported, for example, that the Navy wants to reduce the number of ESGs from the current 12 down to as few as 8, that the DD(X) procurement run may be reduced from 24 down to as few as 9, and, as everyone in this room is probably well aware, that the attack submarine force-level goal might be reduced from the current 55 down to as few as 37. The potential reduction in the attack submarine number reportedly is based in part on shifting some submarine ISR missions to other platforms, and on forward homeporting up to 9 attack submarines at Guam.

At a recent conference in New Orleans, one shipbuilding industry official raised the possibility that the submarine number might wind up being somewhere in the range of 40 to 50. This official also mentioned a figure of 8 to 12 ESGs, and figure of 10 to 12 carrier strike groups.

All of this is to note that if the submarine number is reduced, it may be part of a new plan that reduces other parts of the Navy as well. The fact that other parts of the Navy are being reduced wouldn't necessarily make a reduction in the submarine number any more or less correct, but it might make it more difficult for submarine supporters to convince others that submarines are being treated unfairly.

Force-level goal of 40 SSNs (excl SSGNs)-potential implications for procurement:

- *Nearer term*: Option for 1 sub, or 0, in FY09, and 1/year thru FY10 or FY11
- *Longer term*: need to procure avg. of 2/yr from about FY11 or FY12 thru about FY24
- bottom line: 40-boat force will (eventually) require avg of 2/yr for about 12 or 13 years
- Assumes 33-year life for 688s; if <33 yrs, then procurement might need to be increased

My second point concerns the potential implications of a reduced attack submarine force-level goal on the downstream submarine procurement rate. As you can see on this slide, if the attack submarine force-level goal turns out to be 40, excluding SSGNs, then in the nearer term, the Navy might have the option of procuring 1 submarine, or none at all, in FY09, and of continuing to procure 1 per year through FY11 or FY12. By the same token, however, even if the submarine goal is reduced to 40, the Navy would still need to procure an average of 2 submarines per year between about FY12 and about FY24. The bottom line, in other words, is that even though a force-level goal of 40 could permit the start of 2-per-year procurement to be deferred for a few years, it would still require procurement to be increased after that to an average rate of 2 per year for a period of about a dozen years. These numbers, moreover, assume that 688s remain in service for 33 years. If high optempo reduces service lives to less than 33 years, then procurement might need to be increased.

Budgeting for new ship acquisition

	Full funding	*Initial fuel cost included*	Incremental funding or equivalent	Funded in RDT&E	Modules funded in OPN	Funded in NDSF
SSN-774	X	X				
CVN-21		X	X			
DDG-51	X					
DD(X) lead			X	X		
DD(X) follow	X					
LPD-17	X					
LHD-8			X			
LHA(R)	X					
LCS lead			X	X	X	
LCS follow	X				X	
TAKE			possible			X
TAOE(X)			possible			X
MPF(F&A)			possible			X

My third point concerns the ways in which ships are now being budgeted for acquisition. This slide lists the various kinds of ships being procured now, or scheduled for procurement later in the FYDP. What it shows is how budgeting for ship acquisition, which used to be fairly uniform, has now become more complex and varied from class to class.

The Virginia class is the first program listed, and as you can see in the first column, this program uses the traditional full funding approach, under which the entire procurement cost of the platform is to be funded in the shipbuilding account in the year of procurement. And as shown in the second column, in the case of the Virginia class, the procurement cost includes the cost of the ship's fuel, which increases the procurement cost of the ship by something close to 7%. The combination of these two features—the use of full funding in the highly visible shipbuilding account, and the inclusion of fuel costs in the ship's procurement cost—is true of no other kind of ship.

As you can see in the third column, a number of other programs are using formal or de facto incremental funding, or have the option of using it. As shown in the fourth column, the lead DD(X) and lead LCS are to be funded in the R&D account, making their total construction cost less visible. As shown in the fifth column, LCS payload modules, which form a major part of the total LCS program cost, are to be funded in the Other Procurement account, which shifts those costs to a less visible account. And as shown in the final column, 3 or 4 classes of auxiliary ships are to be funded in the National Defense Sealift Fund, making those costs less visible.

If spreading the procurement cost of a ship over several years, or transferring a ship's procurement cost out of the highly visible shipbuilding account, make it easier to gain approval for procuring the ship, then submarine supporters have reason to be concerned that their platform is presented in a less advantageous way than several other kinds of ships.

Short of returning to a uniform policy of fully funding all ships in the shipbuilding account, one option for partly addressing this situation would be to shift nuclear fuel costs from the shipbuilding account to the Other Procurement account. That wouldn't make a huge difference in the submarine's procurement cost, but it would at

least equalize the treatment of submarines and carriers compared to other ships in terms of whether fuel costs are included in the ship's procurement cost as it appears in the shipbuilding account.

UVs and SSN mission analysis

- Navy, press reports: SSN ISR missions could be done by sub-launched UUVs, satellites

On the other hand:

- SSN-launched UAVs might do some overhead/deep-inland ISR missions now done by satellites and manned aircraft/UAVs based on land or surface ships
- SSN-launched UUVs might do some littoral ASW/MCM missions now allocated to surface ships

My fourth point concerns unmanned vehicles and the analysis of submarine missions. Navy officials, when asked about future requirements for submarines, have noted the potential for submarine-launched UUVs to perform ISR missions that are now done by attack submarines themselves. There has also been discussion in the press about shifting ISR missions from submarines to satellites.

There's nothing wrong about exploring the potential for using UUVs or satellites to perform missions now performed by submarines. But if you're going to do that, it would also appear prudent to do the obverse by exploring the potential for submarines equipped with UVs to perform missions that are now performed by other platforms.

One possible area to explore concerns the potential for submarines, if equipped with UAVs, to perform overhead and deep-inland ISR missions now performed by satellites or by manned aircraft or UAVs that are based on land or surface ships. Submarines equipped with UAVs might have certain advantages for performing such missions:

- Compared to satellites, a submarine-launched UAV offers greater persistence over the target and less predictability about when the observations will be made.

- Compared to manned aircraft or UAVs that are launched from in-theater land bases, using a submarine-launched UAV avoids the problem of overseas base access and host-nation limits on use. It also reduces the risk that an enemy agent will observe the launch and warn the ISR target about the approaching aircraft.

- Compared to UAVs launched from land bases in the United States, a submarine-launched UAV would have a shorter flight time to the ISR target area, which could be important for observing transitory ISR targets. It could also be smaller than a U.S.-based UAV, making it potentially less expensive and harder to detect and shoot down.

- And compared to a UAV-equipped surface ship, a UAV-equipped submarine is less likely to be noticed in region, reducing the chance that the ISR target will anticipate a UAV mission and take steps to counter its effectiveness.

Another area to examine concerns using submarine-launched UUVs for littoral missions now allocated to other platforms. Submarine-launched UUVs can be used for detecting and countering mines and enemy submarines in littoral waters, and in some ways might be able to do so better than surface ships or unmanned vehicles launched from surface ships.

The LCS has been allocated certain missions, including littoral MCM and ASW, but the Navy has acknowledged that, prior to announcing the start of the LCS program, it did not perform a formal analysis of multiple concepts to show that a ship like the LCS would be the best way to perform these missions. The Navy argued recently that the LCS reflects 14 years of operational lessons learned from

naval deployments to the Persian Gulf since the time of Desert Storm, and that such lessons can provide "a clarity that might be even better than a study we can conduct here in Washington, DC.

Lessons from past operations are certainly important. They can certainly demonstrate a need for having additional capability for performing certain missions. But in a time of transformation, with the Navy incorporating new technologies, including unmanned vehicles, as well as new operational concepts, whether the past operations of a pre-transformation fleet can form a conclusive basis for intuitively knowing how to best provide that additional capability in a transformational future is another issue. You can't have it both ways: You can't argue, on the one hand, that the Navy is transforming, and that the LCS is transformational, and at the same time argue that the correctness of the LCS as the best possible approach is validated by the technologies and operational concepts of the old, pre-transformation fleet.

As for views regarding the value of doing formal studies here in Washington, the current situation reminds me of the famous line from the 1948 movie, The Treasure of the Sierra Madre.

> *"Badges? We ain't got no badges.*
> *We don't need no badges.*
> *I don't have to show you any stinking badges!"*

Where you see the word *badges*, substitute the term *formal studies*.

The Navy has long been proud of its role in establishing the field of operations research in this country around 60 years ago, during a period of profound wartime urgency. Consequently, for the Navy to argue today that studies are perhaps not so important to the acquisition process, and that there isn't enough time to do one before embarking on a program costing billions of dollars, is rather extraordinary. I suppose one could say it's an example of transfor mation.

As a counter example, you might recall it was only 4 or 5 years ago when senior Navy officials, citing decades of operational experience, argued that the range at Vieques was a critical, unique, and irreplaceable asset for training deploying battle groups, and that closing Vieques would therefore have significant consequences for Navy readiness. That argument was made repeatedly.

And then a funny thing happened: The Secretary of the Navy directed the Center for Naval Analyses, which is based in the Washington area, to do a formal study on potential alternatives to Vieques—alternatives that had been dismissed repeatedly in the debate up to that point. And guess what? The study identified an alternative approach that would rely on using multiple sites rather than a single site. The Navy has now adopted this general approach, and Navy officials are expressing satisfaction with it, arguing that the training it is providing is as good as, and in some respects even better than, the training that was provided at Vieques. So studies done here in Washington can in fact sometimes overturn deeply held views based on operational experience going back many years.

It has been argued, correctly, that paper analyses by themselves cannot prove that a proposed platform or weapon is the right way to go. But they can test key assumptions behind proposed programs, and force advocates of those programs to confront potentially inconvenient questions they might have been inclined to skip over, or perhaps weren't even aware of.

I want to be clear: I'm not saying that LCS isn't the best way to perform these missions, or isn't a good program to pursue. It very well might be. But taxpayers could have more confidence in that if the LCS were assigned its missions following a competitive analysis conducted by a neutral party in which advocates of alternative approaches for performing these missions, including submarines, have a chance make their best case.

The point is that, when it comes to the effect that unmanned vehicles can have on submarine roles and missions, things can cut both ways. If the focus in a submarine mission analysis is primarily on how submarine-launched UUVs can reduce requirements for submarines, and less on how submarine launched unmanned vehicles could in other ways increase requirements for submarines, then submarine supporters have grounds for arguing that the study in

question is not so much an analysis of attack submarine requirements as it is an exercise directed at knocking down the attack submarine force-level goal.

Submarine R&D
- one potential area of focus: sub-UAVs for overhead/deep-inland ISR missions
- two general approaches:
- minimum annual funding level
  - aim: keep technology cupboard ready for emergent needs
  - articulated in 90s
- annual funding is driven by specific tasks to be done
- aim: use limited DoN funds wisely

My fifth topic is submarine R&D, and here I want to make two points. The first, which grows out of what I just said, is that a potential key focus for submarine R&D in future years might be developing submarine-launched UAVs for carrying out overhead and deep-inland ISR missions.

The submarine community has experimented with UAVs as far back as '96, and initial concepts have been drawn up for submarine-launched UAVs, but it's not clear that there has been much focused work in this area beyond this. Developing such a capability could be important not only in terms of maximizing the potential cost effectiveness of submarines, but in terms of optimizing investments in the overall constellation of U.S. ISR assets.

The second point concerns general approaches for funding submarine R&D. One approach, articulated in the 90s, is to maintain a certain minimum level of funding for submarine R&D each year. This steady-funding approach was advocated in reaction to an earlier period of intermittent funding for submarine R&D that reflected periodic efforts to design new submarine classes.

Given the increasing interval between submarine classes, observers believed this approach, if continued, would produce an insufficiently stocked cupboard for supporting future submarine design efforts when they did arise. The rationale for the steady-

funding approach was to make sure that, when policymakers opened up the submarine technology cupboard in search of solutions to an emergent problem, the cupboard would not be bare, but instead would offer a selection of potentially useful ideas ready for rapid implementation.

When asked about the steady-funding approach earlier this year, the CNO responded rather unenthusiastically, and outlined an alternative approach under which annual funding for submarine R&D instead is an outcome of specific tasks to be done that year for specific purposes.

This raises the following questions: If the logic of maintaining a certain minimum annual level of funding made sense to policymakers a few years ago, why does it not make sense now? Similarly, if a task-oriented funding approach was viewed a few years ago as one that would produce an insufficiently stocked technology cupboard, why is it not viewed that way today? And with the new focus on capabilities-based planning, spiral development, and reducing acquisition cycle time, has maintaining a sufficiently stocked technology cupboard between class design efforts become less important, or more?

The aircraft and missile sectors are now grappling with challenges that can arise when older engineers—who have many development projects under their belts, and consequently a lot of unwritten wisdom in their heads—retire and are replaced by younger engineers who have worked on many fewer projects and consequently may have accumulated less of that wisdom. If submarine R&D is funded under the task-oriented approach in coming years, will a similar problem arise in the submarine community when the older submarine designers and engineers retire?

It's not that the steady-funding approach is right and the task-oriented approach is wrong. Both approaches have merits, and the task-oriented approach has particular merits in a time of constrained funding. But funding was also constrained in the 90s, when the steady-funding approach was articulated. If the pendulum now swings back too far toward the task-oriented approach, is there going to be a hearing years from now in which the problems of that approach are once again lamented?

Elements of an integrated approach

- For SSN supporters to consider:
  - satellites, sub-launched UUVs for ISR
  - additional forward homeporting at Guam
  - multiple crewing (CBO)
  - extending VA service life to ~40 years
- For others to consider:
  - sub-launched UAVs for overhead/deep-inland ISR now done by other platforms
  - sub-launched UUVs for ASW/MCM tasks now allocated to surface ships
  - R&D for sub-UAVs; stocked cupboard
  - proc. rate consistent with force-level goal

My last point is to outline some of the elements that might be included in an integrated approach to the situation regarding submarines. The slide shows those elements. This is by no means everything that would be included in such an approach. It's simply a partial list that mostly picks up on the points I've been making. As you can see, there are items here for both submarine supporters and for those who have to concern themselves with other platforms. For submarine supporters, things to consider include:

- first, the potential for satellites and submarine-launched UUVs to reduce requirements for submarines to perform certain ISR missions,
- second, the potential for additional forward homeporting at Guam to reduce requirements for submarines,
- third, the potential for multiple crewing, as suggested by CBO a couple of years ago, to reduce requirements for submarines,

- and fourth, the potential feasibility of extending the service life of Virginia-class boats to about 40 years, which might well require returning to the concept of mid-life refueling, but which could also permit a given procurement rate to maintain a higher force level over the long run.

And for those who have to concern themselves with other platforms, and with limits on total funding, things to consider include the following:

- first, the potential for submarine-launched UAVs to increase requirements for submarines by having them perform some overhead and deep-inland ISR missions now done by satellites and aircraft,

- second, the potential for submarine-launched UUVs to increase requirements for attack submarines by having them perform some littoral ASW and MCM missions now allocated to surface ships,

- third, the potential need for funding the development of submarine-launched UAVs, and for making sure that the submarine technology cupboard is sufficiently stocked,

- and fourth, a procurement rate that is consistent with the force-level goal. As I mentioned earlier, even if the force-level goal is reduced to 40, an average rate of 2 boats per year will at some point need to be maintained for a number of years, assuming a 33-year life for the 688s.

An integrated approach that includes elements like these might make for an efficient and effective way ahead. I offer it as an option to consider. Thank you.

AWARDS LUNCHEON ADDRESS
NAVAL SUBMARINE LEAGUE
ANNUAL SYMPOSIUM
ADMIRAL TOM FARGO
US PACIFIC COMMAND
10 JUNE 04

"Your Future is in Asia and the Pacific"

Thanks Admiral DeMars for the introduction and my thanks to the Naval Submarine League for such strong support of the Force and especially today for its recognition of some of our very best Sailors.

It is great to be back with so many old friends again. I think it has been a couple years since I talked here last. June usually has me heading West vice East and actually, that's where we'll be later on this month. But this is an invitation I really wanted to accept.

I have been in Hawaii and the Pacific for almost 5 years now. By the way, I find that doesn't take anybody's sympathy meter off the low end of the peg especially here in Washington.

So it certainly won't surprise you that I am going to talk in clear terms about the Pacific—or more correctly Asia and the Pacific. Some of you—hopefully many of you—may see as self-evident several of the points I'll make this afternoon. But I thought it would be worth the time to talk about where I think the Navy and the Nation are headed with respect to key and future security interests.

I have picked this topic because I'm not convinced we all truly, and fully understand just how much the world has changed and how our center of gravity is shifting toward Asia and the Pacific.

World has changed

In his book, The Lexus and the Olive Tree, journalist Tom Friedman describes the incredible effects of post-Cold War globalization. He makes it clear that globalization is having a profound impact on political, economic, social, and military change. No place is this more evident than Asia—and the Pacific.

Most of this change is certainly for the good. Communications and commercial transactions circle the globe at the speed of light. (The last time I used my VISA card in Thailand, it was posted to my account before I could remember my PIN.) Airline and merchant fleets have opened almost every corner of the world to business and pleasure travel. Our military and those of our friends and allies are significantly more capable than they were just a decade ago, both individually and in coalition arrangements.

But there are downsides to rapid globalization. Broadly speaking, crises affect more people faster, spreading instability without regard to borders, and reducing available time to respond. (In 1997, the Asia economic crisis—everybody goes into the tank together.) And of course speed is an essential characteristic for success in today's world.

And Geography doesn't provide a lot of protection. Today physical borders cannot insulate anyone from threats that are both real and perceived. SARS, for example, was a big deal in Asia. While not the result of a malicious act, it demonstrated the enormous destructive potential of a biological threat. Singapore, which handled the outbreak very well, suffered a loss of one to two percent of its GDP. And the hotels in Chiang Mai Thailand, a tourist center with no SARS cases, were essentially empty when I visited just one year ago this time.

Combine these new globalization trends with more traditional security concerns such as North Korea, the potential for miscalculation across the Taiwan Strait or in Kashmir, and a wide range of transnational threats headed by terrorism and you start to gain a feel for this new security context.

Our mutual security interests are linked like never before. The instantaneous nature of the global economy and global information network mean that all of us will collectively and quickly - prosper or suffer together. No nation alone can secure itself or improve the world for others. Our current situation demands a more proactive, a multilateral, and frankly, a more courageous approach.

Asia-Pacific region is changing too

So the pace of change is stunning. And no place is the impact of that change more important to us than in the Asia-Pacific region.

I mentioned a few minutes ago about how our *center of gravity* is shifting.

- The CNO understands this—we've talked about it many times
- Our National Security Strategy addresses it.
- And our transformational proposals reflect it.

Certainly the Commander-in-Chief stated it early on in this administration when he said "...I am convinced the 21st century will be the Pacific century."

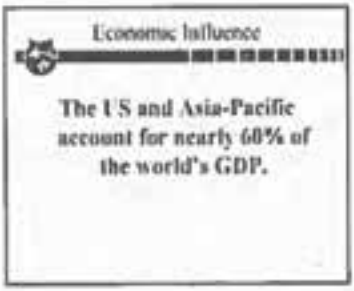
Fundamentally, our future—and especially the future of our Navy —lies in the greatest measure—in the Pacific. So it is time to adjust our programs, our posture and our policies to acknowledge this change. Let me show you why.

Normally I don't show slides to a group like this - especially after lunch. I promise the few I use, we'll move through quickly. First, here's the problem - walk into any office in our government, and I'll bet the map on the wall looks like this. (See map)

Now the National Geospatial-Intelligence Agency (NGA), which used to be NIMA, which used to be the Defense Mapping Agency will tell you there are at least 6 different primary views of the world,

but even they refer to this one as *the standard*. The first step in navigating your way through any problem —as we all remember as an Officer of the Deck— is make sure you have the right chart! And typically, this is what you see hanging on a wall, unaware that, as you look at *this world*, you may be missing some of the facts. Here are some of those facts:

First, there's the economic piece ...



(Nearly 60% world's GDP in A-P + US region) North East Asia combined with the U.S., alone make up over 50%, and this number will grow.

(2000, A-P + US consume ½ world's energy) Half the world's energy is consumed in the region, and of course, the vast majority moves by sea.

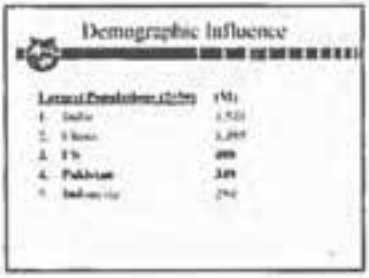
(Highest economic growth) Asia has the fastest growing economies in the world. Ironically, it is also home to some of the world's poorest countries.

(Trade partner w/ South Korea and Japan) This is recent data and a clear shift. China is now the largest trading partner of two of our best allies.

(Japan, China largest foreign holders of US debt) Imagine the potential here. These folks could influence your mortgage rates.

Then there are the demographics ...

(2001 largest populations) This region is home to giant pockets of potential consumers, but combine this with high education levels, and low wages and you have an incomparable labor base of human capital.

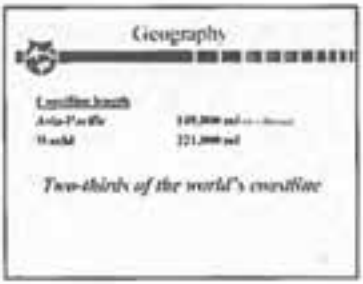


(2050 largest populations) And look what experts expect those numbers to turn into by 2050 and the gap between # 2 and 3.

(U.S. geography overlaid Indonesia) Of course Indonesia is the largest Muslim country both from a population and geographic perspective -- and both moderate and secular. Second largest population is Pakistan then Bangladesh, followed closely by India.

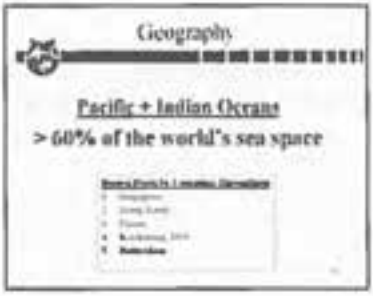
Political vitality continues to grow.
(AOR elections 2004) This year alone, 14 nations, including the US, are conducting free elections. 35 countries within this region declare themselves democracies or republics. This is good and healthy, but many are fragile, some as young as 2 and 5 years old. But even the non-democratic states (except North Korea) are moving toward market-based economies.

Diplomacy has engendered solid relationships in Asia and the Pacific.
- (5 of 7 treaty partners) As you can see, 5 of 7 treaty partners -- and we're proceeding toward a Strategic Framework Agreement with Singapore.



The Geography demonstrates the maritime character of the theatre...

- (Coastline) This slide is important because the maritime Battlespace of the future is the contested littoral.



(60 % of the world's sea space) We all understand the size of this region. Much of it is ungoverned and attractive to transnational criminals. 7 of the world's top busiest ports by volume are in Asia and the Pacific - adding to the security challenge.

From a Military perspective, the region is home to some of our most significant security concerns...

- (Key Security Issues) these are the conditions that I commonly refer to as *what keeps me awake at night*. That's another speech in itself and I think you get the idea.

(Top Navies) As Navies have become appreciably smaller in Europe. The size and capability of those in Asia catch your attention.

(Submarine) We see that manifested clearly in submarine force structure across the AOR.

A "New" Map of the World to Consider

I promised you at the outset I wouldn't spend a lot of time on slides, and I only have one more to show you. But before I do, reconsider the areas I touched on:

- Economics
- Demographics
- Politics
- Diplomacy
- Geography
- Military capability

We have a Navy to protect Americans—to the far *corners* of the earth—our people and our interests and those of our friends and allies. Here is where those corners meet.

And for all of you that have the next maneuvering watch, check with the Commander at the back of the room on your way out. He's got a new chart for you!

PACOM initiatives

Let me talk about some of the activities we've undertaken in the Pacific Command to respond to these changes and lay out recommendations I have regarding what I believe we still need to do.

The first is what we refer to as "Operationalizing the Asia Pacific Defense Strategy."

At Pacific Command, like all regional combatant commands, our task is to *operationalize* our strategic guidance, synchronizing multiple efforts and putting them into action with regional emphasis. So in examining new ways of commanding, supporting and employing our forces we've formulated a strategy consisting of six primary elements.

First, we are updating our operational plans. You have already seen some of the benefits of such an effort in terms of knowledge, speed, precision, and lethality.

Second, we are strengthening our command and control constructs to better respond to emerging security threats. Our aim is to put joint command structures in place that reduce overhead and streamline decision-making processes. In this new threat context, success is all about speed of command.

Third, we're working hard to develop expeditionary capabilities for immediate employment. Both in the Pacific and anywhere else they might be needed. Naval and Marine forces are inherently expeditionary, but they too can be enhanced for a variety of scenarios. Air and land forces are moving in this same direction.

These immediately employable capabilities are being integrated into new operating patterns and concepts. Expeditionary forces, collocated with appropriate high-speed lift and interdiction assets, ensure we can respond with regionally tailored power on short notice.

Advancements in precision, lethality, and the capabilities of our friends and allies provide a great opportunity to improve our force posture and footprint worldwide. Our goal is an enduring posture and footprint that demonstrate our commitment and is sustainable for the long term.

Finally, we're looking for access and logistic pre-positioning opportunities throughout the theater that allow us to move forces quickly to the location of greatest need. It's like Chuck Larson said some years ago—around the world, our operational strategy is one of "places, not bases."

We've also proposed what we call the Regional Maritime Security Initiative, or RMSI. It is a concept that we will develop with our friends and allies in the region to deal with transnational concerns. It's similar to the Coast Guard approach to Maritime Domain Awareness in the U.S.

You'll remember earlier I showed you a slide stating the Asia Pacific Region comprises 60% of the world's sea space and I mentioned that much of that space is ungoverned and exposed to transnational crime. The problem is pretty elementary.

Fundamentally we don't have as clear a view of the sea space, the maritime domain, as we do the airspace. When an aircraft takes off today—we know where it's going, who's on board, its cargo, and we know its status throughout its trip. We can't say that about traffic sailing the oceans right now. And we certainly know that an awful lot of the transnational crime is generated on those seas to include terrorism, piracy, the trafficking in drugs and humans, and certainly proliferation.

So our intention is to consult with our neighbors and devise a

mutual architecture that allows willing participants to share information, share intelligence, and construct standing operating procedures, such that each can take effective action in their own territorial sea against this illicit activity.

Both of these initiatives to Operationalize the Asia-Pacific Defense Strategy and to put in place a Regional Maritime Security structure will make a difference and will help PACOM better execute our mission and anticipate regional changes.

Recommendations (programs, posture, policies)

But PACOM-based initiatives are not enough. Successful capabilities require complementary policy modifications that need to come from the Navy. And, as you might expect, I have a few recommendations ...

Alignment

First, we need to recognize the Pacific Fleet Commander as the Navy's chief operator.

He already is, in fact, a four-star Joint Task Force Commander, as the leader of the Standing Joint Task Force Pacific. He has a standing Joint organization, plans, procedures and a demanding training regime. The habitual relationships among his functional joint commanders have been established; they work together continuously thereby ensuring success.

If we believe he is the Navy's chief operator, we should align key operational missions and organizations to the Pacific Fleet. The most obvious of these is our new ASW Command. The Pacific is the place where we will have the greatest opportunity to test and employ an ASW concept of operations for our future. The mission is here, so too should be the responsibilities.

Missile Defense is another important area for our future. As I survey my plans, sea-based mid course and a sea-based terminal systems are essential to their execution. The first priority is to accelerate fielding of both these systems. The next is to give the Pacific Fleet responsibility for developing our organization and operating concept.

A third adjustment would be to align the Navy's Network Operations Command to PACFLT. Obviously the future of com-

mand and control and more broadly C4I, is fundamental to our Naval Operations. This also helps us properly, in my view, develop an appropriate balance of span of control between PACFLT and Commander Fleet Forces Command.

As you look at each of these initiatives, you recognize that to move forward with new concepts we will have to do a great deal of experimentation. While the clearinghouse for this properly resides with CFFC and its relationship with Joint Forces Command, a great deal of the opportunity resides in the Pacific. Third Fleet and USS CORONADO did a lot of good work in the past as an operational battle laboratory. We need to figure out a way to recapture that momentum.

Forces

A second key understanding has to be that we are going to need to move some forces. As I mentioned earlier, the assumptions on where we will employ forces have changed.

I believe I've stated pretty clearly we need to move another Carrier Strike Group to the Pacific that can operate on the same model as KITTY HAWK—collocated with its air wing and funded to level readiness.

We have moved three submarines to Guam—actually two are there now. This is a good plan that Al Konetzni conceived and put into motion. Guam is good, but we recognize there is probably a limit to what we can put in Guam. I'll leave it to Kirk and Paul as to where to put additional submarines in the Pacific. But what I'm looking for is greater capacity and greater capability.

The reason is provided by the original construct I mentioned earlier, illustrating this new world in which speed is so vital a component. Forces for immediate employment are essential to dissuade, to deter and to control escalation, should a conflict occur.

The hallmark of the Submarine Force has been its ability to respond, its uniformly high state of readiness, and its capability—in the current vernacular— to *Prepare the Battlefield.* There is no doubt in my mind that in advance of conflict and in its earliest stages, submarines will play a decisive role.

You have probably heard me say this each time I have stood before this group. But I feel it more strongly today. As you look at

the advances in technology and its proliferation—it is survivability, toughness if you will—in the contested littoral that provides our submarines their foremost advantage.

Conclusion:

In reality though, recognizing the shift in center of gravity to Asia and the Pacific is an issue of perspective, and hopefully today I've shed a little light on some telling facts. Nearly every aspect of national character portends a future focused in great measure in this important region.

And to provide for peace, not only in Asia and the Pacific, but throughout the community of nations, we must have arches of stability with keystones of credible, ready forces.

Our nation quarries that keystone from a cross-section of America, a cross-section of our society's young people.

Notwithstanding the importance of the strategic posture I've reviewed for you, none of our transformation would be possible without the Sailors that defend our freedom and the families that uplift them.

- It's the second class Sonar Tech sitting the stacks and snapping up every contact on an important mission.
- It's the third class mechanic that actually understands Admiral Bowman's hotwell level control system.
- It's the Junior Officer that has the instinct to recognize when he is treading in harm's way.

Those young professionals, the officers and Chiefs that mentor and lead them, and the families that encourage them…they are the keystones of our security.

In a few moments, some, and only some, of our Force's best and brightest will be recognized before you, and I'm very proud to be here to shake their hand. Each has met the standard. Each rightfully takes his place among a long list of other distinguished Submariners both here in this room and those that have gone before us.

Now…if I can just get them a set of orders to the Pacific!

Thank you very much.

NAVAL SUBMARINE LEAGUE SYMPOSIUM KEYNOTE ADDRESS BY ADMIRAL F. L. "SKIP" BOWMAN, U.S. NAVY DIRECTOR, NAVAL NUCLEAR PROPULSION WEDNESDAY, 9 JUNE 2004

Admiral DeMars, thank you for that warm introduction and for the invitation to address this Symposium for the eighth year in a row.

As I've done each year, I'll begin this symposium by giving my view of where we are and where we're headed. I'll touch on operations, people, submarine numbers, and what we're doing on the cutting edge of experimentation. I know that Kirk Donald, Paul Sullivan, Joe Walsh, and others plan to fill in a lot of the details, so I'll be brief. There's a lot of good news, and we're taking on many challenges.

As we address the challenges, especially the ones that arise inside the beltway, we as a community need to stay on the high road. Recent leaks of internal budget deliberations are not helpful—not that I believe the leaks came from our community. I don't. But the wild stories that followed are simply disruptive, as is the creation of stories of an "us versus them mentality inside the Navy. Those kinds of tactics are beneath our dignity. We must stay the course of simply telling the truth and emphasizing the facts.

The submarine requirement is grounded in solid analysis, which is a fundamental underpinning to long-term commitments by not only Navy but also OSD and Congress. No one can challenge the factual and historical basis for the need for submarines—not even those who claim "they're just too expensive. Not only do I participate in, I *support* the process of *internal* deliberations that are necessary for the very difficult budget decisions that have to be made. The submarine voice is heard. Enough said?

Operations

I'll start my *tour d'horizon* with **operations**. At last year's symposium, I talked about the significant, decisive role our submarines had in the success of Operation ***IRAQI FREEDOM***. Now I can

say that the after-action analysis confirmed this point, proven by the recognition our submariners earned. As you're probably aware, 12 of our skippers received the Bronze Star for their combat action. What's not so widely reported—because the facts undermine the juicy, negative *Navy Times* headline to the contrary—is that the *crews* led by those skippers received a total of 497 personal medals as the result of *their* performance in combat. *Every* generation of submariners can be proud of what *this* generation has accomplished.

As the war on terror continues, appreciation for the value of submarines has, in fact, *grown*. Right now, we're deployed all over the world, collecting actionable intelligence, and working with special operations forces. I've recently had briefings from four skippers—Bill Frake, formerly of MONTPELIER; Andy Hale, formerly of SANTA FE; Lee Hankins of GREENEVILLE; and Steve Oxholm of PHILADELPHIA. I came away convinced that the work our boats are doing is highly prized by the combatant commanders because it is *relevant* and *unique*.

In fact, the combatant commanders' respect for, and reliance on, submarines is reflected in their demand for SSN ISR services, which outstrips what today's SSN numbers can provide. This year, for example, they asked for a continuous forward presence of more than 13 boats, whereas today's force structure can only provide around 9. The bottom line is that our submarines are fully engaged on the frontlines of our country's war on terror while conducting intelligence, surveillance, and reconnaissance for future contingencies.

People

Now let me talk about our submarine people.

On the officer side, retention numbers are impressive. Thanks in no small part to quality leadership by our commanding officers, we're seeing historically high numbers of junior officers rolling to shore duty, and a greater proportion of these officers wanting to go back to sea as department heads. Junior officer retention has increased to *43 percent* for those beginning their department head tour—the highest it has been in 10 years.

Because retention is so strong, we've been able to reduce our officer recruiting goals: in mid-year, we cut our goal from 440 to 399. We've already made that goal for the fifth consecutive year.

Achieving a 9-percent reduction in accessions while satisfying the increased demand for junior officers is a phenomenal success story, resulting in huge savings to the manpower account, and certainly in keeping with the CNO's *Sea Enterprise* initiative.

The enlisted numbers are also a great success story: our recruiters have achieved accession goals in the nuclear ratings every year since 1994, and for all ratings every year since 2001. We'll make goal again this year.

In the nuclear training pipeline, we continue to win the battle against attrition. Today, 7 out of 10 who join the Navy as prospective enlisted nucs make it to the Fleet. Contrast these numbers with what we were achieving just a few years ago—just the opposite: 3 out of 10 reaching the Fleet. Put another way, we have reduced our enlisted recruiting requirements by over 1,600 sailors while Fleet requirements have increased. I credit our enlisted leadership at our training commands for this success. Just imagine how much this has reduced our recruiting and training costs. That's another huge savings for *Sea Enterprise*.

At the other end of the equation, enlisted retention continues to improve and is exceeding the Navy average in all reenlistment zones. More and more boats—*Tridents* and *fast attacks*—are achieving retention levels over 80 percent. Put this in perspective: remember about 5 years ago when we'd have been happy to have numbers that were half as much? I take my hat off to the many deckplate leaders who are making this happen.

Force Structure

So what's in store for all these sailors and officers when they hit the Fleet or return for a department head tour? Let me shift to our submarine fleet, both composition and size.

My discussion of operations is centered around the indispensable role of our Los Angeles-class SSNs in winning the ongoing war on terror. Our Nation needs every one of these very capable submarines. We'll continue to make the case for refueling the remaining first-generation 688s. As I've said many times, 10-12 years of frontline service for $200 million is a phenomenal bargain—money well spent for a clear national-security advantage.

However, the undersea superiority our submarines so capably deliver *today* is not sufficient to confront the national security challenges of the *future*. The solution is the Virginia class. As I did at NORTH CAROLINA keel laying, let me make one key point: VIRGINIA is our Navy's ***only*** major combatant ready for delivery to the Fleet that was designed with the post-Cold War security environment in mind.

VIRGINIA embodies warfighting and operational requirements developed and approved nearly 4 years *after* the fall of the Berlin Wall—a point that, to my great frustration, is lost on so many commentators. The lead ship of this most capable class of SSNs ever built will begin sea trials soon, deliver this summer, and commission in the fall. These dates meet the schedule of the Acquisition Program Baseline that was approved over 11 years ago—a remarkable accomplishment for the first of a class.

Right now, there are 10 Virginia-class ships under construction, the last 5 under a multi-year contract that brought significant cost savings. TEXAS (which will be christened by the First Lady at the end of July) is over 85 percent complete, and HAWAII is over 60 percent complete. NORTH CAROLINA, the subject of the keel-laying ceremony officiated by the beautiful Mrs. Linda Rich Bowman on 22 May, is over 45 percent complete.

In the longer view, we needed to get to a Virginia construction rate of two per year *4 years ago*, as originally planned—and currently scheduled for FY09. Only the build rate of Virginia class directly controls our force structure low point. With two per year not starting until FY09, our fast-attack numbers bottom out at 43. Each year we delay getting to two per year will take the bottom number down by one. This makes the never-ending studies and debates almost moot—we're heading *right now* where the Nation can't afford to go.

We have awaited the futuristic, even revolutionary Virginia class for many years now, and I am very excited that it's almost here. Let's keep sight of the fact that we need more of these crown jewels. And in case I forgot to mention this point: Virginia class is the only ship in the Navy ready for delivery to the Fleet that was designed with the post-Cold War security environment in mind.

Just as anticipated has been the arrival of USS JIMMY

CARTER (SSN 23). I had the honor of escorting President and Mrs. Carter to Groton this past weekend to christen this truly revolutionary boat. I expect sea trials in late August and delivery this December.

The last chapter in this force structure discussion is SSGN. Right now, OHIO, FLORIDA, and MICHIGAN are well into the refueling overhaul and conversion process, with GEORGIA scheduled to follow early next year.

The key attributes of SSGN—the inherent stealth and endurance of the *Trident* class, payload that is unprecedented in volume and flexibility, and an onboard joint battle management center—will make these ships the combatant commanders' platform of choice to directly influence events ashore. When OHIO returns to the Fleet in early 2006, followed by the other three SSGNs, we'll say with authority and legitimacy that these platforms are *the Navy's* biggest contribution to transformation.

Seapower 21 Sea Trial: Experimentation

As we look forward to many near-term advances, we need to keep working to maintain undersea dominance well into the future. I'm intentionally not going to talk about what's on the drawing board or in someone's imagination or in the ether. While those things may have promise, I want to talk about real hardware getting wet and real operational concepts undergoing rigorous tests . . . even at the risk of leaving daydreaming headlines to others. Once again, we'll stick to the facts.

Later this year, USS GEORGIA (SSGN 729) will participate in ***SILENT HAMMER*** to continue to define and demonstrate the SSGN-SOF team. GEORGIA will embark the Joint Special Operations Task Force (JSOTF) commander in an onboard battle center. He'll be fully engaged—on scene, receiving high-data-rate communications, with full situational awareness, and directing action ashore.

A variety of aircraft will act as UAV surrogates. Both the SOF ashore and the SSGN battle management center will receive UAV data, including data relayed from unmanned ground sensors. With input from four sources—the UAVs, the ground sensors, the SOF ashore, and GEORGIA's own sensors—the embarked joint

commander will develop a clear tactical picture that he'll send up the line as information, rather than just raw data. This is a giant step forward in capability for what is already a submarine specialty—battlespace preparation.

When the scenario develops to warrant forcible entry, GEORGIA will do a clean handoff of tactical control to the Expeditionary Strike Group. But the SSGN's direct role will continue with rapid precision strike from close-in to support forces ashore.

GEORGIA will perform an at-sea launch of the capsule technology that has been under development for the past 3 years. The capsule will use a standardized, wireless interface to connect the payload to onboard control systems, minimizing the shipboard hardware changes needed to accommodate a variety of payloads. In this experiment, the payload is a simulated UAV; but it could just as well be *anything* that can fit in a *Trident* missile tube. And of course, just about anything fits in a *Trident* missile tube.

But at the same time, much of what we'll demonstrate in ***SILENT HAMMER*** will have utility beyond SSGN, such as a VIRGINIA multimission module or advanced sail—concepts that could be built into follow-on Virginia-class ships as early as 2010.

SILENT HAMMER will be more than a demonstration of what SSGN as a *Sea Base* can do. It will also show what Industry—in this case, Team Forward Pass and Team 2020—can do for the warfighter.

Conclusion

Let me wrap this up. I said at the beginning that we are undertaking changes that are radical by any measure: the kind of operations we're engaged in to win the ongoing war on terror, unprecedented accession and retention of quality people, the most advanced submarines in the world—VIRGINIA and JIMMY CARTER — about to put to sea while the transformational SSGN takes shape and is being proven at sea.

These are exciting times for the Submarine Force, especially for those officers and sailors taking boats to sea. But exciting as these times are, in one profound way, they are no different from our last 104 years. Every generation of submariners has proven over and over again the spirit of *innovation, adaptability, courage,* and

ingenuity—in short, the ***"can do"*** spirit that shines through, every time our relevance is challenged, every time someone claims we're in search of a mission—the ***"can do"*** spirit that permeates our culture and our people to respond to the challenges of the day.

We're responding decisively in these times. And our future, led by the submariners who are just now joining our ranks, looks very bright, indeed.

Now, let's have a great symposium!

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NAVAL SUBMARINE LEAGUE SYMPOSIUM
REMARKS BY VADM KIRK DONALD
COMNAVSUBFOR
09 JUNE 2004

Admiral DeMars, Admiral Bowman, VADM Reynolds, fellow Flag Officers, honored guests, it is a pleasure and a distinct honor to be with you today and to have the opportunity to address this vitally important forum on the state of our fine Submarine Force. I will delve a little deeper than Admiral Bowman from my position here on the waterfront and I think I have a really wonderful story to tell you today. Before I do that, I want to thank Mickey Garverick for the work that he has done and the folks of the Naval Submarine League. I can't tell you how much I admire the work the Submarine League does for us because they really support our Force and our sailors. Whether it's simply spreading the word through C. J. Ihrig's emails, some call it spam, sponsoring gatherings such as this and the recently completed Submarine Technology Symposium, or providing well deserved recognition to our Sailors and civilians through the awards that will be presented tomorrow, the Submarine League is a rallying point for Submariners near and far, active and retired, military and civilian. Thanks for all your great work!

As Admiral Reynolds stated, he is a glass half full kind of guy, but I am a glass three quarters full kind of guy. Let me tell you, I think it is a great time to be a submariner. You are going to hear some great stories over the next couple of days. I don't think it matters if you are an E-3 or an O-9, there is really some great work going on out there. Now some of you doing Washington duty may not completely share my unbridled enthusiasm, but that only means that things are just as they should be. After all, we need to have some incentives to get you folks to come back to the Fleet! You can't deny that we are in the midst of some remarkable times for our Force, the Navy, and our country. Our ships are operating in virtually every corner of the globe supporting the Combatant Commanders in the Global War on Terrorism, providing critical intelligence, surveillance and reconnaissance to those same Combatant Commanders, and improving Fleet capabilities in anti-submarine warfare, strike,

special operations, and mine warfare through exercises, experimentation and real world operations.

We are working closely with the British and our other NATO allies, with the Australians, the Japanese and other Pacific Rim countries, and with Peru, Chile, and our other submarine brethren from South America. We are all working together to raise the bar of our, and their, undersea warfare prowess.

Our SSBNs, often overlooked because we have become so accustomed to their usual stellar performance, remain, without question, the most robust, capable, and survivable force in our nation's strategic arsenal. Suffice it to say, we are very busy on many fronts.

We are also busy building submarines. We have 11 submarines under contract or construction. I had the pleasure last week of participating in the christening of PCU JIMMY CARTER, a ceremony conducted marvelously by First Lady Rosalyn Carter. That ship will join the Fleet in 2005.

Just across the yard at Electric Boat, VIRGINIA is straining at her lines, ready to go to sea. We had the distinct pleasure of hosting Vice President Cheney as he toured through this marvelous ship a couple of weeks ago; in fact he enjoyed the first meal served in the Crews' Mess and met a fine group of Sailors who, along with skipper Dave Kern, are bringing that ship to life. The Vice President walked away, as we all have after a visit to VIRGINIA, thoroughly impressed and convinced we have successfully designed and built a submarine to operate, fight, and dominate in the contested littoral.

We laid the keel for NORTH CAROLINA, under the sure hand of sponsor Linda Bowman, on May 22, 2004 at Northrup Grumman Newport News shipyard. Linda gave some of the most thoughtful and heartfelt remarks I have heard at one of these ceremonies. Also at Northrup Grumman Newport News, PCU TEXAS is 88% complete and will enter the Fleet in 2005. PCU HAWAII being built at Electric Boat is 61% complete and well on track to go operational in 2006.

I get excited every time I think about the three former Ohio-class Fleet ballistic missile submarines in conversion for their new role as SSGNs. OHIO and FLORIDA have completed refueling and are well into the conversion stage. MICHIGAN entered Puget Sound Naval

Shipyard in March of this year and work is on schedule. The fourth ship, USS GEORGIA, will enter conversion later this year. These ships will start entering the Fleet in 2007 and I do believe when you talk transformation, this is it.

They will carry up to 154 land attack cruise missiles and up to 66 special operations forces equipped and sustained for up to 60 days at a time. By combining the Advanced SEAL Delivery Systems, Dry Deck Shelters, Swimmer Delivery Vehicles, robust connectivity and advanced command and control in the battle management center, you have a capable platform that provides substantial joint capability to direct forces from a stealthy Sea Base for extending the combat reach of our Force to unprecedented ranges.

We are going to leverage the existing TRIDENT program infrastructure and the substantial body of experience we have gained through over 40 years of high tempo operation of our SSBNs. We will be able to provide the Combatant Commanders with SSGN operational availability approaching 70% and a theater presence, at any given time, of over two and one-half ships.

And there is more. These ships will give us the volume and large ocean interface we have long sought that will allow us to host an array of emerging capabilities. Those possibilities include unmanned vehicles, distributed sensors and weapons, and new weapons that will help us stand and fight if necessary or allow us to put steel on target much quicker, at greater range, and with greater lethality. Realizing the payload capacity of the SSGN will, as Secretary John Stenbit encouraged us a couple of weeks ago at the Submarine Technology Symposium, expand our "area of regard . I think this ship will do just that.

To use a baseball metaphor, I like to think of the attack submarine, and soon the SSGN, as the ultimate utility infielders, but packing a long ball hitter's punch. To understand what I mean, let me talk a bit about how we operate the Force today. In addition to the baseball attributes I mentioned, sometimes we find ourselves requiring the skills of a tightrope artist. There is a demand signal for these multipurpose, flexible ships by the Combatant Commanders that outstrips what we can deliver.

Without getting into the details of classified operations or contingency plans, it is clear that the submarine provides the

capabilities of choice in those situations where stealth, endurance, flexibility, and firepower matter, and, accordingly, they are a key element of many of these plans. These submarine core attributes are particularly important in what is sometimes known as the *pre-hostilities* phase of a conflict. The phase where the close-in presence of substantial *on call* combat power, the ability to develop exquisite situational awareness and then report that knowledge immediately to the decision makers may be critical to the success of follow-on operations. Yet at the same time, the submarine's stealth affords it the ability to operate in a non-provocative manner. This can be essential to retaining the element of surprise for a subsequent military campaign or allowing the freedom to pursue diplomatic efforts while minimizing the impact on military options. And when you start thinking of how to manage the very challenging transition period between pre-hostilities and hostilities, I would think, that as a Joint Task Force Commander, it would be reassuring to know that you not only had a capable platform as your *eyes and ears* at the right place and the right time, but you had one that can also deliver a long ball hitter's punch, in the event that you need it. And finally, should maritime combat call, with its associated danger from high speed cruise missiles, quiet diesel submarines, and anti-shipping torpedoes, nuclear attack submarines will be a vital arrow in the quiver of our Joint Force Commander to sustain and dominate the fight under circumstances not suited for other platforms.

While the war fighting requirements for submarines are of paramount importance, the Combatant Commanders, through the annual Joint Staff SSN Allocation, have made it clear that they value SSNs as a key part of their overall theater intelligence, surveillance, and reconnaissance, or ISR, strategies. Complementing the full array of ISR capabilities that exist within DOD and other government agencies, the SSN provides the unique ability to dwell in an area of interest and develop in-depth understanding of operating patterns, tactics, and weaponry, and to take advantage of unique vulnerabilities that may not be exploitable by other means. Additionally, it is important that we afford our skippers and crews the opportunity to operate frequently in tactically significant areas, building the Force body of knowledge and experience that may very well spell the difference between success and failure in future conflicts. And

finally, that body of knowledge will be available and, I believe, valued by other maritime forces that will possibly be called upon to operate in those same waters. With our current force structure, depot maintenance workload, and an interdeployment readiness cycle tuned to be as efficient as we can make it, we can provide the Combatant Commanders with about 65% of the "presence with a purpose they requested.

Which brings me to my last demand signal, and that is support of our carrier and expeditionary strike groups. As many of you in this room know, we have worked closely with the carrier and cruiser-destroyer groups for many years in what has, for the most part, been a richly rewarding experience for all concerned. With the transition to carrier and expeditionary strike groups, this relationship is even more important. The smaller complement of ships associated with Carrier Strike Groups increases the marginal value of combat power of each assigned unit, which certainly includes the submarine. Similarly, the marriage of expeditionary forces with organic ISR, strike, SOF and mine warfare capabilities has strong appeal. The multi-mission capabilities that the submarine brings enhance the overall flexibility and responsiveness of the strike group. We have aligned attack submarines with both the carrier and expeditionary strike groups and we manage their readiness within the Fleet Response Plan. If the strike group is called upon to surge, we want to surge a submarine that has worked with that strike group and developed a relationship with the commander and his other supporting units. We are retaining the ability to *plug and fight* with any strike group – given the uncertainty of world events and the need to respond quickly and effectively, that type of flexibility will certainly be in demand – but we want to make sure that our submarines and the strike groups are fully ready to respond as an integrated team.

We haven't worked all the bugs out yet, but we are smartly climbing the learning curve. USS MIAMI just surged with ENTERPRISE CSG and USS ALBUQUERQUE surged with HARRY S. TRUMAN CSG, commanded by RADM Mike Tracy. This surge is a demonstration of the combat power that we can generate with very short notice. We are building upon current and past lessons. USS ALBANY is deployed with GEORGE WASHINGTON CSG and the strike group is fully engaged in combating the Global War on

Terrorism. USS CONNECTICUT and DALLAS are deployed with the WASP ESG and over the course of the deployment are honing the tactics, techniques and procedures for delivering organic strike in support of expeditionary forces. PELELIEU ESG had TACON of USS PHILADELPHIA during operations involving Special Operations Forces employed from the Dry Deck Shelter and Swimmer Delivery Vehicle.

As you would expect, competing demands lead to conflicts–hence our need for *tightrope walking skills*. Every year we prioritize our intelligence, surveillance, and reconnaissance mission requirements because there is no way to fulfill all the tasking with the assets available. Similarly, we are still not as integrated with the strike groups as we would like to see. We do our best to ensure the strike group submarines participate in the Interdeployment readiness process, but we are not batting a thousand as of yet. Our attack submarines frequently deploy with a *foot in both camps* as both a national ISR asset and as a member of a strike group and that results in situations where the ship is pulled away from the strike group to conduct special operations, but we are working our way through that.

Given these competing demands, it is essential that we operate the Force as efficiently and effectively as we possibly can to increase what is known as *operational availability* of our ships and their associated combat power. I believe there is a really good news story about the forehandedness of our predecessors that has positioned us nicely to be able to do exactly that. It's a story that is not always well understood, but one for which many of you in this room should be very proud.

If, for instance, you take a look at the depot maintenance profile of LOS ANGELES class submarine, you see the following:

- A class that has had its operational life extended by 10% since it was designed

- A class that has gone from spending 22% of its life in depot availabilities and unavailable to the Combatant Commanders, to one that is now spending only 11% of its time in those same availabilities

- A class that has similarly seen the man-days of depot maintenance required reduced by about 50%

If you consider what this means across the inventory of LOS ANGELES class, we have gained back 280 operational submarine-years now available for the Fleet and Combatant Commanders to use. And this was accomplished the right way – starting with a sound design, capitalizing on the experience we gained in operating these ships and earlier classes to understand what the limiting factors were in ship longevity, and through the use of sound engineering and technical judgment to make smart decisions on risks we could take to get the most life out of our equipment. The end result is a lean, efficient class maintenance plan that will ensure these ships remain combat ready their entire design life.

Taking this line of thought further, it wouldn't do much good to have ships available more if we didn't invest in keeping their war fighting capability current. That means we have to modernize these ships with upgraded combat systems, sensors, weapons, and engineering equipment. Again, I think you have many reasons to be proud. The Submarine Force led the way for the Navy in open architecture sonar and combat systems, starting with the first Acoustic Rapid COTS Insertion installation on USS AUGUSTA in 1997. Now we are in the third hardware refresh and the sixth software upgrade with Advanced Processor Build 03 delivering this summer on USS ASHEVILLE, giving the Fleet significant improvement in littoral sonar performance against quiet contacts.

Similarly, the AN/BYG-1 Combat System delivers significantly improved capability with the flexibility of open architecture. We have deployed the AN/BYG-1 in the most challenging tactical environments on the face of this earth. Every time the Commanding Officers return from deployment saying they don't know how we have done without the situational awareness and tactical decision aids provided to the watch teams and decision makers. Similar systems will be seen on the VIRGINIA-class and will be backfit to SEAWOLF class and OHIO-class SSBNs.

Being operationally available implies you are operationally *connected*. Your Submarine Force has made remarkable strides in moving from being the *disadvantaged user* on the net to being a fully

connected partner on the Joint net. During Desert Storm, message traffic was funneled through a central point called the Submarine Broadcast Authority. Tactical information was passed on the Officer in Tactical Command Information Exchange System, or OTCIXS, which required user intervention to push information to the submarine. Voice communication was the way we handled operational strike at the time.

Fast forward to Operation Iraqi Freedom, we began to realize the potential of FORCEnet. The battle groups could exchange messages and data directly with their submarines. EHF was used extensively to conduct point-to-point voice and data communications with locations around the world. And the real revolution was the use of SIPRNET, and more specifically *chat*, to coordinate and pass orders. Through chat, the task force commander could pass orders to all his subordinates simultaneously. If there was a problem, such as a missile failure, everyone knew it and was able to respond with backup plans almost instantaneously. This flatter model of communication helped to speed the execution of operations and it is the way we are going to continue to do business. Submarines had access to all of this through a lot of hard work in design and it really turned out well.

Today, we are leading again by installing in our submarines a completely new radio room based on the Internet Protocol. More specifically, our network will become RF path independent, which translates into more efficient use of the available bandwidth and the ability to *plug and play* new equipment into the backbone. We are installing high data rate antennas to enable access to the larger volume of information that will be required in the future. The submarine will be fully connected and have sufficient bandwidth to participate in the Joint War fight.

We are designing and building the sensors, vehicles, and weapons of future undersea warfare and they all have one thing in common: the need to communicate in order to stay relevant. To address this, we need to take a system of systems approach for future undersea communications that consists of: Nodal communications grids to support a fixed, but transient battlespace; and reusable communications systems that support more mobile units. The future communications architecture will be flexible, allowing sensor and

weapon nodes to be continuously connected, or able to plug into the net, depending on operating mode and external factors. Ultimately, these systems will bridge the gap between the underwater environment and the above water RF spectrum.

While the hardware and software that we employ to modernize our ships are certainly important, it would be easy to get caught up in the technology of the *possible* and then find ourselves chasing the *next big thing* - taking excessive technological risk to the point of failing to deliver REAL capability to our Sailors. Boldness and risk-taking are good things, but without good engineering, sound technical judgment and process discipline, disaster looms. I am satisfied that our Sea Enterprise has a good process in place to identify, prioritize, resource, and install alterations that we need to keep our Submarine Force relevant.

The Submarine Force Fleet Modernization Process brings key decision makers together to prioritize each alteration based on the impact to war fighting, safety, operability, and cost. Integration with and impact on the Fleet Response plan is considered when scheduling modernization upgrades. This information is formalized in the Threshold Modernization Matrix, a tool that eliminates waste and results in the development of a fully integrated and executable Submarine Force Sponsor Program Proposal. The Fleet is able to express their concerns and needs through the Submarine Tactical Requirements Group. This filters up to our modernization process so we know exactly what the warfighter needs and can prioritize and fund accordingly.

And we aren't afraid to experiment. We are running two major experiments this fall that will explore technologies and doctrine that will enhance our ability to gain and maintain access in the contested littorals. SILENT HAMMER will investigate the ability of USS GEORGIA, acting as an SSGN, to Sea Base ground forces and conduct missions ashore in support of a larger Joint operation.

In this experiment, we will launch a test shape from the Stealthy Affordable Capsule and Flexible Payload Module to continue our encapsulation spiral development efforts. This will open up the possibility of rapidly and economically converting existing weapons and sensors for launch from SSGN and VIRGINIA advanced sail.

We are populating GEORGIA's Battle Management Center with

organic targeting equipment to help better understand the future capabilities that SSGN will require to support her myriad of missions, which include: Quick reaction fire support of SOF on the beach; strike of time critical targets, and Strategic Command's emerging global strike mission.

We will set up what we are calling a ground mesh network to facilitate information exchange between the forces and sensors on the beach and there will be a gateway to the Sea Base that will facilitate command, control and situational awareness.

We are also spiral developing a stand and fight weapon that will enable the SSGN to provide an umbrella of protection over SOF when they are most vulnerable during ingress and egress.

The tactics, techniques and procedures for Sea Strike will be honed for fire support and time critical strike using the new capabilities that Tactical Tomahawks, or TACTOMS, will provide in the near future. And to tie this all together, we intend to Sea Base the Joint Special Operations Task Force Commander onboard GEORGIA, and supported by a reach back center, to give the Commander the most direct access to his troops.

The Undersea Dominance experiment will explore how to establish a Sea Shield around the Sea Base in a littoral operating area. This will be a combined arms experiment, incorporating aspects of submarine, air and surface Anti-submarine warfare. A Theater ASW Commander will command the overall effort. This experiment will test truly coordinated operations as opposed to today's framework of divided waterspace.

All platforms and command nodes will be fitted with the Undersea Tactical Decision Aid, formerly named the Common Undersea Picture, to facilitate this type of collaboration, that we know we are going to need. To enable submarine participation, we will trial several potential technologies that will help us achieve the goal to communicate at speed and depth.

And to expand our area of regard, we will use the Advanced Deployable System for cueing. This experiment, although conceived within the lifelines, has been subsumed under Task Force ASW because of its broad applicability to Naval and Joint warfare.

Another means that we have used to enhance our operational availability is through improvements to our interdeployment

readiness cycle. This has been a constantly evolving process for several years, with the first changes starting in the mid-90's as we improved our class maintenance plan allowing more time between major overhauls. Once we anchored the life-of-the-ship schedule around the major availabilities, then we went to work maximizing deployed days while balancing against a comprehensive Inter-Deployment Readiness Cycle training plan and against the need to ensure that our ships' nuclear fuel would last for the life of the ship. The result is an efficient and effective readiness plan that not only provides *presence with a purpose* – deployed days for the Combatant Commander, but also provides a robust surge capacity. At any given time, approximately 70% of the Force is ready to surge.

To further enhance our readiness generation capacity, we recently completed a shore staff rationalization process where we have further reduced redundancies in our administrative staffs ashore and redirected those precious personnel assets toward the *pointy end of the spear*, closer to the waterfront where they will make our ships even better. We monitor this through a metric called the *tooth-to-tail* ratio. We will continue to adjust so that the most efficient mix is achieved.

We sized and resourced our waterfront staffs–the groups, squadrons and Naval Submarine Support Commands – to allow them to train, mentor, and support our Commanding Officers and their crews. The Naval Submarine Support Command is primarily tasked with lifting administrative burden from the crews and overseeing waterfront maintenance. We have tools in place, such as Type Commander led Tactical Readiness Evaluations and squadron led Basic Submarining Assessments, to measure our training effectiveness and to *take the tactical pulse* of the Force such that we have an accurate, daily picture of our readiness. We continue to evolve as we fully integrate our Interdeployment Readiness Cycle processes into the Fleet Response Plan. The squadrons and NSSC work to synchronize the submarine's training and maintenance so that they achieve surge status with the partnered strike group. However, if called upon to surge, we will strive for capabilities based integration by sending the submarines with the highest level of readiness in the mission areas that may be required.

Lest we not forget our comrades on strategic patrol, there is

change afoot on the TRIDENTS. Today's SSBN fleet is taking a leading role in transforming and preparing our nation's nuclear forces for an unpredictable future. Advances in the TRIDENT Strategic Weapons System make the platform adaptive and responsive to provide the President a range of options to defeat any aggressor. As our nation draws down its nuclear warheads, TRIDENT submarines remain the cornerstone of our nuclear posture. They are a vital part of the *New Triad*, consisting of offensive strike systems both nuclear and non-nuclear, active and passive defenses, and a revitalized defense infrastructure that will provide new capabilities in a timely fashion against emerging threats.

U.S. forces must pose a credible deterrent to potential adversaries who have access to modern military technology, including weapons of mass destruction and the means to deliver them over long distances. To counter these emerging potential threats, just as we have done in the past, we are constantly refining our force posture. The most recent example is USS Nebraska transferring from Kings Bay, Georgia to Bangor, Washington this October.

And we couldn't talk about true operational availability unless we talked about our people and how they are contributing and how we are helping them contribute. As we have invested in technology, improved our management processes, and improved our training and education for our people, we believe we are creating opportunities to become more efficient and leaner. If this is going to be achievable, we must continue to invest in the development of our sailors and officers.

For example, we are giving our people more opportunity to continue their education. In the Submarine Force, over 8 percent of our enlisted people have college degrees, compared to 5.4% Navy wide. That is in part attributable to the high caliber of our accessions, but we are also offering many opportunities to earn a degree through correspondences and online courses and our nuclear personnel get college credit for their experience. For officers, graduate degrees are becoming more valued and to assist them, we offer more programs to complete their graduate degree either in residence, via seminar or correspondence. There are over 100 billets dedicated for submariners to earn a master's degree and if you include the Navy wide education programs, War College, and off-

duty options, there is opportunity for everyone to complete this milestone if they so desire.

Designation as a Joint Specialty Officer will become a prerequisite for the Fiscal Year 2008 O-7 selection board. We are making adjustments now to our career path and detailing processes to provide officers more opportunity to complete their Joint Professional Military Education earlier in their career so that they can better contribute in the Joint arena and as a benefit, provide a larger pool of eligible officers for promotion. We are on the right vector to produce the desired results.

Before you can be a joint war fighter, you must be a submarine war fighter first. We have made substantial changes in the last two years in how we prepare our officers for command over the course of their careers to ensure they get the opportunity to hone their warrior skills. We went back to the drawing board with our officer pipeline courses, re-evaluating the knowledge and skills necessary to assure the success of our operators at every level of seniority, and then aligned those courses to provide the requisite skills. All of the courses have become more *hands on*, taking advantage of the *state of the art* simulation technology that we have installed in all our submarine training facilities. Even the greenest ensign leaves school ready to integrate into the tactical teams onboard the most modern SSN. We rebuilt the Prospective Commanding Officer course to make it more scenario driven, requiring the PCOs to plan, execute, and assess their training missions. We are now sending PXOs through PCO training, soon to be renamed the Submarine Command Course. The XOs now have to pass this crucible event, which translates into more experience for the individual and for the ship. We will reap a double benefit from this arrangement, in that the XO will now be a more experienced and confident back up for the CO and will be better prepared to train the Wardroom.

This idea originated from an exchange program where we send some of our PCOs to the British Royal Navy and Dutch Perisher courses and they send some of their officers over here. This has been a marvelous exchange We have already harvested many ideas from this exchange that are, or will be, incorporated into our procedures. For example, we modified our periscope employment as a direct result of what we have learned from the Royal Navy. The Royal

Submarine Force has learned from our metrics based approach to tactical evaluation, and they are going to take that back as well.

To support these upgraded training pipelines, we have been making a full power run on improving the shore training infrastructure. The attack centers, navigation trainers, and sonar trainers of today not only look like the hardware installed in the boats, but they run the tactical software, in a simulated ocean that is almost as complex and realistic as the real ocean. The contacts in these virtual environments have been *tuned* by our ACINT specialists to look and act as challenging as the real world targets of today. Taking a submarine to sea and operating, no question about it, is still the best training environment for a crew, but for many of our missions, the gap in training value between going to sea and going to the schoolhouse has narrowed substantially. With VIRGINIA class submarine, we have even built this high fidelity training capability into the tactical systems installed in the ship, negating even the *walk up the hill* to the schoolhouse. And we're not done yet. In the foreseeable future we will have real time playback capability built into these trainers, so that at any point in a problem you can compare reality to the solutions being worked by the submarine crew being trained.

This summer we will put into operation our first Fleet Interactive Display Equipment in Kings Bay, a state of the art Maneuvering Room simulator that will allow us to run the same, or even higher, quality of drills as on the boat. The value added includes drills you can run with the FIDE that you would never allow on an operating plant. This expanded experience will better prepare our operators for casualty response and should also translate into an overall better understanding of plant operations. It also gives us the flexibility to run operational scenarios while inport, resulting in improved efficiency of training.

Arnie Lotring, at the Submarine Learning Center, is making marvelous progress toward taking full advantage of the technology that is available today. If you were at the Submarine Technology Symposium, you saw the video of the virtual fire fighting trainer that can be taken shipboard and provide more realistic indications then we have ever been able to achieve. Single systems on today's submarines, like the ARCI sonar system, have more information resources, more processing power, and more decision aids than could

have been found on an entire submarine just a few years ago. Accelerating rates of technology insertion, greater information availability, and shorter decision times characterize the war fighting environment in the second 100 years of the Submarine Force. Our challenge now is to ensure submarine education and training keep pace to support the Submarine Sea Warrior who will operate and fight our boats in the 21st century. The Submarine Learning Center is working on a new model of training and qualification that will replace today's 'A' and 'C' schools, which offer higher level training about every 5 years. The new model is based on a continuum approach that will allow each sailor to improve knowledge and skills at their own pace. They are moving training out of the industrial age and into the information age.

We are using knowledge management tools to harness the computing power that has been installed in our submarines. This means more than just automating the same processes that we have been doing for years on paper, but instead, utilizing computers to enhance the human thought process. Knowledge management will be critical to the development of the submarine Integrated Learning Environment. VIRGINIA, the Submarine Force's first *paperless ship*, is outfitted with the Non-Tactical Data Processing System, automating numerous administrative functions and providing operational documentation in a readily accessible electronic format. Using portal technology, it integrates a variety of Navy-supplied software programs including supply, medical, maintenance, and personnel applications. It also serves as the entryway into the submariner's onboard version of the Integrated Learning Environment.

Another aspect of our business we don't discuss much, but still contributes mightily to our undersea dominance, is the fine organization run by Commodore Steve Gabriele at Commander, Undersea Surveillance, the Type Commander for the Integrated Undersea Surveillance System, or IUSS. Commemorating its 50th anniversary this summer, IUSS today is a far cry from the early days of SOSUS. From a Cold War peak of over 20 shore processing facilities and more than 4000 personnel, and a strategic cueing program shrouded in deep secrecy, IUSS has evolved to a modern, lean, more tactical contributor to undersea warfare. IUSS employs fixed hydrophones

connected by hundreds of miles of submerged cable placed around the globe to detect and track submerged, surface and air contacts. In addition to the fixed hydrophone systems, IUSS also employs mobile towed array sensor ships, called SURTASS, that can be pre-positioned in high interest areas where fixed systems either can't be placed or don't exist. These ships are capable of passive acoustic detection and two of the ships are also equipped with a Low Frequency Active capability. In addition to the classic submerged contact monitoring mission, IUSS is also adaptable to Homeland Security missions and the Global War on Terrorism through its demonstrated capabilities against surface contacts of interest. IUSS, however, is not resting on its laurels – with an eye to the future, the community is looking to the following:

- Employment of Compact LFA – designed for the littoral environment – on all SURTASS ships.

- Implementation of the Advanced Deployable System - in essence a fixed system capable of being delivered to almost any location in the world.

- Continued improvements in detection and processing system hardware and software.

Your Submarine Force is operationally ready, operationally available, and working to get even better every day. The training, maintenance, modernization, personnel, and command structures that many of you helped put in place have positioned us to provide *presence with a purpose* and, at the same time, to have the strategic reserve available to surge significant combat power if called upon by the President.

You've probably heard this before, but it is still true, so you are about to hear it again. We cannot count on being so fortunate in the next significant conflict to have essentially unimpeded access like we enjoyed during OPERATION IRAQI FREEDOM. And the anti-access capability that is proliferating worldwide leads me, and I bet most people, to believe the collective submarine attributes of stealth, endurance, flexibility, and lethality will be critical to success in

future conflict. We must be ready to go and stay places where others cannot be, and survive. Today, submarines deliver real capability, surveilling that battlespace, collecting intelligence, developing situational awareness and building a body of experience in those tactically significant areas of future conflict. If things go hot, we will be able to join with our brethren in combined arms to establish the Sea Shield around our Sea Base of operations. And if so directed, we will take the fight to the enemy.

Through our experimentation, innovation and smart investment in our ships and our people, we are developing the Force of the future that will extend our area of regard in the undersea and terrestrial domain. I see the submarine entering the battlespace undetected and undeterred, well in advance of hostilities, to weave an intricate web of sensors precisely placed in the most strategically significant areas. A net that is fully integrated with onboard sensors and with that of the distributed battle force. Prior to the outbreak of hostilities, the submarine will maintain situational awareness, he will hold the enemy at risk, and be ready to interdict when directed or when rules of engagement allow.

We have the finest people in the World. They operate routinely in littoral waters and are improving our ability to penetrate anti-access environments and to kill enemy submarines and thwart mining efforts. They are people who think, act and constantly improve. They are people of vision who are working hard to build ties with other nations so we can share ideas and unite if called upon. We will continue to give our people the tools necessary to do this great country's work.

Now if we are going to realize this dream, we must today, OPERATE in the real environment, boldly EXPERIMENT with technology and tactics, INVEST in those with promise, and ADAPT to change. However, through all this, we need to stay grounded in the realm of the *real* and be ready to deliver *real* capability, *real* ordnance on *real* targets TODAY, tomorrow, and in fact the next day!

Thank you again for the great support of this group. It is wonderful to be here.

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ARTICLES

COLD WAR AT SEA CONFERENCE

by Captain Bob Loewenthal, USN(Ret)
and Captain Jim Patton, USN(Ret)

Both Captain Patton and Captain Lowenthal are retired submarine commanding officers with extensive pre-and post-retirement experience with the Naval War College.

A Cold War at Sea conference was recently held in Rhode Island. Between 7 May and 10 May 2004, proceedings and events were conducted at the Naval War College in Newport, at the ex-Soviet JULIETT–class guided missile submarine (SSG) K-77 docked in Providence RI, and the Watson institute for International Studies of Brown University. Translators were abundant at all functions, including social events. Real time translations were simulcast in both English and Russian for the formal presentations at the War College and Brown University. These extraordinary events were the result of extensive efforts by USS SARATOGA Museum Foundation—owners of both K-77 and USS SARATOGA (CVA-60). Both ships are to be major parts of a proposed permanent Cold War display at Quonset Point, Rhode Island. The K-77 acquisition sparked the idea of the conference.

The authors were fortunate enough to have been invited to participate. Some of our observations, and those of other US submariners present, are provided as information for readers of the Submarine Review.

It should not come as a surprise that the affair was heavily oriented towards the interplay between the US and Soviet Submarine Forces. The Russian delegation consisted predominantly of active duty and retired submarine officers, and included several who had commanded or served aboard the K-77, including an active duty Rear Admiral. The senior member of the Russian delegation was

VADM Yuriy Sysuev, a submariner and the present Chief of the Kuznetsov Naval Academy in St. Petersburg. Three retired 4–star US Admirals participated: Admiral Carl Trost, Admiral Bill Studeman, and Admiral Stansfield Turner. Several prominent Naval Historians, who are researching and writing about the Cold War presented some of their papers.

Other interesting civilian participants included Sergei Khrushchev, the son of the Soviet ex-premier, and Francis Gary Powers, Jr., the son of the U2 pilot shot down in May of 1960 while Nikita Khrushchev was Premier. A notable event occurred at a reception at the home of Sergei Khrushchev in Cranston RI, when he and Francis Gary Powers, Jr. embraced and called one another *friend*.

The presentations at the Naval War College on Friday and Saturday revolved around the history of Soviet interest in naval matters, including the great deal of support given to an emergent fleet by Joseph Stalin after World War II. An anecdotal story about his admiration of the appearance of Italian designed warships led to what the Soviet mariners referred to as *the Gucci Cruisers*. The Cuban Missile crisis, the increasing Soviet capabilities under Admiral Gorshkov, and the impact of the *Maritime Strategy* under President Reagan were all discussed from the Russian perspective. Of particular interest was the Russian view that Khrushchev's fiscal defense philosophy was not unlike that of Eisenhower's as expressed by Norman Friedman in *The Fifty-Year War*. That is, not to just *throw money* at the US/USSR military competition, but participate in that contest just enough to stay in the game, while the *real* battle was fought in terms of agricultural products, standard of living and consumer goods. It was only with the ascendancy of Leonard Breznev that a *money is no object* tack was taken as regards the construction of a world class Soviet blue water navy.

Several fascinating insights came from the Russian discussions of the Cuban Missile Crisis from their perspective. One of the Russian delegation, Captain First Rank (Ret) Ryurik Ketov, was the Commanding Officer of one of the four FOXTROT diesel submarines attempting to reach Cuba (for permanent basing!) During the blockade. His boat was the only one not forced to surface by USN Forces, and he was promoted upon return to the USSR and later commanded a VICTOR SSN.

His testimony was that each FOXTROT had a nuclear-tipped torpedo on board. He stated that the Commanding Officer was authorized to use them if his ship was attacked and all communications had been lost with Moscow when US ASW Forces were prosecuting them. He stated that the Soviet submarines' only link with what was going on was from US civilian radio (and TV audio) broadcasts and what they were able to intercept from US military communications. During the conference, it was stated several times by several historians, that US Forces were not aware that the FOXTROT submarines had nuclear torpedoes on board.

Russian testimony also indicated that sound quieting of their submarines was the top military priority throughout the 70's and 80's, and was pursued with a fervor equivalent to that of our Manhattan Project in World War II, or the Project Apollo moon landing. Also, since they perceived (almost Army-like in thinking) that the *turning of their Northern Flank* essentially cancelled all other Soviet advantages in a Central European conflict, the Maritime Strategy really did cause them a significant degree of strategic discomfort. Their basic strategy called for placing the bulk of their naval assets into a defensive role for which there were concentric far, medium and first *echelons* of keep-out radii. US submariners, of course, saw this entrenchment of their naval assets as the creation of a *target-rich environment*.

Sunday's Victory Day (we call May 8th VE day and it is a major Russian holiday celebrating the WWII defeat of Germany) memorial services at the K-77 JULIET SSG was impressive, as was the tour of the K-77—a 3500 ton behemoth of a diesel-electric submarine (US diesel submarines were about 1700 tons). At the end of that affair, each of the US and Russian delegations tried unsuccessfully to outdo the other in the quantity and quality of gifts and mementos exchanged.

Monday was somewhat a continuation of Friday and Saturday's presentations, but with a smaller group and a good deal of Brown's academia in the audience. It had a somewhat different agenda: how the scientists viewed the Cold War, how the operators (submariners) viewed it, how the film industry played off it and the state of US-Russian relations today.

Of interest was a description of the development and testing of

the cruise missile employed on the JULIET, how the post-launch wing deployment was absolutely revolutionary for its time, and how, during testing, it managed to inadvertently attack a civilian trawler, a fishing village and a Japanese cruise ship. In one presentation Mr. A. Homer Skinner, who had been associated with the CIA, alleged that the way we found out about the Soviet submarines anechoic coatings was when one of ours *bumped* one of theirs and some of the coating stuck to our submarine. At that point Captain First Class (Ret) Ryurik Ketov, previously mentioned as a Cuban Missile crisis FOXTROT CO, spoke up to say that it was his VICTOR that had been bumped by a third party while he was trailing USS GEORGE WASHINGTON.

It was a fascinating three-four day event during which two groups of Cold Warriors expressed their mutual admiration and respect for one another—not as enemies, but rather as adversaries—united as all seamen have always been in a battle against a common enemy–the Ocean.

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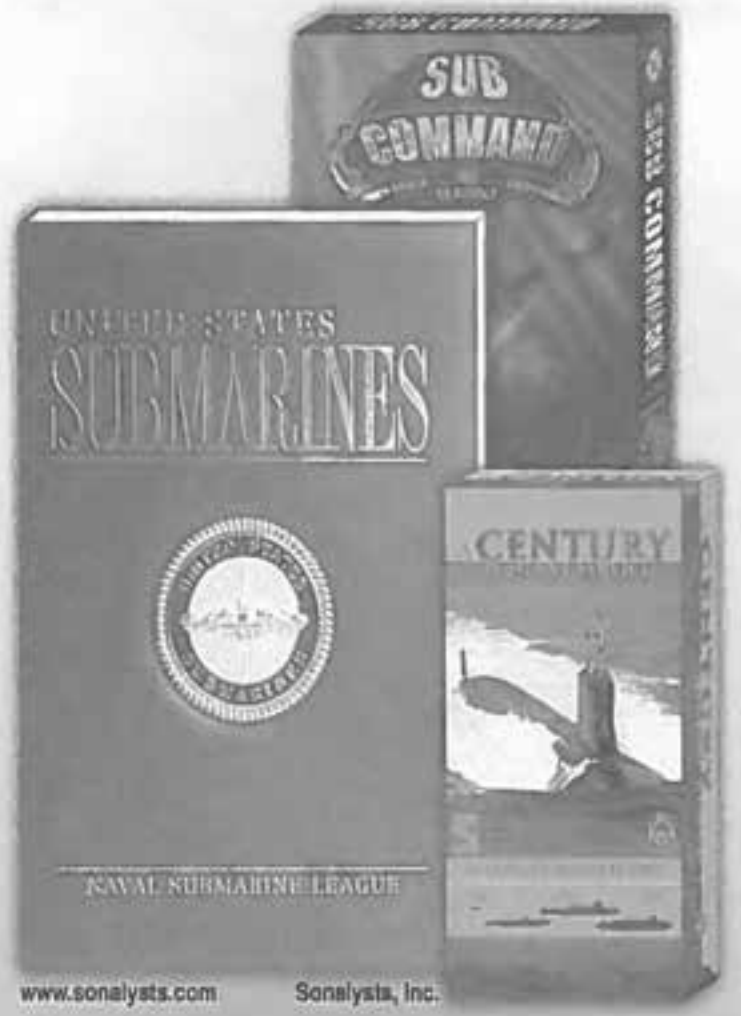

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TA ELENIKA YPOVRIHIA*: A BRIEF HISTORY OF THE GREEK SUBMARINE FORCE

by CAPT Sam J. Tangredi, USN

Captain Tangredi is a frequent contributor to THE SUMBARINE REVIEW. He is a surface warfare officer with a PhD in International Relations Captain Tangredi is under orders to Defense Attack at the US Embassy in Greece.

In many smaller but technically advanced nations, the Submarine Force is considered among the most elite military units, often receiving a very high proportional share of the national defense budget. This has been true for several NATO nations, one of them being the Hellenic Republic of Greece, which is justifiably proud of its undersea warfare heritage.

Greek historians date the start of this heritage to at least 322BC, when the forces of Alexander the Great utilized diving bells and other submerged chambers to conduct combat swimmer operations against the city of Tiros (Tyre), an event attested to by Aristotle. Impressed by these activities, King Alexander was reported to have later descended to the sea floor in a specially constructed glass barrel, staying there for several hours.

Another point of pride is the fact that a Greek submarine conducted the first recorded wartime submarine torpedo attack against an enemy warship in 1912.

Today the Greek submarine command operates exclusively a force of eight Type-209 diesel-electric submarines designed by Howaldtswerke Deutche Werft (HDW). Greece has also recently contracted HDW for four Type–214 diesel/fuel cell–electrics with air independent propulsion (AIP) capability. There have been conflicting reports concerning whether the Type–214s will replace the four oldest 209s, or whether the Hellenic Navy will operate a twelve boat force.

*The Greek Submarines

Early Submarine Developments

In the late 1800s, the prospect of developing a practical submarine warship intrigued many of the European states, particular those whose forces could never otherwise challenge the navies of the great powers, especially the Royal Navy. Numerous engineers and would be-inventors developed plans and designs to attract investors and government support. Like John Holland in the ports of New York/New Jersey and Simon Lake off Bridgeport, Connecticut/Long Island Sound, prototype construction and underwater experimentation occurred in a number of European port cities, including Piraeus, the port of Athens.

Greek engineer N. Gryparis is reported to have built an experimental submarine named GRYPARA in 1880 and tested it in the waters off Farliro (Athens–Piraeus). But as with Holland and Lake, it proved difficult for most European inventors to find the financial backing to bring their plans into fruition. Whether or not that was the case for N. Gryparis, there is no record that he ever went on to develop a full-scale operational submarine.

Yet, the Greek government did have an urgent incentive to pursue submarine development. While remaining on generally good terms with the naval powers of Britain, France and Russia (all of whom fought as allies at the naval battle of Navarino in support of Greek independence), the Ottoman Turkish Empire remained an implacable foe with a numerically superior fleet. In 1885, Anglican clergyman George William Garrett produced a design for a torpedo-firing submarine that was built by the Swedish shipbuilder Thorsten Nordentfelt. When the trials for NORDENFELT #1 were held off Landskrone in Sweden, Nordenfelt invited naval observers from many European and Latin American countries. Although some observers went home unimpressed, the Greek government decided to buy NORDENFELT #1 for 9000 British pounds.

One source states that the infamous Baron Basil Zaharoff played the role of middleman for this purchase. (Fans of the ITV1/PBS series *Reilly, Ace of Spies* will remember Zaharoff as Sydney Reilly's initial and persistent opponent.) Reportedly, Zaharoff claimed to be (at least in part) of Greek descent and protestations of his patriotism had some influence over the Greek government's decision.[1] Whatever his origin or patriotism, Zaharoff turned around

and promptly sold the next two NORDENFELT submarines to the Ottoman Empire. The Turkish Sultan wanted to neutralize any possible Greek advantage, and was willing to pay even more money.

It is difficult to get a true assessment of the actual operational capability and reliability of NORDENFELT #1. By design, she was steam-powered, 33 meters in length, 160 tons displacement, capable of making 9 knots surfaced, had a crew of three, and carried one torpedo. Presumably the Greek Navy used her as a test and training platform. According to a quasi-official source, she remained in the fleet inventory until 1901, "without being operational. [2] It is unclear whether such a statement indicates that, as a training platform, the boat was never assigned to the fleet, or whether it indicates that in reality NORDENFELT #1 could not get underway and/or submerge.[3]

Balkan Wars and First World War

From 1901 to 1912, Greece does not appear to have operated submarines. But in September 1910, Greece ordered two submarines from France. In 1912, Greece established the Submarine Command of the Hellenic Navy upon the acquisition of the two French-built submarines, HS (Hellenic Ship) DELPHINE (Dolphin) and HS XIFIAS (Swordfish).[4] They were radical improvements over the NORDENFELT, benefitting from over 25 years of technological advances. The submarines were rated at 310 tons surface displacement, 460 tons submerged displacement, 13 knots surfaced, 8 knots submerged, with a crew of 24. They were fitted with five 45cm torpedo tubes.

It was HS DELPHINE, under the command of Lieutenant Stephanos Paparigopoulos, which conducted the first wartime torpedo attack in history—against the Turkish battle cruiser MECIDIYE. According to the official record, it was unsuccessful. Later in this First Balkan War, the Hellenic fleet scored two victories over the Turkish fleet in major engagements, but the role of submarines in these battles is uncertain.

Sometime during this period, the Greek government decided to contract with a German shipbuilder for a third submarine. However, the First World War broke out shortly before delivery and the German government chose to retain the boat and commission it in the Reichsmarine. She became U-35, the most successful submarine

of that war. (In the Second War World, following her attack, U-35 rescued the crew of the Greek freighter DIAMANTES and put them ashore in Ireland.)

Greece did not initially enter the First World War. Although the sympathies of the elected government were with the Allies (and against German-allied Turkey), the King preferred neutrality (the Queen was the Kaiser's sister). In an incredible series of machinations that greatly damaged Greek society, the King forced the government to resign, but was in turn forced to abdicate by the Allies. French troops occupied Athens in order to suppress the royalists and reinstall the government. During this period, the French seized the Hellenic fleet, demilitarizing the older vessels but recommissioning the newer ones into the French Navy. Thus, DELPHINE and XIFIAS served as French submarines from October 1916 to July 1917. When Greece entered the war on the side of the Allies, the submarines, along with most of the fleet, were returned to her control. Both submarines remained in service until 1920.

Interwar Period

What most nations consider the interwar period was a period of strife and eventual military disaster for Greece. Having made initial gains in Asia Minor, Greek forces were defeated by Turkish armies under Kemal Attaturk in 1922. Much of the Greek population in Asia Minor was evacuated. It is understandable that the Submarine Force was considered a low priority during this period, and it was not until December 1927 that Greece began to acquire new submarines—once again from France. The first was HS PAPANIKOLIS (Y-2), followed by HS KATSONIS (Y-1) in January 1928. Later, Greece acquired four more French submarines, of a slightly more advanced design: HS PROTEUS (Y-3), HS NEREUS (Y-4), HS TRITON (Y-5), and HS GLAVKOS (Y-6). At the start of the Second World War, the Hellenic Navy was operating all six French-built submarines. These were capable of Mediterranean operations, but not designed for long-range patrols.

Second World War

During the Second World War, the Hellenic Navy distinguished itself in combat, and following the German occupation of Greece

(1941), became the primary surviving independent Greek armed force.[5] In addition to the six submarines, the Hellenic Navy began the war with a surface fleet of 24 combatants and 30 auxiliary ships.

In the initial phase (1940-Early 1941)—the war against Italy—the Greek Army drove the Italians back, deep into Albania, while Greek submarines sank 18 Italian ships from Adriatic conveys and damaged others. This is a particularly impressive score and contributed greatly to the support of land operations, although PROTEUS (Y-3) was lost off Albania on 29 December 1940, sunk by Italian Torpedo Boat ANTARES.[6] But lacking an effective air force to provide air cover, both land and sea forces could not hope to defeat the Wehrmacht once German forces came to the aid of the Italians.

Despite British support for Greece, the Luftwaffe gradually took apart the Greek Navy. By the time of mainland Greece's imminent collapse in April 1941, the remaining Greek fleet consisted of 1 cruiser, 3 destroyers, 5 auxiliary ships, and the 5 remaining submarines.[7] The fleet was directed to escape to Alexandria, Egypt, where they remained the prime military assets of the Greek Government-in-Exile, but under the command of the British Royal Navy. The Greek submarines were individually integrated into British submarine squadrons, with the newest, GLAVKOS, operating with the famed British 10th Submarine Flotilla at Malta in an effort to interdict Rommel's supplies. HS GLAVKOS was lost by German air attack in La Valletta harbor, Malta, on 4 April 1942. The other subs patrolled Greek waters with both success and loss. Following a successful attack on a German convoy off Euboea, HS TRITON was lost after a six-hour pursuit by German warships on 16 November 1942. In the same month, HS PAPANIKOLIS scored successes in the Dodecanese islands. In February 1943, HS KATSONIS sunk a German minelayer seeding mines in Greek bays. But on 13 September 1943, KATSONIS collided with another German warship and was lost with its crew of 32.

In order to make up (in part) for these losses, the Royal Navy turned over to the Hellenic Navy the captured Italian submarine PERLA (Royal Navy designation P712) in January 1943. She was commissioned HS MATROZOS, and was joined by HS PIPINOS, a recommissioned Royal Navy submarine. In 1944, PIPINOS conducted the last recorded successful Greek submarine attack of the

war, sinking CALATAFIMI, an Italian destroyer sailing under German colors. (Italy had already surrendered.)

Perhaps more important than tonnage sunk was the use of the Greek Submarine Force for special operations—landing Allied commandos throughout the Greek islands and mainland. Besides courage and stealth, this required patience. Today, residents of the island of Meganissi point out a sea cave as 'Papanikolis cave' because of its (supposed) periodic use as a hiding place for the submarine prior to both attack and special operations. Presumable other such locations were used by the sub force, necessitating considerable skill at near-shore navigation.

In total, Greece lost four of its initial six submarines in the Second World War, along with 106 crewmembers. On the opposite end of the torpedo wake, Greece also lost 334 merchant ships and over 2000 merchant seamen, with 2500 wounded, from Axis submarine and air attacks. This aspect of the submarine war had a devastating impact on the Aegean islands from where most of the sailors were recruited.[8]

Cold War

Once again the Greeks faced some of their bloodiest fighting during a so-called period of peace (but one growing colder with each year). The civil war of 1946-1949 was a tragedy for Greece, effects of which are felt even to this day. But following the eventual victory of the democratic government, Greece became a member of NATO in 1951 and committed land and air forces to the war in Korea. Although the acquisition of new submarines was hardly a priority during this period, British subs were loaned to Greece. These subs, all limited-range Second World War veterans, operated in the Hellenic Navy until December 1958, when they were returned to the Royal Navy.

As replacements, the Hellenic Navy received two U.S. Gato-class long-range fleet submarines: HS POSEIDON (ex-USS LAPON SS-260) received 8 August 1957 and HS AMFRITRITI (ex-USS JACK SS-259) received 21 April 1958.[9] At over 2400 tons submerged displacement and crews of 60, these submarines represented a great increase in range and endurance over their predecessors. This also initiated a thirteen-year period in which the Hellenic Navy

exclusively operated ex-U.S. submarines, a period during which strong ties were developed between the Hellenic Navy and the U.S. Navy.

On 26 February 1965, ex-USS SCABBARDFISH (SS-397) was transferred to Greece and commissioned HS TRIANINA. TRIANINA was a Balao-class sub that had been upgraded to a *fleet snorkel submarine* prior to transfer. In 1968, HS AMFRITRITI was decommissioned and returned to the USN, whereupon it was sunk as a target during Sixth Fleet exercises.

By 1971, the Hellenic Navy made the decision that led to its current composition. It was then clear that the United States was not going to be constructing new diesel submarines. Likewise it was clear that nuclear propulsion was not a practical option for the Greeks. Costs were prohibitive, and operating in the Eastern Mediterranean did not require the range and submerged sustainability of nuclear power. Therefore, the Hellenic Navy took delivery of the first of four Type-209/1100 diesel-electric *coastal submarines* built in Kiel by HDW. Commissioned HS GLAVKOS (S-110), in honor of her predecessor, she is rated 1207 tons submerged, 22 knots, with a crew of 31. Like the other German-designed subs operated by Greece, she is primarily armed with U.S.-designed weapons, including sub-launched Harpoon.

But it was not the intent to sever close ties with the USN, and in 1972 Greece accepted delivery of ex-USS HARDHEAD (SS-365), a Guppy IIA conversion commissioned as HS PAPANIKOLIS (S-114). This was followed in 1973 by a Guppy III, ex-USS RAMORA (SS-487), which was commissioned as HS KATSONIS (S-115). In 1976, HS POSEIDON was decommissioned for spare parts to keep the two Guppys operating.

In 1979-1980, the Hellenic Navy took delivery of four more Type–209s of an advanced version (Type–209/1200), bringing their German–designed force up to eight. In 1980, TRIANINA was decommissioned for use as a pier side trainer. The Hellenic submarine force thereby consisted of ten boats: 8 German, 2 U.S. But age and lack of parts took their toll on the Guppys. PAPANIKOLIS and KATSONIS were decommissioned in 1993, which was much later than their sister ships in the U.S. fleet. (A web site operated by veterans of USS RAMORA claims that it was the last WWII boat to

be decommissioned.) The Hellenic Submarine Force's Euro-American period gave way to the purely European, except for certain sensors and weapons.

Future Force

The future of the Hellenic Submarine Force continues to look decidedly European. With its purchase of the Swedish sub builder Kockums, HDW is now the dominant force in the diesel submarine market, with sales contracts with Germany, Italy, Korea, and Greece. Greece will be the first to take delivery of the Type–214, which, in addition to an air independent propulsion unit, will use fuel cells instead of diesel power to recharge batteries underway (though still equipped with diesel generators). The first sub will be built in Germany and will be commissioned as the third HS KATSONIS sometime in 2005. The three other subs will be constructed at Hellenic Shipyards in Skaramangas, Greece, which HDW–Ferrostaal Essen purchased in 2002. Greece has negotiated with U.S. companies concerning weapons for these subs. These subs are designed with eight 53.3cm swim–out torpedo tubes of which four are equipped with positive discharge for sub–launched Harpoon. As noted earlier, it is unclear whether older boats, all of which have been subsequently upgraded, will be decommissioned to free up operating funds for the newer. And, of course, there is always the potential for resale, although that has not been a Greek practice in the past.

As a member of the European Union, it is natural that Greece would look towards its European partners in acquiring weapons systems. But it is also apparent that Greece would seriously consider the acquisition of U.S. designed diesel submarines if there were any to buy. U.S. shipyards have hinted in that direction, but common wisdom was that cheap Russian KILOS would be flooding the market. In reality most buyers have rejected the KILOS (most recently South Korea which opted for Type–214s). Now it may be that HDW/Kockums have too great of a design lead in AIP and fuel cell technologies.

Given the geographic realities, Greece will continue to devote considerable resources to the Hellenic Submarine Force. Whereas the surface fleet made considerable effort to provide ships to operate

out-of-the Mediterranean in support of the US-led coalition in Operation Enduring Freedom (a first for the Hellenic Navy), the Sub Force will not have that capability. But they are likely to be the most effective force to counter Greece's own perceived threats. It is important for both the United States and Greece to maintain close relations between their respective submarine communities, no matter the source for Greece's future Sub Force.

ENDNOTES

[1] Rochat-Cenise, *King of Arms* (Glauser-Oderbolz, Switzerland: 1943) quoted in "Greek entry in WWI, www.talkaboutabook.com/group/alt.censorship/messages/217854.html

[2] "Helenic Submarines, http:/users.otenet.gr/~confryd/sub.htm

[3] Evidence for the later is implied by the fact that the two Turkish-bought submarines were never able to successful submerge, even with designer Garrett traveling frequently to Istanbul for consultations. See "Cem's Fighting Ships On-Line: Turkish Submarine History—The Submarines of the Ottoman Period, 1885-1923, http://www.geocities.com/Pentagon/Bunker/7704/subhis1.html

[4] Throughout this article I use the current HS (Hellenic Ship) designation. Prior to 1967, the proper designation would be HHMS (His Hellenic Majesty's Ship).

[5] Since only a limited number of troops were able to escape the mainland, the Greek army needed to reconstruct itself as soldiers arrived in Egypt in small numbers via Asia Minor.

[6] www.commandosupremo.com/1940.html

[7] Several sources state that only three submarines escaped to Egypt. However, official records indicate at least four of the original six submarines conducted attacks in 1942.

[8] R. Clogg, *Oxford Companion to the Second World War* (Oxford: Oxford University Press, 1995), p. 508, available at www.ucc.ie/staff/prodr/macedonia/helmodww2e.html

[9] The new Poseidon was originally assigned the hull number of Y-16, but this was later changed to S-78. I have not been able to find an explanation for the change in numbering system.

THE INFLUENCE OF NAUTILUS AND NAVAL NUCLEAR POWER ON CIVILIAN NUCLEAR POWER

REMARKS BY
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THIRD ANNUAL SUBMARINE HISTORY SEMINAR
"NAUTILUS AT 50"
SPONSORED BY
NAVAL SUBMARINE LEAGUE
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The influence of NAUTILUS and naval nuclear power on civilian nuclear power, both in this country and abroad, has been very large. But this influence has not been achieved easily. On the contrary, adoption of naval reactors methods has encountered opposition of formidable proportions as programs of both types went forward. My purpose is to describe the nature of naval reactors influence and how it has been advanced. There are important lessons to be learned about the process of managing complex, high technology programs from doing so.

When NAUTILUS was commissioned in 1954, the organizational environment for nuclear power development had the form I shall now describe. The Atomic Energy Commission was charged by law with development and application of nuclear energy for both peaceful and military purposes. By a big change in the law that year, however, private industry was empowered to own and operate nuclear power plants.

The AEC's own large civilian nuclear power research and development program was carried out by a major division under the general manager. Because the AEC was highly decentralized, the work was, in fact, carried out by its large organizations in the field. Reactor development was centered at two locations, Oak Ridge National Laboratory and Argonne National Laboratory. Under AEC

oversight these laboratories designed, built, and operated prototype reactor plants, using industrial contractors as needed. The laboratories themselves had a large degree of autonomy.

Naval Reactors was also under this same overall arrangement, formally speaking. But it was carried out under then Captain Rickover in a radically different manner. In the first place, it was carried forward as a joint AEC/Navy activity. Even more important, technical guidance and direction was provided by a highly qualified technical management organization. There was not a comparably qualified AEC organization for civilian reactors programs, either in headquarters or field. In that major difference lay the source of many problems ahead.

Initially, the design and development of NAUTILUS prototype was done by the Argonne National Laboratory. It was called Submarine Thermal Reactor, Mark I. In technical concept the job was done well. But two major problems arose. Argonne did not have the engineering and industrial capability and experience for a project of this complexity and magnitude. Also, Argonne was unwilling to accept Naval Reactors' technical direction and authority. So Rickover established what became the Bettis plant under Westinghouse management and progressively transferred Argonne's STR responsibilities to it.

By the mid-nineteen fifties Westinghouse and General Electric had begun to undertake full-scale commercial nuclear power plants in collaboration with major utility companies and their suppliers. In 1953, however, a major development took place in the naval reactors program, a development that was to have an important effect on the civilian nuclear power effort. The Eisenhower administration abruptly cancelled the military requirement for the AEC's carrier reactor project, CVR. However, AEC commissioner Murray, a strong Navy supporter, working with Rickover, induced the commissioners to transform CVR into a civilian nuclear power plant. Against powerful opposition from Congress and industry, Murray saw to it that Rickover was put in charge.

The commission then approved establishing a large ship reactor project (LSR). Within a year or so the political climate had changed and LSR became a carrier reactor project. Now, Rickover had two major projects for reactors of substantial size: one became the

Shippingport nuclear power plant; the other the prototype for the ENTERPRISE reactors. Both were closely related in technology; both were pressurized water.

The late 1950's and thereafter were a heady era, saleswise at least, in civilian nuclear power history. With strong AEC endorsement, many utility companies invested heavily in nuclear power plants. However, all too many had not acquired the needed technical knowledge of nuclear power to be responsible customers for such plants. Neither had the architect-engineers, construction managers, and component vendors been up-graded to perform effectively in the domain of nuclear power. As a result, by the early 1960's problems of major proportions were becoming evident throughout the industry. They became manifest in severe construction delays, massive cost overruns, and unacceptably poor performance in plant reliability and efficiency. Also, the AEC's own reactor development program was mired in mismanagement. Meanwhile, nuclear powered ships were going from success to ever larger success.

These problems had become so widespread and so evident publicly that Congress forced the AEC to act. Milton Shaw, one of Rickover's most outstanding managers and formerly project manager for ENTERPRISE was made director of AEC's Division of Reactor Development and Technology. His principal responsibilities were to foster the growth and development of civilian nuclear power and to revamp the AEC's own research and development programs in furtherance of this objective.

To do this he established a close analog of the Naval Reactors organization and management approach, drawing on former NR personnel to do so. But he did not have regulatory authority; that remained with the regulatory arm. Shaw systematically eliminated a plethora of ill-conceived and poorly managed projects and programs and focused resources on the development of the liquid metal fast breeder reactor. Paralleling NR practice he instituted a disciplined engineering approach to all activities.

A key aspect of that approach is the development and use of proven engineering standards. By stark contrast, no comparably strong body of such standards had been developed for civilian nuclear power. So Shaw obtained standards used for the

Shippingport plant from Rickover and made them widely available to all standards-making activities. He also obtained the splendid set of quality assurance documents used for the eight reactor plants of the ENTERPRISE and put them to similar good use.

One might have expected that the regulatory arm of the AEC would be a strong ally in this effort; but they were not. An AEC commissioner had to insist that the QA standard be issued for compliance, rather than guidance. Also, they delimited applicability to systems described as important to safety, broader applicability was strongly resisted by the industry. I should add here that the regulatory arm to which I refer is not the Nuclear Regulatory Commission, which was established as an independent agency at a later date. But it is important to note that emphasis on standards and quality assurance encountered more resistance than might have been expected given its importance to the success of Naval Reactors.

Part of the standards problem was that Naval Reactors and industry had different views as to their purpose and use. Naval Reactors saw them as a means of embodying and applying the results of advancing technology; industry tended to view them as means by which the government could exercise control of industry activities.

Turning from the organizational environment, I should now like to focus on those domains in which I believe the influence of Naval Reactors has been most pronounced. They are: Technology, Selection and Training of Personnel, and Management Methods.

Technology

The principal legacy of Naval Reactors has been the pressurized water reactor and its fuel cycle. This was not preordained. In fact, NR studied coolants as varied as sodium, carbon dioxide, lead, helium, and heavy water. There was no aspect of power reactor development on which NR efforts did not have a major impact. To cite but a few examples, NR developed the following:

- Zirconium as a fuel element material and Hafnium for control rods

- Components such as control rod drives and pumps which operate with hot water as the only lubricant and radio-active coolant is sealed from leakage

- Basic safety principles such as containment, negative temperature coefficient of reactivity, radioactive discharge controls, and methods of decay heat removal

NR vigorously advanced the development of fuels of long core life and the extraordinary potential of burnable poisons. And by vigorously I mean carrying out very extensive and costly programs in test reactors before applying the results to ships at sea. The fuels so developed permit naval reactors to operate many years without refueling.

While these and other contributions will be recognized as having had a large influence, they have not been used to their full potential. For one example, a group of the world's top reactor experts carried out a comprehensive study of advanced light water reactor design, sponsored by the Electric Power Research Institute. The membership of the group was drawn from countries having major nuclear electric generating capacity. It was chaired by Captain Ed Kintner, NR's project officer for NAUTILUS and a leading nuclear power executive.

The design studies were based on the application of Naval Reactors principles, which included the following:

- Simplicity, so as to reduce the number of components by half
- Increased thermal margins
- Decay heat removal by natural circulation
- Separation of safety systems from those used in normal operation
- Larger, more robust containment

The resulting designs offer safety improvements of the order from ten to a hundred as measured by probablistic assessments.

Essentially no use is being made of these designs in the United States. Yet they are being used in Western Europe and Japan. For example, Japan and Germany are working together on a 1500 megawatt (electrical) design using many of the principles referred to.

Even so, today there are some four hundred and twenty nuclear electric power reactors; of these, some four hundred are descendants of NAUTILUS and naval reactors.

Selection and Training of Personnel

It is my strong conviction that no attribute of the naval reactors program has contributed more to its success than its extraordinary emphasis on the selection and training of personnel. But what constitutes excellence as regards personnel varies widely, so let me give a couple of examples that will suggest what the term means in Naval Reactors. In the early years, fifty of the first hundred engineers in NR itself were Naval Academy graduates who, almost without exception, had two advanced degrees from MIT and the practical experience to go with it. The officers who operated the ships, mostly submariners, were carefully chosen from among the best who had already been selected into that dedicated, engineering oriented organization, the Submarine Force.

These carefully selected personnel had to be trained in nuclear power. To this end, Rickover established schools to provide rigorous academic instruction and then operational training in land-based prototypes of the nuclear plants installed in ships. More on this subject can be found in an article in the Naval Institute Proceedings of August 1987, "Get em young and train em right.

The kind of capability to which I am referring was simply not to be found in the breadth and depth needed among civilian nuclear power organizations of the earlier years. With time, however, utility industry leaders recognized that those with naval nuclear power experience provided a resource which they could tap to advantage. And those who have followed the large improvement in the performance of civilian nuclear power plants over the years will also know of the contributions of those with Naval Reactors experience, both individually and collectively.

There were other influences in effecting this transfer of talent and experience. Impetus was given by the accident at three mile island. Both the Kemeny commission and the Nuclear Regulatory Commission's independent study emphasized the need for improved training. Also important has been the work of the Institute for Nuclear Power Operations. Its first leader was Admiral Dennis Wilkinson, widely known as first Commanding Officer of NAUTILUS.

Management Methods

Much has been written on this subject, especially by Admiral Rickover himself. Some of the best material can be found in his testimony before committees of Congress. Here I would mention especially that of May 24, 1979 before the House Subcommittee on Energy, Research, and Production of the Committee on Science and Technology.

The principles given in such testimony cannot be compressed into a brief talk like this. But there is one concept which, I believe, subsumes many of them—that of the demanding customer—by this is meant an organization with strong technical management and other capability to provide guidance and direction to its ensemble of contractors, to elicit from them performance in full compliance with the terms of the contract, and to know when it has done so. This is what NR knows to do. It does not delude itself, as all too many government organizations do, with merely providing oversight.

Further, the demanding customer does not dissipate the use of its capabilities by doing the contractor's work for him, thus compensating for his weakness. It makes the contractor correct those weaknesses.

I am not close enough to the world of civilian nuclear power today to know how well this principle is being applied. But when it is fully applied, the management legacy of Naval Reactors will have begun to reach its full management potential.

It will be recognized, of course, that many individuals and organizations have had a large influence on the development and application of civilian nuclear power. Beyond those mentioned, they include the U.S. Nuclear Regulatory Commission, the Advisory Committee on Reactor Safeguards, American National Standards Institute, American Nuclear Society, the national laboratories, and many others. The whole story is a larger one than mine has been.

In closing, I should like to express my own conviction that this nation will be forced to return to widespread use of civilian nuclear power–the earlier, the better. As it does, the strong legacy of NAUTILUS and naval nuclear power will become more widely understood and appreciated.

THE SUBMARINE, 1776—1918
It Developed Slowly, then Grew Swiftly, Triumphed Astoundingly, and Failed Decisively

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by Frank Uhlig, Jr.

When, on April 11,1900 the U. S. Navy bought HOLLAND, named for her designer, that little submarine joined a fleet consisting of two armored cruisers, six monitors, seven first and second-class battleships, and 17 each of protected cruisers, gunboats, and torpedo boats. At 64 tons HOLLAND was not the smallest vessel then possessed by the Navy but, at 54 feet, she was the shortest.

Though many of the ships in the not-very-old and not-very-large U. S. fleet of 1900 would last for years afterward (HOLLAND would not be among them), all would be obsolete when the *Great War* broke out only 14 years later. So would all those ships still being built in 1900, and all those yet only a concept, and not only in the U. S. Navy, but in all navies. Technology was moving swiftly. Among those types of warships that made up the American fleet at the beginning of the 20th Century, the submarine alone would survive until the beginning of the 21st Century. Though in what size, shape, or any other particular the submarine will make it into the second half of this century, we cannot know, but we can be confident that survive it will.

The submarine would prove itself to be a revolutionary instrument of naval war. But the submarine was not the only such instrument of war to appear at that time. Within less than five years two other instruments of similar import to those concerned with the struggle for mastery of the sea would make their appearance. In 1899 the Italian inventor Guglielmo Marconi demonstrated, first to the British and then to the U. S. Navy, the practicality of wireless radio communications both between ships at sea and between ships and shore. No one needed to tell the navies the value of this. Just in the U. S. Navy alone, by the end of 1904 there were 59 radio sets in use afloat and ashore. During the Russo-Japanese war, which began that year, both sides used radio; in addition, the Russians engaged in communications intelligence.[1]

Meanwhile, in December 1903 two Ohio bicycle manufacturers, Wilbur and Orville Wright, were to show the world that manned, powered, controlled flight in a craft heavier than air was another practical thing. The first use of such a practical thing in war took place in Libya in 1911 during an Italian war against the Ottoman Empire. The first naval use was by the Americans at Vera Cruz, Mexico, in April, 1914.[2]

Both electrical communications over a distance and manned flight had had long histories before Marconi and the Wright Brothers demonstrated their achievements. It was in 1844 that Samuel F. B. Morse began to communicate via telegraph between Washington and Baltimore. By then men had been flying in balloons for years. The first manned flight, by the Montgolfier brothers, over Paris, took place in 1783. Manned flight it was, but it was barely controlled by those on board, for they were lifted by hot air and driven by the wind. Submarines also underwent a long history of development before John Holland could demonstrate to the U. S. Navy that he had a reliable warship, able at her captain's command to move, steer, shoot, submerge, and surface.

For more than a century before HOLLAND's time, inventors, not often with naval help, had been trying to develop a practical submarine. One of the earliest such was David Bushnell of Connecticut who, in 1776, before there was a United States, built a balloon-shaped undersea craft, TURTLE, which was driven by a hand-cranked propeller. The craft's one-man volunteer crew, Sergeant Ezra

Lee, attacked HMS EAGLE, a 64-gun ship of the line then at anchor in New York harbor. The weapon was a time bomb Lee was to screw into the ship's bottom. Unfortunately for both Bushnell and Lee, their plan was foiled by the copper anti-fouling sheathing that covered their intended victim's planks. Both EAGLE and TURTLE survived their brief encounter unharmed.

Eighty-eight years later, in 1864 eight Southern volunteers, commanded by a Confederate army officer, all of whom were trying hard to put an end to the United States, used another hand-cranked undersea craft, the cigar-shaped HUNLEY, to attack the wooden screw-sloop USS HOUSATONIC, anchored on blockade duty off Charleston, South Carolina. Their weapon was a spar torpedo, a 90-pound charge at the end of a long pole jutting forward from HUNLEY's bow. Unlike Lee, not only did they sink their intended victim, but they sank with her, perishing to a man.

By the end of the 19th Century several countries, including Spain and France, had built some marginally successful submarines. The designers' chief advances had been to abandon reliance on propulsion by quickly-exhausted men in favor of machine-driven propellers, and to replace time bombs and spar torpedoes with the newly-developed *fish* torpedo. This weapon was developed by Robert Whitehead, an English inventor working in Trieste, the main seaport of the Austro-Hungarian Empire. After being expelled from a tube the torpedo would swim under its own power towards its intended victim which, upon being struck, presumably would sink.

In the 19th Century both commercial ships and warships left sail behind as soon as possible, replacing it with coal-fired boilers and reciprocating engines. The first machine-powered submarines were among those steamships. But steam, with its need for air intakes and smokestacks, among other characteristics, was useful for submarines only when they were surfaced. Though it could deliver not much speed and less endurance, the newly developed electric storage battery was the only practical means of propelling the submarine when submerged.

Half a century and more would pass before anyone would develop a better solution to the problem of submerged propulsion, but for surface work the gasoline engine, another late 19th Century invention, had clear advantages over steam, for it needed neither

boiler nor smokestack, and its fuel supply could be kept in tanks. It was gasoline that propelled HOLLAND, and many another of the early 20th Century submarines.

But gasoline carried with it mortal dangers, for its vapors were both poisonous and subject to sudden explosions. Still, it permitted the submarine to dive much more swiftly than the steam engine did, thus potentially saving the crew in wartime from death by enemy gunfire or ramming. [3]

Probably John Holland's biggest step ahead of other submarine designers was that he provided his craft with diving planes so that, for the first time, a submarine's crew had positive control over their craft's vertical movements. It was this quality that put Holland's boat and her new owner, the U. S. Navy, in the van of submarine development. As a British submarine officer, Vice Admiral Sir Arthur Hezlet, was to write in 1967, America was "the true home of the submarine. [4]

Nearly a century before HOLLAND's arrival on the scene Sir John Jervis, Lord St. Vincent, and First Lord of the Admiralty, opposed in 1804 the support given by the Prime Minister, William Pitt, the Younger, to a proposal by an American inventor, Robert Fulton, to build a submarine for Britain to use in her seemingly endless war against the French Revolution and Napoleon: Pitt, he said, "was the greatest fool that ever existed to encourage a mode of war which those who commanded the sea did not want, and which, if successful, would deprive them of it."[5]

St. Vincent's view prevailed over that of the Prime Minister. Robert Fulton was out of luck. But St. Vincent, already recognized as a superb combat commander and commander-in-chief, in this moment, though not in this moment alone, showed himself a fine strategic thinker. He also showed himself a man with a clear sense of the potential course of a nascent technology. Britain's decision to do nothing to encourage the development of the submarine was sound policy, and, with some wavering in the 1880s, remained in effect for 96 years.

By 1900 the time to replace that policy had come. In 1898 Britain, the world's greatest naval power, and France, the world's second such power, had nearly gone to war, after a lapse of nearly a century, this time over clashing colonial ambitions in Africa. French

naval maneuvers that year had shown that, despite their many imperfections, submarines might indeed deprive Britain of her command of the seas, at least off the enemy's coast. Thus, in order to learn all it could about submarines, in 1900 the Admiralty ordered five for its own fleet: 113-tonners, to be almost identical to the seven A-class (SS2- SS8) John Holland had designed for the U. S. Navy.[6]

Political changes in the first fourteen years of the 20th Century were as radical as those in technology. Though many were involved, their chief instigator was the German emperor, Wilhelm II. Largely owing to that unsuitable ruler's words and actions, and those of the men he chose to hold high office under him, Germany, once Britain's friend, had become not only her rival for commercial and naval supremacy at sea, but also her potential enemy ashore. As a consequence, Britain began to extend the hand of friendship to her old foe, France, the revenge-seeking enemy of Germany. She even accepted France's alliance with Imperial Russia, a loathed tyranny that for long had been Britain's opponent in an often obscure struggle for influence in Central Asia. But France and Russia, the second and third naval powers in 1900 had, by 1914, fallen to fifth and seventh place respectively. The Germans had risen to second place, the Americans to third, and the Japanese to fourth. Italy and Austria-Hungary were sixth and eighth. France's need above all for a strong army was the main reason her navy had fallen so badly; the Russian navy had fallen because in war against Japan (1904-1905) it was beaten soundly. In any case, neither was likely to have kept her place in the face of the ambitious German (and, for a few years, the American) building program. Still, the world's second and third navies together would not quite have matched the British numerically, for, in modern, battle-worthy ships, that is, in general, those built after the commissioning of HMS DREADNOUGHT in 1906, by 1914 the German fleet was about sixty percent as large as the British and the American about half the size of the German.[7]

By 1914 all those navies had submarines, and none more than the British. According to Paul G. Halpern's *A Naval History of World War I,* Britain had 73. Her allies, France and Russia, had 55 and 22 respectively. Germany had 28, the distant, and neutral, United States had 30. The newest submarines in all navies were driven on the surface by the complex but comparatively safe internal combustion

engine invented by the German engineer, Rudolph Diesel, for whom they were named, even though some of the latest French submarines were still surface steamers. British manufacturers seemed able to produce a diesel equal to the German originals. Other countries did less well. American manufacturers were to produce disappointment after disappointment until just before the Second World War. When it worked, the diesel provided submarines with enormous endurance at sea. For submerged propulsion, the electric battery, which provided power for only the briefest time before it needed recharging, was still the only way to go. Whatever their power plants, in 1914, the main weapon of almost all submarines was the torpedo, though some submarines carried mines instead of torpedoes. Most of the new submarines also carried a small deck gun, 3-inch or so in caliber, but soon to grow.[8]

Originally, British submarines had been intended to replace controlled mines for the defense of harbors and to protect the coast from prowlers and invaders. In war they were to prove unsuccessful in those roles, but by then they had gone well beyond those roles. Now the submarines were to advance several hundred miles from their bases and ambush German warships in waters the Germans thought as their own. They did these things and, despite often-ineffective torpedoes and poorly designed mines, did them well. They did them in the North Sea, in the Baltic, where no other British warships could go, and they did them in the Dardanelles and Sea of Marmara during the otherwise unsuccessful Allied attack on the Turkish Straits in 1915. German submarines, or *U-boats*, were active in the same way against the British fleet, with similar results. Throughout the war submarines on both sides were to sink many more large warships than surface warships managed to sink; but, unlike the surface warships, all the submarines' victims were obsolete pre-dreadnoughts and armored cruisers.[9]

In a third task, that of serving as distant scouts for the fleet, the submarines of both fleets were to fail repeatedly. That failure stemmed mainly from their low speed compared to the rest of the fleet and the necessity to submerge when in the presence, or anticipated presence, of enemy fighting ships. Because they could neither transmit nor receive radio signals while in that state, they had to surface and then rig cumbersome aerials before they could use

their radios (and unrig them before diving.) The result was that for any combined operation they had to sail long before the rest of the fleet and, as soon as they entered hostile waters they had to dive or be ready to dive, thus falling effectively out of touch with their commander-in-chief.

The big thing German submariners learned was that they need not focus on the powerful British Grand Fleet, a fleet of many types of fighting ships centered on an all-new battle line of dreadnought battleships. Though that fleet existed mainly to ensure Britain's ability to snuff out German overseas trade, about which the German submarines could do nothing, and to ensure Britain's ability to protect Allied and other friendly shipping from German raiders, it soon proved itself ineffective against, even fearful of, German submarines.[10]

Shipping was almost exclusively privately owned and manned by civilians. It included everything afloat that wasn't part of the fighting fleet–passenger liners (some of them, eventually almost all of them, converted during the war into troop transports), cargo ships, oil tankers, colliers, and the rest. Those were the ships that moved Allied armies across both broad oceans and the narrow seas, that kept those armies (and the fighting fleets too) supplied and re-supplied; that, inbound, carried the raw materials from which factories fashioned arms and ammunition and, even more important, carried the food that every Briton, soldier, sailor, and civilian alike, ate; and that, outbound, carried the mined and manufactured goods that did so much to pay for the essential imports and the other costs of war. In contrast to Britain, France was able to feed her own people, but in other respects shared Britain's dependence on imports from abroad.[11]

However, we should not underestimate the influence of the Grand Fleet. First, under its protection, except in the unreachable Baltic, Britain's blockading cruisers ended all of Germany's enormous seaborne international trade. During the first year or so of this blockade the cruisers captured more merchant ships from the Germans than the British lost to the U-boats. Those captured ships went into British employment, so, despite early U-boat successes, the size of the British merchant marine actually increased in the first year of the war. Moreover the cruisers detained over 700 neutral

merchant ships filled with cargoes bound for Germany. The British took those cargoes for their own use. Second, the Grand Fleet provided the cover behind which the small warships assigned to protect British shipping could do their work.[12] Without the distant presence of that fleet, those small warships would likely soon have perished under the guns of German cruisers.

By the middle of 1915 the British windfall of captured German ships and seized cargoes had come to an end. But the blockade of Germany did not end; neither did the cover under which the anti-submarine forces worked.

Effectively for the first two years of the war Britain was under no blockade. Self-satisfied, the Admiralty cut back severely the construction of new merchant ships in favor of new warships and delayed endlessly the repair of existing merchant ships in favor of repairs to warships. In so doing, the Admiralty squandered the work of its blockading cruisers. It did so for it had not anticipated the disaster at sea about to befall Britain and her allies.[13]

Meanwhile, the U-boats came to cruise independently in the approaches to British and French ports, the places all Allied merchant ships had to sail from and return to; others even trespassed even closer, and stealthily laid mines in the fairways. To employ a useful term only recently created, from the beginning, the U-boat captains had information dominance over their victims, for the latter knew nothing of any U-boat's whereabouts until a submarine's skipper chose to make his presence known by means of a challenge, a shell, or a torpedo. The latter would likely attack with his deck gun, or board and sink his victim with a bomb placed inside. If a merchantman were armed, he would submerge and attack with a torpedo.

The U-boats' numbers were small at first, only 30 in February 1915, but 52 in March 1916, and more on the way.[14]

The British responded to what before long would become an assault on their very existence by building dozens, scores, eventually hundreds, of minesweepers, sloops (that day's equivalent to a modern frigate), and destroyers. Their purposes were to open the channels and keep them open, and to patrol the seaward approaches to the ports (out to four or five hundred miles) in order to find and sink the U-boats before the latter could find and sink the merchant ships. But

men in small ships with no sensors except their eyes, hunting for other small ships that wished not to be found except on their own terms, could not often succeed. The U-boats had information dominance over them too. Small ships: few of the U-boats in that war displaced as much as a thousand tons surfaced; the best of their opponents, the war-built sloops and destroyers, were not much more than that.

Haltingly, eagerly on the part of the Kaiser's admirals and generals, reluctantly on the part of his politicians and statesmen, Germany edged toward ordering her submarine captains to torpedo without warning any ship, regardless of flag or nature, that came within their sight; that is, to engage in "unrestricted submarine warfare." When unsought consequences developed, chiefly in the form of anger expressed by the American government, they edged back.[15]

After two years of intense, seemingly unending warfare on two fronts across the Continent from each other (one in Russia, the other in France), and the ever-worsening effects of the British blockade against which they were helpless, by the summer of 1916 the major figures in the German government, civilians included, could see no hope of victory except by means of an unrestricted submarine assault against British, other Allied, and neutral shipping. (The neutrals were included because they carried about 30 per cent of Britain's imports.) In October, with 96 submarines, the German government moved forward again. In February 1917 they went all the way.[16]

Appalled by the destruction of many civilian lives in sunken passenger ships, notably the Cunard passenger liner LUSITANIA, attacked in May 1915 with a loss of 1,200 lives, 128 of them United States citizens, the Americans had already made clear their opposition to any unrestricted submarine attacks. But the Germans were desperate, and they believed that, even if the Americans entered the war, they could not be effective enough soon enough to save the Allies. The Americans declared war on April 6th of 1917.

Perhaps because they believed in the maxim that *the best defense is a good offense* (strategic and operational thought in those days seems not often to have risen above the level of appealing maxims), the Royal Navy preferred patrolling (hunting) for U-boats, which they saw as being on the offensive, over gathering merchant ships

into convoys escorted by sloops and destroyers, which they interpreted as being on the defensive. Undeterred by the patrols, the U-boats kept on sinking ships. By the spring of 1917 one merchant ship in four that cleared a British port would fail to return; the Germans calculated that the end of the war at sea was nigh.[17] Gloomily, the British reached the same conclusion. When that end came, the Allied position on the Eastern Front (disintegrating), on the Western front (shaky), everywhere, would collapse. The war would end everywhere in German victory.[18]

In the nick of time the British and their new associates, the Americans, adopted the escorted convoy. The most authoritative comment on this is Grand Admiral Karl Doenitz's succinct observation in his memoirs that "the German submarine campaign was wrecked by the introduction of the convoy system."[19]

In another passage Doenitz tells us that when the convoys went into effect "the oceans at once became bare and empty; for long periods at a time the U-boats, operating individually, would see nothing at all; and then suddenly up would loom a huge concourse of ships, thirty or fifty or more of them, surrounded by a strong escort of warships of all types. The solitary U-boat, which most probably had sighted the convoy purely by chance, would then attack, thrusting again and again and persisting, if the commander had strong nerves, for perhaps several days and nights, until the physical exhaustion of both commander and crew called a halt. The lone U-boat might well sink one or two of the ships, or even several; but that was but a poor percentage of the whole. The convoy would steam on. In most cases no other German U-boat would catch sight of it, and it would reach Britain, bringing a rich cargo of foodstuffs and raw materials safely to port."[20]

In October 1918 Doenitz himself, commanding the 500-ton UB-68, in the Mediterranean, lost his submarine while he was attempting to attack a convoy, and he spent the last bit of the war in a British prison camp. Later he would put to good use both his experience and that of the U-boats in general when they were opposed by convoys.

The convoy system had not deprived the submarines of their information dominance. It had just made that dominance nearly irrelevant, for it had reduced the number of potential targets from many single ships to a few groups of ships, and when the subma-

rine's captain had, *by chance*, as Doenitz says, found such a group, he found it accompanied by an armed escort bent on frustrating, and if possible, destroying him. Even if a submarine's commanding officer sighted a convoy, because of the escorts he had to avoid closing on the surface. Compared to most merchantmen a submarine's speed on the surface was high; submerged its speed was low. Therefore, unless from the first moment the U-boat was ahead of the convoy, it was not likely ever to get into a firing position. Thus, even if the escorts never knew that a submarine had been nearby, they still would have frustrated its attack.

Admiral Hezlet gives us an example of this effect, in May 1918: "eight U-boats were on patrol in the south-western approaches to the British Isles, deployed to intercept convoys. In operations which lasted about a fortnight, thirty-six convoys passed through the area, but the U-boats made contact with only five of them. All five were attacked and three merchant ships were sunk. Two independent ships were also sunk in this area. In a similar period a year before against unescorted shipping, this number of U-boats would probably have sunk a hundred ships or more." The convoy escorts, Admiral Hezlet adds, sank none of the U-boats.[21]

The first American contribution to the war was with destroyers of which, on 9 April 1917 the Navy had 68, some in the Pacific, some on the Asiatic station, but most in the Atlantic. Six arrived at the British naval base, Queenstown, Ireland, early in May 1917. Early in July half the entire force was in European waters, and more would follow.[22] Their task was to take part in the protection of shipping. They were particularly called on to escort the transports with which the United States advanced its army 3,000 miles, across the Atlantic to France. This the destroyers did without losing a single transport to U-boat attack on the outbound voyage. (They did lose three largely empty transports on the return voyage.)

Many of those transports were former German passenger liners interned by their owners in American harbors in order to avoid capture by blockading British cruisers. Eventually there were two million American soldiers in Europe. They never became as skilled as were the experienced French, British, and German soldiers, but through their weight of numbers, and their vigor, they helped defeat the Germans on the Western Front. This, when combined with the

effect of the blockade on Germany, had enormous effect. Of that blockade, here is what Arthur J. Marder wrote: "The growing demoralization of the home front in 1918 caused by the blockade, and which culminated in a revolutionary outbreak, had given the *coup de grace* to the German military effort. The cumulative effects of food and clothing shortages,... and the absence of any hope of real improvement proved too much for the German people." It was not just the civilians who engaged in a "revolutionary outbreak." So did the sailors of the largely immobile High Seas Fleet, who mutinied for much the same reasons that motivated the civilians.[23]

That "demoralization... caused by the blockade" was what the desperate Germans had hoped their U-boats would achieve in Britain. The U-boats came close but then, as we have seen, their effort was *wrecked by the convoy system*.

In fact, the *convoy system* was the naval share of a great civil-naval effort beginning in Britain in 1917 aimed at overcoming the U-boats. Civilian leaders drove the Admiralty to repair damaged and worn-out merchant ships and to build new ones; they centralized and made orderly the hitherto helter-skelter scheduling of ships'sailings; made ports and railways more efficient; and established a system of food rationing throughout the kingdom, so that, despite the U-boats, everyone had enough, just enough, to eat.[24] Theirs was a great achievement.

Still, with only a few thousand officers and men (about a thousand to start with, five thousand lost, and 13,000 serving at the end), manning from beginning to end only about 350 small ships (of which half had been lost by war's end in November 1918), the Imperial German Navy's U-boat arm had nearly overcome an alliance that eventually included almost the entire world outside of Germany and its principal allies, the decrepit Austro-Hungarian and Ottoman empires.[25]

That was an impressive performance by a very small number of people at a time when navies measured their manpower in the hundreds of thousands and armies measured theirs in the millions. In four years that small number of officers and men sank 5,000 ships. No submarine campaign since then has matched that number. The average size of that vast, unfortunate armada of sunken ships was 2,400 gross tons: not large, but collectively they came to 12 million

gross registered tons, and that is a lot.[26] The most successful submarine commander in any navy, any war, was Lother von Arnauld de la Periere who, in the Mediterranean with his 685-ton U-35, sank more than 435,000 gross tons of shipping; put another way, 194 ships. Many of those ships went down as a result of fire from Arnauld's single 4.1-inch gun.[27] Clearly, in reaching those numbers Arnauld had no convoy escorts with which to contend. And, plainly, most of his victims were small ships engaged in the coastal and short-sea trades. Nowadays only a single tanker, or perhaps two together, might measure 435,000 tons.

There was still another impressive performance. This simple, practical instrument of war, employed directly upon shipping, the object around which naval war revolves, achieved its effect in the most brutal fashion. Because all too often they dared do it no other way, submarines torpedoed merchant ships, including passenger liners, without warning. Then, because they had no way of rescuing those who had survived the blast, they left them to the mercy of chance. Chance is not often merciful.

It was the brutality associated with the sinking of ships by submarines that was a primary cause, perhaps the primary cause, of the U. S. declaration of war on Germany and Austria–Hungary in 1917. Without the participation of the Americans probably there would have been no Allied victory; at best for them, after the Royal Navy's defeat of the U-boats, a stand-off on the Western Front, followed by a negotiated peace motivated by exhaustion on both sides as well as, in Germany's case, the urgent need to end the blockade. So, doing it the only way they could, the submarines nearly brought victory to their side. But, by doing it the only way they could, in fact they brought their own side down to defeat. For them it was a situation without solution.[28]

What about the other two revolutionary instruments that revealed themselves at about the same time as the submarine, the wireless radio and the heavier–than–air craft? By the summer of 1914 both had managed to show themselves as practical instruments of war. It was not until the autumn of that year that the submarine managed to show that it, too, was a practical instrument of war. In the *Great War*, radio communications and one of its offspring, communications intelligence, were to play major roles in the

deployment of forces strategically, operationally, and tactically, especially for the Allies, but not so effectively as they might have hoped in their struggle against the U-boats, for the latter were always better informed about their enemies than their enemies were about them. The submarine's impact on the war, then, was greater than that of radio and its derivatives. As for aircraft, though in the war of 1914-1918 they were built and used by the thousands, they had little influence on the course of events, either afloat or ashore. Both radio (and its derivatives) and the aircraft, however, would have enormous impact on events yet to come; in this writer's view, even greater than that of the submarine.

ENDNOTES

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SUBMARINES: WEAPONS OF CHOICE IN FUTURE WARFARE

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

For the purposes of this publication, the paper is presented here in two parts. The first part was published in the April 2004 issue of THE SUBMARINE REVIEW. The entire document as originally published is available online at www.lexingtoninstitute.org. Hard copies are available upon request to the Lexington Institute.

Part Two:

THE FUTURE SUBMARINE FORCE

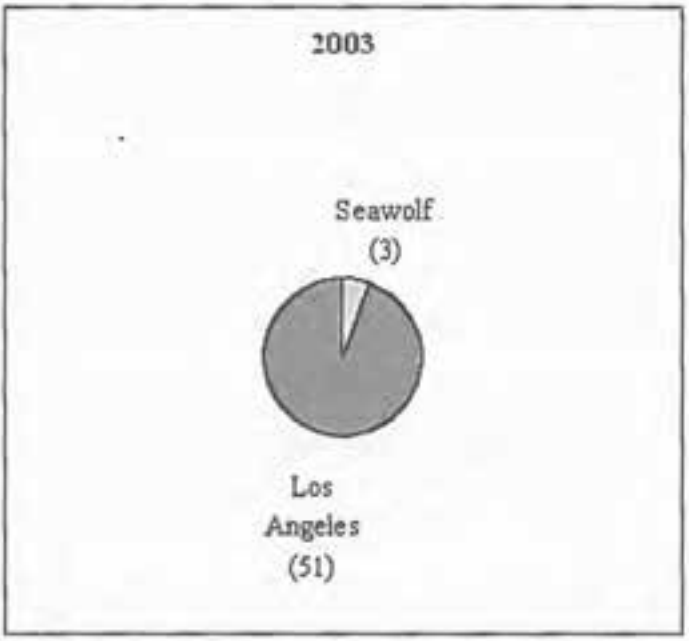
The Current Shipbuilding Program

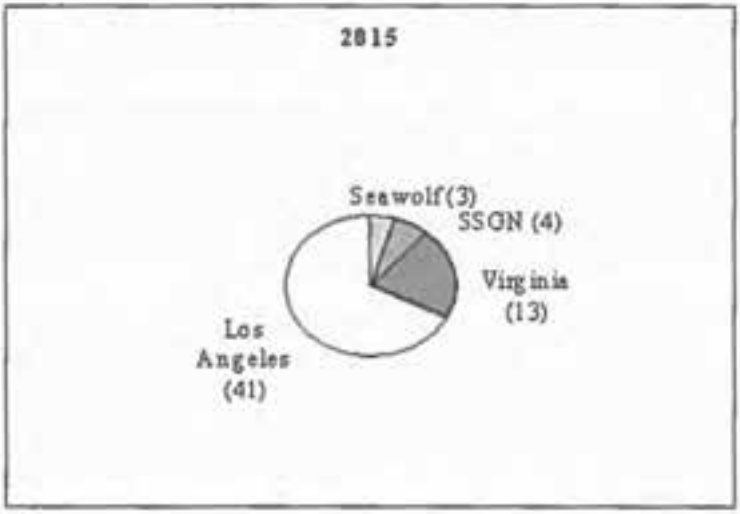
With the fiscal year 2004 budget, the Department of Defense proposed a plan for submarines that would acquire one new Virginia-class SSN a year in 2004, 2005 and 2006. These SSNs will join the five already approved and under construction, and with the 22 planned for the years beyond fiscal 2006, will be part of an overall inventory of 30 Virginia-class boats.

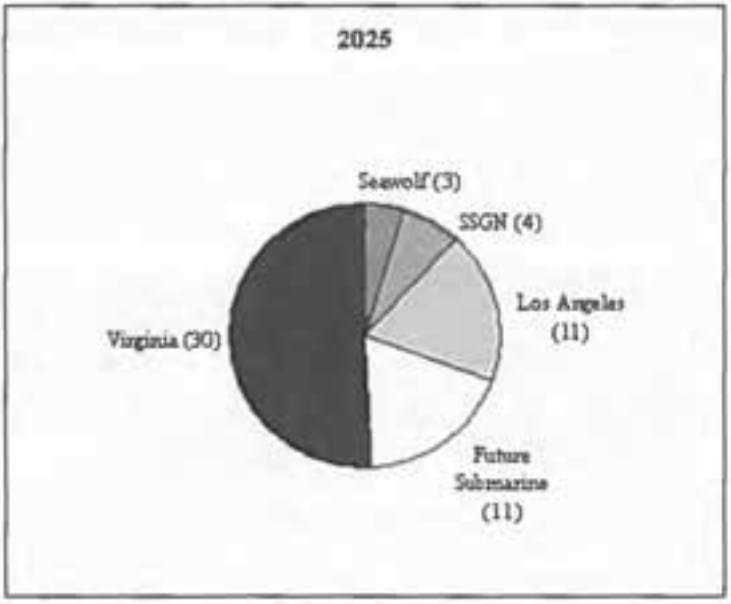
The plan also funds the conversion of one strategic SSBN to the SSGN configuration in 2004, and another in 2005, added to two earlier conversions funded in fiscal year 2003.

With this fiscal 2004 plan, the Defense Department also proposed a long-term program of shipbuilding that would increase the Virginia-class procurement to two SSNs a year in 2007, 2008 and 2009. This increase in the procurement rate was intended to support a fleet objective of 55 attack submarines, consistent with the 2001 QDR as discussed above. As this chart shows, through 2015 this objective will continue to be met based primarily on refueled Los Angeles-class submarines as the new Virginia-class slowly enters the inventory.

"Composition of the Non-Strategic Submarine Force"[7]



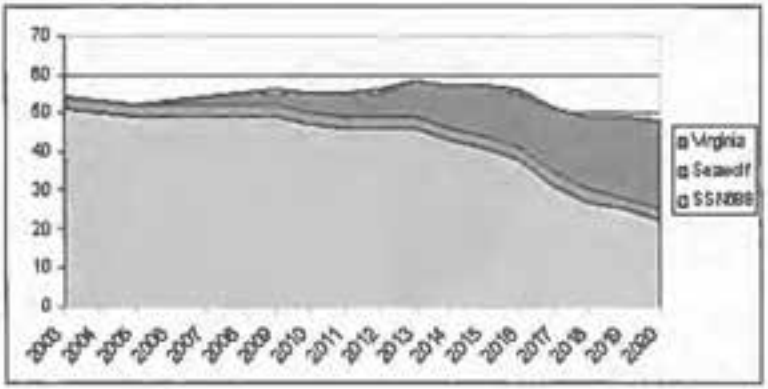

2015
Seawolf (3)
SSGN (4)
Virginia (13)
Los Angeles (41)


2025
Seawolf (3)
SSGN (4)
Los Angeles (11)
Virginia (30)
Future Submarine (11)

Around 2015, however, these older boats will begin reaching the end of their 33-year service life at the rate of 2.7 each year. In order to maintain the QDR force objective of 55 SSNs by 2025, the Navy must buy three submarines per year for much of the next decade. And, to meet the minimum JCS goal of 62 SSNs by 2025, it must begin buying three per year in 2008. According to the most recent Congressional Budget Office analysis, the Navy would have to more than double its current submarine budget to meet the JCS goal. Even meeting the more conservative QDR goal of 55 represents the "greatest procurement challenge facing the U.S. Navy. [8]
With its final approval of the 2004 Defense Appropriation, the U.S. Congress further complicated this picture by refusing to approve the plan to increase submarine procurement to two per year in 2006 and 2007.[9]

The table below shows the picture of a rapidly aging submarine fleet that must be replaced equally rapidly by a new generation of boats in order to sustain force structure goals. It also displays clearly the implications of failing to meet the *procurement challenge* of funding more than the two submarines per year in the Future Year Defense Plan.

SSN FORCE STRUCTURE[10]



How the SSGNs will factor into this SSN force goal remains an open question. The conversion program was not yet in place and thus not directly addressed by either the 1999 JCS study or the 2001 QDR. However, even including the four converted submarines in the SSN force number would delay by only two years the requirement to procure three boats annually.

The year 2025— indeed the year 2015— seems far away now, and the necessity of deciding on a force for that time frame perhaps doubtful. But again in their uniqueness submarines stand apart, requiring more time to manufacture than almost any other weapon system.[11] Starting with two years for advance procurement of long-lead time materials, largely for the nuclear reactor, and adding six years for actual construction, it takes eight years to add a new submarine to the fleet. Careful advance planning therefore is crucial to ensuring continuing American dominance of the undersea environment and its ability to affect operations ashore from under the sea.

Programs and Technology

The force numbers are half of the equation—simply reflecting the logistics of having a platform in place when you need it. The other half reflects the capabilities behind each platform, and here America is fortunate to be on the verge of realizing the benefits of years of research and development in the areas of submarine design and manufacturing, sensor and communications technology and operational innovation.

The three Seawolf-class SSNs were designed to be significantly more capable in anti-submarine warfare than their predecessor Los Angeles class, as befitting their Cold War orientation. The final boat of this class, USS JIMMY CARTER, will be delivered in 2005 with modifications to directly address today's requirements for tactical surveillance, mine warfare and special operations. The other two platform components of the future non-strategic Submarine Force structure are exciting for different reasons—the Virginia-class, because it is the first submarine to be designed with littoral warfare in mind, and the SSGN, because of the opportunities presented by its

enormous payload volume. Additionally, recent work in the areas of sensors, payloads, and communications will lend even greater capability in the future to these platforms.

Virginia Class Attack Submarine.

The Virginia program emerged in the early 1990's, out of the Navy's re-examination of the submarine mission after the collapse of the Soviet Union and termination of the Seawolf program. It is different from every other submarine in the world because it is designed to be dominant in both the open ocean and in shallow (littoral) waters. It will have a number of improved sensors mounted on its bow, hull and sail, as well as towed sensors, which will allow it to detect large objects such as quiet diesel electric submarines, and smaller objects including mines. In another *first*, VIRGINIA will not have a traditional periscope. Instead, two photonic masts mounted on the exterior will provide digital images, including color and infrared, directly onto screens in the central command station.

From the beginning VIRGINIA has been envisioned as a special operations platform. The design includes a special chamber that can house up to nine special operations personnel. With a lock-in and lock-out capability, the chamber allows people to both come and go while the submarine is submerged. If more people are needed to augment the Special Forces team, VIRGINIA's torpedo room can be reconfigured for more people and less weapons. Alternatively, the torpedo room can be reconfigured to accommodate other weapons or sensor payloads. All Virginia-class SSNs will be able to transport a dry deck shelter for special operations' mini-subs, including the new Advanced SEAL Delivery System, discussed below.

The first four Virginia-class submarines—commissioned in 2006 through 2009—will include all these capabilities. Future Virginia-class SSNs will boast even more improvements, with several significant enhancements now in development. Using a modular approach and emphasis on commercial components, the engineers have crafted a submarine design that could accept such major design changes as an advanced new reactor to fuel ever-growing energy demands, and an integrated all-electric drive propulsion system.

SSGN

This designation has been given to the four Ohio-class ballistic missile submarines that are being converted to fire only non-nuclear missiles. These four boats were made available by a 1994 review of U.S. nuclear posture that determined 14, rather than 18, SSBN's were sufficient for strategic nuclear targeting. Instead of retiring the extra four boats, as originally had been planned, the United States will convert them for other missions.

The first step of conversion involves removing the 24 ballistic missiles from their tubes in the middle section of the submarine. The huge space left behind—the tubes are contained in an area equal to the size of about four four-bedroom colonial houses—will be used to launch cruise missiles and both launch and recover special operations forces. The SSGN will carry 154 cruise missiles (compared to 38 weapons on the Virginia-class)[12] and at least 66 SEALs and their equipment. Two of the former missile tubes will be reconfigured to hold special forces undersea vehicles and large-diameter lock-in/lock-out chambers for access outside the submarine.

The tremendous carrying capacity of the SSGN presents many opportunities for future enhancements to the land attack, intelligence gathering and special operations missions of submarines. Ideas under consideration include unmanned air and sea vehicles launched from the SSGN to deliver supplies or gather information; long-range non-nuclear ballistic missiles for global strike; and a laboratory for analyzing samples for evidence of weapons of mass destruction.

Advanced SEAL Delivery System

The ASDS is a key program in the potentially transforming partnership between special operations forces and submarines. It is one of the Special Operations Command's top priority programs, and addresses the greatest weaknesses of earlier versions of swimmer delivery vehicles that included extremely austere conditions for the swimmers who get wet inside the vessel. Within the ASDS, divers can stay warm, dry and at atmospheric pressure until it is time to leave the vehicle and swim. This advantage expands the scope of potential missions to include those with long transit times and in very deep and/or cold water.

In development since the early 1990's, the ASDS program has experienced challenges but is now on track with delivery of the first craft in June 2003. The ASDS is more than 65-feet long, is battery operated and has a range of 125 miles. It is designed to carry special operations forces from the submarine to an offshore location where they can exit and swim to shore, later returning to the ASDS for the trip back to the mother submarine. The Navy plans to buy a total of six of these vehicles, but the second one will not enter service until 2009. It can be carried by specially modified SSNs, by the Virginia-class or by the SSGN's.

Sensors and Payloads

The 1998 Defense Science Board Study on the Submarine of the Future recommended a collaboration between the Navy and the Defense Advanced Research Projects Agency (DARPA) to look beyond the focus of traditional submarine research and development to emphasize sensors, associated vehicles and other interfaces with the water. Out of this recommendation DARPA's Advanced Sensors and Payloads program was born. This two-year program coincided with the decision to convert the four older SSBNs. Between these two initiatives, a variety of new options have emerged to enhance submarine operations of the future. Some of these options can be netted together to provide entirely new levels of situational awareness and operational effectiveness.

Unmanned Undersea Vehicles (UUVs)

Concepts for UUVs span the range of imagination. Both the Navy and industry have used UUVs—primarily vehicles connected to a manned platform via a tether—for years. The emphasis has been on communications and reconnaissance. More recently, research and development has expanded to include mine hunting capabilities, advanced intelligence gathering, high speed data transmission and logistics support.

In the recent *Giant Shadow* experiment with SSBN USS FLORIDA, the U.S. Navy demonstrated several of these missions using a large, autonomous UUV called SEAHORSE. More than 28

feet long and three feet wide, this experimental vehicle was launched from the SSBN and went on to both detect mines and ferry supplies between FLORIDA and special operations forces ashore.

SEAHORSE plotted a course through a simulated minefield using forward searching sonars. A smaller UUV, about the size of a torpedo employing similar technology is currently being deployed to the attack submarine fleet. The Long-Term Mine Reconnaissance System (LMRS) has a forward and side searching sonar that scans both the bottom and the water ahead. The information can be relayed back to the submarine through a radio-frequency link or stored aboard the UUV.

With the information provided by mine-plotting UUVs, submarines as well as surface ships can plot a course to avoid mines. Submarines once again provide the ideal platform for such an activity where secrecy is desired. Covertly deployed special forces or small UUVs could silently de-activate mines and maintain operational surprise for early-entry forces. Taken together, these technologies allow the preparation of safe transit routes for American vessels without the potential adversary ever being aware of the activity.

A derivative of the LMRS called the *mission-reconfigurable unmanned undersea vehicle*, or MRUUV, is being designed to exploit this underwater capability for missions beyond mine-hunting. By changing the sensor packages on the MRUUV, the vehicle can be adapted to best support the overall mission of the submarine carrying it. The MRUUV will be capable of clandestine intelligence gathering, surveillance and reconnaissance. The first MRUUV will be operational in fiscal year 2007. An even larger vehicle, two to four times larger than the MRUUV could be deployed by 2010. This vehicle would dock to a SSN, or could be carried inside a SSGN missile tube. Possible missions include launching UAVs and smaller UUVs.

Anti-Submarine Warfare

Already a top priority for the U.S. Navy, the ASW mission will only increase in importance as modern diesel-electric submarine technology continues to proliferate. Today 12 countries other than

the United States produce submarines. Most of these are U.S. allies, but many export their products to third parties. About 40 countries operate a total of 300 submarines worldwide. The capabilities of these forces vary a great deal, but several represent current and growing challenges for the United States, especially when operated in the complex environment of the littorals where interferences such as currents and shipping undermine acoustic signal processing.

The Littoral ASW (LASW) program within the Office of Naval Research serves as a focus for the Science and Technology efforts to counter these evolving threats to American power projection from the sea. The program is developing technologies to better locate, characterize and neutralize diesel electric submarines as well as other enemy capabilities such as UUVs. While SSNs are just one of the ASW platforms in the U.S. arsenal (others include surface ships and aircraft), once again their covert nature allows only submarines to perform the ASW mission at all times and under all circumstances.

Weapons

Building on the success of the Army Tactical Missile System (ATAMS), the Navy has put together an Advanced Concept Technology Demonstration designed to test naval adaptations of this system. A submarine launched version, planned for deployment later in the decade, will have the ability to carry a penetrating warhead for use against hard and deeply buried targets such as underground storage or command and control bunkers, or area munitions for softer, mobile targets.

A key advantage of the semi-ballistic missile system is its speed once launched. With advanced targeting technologies, an ATACMS-type missile can reach a target up to 250 miles inland within 10 minutes. In the case of targets like mobile missile launchers, which may be active—and thus observable—for only a short while, time is of the essence.

Networking

The stealth, endurance, firepower and special operations capabilities of the newest American submarines are truly remarkable. However, their full contribution to joint operations in both peacetime

and in conflict cannot be realized without effective communication links. In this new era of rapid decision-making based on real-time intelligence and targeting *chat rooms*, the Silent Service must be an integral part of the force network.

The Navy's Forcenet initiative intends to join together all naval sensors, platforms, command and control and data bases in an overarching information network to support joint operations. Submarines must, and can, be a part of this naval-wide network. The new high data rate antennas used by U.S. submarines during Operation Iraqi Freedom proved that submarines can be on the net, sending and receiving large amounts of information in real-time. The *Giant Shadow* exercise with FLORIDA networked a P-3 aircraft, acting as a surrogate Global Hawk UAV, small UAVs like the SCAN EAGLE and SEAHORSE UUV, allowing Navy special operations forces operating from the submarine to successfully complete their mock mission to destroy weapons of mass destruction.

Weapons of Choice

The future threat environment facing the United States is murky at best. It is clear the global war on terrorism will continue for some time, and regional conflicts or imminent threats will emerge. What isn't clear is where or when these things will happen. Keeping their consequences as far from the U.S. homeland as possible will be a key objective. In this environment, forward deployed forces with the stealth, persistence and capability inherent in submarines are destined to prove essential. Whether defending the homeland, deterring aggression overseas, or participating decisively in combat, submarines will continue to be a weapon of choice. Decades of commitment and investment have given America an overwhelming advantage in submarine technology, and continuing commitment and investment will ensure that advantage extends for decades.

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[8] Congressional Budget Office, *The Long-Term Implications of Current Defense Plans*, January 2003, pp. 59-61.
[9] In language accompanying the Defense Appropriations Bill, legislators suggested it was too early in the program to commit to a ramp-up in production in a particular year. Final action on the Bill occurred September 23, 2003.
[10] Office of the Secretary of Defense.
[11] A nuclear-powered aircraft carrier takes longer.
[12] Submarines fired 270 Tomahawk cruise missiles during Operation Iraqi Freedom, about one-third of the total. The 38 weapons on the Virginia-class include a combination of torpedoes and cruise missiles.

REUNIONS

USS NAUTILUS (SSN571) and SS168) - 50th Anniversary of Nuclear Power
Sept. 29 thru Oct. 4, 2004 in Groton, CT - Groton Motor Inn & Suites
go to Web Page http://www2.whidbey.net/rcave for details and registration forms.
POC: Al Charette 88 Somersett Dr. Mystic, CT 06355

USS EMORY S. LAND (AS39) 17-19 September 2004
Virginia Beach, VA
Contact: J. R. Black, 8214 Wedgewood Dr. Norfolk, VA 23518
757-583-0283 JRBSMB39@AOL.COM

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

USS DIABLO SS479 26-30 September 2004
Branson, MO. Contact: Ozark Mtn Sightseeing P.O. Box 1167 Branson, MO 65615

USS BUMPER (SS-333) ASSOCIATION 6-8 October, 2004
2004 Best Western Motor Inn
Vero Beach, Florida 32966 Contact: Edward W. Stone, Secretary
308 Merritt Avenue Syracuse, New York 13207-2713 Tel: (315) 469-3825

QUILLBACK, TRUTTA, PICUDA 21-24 October, 2004
Charleston, SC
Contact: Charles Krewson 109 Poweder Horn Drive Gaston, SC 29053
e-mail: ckrewson@sc.rr.com

SUBMARINE NEWS FROM AROUND THE WORLD

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From the March 2004 Issue

INDIA–Still Attempting to Lease Nuclear Submarine

As of the end of March 2004, conflicting reports continue to emerge concerning the Indian Navy lease of one and possibly two Akula class submarines from Russia. India, which has been in negotiation with Russia since 1991, is attempting to lease one unit of the nuclear powered Akula class as a stop-gap measure until its own nuclear submarine program (Advanced Technology Vessel) comes to fruition in the next decade.

India leased a Charlie I class nuclear powered guided missile submarine (SSGN) from Russia from 1988 through 1991 in order to train a core of 150 personnel for nuclear submarine operations. However, with a 20-year gap from 1991 to the first commissioning of the ATV in 2011, the Indian Navy finds its experienced personnel beginning to retire. This gap is putting pressure on the Indian Navy to conclude a deal with Russia to get an Akula as soon as possible in order to recommence nuclear-submarine training.

Reporting from many sources indicate that up to two units will be leased from Russia while other sources indicate that Russia has no submarines to lease at all. The answer probably lies in the middle with one unit available for India to lease. Price will probably be the critical issue as both sides have been negotiating since 2001, similar to the Gorshkov deal. What is known is that two Akula class submarines are under construction in Russia, the first being the submarine COUGAR, which is now complete and expected to be commissioned into the Russian Navy in 2005. The second unit is still under construction and is scheduled for completion by the end of 2005 and will probably be leased to India, arriving in Indian waters by the end of 2006 if the deal is complete.

When India completes the lease (by around 2015), the Russian Navy will probably take possession and operate the submarine as it attempts to rebuild its antiquated submarine force under the 2015 modernization plan.

RUSSIA–Navy Reentering the Submarine Business

On 19 March 2004, the keel for Russia's newest Borey (Project 995) class nuclear powered ballistic missile submarine (SSBN) was laid down. The newest vessel will be named ALEXANDER NEVSKY, and is expected to be commissioned into the Russian Navy (Rosiyskiy Voennomorsky Flot–RVF) by 2008. The first unit of the class, YURIY DOLGORUKIY, was laid down in 1996, however, due to funding shortages and redesign work, the unit was only 47% complete by 2000.

Other than the Borey class, the only other active submarine program in Russia is the AKULA class nuclear powered attack submarine (SSN), of which the COUGAR is expected to commission in 2005 and a second unit is under construction and will probably be leased to the Indian Navy.

Although Russia's nuclear submarine programs have been stalled for better than a decade, there appears to be a renewed emphasis on the strategic and tactical Submarine Forces of the sea services. Under the Naval Doctrine of 04 March 2000 and the Military Doctrine of 21 April 2000, the importance of submarine based strategic nuclear forces was emphasized as well as the renewal of the tactical Submarine Forces. Both programs were to be revitalized by 2015 and the recent start of the ALEXANDER NEVSKY as well as the completion of the COUGAR attests to the fact that Russia is again moving forward with its submarine programs following over a decade of decline.

INDONESIA–Naval Modernization Effort Progresses

In early March 2004, reports continue to surface concerning the continuation of the naval modernization effort by the Indonesian Navy (IN). Press reporting indicated that Indonesia intended to acquire up to four submarines from South Korea for around US $270M per unit.

Press releases subsequent to October 2003 suggested only two submarines would be procured although the IN had a requirement for up to six units.

Since the IN already operates two Type 209/1300 submarines, it is logical that the sea service would continue with the Type 209 series, and Daewoo Shipbuilding and Marine Engineering (DSME) already has experience in the construction of the Type 209/1200 (Chang Bo Go class). DSME constructed nine Type 209 submarines from 1989 through 2001 for the South Korean Navy, however, lost the follow-on Type 214 contract to Hyundai Heavy Industries. Since 2001, the only submarine related work for DSME has been maintenance for the Chang Bo Go class and now the first overhaul of the IN Cakra class. If the IN accepts the attractive offer of US $270M per unit, it appears that DSME will finally get its export market for submarines and the IN will get new submarines at considerably lower prices that if it had utilized European sources like the original Cakra class in the 1970s. It was originally thought that the IN would procure used South Korean Chang Bo Go class submarines as an incentive to buy additional used vessels, however, it appears that the IN desires four new units instead.

From the April 2004 Issue:

UNITED KINGDOM–Further Downsizing Leads to Future Cutbacks

On 01 April 2004, the United Kingdom announced that at least two of the three British aircraft carriers (ILLUSTRIOUS and INVINCIBLE) will be withdrawn from operational service with the third unit (ARK ROYAL) remaining in service. This announcement was in reaction to the Finance Ministry looking for ways to cut costs of 1B Pounds (US$1.7B) to address cash problems caused by a new accounting system and the Iraq War.

This is not much of a change from the present set up for the RN carrier force. One unit is typically on a two-day alert for operations, the second is generally on a 60-day standby with the third in deep refit or reserve meaning the changes for the carrier force must be considered minimal.

This decision, however, in conjunction with Ministry decision in late 2003 (following the Defense White-paper of 2003) to reduce the RN's surface combatant force from 32 to 27 units has lead to much speculation concerning overall force levels for the sea service. A final decision on any future cutbacks is not expected until July 2004.

Some of the proposals from both decisions are expected to offset costs of Iraqi operations as well as attempting to fund future naval procurements such as the new aircraft carriers under the CVF Program. Proposals to date include:

- Reduction of surface combatant force from 32 to around 27 units. The final number is not considered solid as the number continues to fluctuate and could very well be 28 or even 26. What is becoming more certain is that three Type 42 Batch I frigates will decommission, however, the decision on the two or possibly three Type 23s is not certain and will probably not be known until July. If the Type 23s are in fact decommissioned, these vessels could very well be resold to Chile as has been discussed several times. As for the Type 42 Batch I frigates, candidates may include: Bulgaria, Thailand, Brazil, Ecuador or even Portugal.
- **Discussions that the Submarine Force would be reduced from 12 units to 10 have also taken place. A reduction in force could have an impact on the Maritime Underwater Future Capability (MUFC) program possibly slowing the program.**
- Decommissioning of two aircraft carriers (ILLUSTRIOUS and INVINCIBLE). As discussed above, the RN carrier force currently is maintained in a status fairly close to the one discussed by the Finance Ministry. The impact is minimal for the short term. However, in the long term, all three carriers will become available for resale following delivery of the two new carriers under the CVF Program.

- Decommissioning of three Sandown class MCMVs has been discussed. At least one unit is already laid up and unserviceable meaning the decommissioning of two additional units will have a minimal impact on 22-unit mine-hunting force.
- Reduction of the Type 45 Destroyer purchase from 12 units to between a maximum of 10 to a minimum of 7. Like the other programs mentioned above, this issue will not be decided until July. A reduction to seven units will have a serious impact on the future of the RNs surface fleet.

Needless to say, the cutbacks as envisioned under the Defense White-paper of 2003 and recent announcements by the Finance Ministry could end up having a major impact on the RN if fully enacted in July. Long range planning suggests that the RN will begin to face considerable shortages in its surface and submarine fleets by the next decade if the trend is not reversed. Like many European fleets today, the RN will probably find itself scaling back on its commitments worldwide and in the time of crisis not able to respond with the flexibility that it was once able to.

Additionally, the United Kingdom like most of Europe will also find itself not able to fully support its shipbuilding industry. Large shipbuilders such as BAE Systems and the VT Group will find themselves struggling to maintain their respective infrastructures and labor forces as the numbers of new vessels continue to spiral downward.

PORTUGAL–Inks Deal for Two Type 209 AIP Submarines

After six years of debates, evaluations and negotiations, the Portuguese Navy (PN) signed a construction contract with the German Submarine Consortium (GSC) for Type 209 submarines on 21 April 2004 with an option for a third. The contract for the two U209PN submarines is worth €770M (US$911M) and includes €1.2B (US$1.42B) in offsets for Portuguese industry. Specific offset arrangements include the provisions for the LPD design to meet the PN's specifications, of which the GSC is teamed with Schelde Naval Shipbuilding.

The U209PN is tailored for the PN and includes Air Independent Propulsion (AIP) and other features of the later U214 design. Both submarines are scheduled for commissioning in 2009 and 2010. The ship length will be approximately 65m and displace 1700t submerged.

It must be noted that much criticism by the North Atlantic Treaty Organization (NATO) followed the contract signing. NATO believes that Portugal has no need for a Submarine Force. However the Portuguese position is that Portugal, although part of NATO, still has its own goals to achieve.

GREECE–First Type 214 Launched

On 22 April 2004, the first Greek Katsonis (Type 214) class submarine was launched from the Howaldtswerke-Deutsche Werft (HDW) shipyard in Kiel Germany. As the first fuel cell submarine for export, the PAPANIKOLIS will undergo sea trials prior to its commissioning in late 2005. The PAPANIKOLIS is the first of four Type 214s that will be procured by the Greek Navy. The first four units of the class are under contract, with the first unit built in Germany and the follow on three units to be build at HDW's subsidiary, Hellenic Shipyard in Greece. All four units are scheduled to commission by 2009.

A second batch of four units could be ordered by 2008 if the Greek Navy decides to maintain an eight-unit Submarine Force. The current Submarine Force consists of eight Glavkos class submarines that were commissioned from 1971 through 1980.

From the May 2004 Issue

GERMANY–Step Towards Consolidation
European Naval Industrial Consolidation

ThyssenKrupp Werften and One Equity Partners (OEP) signed a letter of intent to allow ThyssenKrupp to purchase Howaldtswerke Deutsche-Werft (HDW). ThyssenKrupp Werften would create a new shipbuilding group by combining HDW and its assets (Keil, Kockums AB in Sweden, and Hellenic Shipyards in Greece) together with their current shipyard group of Blohm + Voss Gmbh, Blohm+Voss Repair GmbH, and Emden. This new shipbuilding

group would represent some 9,300 employees in three countries with over €2.2B in annual revenues.

The agreement is for ThyssenKrupp to purchase all of OEPs shares in HDW by providing OEP €240M in cash together with 25% of the shares of the new shipbuilding group. A spokesperson at ThyssenKrupp said this represents a first step toward greater consolidation of European naval shipbuilding.

It's great to see Germany regain controlling interest in their indigenous shipbuilding industry. However, more interesting is Thyssen's belief this is a *first step*! Let's face it, with the continuous decline of naval ship new construction orders since the early 1980s, further consolidation is not just needed it is mandatory. Given the political and economic constraints of the European Union, a complete consolidation of EU naval shipbuilding is the end game sometime in the next 15 years.

With South Korea, China, and others owning the commercial shipbuilding for the foreseeable future, naval shipbuilding is where European shipbuilders will make their profits, which will become a more mandatory requirement for their survival. Now, given the complexity of today's naval warships the naval industry must embrace the fact that electronics, sensors, weapons, and systems integrators represent over half the cost of a naval warship. In fact, when we look at the typical European shipbuilder's value added contribution to a naval warship construction contract, it is approximately 8 to 12%. The command and control systems and weapons systems providers are the real significant valued added contributors with nearly 50%.

Right now, ThyssenKrupp will be seeking to consolidate its staff functions in reducing the operating costs of the new conglomerate. The facilities and the shipyard workers should not see much change. Where will the headquarters reside, Hamburg?

But when ThyssenKrupp is ready to look at step two or three in consolidation, AMI expects it will look towards systems houses such as Thales, SAAB, or AMS. Thales appears the likely candidate for this consolidation in that their strategy seems focused on being a naval warship prime. While they established ARMARIS to perform this function, there seems to be a lack of progress by ARMARIS in this endeavor. Since SAAB purchased Celsius and Kockums

Shipbuilding was sold to HDW, SAAB has still to decide on the breadth and commitment to its naval focus. Alenia Marconis Systems appears to offer the best consolidation partner with ThyssenKrupp.

From the June 2004 Issue

DENMARK–Danish Navy Stepping out of the Submarine Business

In June 2004, Denmark's Ministry of Defense released the Danish Defence Agreement 2005-2009. The new goals of Danish Defence include:

- Counter direct and indirect threats to the security of Denmark and allied countries.
- Maintain Danish sovereignty and protection of Danish citizens.
- Work towards international peace and security in accordance with the principles of the UN charter.

The white paper also emphasized that changes in the international security environment require that Danish Defense strengthen its capacities in two areas:

- Internationally deployable military capacities.
- Ability to counter terror acts and their consequences.

Denmark, like several other NATO nations are beginning to pick and choose what capabilities that they feel can be done away with. For the Danish, it appears that they believe there is an insufficient threat to maintain a Submarine Force and that under NATO; other member nations will retain the capability allowing them to depart the business.
Http://www.amiinter.com/wnpr/denmark/index.html

LETTER

TO THE CHARLESTON POST & COURIER TUESDAY, 11 MAY 2004

by Captain Richard T. Wright USN(Ret)

Our country lost a real hero and patriot when retired Navy Rear Admiral James B. Osborn died Mach 30th in Summerville. A brilliant man and inspirational leader, Admiral Osborn had a distinguished naval career that included service in three wars (World War II, the Korean War and the Vietnam War). During the last of these, he was in command at Danang in 1968 during the notorious Tet Offensive.

Of particular significance, he was one of the earliest pioneers in the Navy's submarine guided missile program in the early 1950s and commanded the first guided missile submarine, USS TUNNY (SSG 282). In the late 1950s, when the decision had been made to marry the nuclear-armed ballistic missile to the new nuclear-powered submarine, he was selected from a host of highly qualified submariners to be the first commanding officer of the USS GEORGE WASHINGTON (SSBN 598), our first ballistic missile (FBM) submarine, better known then as Polaris submarine, then being built at the Electric Boat Co. in Groton, Conn.

What is little known today is what an extraordinarily ambitious undertaking that new Polaris program was. Every element of the Polaris weapon system–missile propulsion, missile guidance, missile checkout, fire control, navigation, launcher and ship control–was based on state-of-the-art technology that had never gone to sea before, much less in a submarine. Today it takes more than a decade to place even an improved weapon system in operation. From conception to at sea on patrol, it took less than four years for the GEORGE WASHINGTON.

This was a monumental achievement, and the man most responsible for its early success at the shipboard level was Admiral Osborn. He conducted the first ever launch of a missile from a submerged submarine, then went on to take GEORGE

WASHINGTON on the first Polaris patrol from Charleston in November 1960. In conducting that first patrol, Admiral Osborn and his crew were required to overcome a myriad of difficult technical problems. The U.S. Submarine Force has conducted more than 3,000 ballistic missile patrols since then, many out of Charleston, and they have become almost routine about those early patrols.

Many observers credit the U.S. Navy's FBM submarine fleet with being the primary factor in our victory over the Soviet Union in the long Cold War the Soviets tried relentlessly to locate and/or neutralize our FBM submarine deterrent, but were never remotely successful. Admiral Osborn deserves great credit for his significant part in that great victory.

Admiral Osborn was a hero to a generation of submariners. His many devoted shipmates will always remember him and will miss him greatly.

Dr. Waldo Lyon Scholarship Fund

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

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BOOK REVIEWS

HUNTING ENEMY SUPERWEAPONS, CIRCA 1918

The Archaeologist was a Spy: Sylvanus G. Morley and the Office of Naval Intelligence,
by Charles H. Harris, III and Louis R. Sadler,
University of New Mexico Press, Albuquerque, 2003.

Reviewed by Captain Jamie Bisher

Jamie Bisher is a graduate of the U.S. Air Force Academy with a master's degree from the University of Maryland. He works with airspace management and maritime surveillance programs at Northrop Grumman Electronic Systems. His first book White Terror: Cossack Warlords of the Trans-Siberian, will be published by Taylor & Francis (UK) this year.

In April 1917, after a two-year terror campaign in which saboteurs had killed scores of American civilians in factories and on the high seas, President Woodrow Wilson reluctantly declared war on the Central Powers and very soon had to tackle the burning issue of whether the enemy could position U-boats—the superweapons of the era—to strike the American homeland. The critical question was: could Germany establish secret bases in Mexico and Central America that would enable forays against the Tampico oilfields (which produced 60% of the Royal Navy's oil), the Panama Canal, American shipping lanes or even US coastal communities? The question was fueled by unsubstantiated intelligence from multiple sources dating back to 1916 indicating that such bases already existed or were in the works.

Fortunately, the prewar Office of Naval Intelligence included a few thinkers who anticipated this strategic question and decided to pursue the answer in spite of obstruction from Josephus Daniels, the pacifist, landlubber politico that Wilson had rewarded with the title of Secretary of the Navy. The peacetime ONI had become *a*

professional backwater manned by a skeleton crew that was surely outnumbered by German intelligence officers and agents in North America. The depth of Naval Intelligence in the very shadow of the United States was so shallow that it could not even answer the question of whether or not a German *unterseekreuzer* might be making port calls in the Gulf of Mexico.

So, the arduous chore of digging up the answer fell to a handful of patriotic archaeologists, anthropologists and naturalists, an unlikely gaggle of eggheads who volunteered to ONI just before the US entered the World War. Most spoke Spanish, had enough field experience in the wilds of Central America to know the risks, and understood that their mission added another possible cause of death—murder by German agent—to an already lengthy menu of unpleasant tropical fates: bandits, rebels, drunken soldiers, wild rivers, landslides, deadly critters, festering sores, mysterious fevers, food poisoning, etc. A few volunteers would botch their missions and quietly resume their scientific careers. Others performed brilliantly.

Sylvanus G. "Vay Morley (1883-1948), a bespectacled, 34-year old scholar of Mayan history, organized and led the most successful team. Morley approached ONI in March 1917, took his navy physical on the 27th of that month, was commissioned an ensign on April 7, designated Agent No. 53, issued codebooks and a keyword, assigned mail drops in New York and Boston, outfitted by Abercrombie and Fitch, and was on his way to Belize April 22. His core team included a young illustrator, John Held, Jr., Dr. Herbert J. Spinden of New York's American Museum of Natural History and Dr. Samuel K. Lothrop of Harvard's Peabody Museum. Of the latter, only Spinden was commissioned before Josephus Daniels ordered a halt to reserve commissions; in a fit of bureaucratic myopia, the Secretary deemed it better to bar commissions to all volunteers rather than risk their issuance to *undeserving and well-connected individuals*. However, an ensign's bars would have been a minimal acknowledgement of the contributions and sacrifices that Held and Lothrop were to make.

These gentlemen accepted responsibility for a huge strategic area where lush tropical beauty and genteel culture masked a treacherous atmosphere of recurring biblical pestilence and byzantine politics dominated by paranoid caudillos and oligarchs.

Revolutionary Mexico practiced a pro-German neutrality, Guatemala's iron-fisted dictatorship embraced pro-Allied policy to spite Mexico, rival El Salvador asserted an anti-American policy in direct proportion to US-Guatemalan warmth, an anemic Nicaragua had been bled dry by extortionate New York creditors with political connections in Washington, and British Honduras was, of course, solidly behind the war effort but her citizens were more concerned with Mexican aggression against their Mayan brethren in the Yucatan. When Honduras severed relations with Germany in May 1917, Vay Morley pulled a small American flag from his luggage and, to the accompaniment of a military band, raised it alongside the Honduran colors over a baffled crowd and a formation of soldiers wearing *dirty cotton shirts and pantaloons, straw hats, and sandals and armed with machetes and flails*. The archaeologist-spy noted that "...the European War is more remote—less comprehended — than the life of the ancient races I am studying."

Morley's archaeological survey enabled him to reconnoiter from Campeche, Mexico to Bluefields, Nicaragua on the Caribbean side, and from Ayutla, Guatemala to the Gulf of Fonseca on the Pacific side, scrutinizing nearly two thousand miles of coastline of particular interest that could have harbored German activity. He reported on every suspect river, bay and lagoon, noting the varying depths, commerce, shipping, settlements and resident foreigners. After enduring just a few months of "ticks, mosquitoes, fleas, sandflies, saddle-sores, seasickness," scrapes with pompous bigwigs, and brushes with accidental death, Morley and company could dispel most rumors of secret German lairs, and by June 1918 they could conclusively declare that the ONI Section A-7, Yucatan and Central America, harbored no U-boats or enemy bases. Meanwhile, Morley built a well-placed network of reliable agents and informants, identified several German and Austro-Hungarian expatriates suspected of belligerent activities, reported extensively—in the thousands of pages—on local political and economic situations, and built goodwill by befriending presidents, generals, peasants, scholars, mariners and a cornucopia of others.

The authors, Charles H. Harris, III and Louis R. Sadler, are both historians at New Mexico State University with many previous works about the history of the American southwest and military

history south of the border. This book is the product of extensive, groundbreaking research, masterful collation, and expertise, truly "superb scholarship" as one reviewer put it.

Although one reviewer asserts that "many archaeologists will be made uneasy by the authors' lack of concern over the ethical issues raised by Morley's espionage," Harris and Sadler even address the modern anguish of liberal and leftwing academics who assert that Morley's *duplicity* endangers his professional descendants. The accusing reviewer, *Archaeology* magazine's David H. Price, appears unaware that the dangers and difficulties facing archaeologists overseas also face foreign aid workers, field engineers, missionaries, tourists and, indeed, all foreigners, who, in the eyes of counterintelligence services everywhere, are all suspects. This same ethical issue arose in 1919, when prominent anthropologist Franz Boas exposed some of the archaeologist-spies and even wrote about it in a letter to the editor of the magazine *The Nation*. Alas, Boas' outspoken pro-German sentiments were well known, and his self-righteous attempt to denigrate Morley and company boomeranged into Boas' public humiliation and professional ruin.

Harris and Sadler also provide a number of fact-filled appendices for scholars of Latin American and intelligence history. The Archaeologist was a Spy is the rare example of an excellent read that brings to light an untold tale of selfless heroes and a great reference book that fills a gaping hole in a piecemeal historiography. And finally, the findings of Morley, Harris and Sadler dispel the myths in submarine history of the Kaiser's secret U-boat bases in Mexico and Central America.

GALLANT LADY
A Biography of USS ARCHERFISH
by Ken Henry and Don Keith
Publication Date: June 2004
Tom Doherty Associates, LLC. Publisher
$25.95, 352 pgs., 24 photos
Reviewed by Captain Gordon W. Engquist, USN(Ret)

Captain Engquist was commanding officer of USS ARCHERFISH (AGSS-311) in 1964-65.

Gallant Lady is the first USS ARCHERFISH's twenty-five year cradle to grave *biography* from 1943 on. The World War II segment previously has been well documented, most notably in *Shinano!* in which skipper Captain Joseph Enright recounts ARCHERFISH's classic sea battle which ended in the sinking of the Japanese super carrier. Had ARCHERFISH exploits ended there, her place in naval history was secured. But a second significant segment—Operations Sea Scan—spanned her final years of service. This demilitarized cold war segment contrasts so strikingly with her wartime heroics that only a unique combination of events and personalities could have made it a story for the telling.

A middle period covering ARCHERFISH's post WWII years through the 1950s while homeported in Key West is also recounted. Twice out of commission, she was one of many fleet boats passed by for modernization. Services for the Fleet Sonar School were the usual routine. In 1959 ARCHERFISH was redesignated Auxilliary Submarine (AGSS) and, when scheduled for a third decommissioning, no one realistically thought she would ever be again brought into service. This may have been the reason that, though granted an eleventh hour reprieve, she arrived for refit at Philadelphia Naval Shipyard in sorry material condition. More on this later.

Operation Sea Scan was a survey of the earth's gravitational fields. Early missile tests by the Air Force had revealed that precise global gravity measurements were required for programming overflight missile paths. The Naval Hydrographic (later Oceanographic) Office was assigned responsibility for getting the data. The office contracted for development of sensitive ship-

mounted gravity-reading meters for the purpose. But in rough seas the meter readings were unreliable. Thus a submarine was proposed; in calm weather the boat could read unhindered on the surface while in transit; in rough weather the boat could dive to a stable depth. Enter ARCHERFISH.

For this assignment Operation Sea Scan required a unique crew. The qualifications were simple: only bachelors need apply. The word was sent to the Submarine Force: volunteers were wanted for an extended cruise to the far reaches of the world; no complicating family relationships, single men only. Implicitly, *homeport* would be more an administrative title than a practical assignment.

The allure proved so great that hundreds applied for the sixty billets. Even other submarines got into the recruiting act by dangling ARCHERFISH as a shipping-over incentive. Thus, a group of adventure-minded men came together at Philadelphia Naval Shipyard in late 1959.

The refit proved daunting. The boat was issued only $10,000 for ship's force repair and maintenance. Impossible. By this time all four main engines were out of commission along with numerous other major and lesser components. The still-forming crew, in transition, without firm direction, got to work in the only way available–by hook or by crook.

It required both. Cumshaw and salvage were the order of the day; when they proved inadequate, outright theft kicked in. The crew became experts in swiping parts and materials and anything else lacking. Victims were other boats in overhaul, the joint submarine mess at the shipyard barracks (eg, bulk coffee to be used as a cumshaw bait), and from the yard itself. Thefts were often from under the victims' very noses. Despite all, task versus schedule seemed impossible.

But the new personnel were taking hold. Arriving crewmen were largely experienced and heavy in leadership. New skipper Kenneth Woods and executive officer David Dimmick, free spirits themselves, found a crew of their own stripe bound more by urgency of commitment than regulation. Another rare leader appeared in the person of engineer officer Miles Graham. Graham, after a disgusted look around, relieved his predecessor on the spot and immediately shifted to flank speed. He demanded the impossible–and got it. With

the scheduled completion date endangered he ordered port and starboard work shifts–twelve on, twelve off–for the engineers. When completion still lagged, Graham arm-wrestled the Exec and cancelled *starboard*. Work, he said, till you can't stay awake, sleep in place, grab a sandwich when hungry, and forget about liberty. Giving draconian orders is one thing, having them obeyed willingly is another. Somehow, the unorthodox leadership of officers and crew jelled and tired old ARCHERFISH came together. But the results of that yard period were permanent. It was there that a renewed ARCHERFISH personality was formed and forged–us against the world. Even much later, when material and funding support caught up and wide-scale larceny faded into memory, the spirit survived changes of location, events, and personnel until the very end. And survives today as the crew reassembles in odd years to relive a colorful youth.

The boat was still shaking down when she deployed from New London in May 1960 on what would be known as phase I of Operation Sea Scan. The Hydrographic Office routinely assigned two or three civilian technicians to man the gravity meter. Called *Hydros* by the crew, these men became as much a part of ARCHERFISH crew as the sailors themselves. A number of them attend the boat's reunions.

The entire mission was initially envisaged to take two years. Phase I ranged across the Atlantic, northeast to the Arctic Circle, crisscrossing west and east as far as Hudson Bay to the coast of Europe. The liberty loving crew descended on British and Norwegian ports, and tolerated less exotic stops in Greenland. As fall set in, weather became a factor–heavy seas, icebergs, bitter cold–while occasionally surveying sketchily charted seas in marginal diving depths. Overtaken in Hudson Bay by the rapidly forming ice pack, unable to make even minimal headway, Woods ordered a dive. Eight hours later, with a flat battery and match-won't-strike air in the boat, they reached open water.

ARCHERFISH returned without fanfare to New London in later 1960. In February 1961 she transited the Panama Canal to start Phase II in the Pacific. She would never return to the Atlantic.

By this time longer range and more accurate missiles greatly expanded gravity data requirements. Thus, Phase II eventually grew

to Phase IV and one year stretched to seven. The crew fit with gusto into the Pacific's superb liberty ports in Japan, Hong Kong, Australia, New Zealand, the Philippines –to mention only some major favorites. Home port, Pearl Harbor, was more commonly visited in the later Sea Scan phases as the survey areas moved eastward. During those years of almost constant operation ARCHERFISH reliably kept the data rolling in to the Hydrographic–now Oceanographic–Office. Over the shank of those years the boat's material condition, pampered by a stable crew, even improved in many regards. This reviewer, for example, recalls no major engineering outage during his tour. But inevitably the boat was wearing out–even parts that aren't expected to fail eventually will, and did.

A combination of casualties resulted in ARCHERFISH's unscheduled decommissioning. While surveying out of San Diego the bow planes became inoperable. Fleet boats routinely drilled using stern planes only to control depth; thus, ARCHERFISH attempted to continue Sea Scan surveys with only the stern planes. But control proved to be erratic. In San Diego a diver discovered that the starboard stern plane had broken off at the yoke. Rust evidence indicated that the plane likely had been missing for some time.

With the higher priority segments of Operation Sea Scan complete, ARCHERFISH did not merit expensive repairs. She was decommissioned in May 1968 and sunk at sea that November as a target in the submarine torpedo test and validation program.

Gallant Lady's accounting of the Operation Sea Scan portion in particular may elicit skepticism from opposite directions. Those who were around when ARCHERFISH yarns were legion may complain that some juicy adventures are soft-pedaled or unreported. Others, contrarily, may complain that the authors let their imagination override accuracy–after all, ARCHERFISH was a US Navy submarine manned by US Navy officers and sailors, not a fictional *Operation Petticoat*. Only the first complaint is valid. And in the broad sense, in exercising restraint, the authors have caught the full range, the essence, and the spirit of a near-unbelievable saga of real men doing their duty first, then savoring liberty's rewards to the maximum. The entity unfolds with crisp style and good humor.

Co-author, Senior Chief Petty Officer Ken Henry was an engineman second class when he shipped over for ARCHERFISH

duty in 1959. In retirement he is ARCHERFISH crew's organizer and historian. His vehicle is *A-Fish-L-Blast*, newsletter and information exchange, which he writes and publishes. Over the years most of the yarns and high-jinks in Gallant Lady first appeared in the Blast, some told by Henry himself, the majority by other crewmembers. With the advent of a website (http://www.ussarcherfish.com), pre-Sea Scan personnel became aware of and involved in the organization and in recent years the *Blast* has expanded to cover the entire ARCHERFISH history back to 1943.

One of those pre-Sea Scan crewmen is Bob Robison, now a literary agent. Robison attended the 2001 ARCHERFISH reunion, got acquainted with Ken Henry, and Gallant Lady was conceived. Robison organized a publisher, and co-writer novelist Don Keith joined the team. Keith and Henry enjoy a happy and productive partnership as evidenced by the final product, Gallant Lady.

THE SUBMARINE REVIEW

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

Articles for this publication will be accepted on any subject closely related to submarine matters. Their length should be a maximum of about 2500 words. The League prepares **REVIEW** copy for publication using Word Perfect. If possible to do so, accompaning a submission with a 3.5" diskette is of significant assistance in that process. Editing of articles for clarity may be necessary, since important ideas should be readily understood by the readers of the **REVIEW**.

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

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This year the Dolphin Scholarship Foundation will fund 133 Scholarships, including 42 new recipients. Each grant will be $3,000, totaling $339,000 in Scholarship monies.

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USS SCRANTON (SSN 756)

LEVERING SMITH AWARD
FOR SUBMARINE SUPPORT ACHIEVEMENT
LCDR NONITO V. BLAS, USN
USS FRANK CABLE (AS 40)

FREDERICK B. Warder Award
FOR OUTSTANDING ACHIEVEMENT
LCDR VERNON N. HASTEN, USN
USS SCRANTON (SSN 756)

FRANK A. LISTER AWARD
FOR EXCEPTIONAL LEADERSHIP AND MOTIVATION WHILE SERVING AS A CHIEF OF THE BOAT
CDMCM (SS) WAYNE P. OWINGS, USN
USS OLYMPIA (SSN 717)

THE NAVAL SUBMARINE LEAGUE DISTINGUISHED CIVILIAN AWARD
FOR OUTSTANDING PERSONAL CONTRIBUTION
THOMAS R. NUTTER

GOLD AND SILVER DOLPHIN AWARDS
CDR CHARLES A. RICHARD, USN
Commanding Officer, USS PARCHE (SSN 683)

CDMCM (SS) RUSSELL C. NEAL, USN
USS PROVIDENCE (SSN 719)

NAVAL SUBMARINE LEAGUE LITERARY AWARDS
NAVAL INSTITUTE PRIZE – **RADM JERRY HOLLAND**
"REALLY NEW SSNs JANUARY 2004 ISSUE

FIRST PRIZE – **CAPTAIN JIM PATTON**
"SET CONDITION 2SC OCTOBER 2003 ISSUE

SECOND PRIZE – **CAPTAIN FRANK ANDREWS**
"THRESHER DEBRIS FIELD APRIL 2004 ISSUE

THIRD PRIZE – **MR. BILL GRIEVES**
"SKIPPER'S TRIBUTE APRIL 2004 ISSUE

FOR BEST ARTICLE BY AN ACTIVE DUTY OFFICER–
LIEUTENANT JOHN LEHMANN
"TIME TO RE-MAN THE DECK GUN JANUARY 2004 ISSUE

NAVAL WAR COLLEGE AWARD FOR BEST PAPER
ON SUBMARINES OR ASW
"ANTISUBMARINE WARFARE IN THE TWENTY-FIRST CENTURY
LIEUTENANT COMMANDER TIMOTHY N. KETTER, USN

6TH ANNUAL PHOTO CONTEST
FIRST PLACE: **STSMC (SS/DV) JEFF ROWE**
"PERSIAN GULF TRANSIT"
SECOND PLACE: **JOC KEVIN ELLIOT**
"USS HAMPTON (SSN 767) "Control Room"
THIRD PLACE: **MARION J. SNIPES**
"NAVAL SUBMARINE SCHOOL"

SUBMARINE SCHOOL
HONORABLE MENTION: **MARION J. SNIPES**
"CEREMONY ABOARD USS NAUTILUS"

NAVAL SUBMARINE LEAGUE

COMPARATIVE STATEMENT OF FINANCIAL POSITION

	31-Mar-04	31-Mar-03
ASSETS		
CURRENT ASSETS		
Cash	$ 76,840	$ 22,349
Cash Equivalents	44,955	13,576
Restricted Cash	0	4,411
Investments at Market	291,253	274,159
Prepaid Expenses	10,776	11,013
Accounts Receivable	868	1,448
Total Current Assets	$ 424,292	$ 326,956
FIXED ASSETS		
Furniture & Computer Equipment	36,359	27,879
Office Condominium	251,021	251,021
	287,380	278,900
Less Accumulated Depreciation	(121,276)	(114,123)
Total Fixed Assets	166,104	164,777
	$ 590,396	$ 491,733
LIABILITIES		
CURRENT LIABILITIES		
Accounts Payable	$ 983	$ 1,089
Deferred Income	87,680	79,985
Deferred Membership Dues	103,048	75,318
Rental Deposit	675	675
Total Current Liabilities	192,386	157,067
LONG-TERM LIABILITIES		
Deferred Membership Dues	133,435	144,898
Total Liabilities	325,821	301,965
NET ASSETS		
UNRESTRICTED		
Undesignated	243,413	21,381
Board Designated for Equipment	21,330	21,330
RESTRICTED	0	147,237
	264,575	189,768
	$ 590,396	$ 491,733

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

	Permanently Restricted	Unrestricted	31-Mar-04 Total	31-Mar-03 Total
REVENUES				
Contributions		$135,594	$135,594	$131,467
Dues		82,702	82,702	61,178
Annual Symposium		136,977	136,977	101,166
Subtech Symposium		254,781	254,781	291,331
Submarine Centennial	-0-	-0-		1,790
Bank Interest		114	114	118
Dividends	721	9,493	10,214	7,585
Advertisements		23,750	23,750	23,725
Rent		8,275	8,275	8,100
Net Realized & Unrealized Market Gain (Loss) on Investments	6,722	31,998	38,720	(30,832)
Royalties		20,554	20,554	-0-
Other		3,356	3,356	3,262
Total Revenue	7,443	707,584	715,037	509,311
EXPENDITURES				
Awards and Grant		70,552	70,552	11,113
Publishing		70,503	70,503	69,606
Promotion		35,772	35,772	33,759
Annual Symposium		130,472	130,472	114,635
Subtech Symposium		127,840	127,840	153,059
Submarine Centennial	12602		12,602	1,582
Chapter Support		14,131	14,131	13,279
Special				
Total	12,602	449,270	461,872	397,233
SUPPORTING SERVICE		178,358	178,358	185,124
Total Expenditures	12,602	627,628	640,230	582,357
INCREASE (DECREASE) IN NET ASSETS	(5,159)	79,956	74,807	(73,046)
NET ASSETS, BEGINNING OF YEAR	147,237	42,531	189,768	262,814
Transfer to Unrestricted	(142,078)	142,078	-0-	-0-
NET ASSETS, END OF YEAR	$0	$264,565	$264,575	$189,768

NAVAL SUBMARINE LEAGUE
HONOR ROLL

BENEFACTORS FOR MORE THAN TWENTY YEARS

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

BENEFACTORS FOR MORE THAN TEN YEARS

AMADIS, INC.
APPLIED MATHEMATICS, INC.
CAE USA INC. MARINE SYSTEMS
CORTANA CORPORATION
CUSTOM HYDRAULIC & MACHINE, INC.
DRS TECHNOLOGIES, INC.
DYNAMICS RESEARCH CORPORATION-SYSTEMS & TEST EQUIPMENT DIVISION
ELIZABETH S. HOOPER FOUNDATION
GENERAL DYNAMICS-AIS
HYDROACOUSTICS, INC.
KOLLMORGEN COPRORATION/E-0
LOCKHEED MARTIN CORPORATION
L-3 COMMUNICATIONS, OCEAN SYSTEMS
MARINE MECHANICAL CORPORATION
NORTHROP GRUMMAN CORPORATION-MARINE SYSTEMS
NORTHROP GRUMMAN SPERRY MARINE
PLANNING SYSTEMS INC.
RIX INDUSTRIES
ROLLS ROYCE NAVAL MARINE INC.
SAIC
SARGENT CONTROLS AND AEROSPACE
SIPPICAN, INC.
SONALYSTS, INC.
SYSTEMS PLANNING AND ANALYSIS, INC.
VEHICLE CONTROL TECHNOLOGIES

BENEFACTORS FOR MORE THAN FIVE YEARS

ADVANCED ACOUSTIC CONCEPTS, INC.
AETC INCORPORATED
AMERICAN SUPERCONDUCTOR CORPORATION
BURDESHAW ASSOCIATES, LTD.
CURTISS-WRIGHT ELECTRO-MECHANICAL CORPORATION
ELECTRO-MECHANICAL DIVISION
E. C. MORRIS CORPORATION
GOODRICH CORPORATION - EPP DIVISION
HAMILTON SUNDSTRAND SPACE SYSTEMS INTERNATIONAL DEVELOPMENT GROUP
MATERIALS SYSTEMS, INC.
MCALEESE & ASSOCIATES, P. C.
RAYTHEON COMPANY
SCOT FORGE

ADDITIONAL BENEFACTORS

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

NEW SKIPPERS

RADM John Barrett, USN(Ret)
Mr. Joe Buff
RDML(Sel) Fred Byus, USN
CAPT Robert Connelly, USN(Ret)
CAPT Henry Chiles, USN(Ret)
MMC(SS) Paul Deignan, USN(Ret)
FTG(SS) Michael Denk, USN(Ret)
Rev. Melvin Dornak
CAPT Wayne Fritz, USNR(Ret)
CAPT C. Michael Garverick, USN(Ret)
RADM Ralph Ghormley
CAPT George Graveson, USN(Ret)
CAPT Earl Griggs, USN(Ret)
RADM John Kersh, USN(Ret)
ENCM(SS) Kenneth Kinder, USN(Ret)
RADM Larry Marsh, USN(Ret)
CAPT George Martin, USN(Ret)
CAPT Willis Matson, II, USN(Ret)
RADM Jeffrey Metzel, USN(Ret)
LCDR Alban Pampel, III, USN(Ret)
CAPT John Pauslon
Mrs. H. G. Rickover
RADM Maurice Rindskopf, USN(Ret)
VADM James Sagerholm, USN(Ret)
Mr. John Sheridan
LCDR Jules Steinhauer, USNR(Ret)
CAPT Donald Terquin, USN(Ret)

NEW ADVISORS

CAPT James Adkins, USN(Ret)
PVT George Billy, USA(Ret)
RADM Herbert Bridge, USNR(Ret)
CAPT Christopher Brown, USN(Ret)
CAPT Alan Cabot, USN(Ret)
CAPT Howard Crosby, USN(Ret)
CAPT Carl W. Gronemann, JR., USN(Ret)
CAPT LeRoy Hebbard, Jr., USN(Ret)
Mr. Victor Hulina
CDR John F. Mangold, USN(Ret)
CWO4 H. "Lynn Miller, USN(Ret)
CAPT Oscar Nelson, USN(Ret)
RADM Sam Packer, USN(Ret)
ENC(SS) John Scairpon, USN(Ret)
RADM Hugh Scott, USN(Ret)
RADM Sumner Shapiro, USN(Ret)
ADM William Smith, USN(Ret)
CAPT James Van Metre, USN(Ret)
Dr. Anthony Wells
LCDR Paul Whitescarver, USN

NEW ASSOCIATES

ETCM(SS)Matthew Beckman, USN
RDML Jim Beebe, USNR
Mr. Randy Dean
MM1(SS) Sammie L. Collins, USN
CAPT Joseph Fallone, USN
QMCM(SS) John E. Kettenring, USN(Ret)
Ms. Ann Sauer
RADM John Seesholtz, USN(Ret)
CAPT Roy Springer, Jr., USN(Ret)
LCDR Gene Stanley, USN(Ret)
CDR Chris Thompson, USN(Ret)
LCDR Robert B. Thompson, USNR(Ret)
CAPT Larry Valade, USN(Ret)
Mr. Robert Wade

SPONSOR

ADM Bruce DeMars, USN(Ret)
VADM Daniel Cooper, USN(Ret)
VADM J. Guy Reynolds, USN(Ret)
Mr. John Welch

ETERNAL PATROL

CDR Raymond E. Vaughn, USN(Ret)
CAPT John OL. From, USN(Ret)
RADM James B. Osborn, USN(Ret)
CAPT John A. Webster, USN(Ret)
YN1(SS) Richard A. Gale, Sr., USN(Ret)
VADM John A. Tyree, USN(Ret)
CAPT William A. Whitman, USN(Ret)
James R. Scherling
CAPT James L. O'Keefe, Jr., USN(Ret)
LCDR Orlando A. Suarez, USN
CDR Paul W. Crutchfield, JR., USN(Ret)
COL Donald H. Hildebrand, Sr., USMC(Ret)
ADM Ignatius Joseph "Pete Galantin

WANTED to Contact: The fastest diesel submarine sailors. The Friends of Albacore Committee is seeking former ALBACORE shipmates. The Committee is working in partnership with the Port of Portsmouth Maritime Museum Association, a non-profit organization in whose care the historic ship ALBACORE is entrusted. The Committee is engaged in activities designed to preserve and maintain the historic ship and to present the role she played in the development of submarine design, operation and technology. All former crew members are invited to learn more about ongoing efforts by contacting us at "Friends of Albacore, P.O. Box 392, Kittery, ME 03904-0392".