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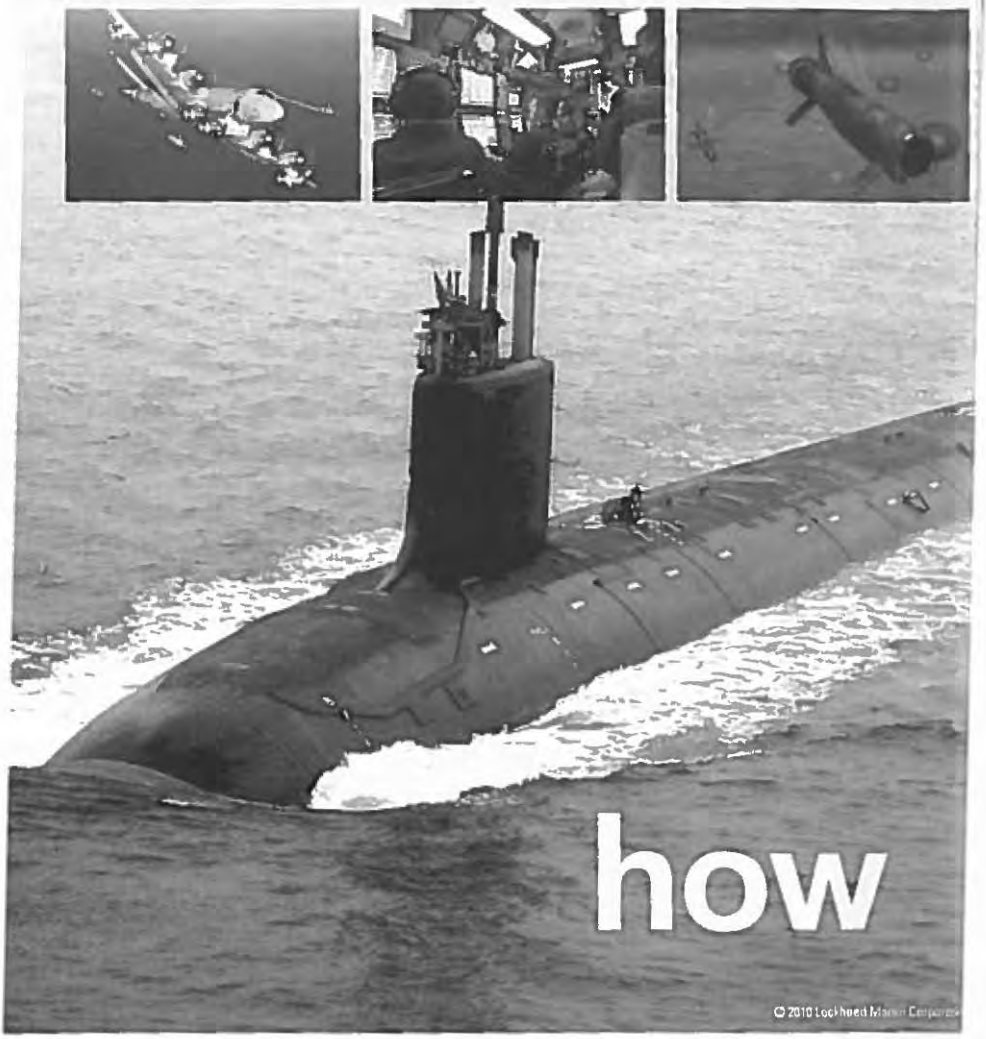

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EDITOR'S COMMENTS

The FEATURES of this April 2010 issue are particularly appropriate for the season. The remarks given by the Hon. Sean Stackley, the Assistant Secretary of the Navy for Research, Development and Acquisition, go to the heart of the Navy's Shipbuilding strategy, and they show that the acquisition of submarines—ballistic missile and attack—are at the heart of that strategy. They also point out that national concerns for return to financial health do not bode well for that strategy. The message seems to be that it is to the advantage of every segment of the submarine community to continue to be the best of the best in operations, acquisition, program management, R & D—of all classes of development categorization—and most importantly, in excellence of performance across the board. It is that kind of record which is needed to keep our community at the forefront of national security attention during the *lean days sure to come over the next ten to twenty years.*

The second FEATURE is by Admiral Jim Holloway, a career carrier pilot who was the CNO during the late seventies. For all of the younger members of the submarine community, us older types can certify that things were a bit unsettled at the time , both internally with the aftermath of *Watergate*, and externally with the active expansion efforts of the Soviet- sponsored *Wars of Revolution.* All the while the US was trying to negotiate government-to-government nuclear arms control with a national regime which did not foster optimism about its stability/longevity. It took a good bit of Leadership, Institutional Saavy, Unparochial Understanding of Naval Strength , and plain Fortitude for the CNO to stand up to the National Leadership and refuse to let naval cruise missile capability be used as a *Bargaining Chip.* It would help to evaluate those days, and Admiral Holloway's position, to recognize that a few years earlier the *Sea Launched Cruise Missile* was pushed in development by the DoD leadership precisely for its *bargaining chip* value. There are many lessons to be learned from ADM Holloway's article. Not the least is that admirals are expected to *stand fast* when called upon. Another lesson seems to

be that the juniors have to insure that their seniors are aware of their individual capabilities if the seniors can be expected to *stand fast* when the time comes to do so.

The third feature is written by a nephew of our own Captain Ned Beach, about the First Submerged Circumnavigation. The year was 1960; GEORGE WASHINGTON had not yet gone on its first patrol , NAUTILUS had been to the North Pole, and SEAWOLF, in its original reactor configuration, had conducted an extended submerged operation, but the four SKATES and the SKIPJACK were the only other SSNs at sea and doing great things. It was truly a cruise which tested the crew's mettle and proved the skipper's *tenacity.* More than that, however, it again proved to all who cared to listen that the US Navy could go anywhere, at anytime, and do what ever was required. It's a good sea story about doing what had to be done. On the fiftieth anniversary of the First Submerged Circumnavigation it's a good thing to do to re-read about one of the forerunners of all we've done since.

Also in this issue is RADM Jerry Holland's second half of his *Reflections* on the sea-centered part of the Cold War. It is important that the leaders of today's Navy, and especially those who will lead tomorrow's Navy, know just what was done, and how it was done, to bring that long, very dangerous confrontation to a peaceful and victorious end. This is particularly true for the practitioners of Submarine Warfare—because it was the credibility of US submarine capability which built to that happy conclusion.

Jim Hay
Editor

FROM THE PRESIDENT

The Submarine Force is taking delivery of submarines ahead of schedule and at or below cost. The commissioning of USS NEW MEXICO (SSN 779) on March 27 is the latest in the series of early deliveries that has resulted in the funding of two submarines per year in the Five Year Defense Plan and Navy Shipbuilding Program.

The Naval Submarine League completed its fiscal year on 31 March 2010 achieving its goals and objectives. Modest progress was made restoring the corpus. The League's investment portfolio is positioned with securities that have performed better than the overall market. The Corporate Benefactors sponsorship of the Annual Symposium, Corporate Benefactor Recognition Days, and the Annual History Seminar provided almost $160K. This generous support allows the League to keep the cost for attending events down while providing outstanding quality in both program and venue support.

Corporate Benefactors continue to be the lifeblood of the NSL. Eight new benefactors were added during this fiscal year more than compensating for departing benefactors. When you see Corporate Benefactors at one of the League events, please thank them for their continued support. Individual name tags and a blue ribbon identify Corporate Benefactors. I will continue to encourage new submarine-related businesses to join the League as Corporate Benefactors.

The Corporate Benefactor Recognition Days held 3-4 February 2010 had good attendance in spite of the threatening weather. This event was a success in every measure. The active duty submarine flag officers' participation and the guest speakers were highlights of the event. More than 240 members of the League's submarine support community attended the reception following Admiral Kirk Donald's remarks and appreciated the opportunity to interact with the active duty flag officers. The Honorable Sean Stackley, Assistant Secretary of the Navy for Research, Development and Acquisition spoke to luncheon attendees on the importance of sound development policy and program execution. His remarks

are in this issue. At the Congressional breakfast Senator Jack Reed, (D-RI), addressed members on the importance of achieving the two submarines per year acquisition goal. He is a strong supporter of the Submarine Force. In addition to the Submarine Force leadership of Vice Admiral Donnelly and RADM Haney, RDML Dave Johnson provided an excellent report on the OHIO Replacement Program and the incorporation of many new technologies that will enable additional cost reductions and improved system reliability.

The Submarine History Seminar, *"Ocean Surveillance in the Cold War,"* is scheduled for April and will address the contributions of undersea systems to the overall success of the Cold War ASW mission. This seminar continues to be an outstanding resource in providing first-hand testimonies by submarine pioneers.

The Submarine Technology Symposium will be held at The Johns Hopkins University Applied Physics Laboratory 11 to 13 May 2010. Registration for this classified event is open. The agenda can be seen on the registration website which can be accessed through the League's website www.navalsubleague.com.

The final NSL event for 2010 will be the Annual Symposium to be held at the Hilton McLean Tysons Corner, Virginia on 20-21 October 2010. The Submarine Force Fall Cocktail Party will be held on the first evening of the program. Please look for the mailing to all members this summer which will include a ballot for the election of NSL Board of Directors' members.

Your Naval Submarine League continues efforts to increase membership and focus on initiatives to recruit members who are active duty, retired, or submarine advocates. I ask each of you to recruit a new member by asking friends and associates to join the Naval Submarine League.

The online Membership Directory provides an outstanding resource for contact information on League members. Your assistance in updating this resource is appreciated.

On a personal note, I want to thank all of you for your prayers, encouragement, and support to Jan, me, and our family during this difficult time. Jan and I truly appreciate your messages on the

Caring Bridge website and your calls, cards and visits. We are humbled by the recognition you have afforded us through the Dolphin Scholarship established in our name. I sincerely appreciate the recognition you have made on my behalf with the institution of the VADM J. Guy Reynolds Award for Excellence in Submarine Acquisition and my designation as President Emeritus of the Naval Submarine League. Let me also add my personal appreciation to Admiral Rich Mies for picking up my duties as President of the League during my illness.

Jan joins me in wishing you a healthy and refreshing spring.

J. Guy Reynolds

President Emeritus

In Memoriam

The Naval Submarine League reports the departure of VADM J. Guy Reynolds, USN (Ret) on his Eternal Patrol March 29, 2010

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Dedicated shipbuilders of the *Virginia*-class submarine program (pictured left to right): Jerome Stokes (shipfitter), Harriet Towns (foreman), and Brian Stockunas (construction supervisor)

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THE SUBMARINE REVIEW IS A PUBLICATION OF THE NAVAL SUBMARINE LEAGUE

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FEATURES

NAVAL SUBMARINE LEAGUE CORPORATE BENEFACTOR'S DAYS

REMARKS BY THE HONORABLE SEAN J. STACKLEY, ASSISTANT SECRETARY OF THE NAVY, RESEARCH, DEVELOPMENT & ACQUISITION 4 FEBRUARY 2010

Good afternoon, and thank you for this opportunity to speak with you today.

Given that the budget, the QDR, and the 30 year shipbuilding plan are all released this week, the timing for this event is particularly conspicuous.

Today, we're a 285-ship Navy, and on any given day, about half of our battleforce is underway; supporting operations in Iraq and Afghanistan, providing Maritime Security in the western IO, Building Partnerships with nations on both African coasts, conducting multi-nation exercises with allies in the Pacific, and with neighbors in the Americas, standing, as a shield, against the threat of ballistic missiles while on watch in the Sea of Japan, testing and training off our coasts, to relieve the watch, and, of course, providing humanitarian assistance—today in Haiti—and tomorrow, wherever disaster may strike.

And while these very evident displays of what has been called, "A global force for good" dominate the media; quietly, our Submarine Force maintains persistent surveillance in regions of interest, conducts special operations un-detected, trains and operates at the chokepoints of the world, to assure access in the event our freedoms, or the freedom of our friends and allies, are threatened, stands poised to conduct conventional strike missions a thousand miles inland from wherever the waters may reach, and serves as the enduring, reliable deterrent that has underpinned our national security strategy for near half a century.

Today, we're a 285-ship Navy, arguably, with greater reach, greater command of the seas, than any Navy at any point in history.

Our primacy as a naval power is virtually unchallenged, due to the skill, dedication, and resourcefulness of our Sailors and Marines who are called to perform the Nation's business under the most stressing conditions imaginable. And it is given to us to place in the hands of these young men and women the weapons and systems that they need to win the fight we're in and to return home safely. And too, it is our responsibility to provide the capabilities and capacities to win the next fight; wherever, whenever our freedoms are met with violence. This is our call, our common ground—to protect the Nation and to take care of our men and women in uniform. And looking back—over this past year—how have we—Navy and industry, together—How have we done?

GEORGE H.W. BUSH, CARL BRASHEAR, GREEN BAY, STOCKDALE, DEWEY, TRUXTUN, WAYNE E. MEYER, MAKIN ISLAND, WALLY SCHIRRA, NEW YORK, INDEPENDENCE, and NEW MEXICO, ... all, have reported for duty.

As well, we christened GRAVELY, MATTHEW PERRY, JASON DUNHAM, and MISSOURI;

Well and truly laid the keels for

- FORD, CHARLES DREW, FORT WORTH, AMERICA, SPRUANCE, SOMERSET, CORONADO, and CALIFORNIA,

And cut steel on

- ZUMWALT, WASHINGTON CHAMBERS, WILLIAM MCLEAN, FORTITUDE and NORTH DAKOTA.

Together, these ships would represent the second most powerful Navy in the world. Meanwhile, MV-22 went to sea on BATAAN, the Joint Strike Fighter arrived at Pax River for testing by the Navy and Marine Corps, FireScout deployed on McINERNEY, standard Missile opened up the battle space in testing out at White Sands, BENFOLD demonstrated Aegis' ability to detect and engage a short range ballistic missile and a low altitude cruise missile, simultaneously.

And perhaps most significantly, the Mine Resistant Ambush Protected All Terrain Vehicle, the MRAP ATV, arrived in Afghanistan. Of particular interest to this group, VIRGINIA is writing a new chapter in naval warfare during her maiden deployment, SSGNs are, today, providing continuous two-theater coverage; we demonstrated a submarine's ability to communicate and potentially control a UAV, exploring a new role in support of strike and irregular warfare missions.

Meanwhile, Common Missile Compartment design work for the OHIO and VANGUARD replacements is underway; Navy and industry teams continue to capitalize on lessons learned, with NEW MEXICO four months early, OHIO Class refuelings proceed on schedule; and we look forward to commissioning NEW MEXICO and MISSOURI, christening CALIFORNIA, laying the keels for MISSISSIPPI and MINNESOTA, and, in what promises to be a very special occasion, starting fabrication of the JOHN WARNER.

And, as an important historical note, we decommissioned USS LOS ANGELES following 33 years of honorable service and 18 deployments in the defense of our Nation. These are tremendous accomplishments that the community can be very proud of.

The bar is high. Now, we need to talk about raising the bar. I noted earlier that we delivered the 30 year shipbuilding report to Congress this week. Of *ALL* the annual reports to Congress, none generates greater debate in the building, interest in the press, or consternation on the Hill than this report, more formally titled, *The Annual Long Range Plan for Construction of Naval Vessels.*

In the building, we fight over every word, every dollar, and every number in the report. It is at once an important and an imperfect document, important because it provides today's best insights to the force the Navy intends to build to meet operational requirements for the foreseeable future. Imperfect, because these requirements can, and do, change rapidly in response to emerging threats, emerging technologies, and elusive budgets. When asked the value of a 30 year plan that tends to change annually, I offer a few observations.

First, 30 years is about the average service life of a warship which suggests that that's about how long it takes to build a Navy. In fact, our naval superiority today, in large part, is due to decisions made by our predecessors some 30, and even 50 years ago.

Such is the nature of shipbuilding – that we must take the longer view. Of course, then we were building a Cold War Navy, and no one could precisely envision today's era of naval dominance, the role of networks and information, the advent of unmanned systems, sea based missile defense, or the specter of irregular warfare; however, the fundamental roles and missions and therefore, architecture, of our Navy have proven enduring:

Global Presence
Sea Control
Carrier Strike
Air Defense
Maritime Security
Strategic Deterrence
Amphibious Lift
Humanitarian Assistance

A second observation is that the report has great value if for no other reason than it forces the Department to size itself up each year, anew and confirm that we have drawn the right balance across the numbers and mix of ships that make up our Navy, and as well, across our budget, our requirements, and uniquely in shipbuilding, our industrial base.

A final observation is that it is ultimately the responsibility of the Congress "to provide and maintain a navy", the role of industry to build that navy, and the burden of the taxpayer to pay for that navy, and so it is only right that we should provide our vision for our future fleet to explain it, to debate it, and when all other options have been exhausted, finally, to build it. And despite the change of times, many of the issues we confront today as we consider the challenges in building our future Navy, were similarly confronted by our predecessors.

Consider this memorandum, written by the Assistant Secretary for Shipbuilding & Logistics 3 decades ago:

Subj: Navy Acquisition Policy in the 1980s

Secretary Lehman and I are fully committed to insure the Navy has the ability to fund and man the Navy's expansion program in the 1980's. We are equally concerned with our ability to manage our industrial base and assure production in an affordable, timely manner for those programs now being authorized by Congress.

Certainly, the more glamorous issues of acquisition are those such as how many CVN's and F/A-18's should be built, but it is the detailed negotiation and actual production through fair and equitable contracts with our multitude of prime and sub-tier producers that will ultimately provide a more capable Navy.

Accordingly, I want to share with you some of the primary management principles that I believe must mutually guide us in our quest to achieve an equitable sharing of responsibility and risk between the Navy and its suppliers. Most of these principles are not new, but it is important that they not be treated as terms of past rhetoric, but as future commitments, if indeed we are to realize a 600 ship Navy.

Specifically, our improvement principles should include:

- *Judicious use of Taxpayers' Dollars.*
- *Management Accountability.*
- *Competition.*
- *Fair Share Contracts.*
- *We need to place greater emphasis and commitment to long range planning to create mature, stable programs.*
- *We must give the highest priority to both the quality and quantity of our civilian and military contracting and program management personnel.*

With very few edits, this memo has served as preamble to policy and 30 year shipbuilding reports in the decades since. And

the 600-ship Navy that resulted has served our Nation well. The decade of the 80s gave us Nimitz, Los Angeles, Ohio, and Aegis —in numbers that would assure our naval superiority to this day.

The challenge before us now—as these ship classes approach retirement—is that we cannot replicate the rate of construction of that era, and yet we must increase our build rate of the past decades in order to realize a 300 ship Navy.

So, what does that portend in the FYDP?

Over past years, the CNO has outlined his requirement for a 313-ship Navy. That is not 313 in 2013, but it's forward-looking, it considers today's missions and anticipates the capabilities and developments of potential adversaries ten and twenty years ahead. To this end, we plan to procure 50 ships across the 5 years of the FYDP, perhaps most significantly, regarding the Submarine Force, we've requested funding to increase VIRGINIA class construction to 2 boats per year in 2011...and, across the new attack and strategic programs...we intend to sustain submarine construction at this rate for the next quarter century.

To ensure our readiness to begin construction of the OHIO Class replacement—in 2019, we are investing significantly in Research and Development inside the FYDP to bring the needed design and technologies to bear that will ensure the survivability and effectiveness of this platform for the next generation, and the generation after. Arguably, submarine construction dominates the plan for the next 20 years; we do this with deliberation. This is the need of the Navy and the Nation, and it's a damned good thing that the Submarine Community—the Program Executive Office, the SYSCOM, the Shipbuilders, and the Vendor Base are sufficiently strong and in stride, and eager to answer the call. Because the need is great. Despite this planned investment, the far-term points towards a gradual decline in Submarine Force structure driven by the rate of retirement of today's 688 fleet.

That reality drives emphasis towards availability, readiness, and combat effectiveness. Clearly, today's VIRGINIA submarines bring capability that outmatches the submarines she replaces, and more importantly, those she opposes. Her life of hull and core effectively serves as a force multiplier.

Her technology insertion strategy is key to ensuring that we maintain our tactical advantage in the decades ahead, and frankly, we are only beginning to understand the contribution that unmanned vehicles bring to the submarine mission as we develop these capabilities in concert with fielding VIRGINIA.

The Issue—before us all, however, is affordability. In the most pragmatic terms, in balancing requirements, risk, and realistic budgets, affordability controls our numbers. The fact is that acquisition costs have increased faster than our top-line, and that drives very difficult choices within the budget process, which over the long term, takes a measure from our hands as we shape the future force...over the long term, takes capability from the hands of our Sailors and Marines.

This requires that we closely examine the way we do business with a clear eye on controlling cost. There are no quick fixes and the principles are well understood, but it's worth a moment to outline a few of those principles we're working on. It all starts with requirements, and so our first priority is on tightening the standards for our technical assessments and improving the quality of our cost and schedule estimates that inform our requirements decisions at the front end in order to reduce the risk of broken programs at the back end. VIRGINIA cleared that hurdle.

As we move forward with the Sea Based Strategic Deterrent AoA, we must ensure that the OHIO Class replacement does likewise. We are drawing a distinction between what systems *could cost* and what they *should cost*, and addressing risk in the budget while driving to a greater understanding of how we need to construct our acquisition strategies to meet a *should cost* objective. To quote Secretary Mabus, "nothing is sacred." Across the Department, we're placing greater emphasis on competition and, too, on the use of fixed price contracts. We are intent upon opening up competition on programs and subcontracts that have traditionally been sole-sourced, but have priced themselves out of the range for justification of continued sole-sourcing.

This is a particular challenge for the submarine community, where unique requirements across a highly specialized industrial base provides limited opportunity for competition.

Then-CNO Mullen addressed this challenge, however, by creating a different competition—competition for resources in the budget process. Much to the credit of folks in this room to meet CNO Mullen's mandate for affordability, "2 for 4 in 12" has become "2 for 4 in 11" this year. As industry is well aware, and quick to remind us, stability is key to affordability. Within the bounds of the budget, we seek to provide stable procurement rates across the 30 year shipbuilding plan. At the individual program level, authority to change requirements and to change contracts is being reined in. At the Department level, we have emphasized stable procurement rates in the 2011 budget and the authority to change that program in POM 12 is likewise being reined in.

Our goals for modernizing today's force and recapitalizing the fleet affordably cannot be accomplished without sustaining the health of the industrial base and likewise, cannot be accomplished without strong performance by our industry partners.

The defense industrial base is a strategic asset, fundamental to our national security, and it's essential that we have a clear understanding of the issues affecting industry's performance. To this end, with particular regard for the unique characteristics of the shipbuilding industrial base, we will be building upon past studies this spring to assess our shipyards, the vendor base, and the design industrial base with an eye towards capability, capacity, and productivity requirements needed by our Navy near-term and far-term. As well, to provide a government-industry forum for open discussion and debate, and advise on acquisition policy and broad industry trends and matters—outside of the confines of a contract - we are establishing an Industrial Base Council with participation by Navy, other services, and industry, and I'll be looking for engagement in the near future.

In the end, industry must perform. We will work to benchmark performance, to identify where improvements are necessary, to provide the proper incentives for capital investments where warranted, and to reward sustained strong performance with more favorable terms and conditions. As I've stated before, my goal is for the defense corporation to spend less time describing the

concerns of the Street to me and more time describing the concerns of the waterfront to the Street.

To meet our objectives, we must be smart buyers. We have gone far in the course of the past year to reverse the downsizing trend in the acquisition workforce. From supervisors of shipbuilding, to the warfare centers, to the SysComs and program executive offices; we've filled vacancies and have added more than 2000 professionals in the fields of systems engineering, manufacturing, program management, contracts, and T&E. Of course, we have much farther to go. The objective is not merely to increase the workforce, but to restore core competencies that have slipped loose over the course of a decade and a half of downsizing.

Admiral Rickover once offered, that

> *"Good ideas are not adopted automatically. They must be driven into practice with courageous impatience. Once implemented they can be easily overturned or subverted through apathy or lack of follow-up, so a continuous effort is required."*

We serve today in a Navy that Admiral Rickover began to shape a half century ago. And though today's is a very different world, complicated by different challenges and new dangers, what we learned through the SKIPJACK and PERMIT and STURGEON and "41 for Freedom", brought us LOS ANGELES and OHIO; and as we move forward from SEAWOLF to VIRGINIA and the next BOOMER, we need be careful to heed Rickover's wisdom, and drive into practice with courageous impatience those good ideas needed to ensure our continued naval dominance for the next half century.

Thank you for your support of our Navy and this opportunity to join with you today. ■

THE SURVIVAL OF TOMAHAWK

by ADM James L. Holloway III, USN (Ret.)

The following article is adapted from the book, Aircraft Carriers at War. A Personal Retrospective of Korea, Vietnam and the Soviet Confrontation *by Admiral James L. Holloway, III, USN (Ret).*

The book has recently been awarded one of two honorable mentions for the 2007 Theodore and Franklin D. Roosevelt Naval History Prize, which honors outstanding work on American naval history. It is given each year by the New York Council of the Navy League in cooperation with the Franklin and Eleanor Roosevelt Institute and the Theodore Roosevelt Association. The prize commemorates the contributions made by Theodore and Franklin Roosevelt while serving as assistant secretaries of the Navy and their support of the Navy during their presidential administrations.

The book has also been selected by the Chief of Naval Operations for inclusion in the Navy Professional Reading Program as a primary offering in the "Leadership" collection. It is one of five books to be added to the NPRP library since that program was launched in October 2006.

In early 1976, President Gerald Ford was running hard for renomination facing a very strong challenge from Ronald Reagan, and he was very anxious to consummate some sort of a SALT II agreement to show progress in his administration for arms limitation.

At that time the Secretary of State and National Security Advisor, Henry Kissinger, was in Europe negotiating with the Soviets on these issues and Kissinger cabled back from Vienna the outlines of a new treaty to which he had tentatively agreed. This agreement would ban the deployment of the Tomahawk missile on submarines, and limit its deployment on surface ships to only ten cruisers with ten Tomahawks each.

Kissinger had previously sent the outline of this agreement to the Pentagon for comment. Secretary of Defense Donald Rumsfeld and Chairman of the JCS General George S. Brown both indicated their agreement by initialing the draft. General Brown had previously shared this information with me, aware that the Navy was the principal service affected. I told him that the Navy would definitely oppose such an agreement, as Tomahawk was very important in the future plans of the Navy. It was essential to provide our submarines, cruisers, and destroyers with standoff weapons. This was absolutely necessary to provide them with an offensive capability into the twenty-first century and thus extend their useful life in the Fleet.

I told General Brown—and this was in my authority as a member of the JCS—that I wanted a meeting of the Chiefs to review this proposal and to develop a formal position for the JCS, with all of the members participating. General Brown agreed to call a meeting of the Chiefs to get a JCS position on the cruise missile before the proposal went to the NSC for a final decision.

However, very shortly after that, both General Brown and Secretary Rumsfeld left Washington to attend a NATO ministerial meeting in Oslo, Norway. It was at that juncture that the President called a meeting of the National Security Council to formally review Kissinger's proposed agreement. In the absence of the Secretary of Defense and the CJCS, the Deputy Secretary of Defense, Bill Clements, and I as acting Chairman attended.

The announcement of the NSC meeting came on very short notice and I had less than an hour to prepare myself before going to the White House. I immediately tried to call all the chiefs, but I could locate only General Lou Wilson, the Commandant of the Marine Corps. He felt we should not agree to a treaty without a formal review by the Joint Staff and a meeting of the JCS. Armed with this backing, I went off to represent the Joint Chiefs of Staff in a NSC meeting chaired by the President.

President Ford first spoke to the Council very much in favor of the proposal, remarking on the fortunate political timing of the agreement. Then, the President went around the table, asking each representative for his position, I was under tremendous pressure.

All of the other members of the National Security Council, as they were queried, were voting in favor of the Kissinger agreement. I was one of the last members the President called on and he probably expected me to echo General Brown's position. But George Brown had not brought the matter before the Joint Chiefs of Staff so, by initialing the proposal, he was only expressing his personal position, not that of the Chiefs. I replied that I was aware of the President's desire for a SALT agreement, and how important it was to the nation that we have one. But in representing the Chiefs, I had to say that our responsibility was to secure the SALT agreement that was best for the security of the nation, both now and in the future, and that I was persuaded that this was an unbalanced agreement in that we were giving up a tremendous military capability in the cruise missile for a transient reduction in throw-weight on the part of the Soviets. I was convinced that the potential for the cruise missile in the U.S. Navy was virtually unlimited. We saw it as the principal weapon of the future for our cruisers, destroyers and submarines and were considering an airborne version for use by naval aircraft. I added that, given an opportunity to review the treaty, the JCS would not recommend it be accepted.

The President was obviously upset. But he was honest and in his reply said, "Admiral, I asked for your view and you gave it to me, but I want you to think about it very carefully, because this is a vitally important decision we are making today." I replied that there was no question in my mind that the Chiefs would not be in favor of it, but I pointed out in words to the effect that, "Mr. President, you are the person that has to weigh the considerations from all aspects, including domestic politics, the views of our allies and the reaction of the USSR. You can certainly make the decision to go with this agreement with the Chiefs registering their disagreement. It is a Presidential decision. If you say it will be done, the treaty will be approved by the NSC. But in the ratification of the treaty in the Congress, the Chiefs will be called upon for their views. It is the responsibility of each member of the Joint Chiefs of Staff to give his personal opinion, and the Chiefs

will have to say we disagree, and that we advised the President of our disagreement."

The President then said, "We have everybody in the room voting for it, except for the Joint Chiefs of Staff. But I have to say, I will not go against the judgment of the JCS in matters such as this. Jim, will you go back and meet with your colleagues and discuss this with them again, and make sure you are accurately representing their position? We will reconvene the NSC meeting at 4:00 p.m. this afternoon."

When I arrived at the Pentagon, the other Chiefs were standing on the front steps of the River Entrance to meet me, and we immediately went into executive session in the tank. The Chiefs, to a man, were very positive in their position that we should not give up the cruise missile for the tradeoff that was offered in the proposal.

At the 1600 White House NSC meeting, I reiterated the fact that the Chiefs were unanimous in recommending in the strongest terms that the President not agree to this proposal. So the NSC meeting was adjourned with the NSC Staff being directed to send a message to Secretary Kissinger that the Joint Chiefs of Staff were opposed to the agreement, and that the President had decided he could not agree to the proposal without JCS support.

As you can imagine, I was not very popular at that time. The only people who told me that I did the right thing were Fred Ikle, who was the Head of the Arms Control and Disarmament Agency and his deputy, John Lehman, who was eventually to become the Secretary of the Navy. Lehman discusses this incident in some detail on page 167 of his book, "Command of the Sea."

As a sequel to this story, many years later in 1988, I was a member of the Commission For a Long Term Integrated Strategy, along with Henry Kissinger among others. During one of our meetings, Dr. Kissinger said to me privately, "Admiral, at one time I was very mad at you." And I knew he was referring to the cruise missile incident. I said, "Mr. Secretary, I know you were, but we all have to do what we have to do." He chuckled and said, "Well I'm not sure your decision wasn't the right one."

The Tomahawk cruise missile has become the most important offensive weapon in the arsenal of the U.S. Navy's surface combatants, destroyers and cruisers as well as submarines. Ballistic missile submarines are being modified to remove SLBMs and replace them with Tomahawks. It is effective against ship and land targets. Modern warships carry up to 80 of these missiles in vertical launchers. During the U.S. campaign in Afghanistan, the submarines, destroyers and cruisers of the Fifth Fleet, operating off the coast of Pakistan in the Arabian Sea, fired 176 Tomahawks in the first hour of the war against targets in Afghanistan with 90% effectiveness, to pave the way for the carrier strikes and the airborne assault. In the *shock and awe* phase of Operation Iraqi Freedom, 250 cruise missiles were fired into Iraq from the Fifth Fleet surface combatants and submarines.■

USS TRITON (SSRN 586): First Submerged Circumnavigation of the World

by Mr. John Beach

The ship which left New London, Connecticut for her shakedown cruise on the afternoon of 16 February 1960 was already unique. She was the only non-Soviet submarine to have a dual reactor propulsion plant, and at a length of 447½ feet and surface displacement of nearly 6,000 tons, was the largest sub ever built. I recall clearly the day TRITON was launched, 19 August 1958, when as a boy of eight-and-a-half I stood on the dock at Groton, staring high up at the line of men in dress-whites on the forecastle, and with the help of the unfortunate Electric Boat official who had drawn *children's duty* finally located my uncle Ned Beach who had not yet ascended his platform. Equally vivid is my memory of the afternoon of 10 May 1960, when I came home from school and my mother gave me the newspaper with Ned's photo and the astonishing story of TRITON's submerged circumnavigation on the front page. Today, although half a century has passed, this epic voyage remains as one of the proudest and most significant achievements in the history of our Navy.

Following TRITON's launch in 1958, fitting out and preparation for sea trials would require another thirteen months, during which the crew were assembled and organized into a cohesive ship's company. Both the future skipper and the executive officer, Ned Beach and Will Adams, had undergone months of nuclear power training at the NAUTILUS prototype power plant near Arco, Idaho to prepare for service on the only two-reactor nuclear submarine in the fleet. The entire engineering crew came directly from TRITON's own prototype at West Milton, New York.

But whatever their background, all officers and men aboard TRITON were proficient in their duties, and as the circumnavigation would later prove, "goddamned good people." Having passed her initial sea trial at the end of September 1959 and preliminary

acceptance trials during the latter part of October, TRITON was commissioned on the tenth of November, commanded by Captain Edward L. Beach, Jr. The ship had been named for the sub TRITON of World War II, which after compiling an outstanding record, was presumed lost to Japanese depth charges on 15 March 1943 and now rested at the bottom of the South Pacific. But her ship's bell had been removed before that tragic day and kept for years by her first skipper, whose widow now graciously presented it to the grand new ship of that name.

Ned Beach, first son of Captain Edward L. Beach, Sr., was a highly-decorated submarine officer who had seen action at the Battle of Midway and in twelve combat patrols in the Pacific. From 1953 to 1957 he had served as naval aide to President Eisenhower, and was also the author of the best-selling novel, *Run Silent, Run Deep*. Tom Clancy was later to write, "Ned loved the Navy as a man might love his own family. For the Navy *was* his family, the junior officers he trained and the enlisted men who did so much of the hand-labor in the boats. He served with distinction approaching perfection and, like his father, would then write about the things he'd seen and done."

Torpedo trials and special tests followed the commissioning, and in early December 1959 TRITON returned to Groton for installation of some new communications equipment. All aboard were grateful to spend the holidays with their families but became restless in January and were anxious to leave the dock at Electric Boat. The ship was scheduled to begin her shakedown cruise to the North Atlantic on 16 February and valuable time was passing. Finally, toward the end of January, EB finished the equipment installation and TRITON got under way immediately to complete all remaining tests and evaluation. She returned to New London late in the evening of 1 February 1960, and once safely moored, Captain Beach came down from the bridge and found waiting on his desk a soiled and slightly crumpled envelope, apparently carried some distance by hand.

Operation Sandblast

Inside was a brief note: Ned was required to be in Washington in three days and was to call immediately for instructions. Accordingly, early on the morning of the fourth of February, he appeared in civilian attire at the office of the Deputy Chief of Naval Operations for Fleet Operations and was ushered at once into an inner room. Maps were spread out on a large table, and in addition to the Deputy Chief, Admiral Wallace M. Beakley, two other admirals and a number of captains and commanders were present. Almost immediately, Admiral Beakley came to the point. "Beach," he said, "you're about due to start your shakedown cruise. Can TRITON go around the world— submerged— instead?"

"Yes, Sir!"

And so TRITON's carefully prepared trip to the North Atlantic would be scrapped for a Top Secret expedition infinitely more exciting, but the departure date of 16 February must still be met. *Operation Sandblast*, the name chosen for the circumnavigation, would closely follow the track of Magellan's voyage of 1519, and among other activities was to collect oceanographic and gravitational data. But Captain Beach was puzzled by a remark made at the end of the conference: "There's a lot more riding on this than what you've heard today, Ned. We're depending on you to get back on the tenth of May!" The crew were not to know of the change in plans until TRITON was under way, but this presented a number of problems. Personal affairs would have to be arranged for an extended voyage which was sure to raise questions. Additional provisions and instructions to all hands to lay in an extra supply of personal necessities were issued. The secret of the voyage could not be kept from the officers and Chief Quartermaster, however, because there was simply too much work for them to do. And although it was not *entirely authorized*, Ned's wife Ingrid was given the clue. But one bit of information Ned did withhold was the urgency of returning on time.

A sea trial on 15 February uncovered a few problems with some of the new gear installed for the expedition, however emergency repairs the next day at Electric Boat put all but the

wave motion sensor back in commission. But TRITON could not be delayed for that final piece of equipment. So at 2:16 PM on Tuesday, 16 February 1960, her last line was taken in and the great ship eased away from the dock at Groton to earn her place in history.

Bound for "The Rocks"

An hour and a half later, TRITON passed Montauk Point Lighthouse, turned due south, and increased speed to flank. A couple more hours and she had reached the thirty-five fathom line, and Captain Beach gave the order to take her down when ready. "Depth one hundred and fifty feet, no closer than seventy-five feet from the bottom; at one hundred and fifty feet sounding, follow the bottom on down to running depth." A short time later he returned to his tiny stateroom, sat at his desk, and began his report: "Dived. We shall not surface until May."

The first leg of the voyage was a 3,250-mile run to St. Peter and St. Paul's Rocks, a small group of islets some five hundred miles northeast of the bulge of Brazil and fifty miles north of the equator. This was the point selected for the start and end of TRITON's circumnavigation. By the afternoon of 17 February the crew had realized that the ship was not on course for the North Atlantic and pressure was building on Captain Beach to inform them of their true destination. His announcement was heard throughout the ship: "Now, at last, I can tell you that we are going on the voyage which all submariners have dreamed of.... We have the ship and we have the crew. We are going to go around the world, nonstop. And we're going to do it entirely submerged!"

The Court of King Neptune

On 24 February TRITON reached the vicinity of St. Peter and St. Paul's Rocks—barren and forbidding bits of land topped with guano. For several hours she cruised slowly about, gathering data and photographs, while those who were interested were permitted to come to the conning tower for a look.

Four hours later TRITON hit the equator with a grinding jolt, or more accurately, a water slug fired from the forward torpedo

room. What followed was a time-honored tradition; that all those who had not crossed the equator before (known as pollywogs) must be properly indoctrinated. The captain was promptly notified that King Neptune and his Royal Party had just arrived on board and that his presence was desired in the crew's mess hall. He wrote in the log:

"2003—Their Majesties, Neptunus Rex, and his Queen, accompanied by Davy Jones, the Royal Baby, and the entire Royal Entourage, ascended from the depths and entered the ship through the After Torpedo Room escape trunk to greet all Loyal Shellbacks and to visit their wrath upon the lowly pollywogs who had dared to enter his realm."

After assuming operational control of TRITON, Neptune summoned unworthy pollywogs one by one into the Royal Presence to be confronted with evidence of their guilt—and to tremble in fear before his Magnificent Grandiloquence.

There followed accusations of great crimes and incredible wickedness against the hapless pollywogs, all of whom were incompetently defended by the Royal Sea Lawyer who had never won a case. Terrible punishments were inflicted with glee, such as artful haircuts other humiliations, but at the end of his ordeal each wretched pollywog received a salt water shower to remove the last vestiges of pollywogness. Thus purified, all became loyal Shellbacks and worthy to enter the watery realm of the Royal Ruler of the Raging Main. The first leg of her trip now completed, and all those willing now initiated into the mysteries of the deep, TRITON proceeded toward the southwest and Cape Horn.

Triple Trouble

The run down the coast of South America started well enough, but good fortune was not to last. On 1 March the ship's doctor told Captain Beach that J.R. Poole, Chief Radarman, might have a kidney stone. Usually the condition cleared up spontaneously, but if not, treatment would require special medical tools which TRITON did not carry. Without that proper care the individual would suffer terribly and in extreme cases could die. While pondering how to help Poole, Ned received another

disturbing report. There was a problem with the fathometer. The strength of the echo was becoming noticeably weaker and the equipment could fail completely at any time. As TRITON would be traveling in uncharted waters, a working fathometer was vital, but if need be, precautions could compensate for its loss.

That evening brought more bad news—something might be seriously wrong with one of the reactors. But apart from monitoring the readings to see that they didn't go over limits, and investigating to determine if the issue were caused by a design flaw which might manifest itself in the other reactor, nothing needed to be done at the moment. Poole, fortunately, was better.

In the control room men were working on the fathometer problem, and after ascertaining the status, Ned proceeded toward the engineering spaces. Soon after joining the engineers there, he received a call to the effect that the trouble with the fathometer had been located and would be fixed in a couple of hours. But then the next reactor readings were delivered and showed the plant to be at the limits of safe operation. "Shut her down," said the captain.

With the reactor secured, all readings were carefully reviewed and before long the crucial anomaly was located. There was nothing wrong with the plant after all—the problem had simply been an error in calculation. Captain Beach gave instructions that this be verified and then made his way forward, his only concern now being Poole.

Mission in Jeopardy

Poole's condition worsened during the early morning hours of the following day, at the same time that the sonar picked up a possible submarine contact. The *submarine* turned out to be a school of fish, but Poole's situation was real and had to be resolved before TRITON rounded Cape Horn. From a briefing prior to departure, Captain Beach knew that the cruiser MACON was likely to be in the waters near Uruguay. If necessary, it might be possible to transfer Poole to MACON—how to do so without surfacing was a question for later.

Surprisingly, Poole improved that day, and on the morning of 3 March he looked almost well. TRITON's course for the Cape would bring her close to the Falkland Islands and a run near Port Stanley for photo reconnaissance. But just as the ship came within range of the Falklands, the doctor sought out the captain once again. It was Poole, and he was worse than ever.

There was no question about risking Poole's life. He had to get to a hospital even if it meant jeopardizing the mission. TRITON turned and raced north toward Montevideo. Her plea for help was drafted, encoded, and transmitted. It concluded: "Can MACON meet us and transfer Poole?"

Rendezvous with USS MACON

If MACON could not assist, then TRITON would have to surface and enter port. But if the cruiser were in the vicinity of Montevideo, then TRITON's mission could be preserved. She could broach with only the upper part of the conning tower above water. Poole and the transfer party would be inside the conning tower sealed off from the rest of the ship, and the pressure hull and superstructure would remain entirely beneath the surface.

Just before midnight TRITON received a message from Rear Admiral Lawrence R. Daspit, ComSubLant. MACON was under way and would rendezvous at the time and place requested. Some twenty-seven hours later, in the early morning darkness of 5 March, the two ships were in position.

TRITON's conning tower was three feet above water, illuminated by the huge spotlights of MACON, five hundred yards distant. Captain Beach was the only man topside. MACON's deck crew hoisted out a whaleboat, and when it was in the water, Beach ordered the topside line handling party to the bridge. Soon after, MACON'S boat alongside, Poole appeared on deck steadied by two men. Two others in the whaleboat made ready to catch Poole as their craft rocked from side to side, and seizing the moment when the gunwale of the boat was level with TRITON's deck, he was propelled into the whaleboat and the transfer was complete. *The line is cast off, the boat pushes away, the engine is gunned, and Poole is gone.*

TRITON returned to running depth and headed south, wide open for Cape Horn.

Cape Horn to Easter Island

Two days later, on 7 March, TRITON reached the rocky tip of South America. In the days of sailing ships, if a sailor rounding the Horn saw the promontory, it was legend that a shipwreck was sure to follow. But the modern tradition, Captain Beach announced, was much different: a sailor who deliberately viewed Cape Horn would have good luck follow him all the rest of his days at sea. To give every man aboard his time in the conning tower, TRITON circled twice and passed in front of the Cape five times.

The run northwest to Easter Island would be twenty-five hundred miles through deep water, but there was trouble almost immediately. Late in the night of 8 March, a severe leak around the starboard propeller shaft broke loose, forcing great sheets of water perpendicularly out from the shaft around its entire circumference. Captain Beach ordered the starboard shaft stopped and the ship brought to a shallower depth. With the reduction in outside water pressure, the leak decreased, and investigation showed that the water seal had been improperly installed.

It had become partially cocked on its seat and proved impossible to straighten, but after many hours of back-breaking work a modified clamp was in place and the leak was manageable.

At 0020 on 12 March, the captain recorded in the log that the fathometer was once again out of commission. This time it could not be fixed since the problem was determined to be in the installation of the fathometer head itself. But even without the fathometer TRITON could continue her voyage, using her search sonar to detect shallow water and warn of sudden changes in the depth of the ocean bottom. At five o'clock on the morning of 13 March, TRITON came to periscope depth and shortly afterward made radar contact with Easter Island. Two hours later she commenced photographic reconnaissance of its northeastern coast, and at about 0930 the huge stone monolith re-erected by Thor Heyerdahl was located. As at Cape Horn, anyone who wanted a

glimpse of the statue was invited to come to the conning tower. Then at a quarter past eleven TRITON departed Easter Island for Guam, a distance of more than sixty-seven hundred miles.

Sea Monster at Mactan Island

The passage across the Pacific took two weeks. On 20 March TRITON was at her closest point of approach to Pearl Harbor and celebrated with a Hawaiian Luau complete with poi, leis, Hawaiian shirts, and a coconut tree. Three days later the ship crossed the International Date Line and Captain Beach received a message from King Neptune, informing him that due to exemplary conduct during the crossing of the equator four weeks earlier, there was no need for further examination and all hands were automatically inducted into The Royal Order of Golden Dragons.

On 27 March TRITON reached her closest point of approach to the presumed location at which TRITON of World War II had gone down in action. A memorial service was held with the captain in dress uniform and sword, and at its conclusion, the ship's company came to attention as the forward torpedo tubes were fired three times in salute.

On 28 March TRITON made landfall on Guam, and at 0726 came to periscope depth. For one seaman, that day was especially significant. Edward Carbullido was born on the island and as a youth had lived through the Japanese occupation. Just after the war he enlisted in the Navy and had not been back in fourteen years. So after her photographic reconnaissance drill, TRITON closed Agat harbor to give Carbullido the best view possible of his home town. No one asked for any of his time in the conning tower—he received maximum periscope liberty.

Three days later, on 31 March, TRITON passed through Surigao Strait, crossed Mindanao Sea, and started to work her way up Bohol Strait northward to Mactan Island and Magellan Bay. There, in April 1521, the Portuguese explorer lost his life in a battle with native warriors. TRITON entered Magellan Bay at 1100 on 1 April and began to search the south shores for the monument. Twenty minutes later it came into view—a rectangular pedestal, gleaming white in the sun. Just before noon, upon raising

the periscope again, Captain Beach found himself looking straight into the eyes of a young Filipino in an outrigger canoe. Down went the periscope, but the opportunity for a picture couldn't be missed. "Up periscope!" said the captain. "There he is—here!" After some pictures, "Down periscope!" Then a moment later the periscope was raised once more, and the young man was still there, staring right at it.

After spinning the periscope for one last look around, Captain Beach snapped up the handles. "All ahead two-thirds. . . . Right full rudder!" TRITON slipped away as the young man in the canoe began to paddle furiously in the opposite direction. The only unauthorized person to spot TRITON during the voyage, he was later located and identified as Rufino Baring of Mactan Island, age nineteen. On that day, coincidentally April Fool's Day, he was certain that he had seen a sea monster.

Casualty in the After Torpedo Room

On 5 April Triton transited Lombok Strait, between the islands of Bali and Lombok, and entered the Indian Ocean. Five days later, after a complete sweep-out of the atmosphere of the ship, ventilation was secured for a sealed-ship test. During the next two weeks it would be found that a standard level of oxygen and humidity was much more comfortable than the daily cycle of gradually diminishing oxygen followed by rapid replacement with fresh sea air.

The no-smoking test began on 15 April and proved to be very difficult for some of the smokers, who also had to contend with the superior attitude of a number of their non-smoking shipmates. The test was expected to require only a few days but all that was said was that it would last no more than ten days. Shortly after the smoking lamp was put out tensions began to build, and minor hostility and irritability soon became evident.

On Easter Sunday, 17 April, Triton re-entered the Atlantic Ocean and reached Cape of Good Hope. But the sky was overcast and so photo reconnaissance was not as successful as at previous landfalls. Mt. Vasco de Gama reminded Captain Beach of Diamond Head, although not quite so rugged, and there was

surprisingly little vegetation for a temperate latitude. At 1721 Triton departed for St. Peter and St. Paul's Rocks, eight days distant and the point which would mark the finish of the circumnavigation.

On 18 April the no-smoking test came to an end, but the captain decided against merely ordering the smoking lamp relit. Instead he fired up a cigar and strolled about the ship, casually blowing smoke in the faces of various people. "Don't you wish you could do this?" he enquired pleasantly. This new torture by their sadistic captain was too great for the suffering smokers to bear, and within seconds they had mutinied and were busily lighting cigarettes.

Late in the evening of 24 April, with the circumnavigation virtually complete, a serious casualty occurred in the after torpedo room. The torpedoman on watch, Al Steele, heard a loud report followed by a heavy spraying noise, and upon turning saw clouds of oil vapor issuing from beneath the deck plates forward on the starboard side. Steele instantly called the control room and then dived into the high-pressure spray to find and isolate the leak. He was able to shut one of two quick-closing valves but the other resisted until help arrived. For his swift and decisive action, Steele was to receive a Letter of Commendation for meritorious service and a Commendation Medal.

History is Made

At 1500 on Monday, 25 April 1960, having carefully passed on the western side of St. Peter and St. Paul's Rocks this time, the first underwater circumnavigation of the world was complete. The total distance traveled *Rock to Rock* was 26,723 nautical miles, and elapsed time was 60 days of twenty-four hours, plus 21 hours. Average overall speed came to slightly more than 18 knots.

But it was not yet time for TRITON to return home. She proceeded to a point off Cadiz, Spain, and was met on 2 May by the destroyer Weeks. Remaining submerged and using the conning tower once again as an air lock, the bronze plaque designed in tribute to Magellan was brought aboard. It would later be presented to Spain by the American ambassador. TRITON then

headed west across the Atlantic for the Delaware Capes, and early on the morning of Tuesday, 10 May 1960, she surfaced, having been submerged for exactly 83 days and 10 hours.

As TRITON steered toward the rendezvous off Rehoboth Beach, the darkness of night gave way to heavy gray skies. Two helicopters approached from the west and soon one was overhead, lowering a seat to the deck. Captain Beach was lifted up and into the helicopter, and TRITON set course for New London.

Waiting for Ned at the White House were many well-wishers, and most importantly, his wife Ingrid. The helicopter landed a few yards in front of the South Portico and TRITON's captain was soon in the midst of a celebration – later he was ushered into the oval office for a meeting with President Eisenhower. And now Captain Beach understood the urgency of returning on time. Someone said to him, "You've shown the oceans are still free to all. Of all the things we'd planned to prove for the summit conference, you were the only one to come through!" TRITON's epic voyage had enhanced American prestige just before the 16 May opening of the Four Power Summit in Paris.

Five hours after leaving TRITON's deck, Captain Beach returned in the same manner. The next morning in drizzling rain, the greatest submarine in the world proceeded to berth in New London, welcomed by pleasure boats and cheered by people on both banks of the Thames River. Among the women and children assembled on the dock were signs, "Welcome Home TRITON," and the Coast Guard Band played martial music. "Dockside liberty" was announced pending the arrival of Secretary of the Navy William B. Franke who was en route from Washington. After presenting the Commendation medal to Steele, Franke then awarded the Presidential Unit Citation to the ship, a grateful acknowledgment from their country to the men now reunited with their families and filled with the conviction of "a job well done."

Many thanks to Ingrid Beach, Jim Hay, and Al Steele for their invaluable assistance with this article.)

TRITON's voyage was not without equipment problems typical of a shakedown cruise. Some of these were:

- Smashed and rusted flashlight lodged in induction valve seat.
- Leak in port engine condenser circulating water pump.
- Bad electrical connection in circuit of reactor warning siren.
- Insufficient ventilation for ship inertial navigation system (SINS).
- Jammed outer door on garbage ejector.
- Fathometer malfunction and failure.
- Reactor shut-down due to calculation error.
- Starboard propeller shaft leak.
- Control air compressor electric motor failure.
- Periscope sextant out of order.
- Severe oscillation in gyro repeaters.
- Active sonar out of commission.
- Stern plane control valve - cracked body.

USS TRITON (SSR(N) 586)
Care of Fleet Post Office
New York, New York

Submerged in the
South Pacific Ocean
11 March, 1960

Dear Aunt Jackie:

The TRITON is about one quarter of the way on the world's first trip around the world submerged and this letter will be carried around the world two before it can be put in the mail. When you get it I hope you will want to keep it as a souvenir.

We will have crossed the Equator four times during the voyage, and been around both Cape Horn and Cape of Good Hope. All is going very well indeed, so far.

Best wishes from
Your Uncle Red

ARTICLES

REFLECTIONS ON THE COLD WAR AT SEA
PART TWO
SOME LESSONS TO BE LEARNED
"Observation! Up Scope!"

by RADM Jerry Holland, USN (Ret.)

Jerry Holland is a retired submarine officer currently serving as the Vice President of the Naval Historical Society. He has been a frequent contributor to THE SUBMARINE REVIEW and Naval Institute PROCEEDINGS.

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By 1982 or so, the US Navy had a good grasp of the Soviets plans and intentions and was planning accordingly. Admiral Michael Mullen, when Chief of Naval Operations, characterized what he termed "Cold War sureties".

"We knew who the enemy was."

"As time went on we learned how he was likely to fight."

"This focused operational planning though it didn't make the task of maritime dominance easy."

Not clear from this ex post facto analysis is that "As time went on ..." meant twenty-five years. Could the American Navy have recognized issues relative to knowing who the enemy was sooner? Would such recognition have made a difference in learning how the enemy was likely to fight? How did the operational planning depend upon technological development and tactical innovation? What other lessons can be drawn from this history that might improve chances for maritime dominance in the future?

Learning from history is not easy. In part because, those who make history have a vested interest in its outcome (otherwise known as an axe to grind), generally lack peripheral vision, and are not usually invested in the labor of writing. On the other hand, the historians who record and analyze history often do not understand or appreciate the technical factors and personal relationships involved in its making. Then too, few victors analyze carefully why they won so usually losers in war learn more than the winners.

Comparison of adversaries is a necessary ingredient in any war plan. This comparison usually starts with lists of equipment, manpower and estimates of their capabilities. These factors are usually played against each other in planning and in war games. However in evaluating a long-term adversarial relationship, trying to grasp the sociological or cultural bases and biases of each side provides a more useful ingredient for analysis than snapshots of the equipment base. In this regard trying to compare the culture of the two navies can be more revealing than comparing their table of equipments.

In reviewing these forty years, the culture of the United States Navy becomes apparent. With rare exceptions—and those usually impressed on the service by forces outside of its own ranks—the characteristics that marked the American Navy in the Cold War were:

Forward deployed
Attack oriented
Some central planning
Decentralized execution
Balanced forces
Multiple platforms
Mobile logistics
Trained, volunteer Sailors

Many of these characteristics were inherited from the Royal Navy. However the studies associated with the rise of the United States Navy to rank as a first class maritime power at the end of

the nineteenth century and the experience of World War II, including the planning that occurred between the end of the First World War in 1919 and the beginning of the Second in 1939, buttressed these ideas.

The offensive mindset, Nelsonian in its context, exemplified by commanders in the War of 1812, by Farragut and Porter, preached by Mahan, followed by the leaders in World War II, was easily identified and well known by seamen around the world. The combination of advancing technology, intelligent direction, combined arms, and skillful use of opportunities culminated in an effective anti-submarine warfare effort not seen since late in World War II.

The culture of the American Navy reflects recognition that sustained operations at great distances are the norm. Mahan wrote before World War I that, "... to be useful, any ship had to have a range greater than 4,000 miles." High speed was always valued but endurance was the greater virtue. Most platforms had to be designed to be able to accomplish many missions. Ever since Joshua Humphery designed the *44 gun* frigates in 1794, advanced technology was almost always sought.

Actual experience does not match the part of the hypothesis: Building the best ship possible. More than one CNO openly disregarded some of these traits in regards to acquisition of warships. The cause of their departure from these principles was in part because budgetary pressures demanded less expensive platforms and partly because their individual experience at sea was of such a nature to expect great things of small ships. Though *chiefly a theoretical* belief of those unpracticed in war, quantity over quality has not been a rare or isolated opinion among military officers. Many in the Submarine Force in the sixties expressed the argument, "Why nukes when we could have two diesels for the same price?" But in the long run over these forty years, the successful platforms were the ones that were as good as one could make them. Leaders of naval aviation always resisted small carriers—never succumbing to *more is better*, holding fast to *better is better* and demanding nuclear power first before determining any other characteristics.

Attempts at quantity generally came up short. Very small warships were hard to maintain and often not useful in the regions required or missions that arose. Where ship types compromised for the sake of quantity, resulting ships tended to be short lived with limited capabilities. The "B girls", *Barracuda, Bass* and *Bonita* were prime examples. These SSK's had big sonars but were hobbled by a thirteen knot top speed and a limited endurance. To transit to their stations in the barrier at the GIUK Gap for which the ship was designed, the SSK had to be underway en route well before the war started in order to be on station in time to intercept the oncoming Soviet submarines. BARRACUDA served 22 years as a target and training ship for sonar school but the other two were decommissioned after only five and six years service respectively.[1]

On the other hand the Soviets had a culture that was never appreciated by their erstwhile opponents. Commander Robert Herrick described the defensive nature of the Soviet mind but few read and even fewer believed because that thesis did not help to build force sizes.[2] The features of this culture that became evident in the later stages of the Cold War included:

Defense of the homeland was paramount.

Correlation of forces was central to their thought process.

Europe was the focus of their efforts and seat of purpose.

Acquisition was oriented to the *Machine Tool Industry* management practices and mentality of the Soviet Union.

Generals ran the strategy of the Soviet Union.

These conclusions, while generally apparent now, were not part of our understanding early in the Cold War. Yet Soviet dispositions throughout the Cold War always seemed to be aimed at homeland defense. This focus should not be surprising. Germany had invaded Russia twice in fifty years, coming close to conquering her both times. The Soviets were heir to the Russian Empire so their continental strategy, based in Europe and always dominated by generals was natural. Interest in sea power and maritime affairs was peripheral at best.

The industrialization created by Stalin through the 1930's dominated the economic and material resource planning in the Soviet Union. Most of the Soviet military acquisition was created and managed by these industrial organizations, not by the military operators. This did not necessarily lead to poor or bad equipment – the T-34 was the world's best tank for over 20 years. But designers and builders held sway throughout the acquisition process in the Navy and many of the results were demonstrations of the skill of the builders rather than incorporation of characteristics valuable to the operators. Soviet ships bristled with weapons and antennae, many self-limiting, and some that were not coherent with the ships' missions. As one acute observer, Captain Jim Patton, remarked, "The ALFA [submarine] was a dog. A fast dog but a dog nevertheless"!

Comparing these two summaries of the cultures helps understand why each side performed the way it did. By the end of the period, both sides pretty much had the other's dimensions staked out though not always accurately. The Soviet penchant for never putting a ship out of service meant that what were really liabilities were counted by Americans as assets when drawing force comparisons chiefly for budget purposes. The resulting magnification came to be a matter of belief limiting thought on strategy and constructive planning by disguising the Soviets real capabilities.

In addition to the cultural dimensions, other lessons become evident as one reviews the actions and opportunities of the Cold War at Sea. Because this war took place in the undersea domains, that is, a submarine war, many lessons apply to that domain but not necessarily to others. Avoiding generalization of conclusions is as important as drawing the conclusions themselves. The remainder of this essay is based in the submarine/anti-submarine world and should not necessarily be associated with other dimensions.

In submarine warfare, the importance of careful and thoughtful intelligence cannot be overestimated. In this area, overwhelmed by variables and unknowns, every piece of evidence helps. Preparation of the battlefield, i.e. the hydrography, is crucial. To understand the ocean's environment one must observe

its conditions throughout the year. That means being a persistent presence in areas that could become the scene of action.

The size, number and material condition of the potential enemy force is a second ingredient. This begins with regular observations of yards and docks. *Counting every day*, allowed recognizing operational patterns and determination of what submarines were at sea. These are vital ingredients in calculating search plans, alert rates and probability of detection.

Where possible, watching the other side's individual and collective ships at sea yielded great information on what sort of an opponent one might face in a war. Not only did these observations yield data on technical parameters but they shed light on how the equipments were likely to be employed and the tactics of operations. Intelligence agencies rarely underestimate the possible capabilities of the potential enemy's equipment, so realistic evaluations, in other settings called *measurements*, were particularly valuable. As every bridge player knows, *A peek in the hand is worth two finesses!*

ASW during the Cold War demonstrated the value of full time dedicated analysts and close long-term relationships between intelligence professionals and operators. During the Cold War this relationship grew until it existed from the highest levels of the Navy down to individual ship's companies. Out of this mutual interaction grew the understanding of *how he was likely to fight.* [3] Such relationships cannot be built quickly but can be destroyed in a flash of budget anxiety or pangs of professional jealousy.

Experience in ASW is hard to obtain. A couple of tours rarely provide the background to appreciate the problems much less the knowledge to exploit the environment and pursue a quarry. For destroyers and frigates often a year of operation can go by without a meaningful (against a real submarine) exercise. During the Cold War of Admiral Mustin's *two navies*, one faced mainly submarines and the other seldom faced any maritime challenge. This second remains the *real Navy* in the eyes of most of its operators. But experience in other venues work against competence in ASW where time constants are long and anxiety takes its toll on the necessary patience and deliberateness.

Successful ASW is usually a combined arms operation in which no other service other than the Navy is engaged. There is no jointness credit awarded for ASW. The requirements for professional military training and joint duty take officers away from those necessary tedious efforts that prepare them for command of ASW forces. Too many ASW operations develop problems when a leader of Mustin's *real Navy* has to oversee the efforts of the *NATO Navy*. Finally, most admirals are ill fitted for ASW. Those activities require intuition and judgment built on patience and understanding generated through experience. The reluctance of admirals trained in battleships to adopt convoying in both World Wars is symptomatic of the problem.

In ASW the marks of knowledgeable leadership is patience with communications. VADM Art Cebrowski, father of network centric warfare, characterized ASW as *Awfully slow warfare*. Because time constants are long, routine communications are adequate to the task but not to the comfort level of flag officers from other communities used to the high data rate low latency information associated with anti-air warfare. ASW does not require instantaneous or even quick orders or responses. Doctrine and process substitute for real time verbiage. The methods used so successfully in the ASW actions of the Cold War seem to have been lost in the frantic desire to obtain *Comms at speed and depth* in order to calm the nerves of senior officers.

Probably the most important lesson from the period is that training must be accomplished. Without that experience, the false contacts will drive all efforts as they did in the Falkland Islands campaign. Unless demanded and dedicated at high levels there was and probably still is never enough time to train because most ships' companies are busy with urgent matters. But even during the Cold War many did not use the opportunities available. As a result of the lack of opportunity in many cases, the equipments were better than the personnel operating them. This becomes particularly true when tours are short and turnover high. Complex equipment has facets that operators cannot appreciate without time on the stack and targets in the bin.[4]

Among the reasons for this failure was that services were always hard to come by—the submarines were needed for higher priority operations. Few exercises were large enough or long enough to develop real expertise at any level. Many were structured to maximize interactions creating a false impression of capabilities and dangers. In too many cases, sonarmen and aircrewmen never exercised with a real submarine so were neophytes when operating their equipment. Fortunately for some, the Soviets provided good training opportunities for much of the Cold War. That such generous cooperation will be available from future adversaries is unlikely but every opportunity that finds someone else's submarine at sea should be exploited.

Knowing what the equipment can do really takes time, energy and education. The first large stave passive array, the BQR-4, was considered inoperative by many ships when in fact it was hobbled by operators' ignorance. The TULLIBEE/PERMITS' sonar, the BQQ-1, offered options unheard of in its predecessors. Years passed before those options and the subsequent upgrades were able to be employed to anywhere near their full capability because of a very steep learning curve and a lack of practice. Computer aided detection and tracking became really effective when officers spent time to understand the concepts and practiced manipulating the equipment. When introduced, the Mark 48 torpedo offered so many options that the associated weapons consoles were provided with *gouges* to assist operators in selecting the features. Five years later, after investments in practice torpedoes and exercise scenarios for every submarine every year, skilled officers could set the fish's optimum settings within seconds.

Early SOSUS equipment demonstrated the crucial relationship between complicated technical equipment and its operators. When originally deployed, data was displayed on paper graphs that showed time versus frequency on a specific array and bearing. Determining which black marks on which graphic displays (*grams*) reflected a possible contact and then correlating that with five dozen other machines only some of which might hold contact on that same target was a challenging task. Nothing was automatic. Detecting the presence of a possible target and then

correlating between a number of displays in order to turn this data into information, was accomplished entirely by individuals. Interestingly, the Navy found that women were much better at this task than men and before long the SOSUS network became the property of women.

The hardest task in warfare is detection of a submarine that does not wish to be found. When ASW must be conducted against an uncooperative target, one that operates very stealthily, detection is very difficult. In past wars, the submarine's presence was generally heralded by a *flaming datum*. Torpedo ranges of a mile or two meant the area in which the attacking submarine was located could be limited to a few square miles of ocean. The submarine's restricted maneuverability and endurance also meant that prosecution by surface escorts was practical. However with the advent of long-range missiles and torpedoes coupled with the speed and endurance of nuclear power, the explosion while alerting everyone to the submarine's presence, no longer provides a useful datum. Detections at reasonably long range require large aperture arrays, sophisticated analysts, and patient exploitation. Even then, the result is a *hunch* not a point.

This difficulty does not mean that such a quarry cannot be found. Issues relating to such detection involve search rates, information accumulation, area definitions and most of all time. Understanding what the *Probability of Detection* really means is fundamental to overseeing a theater or area search. Yet even experienced operators are never entirely comfortable with the concept. Searches to *sanitize* an area large enough to operate carrier flight operations require weeks—depending upon the targets' characteristics and operational employment. The facts can be learned in an afternoon but until experienced are rarely appreciated.

In summary and at a risk of over-simplification, some of the observations (lessons learned?) that arise from a review of the Cold War at sea that have continued relevance seem to be:

Nothing pays like training.

Pushing technology is endless. In the words of Admiral Kin McKee, "If you are not getting ahead you are falling behind".

Fancy gear needs experienced operators at all levels.

Quality lasts.

One should beware of:

One's own propaganda;

Mirroring;

Worst-case analysis;

Speculation as a substitute for facts.■

ENDNOTES

1. Norman Friedman, "U.S. Submarines Since 1945", Annapolis, Naval Institute, 1994. p. 241.

2. Robert Waring Herrick, "Soviet Naval Strategy; Fifty Years of Theory and Practice", Annapolis, Maryland, U.S. Naval Institute, 1968.

3. Christopher Ford and David Rosenberg, "The Admiral's Advantage: U.S. Navy Operational Intelligence in World War II and the Cold War", Annapolis, Maryland, The Naval Institute Press, 2005.

3. For commentary on current conditions see RADM Jerry Ellis, "Regaining contact: Reemergence of ASW in USN", THE SUBMARINE REVIEW, April 2009.

4. For commentary on current conditions see RADM Jerry Ellis, "Regaining Contact: Reemergence of ASW in USN", THE SUBMARINE REVIEW, April 2009.

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GERMAN SPECIAL SUBMARINE OPERATIONS DURING WW I

by CAPT John F. O'Connell, USN (Ret.)

This article is excerpted from a forthcoming book on the effectiveness of submarine operations during the 20th Century.

During World War I German U-boat operations were focused initially on sinking enemy warships. Later they became involved in mercantile warfare, that is attacking shipping carrying war material to Great Britain. Established rules and regulations came into play and hampered submarines with their low freeboard, small crews, and inherent vulnerability. The German Navy and government, facing in their view a merciless British blockade designed to starve Germany into submission, cast off adherence to the Rules of Civilized Warfare, and commenced an unprecedented unrestricted submarine warfare campaign against Great Britain, its allies and any neutral nations engaging in maritime trade with Great Britain. However there were also some little known submarine special operations conducted by the German U-boat Service, and they are the subject of this article.

During the First World War strategic communications used two modes of transmission: underwater telegraph cable and long range radio. Great Britain, France, Germany and a few other countries had invested in underwater cables but Great Britain led the world in the number of cables it controlled. The British government well understood the importance of strategic communications and the advantages that such control could bring them. Plans had been formulated to attack German cables in the event of war. The desired result would be to force German cable traffic to flow through British controlled cables, where the messages could be intercepted and read, or to force the traffic into radio transmission mode where it could be intercepted. British plans were to impose an information blockade on Germany in

parallel with the economic shipping blockade it envisioned if a war occurred.

This story begins with British attacks on German undersea cables using surface ships, and the inevitable German countermoves, but segues into little known German *special operations* using submerged U-boats to attack British and Allied cables.[1] In 1911 in Great Britain a Special Subcommittee of the Committee of Imperial Defense considered the role of undersea cables in strategic communications in the event of war. Plans were made to sever enemy cables at the start of war. The General Post Office, which controlled cable laying and repair operations, and the Royal Navy, agreed to cut five major German cables in the English Channel. The British army was tasked with plans to defend cable landing sites against enemy raiding parties that might come ashore to destroy British cable facilities.[2] The Eastern Telegraph group agreed to stockpile cable supplies and cable repair ships at appropriate locations within the Empire.

For Great Britain the First World War began on 4 August 1914 when Germany invaded neutral Belgium, in violation of treaty, and refused a British demand to withdraw its forces. The British Empire immediately set its operations into gear to sever German cable connections. On the second day of the war, British civilian cable ship ALERT left the port of Dover and sailed into the English Channel. When it reached the appropriate location it dragged for and pulled up five German undersea telegraph cables to her deck and cut them.[3] This severed many of Germany's cable links to its colonies in Africa and other locations, and forced German authorities to send a great deal of message traffic from their high powered radio station at Nauen, near Berlin. Such traffic was subject to interception and could possibly be deciphered.

That day, 5 August 1914, the Joint Naval and Military Committee, a Special Wartime Subcommittee of the Committee of Imperial Defense, met to consider further action against German communications with her overseas colonies. Prior to the war mainland Germany and her colonies in Africa and the Pacific were connected by cable and radio, and it was feared that those communications would be used to direct German naval units

against British seaborne trade. Personnel from the Foreign Office, the Colonial Office and military representatives attended. In addition to the Channel cables that had already been cut, the Joint Committee directed attacks on German radio stations in her African colonies and the destruction of the German-controlled cable facilities at Yap Island in the Pacific.[4] On 12 August HMS TRIUMPH destroyed the Yap Island cable facility with naval gunfire. Operations to capture or destroy radio stations in West and East African colonies were begun. Later that year, in November, the Royal Navy cut another German cable near the Azores which carried traffic from Tenerife to Monrovia in Liberia. The following year, on September, 1915 the British cable ship TRANSMITTER cut the German cable to Brazil, off Monrovia.

The German government also understood the importance of strategic communications, and had planned to sever its enemies' cables in the event of war. In the Baltic the Germans attacked the Great Northern Company cables that linked Russia with its allies, France and Great Britain. Later, between September 29 and November 30, German warships attacked the cable connecting Denmark with Russia at the ports of Libau and St. Petersburg. In the Black Sea German battleship GOEBEN cut the cable between Sevastopol and Varna, Bulgaria. Russia was now without direct cable links to Great Britain and her principal ally—France. Since Russian and French military operations were supposed to be coordinated against the common foe Germany, that situation presented a serious problem.[5]

In the Pacific area, German cruisers attacked British cable stations on small islands to destroy terminal equipment and cut the cables on shore. But before long German cruiser squadrons had departed the Pacific and this threat ended. In the Atlantic, British naval superiority limited German surface force activities to the Baltic Sea and close-in operations in the North Sea.

Since British naval superiority prevented ordinary hostile surface ship operations against British and allied cables, the German Navy turned to its submarine arm which had demonstrated a capability to operate all around the British Isles.

In 1915 German U-boats began submerged attacks on cables in the North Sea and Adriatic at depths of 40 fathoms or less (240 feet). The submerged U-boat trailed a grapnel, attached to a wire rope, and trolled in the approximate position of the cable until the grapnel caught (on something). Cable locations were no secret but navigation out of sight of land had a fairly large area of uncertainty in the days before GPS. The wire rope was attached to one of two motor-driven winches driven by the capstan and controlled from inside the U-boat. An engineer monitored a strain gage attached to the wire rope. Increased tension indicated that something had been snagged. The grapnel apparatus contained a shearing mechanism and if everything went well, the U-boat was able to snag and cut the cable. The U-boat operated at slow speed on the battery about 10 to 20 feet above the sea bed while carrying out this operation.[6]

Training operations were carried out in Germany, near the port of Emden on the North Sea. The mechanism used may have been a *Lucas* cutting and holding grapple. Germany operated cable ships of her own and her engineers would have been very familiar with the technology involved.

U-47 *distinguished* itself in the northern Adriatic Sea by accidentally cutting an Austo-Hungarian cable while conducting training operations near Pola in Austria, a major naval base.[7] Since the Germans and the Austro-Hungarians were allies, there had to have been some embarrassment. How do you say "Oops" in German?

To reach cables beyond the North Sea required the use of specially outfitted and trained long range submarines. The German Admiralty proposed the use of U-cruisers (U-151 through 157). They were large (65 meters in length, and 1,875 tons submerged displacement) with a range of 25,000 miles at 6 knots. They were designed and built in 1916-1917 to be commercial submarines to import critical goods through the British naval blockade. DEUTSCHLAND made two successful round trips to the United States in 1916. BREMEN was lost early in 1917 on her first voyage, possible due to a mine. They were unarmed.

Six more cargo submarines were still under construction. They, along with DEUTSCHLAND, were converted into U-cruisers, long range submarines, equipped with torpedo tubes and two 105 mm. guns. DEUTSCHLAND became U-155.

The German High Seas Fleet staff objected to the Admiralty scheme on the grounds that cable attack operations were too difficult technologically and that the diversion of the U-cruisers would interfere with the ongoing unrestricted submarine campaign that commenced on 1 February 1917. The Admiralty won the argument, not unexpectedly, and the U-cruisers were equipped, trained, and detailed to cable cutting duties in addition to attacks on Allied merchant ships.

From 10 to 12 February 1917, U-155 cut British cables between the British Isles, Portugal, Gibraltar, and the Azores.[8] After the United States entered the war in April 1917, the German Admiralty identified cables off the U.S. coast as possible targets.

During the period March—April 1918 four cables were attacked off the Iberian and African coasts. Three U-cruisers damaged cables to the Mediterranean, Africa and America at points off Lisbon, and Sierra Leone in West Africa.

On March 7—8, U-155 attacked cables off the Spanish coast. In April U-153 and U-154 attacked cables off West Africa. Room 40 of British naval intelligence intercepted and deciphered a radio message setting up a rendezvous on 11 May between U-153 and U-154. Two British submarines, J 1 and E 35 were sent to the rendezvous area to ambush the German boats. E 35 was submerged and sighted U-154 on the surface, and made a submerged approach. She missed her with one torpedo which was not seen by the target's lookouts and sank her with two more torpedoes. U-153, in the vicinity and operating on the surface, saw the explosion and sighted E 35 on the surface briefly. E 35 then re-submerged and moved away before U-153 could avenge her comrade.

On 28 May 1918, U-151 succeeded in severing two cables off New York City. In June 1918 the British Admiralty complained that six different cruiser U-boats had attacked cables off the Azores, Lisbon, Gibraltar, Dakar, Freetown, and off the United

States. In mid-September 1918 British cables off Portugal were attacked.

However all was not peaches and cream for the U-cruisers. It was difficult for the U-boat to know if it had severed a cable, merely damaged it, or at worst had just moved it a short distance along the sea bottom. In one instance U-157 had to abort her cable operations off the Azores when she lost both grapnels. U-156 was probably lost to a mine in September 1918 while returning to base through the North Sea Mine Barrage.

The British undersea cable infrastructure was too strong to fold under what were essentially pin prick attacks. The author of Nexus opines that an attack on the vital and scarce British cable ships might have been more productive. However, the British Admiralty was well aware of their value and vulnerability while lying to, conducting cable repair operations, and regularly assigned escorts to them.

In early 1918 the U.S. Army was faced with an increasing volume of cable traffic to France to support the American Expeditionary Force in France. Laying additional cables would take far too long, so other means to increase capacity were examined. One idea looked feasible. If messages were not enciphered, more information could be pushed through the cable per time unit. The Army Chief Signal Officer was not completely comfortable with that proposal, although it was commonly believed that underwater cable traffic was not capable of being intercepted. He contracted with AT&T to test that assumption. AT&T, in connection with Western Union and Western Electric, pulled up an operating cable to Europe from the sea bed, placed an induction sleeve around the cable, and discovered that they could read the cable traffic without the cable operators on shore having any indication of their eavesdropping. The neat assumption died, and the Army continued to encipher its traffic.[9]

Some may have read the book, Blind Man's Bluff, about the use of U.S. submarines in clandestine operations against the Soviet Union during the Cold War. The authors reported that USS HALIBUT (SSN 587) entered the Sea of Okhotsk and used an induction pod to read and record important Soviet cable message

traffic between their commands on the Kamchatka Peninsula and headquarters further west.[10] I believe that the official U.S. Navy comment about Blind Man's Bluff, published in 1998, was "no comment". It is fascinating to realize that the same basic technology reportedly used by HALIBUT was developed in 1918 to test the vulnerability of cable traffic from the United States to France.■

ENDNOTES

1. Edwyn A. Gray, The Killing Time, p. 189.
2. Jonathan Winkler, Nexus, pp. 16-17.
3. Nexus, pp. 5-6.
4. Nexus, pp. 23-24, 27.
5. Nexus, pp. 28-30.
6. Nexus, p. 31.
7. Nexus, p. 295.
8. Nexus, p. 106.
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10. Sherry Sontag and Christopher Drew, Blind Man's Bluff, chapter 8.

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ASW AND THE NON-COOPERATIVE TARGET: RISK MANAGEMENT AND THE EXPLOITATION OF THREATS

by CAPT Jim Patton, USN (Ret.)

Captain Patton is a retired submarine officer who is a frequent contributor to THE SUBMARINE REVIEW.

Background

Many times in the past, during peacetime conditions, the Navy has convinced itself that the *submarine problem* has been solved. For example, during the 30s, a series of scripted exercises lead to the conclusion that with the new advances in escorts' active sonars, enemy submarines would not be able to reach a firing position without being detected, attacked and killed. In the process of doing this, a whole generation of submariners became so intimidated by participating in and by the results of these flawed exercises that a large number of U.S. submarine COs were relieved during the first year or so of WWII for *failure to engage the enemy*—having been convinced, for example, that to operate on the surface within 400 miles of an enemy air base was suicidal. In fact, to avoid visual detection by aircraft, many submarines in transit to the war zone early in the war spent daylight hours at bare steerageway at test depth even though just a few hundred miles from Pearl Harbor. Present examples of similar *we've solved the problem* phenomena include the jubilation surrounding such as the development of good periscope detection radars.

Discussion

At the same time that accounts in the open literature are speaking of how effective ASW efforts have become in preventing a modern submarine reaching a position from which to launch torpedoes at *High Value Units* (HVUs), the same open literature is reporting how other navies, including near-peer competitors, are converting, buying or building submarines which are armed with

long-range, stealthy and very effective Anti-Ship Cruise Missiles (ASCMs). At some conferences, when asked how ASCMs impact their ASW equations, Surface Warfare representatives have dismissed them as being "Anti-Air Warfare (AAW), not ASW issues."

With a few notable exceptions, submarines and submariners have been quick to identify their strengths and weaknesses on a continuing basis, exploiting the former and avoiding the latter. During WWII, the U.S. Submarine Force rather quickly determined that too much radio traffic *from* deployed units was decidedly unhealthy for them—even though it took a visit from ADM Nimitz himself to convince RADM Jimmy Fife in Australia to 'stop playing checkers' with his submarines, and let them conduct their patrols in accordance with their Operation Orders with little or no external manipulation or communications expected *from* them. However, ADM Doenitz was slow to recognize this same practice as a significant contributor to U-Boat losses, and his forces paid a frightful price, losing nearly 1000 submarines during a war which was started with about only 50.

More recent examples of how submariners adapt to reality in mitigating threats to them involve the Soviets. Realizing early on that they suffered from an acoustic disadvantage compared to U.S. submarines (although it doesn't appear that they realized just how acoustically inferior they were until very late in the Cold War), they realized that very long-range detections upon them by the Sound Surveillance System (SOSUS), Maritime Patrol Air (MPA) or U.S. submarines could be greatly mitigated if they sortied and returned to their bases in Northern waters by transiting along such as the mid-Atlantic Ridge. They also became past masters in locating and exploiting such geophysical features as hot and cold *eddies* in the open ocean—essentially sort of acoustic *black holes*, where detections across their boundaries are virtually non-existent.

In some cases, a thorough understanding of an actual or perceived *threat* can open an opportunity to covert that threat to an operational *asset*. For example, starting during WWII and ever since, the ability of a submarine with good Electronic Support Measures (ESM) systems to detect (and classify) incident radar

signals long before the emitter is close enough to get a return from these signals has enabled that submarine not only to avoid detection, but to use those signals to locate, classify and close potential targets. Similarly, the employment by ASW platforms of high-powered monostatic sonars in areas where bottom bounce or other multipath acoustic propagation conditions exist can sometimes provide reasonably accurate range information as well as bearing.

In any case, if indeed the advance of radar technology has created an environment where submarines can no longer get close enough to use a periscope for torpedo targeting purposes, this forced dependence on long-range ASCMs must be approached as a new vulnerability rather than a show-stopper *if* it is to be successfully countered. The new vulnerability created is the fact that these missile-firing submarines now become dependent on *third-party targeting*, and must be told where the targets are, and how many missiles to fire, on what bearing, and when (to create a defense-saturating simultaneous time-on-target)—most likely from their seniors ashore who are receiving or deriving such information from a myriad of sources.

This revisited dependence on connectivity (especially if the submarines in question are required to acknowledge or *roger* for such targeting parameters to assure coordination with other attacking entities) opens a whole new set of ASW options, to include precision attack of those C^3I nodes ashore that are generating and forwarding this information to the shooters. This *close-in land attack from a covert stance* would appear to be a much more profitable employment of attached SSNs than the legacy attempts to *sanitize* vast areas against very quiet targets not going anywhere—especially if the threat from those ASCMs inhibits sea-based air power from getting within strike range. Just as with mines, some threats are best managed by avoiding or neutering, and if the *fall back* role of these submarines is to then revert to a *find your own HVU screen-penetrating torpedo attack* role, then the adversary has been forced to play into a strength rather than being left to exploit a weakness.

Conclusions

Submarines are very much *non-cooperative targets* who will not only be operated in such a manner as to reduce their susceptibility to *known* vulnerabilities, but strive, in a *Red Team* fashion, to be the first to discover new and evolving vulnerabilities and therefore devise the means and methods to mitigate those threats, and perhaps even turn the tables on the adversary and make those threats an operational asset.

With the foreknowledge of that reality, ASW concepts must play the same sort of game, and not only strive to block a promising avenue of a potential adversary's submarine employment, but must also envision what alternate employments that blocking will engender, and invest some intellectual capital on how to make *those* ineffective. Such as submarines needn't be destroyed in a conflict, but rather just made impotent. In a Darwinian sense, if submarines attempting to impose regional sea denial are made operationally insignificant enough, ownership of them will become unattractive.■

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THE PROBLEMS AND POSSIBILITIES OF GENDER INTEGRATION IN THE UNITED STATES NAVY SUBMARINE FORCE

by Mr. Stephen L. Jackson

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Recent public statements by the leaders of American naval forces have signaled both their willingness and determination to gender-integrate the Submarine Service, one of the last remaining bastions of male-only populations in the American military. Chief of Naval Operations Admiral Gary Roughead acknowledged women's changing roles in the American military in an interview that appeared recently in *The Navy Times*. In another interview, this time with the American Forces Press Service, Admiral Roughead acknowledged that although there will be challenges, they are not insurmountable. He stated, "Having commanded a mixed-gender surface combatant, I am very comfortable addressing integrating women into the Submarine Force. I am familiar with the issues as well as the value of diverse crews."[1] Navy Admiral Mike Mullen, Chairman of the Joint Chiefs of Staff, agreed with Roughead's assessment when he made the following statements in an address to the Senate Armed Services Committee in September, 2009. "I believe we should continue to broaden opportunities for women," Mullen said. "One policy I would like to see changed is the one barring their service aboard submarines." Admiral Mullen was also quoted as saying, "...that having a military that reflects the demographics of the United States is 'a strategic imperative for the security of our country.' " United States Secretary of the Navy, Ray Mabus, was more definitive, but no less positive, on the issue. Following a tour the Newport News shipyard, a builder of nuclear submarines, he told

reporters, "I believe women should have every opportunity to serve at sea, and that includes aboard submarines."[2]

Since stationing women on submarines is being seriously considered, the Navy must also evaluate what effect introducing females into a formerly single-sex ship will have on the organization and effectiveness of the boat's mission, on the male and female crew members themselves, and on the spouses that wait in anticipation for their return. However, the issue in 2010 might be more how can it be accomplished and not if it can it be done at all. Are there valid and insurmountable obstacles that would preclude women from effectively serving onboard undersea warships? Furthermore, if women are ultimately denied the opportunity to become a part of this technological frontier, will this be a just decision based on real military, physiological, and sociological impediments, or an expedient verdict derived from prejudice, apprehension, and devotion to custom? The arguments against gender integration on submarines can be condensed into four general areas: the suitability of females for this particularly arduous duty, the difficulty of creating and maintaining appropriate personal privacy zones, and the issue of pregnancy of the female crewmember, and the sociological effects of a mixed-gender crew. While the remedies for the first three can be at least easily conceived, the last issue will require a new and creative set of solutions.

Considering the first issue, women have demonstrated in virtually all navy occupations over the last fifty years, their ability to master complex training, endure the physical hardships, and excel at levels commensurate with their male counterparts. Clearly, as supported by the reality of the current state of naval forces and, with few exceptions, women can and do fill positions requiring the stamina for sustained arduous conditions, the demand for acute mental capacity and discipline, and the prerequisites of intense and thorough training.

Also at issue is the difficulty of creating and maintaining appropriate personal privacy zones and this is undoubtedly a valid concern. This concern, however, has available engineering and financially based remedies and, given the will to change, could be

easily surmounted. Some options would require the patience to wait for a submarine class specifically designed to accommodate a mixed gender crew, but it also may be possible to modify existing boats for an integrated crew.

As on any mixed-gender military vessel, the issue of the possibility of the female crewmember becoming pregnant presents some clearly valid concerns. An unexpected pregnancy may challenge the viability of the continued mission of the submarine and creates the possibility of a medically truncated cruise.

The only concern that cannot be addressed by the appropriate application of financial, medical, or scientific resources are the sociological effects on shipmates and shipboard operations when women enter an exclusively male populated occupation. The potentially erosive effects on relationship matrices are complex. No doubt, living and working in a small space like a nuclear submarine at sea involves unique challenges not found on the significantly larger and more populous navy surface ships. Patty Marr, a female graduate of the U.S. Naval Academy, who served two years at sea, spoke against attempts to assign women to submarines when interviewed by a Connecticut newspaper in 2000:

> "I was the division officer for 60 people, of which six were women, and three of those were removed during deployment for pregnancy. Close quarters with mixed crews produce romantic relationships."[3]

While the relationships between men and women stationed on a submarine can become problematic, the relationship between the spouses of sailors on a mixed-gender submarine also could suffer. Currently, the wives that remain behind must accommodate themselves not only to absences, routinely longer than three months, but also to periods of sporadic or nonexistent communication with their husband, and the natural worry that go along with such extended deployments.

Although these concerns hold some validity in the naval community, the reasons supporting placing women on submarines are few and simple, but equally compelling. First, and perhaps most obviously, females represent a significant source of high-quality, expertly trained, and in many cases, well experienced, potential submarine sailors. At least since the 1970's, women have been allowed entry into the most technical of enlisted rating training programs. There now exists a substantial pool of female naval personnel in all of the ratings needed at sea on submarines. Utilization of this resource could only lessen the problems of staffing these submarines, creating a better trained and educated submarine crew.

Further, assuming that the logistical issues can be addressed and that there are no overriding physiological or national security issues involved, the strongest case for allowing women to serve on submarines is that justice demands that these "free and equal" navy women be allowed a fair chance to compete for these positions. When considering the fundamental ideas of the twentieth century philosopher and noted Harvard professor John Rawls, the current navy policy toward women fails the tests presented by both of his fundamental questions concerning the principles of justice. First, Rawls wrote that:

> Each person has an equal claim to a fully adequate scheme of equal basic rights and liberties, which scheme is compatible with the same scheme for all...[4]

Clearly, women in the navy who can meet the physical and intellectual requirements for submarine service do not have an equal claim to a scheme of basic equal rights, especially if it can be ascertained that the gender prohibition has no real basis.

Rawls' second principle seems to speak even more clearly and directly to the issue:

> Social and economic inequalities are to satisfy two conditions: first, they are to be attached to positions and offices open to all under conditions of fair equality of opportunity; and second, they are to be to the greatest benefit of the least advantaged members of society.[5]

The *least advantaged* members of this navy society, women, are in actuality experiencing the least benefit of the current policy. Additionally, if considering the *positions and offices*, in this case to be a position on a navy nuclear submarine, then the policy is again found to be unjust since the positions are not "open to all under conditions of fair equality of opportunity." The current policy denies female officers opportunities for promotion and advancement in a large and increasingly important segment of the naval hierarchy. With the advent of the nuclear navy in the 1950's and especially with the development of the Los Angeles class attack boat and the Ohio class Trident ballistic missile submarines, submarine service became a legitimate, and even sought-after, career path for officers desiring high rank and a long and fruitful career. To deny female officers the opportunity to serve on submarines is to cut them off from this vital, viable and flourishing naval career path. According to Rawls' philosophy of justice as fairness, the policy prohibiting women from being assigned to navy submarines cannot be considered fair since it violates both of the fundamental principles of justice.

The sociological effects and challenges of a mixed-gender crew are, no doubt, the most difficult challenges facing the proposed integration. These intricate issues might be addressed by the modification of a single, simple, and currently existing sociological construct; the tradition of voluntary submarine qualification. Qualification is in effect a social contract that all members of the submarine crew must freely enter into of their own volition. The French philosopher Jean-Jacques Rousseau, in his book *The Social Contract* written in 1762, could have been describing the human organizational relationship at work within the submarine crew:

> These articles of association, rightly understood, are reduced to a single one, namely the total alienation by each associate of himself and all his rights to the whole community. Thus, in the first place, as each individual gives himself absolutely, the conditions are the same for all, and precisely because they are the same for all, it is

in no one's interest to make the conditions onerous for others.[6]

The submarine crew member, when he, and now potentially she, voluntarily joins the Submarine Force, enters into a contract, or pact, exactly as described by Rousseau. The individual must, without coercion, give themselves absolutely, agreeing to learn the unique regulations, the requisite skills, and pass the required tests that will qualify them in submarines. Certainly, the conditions of this qualification program are the same for every member of the crew and every person onboard has a vested interest in assisting every other member onboard in attaining and maintaining peak qualification because, literally, their lives depend on it. The new submarine crew candidate gives up some freedoms but finds, as Rousseau wrote, "...a form of association which will defend and protect with the whole common force the person and goods of each member with the collective force of all, and under which each member, while uniting himself with the others, obeys no one but himself, and remains as free as before."[7]

Most importantly, it would be crucial to have a Captain that was totally supportive, indeed a champion of the proposed change. The effect of attitude of a captain on the culture of the crew was succinctly described by Ronald S. Steed, former commander of Submarine Squadron Two at the Naval Submarine Base in Groton, when he was interviewed concerning the collision of the submarine USS HARTFORD (SSN 768) with another Navy ship. Steed said, "People always ask why is the commanding officer almost always relieved when there is an incident, and the answer is that we hold him accountable for establishing a culture on a ship that is safe, efficient and capable of carrying out the mission."[8] The culture established by a captain that is supportive of establishing a well-functioning, mixed-gender submarine crew would be an essential component in successful submarine gender integration.■

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EXPERIMENT AT DUNDEE: THE ROYAL NAVY'S 9TH SUBMARINE FLOTILLA AND MULTINATIONAL NAVAL COOPERATION DURING WORLD WAR II – PART III

by Mr. Mark C. Jones

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Post-war Departures from Dundee

The end of hostilities in May 1945 resulted in a gradual transformation of S9. There had not been a substantial French presence at Dundee for quite some time. MINERVE and JUNON had both been sent to the Mediterranean in late 1943, leaving only RUBIS at Dundee. CURIE arrived in April 1945 for a brief stay. Since some French ports were liberated beginning in 1944, and the major French naval bases in North Africa were opened in early 1943, the French submarine service had multiple places to base their submarines and conduct refits. RUBIS left Dundee for the last time on 8 June 1945 bound for Oran in North Africa.

July 1945 saw the Norwegian boats leave Dundee for Norway. This late departure was due to the need for Norwegian submarine personnel to assist with the disarmament of the many

German submarines present in Norwegian harbors when the war ended in early May. After helping the RN disarm surrendered U-boats, Norwegian submarine personnel returned to Dundee to bring their boats back home. On 16 July the ULA, UTSIRA and recently re-commissioned B-1 left Dundee for Bergen.[1]

The Dutch sent most of their boats from Dundee to Rotterdam in August 1945, presumably so the crews could have leave in their recently liberated homeland. These boats, after a month, returned to Dundee since ports in the Netherlands, particularly the pre-war major naval base of Den Helder, were still so badly damaged that they were not fully operational. The Dutch later moved most of their *Onderzeedienst* (submarine service) from Dundee to Rotterdam in December 1945. Dutch personnel left Dundee for good effective 1 February 1946.[2]

In the case of the Polish Navy, the end of the war was even more complicated. Since Soviet armies had driven the Germans from Poland and then installed a Communist puppet regime (the so-called Lublin government) in Warsaw, the British government was placed in a difficult situation regarding how it dealt with the Polish government and armed forces in exile. While the British government was ideologically opposed to Communism and had no genuine desire to abandon the Polish exile government based in London for the previous five years, the British government recognized that the Soviet sphere of influence would inevitably include Poland. So Britain withdrew recognition from the London government, and thus the Polish armed forces in Western Europe (Britain, occupied Germany, occupied Italy) were demobilized. While the Polish armed forces in Western Europe were deeply hurt by this political maneuver, discipline held. One incident sheds light on the disappointment felt by the Poles at Dundee. A Dutch naval officer at Dundee on VE Day (May 8, 1945) while his destroyer was under refit, remembers a conversation with a Polish naval officer who said, "The war may be over for you guys, but we, Poles, are left out in the cold." That night there were some fights between Polish naval personnel and men from other navies.[3] SOKOL and DZIK remained at Dundee until November 1945 when their transfer to another base was requested by the

Commander-in-Chief of Rosyth Command so the Dundee base could be closed. The two subs appear to have been towed to Harwich to be placed in care and maintenance status, moored on the destroyer BURZA.[4] Polish naval vessels remained in service until August/September 1946 when they were all decommissioned. The ships either returned to the RN in the case of wartime transfers (SOKOL, DZIK and many destroyers) or towed back to Poland in 1951 in the case of pre-war vessels like the submarine WILK or the destroyers BURZA and BLYSKAWICA. Polish warships including submarines were collected together in one port until final disposal.

With hostilities over and French, Norwegian and Dutch submarines returned to their homelands, and Polish submarines decommissioned due to the political situation in Eastern Europe, HMS AMBROSE closed 1 March 1946.[5]

Though in most cases the exile navies had returned to their home ports, they retained close connections with the RN during the immediate post-war period. For example, during the war Captain Gilbert Roberts, RN directed a school that studied German submarine tactics and taught Allied escort vessels how to foil German attacks based on typical U-boat movements. In his capacity as director of this tactical school, Captain Roberts had extensive contact with Norwegian naval officers. Upon the conclusion of the war, the Royal Norwegian Navy (RNoN) sought British assistance in rebuilding and restructuring the RNoN and requested that Captain Roberts be assigned to the RNoN. Captain Roberts spent several years in Norway helping the RNoN update its regulations and operational procedures.[6]

Conclusion

According to the accounts of exile naval officers who served in S9, the flotilla was a happy and successful multinational naval unit. What were the reasons for this success? Based on the limited documentary and anecdotal evidence available, it seems that there were six key features to its success. First, there was one common system for doing everything, that of the RN. The five navies each had their own tactics, weapon systems, signals procedures, etc.

before the war. Upon being integrated into the RN, the exile navies had to adopt the British way of doing things. Second, all the exile personnel had to learn English as all orders were given in that language.[7] For some of the navies, few personnel including officers spoke English prior to arriving at Dundee. With time, however, English became a working language among the flotilla's men. For a Polish sailor to communicate with a British sailor, English was needed. But English was also needed for that Polish sailor to communicate with a Norwegian sailor. Third, the men assigned to S9 lived together in common barracks. While records indicate that the enlisted men did live in separate sections of the old jam factory and the Dutch were on a separate floor, they lived in the same building and used the same mess and recreation facilities. The officers lived in a separate building, but were not assigned sleeping quarters according to nationality. These messing and berthing arrangements ensured that the men could not live in isolation from other nationalities. Fourth, it seems that conscious efforts to be hospitable to other nationalities by inviting the other navies to parties and ceremonies, or displaying portraits of the heads of state of all the navies in the officer's wardroom, created a sense of camaraderie. Fifth, the exile navies enjoyed the right of appealing to higher authority, the Admiral (Submarines), if they felt their national interests were seriously threatened by decisions made by Captain S9. Sixth and perhaps most important, was the thoughtful leadership by successive flotilla commanding officers, particularly Captain J.G. Roper. Problems and irritations due to the mix of nationalities were sure to arise on occasion, but these could be overcome with the right attitude and tactful communication.

While all evidence points to the conclusion that S9 was a happy and successful unit, there are also clear indications that operating S9 was more challenging than operating a flotilla with either all British submarines or just a token exile navy presence. As explained above, the exile navies operated submarines of various types, sizes and ages that posed a considerable supply and maintenance problem overcome by custom manufacturing spare parts and cannibalizing decommissioned ships. Many of the submarines assigned to S9 spent considerable amounts of time in

dockyard hands, so the available strength for operations was always considerably less than the number of vessels assigned to the unit. This problem eased somewhat during the later stages of the war as British industry produced enough new submarines for exile navies to decommission pre-war ships and transfer their crews to new units.

Language was likely a second major challenge. While there was a concentrated effort to help members of the exile militaries learn English, at least early in the war communication between the RN and the exile navies would have been quite difficult. It could be expected that individual members of the exile submarine crews, particularly the officers, might be able to converse in English, but these men were few in number. Naval liaison teams were not expected to speak the language of the ship they were assigned to, so other means of translation were needed. The account of one BNLO given earlier in the article says that many Dutch submarine personnel spoke English well. Communicating with French personnel might also have been somewhat easier, given the presence of British personnel who studied French during school as did one of the BNLOs assigned to RUBIS, Sub-Lieutenant Ruari McLean.

Third, national interests might be submerged within the Allied high command but these national interests did not vanish. This affected where exile submarines were stationed. For example, the Royal Netherlands Navy had quite a number of submarines in Britain but after 1940 most of the modern ships were sent to the Indian Ocean and not assigned to S9. This could be due to the large size and long range of the O-21 class submarines not being suitable for operations in the North Sea, but it may also have been a result of Dutch determination to contribute combat forces to the campaign to retake the Netherlands East Indies from the Japanese. A sizeable portion of the Royal Netherlands Navy's largest and most modern ships were stationed in Ceylon or Australia rather than Europe, an indication of the importance the Dutch government attached to having their forces help liberate the country's most important colony.

It is most unfortunate that none of the officers who served as

Captain S9 left memoirs or collections of personal papers. This is particularly true of Captain Roper who as the first commanding officer was in a position to 'invent' the flotilla and establish potentially long-standing ways of doing things. If any of the four officers had left written observations of their time with the flotilla, surely these would have been revealing about the challenges and successes of running a multinational naval unit. Likewise, it would have been helpful if one of the three flag officers who served as Admiral (Submarines) between April 1940—late 1945 had left papers that referred to S9. Another potentially valuable perspective would have been that of the two officers who served as the PNLO, Admiral Dickens and Vice Admiral King. They were in a position to comment on how the RN viewed S9 as a multinational naval unit, and what lessons were learned about multinational naval cooperation. While it is unknown what the RN officially thought of S9[8], the assumption can be made that since the RN did not disperse the foreign boats to other units, S9 was seen as a satisfactory arrangement.

It is also unfortunate that few veterans of S9 were still alive at the time the research for this article was conducted. Due to the small size of their navy's submarine force, not many Poles, Norwegians or Free Frenchmen served with S9, and the British contribution declined quickly as their submarines were sent to other theaters. Even those veterans still alive and able to be located through veterans organization and personal connections among veterans have limited memories of Dundee as six decades have passed since the end of the war, and advancing age has reduced many veterans' ability to recall events and details of their wartime experiences.

So while the documentary and anecdotal evidence available today about S9 is limited, this was not the case in the immediate post-war period. When NATO was established in 1949, just four years after the end of the war, the new alliance could draw upon the extensive lessons learned by the RN from five years of integrating the exile navies into its various commands, and the far larger cooperation between the RN and United States Navy (USN) in both the Atlantic and Pacific theaters. Many of the top officers

in the RN and the now autonomous European navies in the late 1940s and early 1950s would have direct personal experience working with other navies, and so the first NATO steps toward establishing standing and ad hoc multinational naval formations would be easier to initiate than if there was no earlier example, such as S9 or one of the many anti-submarine escort groups in the Western Approaches Command, to learn from.

What might be done to more fully develop the literature on how multinational naval operations have become routine and successful? One direction might be to complete studies of other individual multinational naval units such as anti-submarine escort groups in the Western Approaches Command (which routinely included ships from the RN, Royal Canadian Navy, Royal Norwegian Navy, FNFL, and Polish Navy and occasionally Dutch and Belgian ships), or a destroyer flotilla in the English Channel or Mediterranean where exile navy ships were often deployed. A second direction is to further investigate the National Archives at Kew outside London in hopes of uncovering more files relating to the PNLO. Such files, if found, could create a better understanding of the RN's approach to working with the exile navies. A third direction would be to investigate how the birth of the NATO naval system was influenced by British wartime cooperation with the exile navies, as well as cooperation between the RN and the USN.

The multinational submarine flotilla established by the Royal Navy at Dundee in April 1940 was an unintentional experiment, attempting to combine men from five navies who spoke five languages. While its strategic significance declined as the submarine war moved to the Mediterranean Sea and later the Indian Ocean, and British submarines were completely withdrawn from the unit, S9 remained an important example of a successful multinational naval force. Fortunately for the men involved, the Allied war effort, and the post-war political and military structures created in Western Europe to prevent Communism from succeeding where Fascism failed, the 9th Submarine Flotilla was a success.

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information about S9, the PNLO or the general relationship between the exile navies and the RN are encouraged to contact the author through the editor.■

ENDNOTES

1. E-mail of 28 August 2006 from Commander (senior grade) Hans-Christian Kjelstrup, RNoN to author. Commander Kjelstrup is an active duty officer assigned to the submarine service. He has researched the history of the Norwegian submarine service.
2. Letter of 3 March 1945 from Dutch Naval Liaison Officer to the RN Captain E.J. van Holthe, Royal Netherlands Navy to Sir Henry V. Markham, Permanent Secretary at the Admiralty. Van Holthe asked that the Dutch submarine service be allowed to remain at a base in the UK after the end of hostilities in Europe due to damaged ports in the Netherlands, and that Dundee remain the base. Letter found in NA file ADM 1/18418 "Dundee naval base: reductions in status and personnel, disposal of foreign submarines and release of requisitioned property" (1944-1945).
3. E-mail of 6 September 2006 from Rear Admiral Pierre Besnard, Royal Netherlands Navy retired, to author. Admiral Besnard, then a junior officer, served on the British-built Dutch destroyer TJERK HIDDES which spent most of 1944-45 in the RN's Eastern Fleet, itself a multinational unit with British, French, Dutch and Australian ships.
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5. Warlow, *Shore Establishments of the Royal Navy*, p. 19.
6. Mark Williams, *Captain Gilbert Roberts RN and the Anti-U-boat School* (London: Cassell, 1979).
7. Letter of 23 October 2005 from P.J.S. de Jong to author. Mr. de Jong was a lieutenant on the Dutch submarine O-24 that was part of S9 during 1940-41. He retired from the Royal Netherlands Navy as a captain and entered politics. He later was the Minister of Defense and ultimately Prime Minister of the Netherlands between 1967-1971.
8. I thank one of the anonymous peer reviewers for suggesting this point.

SIEGE AND BOMBARDMENT
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FREDERICKSBURG, TX

by RADM Maurice H. Rindskopf, USN (Ret.)

Author's Note: The first day of this two-day symposium was devoted to the submarine strangulation of the Japanese Navy and Merchant Marine, a major contributor to ending of World War II. Carl LaVO, the author of a popular biography of RADM Eugene Fluckey. Commanding Officer of BARB "The Galloping Ghost" was one of panel moderators. He had first invited Captain Max Duncan, who served in BARB during WWII under Gene Fluckey. Duncan suggested LaVO invite me. The second day was devoted to a similar detailed discussion of the air bombardment of the Japanese Empire by veterans of that campaign.

The Origin of the Museum

The Nimitz National Museum of the Pacific War was housed in a hotel which had been owned and operated by Admiral Chester Nimitz' grandfather in the 1860's. It is located on the main street of the modest town of Fredericksburg, TX which was founded by German immigrants as early as 1840. The hotel was converted into a museum which depicts the life of the Admiral from his days as a youngster to his maturation at the U.S. Naval Academy in the Class of 1906. It covers his career as one of the nation's earliest submariners to his service as a Fleet Admiral and Commander in Chief Pacific from 30 December 1941 until the conclusion of the war. The original museum is modest in extent with written descriptors as it takes the visitor through the Admiral's life, with but a single audio available at the touch of a button.

The Annual Symposia of Yore

The symposia originated in 1988 with a goal of presenting detailed information from those who were there on a broad spectra of World War II in the Pacific. Highlights of the 21 symposia include

- *The Yamamoto Mission* with P-38 pilots and the last remaining Zeropilot as participants;
- *Submarine Operations in the Pacific War* with the four living *MOH* winners and RADM Chester Nimitz Jr. on the panels;
- *The Gathering Storm*—reflections on the 50th Anniversary of Pearl Harbor attack with 2,000 in the audience.
- Pacific D-Days
- The major sea battles, including Leyte Gulf, Midway and Guadalcanal, Philippine Sea, and Okinawa;
- Commencing in 2004, the topics covered the significant sea battles of the war, including Leyte Gulf, Coral Sea, Guadalcanal, and Midway.

As the years have rolled on, and fewer veterans of those gigantic encounters remain alive, the Museum sponsors have exerted extraordinary efforts to find panel participants with stories they can tell.

The 2009 Symposium

As noted above, this symposium entitled *Siege and Bombardment*, devoted one full day to the submarine campaign, and a second to the air bombardment. Submariners will note with interest that the announcement poster included the Japanese Flag and a bomb, but no torpedo, an omission the author was unable to unravel.

The opening segment included a welcome by the new Executive Director, Marine General Michael Hagee. This was followed by a poignant remembrance of the original Executive Director, submariner RADM Charles (Chuck) D. Grojean, USN (Ret) who died in late 2008, delivered by his son, Peter. The keynote address

was an opportunity for Dr. Craig Symonds, American History Professor Emeritus at the Naval Academy, to describe the initial surprising Japanese success in gaining control of thousands upon thousands of miles of territory and ocean only to succumb to the Allied industrial might which ended Japan's dreams after four full years.

Three panels, composed of officer and enlisted veterans, addressed *Intelligence Gathering and Reconnaissance*, the *Elimination of Men o' War and Transports* and finally *Submarine Personalities*. The first and third panels were moderated by Carl LaVO, a newspaper editor in Bucks County, PA and noted submarine author who has written about Captain Slade Cutter and RADM Gene Fluckey. The second panel, moderated by Dr. Mark Parillo, an associate Professor of History at Kansas State University, reviewed the success the submarines had against both Japanese men 'o war and merchant marine.

The panelists included the author who made 11 war patrols in DRUM, the last two as Commanding Officer; Captain Max Duncan, USN (Ret) who made four war patrols in BARB with Gene Fluckey, including the one in which Fluckey earned the Congressional Medal of Honor; and Commander John Alden who made three patrols as a Junior Officer in LAMPREY but later gained fame as the pre-eminent expert on U.S. submarine sinkings of Japanese warships and merchantmen in WWII. Through questions from the moderators, the panelists were able to describe from personal knowledge the failure of the Torpedo Mk 14 and its magnetic exploder, the challenge of evading certain depth charging after an attack, the thrill of tracking convoys to achieve optimum submerged firing position at dawn; and the success of WolfPacks, modeled after the German experience in the Atlantic.

The inclusion of two ex-enlisted personnel provided a vivid description of things little known such as the recommendation by Arthur DeLarios, the pharmacists Mate in HAMMERHEAD who recommended to his Commanding Officer that he not perform an appendectomy at sea. He knows he did the right thing after 50 years as a Doctor in Texas. Art Burry and Jack Tolliver made an interesting pair, as the former was a P-51 pilot shot down over the

China Sea, He was rescued by a team headed by Jack Tolliver in TRUTTA who miraculously found him after six days (in and out of a raft) during a typhoon.

The panel on personalities gave Carl LaVO an opportunity to explain why he chose Captain Slade Cutter and RADM Gene Fluckey as subjects of successful biographies. The leadership characteristics which both of these famed officers exhibited were a model for all to follow. Mike Rindskopf had a chance to praise LCDR Bob Rice, first CO of DRUM, for his quiet but firm leadership, his skilful tactical execution and his bravery in the face of severe depth charging early in the war.

The lengthy Q and A session which followed each panel presentation gave several veterans in the audience full opportunity to pose some complex and difficult questions. Perhaps the most telling comment heard at the conclusion of the day was "I did not know how much I did not know about submarines in WWII".

2010 Symposium

The next symposium is scheduled for 18-19 September at the Museum. Its title is *Termination of WWII with a Focus on Unconditional Surrender*. Be assured that the Museum will call for participants who remember what it was like using untried new mine-locating sonar during entry into the Sea of Japan, or being amongst the 12 submarines at the surrender ceremony in Tokyo Bay.

The symposium may well be held in the newly enlarged Museum which was dedicated to President George H.W. Bush on 7 December 2009. Highlights include:

- Japanese midget submarine recovered off Bellows Field in Hawaii on 8 December 1941;
- Interactive kiosks and map tables describing numerous WWII actions;
- USS DENVER in action at the Battle of Leyte Gulf;
- A partial submarine mock-up with targets viewed through a periscope and a video depicting the rescue of President Bush off Iwo Jima by FINBACK under the command of LCDR R.R. Williams.■

TORPEDO EXPLODER MECHANISMS OF WORLD WAR II:

A NEW PERSPECTIVE

Victor S. Alpher, Ph.D.

Many readers of *THE SUBMARINE REVIEW* will be familiar with the legacy of Admiral Lockwood and the attributions of egregious failure of the Bureau of Ordnance to address rapidly problems with the mainstay torpedo of World War II, the Mark 14. However, new information has come to light that will render a substantial new rewriting of this history. The purpose of this paper is to present some of this critical information, as well as to place some of it in a broader, deeper historical context.

The Ongoing Record of Torpedo Development

I would first call attention to the apparent failings of the written record of the war to represent accurately a sequence of events critical to this inquiry. For example, the Mark 14's exploder, ultimately dubbed the Mark 6, introduced in the 1920s, was tested only twice before the war—in 1926. These two tests were remarkable. One official photograph of the result of one of these tests (see Figure 1) shows an experimental torpedo armed with the Mark 6 inertia-contact magnetic-influence exploder mechanism running under the keel of the hulked submarine L-8. One sees only the bubbles of the trail of the torpedo's path athwart the keel of the target. The other test (see Figure 2) sank the venerable old sub performing its last duty with an under-keel shot. In this photograph one can see the desired effect of the magnetic-influence exploder, which is the breaking of the back of the target's keel from the upward-directed plume of the warhead's explosion. The live fire tests thus yielded a 50% success.

Figure 1. U.S. Navy photograph #NH 88457. This test of the Mark 14 torpedo's magnetic exploder mechanism shows its bubble wake as it passes under the hull of hulked submarine L-8 on 26 May 1926. Note that it passed quite shallow, under the keel of its target, without detonating. The Mark 14 was later found, during tests conducted during the war, to run considerably deeper than its settings, rendering it less effective. During the test, this appears not to have been a problem, at least from visual inspection of the photograph. Source: Naval Heritage and History Command at www.history.navy.mil . Retrieved June 30, 2009.

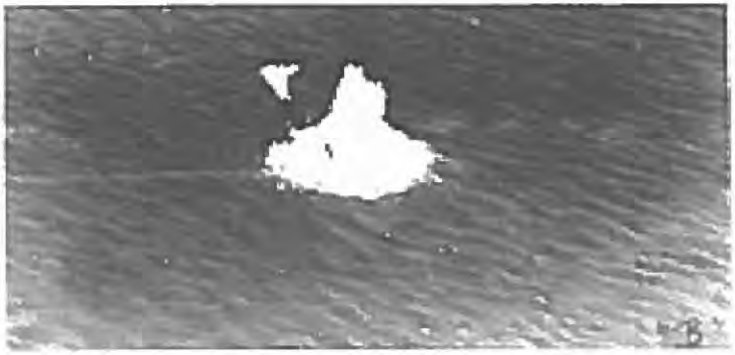

Figure 2. U.S. Navy photograph of one of the two 1926 tests of the Mark 14 torpedo's magnetic exploder mechanism Mark 6 Mod 0. This photo # NH 88458, is titled "Hulked submarine L-8 is sunk by a magnetic exploder torpedo, 26 May 1926." Note the bubble wake from the shallow run on the left side of the photograph. Source: Naval Heritage and History Command at www.history.navy.mil .Retrieved June 30, 2009.

Later, during World War II, the Bureau of Ordnance required a 50% success rate for the radio-controlled Proximity Fuze to move from *experimentation to production*. During the crucial test with the radio-controlled fuze in a 5"/38 anti-aircraft (AA) shell following development of radio-controlled fire over many months, three drone aircraft were sacrificed and shot out of the sky in a demonstration for BuOrd. It was decided not to risk loss of the fourth test drone, the Army Air Force having objected to the destruction of these expensive targets. This was followed by a "three hits, three runs, no errors" communication back to Section T. The game was on—leading to the development, testing, production and use of *millions* of VT (variable time) Proximity Fuzes for numerous Navy and Army projectiles by the end of the war.

The apparent justification for the two-shot experimental *procedure* in the case of the magnetic-influence exploder was the *expense* of live fire—demolished test vessels destroyed, and expensive test torpedoes destroyed. So, the first two years of the war were the real *experimental test period* for the Mark 14—a colossal failure for which, in Naval tradition of individuals taking blame, skippers were found ultimately *at fault* for duds and apparent misses. This was ultimately much more costly. For those involved, the marks on their records are unfortunate from what we now know. These records perhaps could, and should, be amended. Later wartime tests of the depth-maintenance mechanism found that these torpedoes ran deeper than designed. Of course, any testing with inert warheads designed so that the torpedo would float after running was bound to be misleading, and it was. Competent skippers were likely lost.

Even the written record as we can examine it today fails to answer important questions. The Mark 14 Mod 0 was followed by the Mark 14 Mod 1, 2, and 3. OP 635, in Record Group 74 (Bureau of Ordnance) is titled "Torpedoes Mark 14 and Mark 14 Mods 1, 2, and 3—Description, Operation, Adjustment and Care." It is dated, significantly, ***24 March 1945***. Remarkably, this demonstrates one of greatest problems in conducting research on torpedo development during this war; the great time lag between

modifications and publication of such procedural manuals, ***during which significant research, dissemination, and change was already coming down the line to operational level in the Fleet.*** None of the personal public accounts written between 1945 and 1996 apparently contain any such information, inspiring and accurate as they may have been, regarding other aspects of submarine warfare. Also, there was an earlier nomenclature for identifying manuals, which I will discuss in a future article.

Declassification

Many researchers in such military areas have confronted the nature of the historical record and the great effect declassification review has on it. Many official U.S. Navy documents of WWII vintage have mixed SECRET, CLASSIFIED, CONFIDENTIAL, and RESTRICTED components within the same document (the nature and implications of these mixed designations is beyond the scope of this paper). To its credit, the *Historical Naval Ships Association* (HNSA) has done a great service in making more of the written record available, not only to researchers, but also to the general public when possible. In this way, modern research will improve significantly in quality and scope. On the other hand, for the serious researcher, the on-line versions are often not 100% complete. In my experience, it is still necessary to find and examine the *original* document, unexpurgated and unabridged, for critical clarifications. Whenever possible, when I am unable to examine the original documents or a copy with suitable provenance, I will indicate so in the references. This applies to many documents referenced in this paper as well.

These accounts were no doubt important for public relations leading to the development of the military-industrial complex, which relied on taxes and the interest and support of the taxpaying public for its major successes in subsequent decades of the Cold War. The *existence* of the National Defense Research Council (NDRC) and the Office of Scientific Research and Development (OSRD) had been disclosed. However, these *book club* tomes were generally *not* "gee wiz" type accounts of the role of science and advanced engineering in prosecuting a quick end to the war.

They were serious studies of different aspects of OSRD work—within the bound of SECRET, CLASSIFIED, CONFIDENTIAL, and RESTRICTED classifications of much of the work. They were certainly much more scholarly than, say, *Popular Science* or *Popular Mechanics*. My point is that the serious academic researcher or even philologist had to wait decades for access to the kind of material that I refer to here.

Following upon the war (which, for veterans' purposes, continued into 1946), many publications touted the accomplishments in turning scientific advances to application on the battlefront, land, sea, and air.[1,2,3,4] One such volume authorized by the Navy has a brief (ten page) summary of various scientific contributions to the Navy's air war. The torpedo issues dealt with in my previous article (the Mark 13 air to surface torpedo launched from the Avenger) are not mentioned, nor is any other major torpedo problem. Magnetic Airborne Detection (MAD) is dealt with in one paragraph (p. 377).[5] Although they are interesting, these types of books were meant primarily to satisfy public curiosity and are of minimal value to the serious researcher. Today they might be slanted also to justify expenditure of taxes. During WWII this was not the case – the relative wartime expenditure on scientific development was small compared to the overall cost of the war. Also, government bonds to pay for the war were eagerly bought and promoted by the government for what was generally regarded as a just and moral conflict.

An excellent parallel case study is that such a significant advancement as the Proximity Fuze was not really declassified in significant detail until 1976. Some have called it "the mini atomic bomb." Following this, Dr. Ralph Belknap Baldwin, who worked on Section T Proximity Fuze contracts and liaison with the U.S. Army was able to publish the landmark *The Deadly Fuze* in 1980,[6] and *They Never Knew What Hit Them* in 1999.[7] Having "been there" he most definitely had an inside track on producing these books. Dr. Baldwin was also the liaison from Section T to the U.S. Army. Five years prior to his recruitment into Section T, he had earned his doctorate in astronomy at the University of Michigan in 1937.

Evolution of the Mark 14

Who would be surprised to find out, today, that before the publication of OP 635 there was already in existence further modifications of the Mark 6 TEM for the Mark 14 torpedo, Mods 5, 6-5 and 6-6 with effective changes to the original Mark 6 Mod 0 TEM? They were not only already in progress, but also in operation. I believe many in the submarine and academic military community will find this an exciting historic finding. It has almost become a matter of decades of World War II folklore or dogma, in my experience of talking with military and nonmilitary people about the dreadful torpedo that had been a dismal failure during the 1941-1943 period, the Mark 14 with the Mark 6 TEM.

I prepared an article for *THE SUBMARINE REVIEW* on the subject of Torpedo Exploder Mechanism development under the auspices of "Section T" contracts within Section 6 of the OSRD.[8,9] This article focused on the development of the Mark 9 TEM. This was a magnetic-influence exploder that operated on different principles than the Mark 6 TEM (and Mods) used with the Mark 14 submarine torpedo (in this early period, the torpedo was often referred to with Roman number designation such as the "Mark XIV").

I refer the reader to the first article for detailed information on the Mark 9 TEM, which shows its position, as was typical, on the underside of the torpedo. Like the Mark 9 TEM, the Mark 6 TEM was also inserted from the outside of the torpedo hull with 24 screws, thereby allowing replacement of Mark 6 Mod 0 TEM with the subsequent Mark 6 Mods 1, 2, and 3 described in OP 639.

The Mark 9 TEM was a combined inertia-contact magnetic-influence exploder that *employed reverse polarized electromagnetic rods to detect changes in a vessel's magnetic signature* directly underneath the keel, where most ships of World War II vintage and earlier were weakest. Most seagoing Naval vessels were best armored on the sides, which led to ineffective direct hits from contact exploders that did not contain warheads powerful enough to pierce the reinforced armor. Perhaps this idea of reinforcement goes back to the Civil War, when a torpedo [mine] was attached by the C.S.S. Hunley to the side of the wooden-hulled U.S.S.

Housatonic, sinking this large ship in the Federal blockade of Charleston Harbor in 1864. The Federals began to employ "torpedo nets" hanging from the sides of wooden-hulled warships. The reinforcement of the hull during WWII plagued many submarine, destroyer, PT boat and airplane–launched torpedoes throughout the war.

At one point, firing solutions allowing only ninety degree hits (direct) were permitted, although this did not solve the problem. A new warhead material, Torpex (Torpedo Exploder) was a useful development in compensating for other deficiencies in pre-war ordnance advances.

The Mark 14 torpedo used later in the war was much more successful.[10,11,12] Most of these torpedoes were employed in the Pacific theater. What was the change? OP 635 does not give us the answer. I pondered this matter for some time, reaching into many newly available documents until I obtained a publication of the Underwater Ordnance Department on "Mine Disposal" dated 1 October 1944 (CONFIDENTIAL). This is a phenomenal eye-opener. It includes instructions for rendering torpedoes of all types *currently in use safe for storage or destruction*. It is quite specific and mentions all wartime torpedoes, as well as all previously known and many previously unknown torpedo exploder mechanisms. It shows and describes in great detail many modifications for all known torpedoes during the WWII period. In this manual, I found information not only on the Mark 9 TEM, but also the Mark 10 TEM. The Mark 10 Mod 3 TEM was intended for use in the Mark 15 Mod 0, Mark 15 Mod 1, Mark 16, and Mark 17 (and Mods) through 10 June 1945. The Mark 10 TEM was also a combined inertia-contact and magnetic-influence exploder device.[13]

This manual also includes specific information on the ***Mark 6 Mod 5 and Mark 6 Mod 6 Torpedo Exploder Mechanisms*** which were employed with the Mark 14 torpedo – and could be easily inserted in the location of previous modification on the underside of the torpedo. The date of this section of the manual is 1 October 1944, nearly a year before the end of the war. These were substantially different from the maligned Mark 6 Mod 0 TEM of

the early 1941-1943 period of America's involvement in WWII.

Change No. 6 to the Mine Disposal Manual for Undersea Ordnance, added 10 June 1945 is also pertinent to this discussion. It covers other ordnance, for example, the Mark 15, which was a surface-launched torpedo (e.g. destroyer, except PT boat). The Mark 17 was a submarine-launched torpedo intended to rival the long-distance Japanese Long Lance; 400 were reportedly produced—although combat use statistics are not reported.

The Mark 18 was an electric submarine-launched torpedo, developed by Westinghouse after capture of the deep-running German G7e soon after America's entry into the war. U-570 (see Figure 3a typical Type VIIC German submarine, the most ubiquitous of the war) was captured under a rare attack by a British Hudson of Squadron 269 on the U- 570's first war patrol (1 August to 27 August 1941, when it was captured), yielding the German G7e torpedo with its unreliable T2 inertia-contact and magnetic-influence exploder. T2 problems were corrected with the T3 exploder under direction of the German *BdU* (*Befehlshaber der U-Boote; Submarine High Command*).

Figure 3. Photograph of U-570, Type VIIC German submarine with the G7e electric torpedo (contact-inertia and magnetic-influence detonator T2), which became the model for the U.S. Navy's Mark 18 electric torpedo.
Source: http://upload.wikimedia.org/wikipedia/commons/7/79/U_570.jpg (Retrieved 22 August 2009).

The distinct advantage of the electric Mark 18 was that it ran deep and had no wake or bubble trail visible from the surface. The under-keel plume from the explosion was intended to break the back (keel) of the target. I have, to date, found no specific reports of Mark 18s fired during the war in combat, although information in the Underwater Ordnance Mine Disposal manual refers to torpedoes and TEMs *in use*; therefore, it is not unreasonable to speculate as to its use. It was in Allied hands throughout the 1941-43 period of dismal performance of the Mark 14 torpedo.

Also, the only history of the Naval Undersea Warfare Engineering Station at Keyport, Washington indicates that the Mark 9 TEM *was intended for use in the Mark 18 torpedo and was effective in combat.*[14] The Applied Physics Laboratory of the University of Washington was contracted along with JHUAPL in the development of the Mark 9 TEM in cooperation with Keyport – the first torpedo development station to follow Newport. Successful firing of the Mark 13 torpedo employing the Mark 9 TEM (inertia-contact and magnetic-influence) apparently sank the behemoth Japanese battleship *Yamato* in early 1945.

The Mark 9 Mod 3 TEM preliminary manual (OP 1365) was published on ***13 March 1945***. OP 1369 for the Mark 10 Mod 3 TEM was published on the ***same date***. As both were combined contact-inertia and magnetic-influence type exploders, BuOrd can neither be said to have been unresponsive nor bumbling in reaction to the Mark 14 debacle as is often implied — or outright accused. These new TEMs were obviously in service long before the end of the war and undoubtedly helped to shorten it. These two papers in combination should go some distance in vindication of the Bureau of Ordnance under Rear Admiral, and later Admiral George Hussey, Jr., as well as Admiral Lockwood.

New Exploders for the Mark 14 Submarine Torpedo

There were a number of precursors to the Mark 6 Mod 5 and Mark 6 Mod 6 TEMs (Mods 1, 2, 3, 4a and 4b). Under tremendous pressure from Admiral Lockwood, Admiral Nimitz eventually ordered turning off of the magnetic-influence portion of the Mark 14 torpedo to the portions of the Pacific Fleet under the command

of Admiral Lockwood on 24 June 1943. An interesting footnote to this affair is that Rear Admiral Ralph Christie, inventor of the Mark 6 magnetic-influence exploder mechanism, did not follow this command immediately under his South Pacific domain, although ultimately, he fell into line with orders.[15] Christie lamented in his diary, "Today, the long hard battle on the Mark VI magnetic feature ends—with defeat. I am forced to inactivate all magnetic exploders. We are licked."[16]

This change did not solve all of the Mark 14's problems; prematures were reduced, but deficiencies in the contact-inertia component became more apparent, as torpedoes that were heard to hit the hulls of their targets did not fire. One can imagine Christie's dismay—as a line officer, he would not have been privy to the extensive research and development already under way. Christie's basic idea was vindicated. After the war, the magnetic-influence concept underwent even further development; this will be the topic of a future report.

Analysis of Later Developments for the Mark 14

Mark 6 TEM Mods 5 and 6 were substantially different from all of the previous exploders used in the Mark 14 torpedo. They therefore merit closer examination here. First, the firing speed of the impact-inertia device was increased through the use of an electronic detonator, as opposed to the mechanical detonator originally used. Because electronic detonation was employed, the percussion striker and trigger assemblies were eliminated.

Use of the electronic detonator made it unnecessary to use the solenoid and lever assembly originally employed in the magnetic-influence portion of the fire control apparatus. Any loss of weight rendered by these changes underwent compensation with dummy weights added to the TEMs. The impact-inertia section was more sensitive as well, with an impact of only 28 oz. closing the inertia switch.

The magnetic-influence portions of these torpedo exploders were also different from the original Mark 6 TEM Mods. The magnetic devices passed current directly from the thyratron to the detonator, eliminating energizing of a solenoid from the circuit.

This removed one variable of complexity and potential source of failure in the circuitry that, along with the all-electric fire control produced a vastly more reliable and effective torpedo.

The Mark 10 Mod 3 Torpedo Exploder Mechanism

The story of the Mark 6 TEM does not end here, however. The Mark 10 TEM was designed to fit in the pocket of the Mark 6 on the Mark 14 Torpedo with minor modifications. Preliminary OP 1369 dated 13 March 1945 described the Mark 10 Mod 3 in great detail. Essentially, it is comprised of the many advances of the Mark 9 TEM described in my previous article (see Figure 4). It is designed to detect changes in the magnetic field in either polarity (with a .5 second delay to allow detonation under a vessel's keel). Figure 4 shows the typical sequence for fire control of the exploder, while Figure 5 demonstrates the manner in which a magnetic-influence exploder mechanism performs once a ship's magnetic signature (perturbation of the earth's magnetic field) is detected. This leads to a depth increase so that when detonation occurs after a brief delay, it is at an ideal depth below a ship's keel, the upward plume of the explosion breaking her back. Another problem inherent in the Mark VI TEM, that attendant to variations in the Earth's magnetic field from the higher latitudes to the equator, was also solved.

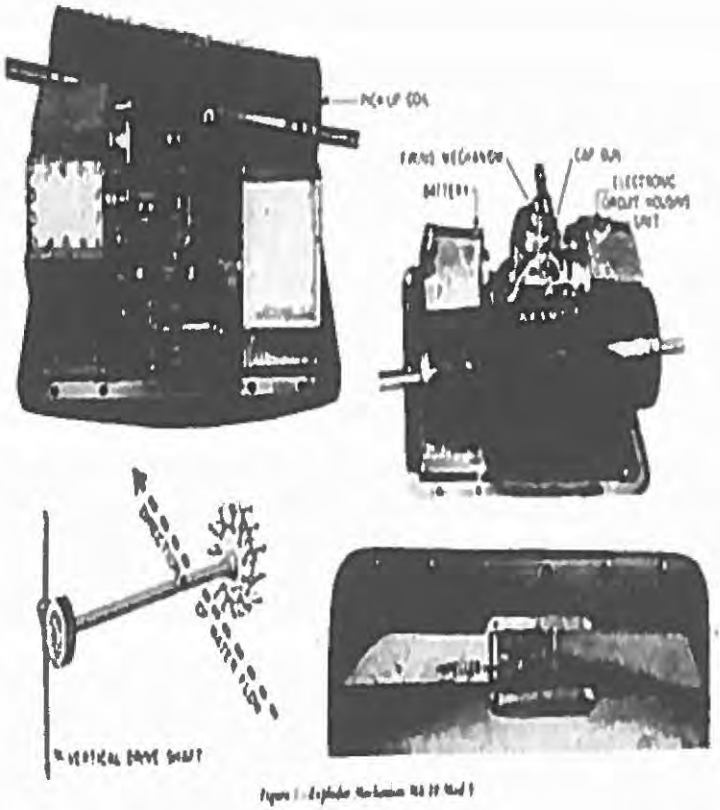

Figure 4. Diagram of Torpedo Exploder Mechanism Mark 10 Mod 3—Magnetic Firing, from OP 1369, 13 March 1945. Note magnetic pick-up coil location, and star wheel to delay arming until a safe distance from launching submarine. Declassified 20 June 2009, Authority NND34869 NARA.

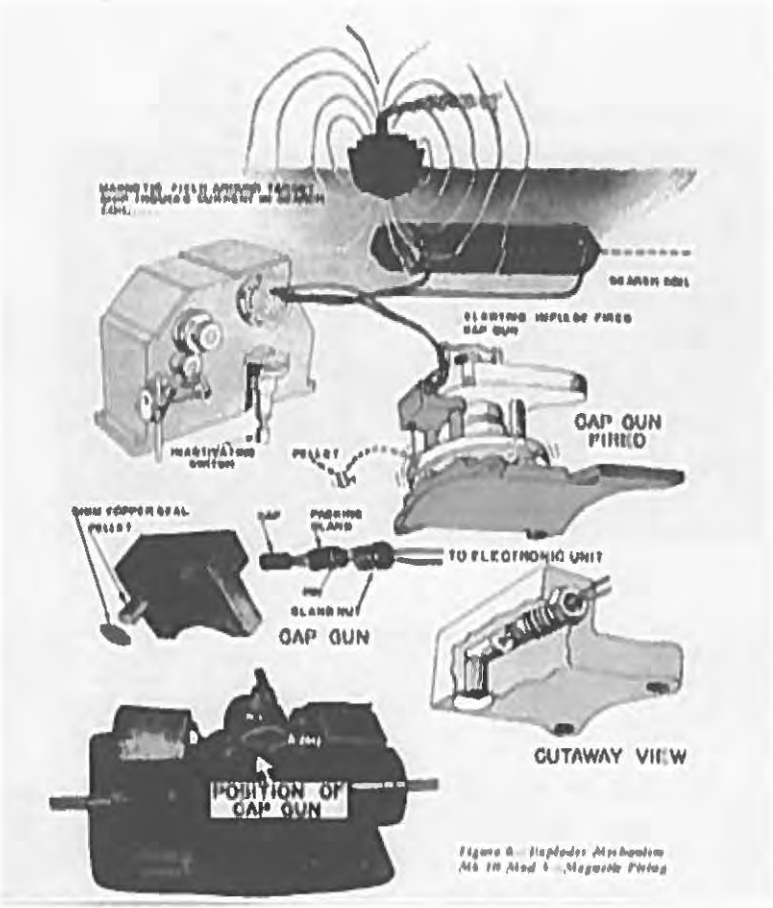

Figure 5. Diagram of sequence of firing of the Mark 10 Mod 3 Torpedo Exploder Mechanism. Note position and identification of new cap gun. Declassified 20 June 2009, Authority NND34869 NARA.

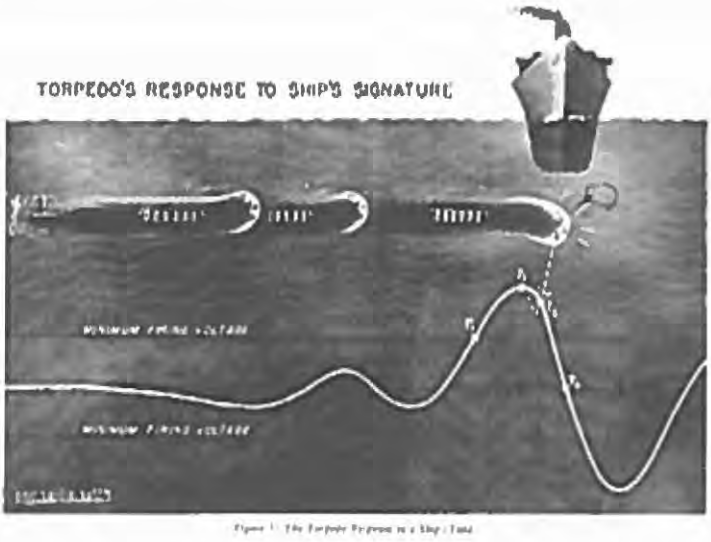

Figure 6. Diagram of typical magnetic induction torpedo exploder in target-seeking mode. It responds to detection of the surface ship's magnetic perturbation of the earth's magnetic field, at which point it "dives" so that after a .5 s delay, the plume from the explosion upward will do the most damage to the vessel by breaking its "back." Declassified 20 June 2009, Authority NND34869 NARA.

The Mark 10 TEM also contains a contact-inertial component. Both the Mark 9 TEM and the Mark 10 TEM were supplied with extensive and unique testing equipment designed to assure that they were working properly before deployment. Thus, by the time even a preliminary OP was disseminated (with RESTRICTED, CLASSIFIED, CONFIDENTIAL, and SECRET components), a great deal of design, testing, and production work had already been done to assure that the device met the standards of the Bureau of Ordnance. Although the 50% effectiveness mentioned previously was necessary for further development (e.g., the Proximity Fuze), a much higher standard was necessary for *production* testing and deployment.

Ordnance meeting these standards developed during the war typically operated with reliability and efficiency in the high 90%

range. (Army ordnance, such as artillery, bombs, and mortars employing the Proximity Fuze turned the tide of the Battle of the Bulge). The Mark 10 TEM was similar to the Mark 6 Mod 4 with significant modifications. A cap gun was added, as well as a mechanical gear for arming the influence feature of the exploder only after the torpedo had run for several hundred yards (this firing mechanism is described in detail in OP 663). Figure 4 shows how the magnetic-influence exploder was intended to operate under a target's keel, reacting to changes in the magnetic signature expected given the nature of the earth's magnetic field. This figure applies to all magnetic influence exploders in theory.

The Mark 9 Mod 3 TEM was designed for use with the Mark 16 Warhead. This was the Warhead used by the Mark 14 torpedo.[17] In the pre-war and early war period, this Mark 16-1 Warhead employed 507 pounds of TNT. Later on, it exploded with either 643 or 666 pounds of Torpex (Torpedo Exploder).[18] Torpex was a much more effective destructive force behind the phosphor bronze-covered (nonmagnetic) warhead.

We have seen that by the mid-1990s, a complete history of torpedo use and development during WWII could not have been written for public consumption. Many of the documents used to conduct the current research are in Record Group 74 boxes at the National Archives that were declassified in *December, 1996* (this is marked clearly on the side of the respective RG 74 box from which the documents discussed here were obtained in 2009).

In *The Submarine Review*, a six part series on torpedo development from before, during, and after WWII was written by Professor F.J. Milford. Referring to the turning off of the Mark 6 Torpedo Exploder Mechanism of the Mark 14 torpedo, he stated emphatically: "Magnetic influence exploders were not used by the U.S. Navy submarines through the balance of WWII."[19] In light of more recent data, this statement would require reconsideration.

Now we can see that the final story has not been written—not in 1996, 2006, and I doubt even 2010. A final exposition is probably not in the offing due to classification and declassification procedures. Dr. Baldwin's account of the development of the Proximity Fuze and its application to Army Ordnance is

instructive. The degree of separation of design and production contracts necessary in order to maintain secrecy and "need to know" dissemination of information was crucial during wartime, and maintained with utmost scrutiny. Even though the existence of the Proximity Fuze was known, the most revealing and technical exposition of its development was first made in 1947 in the American Journal of Physics.[20]

One particularly revealing section of this paper notes that while quality control was usually handled by one of the military branches, in this case it was carried out by the Johns Hopkins University Applied Physics Laboratory (JHUAPL), and in the case of bomb and rocket fuzes, the National Bureau of Standards. Production testing was done at seven existing proving grounds, and seven additional proving grounds developed solely for the testing of the new fuze. I have heard the stories from my father of personal experiences during the testing of torpedo exploder mechanisms in the Pacific Northwest in the water—sometimes quite harrowing as when experimental torpedoes broached in the direction of the experimental personnel! One can but imagine the extent of secret testing of these new devices before they ended up in use by the Navy.

My father's work under Section T at JHUAPL could only have occurred were it an absolute certainty that he could not and would not enter the armed forces, although he did try to obtain a commission.[21] His colleague, Dr. James Van Allen, received a Lt. (jg) commission so that he could travel to the Pacific and "sell" the first anti-aircraft Proximity Fuze to line officers (by 1944; such a risk in the case of my father was not permitted). In one example of the production of safety devices for the Proximity Fuze (to protect military personnel), four out of five components were rejected.[22] It is apparent now that some of the material that was once declassified in the National Archives and Records Administration Record Group 74 has been reclassified and therefore no longer accessible for public release or research. Much more is left to be understood, particularly how Navy and Army needs were met by scientists and engineers employed under the NDRC and OSRD. I believe we can say with some certainty that Magnetic-Influence Exploders, along

with the Proximity Fuze and the Atomic Bomb, were among the most secret ordnance developments that allowed the Allies to defeat the Tripartite powers with dispatch, once the United States entered the conflict.

Admiral Hussey, Chief of the Bureau of Ordnance, was able to publicly praise the Proximity Fuze which was developed under his administration, as did Admiral Blandy and Secretary of the Navy James V. Forrestal. They would probably have been pleased to mention publicly other Section T projects such as those described here, but could not. Although the existence of the Proximity Fuze had been made public, the extent of its decisive use in the European Theatre on the continent was not revealed until 1976.[23,24] We may well yet discover other SECRET projects that brought this worldwide conflagration to a surprisingly rapid end.

Other aspects of torpedo development, such as underwater homing mechanisms developed at locations such as the Harvard Underwater Sound Laboratory (HUSL) were important. They are, however, beyond the scope of this paper.

A Final Note of Caution

I would like to quote from an October 17, 1945 Report (No. 1125) of the Committee on Appropriations of the House of Representatives, in closing:

> "This splendid agency [NDRC] but a few months hence will go out of existence. The contribution that it has made to the winning of the war is inestimable.
>
> Without such contribution, it is safe to say that victory would await achievement. However the office has been essentially a war agency, and it is now engaged in liquidation. To its distinguished and internationally known head, Dr. Vannevar Bush, and the staff of great scientists he gathered around him to aid in the development of new weapons, the Nation owes much."

Contrast this with the situation we have today in the United States. Is Nationhood a thing of the past? Many would argue yes, that these divisions are the *de facto* precursors to wars. However, there is insufficient space here to discuss foreign policy and global armament issues.

Yet, on the other hand, the former Axis powers, German, Italy, and Japan, are set to repeal post-war constitutional provisions in the Tripartite Pact that prevented preparations for offensive war and, in a sense, affect their sovereignty and national identity.[25] In some cases these provisions may have already been violated technically if not in spirit. However, sentiment in these Nations and their former military adversaries has changed over the decades following V-E and V-J days. Where is the next Vannevar Bush, upon whom the United States will rely for a broad and deep comprehension of America's technical and scientific capabilities not yet imagined? Someday, such a person will doubtless be needed. Franklin Delano Roosevelt's choice of Dr. Bush was prescient, expedient, and in retrospect, virtually miraculous. The story of the Mark 14 torpedo is a small, but instructive chapter leading to my question. Vannevar Bush stated:

> "Science, by itself, provides no panaceas for individual, social and economic life. It can be effective in the national welfare only as a member of a team, whether the conditions be peace or war. But without scientific progress, no amount of achievement in other directions can insure our health, prosperity and security as a nation in the modern world."[27]
>
> It is fitting to ponder the low position of the 21st-century United States in national comparisons of technical and science education and popular comprehension of these subjects. The 100-odd German scientists brought to the U.S. in Operation Paperclip following WWII have been estimated to be some ten to fifteen years ahead of the US in aerodynamics. They had created the first ballistic missile (V-2 or A-4). Dr. Robert Sauer's 1943 book Theoretische Einführung in die Gas-

dynamik was captured and translated into English for the military by Ralph A. Alpher and Freeman K. Hill.[28] Professor Sauer's work provided one of the foundations for the great strides taken at Pennemünde.

Figure 7. The Submarine *artwork* was used in one of the OPs used as a reference in the article by Dr. Victor S. Alpher.

Acknowledgements

One of the rarefied pleasures of conducting an extensive research project of this nature is reflecting upon all of the people with whom one has had contact, and who provided encouragement, leads, information, warning of the dead ends and false leads, and adding a human dimension to the solitary esoteric work of research and writing.

I am indebted most to my father, Dr. Ralph A. Alpher. He provided the inspiration for me to enter a career devoted to scholarship. The decision to enter into an intensive study of his career, which is part of the History of Science as well as the history of scientists' involvement in protecting and defending the United States of America was inspired by many technical, scientific, and moral discussions we had over the course of many decades. Without handwritten notes he kept during the period 1940-45 (and beyond), I could not have embarked upon this investigation. Yet, as would be expected of anyone with a Q clearance, I had to be satisfied for much of my life with repeated vague statements about what my Dad did during the war, while my contemporaries told tales of their fathers slogging and freezing across Europe or sweating across the islands of the Pacific—or breathing in the dust of North Africa. And, of course, he could not serve because of his *poor eyesight*. This was his quick discussion-ending statement. His contributions were unique, sensitive, and irreplaceable. Draft boards and enlistment centers were provided a list of several thousand such persons who were not to be drafted or allowed to enlist.

I also acknowledge the contribution of his longtime colleague in Cosmology and Astrophysics, Dr. Robert C. Herman, who also worked on Section T contract, for his inspiration as I developed my career interests and philological nature. Bob recognized my passion of music as well—which we both shared and which he and his wife encouraged with a gift of a rare edition of "Old Irish Folk Music and Songs" by P.W. Joyce upon my college graduation.

Mr. Jack Lopez (USN-Retired), President of Aviation Archives, was my proxy at the National Archives II in College Park, Maryland. I was referred to him serendipitously; over time he has become an increasingly more important part of this project.

Friends, family, and colleagues are always important when one takes time away from day-to-day life to "do another dissertation." They must accept that there is a moral imperative guiding such devotion to work of such devotion and drive. During the course of this period, I acknowledge the support, counsel, and consideration (in no order of importance) Jack Lopez, Lt. Col. C.

Jay Lyons (*U.S.A.F.-Retired and his family*), Dr. Dwight (Ed) Neuenschwander (*Southern Nazarene University and American Institute of Physics*), Dr. Barbara Goss Levy, Dr. Gerard J. Connors, Dr. Marcelo Gleiser (*Dartmouth University*), Matt Hickey (*Workaholic Productions*), Dr. Gary White (*AIP*), Dr. Igor Gamow, Dr. Bill Henry, Dr. Phil Kosky, Dr. Sandra Sessoms, Dr. and Mrs. Richard and Molly Schneider, Dr. and Mrs. James and Loys Marsden, Rich Pekelney (Historic Naval Ships Association), Captain C. Michael (Mickey) Garverick (*USN-Retired*), Dr. Ron Presswood, Paul Shomsky and *The Military Rifle Journal*, Janet Frostad and Renee Kurdzos (*University of Puget Sound*), Jane Doggett (*Librarian, University of Washington Applied Physics Laboratory*), FOIA Staff at NAVSEA, Reference Staff at the *Defense Technical Information Center*, Mary Jane Valachovic, Robert L. Bodin, Stacie Jo Carson, David Cave (University of Michigan), Tim Frank, M.A. (Historian-Consultant, *Military Research Associates*), Drs. Ralph Belknap Baldwin, James van Allen, Don White, Charlie Muckenfuss, Samuel Wait, Bob Johnson, and John C. Mather; Herr Udo Pfleghar, Herr Gottfried Leich, and Dipl. Arch. Wolfgang Graeser, and my longtime friend and cheerleader, Bill Erickson. Special thanks to Dr. Friedrich Dr. h.c. mult. Bauer. Responsibility for the ultimate content, interpretation and conclusions is of course attributable only to me.■

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2. Baxter, James Phinney, III. Scientists Against Time. Boston: Little, Brown, & Co., 1948. Baxter, the OSRD Historian, was President of Williams College in Massachusetts. This book received the 1947 Pulitzer Prize.

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7. Baldwin, Ralph Belknap. They Never Knew What Hit Them. Naples, FL: Reynier, 1999. Dr. Baldwin, an Astronomer, also predicted that moon craters were not volcanic in origin, but resulted from asteroid impact. This was based on his optical analysis of the crater. Subject to professional ridicule, he was vindicated when moon rocks collected during the Apollo missions were analyzed; this led to a revitalization of his career in Astronomy, and international recognition and reward.
8. "Section T" contracts under the Office of Scientific Research and Development were first made to the Carnegie Institution's Department of Terrestrial Magnetism in 1940, where my father was then employed. The prevalent explanation for the nomenclature is that the director of these projects throughout the war was Dr. Merle Tuve, who instituted very novel methods of assigning personnel to research, design, and experimental testing projects for the Bureau of Ordnance, Department of the Navy. Eventually, after a long period of negotiations with Board Member D. Luke Hopkins of The Johns Hopkins University of Baltimore, administration of these contracts came under the new Applied Physics Laboratory of Johns Hopkins University, the first free-standing laboratory of its type conducting research for the government. Letterhead of correspondence for research conducted under these auspices continued, under the Johns Hopkins University imprimatur, to contain in small print "A Section T Contract" throughout the war. My father worked on Section T contracts throughout the war, and was hired to work on the TEM Mark 9 project officially beginning 1 August 1944. The project was headed by Drs. Wilbur Goss and Dr. Freeman K. Hill. My father was assigned to the Production Problems group starting on 8 December 1944 and became Project Supervisor—Production Problems on 1 July 1945 (according to his personal notes in the possession of the author).
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22. These personal papers did not contain classified material—author. Before his death in 2007, my father did explain enough about his pre-cosmology work to enable me to "crack the codes" which first led me to spend a week at the National Archives in October, 2004. Many people I have contacted about projects he worked on have been rather astounded that anyone was interested anymore; colleagues in his later career were astounded to find out what he had done during and after WWII—but wished they could have talked to him about it.
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A NEW ESTIMATE OF U.S. TORPEDO SUCCESSES IN WORLD WAR II

by Mr. John Alden

John D. Alden is a retired U.S. Navy Commander and a veteran of three war patrols in the Pacific Theater of World War II. He has written extensively on naval history, including five books and numerous articles. He is known to several generations of submariners as the author of The Fleet Submarine in the U.S. Navy. He lives in Delmar, N.Y.

Our submarines' major contribution to the destruction of the Japanese Navy and merchant marine is well known, as are the handicaps they suffered from defective torpedoes. Their successes are usually stated quantitatively in terms of the number and tonnage of enemy ships sunk or damaged. However, two data sources, one old and one new, now offer the means for calculating a different and more direct measure of the success rate of our submarine attacks during World War II. The old source is a master list of all U.S. submarine attacks issued by the Office of Strategic Planning, ComSubsPac (sic) and titled "U.S. Submarine Attacks, Listed by Date and Hour of Attack, Based on Task Force Commanders' Assessments, Data from Records of SORG."[1] The new source is statistics derived from the data base for the recently published book *United States and Allied Submarine Successes in the Pacific and Far East During World War Two* by Craig R. McDonald and myself.[2]

Source 1—The Submarine Operations Research Group (SORG)

Little specific information has been published about SORG and its work during the war. According to Admiral Charles A. Lockwood, he added the group to his staff organization in 1943.[3] The results they produced, he wrote, "were startling at times and

always highly valuable in shaping the trend of our efforts. Before the war ended they could tell us—and prove their statements—what firing ranges produced the best results, what type of torpedo spread got the most hits, what agencies probably caused our heaviest losses—there seemed to be nothing which they could not reduce to a punch card on an IBM machine. The results of their studies were published monthly or oftener, in our *Submarine Bulletins*." Considering their subject matter, these bulletins, and SORG's output in general, would have been classified secret or higher and given limited distribution.

Although the SORG document that is the basis for this analysis is undated, it was obviously produced very shortly after the end of the war. Originally classified secret, the report was not publicly available until declassified in March 1972. It is a compilation of all reported U.S. submarine attacks during the war, whether by torpedo, gunfire, demolition, or other means. Its columns provide data on some 15 key elements of each attack such as the time and location of the attack, the presumed type and tonnage of the target, and the claimed result: sunk, damaged, or not hit. In the case of a torpedo attack, it gives the number and type of torpedoes fired and the hits claimed. I have checked it extensively against the actual patrol reports and can attest that it is an accurate compilation of data from those reports.

There is no indication in the document itself of its intended purpose, but in context it (or a similar compilation) appears to have been the basis for Admiral Lockwood's post-war effort to publicize the Silent Service's achievements, which until then had been largely cloaked under strict security. Summary totals for each month and year give the number and tonnage of ships claimed sunk and the same for those damaged. Adding up the yearly figures produces these grand totals: 2,662 ships of 10,751,700 tons sunk, and 1,005 ships of 5,733,800 tons damaged.

According to Clay Blair, "Lockwood and his staff tabulated the final results for all submarine commands and submitted the figures to the Navy Department. Lockwood claimed that U.S. submarines had sunk about 4,000 Japanese vessels for about 10 million tons."[4] However, the Joint Army-Navy Assessment

Committee (JANAC) arrived at much smaller figures: 1,392 ships of 5,611,117 tons sunk.[5] "When confronted with the revised sinking figures according to JANAC, Lockwood laid most of the blame for the large discrepancy between claims and actuality on defective torpedoes. A total of 14,748 torpedoes had been fired. Had all these run, hit, and detonated as designed, the claims might well have been closer to the actuality, he maintained.[6]

While Lockwood was understandably disappointed that his claims were so significantly discounted, he accepted the JANAC figures in place of his own, only adding: "Where JANAC does not credit a sinking as claimed by the Submarines Forces, it appears fairly safe to list that ship as having been damaged."[7] Lockwood was wrong on that count, but the record of his beloved Submarine Forces was indeed much better than credited by JANAC. Actually, the two sets of figures are not even directly comparable, because the ComSubPac/SORG totals counted vessels of all sizes, down to the smallest sampans, whereas JANAC arbitrarily excluded all merchant types of less than 500 gross tons, eliminated other valid sinkings as well, and made no attempt to assess damage.

The ComSubPac/SORG document (hereafter referred to simply as SORG) contains a wealth of information about U.S. submarines' performance during World War II, but it has important drawbacks. From a working standpoint, the printed version is too voluminous and detailed to be readily analyzed by hand. Until very recently the data were not machine-readable, a deficiency that has now been overcome by my colleague, Craig McDonald.

The most serious weakness, however, is that SORG's claimed results were based solely on uncorroborated information from the U.S. side. They did not reflect any of the wartime intelligence from Ultra intercepts of Japanese radio messages, which confirmed and identified many victims of our submarines but also revealed many instances where ships that submarine skippers believed to have sunk actually escaped undamaged. The extreme secrecy under which the Ultra findings were held precluded the release of such information, apparently even to so important and highly classified a group as SORG.

At this point, a word of explanation is necessary regarding the SORG definition of an attack. Submarine commanders generally did not fire torpedoes singly but preferably in salvos of two or more spread out to increase the chances of obtaining a hit. In the case of multiple targets such as convoys, a salvo could be split among several targets. If a target was not sunk immediately, additional torpedoes would be fired until the target sank or the attack had to be broken off. SORG therefore did not assess the result of an attack on a designated target until the final torpedo had been fired. However, it counted as a success any attack that resulted in sinking or damaging the target, no matter how minor the damage. Also, where SORG assigned partial credit to a submarine, it credited each such case as a success. Attacks as defined by SORG realistically reflect actual submarine performance, whereas the mere fact that 14,748 torpedoes were fired cannot lead to a meaningful assessment, because there is no way of determining which individual torpedoes hit and which ones did not. The results claimed by SORG, and probably used by Admiral Lockwood, are as follows:

SORG Claimed Results

Type of Attack	All	Sunk	Partial	Damaged	Total Successes	Missed
All	5294	2616	46	1005	3667	1627
Gun etc.*	1051	821	20	158	999	52
Torpedo	4243	1795	26	847	2668	1575

*Includes 27 attacks by burning, demolition, etc.

The above figures show an apparent success rate of 95% for the gun attacks. This high rate is not surprising, given that the gun attacks were made on the surface mainly in daylight. The same cannot be said for the torpedo attacks. To arrive at a more realistic success rate, it is necessary to turn to the second data source.

Source 2—U.S. and Allied Submarine Successes

Our book is the fourth edition of a work originally published in 1989, to which each update added newly available data from declassified Ultra records and post-war Japanese sources. It was

initially developed as a list of only those attacks that were claimed by the submarine commanders as successful, i.e., that resulted in the sinking of or damage to the target. These attacks were extracted from the SORG list and matched against the records of actual Japanese ship losses. Over the years we corrected many of SORG's assessed results and picked up some cases from other sources, so that the numbers of attacks in our data base now vary slightly from SORG's counts. Craig McDonald has just started the onerous task of fully merging the two sets of data, our book's and SORG's. This will ultimately enable us and other researchers to analyze the performance of the different Marks/Mods of torpedoes fired, examine how the success rate changed from month to month, and make many other detailed studies.

As a first cut, I have used the overall data to derive a new estimate of the success rate of U.S. submarine torpedo attacks. (Note that even negligible damage caused by a dud hit is counted as a success.) Our data indicate that approximately 116 cases that SORG had rated as misses were actually successful. On the other hand, 971 of SORG's claimed successes turned out to be misses. Applying these adjustments to SORG's claimed results yields the following revised figures for the torpedo attacks:

SORG Corrected Torpedo Results

All	Sunk+Partial	Damaged	Total Successes	Missed
4243	1237	576	1813	2430

Allowing for probably minor inaccuracies in the data, it appears that about 43% of U.S. torpedo attacks succeeded in hitting their targets while 57% missed.

It is now known that many misses were indeed caused by torpedo malfunctions. Some, such as premature detonations close to the target, certainly could have looked like direct hits and were so claimed by submarine skippers. Other failures, such as torpedoes that ran too deep or magnetic exploders that failed to function even though the torpedo passed directly under a ship, undoubtedly occurred but are impossible to prove. On the other hand, submariners tended to be overly optimistic in interpreting the results of their attacks.

A more detailed examination of our statistics shows that damage claims were considerably more likely to be incorrect than were claims of sinkings. This conclusion is supported by descriptions in scores of patrol reports where damage was claimed on very weak evidence: explosions heard but not seen, targets not in sight after surfacing later, disappearing radar pips, etc. The overall reliability of torpedo attack claims is indicated by these rounded-off statistics:

> Of all claimed sinkings, 71% were in fact sunk, 8% damaged, and 20% missed.
> Of the damage claims, 15% actually were sunk, 20% damaged, and 65% missed.
> Of the claimed misses, however, 3% turned out to be sunk and 4% damaged.

Given the ordinary limitations under which our submarines had to operate at different stages of the war—such as unfavorable ranges or target angles, torpedo shortages, enemy countermeasures, bad weather, etc.—compounded by the handicap of unreliable torpedoes—an overall torpedo attack success rate of 43% seems quite commendable.■

ENDNOTES

1. This document is now available on line at www.hnsa.org/doc/subreports.htm, listed as "Appendix 6 Date Time Attacks".
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5. The Joint Army-Navy Assessment Committee, NAVEXOS P-468, *Japanese Naval and Merchant Shipping Losses During World War II by All Causes*, Washington: U.S. Government Printing Office, 1947.
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7. Lockwood, op. cit., p. 351.

SUBMARINE NEWS FROM AROUND THE WORLD

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From the January 2010 Issue

NORWAY – Future Submarine Decision in 2011

In mid-January 2010, AMI received information regarding the possible collaboration between Norway and Sweden for the acquisition of the next generation of submarines for the Royal Norwegian Navy (RNoN).

Admiral Arne Roksund, head of the working group within the RNoN that will ultimately decide the fate of the Norwegian Submarine Force, stated in December 2009 that the navy has three options with regards to its subsurface fleet. Those are to "replace, refurbish or discontinue the submarine fleet."

Although a modernization plan is already in place to upgrade the sonar systems onboard the six units of the Ula class by 2012, it is clear that the current Submarine Force will be obsolete and require replacement by the end of this decade. Considering Norway has no indigenous submarine building capability, the RNoN is already considering joining Sweden for its next class of submarine (A26), a plan similar to the now defunct Viking program.

The RNoN began conceptual studies for a replacement of the Ulas under the Ny Ubat Project 6346 program. Should feasibility studies conclude with the go-ahead to replace by 2015 in order to allow the first unit of the new construction submarines to enter service by 2020.

Cost for the replacement submarines are estimated to be as high as US$650M each, including through-life support contracts. This alone would put a huge strain on the already limited Norwegian defense budget. Currently, the Royal Norwegian Armed Forces (RNoAF) are involved in the acquisition of the

Joint Strike Fighter (JSF) as well as the ARCHER artillery system and the final unit of the Fridtjof Nansen class frigate will deliver in 2010.

It is likely that Kockums of Sweden will be the preferred supplier of a new class of submarine for Norway if that option is selected and an acceptable offer can be reached. Much will depend on the outcome of the Swedish A26 submarine program, which entered the design phase in January (see A26 submarine article). Collaboration between the two nations would certainly aid in reducing the overall cost for all involved as well as continuing the ability to provide a subsurface deterrent to Russia's Northern Fleet based in Murmansk.

SWEDEN – A26 Submarine Program Enters Design Phase

In late January 2010, AMI received information that the Swedish Government has approved the design phase for the royal Swedish Navy's (RSN) A26 submarine program. Negotiations are currently ongoing between the Swedish Defence Material Administration (FMV) and the government in order to complete a design contract by the end of the year. The program began in 2007 with initial feasibility studies for the acquisition of four new construction submarines that will be built at the Kockums Malmo Shipyard. The submarines will replace the remaining Gotland (A19) and Sodermanland (A17) classes that were commissioned in the late 1980s through the mid-1990s.

A construction contract was initially scheduled for 2010, however, this date has probably slipped at least three years to 2013 as the design phase is just now beginning. Assuming a construction contract in 2013, the first unit would enter service around 2018 and replace SODERMANLAND.

The new A26 submarines are being designed for littoral operations but will also possess ocean-going capabilities and will have the Kockums Stirling Air Independent Propulsion (AIP) system for increased on station time. As noted in the Norway Future Submarine article, it is possible that these programs could be linked similar to the Viking Program of the 1990s in which Norway and Sweden joined with Denmark. The Viking program

was terminated in 2004 as all three nations made drastic cuts to their submarine levels, with Denmark decommissioning its entire force.

Since the discontinuation of the Viking Program, and the resurrection of independent submarine programs for both Norway and Sweden on a similar timeline, it would make sense for both countries to take advantage of the economies of scale from doubling the number of hulls built. This submarine design could also be attractive to Singapore if and when it makes a decision on whether to procure new construction submarines later in the decade. For Kockums, this program could be just what the doctor ordered to keep the yard going over the next several decades.

ISRAEL – NEGOTIATING A Sixth Submarine and New Frigates

In mid-January 2010, AMI's sources indicated that the Israeli Navy was in negotiations to acquire a sixth submarine and two MEKO frigates from Germany. The following information is provided for both programs:

A: Dolphin II Class Submarine: The submarine will be the third DOLPHIN II. The first two units are already under construction at Howaldtswerft Deutsche Werft AG (HDW) in Germany. Although the actual cost of the DOLPHIN II is around US$700M, Israel will push for deep discounts as it did for the first five units. As a reference point, the Israelis paid an estimated US$459M (per unit) for units four and five. With units four and five due to deliver by 2012, AMI estimates that negotiations for unit six will be completed by 2011 in order to start construction in 2011 as unit five is launched.

HDW built and delivered three Dolphin class submarines to Israel between 1994 and 2002. The first three Dolphins replaced the three Gal Vickers class in the Israeli sea service. By 2004, Israel made the decision to double the size of its Submarine Force to six units with the three additional units having the Air Independent Propulsion (AIP) capability to operate longer on station.

In late November 2005, Germany agreed to sell the two additional Dolphin II class (Type 800) submarines to Israel for US$1.37B, with Germany paying the first US$452.1M. The program officially started in 2006 with construction beginning in 2008.

B: MEKO Frigate: The frigates are based on the MEKO design and are meant as the follow-on surface combatants to the three Northrop Grumman SAAR 5 corvettes delivered in the 1990s. In 2009, the Israeli Government cancelled negotiations with the US companies offering two options, the Lockheed Martin variant of LCS and the Northrop Grumman SAAR 5B.

Israel cited cost as the reason to explore other avenues outside of the US. Given the success with Germany in its submarine programs, Israel decided to explore the German surface combatant design with construction to take place in Israel. Those negotiations are still ongoing as of mid-January. Israel, with a budget estimated to be only US$300M per vessel, is exploring the MEKO 100 as well as the stretched MEKO 100. The stretched MEKO 100 is a more realistic hull size considering the AAW, ASuW and ASW capabilities Israel requires. Unfortunately, it will be almost impossible to procure these capabilities at US$300M per ship unless the Israeli Government can receive steep discounts (or other financing initiatives) from the German Government as it has done in the procurement of its Submarine Force.

AMI believes that Israel will have a difficult time in this case as Israel wishes to build the frigates in-country and the German Government has no incentive to reduce the price unless the vessels are built in Germany. In order for Israel to utilize US Foreign Military Aid (FMA) funding, a big portion of the systems (weapons, sensor, engines etc) will have to be US supplied.

One must also wonder if Israel can build a sophisticated platform of this size without suffering massive cost overruns and schedule delays; which would make the program vulnerable to competition from urgent Air Force and Army procurement requirements.

Thailand—In the Market for Used Submarine?

In early January 2010, the Royal Thai Navy (RTN) Chief Admiral Kamthorn Pumhirun continued to assert publicly the intention of the Thai sea service to acquire submarines in the future and announced that a feasibility committee had been established in order to study submarine technology. The Admiral estimated that the new submarines would cost around US$607M per unit and that it would be several more years before the sea service could move forward with such a plan.

For reference purposes, the RTN's modernization plan, known as the Mega Plan of 2005, called for the procurement of two submarines by 2017. However, the plan has faced many delays due to funding shortfalls and political upheavals that continue to plague the nation. To date, the only portion of Mega Plan that is moving forward is the acquisition of an Endurance class LPD from Singapore.

The Admiral also mentioned that the RTN would first be interested in a used submarine for training purposes as the sea service had not operated a submarine since 1951 and that the estimated US$60M for a used submarine would be more affordable in the near term.

The Navy Chief briefly stated that submarines were now a necessity for Thailand as all of its neighbors including Malaysia, Singapore, Indonesia and Vietnam were operating or ordering new submarines.

With a feasibility committee now working on acquiring a submarine program, the RTN will no doubt begin looking into its used options on the international market once again. Some of those options could include the Israeli Gal class, Rotterdam Drydock Company Submarines (RDMS) Zwaardvis class, German Type 206s and several Chinese designs.

When considering the age and material condition of these submarines, it will probably be quite an expensive endeavor to return one to operational status and that will only be the first step in getting the RTN back into the submarine business, in which it has been absent for over five decades. The success of this first step

will determine whether the RTN will have any chance of reintegrating a Submarine Force into the sea service.

CHINA – Country Highlight

China has embarked upon a long-term program to achieve Great Power status. Elements of the Chinese People's Liberation Army – Navy (PLAN) have argued for the creation of a modern blue water navy, including the acquisition of aircraft carrier battle groups. While there is no firm government consensus evident that details the future of the PLAN, considerable emphasis has been placed on increasing the number and capabilities of the submarine and large surface combatant fleets. With ever increasing acquisition budgets, the PLAN will continue to grow in numbers and capabilities for the foreseeable future.

Presently, it appears that the PLAN will receive continued support for its programs, allowing for the acquisition of new, more advanced, warships as well as the modernization of older platforms. Additionally, the defense white papers released in 2000, 2002, 2004, 2006 and 2009 are based on much the same criteria as in the 1998 white paper, however put much more emphasis on the fact that the US is now to be considered a hegemonic power as well as making note of the subprime mortgage crisis and global economic slow-down.

The Taiwan independence issue is specifically mentioned with procurement and modernization programs indicating that China is realigning some of its force for potential conflict with the island nation. Quoting the 2004 white paper, "We will never allow anyone to split Taiwan from China through whatever means," the paper says. "Should the Taiwan authorities go so far as to make a reckless attempt that constitutes a major incident of 'Taiwan independence', the Chinese people and armed forces will resolutely and thoroughly crush it at any cost." This thought was again reiterated in the 2006 white paper but not in such strong language and again in the 2009 version.

Part of the PLA's strategic plan to defend China's seaward approaches, and its sea borne economic interests lies in the notion of being able to operate its naval forces in two distinct zones.

Known as the Inner Zone and Outer Zone island chains, the PLAN is already modernizing its forces for the Inner Zone (defined by Japan, Senkaku, Taiwan, and the west coast of Borneo – thus including the whole South China Sea). Chinese leaders have consistently stated that the PLAN should be capable of extending China's maritime influence out to the Outer Zone bounded by the "second island chain" (defined by the Kuril, Bonin, and Marianas Island groups). The PLAN has publicly stated that it will not have the proper naval forces to defend China's interests to the Outer Zone until at least 2020.

The majority of the PLAN's current fleet consists of technologically obsolete ships although the last several years have shown a vast increase in the construction of more modern warships being built including the Luyang II (052C) class destroyer with its phased array radar, Luyang I (052B) class destroyer, Luzhou (051C) class destroyer, Jiangkai (Type 054) class frigate, Jiangkai II (Type 054A) class frigate and the Houbei (022) class Fast Attack Craft (FAC). China certainly has the raw industrial capacity to build large numbers of naval ships (both surface combatants and submarines), but it lacks the technological base to equip its ships with the modern engineering and combat systems needed to make them operationally effective in today's multi-threat environment. China desperately wants to acquire these technologies and is eager to purchase them from Western suppliers. Ultimately, China's desire to develop the indigenous capability to produce modern warships, with all their own systems, is slowly coming to fruition; however it is apparent they are still relying on foreign, primarily Russian, weapon and radar systems. With acquisitions from foreign markets and reverse engineering, it is likely China will continue to make progress in the technological advancement of the Navy over the next decade.

To truly achieve Great Power status, China will have to overcome a host of institutional problems (economic, political and social) to create a nation able to catch up with the technological advances of the West. If some of the positive trends currently emerging are allowed to develop, China could emerge, by 2020, as

a formidable power, being able to adequately operate a modern blue water navy to the Outer Zone.

Currently, the PLAN is continuing to order and take delivery of several classes of conventionally powered submarines, destroyers, frigates, FAC and patrol boats. Additionally, the PLAN is making more headway in its transition to more capable nuclear-powered submarines as well as larger, more sophisticated warships in order to meet its goals of defending the nation's interests in the Outer Zone. With the apparent assistance from foreign countries, China has seemingly vaulted ahead in this endeavor in the past 3 years. Numerous western combat systems and ship designs as well as engineering systems have begun to emerge in the increasingly more technologically sophisticated destroyers and frigates being built for the PLAN.

The PLAN currently has the following submarine shipbuilding programs underway or planned for the next several decades:

- **Shang Class (Type 093) Nuclear Powered Attack Submarine (SSN):** The first of a new class of SSNs to follow the five units of the Han class. Designed in the latter 1990s, the first unit was built at the Bohai Shipyard, launched by the end of 2002, and commissioned in 2005. The second unit of the class launched in late 2005 and commissioned in 2007 followed by unit three in late-2009. At least five additional units of this class will probably be constructed through 2019 with two units currently under construction.

- **Jin Class (Type 094) Nuclear Powered Ballistic Missile Submarine (SSBN):** This new class of SSBN had been in the planning stage since the commissioning of the single Xia class SSBN. Construction of the first unit probably got underway in the 1999-2000 timeframe at the Bohai Huludao Shipyard. The first unit of the class was launched in December 2004 and commissioned in 2006, entering full service in 2008. Unit two commissioned in 2008 and is completing sea trials. It should be fully operational in 2010, about the same time unit three will commission and begin trials. The Type

094 uses the same nuclear power plant and other common systems that are also found on the Type 093. At least six units of the class will ultimately be built.

- **Yuan (Type 041) Class Submarine (SS):** The PLAN launched the first of the Yuan (Type 041) class conventionally powered attack submarine in early 2004, nearly four years earlier than had been projected. This launching demonstrates that the PLAN is moving ahead much faster than originally anticipated two years ago with construction programs in both surface and subsurface vessels. The second unit of the class was commissioned in February 2007 following six months of acceptance trials. Unit three was launched in March 2008 and was delivered in 2009. It is anticipated that seventeen more units will be built, approximately six years behind the original schedule, through 2027.

VARIOUS DID YOU KNOW?

ALGERIA: On 18 December 2009, the first of two Kilo class submarines built at Russia's Admiralty Shipyards, was handed over to the Algerian Navy. The second unit will be handed over by the end of 2010.

SPAIN: On 19 January 2010, Navantia cut steel at its Cartagena yard for the fourth and final S80 submarine (S 84) for the Spanish Navy.

From the February 2010 Issue

TAIWAN - US Prepares Arms Package

In early February 2010, the US Government announced its intention to sell US$6.4B of weapons to Taiwan. Included in the package are 114 Patriot (PAC-3) missiles, 60 Black Hawk helicopters, two used Osprey class coastal mine hunters (MHCs) and Harpoon telemetry test missiles. Noticeably absent from the announcement were F-16 fighter jets and submarines.

The US has remained silent on the submarine transfers to Taiwan since the 2001 Congressional notification when president George W. Bush announced plans to sell diesel electric submarines to the island nation. Press reports from Taiwan indicate that the Taiwanese Government has dropped the 8-year old request although official government reports indicate the press reports are false and the island still requires diesel-electric submarines. AMI believes that the submarine program is stalled due to foot dragging on both sides of the Pacific for the past eight years. The final act, in killing a submarine transfer may have been the election of Bejing-friendly President Ma Ying-jeou in 2008. Taiwan realistically has only one possible submarine supplier, the US. The US has not designed or built a diesel submarine in five decades.

MALAYSIA - Scorpene Program Complete, no Additional Units Planned

In early February 2010, AMI received information that the second Scorpene submarine delivered to the Royal Malaysian Navy (RMN) in November 2009 would be the final unit of the class. AMI originally projected that the RMN would order up to three additional Scorpenes (by 2016) as the sea service has a standing requirement for a five-unit Submarine Force.

It would be more practical logistically and in training for the RMN to operate a single class of submarines vice several different classes. AMI's source indicated that the RMN had no intentions of procuring additional units in the near term. The lack of an order for additional units at this juncture may merely indicate that the RMN intends on gaining operational experience in the near term before committing to additional submarine investment.

Once the RMN is operationally proficient and the Scorpene design is fully tested, the sea service could then order additional submarines to fill out its projected five unit Submarine Force. The RMN successfully completed underwater trials for its second submarine (KD TUN RAZAK) in late February following rumors and reports of several technical problems. Although the problems were highly publicized, AMI believes that similar to Chile, these

issues are common in most newly-built submarines and typically corrected during sea trials.

As mentioned above, it would be practical for the RMN to operate a single class of submarines. However, only training, sustained operations and thorough testing of the Scorpene design will give the sea service a true picture on how many submarines it requires and the design of the submarine to meet the fleet's future needs.

AMI estimates that this decision will not be made prior to 2016. At that time, the RNM should have a much better idea of numbers and capabilities. AMI believes that if the RMN intends on keeping at least two units operational at all times as well as performing proper upkeep in the fleet; at least two and possibly three additional units will be needed. This assumes a standard of two units operational at any given time, one or two in the maintenance cycle and the remaining one or two units in a training status.

MIDDLE EAST/NORTH AFRICA (MENA) - DIMDEX Submarine and Undersea Warfare Market Forecast

Key Points:

- Future opportunities for new submarine export sales in the MENA region look most promising in North African countries.
- Iran's continuing investment in submarine capability and the potential deployment of submarines by other navies in the Gulf region continue to influence the acquisition of anti-submarine warfare capability on surface ships and aircraft.
- Many MENA navies in the Gulf Region are adding or plan to add advanced corvettes and frigates to their forces over the next decade. Prospects for new sales of submarines to these navies are expected to remain more limited over the same period.

In 2010 AMI will once again join hosts QMDI and the Qatari Emirate Naval Forces (QENF) at the second Doha International Maritime Defence Exhibition and Conference—DIMDEX—from 29-31 March 2010. This article looks at market prospects for submarine and related anti-submarine warfare capabilities in the Middle East/North Africa region over the next 20 years.

The new construction and refit market for submarines in the MENA region is currently concentrated in North Africa, where countries such as Algeria and Libya look to modernize or replace aging Russian-Soviet platforms with newer capabilities. In the Mid-East/Gulf region, Iran remains the largest current investor in submarine capabilities—both domestically built hulls and potential foreign orders.

The chart below shows AMI's forecast for future spending on submarines and ASW-capable ships in the MENA market over the next 20 years. As noted, Iran is building up its submarine capability in the Gulf region, while Algeria and Libya are upgrading their Submarine Forces in the North Africa region. Egypt retains a force of updated Chinese Romeo diesel boats, and is making some current investments to improve its swimmer delivery vehicles for special-forces use. So far, Gulf countries that have invested to modernize their surface forces in recent years—Oman, Qatar, UAE, and Saudi Arabia—have not looked to add a submarine dimension to their naval surface and air capabilities.

This is not surprising in that the submarine represents a significant investment not just in hulls but in crew training, shore infrastructure, associated rescue and salvage capabilities. Moreover, the current operational environment in the Gulf region has influenced many nations to focus their naval investments on moving from coastal/inshore to a more well-rounded surface fleet centered on larger ships. As noted in previous analysis of the MENA market, the fastest growing naval market segments in the region are frigates, corvettes and OPVs (see the attached Morocco country report for an example of this trend).

The submarine challenge will continue to influence the region's naval spending on more capable frigates, corvettes and OPVs. AMI forecasts that continued improvement in surface ship

capabilities, new helicopters and fixed wing patrol aircraft, upgrades of existing Submarine Forces, and perhaps eventual acquisition of submarines by navies that do not currently operate them, will continue in the MENA naval market.

As the MENA region's economies rely on critical shipping lanes and choke points that ensure resource flows in the global economy. The vulnerability of this trade to closure or interdiction by submarines will ensure ASW remains an investment priority in the region's naval market.

Naval Market Value Forecast 2010-2030: Middle East and North Africa

Analysis of Selected Segments

Country	Algeria	Bahrain	Egypt	Iran	Kuwait	Libya	Morocco	Oman	Qatar	Saudi Arabia	Tunisia	UAE	Yemen	Total
Frigate	0	0	0	0	0	0	1100	0	0	2800	0	0	0	3900
OPV	0	0	0	0	0	30	0	280	0	0	0	0	0	310
Patrol Vessel	168	144	130	125	65	0	450	48	208	340	350	36	40	2104
Submarine	400	0	5	1500	0	700	0	0	0	0	0	0	0	2605
Total 2009														
(USD B)	568	144	135	1625	65	730	1550	328	208	3140	350	36	40	8919

Highlights of Current Submarine Programs in the MENA Market

ALGERIA: On 18 December 2009, the first of two Kilo class submarines built at Russia's Admiralty Shipyards was handed over to the Algerian Navy. The second unit is scheduled to be handed over by the end of 2010.

LIBYA: Libya's Foxtrot (Project 641) class submarines were commissioned in the 1970s and are at the end of their effective service lives. At least four of the six hulls are in the reserve status and none have been modernized since commissioning.

Libya now has the option to look to a wide variety of possible suppliers for the modernization and procurement effort since the European Union (EU) and the US lifted economic and military

sanctions in 2004. Russia just concluded a major US$1.8B agreement for new equipment sales to Libya—that package may include submarines. European candidates to supply new submarines include Italy, France, Spain and Germany. Turkey and South Korea may also see Libya as an opportunity for export of products from their domestic submarine industry.

IRAN: Iran has been developing a domestic submarine building industry since at least 2002, when construction commenced on small submarines displacing about 120 tons. In 2007, Iran started to build a larger submarine—the Qaeem class—with launch of the first unit expected in 2010.

The Qaeem class is a coastal submarine displacing 500-1000T and will be capable of launching torpedoes, mines, and possibly missiles. The Qaeem class will augment Iran's force of larger Kilo class submarines, acquired in the 1990s and expected to reach the end of their service life by 2020.

Iran may also be considering the procurement of additional submarines from Russia, including the latest Kilo (636 variant) or the Amur design. The timeline for delivery is seen as 2015-2016, suggesting that an order for new subs would need to be placed within the next year to enable building to start in Russia by 2012. ■

ETERNAL PATROL

CAPT William H. Barnes, III, USN (Ret)
CAPT Robert C. Gillette, USN (Ret)
QM2 (SS) Daniel Dibert, USN (Ret)
RM1 Terry Alvin Marschel, USN (Ret)
CAPT Joseph M. McDowell, USN (Ret)
CAPT L. Rehme, MC. USN (Ret)
LCDR James H. Peirano, USN (Ret)
Mrs. Sylvia Rindskopf
CAPT W. David Wessinger, USN (Ret)
CDR Avery L. Willis, USN (Ret)

THE SUBMARINE COMMUNITY

NEWS FROM DOLPHIN SCHOLARSHIP FOUNDATION

by Mrs. Randi Klein

Dolphin Scholarship Foundation and the Naval Submarine League (NSL) are proud to announce the ***VADM J. Guy and Mrs. Janet Reynolds Scholarship.*** Funded by a generous donation from NSL and administered by DSF, this scholarship honors the Reynolds' many years of service to the Nation, the United States Navy, Dolphin Scholarship Foundation and the Naval Submarine League, in addition to Vice Admiral Reynolds' distinguished leadership as President of the NSL over the past nine years. You may help endow this scholarship by donating through either the NSL or the DSF websites, www.navalsubleague.com or www.dolphinscholarship.org.

Dolphin Scholarship Foundation begins celebrating ***"50 Years of Scholarships"*** this year by holding another virtual submarine race, *"Race Around the World,"* to commemorate the 50th Anniversary of OPERATION SANDBLAST, the first submerged circumnavigation of the earth, completed by USS TRITON (SSRN 586) in 1960. At press time, 18 submarines are "underway" and following the track of USS TRITON and Magellan. You can check progress or enter your favorite submarine at www.dolphinscholarship.org.

The 5th Annual DSF Golf Tournament will be held Friday, October 1, at Virginia Beach National Golf Course, Virginia Beach, VA. Tournament sponsors and players are needed to help raise funds for Dolphin Scholarships. Contact DSF at golf@dolphinscholarship.org, or call (757) 671-3200 ext. 113.

Watch for more news of 50th Anniversary activities for Dolphin Scholarships!■

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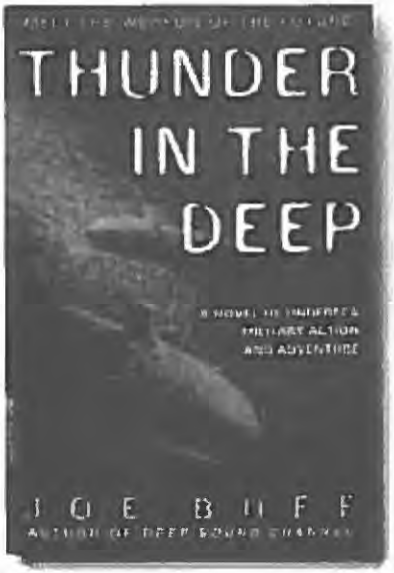

From the producers of *Thunder in the Deep – The Movie,* an upcoming major motion picture set in 2030 extolling the ongoing vital importance of America's Nuclear Submarine Force

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BOOK REVIEWS

THE DEEP: VOYAGES TO TITANIC AND BEYOND

Anatoly M. Sagalevich with Paul T. Isley III. Foreword by James Cameron. Redondo Beach California: Botanical Press, 2009. Illus. Map. Index. 295 pp. $65

Reviewed by Dr. Don Walsh

Captain Don Walsh is a retired submarine officer. He made the deepest dive, to the deepest spot in the world, in the Bathyscaphe TRIESTE in 1960 with Jacque Picard. His subsequent career centered on Deep Submergence and his PhD is in that field.

Other than a few scientific papers, little has appeared in western literature about Soviet and Russian operations using manned submersibles. Published in Russian in 2002, The Deep is the only book in English that describes projects, operations and technologies used since the early 1970's.

Author, Dr. Anatoly Sagalevich, has been closely involved in this work for nearly four decades. For many years he has been Head of the Laboratory for Manned Submersibles at the Russian Academy of Sciences' P.P. Shirshov Institute of Oceanology in Moscow. In addition to running the deep submergence program, he has been an active pilot with over 3000 deep ocean dives to his credit. His experience of four decades covers almost the entire history of Soviet/Russian deep ocean work. While the Soviets built perhaps a dozen other manned vehicles, most were rather crude and rarely used. By comparison the subs operated by Shirshov have been quite active, making thousands of dives worldwide.

While normal book reviews are supposed to have an impartial 'third person' voice, I want to interject my personal experiences with the Soviet/Russian programs. Therefore my review of this book also involves personal experience.

In 1980, I had been retired from the Navy for about six years when I met "Tolya" Sagalevich at an ocean trade show in Washington DC. Having been in deep submergence work in the Navy since 1959 and later as a consultant, I was very much interested in what the Soviets had been doing in this area.

He invited me to his institute as a guest of the Soviet Academy of Sciences and I eagerly accepted. My first trip was in 1981 where I met his team at Moscow and also visited one of their field sites on the Black Sea. At that time they were operating two Canadian-built PISCES (6000 foot depth capable) and two rather primitive Russian-built vehicles, ARGUS (1000 feet) and OSMOTR (2000 feet).

By the end of the 1980's I had made two additional trips to the USSR as Tolya's guest. In the mid-80's, I learned about a program to replace the PISCES subs with two Finnish-built MIR vehicles. They would have a maximum operational depth of 20,000 feet and carry a three-person crew. Put into service in 1989, they are now the most productive deep diving scientific platforms in the world. In fact there are only three other manned submersibles that can dive this deep.

In this book, Sagalevich provides a personal narrative of his experiences from joining the Institute in 1970 until 2008 when the book went to press. Chapters are organized around the evolution of Soviet/Russian deep ocean capabilities, description of technology development and stories of specific diving operations. Emphasis is on the more than 3000 dives made by the MIRS.

Among the interesting diving operations discussed, are the first dive made at the North Pole; the deepest freshwater dive in the world to the floor of Lake Baikal; nearly 100 dives to the wrecks of RMS TITANIC and a half dozen to the WWII German battleship BISMARCK, and numerous trips to hot water vents on the deep seafloor in the Atlantic and Pacific. An interesting fact here...the MIR team claims that they have spent more time on board the TITANIC than did Captain Smith.

There is not much discussion in the book about Cold War use of Russian submersibles to support military requirements. However, as was the case in the US, most Soviet operations were

also for this purpose. While Sagalevich does not say much about this, one of the most interesting chapters is about the operations at the Norwegian Sea to the wreck site of the lost (1989) nuclear submarine KOSOMOLETS. Over the years, the MIRS made six expeditions there operating at a depth of about 5,500 feet. The intricate means to mitigate the possibility of radiation leakage makes fascinating reading.

Printed on heavy stock, this is a *coffee table* size book, loaded with images and drawings. An impressive map on the inside covers shows the world-ranging diving operation of the MIRS and their mother ship Akademik Keldysh. Tolya's colleague Paul Isley has done a magnificent job of organizing and publishing the English edition.

Tolya and I still work together, 29 years after we first met. In years past, I have had the pleasure of diving with him to the Titanic, Bismarck and hydrothermal vents in the Atlantic. At the age of 71 he is still at it and will lead 2010 dive operations at all three of these sites. The book is done but his story continues...■

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. If possible to do so, accompanying a submission with a CD is of significant assistance in that process. Editing of articles for clarity may be necessary, since important ideas should be readily understood by the readers of the **REVIEW**.

A stipend of up to $200.00 will be paid for each major article published. **Articles accepted for publication in the REVIEW become the property of the Naval Submarine League.** The views expressed by the authors are their own and are not to be construed to be those of the Naval Submarine League.

Comments on articles and brief discussion items are welcomed to make **THE SUBMARINE REVIEW** a dynamic reflection of the League's interest in submarines.

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

EXECUTE AGAINST JAPAN
The US Decision to Conduct Unrestricted Submarine Warfare

by Joel Ira Holwitt
Texas A&M Press, 2009

Reviewed by RADM Jerry Holland, USN (Ret)

Jerry Holland is a retired submarine officer and frequent contributor to THE SUBMARINE REVIEW and the Naval Institute PROCEEDINGS. He is the Vice President of the Naval Historical Foundation.

Chronicles of submarine exploits in World War II are blessed with dozens of fine writers from Clay Blair to Ned Beach. The period between the two World Wars has not been as fortunate. Gary Weir has documented the tribulations with submarine design and construction and others have touched on the errors of training and doctrine that handicapped submarine actions in the early days. But until now how the Navy managed to instantaneously move from the overt legal restrictions of the naval arms treaties that bound submarines to the cruiser rules of eighteenth century to a declaration of unrestricted submarine warfare against Japan immediately after the attack on Pearl Harbor has never been explained. Lieutenant Holwitt has dissected this process and has created a compelling story of who did what, when and to whom.

The United States entered World War I chiefly because Germany's unrestricted warfare violated the traditional American belief in freedom of the seas and the legal restraints that arose from this strongly held position. The thrust then of all international diplomatic and internal US political action after that war was to abolish submarine warfare. Though both the United States and

Great Britain, the dominant sea powers, favored such a move, France refused. When elimination of submarines proved impossible, treaty restraints obliged submarines to follow the rules of cruiser warfare requiring them to stop a commercial ship, identify the cargo as contraband and place the crew in a safe condition, all before firing on the ship. In the efforts to control naval armaments between the wars, the proponents and officials representing the United States were politicians and statesmen. Noticeable in most of these negotiations was the absence of any naval officers.

While those efforts played out in the arena of world politics, as early as 1919 a panel of US submarine officers wrote, "It is dangerous to evade the fact that Japan is our most probable enemy. . . . There is no quicker or more effective method of defeating Japan than the cutting of her sea communications." Holwitt follows these dual tracks through a maze of conflicting directives and efforts over the next twenty-two years.

One of the most astute and widely recognized refutations of the prohibitions against submarine warfare was then Lieutenant H. G. Rickover's essay in the May 1935 Naval Institute PROCEEDINGS, "International Law and Submarines". Rickover argued that applying the rules of cruiser warfare was impractical and would have to be abandoned regardless of legal constraints or treaty provisions. His was one of the few open source discussions of the problem that was being dissected quietly by the Navy's most senior officers. As the author explains, unrestricted submarine warfare against Japan was being planned even as legalistic arguments over "Tentative Instructions for the Conduct of War" were being debated between lawyers and the Naval War College.

Evidence of this planning was the order of the Commander in Chief of the Asiatic Fleet, Admiral Thomas C. Hart, to execute unrestricted warfare issued just two hours after the first Japanese strike at Pearl Harbor; thus reversing U.S. official policy without consulting anyone. The Chief of Naval Operations, Admiral Harold Stark, issued a similar directive just four and a half hours after the Japanese attack started following a short meeting with the

President in which such a directive may have been mentioned though no evidence exists that the policy was discussed.

This excellent book arose from the author's PhD thesis in history from Ohio State University. Done with the exceptional thoroughness one would expect from an officer trained in pre-critical check-offs, the end notes and bibliography are a superb resource for any serious student interested in submarines and naval arms limitations policy during the period from 1919 through 1941, The author will surprise most readers by revealing in his final chapter that the London Protocol of 1936 banning unrestricted submarine warfare is still technically the law though characterized by a noted legal scholar as "only in the thinnest stratosphere of reality".■

FORGOTTEN WEAPON: U.S. NAVY AIRSHIPS AND THE U-BOAT WAR

by William F. Althoff
Naval Institute Press, 2009

Reviewed by Mr. John Merrill

Introduction

William F. Althoff, noted Naval Aviation historian, in his 2009 Naval Institute book tells the almost forgotten history of Lighter than Aircraft (LTA), blimps in the vast antisubmarine warfare effort to defeat marauding U-boats. The growing squadrons of K-type blimps also successfully addressed other demands of the World War II years. Hopefully, this article will provoke further interest in Althoff's contribution to the LTA history.

In his Preface, the author states, "What deserves examination are the naval, political, and technological environments in which the platform had to operate in the decade from 1935 to 1945..." His findings are remarkably thorough and presented interestingly. It is his attention to the context of every aspect of the LTA's role in the war effort that provides a sense of completeness and clarity to the aircraft's wartime history. This allows the reader to be part of the ongoing day-to-day LTA activities and to be aware of how the LTAs became part of the growing Navy's growing anti-U-boat efforts.

The LTA WWII history can also stand alone as an exemplary case study of how a Navy program grew and the breadth of its accomplishments. This is in spite of the fact that even though not much liked, LTAs had to grow and fit in under the duress of wartime while simultaneously addressing training, growth, manpower needs and a rapidly expanding geographic sphere of operation. The historical, operational and political aspects are made clear. The eventual decline of the LTA makes the book's

recognition of the wartime contribution timely as the details of non-rigid aircraft and their history are dimming.

The author carefully details the history and high value of the United States Navy non-rigid aircraft (blimp) to our siege and success in antisubmarine warfare against the German U-boat in the period 1941 to 1945. Althoff brings his extensive research on U. S. Naval Aviation and technology to this story of one of the unsung heroes of WWII.

Contents

Some military systems are endowed with high visibility and long-term interest from inception, during their use, and even years later when they have been overtaken by new or more exotic technology. This is true of many of the Navy systems.

However, this is not true for LTAs. As one reviewer of this book noted, "Forgotten Weapon" fills an important void in World War II history."[1] Today many do not know the part the blimp played in the Battle of the Atlantic during WWII. Althoff provides insight about the contributions of the blimp squadrons not only in the Atlantic but also in other oceans and seas.

An article "The Forgotten Blimps of World War II" addresses remembering blimps with the comment "LTA blimp squadrons continued in the U.S. Navy after World War II at an ever decreasing level until the 1960s when they faded from the scene."[2] Another writer entitled his observation about the loss of interest in airships "LTA and WWII: role of Navy airships often forgotten."[3] In the war, blimps escorted convoys along the coasts and well out to sea, as far as 2000 miles.

The first two chapters provide a broad historical review of relevant interwar national and international developments, including the Navy's interest in rigid and non-rigid airships.

The end of the 1930s saw rigid lighter-than-air aircraft removed from Navy planning and blimps (non-rigid) with a fading priority for naval warfare. Flying boats (PBYs) and aircraft carriers were in the ascendancy. The unit cost per PBY approximated the cost of a typical K type LTA without considering the additional extensive ground needs of blimps. In addition, "by 1940 most persons holding responsible positions within the Naval establishment or in other organs of the government viewed airships with skepticism if not contempt; some indeed, were openly vindictive."[4] While the LTA role in escort and shipping control was recognized, new LTA construction was deemed non-urgent, and the construction of two blimps was projected for the 1938 Navy budget.

As the decade ended, the status of LTAs could only be described as at a very low point and perhaps close to obscurity. However, the huge success of the U-boat in 1939 and 1940 brought significant effort to the development of new or improved submarine detection antisubmarine equipment to lessen the impact of the German submarines soon at work along the whole east coast of the United States.

LTA's Participation begins

During the first week of WWII in September 1939, President Roosevelt, under neutrality considerations and a limited national emergency, directed the Navy to organize a neutrality patrol to extend sea control over the western Atlantic: "...the CNO ordered

the commander of the Atlantic Squadron to establish combined air and surface reconnaissance—that is, reporting and tracking any air, surface, or submarine units of belligerent powers in the nation's sea approaches." "Within weeks, New York, and Philadelphia newspapers had added the Navy's blimps to active patrol forces."[5]

The blimps with long range, speed, endurance, night and inclement weather capability would prove valuable for antisubmarine warfare (ASW) and convoy escort patrols. Initially, blimps were limited by small numbers and were not war ready. Lack of clarity regarding Army/Navy responsibility over water air cover during wartime clouded some issues, and time was lost.

Lakehurst Naval Air Station in New Jersey, the Navy's only airship facility, was close to moribund with regard to manpower and equipment at the time of Pearl Harbor. However, it grew and became the center of LTA activity for the war years. For seven months (December 1939-June 1940) Lakehurst LTAs conducted at-sea exercises with submarines from Submarine Squadron Two at New London. In June, the results provided to the Chief of Naval Operations included various blimp missions: search and rescue exercises, marker buoy tests, airship assist in torpedo recovery, mine spotting, depth charging, bombing, aerial photographic and observation exercises. Blimp sightings included surfaced and submerged submarines.

Through all the war years this utility aspect of blimps brought ever widening attention and a continually growing list of ways for the blimp with its unique qualifications to meet new operational needs. Blimp utility now included downed aircraft, disabled vessels, and drifting survivors in addition to the above list. This resulted in the establishment in January 1944 of ZJ-1 Airship Utility squadron to relieve Fleet Squadrons of utility assignments that were incessantly growing.

From this minimal start up in December 1941 with 16 of all types of blimps and very limited personnel, the LTA numbers of blimps and personnel would grow during the war years ahead. In January 1945, there were 141 blimps on hand and 7500 personnel. The book reveals the rapid growth and enormous challenges of

training and setting up of blimp squadrons and fitting in of LTA's main impact as part of convoy escorting with the growing antisubmarine effort.

The small number of blimps then available at the Navy's Lakehurst facility also found use as test platforms for new submarine detection equipments currently in the research and development phase. The blimps provided candidate platforms for experimentation and later use of the new equipment. The book is the story of LTAs adjusting to its new role in antisubmarine warfare and with the development of new high technology systems. The number of LTAs grew from 10 pre-War to the 141 cited above when the War ended.

Work associated with the blimps adapted to a new role in antisubmarine warfare (ASW) by training crews for their operation, establishing 15 squadrons and facilities in the United States and overseas, and lastly (and most important) fitting in with overall antisubmarine convoy escorting tasks with airplanes (Navy and Army) and surface ships participating. These are some of the areas the book brings to light which are carefully examined in the book. All this growth of the LTAs occurred under the pressure of the unending wartime emergency.

The reader is carried along in this large book (8.5 x 11.5 inches) with an extensive forty-five pages of chapter endnotes attributing where appropriate and providing pathways to further knowledge about the subject or topic. The large format also provides space for 30 carefully selected and edited photographs, some full pages, which provide further realism to the historical account.

Aggressive ASW tools: Radar, MAD, Sonobuoy, Loran

Perhaps unexpectedly, the blimp became one of the platforms for several significant high technology innovations for detecting submarines with important blimp involvement in the development and later as a user. MAD (magnetic airborne detection), the sonobuoy and Long Range Navigation (LORAN) are addressed. The blimp, as a test platform and then user of the operational devices, assisted the evolution of these important submarine

detectors from earliest laboratory models to production. Today, sonobuoys are the principal airborne submarine detector.

In the evolution of these wartime systems, the value of the coming together of the civilian scientists and naval aviators in the research and development is cited. During WWII, Vannevar Bush, head of the National Defense Research Committee (NDRC), inaugurated a successful policy for war-related scientific research under contracts to civilian universities and institutions. It developed new effective relationships among American universities, government and armed forces. The Committee's interest included improvement of the reliability and effectiveness of present equipment. The origin, evolution and integration of these new tools, important to the LTA'S role as part of the convoy process, are discussed in detail.

In addition, the blimp had a role in radar development and operational use on the blimp along with the adoption of radar by airplanes. In addition to the human eye, radar with day and night capability provided submarine searching-capability. Once detected, MAD supplied submarine tracking and the sonobuoy underwater submarine tracking.

As example of blimp early participation, the testing of a new submarine detection equipment from Columbia University's New London NDRC Underwater Sound Laboratory March 7, 1942 brought the Lakehurst blimp K-5 cruising over waters south of New London using a new device, sonobuoy, to detect the submarine S-20, then running completely submerged. The buoy was able to receive underwater sounds from the submarine via the radio link to ranges of several miles. "By the fall of 1943, however, these buoys would be effective, invaluable, and famed, their production pushed to supply the demand." Today, sonobuoys are the principal airborne submarine detector.

Convoys coupled with these systems (also useful to airplanes), and additional other peripheral assistance including air dropped weapons on the blimps created a U-boat wariness that caused Donitz to eventually withdraw his submarines from the western Atlantic areas.

Throughout the book, the author frequently quotes Admiral Karl Dönitz, German U-boat Commander in Chief. This use of a contrasting viewpoint, comment or assessment of an ongoing Allied ASW technique or methodology helps to provide balanced perspective.

The blimp also had a role in the rapid wartime development of Loran (long range navigation) that allows a vessel or aircraft to determine its position in all weathers and at great distances from shore. On June 13, 1942, engineer John A. Pierce, of Harvard and MIT Radiation Laboratory, conducted the first demonstration of the Loran navigation system aboard the Lakehurst K-2 during a 250-mile flight from Lakehurst to Ocean City, Maryland and return. This system went from being a concept in October 1940 to operational status by mid-1942 and almost universal use by the Allies at the end of the war.

This comment about new systems evolving is to point out the inclusiveness by Althoff during his examination of the blimp's wartime role in the ultimate defeat of the U-boat beginning in mid-1943.

The low point in the ASW effort against the U-boats is described in Chapter 3, Bitter Spring. A summary of ship sinkings at the end of 1942, tallies a total loss of ships sunk by U-boats at 1,161, accounting for 76% of all ships sunk that year. Turning Tide, Chapter 4, marked the upswing in ASW success in May that continued until the end of WWII.

Blimps as an effective part of the ASW effort were beginning to be recognized during this difficult year. In April 1942, Secretary of the Navy Frank Knox in the naval plane authorization program increased the number of LTAs from 48 to 72.

Early blimp recognition by Admiral Karl Donitz in August 1942 is appropriate. "When queried as to America's 'dwarf dirigibles,' Dönitz replied; 'In contradiction to a wide-spread belief, I should like to emphasize that operations in American waters are by no means a simple matter. It cannot be denied that even the 'blimps' have a certain effectiveness in defense, and the Americans have known how to organize very rapidly a defense that commands respect."[6]

Balancing: Bitter Spring and Tide Turning

Althoff addresses the challenges of the extensive and seeming unending U-boat successes in 1942 costing more than two merchant ships per day during February to March. The loss of lives, ships, and material compounded problems. The early U-boat assault Operation Drumbeat probed almost with impunity the coastal shores from the St. Lawrence to Cape Hatteras as well as penetrating into the Gulf of Mexico not far from New Orleans. This grim year of 1942 became a period of building, waiting, developing new ASW weapons, organizing and focusing. This was the period of preparation to counter the lack of preparedness to protect merchant vessels from the U-boats. Results of these actions were not immediately predictive of the turned tide and successful ASW that began in May 1943.

A coming together

The unexpected reversal of the U-boat's nearly four years of success in the Atlantic Ocean and coastal North America was an end result of the coming together of the creation and fielding of the needed resources, introduction of advanced ASW weapons and overall systems use optimization resulting from significant broad application of operations research to ASW. England's several years of successful experience with the application of operations research to the submarine problem provided enhanced understanding of convoy escort and air cover needs which contributed to Dönitz's late 1943 gradual withdrawal of U-boats from the Atlantic sector. Further, a meeting of the Allied leaders Churchill and Roosevelt in Casablanca during early 1943 ended with a fresh and firm resolve, as a first priority, to counter the U-boats more aggressively.

U-Boat Sinkings

September 1939-April 1943 (44 months) **193**

May-June-July 1943 **100**

The means for this implementation of operations research was the U.S. Antisubmarine Warfare Operations Research (ASWORG) established in early 1942 in support of Admiral King's antisubmarine efforts. The work of the ASWORG, including the collection, analysis and systematic study of ASW, successfully brought science trained civilians and Navy and Army operations officers to address the problems. In some instances positive results were almost immediate. The late May 1943 establishment of Admiral King's Tenth Fleet with defined responsibility for antisubmarine operations sea and air further stimulated this cohesive overall effort.

Beginning in early 1942 through the years ahead, the roles of the LTA in the War effort never stopped growing. Blimp utility soon included torpedo chasing and recovery, aerial observation, photography, radio direction finding calibration flights, radar calibration, sonobuoy training, radar operator training, locating downed aircraft and disabled vessels, drifting survivors, ship's camouflage and submarine operations. Further, the blimp's usefulness on convoy escort, especially on night patrol and under conditions of poor visibility, was recognized.

The Squadrons: U.S., Caribbean, Brazil, Mediterranean and elsewhere

Details of the squadrons, their formation, their locations and operations permeate this story of the LTAs. The author has left no stone unturned to provide the reader with the utmost detail for each squadron and its participants.

The book's *Appendix E Statistical Summary: U.S. Fleet Airship Operation, 1942-45* with a few numbers reflects the hard-earned squadron month-by-month growth, implementation, and results of the 15 squadrons. In various chapters, the reason, purpose and origin of each squadron is told. Squadron commissioning, the adjustment to the geographical location, the particular operations, living conditions, and in some instances the gradual reduction in squadron numbers as the war begins to move along more favorably for the Allies is detailed.

Several chapters devoted to squadron development and broad geographical deployment, the important role of the LTA and the demands on those involved are highlighted. As mentioned previously, Althoff provides rich context explaining why the various squadrons came about and answered particular needs of new geographical areas. As U-boats moved to different geographical areas, the LTA squadrons followed suit.

Squadron Building

Lakehurst, the Navy's sole operating/experimental base for airships in operation since 1921, with a very limited airship complement but a core of competent airmen, provided training and classes for officers, cadets and enlisted men. Befitting personnel had to be found, as well as a hundred or more K-type blimps which had to be manufactured by Goodyear, debugged, and adapted for the ASW and escort patrols. This was all preparation. The establishment and participation of the 15 Airship Squadrons in the ongoing heavy participation in ASW for the four years 1942-45 confirms the importance of remembering LTA.

Merchant marine ship convoy escorts present a group of somewhat disparate members that have to work in coordinated fashion while facing the uncertainties of the oceans and the weather and the enemy. Blimps, destroyers, airplanes and independent merchant ships working together in an escort environment provide many challenges.

Growing LTA support in 1942 saw the dedication and operation of six blimp squadrons four: on the east coast (South

Weymouth, Massachusetts, Lakehurst, New Jersey, Weeksville, North Carolina, Glynco, Georgia) and three on the west coast (Santa Ana, Moffett Field in California and Tillamook, Oregon).

To accommodate the existing and forthcoming squadrons, the construction began on seventeen blimp hangars (1000 feet long) to accommodate the dozens of blimps.

Brazil being at war with the Axis in mid-August 1942 brought increased U-boat activity in the south Atlantic. In 1943, three LTA squadrons were established with multiple detachments to cover the 1800-mile northeast and east coasts of Brazil. Beyond continental United States, the LTAs were needed and sent to locations in Panama, Trinidad, Gibraltar, and Morocco. Detailed consideration of the locations and operations of each of the 15 squadrons is given attention by Althoff.

VE Day in Europe found US Navy Airships in north, central and South America, southern Europe and northwest Africa. The following year, 1946, the LTA squadrons were reduced from 15 to 2; bringing the overall standing within the Navy of LTAs then nearly back to its indeterminate status of 1940.

The Record

Statistical Summary data from Appendix E Statistical Summary provide a measure of the LTA contribution to convoying against the U-boat. A picture caption in the book regarding the sinking of SS Persephone by a U-boat is appropriate. "SS Persephone, 25 May 1942. Bound for New York, the tanker took two 'fish' from U-593—probably the only vessel torpedoed while under LTA escort in two world wars."[7]

With more than eighty thousand ships escorted in WWII, alone this is a remarkable comment about the effectiveness of LTA escorting.

Ships Escorted, Yearly

Ships Escorted	1942	1943	1944	1945	Total
Atlantic	---	26,966	36,485	6,857	78,308
Pacific	14	3,023	4,574	2,119	9,730
Combined	14	29,989	41,059	8,976	80,038

Althoff's History

Aviation historian Althoff's LTA history meets all the right criteria for scale, scope, clarity, and thoroughness. Attention to relevant actions in the world around the challenged LTA is not overlooked and surprisingly helps to make the history an interesting and satisfying read. As previously mentioned, the wonderful and mostly large and significant number of photographs gives the reader a kind of "this is happening now" feeling. The forty-five pages of endnotes provide not only attribution but also paths to further knowledge. The eight appendices are more than a scholarly adjunct to the book. This history from the perspective of the LTA provides another window on the vast WWII.

Endnotes

1. "Forgotten Weapon' fills void in WWII History", Mark Lardas correspondent, Galveston County The Daily News, November 18, 2009.
2. http://www.bluejacket.com/usn_avi_ww2-blimps.html
3. Day Magazine, May-June 2002, Robe Lewis.
4. William F. Althoff, Forgotten Weapon, U.S. Navy Airships and the U-boat War, Naval Institute Press, Annapolis, MD, 2009, p. 10 footnote 4.
5. William F. Althoff, *op. cit.*, p. 7.
6. *ibid*, p. 118.
7. *ibid*, p. 92.

PRESUMED LOST

by Mr. Stephen L. Moore
Published 2009 by U.S. Naval Institute

Reviewed by CAPT. Herbert I. Mandel, USN (Ret.)

Captain Mandel, during WWII, served in FINBACK '42-'43 at Midway, Exec of CROAKER, 1944, CO PERMIT (Dec 1944-Nov 1945) and Chairman of Fund Raising Submarine Memorial "Wall Of Honor" Groton, CT.

There were one hundred fifty eight submarine service Prisoners of War. Only about two dozen of them are still alive. These prisoners were taken from seven boats out of the fifty two that were lost. From interviews with survivors, there is great detail of the final moments of PERCH, GRENADIER, TULLIBEE, S-44, SCULPIN, ROBALO, and TANG.

There is historical content in the details of this carefully researched work. The Bibliography is complete with official reports, interviews, published articles and books about the Pacific submarine war. The photographs, furnished by the survivors, brings the book to life. To complete the detail there are charts of the location of each sinking. There is also a chart of the complete home islands prisoner of war system, including the unlisted interrogation camp at OFUNA, about thirty miles South of Tokyo.

There are complete rosters of the seven submarines, with complete lists of their prisoners and lists of survivors. The interviews with survivors, most of whom, after a period of hospitalization and rest, resumed a normal life. Many of the survivors on liberation, were down to ninety pounds. Although many were disease ridden with beriberi, malaria, etc. the major killer was malnutrition. The American prisoners were not able to survive on a few hundred calories of rice balls, when they could get them.

The real flavor of the book begins with Chapter Three " The First Months of Hell". Japan was not a signatory of the Geneva Convention of 1929, regarding treatment of prisoners.

Chapter Seven "We Became Terrific Liars" was the new code. Say anything to stop the pain. The wilder the better. This writer recalls hearing of a movement in the Navy Department to modify the code, "Name, rank, serial number". In this I would defer to Senator McCain. Submarine prisoners were not officially listed as military prisoners.

Families knew only the customary "Overdue and Presumed Lost". The author starts with the story of PERCH. March 2,1942, contact was made with a large convoy twenty miles North East of Surabaya. After the approach and attack phase, the subsequent depth charging was so severe that the ship could not submerge. The damaged submarine was sunk. The CO, LCDR Dave Hurt ordered all hands over the side. After being picked up they were taken to MAKASSAR, where the interrogation and brutality began.

While there, survivors of destroyer POPE were brought in. This included LCDR Wreford Blinn, CO, Exec. LT Richard Antrim, LT Robert van Rensalear Basset, Jr., LTJG William Oscar Spears, Jr., LTJG John Michel, LTJG Lowndes, LTJG Jack A. Fisher, ENS Donald E. Austin. 'The aim of the questioning was codes and ciphers, fire control equipment (torpedo data computer), and electronics. On matters of commercial design and data from Jane's Fighting Ships, we told the truth which helped us when we were lying", according to a paper written by LCDR Fitzgerald, CO, GRENADIER, who never cracked. Prisoners were transported North to the home islands in two former merchant ships. They received better treatment in the ships than they did in the camps although they came to be known as hell ships. Both were eventually sunk.

PERCH officers at Makassar were LCDR Dave Hurt (CO) LT Bev van Buskirk, Exec., LT Kenneth G. Schacht, LT John Ryder, LTJG "Jake' Van Der Grift. S-44 had received great recognition in the South West Pacific. She was credited with sinking 8800 ton heavy cruiser off New Hanover Island. Aug. 10,

1942. She had further successes off Savo Island during the Guadalcanal campaign. After an extensive shipyard overhaul, she was ordered to the Aleutians.

Leaving Attu, she was ordered to the Northern Kuriles. On the surface sighting a dark silhouette, a surface gun attack was started. The silhouette turned out to be the 860 ton escort destroyer ISHIGAKI. S-44's hull was pierced by gunfire. CO Frank Brown's only recourse was to allow as many of his crew as possible to escape. S-44 went down Oct. 7, 1943. Of the 58 men, only two of the crew were recovered for the camps.

GRENADIER was on the surface the morning of April 21, 1943, West of Penang in the approaches to the Straits of Malacca. She was surprised by a two engine bomber coming in low from an island. The submarine immediately dived. The plane made his drop and caused mortal damage. The ship bottomed, fought free, surfaced but could not move. With two surface ships approaching, and not being able to get away, the ship was scuttled, and all hands went over the side. GRENADIER crew were taken in to Penang for their initial interrogation. Picked up were LCDR John Fitsgerald (CO) LCDR George Whiting (Exec.) LT Harmon Sherry, LT Kevin Harty, LT Al Turner, LT Al Toulon. LT John Critchlow, LT Arthur McIntyre. After staying at Penang, all of the crew were taken to OFUNA.

March 3, 1943 Major *Pappy* Boyington, Marine Corps Ace, and LT George C. Bullard were brought in to Ofuna. Bullard flying off HANCOCK had been shot down Feb 17 during a carrier strike on Truk SCULPIN, patrolling off Truk was hit by surface gunfire Nov. 18, 1943. Fred Connaway (CO) was immediately killed. Captain John Cromwell, Group CDR, was aware of the coming island campaigns. He elected to go down with the ship. Forty one of the crew were held at Truk Nov 20-30, 1943 .These included LT George Brown (Exec), ENS John Gamel, and ENS Charles Smith, Jr. About half of the men were packed below decks in carrier CHUYO for the trip to Japan. Enroute CHUYU was torpedoed and sunk by SAILFISH, the former SQUALUS (renamed). SCULPIN, sister ship, had located the distress buoy, and stood by when SQUALUS went down while on trials off

Portsmouth, New Hampshire, in 1939. ENS Gamel and ENS Smith were aboard.

TANG like TULLIBEE (one survivor-sunk Mar. 26, 1944) was hit by her own torpedo. After gaining hits on six ships and two large tankers, CDR Dick O'Kane returned to the convoy after his final reload. On Oct 24, 1944 the last torpedo to be fired circled around to hit TANG. Picked up were CDR O'Kane, LT Hank Flanagan, LT Larry Savadkin. Several of crew, officers and men were trapped on the bottom. Three were to make the only successful use of the Momsen lung.

In addition to baseball bat beatings there were instances of surgery without anesthesia. When the liberation finally came the author continues his coverage in great detail. Each submariner was welcomed by a Submarine Force host with a car with dolphins imprinted. There were War Crimes Trials in 1947. A total 137 were tried.

A Vice Admiral received a severe sentence for failure to supervise. One of the Camp Commandants and several of the more brutal guards received prison sentences. Mitigating statements made by two of the CO's were "One of the camp commandants shared his meager rations with us".

Several of the liberated prisoners said "'They treated their own men the way they treated us.'" It is not possible to read this book calmly knowing a number of the principals. In 1948 I relieved CDR George Whiting in command of MEDREGAL. In 1957-59 CDR Kevin Hardy and I were in the same office Joint Staff, CinCPac, in Pearl Harbor."(Grenadier)

Ernie Plantz, PERCH, now living in Gales Ferry, CT was recognized by the Governor, received an advanced business degree and is active in the Thames River Chapter, Submarine Veterans of WWII. Joe Baker (SCULPIN) went on to college, and a career in banking, He is well known in the area where I now live (Western MA). My admiration knows no bounds!

For serious students of the Pacific War this book fills a gap hitherto untold.■

THE U.S. NUCLEAR ARSENAL: A HISTORY OF WEAPONS AND DELIVERY SYSTEMS SINCE 1945

by Norman Polmar and Robert S. Norris
Naval Institute Press, 2009

Reviewed by CAPT Chris Ratliff, USN

Captain Ratliff is a submarine officer currently on the staff of the Strategic Command. He has commanded both an SSBN and an SSGN.

The front jacket fold of *The U.S. Nuclear Arsenal: A History of Weapons and Delivery Systems Since 1945*, by Norman Polmar and Robert S. Norris, describes the book as a "comprehensive work. . .a complete and fully up-to-date history" of U.S. nuclear weapons and delivery systems. This is not the first book to tell this story. Other nuclear weapons fact books include the late Chuck Hansen's *US Nuclear Weapons: The Secret History* (1988, Aerofax, Inc.) and James Norris Gibson's *The History of the US Nuclear Arsenal* (1989, Brompton Books Corp.). In fact, Polmar and Norris express gratitude to Hansen in their Preface for whatever he contributed to their book, and the Polmar and Norris book bears a striking similarity in size, appearance, and format to Gibson's coffee-table-style work.

Anyone interested in adding a book of this genre to his personal library is then bound to wonder whether *The U.S. Nuclear Arsenal* is more worthy of the investment than others, such as the Hansen or Gibson efforts. Polmar and Norris have the clear advantage that their book is over twenty years newer. A lot has happened in the ensuing years that must be included to claim *up to date*, including: the Cold War ended and the Soviet Union ceased to exist; the TRIDENT submarine class was completed and the D-5 missile replaced the C-4; the B-2 stealth bomber entered service (shown only as an artist's sketch in Gibson); the arsenal shrank and consolidated; and the U.S. subsumed the old triad into a new one.

While Polmar and Norris cover each of these developments and more, the reader will find only about a dozen pages (out of 259) that really update the story since Hansen and Gibson. If the potential buyer is most interested in the last 20 years, then he'll need to decide if this scant coverage is worth the $35 to $50 cost of the book.

As well, to say a book is up to date that tells of history as it is still occurring is always hazardous. Perhaps Polmar and Norris expected a long static period—a virtual end of history—to allow their book's marketing to run its course. These are hardly static times. With a new Nuclear Posture Review (NPR) due out shortly and follow-on START negotiations with Russia nearing completion, *The U.S. Nuclear Arsenal* is likely to lose its currency in a very short time.

Other than *up to date*, Polmar and Norris commend their work as *comprehensive* and *complete*. If by comprehensive they mean broadly covering the topic, the reader will partially agree. So many weapons and delivery systems are described that there is far more information than the reader could absorb if he chooses to read the book once from cover to cover. If the writers' and reader's intent is that the book is kept handy as a quick reference, then it will serve this purpose.

Completeness, though, the reader will find lacking. Given that people are the source of history, it is reasonable to expect that the individuals behind the history of U.S. nuclear weapons would have a more prominent—a more *complete*—portrayal. For sure, some names are mentioned, such as Groves, Tibbets (but, oddly, not Parsons), Eppley, LeMay, Power, and several others, but the first shortcoming is that each who is mentioned makes little more than a cameo appearance. For example, Power is rightly credited with devising and executing an airborne alert experiment but receives no attribution for, among many other things, defining (or, at a minimum, reflecting) the spirit of the times in his best-selling book *Design for Survival* (1965, Pocket Books, Inc.).

The second complaint is that so many prominent names are absent entirely. For example, in the discussion of *ER* warheads (in which *ER*—meaning enhanced radiation—is not defined, nor is it

called by the better-known name of *neutron bomb*), neither President Carter nor President Reagan is mentioned. They should be, as the political debate on the moral limits of nuclear weapons that they engaged in from one administration to the next was a defining event of the late Cold War. As another example, any complete history of nuclear weapons must surely have a discussion of the Revolt of the Admirals. Polmar and Norris give it just one sentence, call it "the 1948-1949 debate between the Navy and Air Force," and make no mention of the roles of Louis Denfeld, Arleigh Burke, Louis Johnson, and several others. And how can a history of ballistic missile delivery systems not mention Bernard Schriever? I would summarize these criticisms by suggesting that a history of U.S. nuclear weapons that would be called *complete* should perhaps have a section devoted to those who drove that history, presented in a format similar to the chapters that Polmar and Norris devote to nuclear warheads and delivery systems.

Setting aside these criticisms, the reader will feel shorted on the depth of the technical information. For instance, as I live and work within sight of the hangars where the B-29s *Enola Gay* and *Bockscar* were built and modified to deliver their nuclear bombs on Imperial Japan, I would have liked a more complete (and, I believe, more accurate) discussion of the Silver Plated Project. While the project is briefly mentioned in the book, my curiosity was not at all satisfied. As another example, Gibson's discussion of *Davy Crockett*—the 1960s nuclear weapon under the tactical control of sergeants—is much more thorough and revealing than Polmar and Norris offer. If the reader is concerned about the prospect of a terrorist possessing a *back-pack nuke*, he will find Gibson's description of SADM (special atomic nuclear demolition) more accessible, complete, and unsettling. As catalogued by Polmar and Norris, the reader would have to know enough about SADM to sleuth through the text before finding the abbreviated entries. Rather than call their work a complete history, Polmar and Norris would be more precise if they described it simply as a condensed history.

The US Nuclear Arsenal has a quirkiness that the reader might not appreciate. For instance, the discussion of the AIM-54 *Phoenix* missile points out that "no nuclear warhead was fitted to the missile." Fortunately, Polmar and Norris chose not to discuss every delivery platform to which a nuclear warhead was not fitted. In another case, the brief discussion of the Mk 45 ASTOR torpedo includes the observation t"hat two of them were onboard USS Scorpion when the submarine sank in 1968. The ASTOR discussion ends with the statement that a malfunction of a Mk 37 conventional torpedo was ruled out as the cause of the SCORPION's loss. Polmar and Norris neglect to reveal the purpose of these disparate non sequiturs, and the reader is left to wonder.

The question remains, is *The U.S. Nuclear Arsenal* the best investment for someone seeking a ready reference? I would say that Hansen's *US Nuclear Weapons: The Secret History* still sets the unbeaten standard, but at a cost of up to $1500 for a new (i.e., never-before sold) copy, it is not realistically thirty to fifty times better. Gibson's *The History of the US Nuclear Arsenal,* available used for less than half the cost of the Polmar and Norris effort, is a great bargain for a better book, yet it is twenty years out of date. If you must have an up-to-date (through 2009) fact book, that leaves *U.S. Nuclear Arsenal: A History of Weapons and Delivery Systems Since 1945*. But you'll probably find yourself relying on Google to get the whole story.■

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