JANUARY 2005


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FROM THE EDITOR

Given the focus of this magazine on submarines, which the casual observer may think is a subject of limited discussion potential, many readers (all of our readers are very informed folks) have noted the diversity of topics covered in any given issue of THE SUBMARINE REVIEW. This one is no exception, but the difference here is that style is set so definitively in scope by our two lead features about the start and end of service by two individual submarines. VIRGINIA's commissioning marks the beginning of a whole new class of new-age attack boats and PARCHE's decommissioning not only marks the passing of one class of submarines which carried a good deal of the load in the Cold War, but also celebrates a specific ship which performed its special tasking brilliantly. Senator Warner's keynote at the VIRGINIA ceremony, which was ably led off by NavSea's RADM John Butler, and RADM Paul Sullivan, ComSubPac, at PARCHE, all eloquently served their respective subjects well. Bob Hamilton, an experienced defense-beat reporter, has given us a very understandable snapshot about each boat.

The spread of interest is carried further in the articles; from a fine retrospective of one half the submarine effort in the Cold War by Ambassador Linton Brooks to an understandable, if somewhat technical, explanation of what Acoustic Rapid COTS Insertion really is all about in Captain Gib Kerr's piece on the BQQ-10V sonar. Both are must readings to illustrate the why and the how of modern submarining. RADM Jerry Holland gives us a somewhat different aspect of Future ASW for us to consider, and Captain Jim Patton addresses the knotty problem of submarine communications in a way which should ease some of that mystery/tension/roadblock in integrated operations. In addition, Mr. John Merrill does an in-depth treatment of Sea Mines (pardon the pun) in a two part article. The first of which appears here about the early days of that kind of weaponeering.

As a change of pace, Captain Bill Norris offers a look at NATO's present state and future tasks with the inherent challenge to US submarine officers to understand those relations better than others, so their response is always at the point of the Allied spear. For a

completely different approach, a look back rather than forward, consider the *might-have-been* case of a militarily effective submarine in the hands of Spain before the 1898 war between us and them–and before John Holland sold his submarine to the US Navy. Harvard's Professor Marquez gives us a short accounting of just that potential and how it was shorted out by an in-bred naval bureaucracy.

Two World War II submarine tales round out this eclectic mix of information about our world; which doesn't seem so narrow or circumscribed from a viewpoint like this. One aspect of the German U-Boat force is described by Dr. Beynon. A first person observation of SKATE's operations has been left to us by the late CDR Bill Gruner. CDR Gruner had contributed several well thought-out articles to THE SUBMARINE REVIEW over the years and he could always be counted on to provide some fresh insight to tactics, to history and to good submarining. One of his best concerned what it means to be a submarine Executive Officer. Many of us know how hard it is make that transition from watch standing to running the boat. He put some real meaning into just was it is which has to be accomplished.

For dessert, try two experiences which are a bit out of the run of the mill. First there is RADM Dick Riddell's memories as the final CO of NAUTILUS, and all that entailed. Then there is RADM Mike Rindskopf's review of an Australian book about US submarines operating from ports in that country during WW II. I hope you all enjoy this issue. It was fun putting it together.

Jim Hay

FROM THE PRESIDENT

2004 has been a very good year for the Submarine Force. The ships at sea are working harder than ever contributing to the Global War on Terror and standing tall as this nation's most important strategic deterrent force. Two new submarines have been delivered and an impressive number of submarines under contract. The conversion of four OHIO Class submarines into SSGNs is well underway. The delivery of these ships will significantly upgrade the capabilities the Force provides the Combat Commanders for decades to come.

USS VIRGINIA (SSN 724) is demonstrating outstanding capabilities as the crew puts the most advanced submarine in the world through its paces. The expanded capabilities of JIMMY CARTER will provide innovative ways of performing her unique missions. The Navy completed another joint demonstration of the OHIO Class submarine performing SSGN missions. The results are nothing short of spectacular.

The major challenge remains submarine build rate. Building one submarine per year does not sustain the Submarine Force with a force structure that meets the Combat Commanders' needs today or in the future.

Your Naval Submarine League enjoyed a full and profitable year. We strove to improve programs and products. Each initiative is designed to keep the membership up to date on issues important to the Submarine Force. These services were provided within budget and our corpus is slowly growing. Soon we hope to restart the outreach programs. New leadership has been added to our governing boards. In 2004 RDML Joe Walsh, FORCMs Mike Benko and Dean Irwin, Mr. John O'Neill, President of Lockheed Martin Maritime Systems and Sensor Undersea Systems, and Mr. Mike Petters, President of Northrop Grumman Newport News joined the Board of Directors. Mr. Richard Haver, Vice President of Northrop Grumman Corporation, joined the Advisory Council.

The slate of major events for 2005 is exciting. The Corporate Benefactors Recognition Days are 15-16 February 2005. This event provides a day and a half of briefings and opportunities to meet with active duty leadership. The agenda features Admiral Donald in his new role as Director, Naval Reactors and Vice Admiral Munns in his new role as Commander Naval Submarine Forces along with briefings from other members of the Submarine Force leadership. Congresswoman JoAnn Davis (R-1st VA) will be the breakfast speaker. This 'by invitation' event is designed to thank our Corporate Benefactors for their investment in your League.

The fourth Annual Submarine History Seminar is scheduled for 13 April 2005 at the Navy Memorial. The topic is *"Raiders from the Deep"* featuring a historical perspective of WWII submarines putting troops ashore under combat conditions, an assessment of our current SSGN program and their capabilities, and a look at what the

future may hold for Special Operations Forces from the sea. The Submarine Technology Symposium will be 17-19 May 2005 at The Johns Hopkins University Applied Physics Laboratory. The theme is *"Submarine Capabilities for the 21st Century"*. Efforts to develop technologies that will support communications, ship systems and sensors, littoral operations and future concepts will be explored. There is an impressive slate of speakers for this classified program. Finally, the Annual Symposium will be held at the Hilton Alexandria at Mark Center on 8-9 June 2005. The program includes the Annual Awards Luncheon, Submarine Social and Distinguished Submariner Banquet. I want to encourage you to make every effort to attend these events.

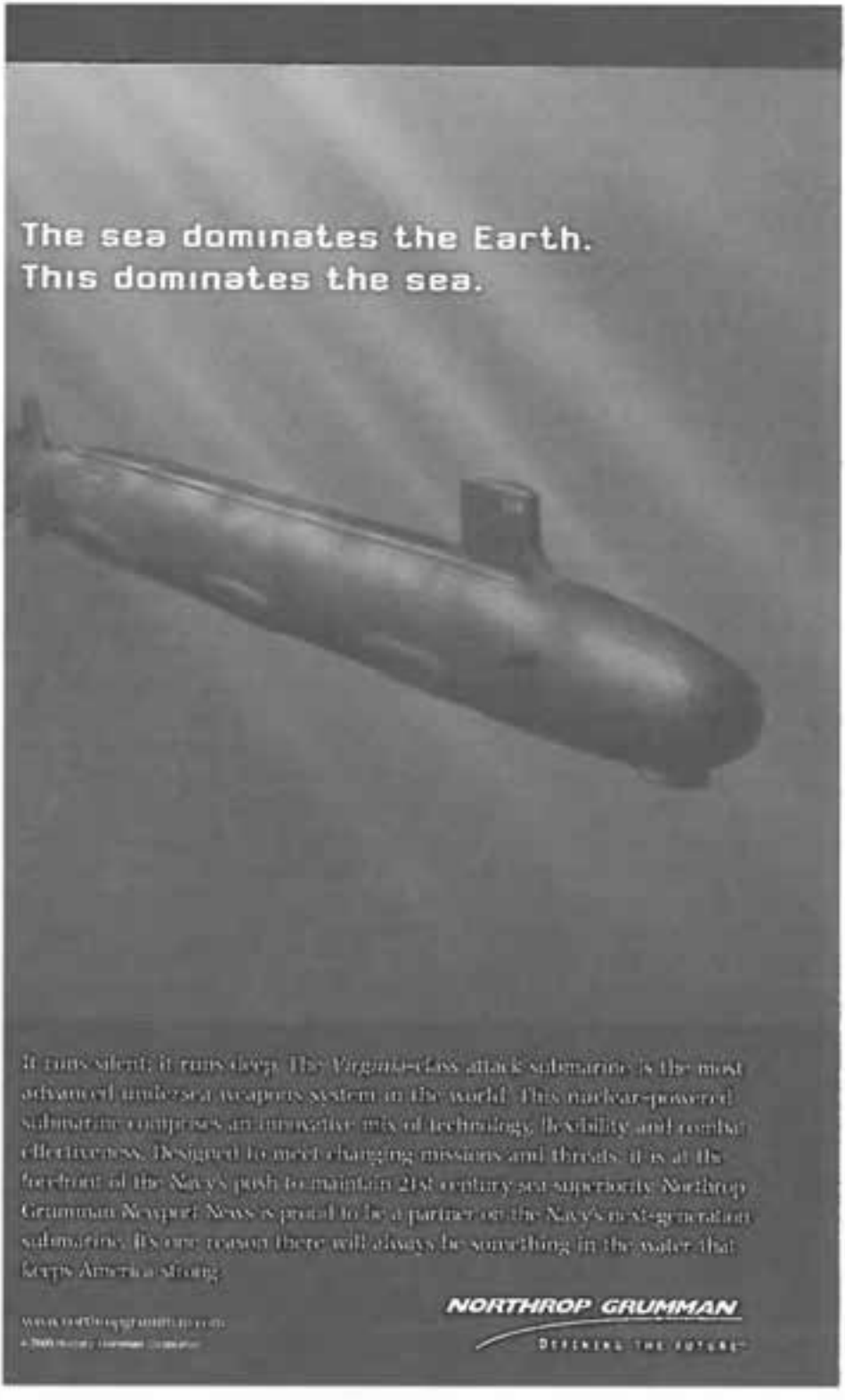
I seek your support for growing the NSL membership. Actions have been initiated to start up a "South Coast" Chapter in Texas and surrounding states. A Chicago area Chapter may also be stood up. The NSL actively supports submarine reunions with announcements in the Review and a special section on our webpage. Membership materials are provided to recruit new members at these events. I ask that you help in these initiatives by telling your friends about the League.

The League provides a forum for discussing topics of interest to the Submarine Force in *The Submarine Review*. Jim Hay publishes a quality journal each quarter with timely and relevant articles about issues and capabilities important to the Submarine Force. Seize the opportunity to express your views on subjects important to undersea warfare.

More of the Armed Forces, including Reserves and National Guard, are deployed during this holiday period. Join us in remembering them and their families in your prayers.

Finally, Jan joins me in wishing you a very Happy, Healthy, Prosperous, and Joyful New Year.

J. Guy Reynolds


The sea dominates the Earth.
This dominates the sea.
It runs silent; it runs deep. The Virginia-class attack submarine is the most advanced undersea weapons system in the world. This nuclear-powered submarine comprises an interactive mix of technology, flexibility and combat effectiveness. Designed to meet changing missions and threats, it is at the forefront of the Navy's push to maintain 21st century sea superiority. Northrop Grumman Newport News is proud to be a partner on the Navy's next-generation submarine. It's one reason there will always be something in the water that keeps America strong.
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USS VIRGINIA COMMISSIONING

KEYNOTE SPEECH
COMMISSIONING OF USS VIRGINIA
SENATOR JOHN W. WARNER, R-VA.
CHAIRMAN, SENATE ARMED SERVICES COMMITTEE
OCTOBER 23, 2004

Editor's Note: Republished from Senator Warner's Web Page: http://warner.senate.gov

I stand before you today humbled to join in the commissioning of this great warship—or as those in the submarine community prefer to call it, a great *boat*. For decades to come, USS VIRGINIA will sail beneath the oceans of the world, protecting this great nation. I know full well that each ship commissioned in the United States Navy develops its own reputation, its own tradition, and its own record. Submarines in particular; some returning to port with empty torpedo tubes and a broom displayed proudly on the sail, symbolizing a *clean sweep* of the enemy, and others not returning to port at all: throughout our history, this proud fleet and the sailors who man the boats have forged in battle the community's reputation as the *Silent Service*, and VIRGINIA is the newest addition to that storied fleet.

Today we commission not just a new submarine, but a new class of submarine, and I want to address my remarks to the crew—those brave few who have been chosen to take this boat to sea—and to the families who will wait for their safe return. It isn't the submarine that earns her reputation, establishes her traditions, or makes her record; it's the crew who commissions her, and all of the crews who sail in her who make history. I envy the adventure, and the contribution to national security, that each of you as crewmembers will make in the years ahead.

As Chairman of the Senate Armed Services Committee, my first priority is supporting the men and women who wear the uniform of our armed forces. Our Committee is responsible for ensuring, on behalf of the Senate, that our military personnel receive the re-

sources, training, technology, and equipment that they need to accomplish their missions.

We took a major step forward just weeks ago. On October 9, Congress passed the Ronald Reagan National Defense Authorization Act for Fiscal Year 2005. This bill authorized more than $447 billion for Defense activities. Our legislation includes a 3.5 percent across-the-board pay raise for all uniformed personnel, and authorizes TRICARE coverage for Reserve members who serve on extended active duty. Further, the bill authorizes a permanent increase both in family separation allowances, and in special pay for duty subject to hostile fire or imminent danger. We also authorized an increase in the Survivor Benefit Plan annuity that will be phased in over three-and-a-half years and, by 2008, eliminates the existing social-security offset system. We feel a duty to take care of our uniformed personnel, retirees and their families. It's our duty to repay them for their sacrifice and service in the war on terror.

Just as important as the personnel benefits, our Committee authorized the procurement of the weapons and equipment that our soldiers, sailors, airmen, and Marines require to perform their dangerous missions, and return home safely. Of particular interest to all who are gathered here today, our bill authorizes the construction of eight new naval vessels, including an additional Virginia Class submarine. I look to today's Navy leaders to continue pursuing a robust shipbuilding program to ensure that those who follow us will have the resources essential to protect the nation's interests in the future.

VIRGINIA is a submarine, the likes of which the world has never seen. She carries with her a proud name and a distinguished line of predecessors. Like our own Commonwealth of Virginia, the state whose name she bears, and the first English Colony in America, she is the first in her class. She is the ninth naval vessel to bear her name – beginning with the frigate USS VIRGINIA commissioned in 1777, to the guided-missile cruiser USS VIRGINIA which was commissioned in 1976; and coincidently was sponsored by my daughter, Virginia Stuart Warner.

In fact, five years ago, when I spoke at the keel-laying of this very boat at Quonset Point, Rhode Island, I recalled that I spoke at the keel-laying ceremony of the last USS VIRGINIA as Secretary of the

Navy in 1972. As my daughter was the ship's sponsor, my remarks that day focused on our collective mission to keep the peace for all our children. "My mission," I said on that day, 32 years ago, is "to bring a generation of peace to my children, to your children, and hopefully to the children the world over." Today, over a generation later, there is no doubt that the last ship VIRGINIA helped keep the peace, and I am confident that this newest and most powerful ship to bear her name will do the same.

The USS VIRGINIA we commission today is sponsored by Mrs. Linda Robb, a former military spouse herself and lifelong advocate for service families. I am pleased to see you here today, Linda, and also your husband, my former colleague on the Committee, Senator Chuck Robb. Linda, you follow in a tradition dating back to Phoenician times, according to which only women are asked to impart their protective spirit to vessels and the Mariners who sail on them. Mrs. Robb, the crew of this ship will always think of you as they sing that comforting verse of the Navy Hymn, "...Oh, hear us when we cry to Thee, For those in peril on the sea!"

This magnificent boat was built under a unique teaming arrangement between General Dynamics' Electric Boat and Northrop Grumman Newport News. Although this teaming arrangement has had its critics, according to the Navy, "VIRGINIA represents the best lead ship performance with respect to cost, schedule and quality of any submarine class since 1970, better than Los Angeles, Ohio or Seawolf." Make no mistake about it: this construction team has performed remarkably, and remains committed to further improvements as we move forward with the deployment of this class.

This deployment will go forward in recognition of a leader who has long been a driving force in naval construction, Tom Schievelbein of Newport News, who retires next month. This is Tom's last commissioning as President of Northrop Grumman Newport News; although I am confident we will work with him again in the future in some exciting new capacity.

Tom and his team at Newport News, together with John Casey and his team at Electric Boat, have delivered to the Navy a remarkable vessel designed to meet head-on the challenging threats of the future. The underwater threat has changed significantly since the beginning of the last decade and the end of the Cold War. The

exploits of our submarine service during the Cold War are significant, much of which can never be told. But the significant underwater, nuclear-powered threat of the Soviet submarine fleet has given way to a quiet, shallow-water, littoral threat posed by quiet diesel submarines that have proliferated around the world. VIRGINIA has been designed to counter this threat through the incorporation of the most sophisticated new technologies, coupled with speeds above 25 knots and depths in excess of 800 feet. She is truly a remarkable and proud vessel, and will doubtless prove worthy of her heritage.

Unlike submarines of the past, whose primary operation was sinking enemy vessels with torpedoes, it is not enough for a ship today to be a single mission platform. VIRGINIA is versatile. She will be able to attack land targets with Tomahawk cruise missiles. She will be able to deploy off-board vehicles and sensors, including both unmanned underwater vehicles and unmanned aerial vehicles. She will contribute to all three pillars of the Sea Power 21 Vision: Sea Strike, Sea Shield, and Sea Basing.

Members of VIRGINIA's crew, in a few minutes; you will bring life to this boat and begin a long tradition. You will be plank-owners. Your skill, training, courage, and sacrifice will establish the tradition for this boat. We are confident that you will live up to all expectations. You deserve to be proud today— this is your day—and we are tremendously proud of you. This is a day no crewman will ever forget. Godspeed and God bless each one of you.

Thank you.

COMMISSIONING OF USS VIRGINIA
RADM JOHN D. BUTLER
PROGRAM EXECUTIVE OFFICER (Submarines)
23 OCTOBER 04

Governor Warner, Senators Warner and Allen, Congressmen Shrock, Forbes and Scott, Mrs. Robb, Secretary Young, Fellow Flag Officers, Distinguished Guests, Ladies and Gentlemen, and men of VIRGINIA, good morning.

Today is an auspicious day, and an important occasion. The Navy has not commissioned a submarine since USS CONNECTICUT (SSN 22) on 11 December 1998. Today, after five years and 317 days, we bring to an end the longest drought in submarine commissioning that we have seen in our 104 years of service. We end it with the commissioning of VIRGINIA, an entirely new class of submarine that was designed after the end of the Cold War to operate in the post-Cold War environment.

In my job, I have been able to work with many of the people who have made this day possible. It was the gifted, dedicated, and tireless efforts of the people within the Navy Secretariat, the Fleet, Team Submarine and NAVSEA, Supervisor of our Naval Warfare Centers and our University Laboratories, the shipbuilders at General Dynamic Electric Boat and Northrop Grumman Newport News, the combat systems electronics and weapons manufacturers at Lockheed Martin, Raytheon, and so many, many others, and especially the officers and crew of VIRGINIA - they are the people who made this day a reality. Their accomplishments are truly astounding.

VIRGINIA is the first U.S. Navy warship designed after the fall of the Berlin Wall to meet the emergent needs of the Post Cold War era. Armed only with a clean sheet of paper and ideas about what the future held, the designers created a submarine tailor-made for current and future conflicts – conflicts like the Global War on Terrorism. Furthermore, they designed a ship that will be easily and readily upgradeable so that no future threat goes without VIRGINIA's decisive response.

The Submarine Force has a history of aggressively and successfully addressing current and future needs. Starting with NAUTILUS, the first nuclear-powered submarine commissioned over 50 years ago, to USS GEORGE WASHINGTON, the first ballistic missile submarine, to USS PROVIDENCE, the first ship equipped with Vertical Launch Tubes, the Submarine Service has been able to anticipate needs and provide the right platforms and systems to our Nation. VIRGINIA is no exception. She is designed to excel in each of her seven major mission areas. Add to that, VIRGINIA's inherent stealth and ability to carry out all of these missions in both the deep water and the world's coastal shallows, and this is truly a first of a kind warfighter.

We designed and built VIRGINIA to be more crew-friendly. We have done away with hot bunking, and given each man his own personal space. We have redesigned the galley and crews' mess for better service and comfort. We have reduced the number of men needed to take this boat to sea through technological innovations and enhancements. VIRGINIA even has a reconfigurable torpedo room that will accommodate our Special Warfare Forces.

VIRGINIA, then, is an aggressive and powerful response to current and future threats. With its stealth, speed, and lethality, VIRGINIA will be a potent weapon in the Global War on Terrorism. From this day forward, our enemies should be sleeping less soundly because even though the seas may look calm, VIRGINIA and her crew will be ever vigilant, ever present, and ever ready.

Men of VIRGINIA, John Paul Jones would be so proud, for today we have delivered all that he requested—a fast ship to sail into harm's way.

Sail with God's speed!

Thank you.

THREE DAYS ON VIRGINIA

by Robert A. Hamilton

Mr. Hamilton is a frequent contributor to THE SUBMARINE REVIEW. A member of the League, he has kept himself abreast of activities with the submarine community. As a member of the working press he was embeded in submarines during Operation Iraqi Freedom.

When you walk into the control room of USS VIRGINIA, it's hard to believe you're in a submarine. No periscopes, no helmsman and planesman stations, no levers and switches to fill and flush the ballast tanks, and very little of the functional but unattractive mil-spec electronic equipment. The changes underscore the fact that this submarine represents as dramatic a change in undersea warfare as has been seen since USS HOLLAND 105 years ago.

In the week before it was ushered into the fleet in October, VIRGINIA made a leisurely three-day cruise from Groton, Conn., to Norfolk, Va., and for the second time in my career as a reporter I got a chance to spend some underway time, pre-commissioning, on a first-of-a-kind submarine (I spent several days on USS SEAWOLF in 1997 traveling from Port Canaveral, Fla., to Groton).

Where SEAWOLF was palpably powerful, VIRGINIA is subtle and sophisticated (though still robust by any other undersea standard). With the ability to carry a mix of 38 missiles and torpedoes, VIRGINIA has a smaller payload than SEAWOLF, but it has a lockout trunk that will allow it to deploy up to nine commandoes and can carry the Advanced Swimmer Delivery System, so it will be able to get the intelligence it needs to place those weapons with pinpoint accuracy.

VIRGINIA is reported to be slower than SEAWOLF, but it has precision of control that will allow it to perform missions in the littorals that would be challenging for any other submarine. VIRGINIA also cannot dive as deep, but the Navy acknowledges it can operate at depths *greater than 800 feet*, so it's going to have no trouble finding the thermal layers it needs to *hide with pride*.

Captain David J. Kern said he has noticed VIRGINIA tends to be more stable surfaced than the 688-class submarines it will replace, and as someone who has served on four of the older boats, and commanded one of them, his opinion carries some weight. In addition, VIRGINIA tends to plane a bit as it drives through the water, giving it a smoother ride than older boats that tend to push down and take more water over the bow, he said. On the trip to its namesake state, VIRGINIA ran into some rough weather on the way out of Groton and on the way into Norfolk with chop of up to 10 feet, but there was a barely noticeable roll inside.

Most submariners had some reservations when they learned that VIRGINIA would have a fly-by-wire computerized control system that you operate with a joystick instead of a steering yoke, giving it more the look of a cockpit than a control room — in fact, the terms *helmsman* and *planesman*, have been replaced by *pilot* and *co-pilot*.

On previous classes of submarines, two of the most junior enlisted people on board handled the helm and plane steering-wheel type controls, while two more senior people sat behind them and made sure they did it properly. On VIRGINIA, two senior enlisted people use joysticks to drive the ship. Senior Chief Torpedoman Joseph Blackwell said that eliminated two positions in the normally crowded control room. And it gets the young people to work through their qualifications more rapidly.

"It allows them to get into their divisions, it allows them to go do the job they were trained to do," Blackwell said. "If the Navy is paying them to be mechanic, they should be a mechanic."

Chief Fire Control Technician Damon Rubin admits he was a bit wary, even after several trips to a simulator that showed it working just fine.

"We still weren't going to be convinced until we could get it to sea and see for ourselves that it operated as good as the trainer," Rubin said. "It turned out it operated even better."

In the past submarines have relied primarily on speed and planes to reach and maintain depth, gliding through the water and angling the planes up to rise, down to submerge. But operating with Special Forces, a submarine has to be nearly dead in the water for them to enter or exit the boat. VIRGINIA has solved the dilemma with a hovering system that allows maneuvering at speeds of less than 2

knots. A series of pumps can move up to 350 pounds of water a second to raise or lower the ship and keep it steady even in rough seas. At one point in sea trials it maintained its depth to within about six inches while at periscope height — for 90 minutes.

"There isn't a 688 in the fleet that could do something like that, even with the best planesman in the world," said Chief of the Boat Casey White. "Computers don't get tired or distracted. More than 7,000 tons of steel and a guy with a joystick can lock it right in the water."

On the trip from Connecticut to Virginia, Kern gave the order to go from 200 to 300 feet while maintaining just two knots of forward movement. Rubin maneuvered a barely moving VIRGINIA 100 feet down through the water, on an even keel, stopping within two inches of the 300-foot depth, the computer filling and emptying ballast tanks to accomplish the task in about three minutes.

Kern said as submarines move more and more into the littorals, the key question has changed from "how fast can you go and how deep can you dive?" to "how slow can you go and how well can you maintain your position?" VIRGINIA is going to enable the Submarine Force to answer, "We'll go as slow as you want, and hold it rock solid in the water column."

"We've always had depth control on submarines, but we've never had the fine control we have with this system," Kern said.

VIRGINIA also has built on the lessons the Navy learned building the Seawolf class, with control surfaces that allow it to maneuver tightly at any speed, and at any heading. Sonar Technician 1st Class Daniel Braman, who has qualified as a copilot on VIRGINIA, said during sea trials the ship was put through several high-speed turns to see how it would react.

"We tried to get it into a snap roll, and it just wouldn't do it," said Braman.

The Submarine Force has a history of being pretty conservative about accepting new technology, particularly in areas such as ship control, preferring systems that have proven to be safe over many years. But submariners seem to have embraced the radical changes of VIRGINIA. Machinist Mate 1st Class Robert Arsego, the auxiliary division leading petty officer who is also qualified as a pilot, said the

extraordinary capabilities that VIRGINIA has delivered have won over most.

"I know the ship control system has gone through a lot of testing, and I know they wouldn't put it out there if it wasn't safe," Arsego said. "It's a lot different. There's no force feedback like you get with a yoke, for instance. But once you get used to it, you can make it do anything."

VIRGINIA's ability to deploy Special Forces has also improved significantly. It is the first submarine with a special chamber that will allow up to nine commandoes with full gear to exit the submarine while it is submerged, and it is designed to deploy with a special mini-submarine for special missions. It is the first submarine with the capability to recharge SEALS' scuba tanks, and a hot-air blower to dry their gear when they get back to the boat.

"This is going to be SEAL heaven," White said. "It was built to take those guys to sea, help them do their mission, and bring them back safe. This ship is going to make its money in the littorals. In the global war on terror, we have to go places we've never gone before, and this ship is going to be able to do it."

Long-time submariners are no doubt going to be more shocked by what is missing in the control room, however. Gone are the twin periscopes in the control room, which have long been probably the most recognizable feature of any class of submarine (sometimes the only familiar feature in a Hollywood submarine when directors take too much liberty with the layout). They have been replaced with a new photonics mast that can be raised and lowered from the sail, which uses a video camera to capture images from the surface and relay them via cable to television monitors in the control room, where the junior officer of the deck can scan the horizon and snap hundreds of still images or high-quality video with the click of a button on a joystick.

That has freed submarine designers to put the control room where it makes sense, rather than right below the sail where the periscope entered the hull. It also means no hole in the hull for the 'scope, long a source of potential leaks into the "people tank."

More important, the new photonics system incorporates an infrared imaging system, which gives a monochromatic image as clear as daylight even on night with solid cloud cover; and a laser

rangefinder that automatically calculates the distance to whatever it's pointed at.

"You can actually see people smoking topside on the surface ships you pass from quite a ways off," said Blackwell. "Infrared is wonderful." Combined with the laser, it's an impressive new capability that will help to avoid collisions at sea, which can ruin any sailor's day. More important, in a combat situation that ability to sneak up on a target at night, and know the exact range and bearing, is going to give VIRGINIA a significant edge,

Gone also from this ship is the traditional *sonar shack*, typically a separate room right off control, because sonar, radar and weapons control are all managed from three dozen large touchscreens in the control room of this highly computerized submarine.

VIRGINIA was designed to be at least as quiet as the SEAWOLF, a goal that has been achieved, multiple Navy officials have said, and even with a smaller reactor it is supposed to be nearly as fast, because of improvements in its propulsor design and its hydrodynamics.

VIRGINIA will also be reliable, White said, with some of the critical systems having three backups, a level of redundancy that should allow it to come through even a serious combat situation with its capabilities intact.

VIRGINIA also boasts one of the quietest torpedo launching systems in the world.

"When I stand in control, if someone flushes the head in the forward berthing areas, that makes more noise than firing a torpedo," Kern said. "And by the way, when we were doing sound tests I made sure flushing the head was undetectable also," he added with a smile. Other quieting improvements have also been incorporated, he said.

"Some of our biggest pumps and motors are so quiet, you can rest your hand on them and can't tell if they're running," Kern said.

The three-day trip was consumed with drills, as the men of VIRGINIA rush to learn the capabilities of the ship. One advantage they had was that the entire VIRGINIA command module was constructed in a building at the north end of the Electric Boat shipyard a year before it was installed on the boat, and tested there under conditions so real that most of the navigation team earned preliminary certification at their job, and the weapons and sonar

divisions were able to get experience as well.

"We made sure they all knew the systems there, before they came down here and had to do it for real, and it made a huge difference," said Senior Chief Electronics Technician Bradley Johnston. That's an advantage the crew needed, because the Submarine Force has reduced the size of several departments as it simplified the systems. Blackwell, for instance, supervises just three men in the torpedo department, where five or six would have been needed on older boats.

So far, the smaller crew size seems to be working just fine. The leaky and temperamental hydraulic systems in the weapons room have been replaced with a network of electromagnetic actuators that move torpedoes or missiles from tray to tube, said the weapons officer, Lt. Joseph Santos. That eliminates a lot of maintenance and repair, and even if the motors break down a technician can move them manually with a 3/8-inch-drive socket set.

"It's a lot easier to move weapons around the room, there's a lot less maintenance, and it's just a lot more user friendly," said Machinist Mate 1st Class Shane Johnson. "I came on board, and learned the system so quickly, within two weeks I was training my younger guys on it. I'd go so far as to say it's the best weapons-handling system in the fleet."

Even more important is how quickly the entire torpedo rack system can be removed and replaced with alternate equipment. During sea trials, when the complement more than doubled with all the riders, the VIRGINIA crew removed the torpedo racks and set up a specially designed 50-person berthing setup in just an hour.

VIRGINIA was also designed to accommodate the vertical launching system for missiles that was backfit into the Los Angeles class of submarines that it will replace, so the controls are more logically laid out, easier to reach, and don't share a space that is also used for spare parts storage.

In the machinery spaces, Machinist Mate 1st Class Derrick Jones proudly showed off an oxygen generator designed to be started in just eight minutes, compared to 24 hours on the 688 where he worked last, and which operates at low pressure, which reduces the risk of explosions from hydrogen gas buildup.

Machinist Mate 1st Class Chris Frank said one of the improve-

ments he appreciates most in the machinery spaces is the new 12-cylinder Caterpillar diesel that provides emergency power. For the first time the engines have preheaters that keep them ready to go on a moment's notice, so the 30-minute startup process had been trimmed to about a minute.

Frank said one of the chief creature comfort improvements on VIRGINIA, though, has to be the toilets. Older submarines had a gravity system that required you flood the bowl, turn a valve to flush it, and then refill it. People new to the ship who tried to flush when the system was pressurized got an unpleasant surprise as the toilet spouted sewerage back at them. VIRGINIA has a vacuum system that is nearly foolproof.

White, the Chief of the Boat, said he's also pleased so much thought went into making life easier for the sailors. On older boats as many as 80 men would share a common berthing area, which meant there was always someone coming or going, making noise that would keep others awake; on VIRGINIA, most men are berthed in 12- and 18-man spaces, and some as few as three to a room.

Culinary Services Chief Frank Chandler said he has a kitchen about three times as large as on a 688, with a dining area that serves more men and is not part of the main passageway for the first time so they can eat in peace.

He also has storage room to bring aboard provisions for as much as 100 days; on 688s, the only way to accomplish that is to cover the floors with food cans, and walk on them until you have eaten down the excess.

Considering the complexity of VIRGINIA, the crew seemed amazed at the minor problems they have encountered so far. The supply officer, Lt. j.g. Timothy Bartha, said on the computer design every spare part had a storage space, for instance.

"When we brought the stuff down here, though, we found some of it didn't fit on the ship the same as it did on the computer," Bartha said. So the crew quickly devised some temporary storage bins, and during a repair period after VIRGINIA's first year at sea the storage systems will be fixed.

VIRGINIA incorporates some older technology as well, however, including some that was developed for 688s or the Seawolf class, he noted.

"We tried to focus all the VIRGINIA investment to where we would get the most bang for the buck, in making it quiet or improving its combat effectiveness or reducing its life cycle costs," Kern said. "And we're right on track."

The manual backup valves that force high pressure air into the ballast tanks to send the submarine shooting to the service in an emergency are the same on VIRGINIA as have been installed on submarines for more than 30 years, White said.

"Some things they got right many years ago, and there's no need to change them."

But White also points out some bright orange cutouts in the walls between the berthing areas and the passageways, which can be quickly removed and are the right size to fit a fire hose through.

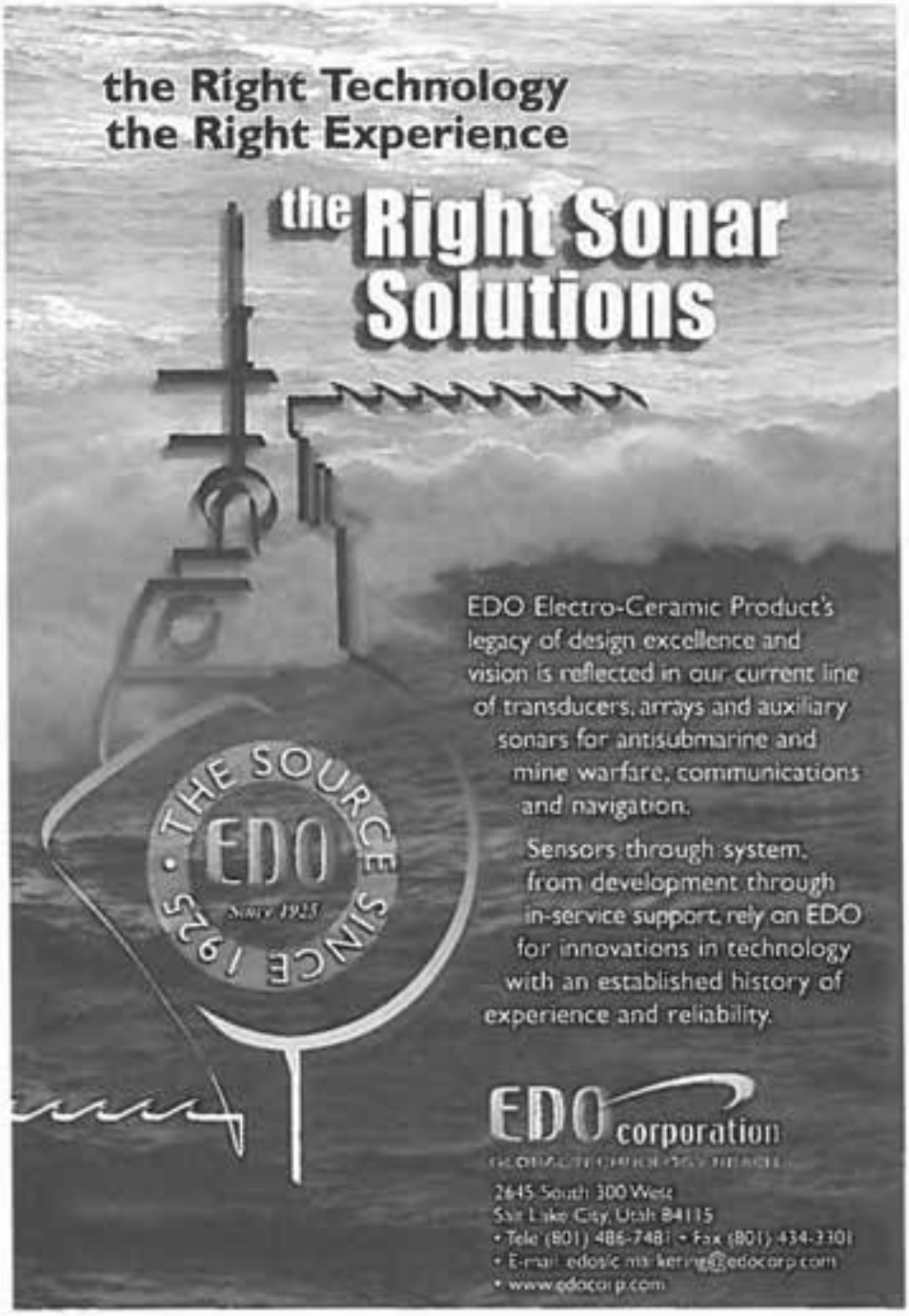
Those were backfit onto VIRGINIA when the crewmen realized a firefighter in full protective gear would have a tough time making it through the berthing area doors. The cutouts are being designed right into follow-on ships.

"That's a good example of the guys on the deck plate working on the boat, figuring out a shortcoming, making a suggestion and then getting it fixed," White said. "That's the way things should work."

Kern said one of the key advantages of VIRGINIA will be noticed in years to come, as modifications are introduced. Given the submarine's modular design, new equipment can be added and old equipment taken off quickly. In fact, Congress has provided preliminary design funding for a multi-mission module that could be added to future flights of the Virginia class, a special hull insert that could be reconfigured over a weekend to whatever mission the submarine will undertake: missiles for a strike operation; unmanned underwater vehicles for coastal surveillance; a Special Forces compartment; and so on.

"I'm not sure we're going to need another submarine class for a long time, because as needs change, as the technology changes, we can just keep adapting this one," Kern said.

"Whether you're talking about the performance of the propulsion plant, or the weapons, or the combat system, we are at the cutting edge of submarine technology," Kern said. "But it's not the technology that is going to win the war, it's the sailor. We're just putting the technology in their hands to go do that."■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USS PARCHE DEACTIVATION

USS PARCHE (SSN 683) DEACTIVATION
RADM PAUL F. SULLIVAN
COMMANDER, SUBMARINE FORCE,
US PACIFIC FLEET
19 OCTOBER 2004

Congressman Dicks, Secretary Kunesh, Fellow Flags, Distinguished guests of the Navy, Richard and Guerrero family members, PARCHE Association Members and friends of USS PARCHE, Commodore Myers and the COMSUBDEVRON Five staff, PARCHE crewmembers, CAPT Rosalli, Mr. Barry Divine and their PSNSY Ocean Engineering Team; ladies and gentlemen, good morning.

It is truly an honor to be here this morning in the beautiful (and wet) Pacific Northwest. Admiral Williams; Commodore Myers; Captain Biesel; Captain Richard; thank you for your hospitality.

To the assembled PARCHE Commanding Officers (all but 1 is here in attendance) Welcome! Dick Charles, Jack Maurer, Pete Graef, Rick Buchanan; Ben Wachendorf, Bruce Smith, Al Hochevar and of course, Chas Richard: your presence here underlines the grandeur of this occasion. For it is each of you and your magnificent crews which have made PARCHE so special.

Chas, and Crew of PARCHE: Your ship never looked better. And finally, let me say welcome to the many PARCHE crewmembers that have joined us today. *YOUR* presence reaffirms the value of your efforts, which for over 30 years sustained a critical and unique component of this nation's defense. You embody the PARCHE herself: "Par Excellence" ... *and* the considerable distance some of you must have traveled to be here further demonstrates your continued commitment to those same ideals which made the PARCHE teams so uniquely successful. Your steadfast devotion to duty, ingenuity, boldness, and confidence as PARCHE crewmembers past and present symbolizes the essence of our nation and is a clear demonstration of your love and passion for freedom.

Seeing you all here today, crewmembers, commanding officers,

family, friends, makes me proud to be a submariner, and honored to be your Pacific Submarine Force Commander.

Thank you for being here to witness and partake in this solemn yet celebratory occasion of PARCHE's deactivation. PARCHE has had a career of service unmatched in the annals of naval submarine service. Steered faithfully by her superb crews over a lifetime of 30 years, PARCHE has accumulated citation upon citation for her superb performance in critical national tasking. In fact, she has become the most decorated ship in our navy's history. Having earned **thirteen Expeditionary Medals, Ten Navy Unit Commendations, and Nine Presidential Unit Commendations**, she now ranks amongst the those legendary vessels which we have all read about, in history books time and time again:

CONSTITUTION...repelling British cannon rounds with her white oak armor, she earned the nickname "Old Ironsides" and helped win our nation's independence and establish American control of the high seas for almost a century. A symbol of our sailors' honor, courage and commitment, she is still in commission and sails from Boston Harbor every September crewed by Chief Petty Officer Selected.

MONITOR... Heralding a new age in naval warfare tactics and armament in 1862, MONITOR engaged the confederate ship VIRGINIA in the Battle of Hampton Roads. The genius of a Swedish immigrant, engineer John Erickson, she is a shining example of American ingenuity and determination. From that day forward, the Navy would abandon wooden-hulled vessels in favor of ironclads. Her recent recovery off the shore of North Carolina clearly demonstrates our nation's appreciation for our Naval Heritage and the role you continue to play in America's economic and national security.

USS MISSOURI (BB 61)... That most powerful Battleship whose awesome 16-inch guns fired for effect throughout the seven seas in conflicts from the 1940s until her final decommissioning in 1990's. Moored in Pearl Harbor just a few hundred yards from my quarters on Ford Island, "Mighty Mo"

serves as an 887-ft billboard announcing the fierce and unrivaled power of American Freedom.

And USS NAUTILUS... As our first nuclear powered combatant, NAUTILUS ushered in a new era submarine warfare. Unconstrained by the tethers of a conventional propulsion plant, she laid the foundation for the remarkable operational readiness we demonstrate now, 24 hours a day, 365 days a year. Her groundbreaking under-ice Arctic transit is now a regular occurrence, repeated just this summer by both USS OKLAHOMA CITY and ALEXANDRIA, as they deployed to the West Pacific from their homeports on the East Coast.

USS PARCHE (SSN 683)... PARCHE initially deployed from Charleston, South Carolina to challenge the Soviet Empire at the height of the Cold War. After transferring to the Pacific Fleet, she began her illustrious career as an Ocean Engineering, Research, Development, Test and Evaluation platform out of Mare Island. Over the next 3 decades, PARCHE and crew sailed thousands of miles at maximum operational readiness, consistently accomplishing the most challenging national tasking. After contributing greatly to the successful defeat of communism in the Soviet Union, she executed innumerable missions, employing her inherent stealth, and joint warfare capabilities.

I recall the names and heritage of these fine ships to illustrate the true significance of this day. PARCHE is the last of the 37 STURGEON or 637 Class SSNs in service, a fleet of superb ships who rightfully deserve a lion's share of the credit for challenging and defeating the Soviet Union.

Yes – the STURGEONs were a significant factor in our winning of the COLD WAR. They were successful not by shooting Tomahawk missiles or Mk 48 torpedoes at the enemy. These magnificent ships did it silently with great stealth, and with their innovative, courageous crews....

Over the course of the last decade, however, our Submarine Force has transformed itself: Today, our current workhorses, the Los Angeles class SSNs, rely upon their inherent strengths of stealth, mobility, endurance and firepower to quickly and decisively defeat any potential adversary. Over twenty 688's deployed in support of Operation Iraqi Freedom and Operation Enduring Freedom, launching Tomahawk cruise missile strikes from the Red Sea and Persian Gulf. And every day they are on station throughout the world employed in missions supporting the War on Terror and conducting tasking vital to our nation's security.

Later this week, in Norfolk, Virginia the Navy will place in commission the most modern and capable submarine in the world, USS VIRGINIA. The first ship designed and built Post-Cold War, the VIRGINIA-class' modular design and spiral development modernization will carry into the future the torch that PARCHE and other SSNs have kept burning for so many years.

2004 is truly a year of transition for the Submarine Force. And I'd imagine a few of the gentlemen seated to my left would say that their years in command of PARCHE were marked by significant milestones, if not similar transition periods. To illustrate the span of history that PARCHE covered, and the monumental efforts of the crew, DEVRON Five, and the many Puget Sound and Mare Island Naval Shipyard workers who made it all a success, I'd like to offer a brief synopsis of each commanding officer's tour, and ask the CO and his crew to stand and be recognized accordingly.

PARCHE Chronology

- In December 1970, Ingalls Shipyard laid PARCHE's keel in Pascagoula, Mississippi and Admiral Hyman G. Rickover was Director of Nuclear Propulsion. In this same year, our shipyards would begin converting our Lafayette-Class SSBNs to launch POSEIDON missiles.

- CDR Dick Charles, the first CO, commissioned her in August 1974, in Pascagoula, MS. I believe the first CO of a ship is arguably the most influential Captain, setting the ship's character

in place for others to build upon. PARCHE immediately transited to her new homeport of Charleston, South Carolina. The crew completed sea and sound trials and would later participate in an annual Atlantic Readiness Exercise (LANTREADEX) before deploying to the Mediterranean. While in the Med, she participated in numerous NATO exercises, operating out of La Maddalena, Sardinia with our European allied navies. By this time, the Navy was moving forward on its plans to establish Bangor, Washington as the initial base for TRIDENT Submarine operations.

- CDR Jack Maurer, after relieving in October 1976, took the ship to Mare Island to join Submarine Development Group One and commenced the first Ocean Engineering conversion. Just a month later, the Navy would commission the lead ship of its class, USS LOS ANGELES (SSN 688) at Newport News, Virginia. PARCHE would later deploy on four separate North Pacific missions in support of CNO tasking, earning a Navy Unit Commendation and her first and second Presidential Unit Commendations. Before the end of his tour, the historic ship NAUTILUS would be decommissioned in a ceremony just a few piers from the PARCHE's at Mare Island. Jack would later become the Commodore of Submarine Development Squadron 1.

- In October 1980, Jack Maurer would turn over the reins to CDR Pete Graef. Pete too would later become the Development Squadron 1 Commodore. While under Pete's command, PARCHE conducted her fifth North Pacific deployment and her first 2 West Pacific missions. In 1982 CDR Graef's crew set the record for the longest port-to-port mission of 124 days while on WESTPAC, almost running out of food, coffee and most importantly the Captain's cigars. These missions earned the ship its 3rd and 4th Presidential Unit Citations and the ship's second NAVY UNIT COMMENDATION. About this same time, Admiral Kinnaird McKee would relieve Admiral Rickover at Naval Reactors; by 1983 the TOMAHAWK cruise missile would be operational. As XO of the RICHARD B. RUSSELL (SSN 687), I would have my first encounter with PARCHE during Pete

Graef's tour. As our squadron-mate in DEVRON One, I remember that the PARCHE took so many of our spare parts on mission, we started calling her 687B… Affectionately, or course.

- CDR Rick Buchanan would relieve in December 1984, just a month after Ronald Reagan was reelected to his second term as our President. Over the course of the next several years he would perfect PARCHE's Ocean Engineering capabilities. PARCHE deployed to the West Pacific for a 3rd and 4th mission in that theater, earning her third Navy Unit Commendation and 5th PRESIDENTIAL UNIT COMMENDATION. During CDR Buchanan's tour, the Submarine Force continued to adapt for new missions and challenges throughout the world, converting USS SAM HOUSTON and JOHN MARSHALL to special operations SSNs and introducing the Dry Dock Shelter (DDS) to the fleet. Rick would complete his distinguished naval career as a successful Flag Officer.

- With PARCHE in dry-dock conducting a refueling overhaul at Mare Island Naval Shipyard, LCDR Ben Wachendorf relieved as Commanding Officer in May of 1988. Just a few months later, USS SAN JUAN, the first improved Los Angeles class SSN (or 688I) would be commissioned and the TRIDENT D-5 missile would enter operation onboard USS TENNESSEE (SSBN 734). PARCHE herself would continue this trend of modernization and improvement, and was converted extensively for Ocean Engineering projects with the addition of a 100-ft hull section to become the Navy's premier undersea Research, Development Test and Evaluation platform. In 1991, during the course of Operation Desert Storm, USS LOUISVILLE and PITTSBURGH would launch the first TOMAHAWK cruise missiles from a submarine in combat against IRAQ. Ben commanded PARCHE for a record 6 years, completing the extensive modifications, the ensuing at sea trials periods and a fifth West Pacific deployment that earned the ship its 6th Presidential Unit Citation. Today, Admiral Wachendorf serves as our Defense Attaché in Moscow, Russia.

- In December 1993, CDR Bruce Smith relieved as CO, and embarked upon the ship's second change of homeport, moving the ship to Bangor, Washington. Just 3 months later, USS MARIANO G. VALLEJO, one of the original "41 for Freedom" SSBNs is the last to be deactivated. Under CDR Smith's command, the ship conducted operations that earned the ship its seventh PRESIDENTIAL UNIT COMMENDATION and fourth Navy Unit Commendation. Bruce would later go on to command Submarine Squadron 11 and eventually return to Pearl Harbor where he exercised total control of the Pacific Submarine Force as my Chief of Staff.

- Al Hochevar commanded PARCHE from November 1995 to December 1997, deploying numerous times from its new DEVRON Five facilities in Bangor. As Group Commander here, I interacted with Al and his PARCHE crewmembers on a regular basis, gaining a renewed appreciation for their ship's unique capabilities and crew's unrivaled work ethic. Under CDR Hochevar's leadership the ship would earn the ship's fifth and sixth Navy Unit Commendations for completing missions vital to national security. The Submarine Force continued to achieve noteworthy milestones during Al's command tour, commissioning USS CHEYENNE, the 62nd and last of the 688 class SSNs, USS LOUISIANA, the last of 18 TRIDENT-Class SSBNs and USS SEAWOLF, the most capable sea-control submarine in the world. Al would later be the Commodore of Submarine Squadron 16 in Kings Bay, Georgia.

- CDR Mark Myers would relieve as PARCHE CO in 1997, and command her through several deployments during which he perfected his cribbage skills... Apparently he also managed to improve the cribbage performance of his COB, Master Chief Mo Pollack while the ship earned its 7th and 8th NAVY UNIT COMMENDATION, and 8th PRESIDENTIAL UNIT COMMENDATION. After his command tour, I repeatedly crossed paths with Mark in my role as the PARCHE resource sponsor at OPNAV and in his current assignment as the DEVRON Five Commodore. Mark has been instrumental in the successful

modification of the JIMMY CARTER (SSN 23). The contributions of he and his staff have ensured that JIMMY CARTER will be ready to serve when she arrives in the Pacific Northwest in the near future. Entries into the Submarine Force almanac continued throughout Mark's tour as well: USS CONNECTICUT was commissioned in 1998, and USS VIRGINIA's keel was laid in September 1999.

- In July 2000 while we commemorated 100 years of "Silent Service", CDR Mark Gorenflo relieved as Commanding Officer. PARCHE deployed in the spring of 2001 to earn its 9th Navy Unit Commendation. While in command, Advanced Rapid COTS Insertions and other modernization installations are occurring throughout the fleet, helping to sustain our acoustic advantage over rising submarine threats throughout the world.

- In a twist of irony certainly not lost on the crowd here today, nearly 30 years after CDR Richard Charles took command, CDR Charles Richard said "I relieve you", and took the reins of this fine ship. Since September 2001, under Chas' command, PARCHE continued her legacy of excellence. He and the PARCHE crew deployed twice, earning a tenth Navy Unit Commendation and, presented today, a phenomenal 9th Presidential Unit Citation...

To round out the historical timeline marked already by today's milestone event, just a few weeks ago, Hawaii Governor Linda Lingle attended the keel laying ceremony for USS HAWAII (SSN 776) (the third VIRGINIA) as the ship's sponsor, Mrs. Linda Robb will commission the USS VIRGINIA in the same role in just 96 hours, and in a matter of months, the USS JIMMY CARTER (SSN 23) will be commissioned and make a homeport shift to Bangor.

Truly Remarkable. I refrain from using the phrase "Unbelievable" because I have worked with submariners far too long to know that they can achieve anything. Still, many of you may wonder how PARCHE has been able to perform so well for so long.

COMMITMENT: Navy leadership has long understood the value that PARCHE plays in our nation's defense, and has always been committed to providing the proper resources, manpower and training. That unwavering support for the PARCHE crew and Commanding Officer, supporting shipyard personnel and DEVRON 5 has enabled their close cooperation and teamwork so essential to mission accomplishment. Which brings me to the second essential element of PARCHE's success:

LEADERSHIP: PARCHE has undoubtedly benefited from strong commanding officers, Chiefs and Officers. Each has been committed to mission accomplishment, communicated their vision, and provided their personnel the tools and roadmap to carry out their orders. (A staggering number who went on to be Chiefs or commissioned officers in our Navy)

TEAMWORK: Each sailor and officer, and each shipyard worker and resource sponsor knows that their contribution to the PARCHE project is essential to mission success. In this era of high priced athletics, analogies to sports are often used to relate the importance of teamwork to businesses and warfighting: Well, I am from Massachusetts, and I can tell you that not even the New England Patriots with their long streak of wins, or the now resurgent Boston Red Sox can hold a candle to the PARCHE team.

UNCOMPROMISING STANDARDS: For our submarines to be proficient at the myriad of mission taskings assigned, a submarine commanding officer, his command leadership, and entire crew must endeavor to do it right the first time. Getting the 'little things' right, day in and day out, wartime or peace, at-sea or in port keeps us on track with our priorities toward achieving the stated goal, Winning. Supervisors enforcing a commanding officer's high standards throughout all facets of ship operations – in the engine room, in the control room and in the classroom – enables a crew to perform at peak efficiency and effectiveness by preventing the diversion of personnel and resources required to re-perform inadequate workmanship.

PROFESSIONAL COMPETENCY: You either have it or you don't, and it comes as a result of applying the 4 traits – really behaviors – I already mentioned. Demonstrating it under pressure when, to use a metaphor, it's 4th and long with the clock ticking down is a measure of how well a crew has made a habit of these essential traits for success.

Well PARCHE, you performed superbly under pressure for 30 years to establish a "Tradition of Excellence". Combat crews throughout the fleet should emulate your habits.

Our ship's motto on RICHARD B. RUSSELL (SSN 687), as the last built of the STURGEON class, was "They saved the best for last."... But in truth, that motto truly belongs to PARCHE, as both the *last and the best*.

The label of "The Best" also applies to all the members of the extended PARCHE team.

Barry Devine and the Puget Sound Naval Shipyard folks, many of whom came from Mare Island when the ship relocated to Bangor, consistently achieved peak operational readiness to support critical national level tasking deployments year in and year out. You have been the pit crew for a winning submarine for over thirty years, and I personally thank you for your outstanding efforts. Please stand and be recognized. Ladies and gentlemen, please join me in a round of applause to recognize our Puget Sound and Mare Island Naval Shipyard personnel.

JIMMY CARTER will be lucky to have your expertise and dedication in the coming years.

And finally, I want to recognize the PARCHE families – you endured countless days without your husbands as they prepared PARCHE for missions. You paid the bills, raised the kids, even coached a few basketball games while your husbands deployed in the nation's defense. Your steadfast support, continuous motivation to your spouses, brothers and other PARCHE families enabled the ship to operate successfully for over 30 years. As the Force Commander, I am indebted to you. Your efforts and those of other Navy spouses and families are the enduring foundation of our Naval Heritage. You have, and will continue to sustain our efforts abroad as we face more

growing challenges around the globe. Please stand to be recognized. Thank you.

PARCHE has clearly lives up to the motto of the first ship to bear the name: "Par Excellence".

Symbolizing the true essence of our nation - Ingenuity, Boldness, Confidence and Love of Freedom, each PARCHE crew has unfailingly lived up to the standard set by Medal of Honor Recipient and famous CO of the first submarine named PARCHE, Red Ramage. Joan Ramage, your father would be bursting with pride if he were with us today.

Before I relinquish the Podium, I'd like to read a message from our CNO, ADM Vern Clark to the officers and crew of PARCHE:

SUBJ: USS PARCHE SSN 683 DECOMMISSIONING

1. WITH THE DECOMMISSIONING AND INACTIVATION OF USS PARCHE (SSN 683) ON 19 OCT, WE WRITE THE FINAL CHAPTER IN THE HISTORY OF AN EXTRAORDINARY UNITED STATES NAVY SUBMARINE. FOR MORE THAN 30 YEARS, PARCHE AND HER PROUD CREW COMPLETED THE SUBMARINE FORCE'S MOST DEMANDING OPERATIONS, EARNING PARCHE A DESERVED PLACE AMONG OUR NAVY'S MOST DECORATED UNITS.

2. THROUGHOUT THE COLD WAR AND THE GLOBAL WAR ON TERRORISM, PARCHE HAS EPITOMIZED THE SILENT SERVICE IN DELIVERING MISSION SUCCESS WITH QUIET DIGNITY AND PRIDE. PARCHE CREWS EARNED THEIR BOAT AN UNPARALLELED RECORD OF EXCELLENCE DURING FORWARD DEPLOYMENTS, WHILE THEIR FAMILIES PROVIDED SELFLESS SUPPORT AND ENDURED LONG AND VIRTUALLY COMPLETE SEPARATIONS AT HOME. PARCHE CREWS COMPLETED THEIR ASSIGNED TASKING WITH COURAGE AND COMMITMENT AND HAVE MADE A LASTING CONTRIBUTION TO OUR NATIONAL SECURITY.

3. PARCHE WAS NAMED IN HONOR OF THE WORLD WAR II FLEET SUBMARINE COMMANDED BY MEDAL OF HONOR RECIPIENT VADM RED RAMAGE. SHE WAS COMMISSIONED IN AUGUST 1974 AND ENTERED SERVICE AS THE 34TH OF 37 STURGEON CLASS NUCLEAR-POWERED ATTACK SUBMARINES. THE CREWS WHO SAILED PARCHE AND THE DEDICATED PROFESSIONALS THAT SUPPORTED HER AT MARE ISLAND AND PUGET SOUND NAVAL SHIPYARDS CONTINUED THE PROUD LEGACY OF HER NAMESAKE AND SECURED FOR SSN 683 HER OWN HONORED PLACE IN HISTORY.

4. WITH THE FINAL LOG ENTRY SECURING THE WATCH, PARCHE'S EXCEPTIONAL SERVICE TO THIS NATION COMES TO AN END. WE CELEBRATE HER LONG AND DISTINGUISHED CAREER AND RECOGNIZE HER AS THE LAST REMAINING SUBMARINE OF A CLASS THAT SERVED OUR GREAT NATION WITH TRUE DISTINCTION.

I EXTEND HEARTY CONGRATULATIONS TO THE CURRENT CREW AND ALL WHO SAILED ABOARD THIS FINE WARSHIP. YOUR NAVY AND YOUR NATION THANK YOU. WELL DONE!

ADMIRAL VERN CLARK SENDS.

Well done, PARCHE. Your spirit and accomplishments will never be forgotten. May God bless you all and may God bless America.

THE SUBMARINE THAT MADE (UNWRITTEN) HISTORY RETIRES

by Robert A. Hamilton

Bob Hamilton is a newspaper reporter who has covered the Defense beat for a number of years. He currently works for The New London Day.

On a cold, rainy fall day in Bangor, USS PARCHE finished its chapter in U.S. Naval history. PARCHE accumulated an unprecedented nine Presidential Unit Citations and 13 Navy Expeditionary Medals. Rear Admiral Paul Sullivan, Commander of the Pacific Submarine Force, likens it to the USS CONSTITUTION and the battleship MISSOURI in terms of its importance to the nation. But PARCHE doesn't yet merit a mention in history textbooks, because its exploits in the Cold War and beyond—it earned its ninth PUC for a deployment to the Mediterranean in 2002—are still highly classified.

Eight of PARCHE's nine commanding officers made it to the ceremony, and most people were struck by the coincidence that the first CO was Captain Richard Charles, who made the trip from Mobile, Ala., while the last CO was Captain Charles Richard. Also in the audience were about 130 former crewmen, including about 20 of the commissioning crewmen, who were allowed one last opportunity to walk through the operations compartment (and not even all of that).

Rear Admiral (ret.) Richard A. Buchanan, who commanded PARCHE for a period in the 1980s, observed that while it was disheartening to see PARCHE retired after a career that lasted more than 30 years, it was encouraging that just days later, the Navy commissioned the submarine USS VIRGINIA, the first warship designed and built for the post-Cold War world, which will capably take over many of the missions which made PARCHE's reputation.

PARCHE made 19 deployments over 30 years, some of them lengthy. Senior Chief Machinist Mate Michael Hedman, now attached to the Naval Submarine School in Groton, recalls one mission during his three-year stint on the PARCHE, 1992-95, when

they got underway for five straight months, without a port call, in fact without once surfacing.

Hedman has earned two PUCs, though he can't tell you what either one is for. Usually the people who recognize the ribbon don't even ask. "Most of the guys who are in the submarine service, they see you're wearing two PUCs, and they figure you were on the PARCHE and can't tell them anything anyway."

Chief Petty Officer Richard Okrasinski of Plainfield wears a PUC as well, though he can't even tell you which year he got it, just that it fell in the 1996-2000 time frame, when he served on the PARCHE.

"Most people have come to understand that I'm not going to tell them anything about that part of my life," Okrasinski said. "My wife doesn't want to know, my father is curious, and my mother doesn't even want to admit I go to sea—she worries about me whenever I'm not at home."

There is a cachet to being a PARCHE sailor, the guys whose missions are so secret they can't even tell other submariners about them.

"We mostly did a really good job of keeping a very low profile," said Adam Bridge of Davis, Calif., who put PARCHE into commission as a nuclear electronics technician in 1972 and rode it until August 1977.

"Civilians just look at you and say, 'oh, yeah, a submarine. Great.' But everyone once in a while someone will have read Blind Man's Bluff and starts to ask questions," Bridge said. "I just say there's nothing I can comment on, that by the nature of their operations, all submarine missions are secret.

"And then I add that, as a taxpayer, I think they got their money's worth," Bridge joked.

Bridge said in a sort of mini-reunion at the decommissioning, he learned that one of the men he served with went on to earn a Ph.D. after his enlistment, another runs nuclear power plants up and down the east coast, many are supervisors at nuclear power plants, and one of them is working for Electric Boat on the program to convert four old Trident-class ballistic missile submarines into SSGNs, or guided-missile submarines, that will also be outfitted to carry large numbers of Special Forces.

"I felt privileged to have served with such highly competent men

and their families," Bridge said. And the tradition continues: Bridge's son Erik is a machinist mate 3rd class aboard JIMMY CARTER, the third Seawolf-class submarine that is being heavily modified at EB to fill the void left by PARCHE's decommissioning, although submariners stress that the PARCHE and CARTER are different ships, and CARTER will have the capability to do a wider range of missions.

"We've already defined a set of boundaries," Bridge said. "We agreed that if I ask a question and he doesn't know the answer, he will say, 'I don't know.' And if the answer would be something that he can't speak about, he'll say, 'I can't say.'"

PARCHE was the 34th of 37 Sturgeon-class submarines, but the sixth of nine *stretch hulls* built in the early 1970s that were lengthened by 10 feet, to 302 feet, to accommodate extra equipment. Commissioned in August 1974, its only deployment ever discussed publicly by the Navy was in 1975, when it joined the Sixth Fleet in a six-month Mediterranean patrol that included stops in Naples, Taranto, La Spezia and La Maddalena, Italy. For most of the rest of its life, it would not make another port call, because its technology was so highly classified it could not risk pulling into any foreign port.

It's rumored that PARCHE, built at Ingalls Shipbuilding in Pascagoula, Miss., and originally homeported in Charleston, S.C., was the quietest of the nine stretch hulls, and was picked for extensive modifications in 1976 at Mare Island Naval Shipyard that gave it an *ocean engineering* capability. For the next 15 years it would be homeported at Mare Island, and it settled into a fairly rigid routine: deploy, return home for repairs and maintenance, and deploy again.

The ship's most dramatic change, though, came in its 1987-91 refueling overhaul at Mare Island, when it got a 100-foot special section that gave it a unique *ocean interface*, which means it can deploy divers or special equipment without surfacing. For the last quarter-century it has boasted some unusual features that are visible on top of its hull as well, but nobody has ever offered any explanations what they might be.

"I used to say the big area forward of the sail is our bowling alley, and back by the stern was just the hump," Okrasinski said.

"Most people were interested in what was up front,"

Those modifications changed its appearance so much some of the crew gave it the nickname "Myra Breckinridge," for the fictional transsexual in a Gore Vidal novel. In Bangor it got its own pier, and the men got their own barracks, to discourage the kind of waterfront scuttlebutt that leads to information leaks.

Hedman, the senior chief who was on the ship as it changed homeports, said it represented a significant transition. The Mare Island shipyard workers knew the ship and were always ready to pitch in to do whatever was needed when it pulled in on a tight schedule.

"Some of the civilian shipbuilders transferred, they came up to Bangor with PARCHE, but we had to get used to a whole new shipyard crew for the most part. All the networking that had been built up over the years in San Diego, we lost all that," Hedman said. "In Bangor, people didn't really understand the program, and there were these news articles about us being 'The Navy's Super Secret Sub.' And the base was huge, more like a naval air station in terms of acreage, so they had all this room to put us off by ourselves. We had to get used to being in our own little world."

Officially, the Navy would only acknowledge that the submarine was used for "intelligence gathering and underwater salvage." But over the years some rumors got out anyway, and it was widely reported that PARCHE was used to retrieve items such as expended ordnance off the seafloor in sensitive areas of the world. But perhaps its most notorious mission was disclosed because of Ronald Pelton, a National Security Agency analyst who spied for the Russians in the 1970s and 1980s.

For five years PARCHE had snuck into shallow water in the Sea of Okhotsk between two large Soviet naval bases to tap a communications cable that carried military signals. Pelton told the Russians about the operation, and PARCHE might have been caught in the act in the mid-1980s if not for satellite photos that showed intense Soviet interest in the area just before it was scheduled to go in to retrieve the recordings that its tap had made. It's not a mission that the U.S. Navy can credibly deny—the tap is in a museum at the former KGB headquarters in Moscow.

Still, submariners were incensed at the level of detail that came

out in the bombshell book, Blind Man's Bluff. Chapter 11, "The Crown Jewels," provides extensive information about Operation Ivy Bells, as it was known.

Because of the demand for its services PARCHE has long been one of the busiest boats in the fleet. Okrasinski said during his first year he did 200 days at sea. Where other attack submarines would do six months at sea followed by 18 months of shore time, maintenance and local operations, PARCHE would do two or three three-month deployments every year, as well as a three-month repair period.

PARCHE was also the only attack submarine homeported in Bangor during its time there, in part because of the Navy attempt to keep the crew from mingling with other SSN sailors, or even with the ballistic missile submarine crews who call Bangor home.

"Nobody talked to the PARCHE sailors," Okrasinski said. "We lived in our own barracks, had our own pier, and had our own parking. We just kept to ourselves."

Retired Vice Admiral Bernard M. Kauderer, who was Commander of the Pacific and Atlantic Submarine Forces at a time when PARCHE had already established its reputation in the 1980s, said he was delighted to learn that CARTER, the third Seawolf-class submarine, would get a special 100-foot hull section to replace the capabilities that will be lost with PARCHE's decommissioning.

PARCHE was decommissioned on Oct. 20, and CARTER is supposed to be delivered to the Navy some time this year, although the engineering challenges associated with inserting a 100-foot section midway through the construction process have made the schedule uncertain.

"The way the program is planned, it can sustain a gap," Kauderer said. In fact, he said, with CARTER slated to go on sea trials early in 2005 and be delivered to the Navy before the end of the year, it won't be much different than if PARCHE had gone in for an overhaul.

"You just plan the kind of operations this submarine does for when the asset is available," Kauderer said. "It's not like a normal SSN, where it has to be instantly available to surge. These are very carefully planned operations, planned well in advance, so it's easy to plan something like this around the schedule."

"It's a great move to have a specially configured submarine asset

ready to perform those very unique missions," Kauderer said. "It's a mission that no other platform, really, can conduct."

But it was missions like that, and others even more hair-raising, that have earned the submarine a number of Presidential Unit Citations. The medal is awarded for extraordinary heroism in accomplishing a mission under extremely difficult and hazardous conditions. It is a rarity on the Groton waterfront, and if you see it on a sailor you can be sure he's done a tour on the PARCHE at some point. Some jokingly call it the "PARCHE Unit Citation."

"I have a little piece of paper that says I'm entitled to wear it, but it doesn't really say anything," Okrasinski said. Does it bother him to have such a prestigious award that he can't discuss? "Not really," he said. "There was a reason that we got it, and I understand there is a reason we can't talk about the reason."■

ARTICLES

WHAT IT ALL MEANT
AMBASSADOR LINTON F. BROOKS
ADMINISTRATOR, NATIONAL NUCLEAR SECURITY ADMINISTRATION
XO SSBN 640 GOLD (1972-74)
Remarks at the USS BENJAMIN FRANKLIN (SSBN-640 Reunion)

Ambassador Linton F. Brooks is the Administrator of the National Nuclear Security Administration (NNSA) and the Undersecretary of Energy for Nuclear Security. The NNSA includes 37,000 federal, military, and contractor personnel who carry out the national security responsibilities of the Department of Energy, including maintaining the U.S. nuclear weapons program, providing naval nuclear propulsion, and promoting non-proliferation. Since leaving FRANKLIN in 1974, Ambassador Brooks has served as Commanding Officer, USS WHALE (SSN-637), Assistant Director of the Arms Control and Disarmament Agency, Chief U.S. Negotiator for the Strategic Arms Reduction Treaty, Director of Arms Control for the National Security Council and in a number of Navy and Defense Department assignments.

September 11, 2004

Good Evening Shipmates. Thank you for having me speak to you tonight. When the organizing committee asked me to speak, I had a natural question. What should I speak about? I first thought about just telling sea stories, but I was an exec, and XOs are not people who tell sea stories, they're people you tell sea stories about. Besides, my sea stories cover only two of FRANKLIN's 28 years. So instead of trying to help us remember what we did, I thought I'd try to look back a little bit from the perspective of today and ask what it all meant.

FRANKLIN made 69 patrols—close to 14 years under water—spread out over almost 30 years. She patrolled in the Atlantic, in the Pacific, and the Mediterranean. She carried Polaris, Poseidon and Trident missiles. She was, in many ways, the most complex self-contained entity ever devised by human beings. But, so what? It was all so long ago. I stepped off FRANKLIN and saw her for the last time 30 years ago. For some of you, it's been even longer. For most in the room it has been at least 20 years and there is no one for whom it has been less than a decade. So why, after all this time, does it matter what FRANKLIN did and what we did when we served in her?

First of all, of course, it matters because of the people. Most of life—at least most of the important parts—is about people. We're here tonight not because of any fascination with technology or any nostalgia for maintaining alert or because we want to rhapsodize over the glories of the Reactor Plant Manual. We're here for each other, for our shipmates. Shipmate is a wonderful word. It refers to people who are thrown together by duty but bound together by shared experience and common affection. So first and foremost, we're here to celebrate our shipmates, the friends of our youth.

Many of my shipmates are in the room tonight. Many others are gone. I served under three Commanding Officers. Two are dead. One – Jack Darby – died as a Commander of the Pacific Fleet Submarine Force. The one living Commanding Officer is John Leonard, sitting over there with his honor restored by a country that, as Churchill says, always does the right thing, but only after it has exhausted all other possibilities. So one reason we are here is for our shipmates.

A second reason we're here is because going to sea is an intense experience that's hard to forget. Going to sea is different and it always has been. That's why there are lots of ship reunions and not very many Pentagon office reunions or SUBASE machine shop reunions.

We're also here because there is something in all of us that makes us want to preserve the past. We see evidence of this desire to remember our roots all around us. From biographies of the founding fathers to histories of the Submarine Force, books to help us remember the past are always popular and special.

In *1984*, George Orwell's frightening vision of totalitarian future,

a Party slogan was "Whoever controls the present, controls the past. Whoever controls the past controls the future." That nightmarish slogan embodies a fundamental truth. The past has made us who we are today, both as individuals and as a nation. The past shapes the future. But as free people we don't seek to control the past but to preserve it so it can help us to understand who we are. That's why it's important to remember the Cold War history of SSBNs and our part in it.

But I think we're here for a fourth reason, one that may be the most important of all, even if we don't recognize it all the time. Human beings need to know that their lives have meaning. We're here because at some level we know that what we did mattered deeply, then and now. And that's what I want to talk to you about tonight.

At one level, what we did was pretty mundane. We got on a bus, then we got on a plane, then we had a turnover, then we went to sea where we spent a couple of months trying to make sure nothing happened. Then we had another turnover, got on another plane, got on another bus, and came home. Our wives turned to each other for support, took care of things that we couldn't deal with because we weren't there, took pictures of milestones that we missed because we were at sea, waited to meet us when we got off the bus, put up with our inclination to immediately try to take charge—as if things hadn't been running perfectly well while we were gone—watched the off-crew period fly by, kissed us goodbye, and watched us get back on the bus and then did it all again and again and again.

And while we were gone, what did we do? Nothing very glamorous. We fixed lube oil pumps; we cooked meals and maintained communications; we trained a lot; we kept a propulsion plant running and a weapons system ready; we watched a few good movies and a lot of bad ones; we tracked contacts and monitored atmosphere quality and did paperwork. At a human level, it was a routine, if somewhat odd, existence. We just got on a bus and went off to do our routine and repetitious job.

But we did a good deal more than that. We won the Cold War. You, me, our shipmates who aren't with us tonight, our counterparts on other FBMs, we won the Cold War. Not by ourselves, of course, but without us, it might have come out differently. We preserved the

peace for decades until the inherent contradictions of communism caught up with the Soviet Union and drove it into the dustbin of history. That's a pretty impressive achievement. The first great philosopher of war, Sun-Tzu, wrote 2,500 years ago "to win one hundred victories in one hundred battles is not the acme of skill. To win without fighting is the acme of skill." That's what we did. We won without fighting.

Let me take you back to the world that FRANKLIN inhabited. It started years before she was even thought of. In 1946, in a small midwestern city named Fulton, Missouri, Winston Churchill sent a sobering message to the world. He said:

> *From Stettin in the Baltic to Trieste in the Adriatic, an iron curtain has descended across the continent. Behind that line lie all the capitals of the ancient states of central and Eastern Europe.... All these famous cities ... lie in what I must call the Soviet sphere.*

Churchill's speech gave a name to an oppression that would lead America and its allies to spend trillions of dollars to prevent aggression and preserve peace, a peace that was built on the bedrock of the American nuclear deterrent.

The Cold War became more than a slogan when a barbed wire fence and later a wall divided a city and imprisoned its people. The Berlin Wall was one terrifying embodiment of Cold War. There were many others, but the most frightening symbol was nuclear confrontation, which reached its peak 42 years ago next month.

At 8:45 a.m., October 16, 1962, President John F. Kennedy received an assessment from the Central Intelligence Agency that Soviet missiles were in Cuba. The President went before the American people and said, "I call upon Chairman Khrushchev to halt and eliminate this clandestine, reckless and provocative threat to world peace.... He has an opportunity now to move the world back from the abyss of destruction." The following days were filled with fear. We all know now just how close the world came to the brink of nuclear confrontation. But catastrophe was averted. And seven months later, on May 25, 1963, FRANKLIN's keel was laid.

FRANKLIN was born of the marriage of three great ideas, ideas

we've lived with for all our life, so we sometimes forget how radical they were. The first was that nuclear power could be used to propel a submarine. Three weeks from now we will celebrate the 50th anniversary of the commissioning of NAUTILUS, the world's first nuclear submarine. Without nuclear power there would have been no SSBN 640.

The second idea was a ballistic missile could be carried on such a submarine and that the country could make a nuclear warhead small enough to be delivered by such a ballistic missile. It is easy to forget what a monumentally difficult task this was.

Those two technical tasks were solved. They enabled a third great idea, a conceptual and strategic innovation. Starting with Albert Wohlsteter's 1959 article, "The Delicate Bounce of Terror," the United States gradually formed a theory of stable nuclear deterrence. The theory was very simple. If America had enough capability to devastate the Soviet Union, and if that capability could survive a Soviet first strike—either by being at sea, by being airborne, or by launching under attack—then major war between the superpowers became essentially impossible. Crucial to the success of that theory was the existence of an invulnerable and capable component called the ballistic missile submarine. That was FRANKLIN and her sisters.

The first decade of FRANKLIN's life saw America deepen its involvement in Vietnam, argue over the relation between that war and what seemed like the implacable spread of international communism, watch as society was wrenched apart by a conflict that almost destroyed the army, which a handful of brilliant officers would spend the coming decades rebuilding. Throughout this period, FRANKLIN made patrols, starting with her departure on her first one on May 6, 1966. Month after month, year after year, we took FRANKLIN to sea, standing watch and making expansion of the conflict unthinkable.

The second ten years of FRANKLIN's life—starting in the early seventies—brought great technological and political change. Missiles with multiple warheads meant that American retaliation was assured regardless of what the Soviets did or did not do with ballistic missile defense. Serious efforts were made to contain the so-called arms race through formal arms control. And Franklin made patrols,

helping to guarantee that no side could gain a nuclear advantage over the other, and thus making arms control possible.

The final decade of Franklin's life saw the major defense build-up of the Reagan years, the deployment of new weapons to Europe—Ground Launch Cruise Missiles and Pershing 2 missiles—and their subsequent elimination through the first successful treaty to actually reduce arms. And FRANKLIN made patrols, ensuring that even though the conventional wisdom was that NATO forces could not prevail against the Soviet juggernaut, war remained unthinkable.

By now the Cold War had become an integral part of who we were as a people. And then, in a three-year frenzy it ended.

In 1989, Soviet leader Mikhail Gorbachev told the peoples of Eastern Europe they had the right to choose their own future. The Polish Communist government began talks on how to shift to democracy. Other states followed. And then came the historical moment that many see as the true end of the Cold War and the Iron Curtain.

On November 9th, 1989, a mid-level bureaucrat in East Germany prematurely announced to journalists that the ban on travel to the west would be lifted immediately. The East German government had meant for the announcement to be made the next day and that it would be done in a phased approach. That November 9th announcement led to a flooding of West Berliners to the Brandenburg Gate. They began to demolish the Wall and in days it had fallen completely.

In the Soviet Union, Gorbachev unleashed forces he could not control. His lifting of some internal controls led Soviet citizens to call for an end to the Communist Party's stranglehold on political power. In a stunningly short time, the Communist Party—a political organization that had ruled since the October Revolution of 1917—fell.

The 15 constituent Republics of the Soviet Union move quickly to gain their independence. Finally, at Minsk on December 8, 1991, Russia, Belarus and Ukraine moved to dissolve the Soviet Union. In an act that symbolized the irrelevance of the Soviet system, those three states informed President George Bush of their action before telling Gorbachev what they had done.

And on Christmas Day in 1991, the Soviet Union, that great experiment in communist totalitarianism, went into the dustbin of history where it belonged. The Cold War was over. Eleven months later, on November 19, 1992, FRANKLIN returned from her last patrol. And then in November of 1993, she was decommissioned. I have a picture of her being towed up the Hood Canal, that ship I still think of as new and pristine and a marvel of technology.

FRANKLIN's life matched almost exactly the period from the greatest crisis of the Cold War to the ultimate triumph of freedom. Why was it only a Cold War? Why, when the West was faced with an expansionist power with a messianic ideology, did global war never break out? I suggest it was because the American nuclear deterrent made global war unthinkable.

The Cold War wasn't peace. In Korea, Vietnam, Afghanistan, Africa, and Central America huge numbers perished. But the apocalypse never came. We don't know why it never came. The nature of deterrence is that you can never prove that it worked, only that it failed. But I believe that nuclear deterrence played a major role and I know that all of us in this room played a major part in that deterrence.

The end of the Cold War, of course, did not mean the end of history. FRANKLIN's watch, which began shortly after the most terrifying crisis of the Cold War, came to its close shortly after the Cold War ended in triumph, not just for America but for all humanity. But the legacy that we built continues today. As we sit here reminiscing others are at sea standing watch. There aren't as many of them. Fourteen Trident submarines have replaced the 41 for Freedom. And the patrols have more flexibility now because the threat is not immediate.

But deterrence still matters. Deterrence isn't just a nuclear concept; it's a concept as old as conflict itself. But now, the country practices a new and more complex kind of deterrence. Indeed, I spend part of my current professional life trying to understand how our nuclear policy should adapt to the post-Cold War world. That world is very different. On this somber anniversary of the terrorist attack on America everyone in this room understands that the world remains a dangerous place. But make no mistake, the threat of annihilation of civilization that we lived with, and that we held at

bay, has been all but eliminated, and *we did that.*

So, that's one look at what we did and what it meant. I said at the beginning that one reason we were here was because at some level we know that we all were part of something important. I hope I've helped remind you what it was.

There's one last thought I'd like to leave with you. We were, all of us, extraordinarily lucky. Not everybody gets to make a difference, but we did. Not everybody gets work with shipmates on whom our very lives depended and to know that we were in good hands, but we did. Not everybody gets to work with exciting technology, but we did. And, above all, not everybody gets to know they did something in the service of the greatest country in the history of the world, but we did. Perhaps that's what it all meant.

Thank you for letting me talk to you tonight. God bless you all, God bless our successors on patrol tonight, and, above all, God bless America.■

FROM THE NAVAL HISTORICAL SOCIETY OF AUSTRALIA

There is a new Naval historical journal. The Journal of Australian Naval History (JANH), published by the Naval Historical Society of Australia twice yearly. The JANH will provide a new standard for Australian naval research. It will also act as a research centre, clearing house and place for collaborative research, including international collaborative research. The Society will also act to preserve diaries, Naval ephemera, other items and private records as they are uncovered. The JANH is ensuring high quality by refereeing articles This is an ambitious undertaking. It is intended to develop the Journal along the lines of the renowned Warship International; very high quality naval and maritime historical articles in a format lacking academic dryness, but of a similar standard. The President of the Naval Historical Society, Mr. Bob Nicholls, and the JANH Secretary, Captain Ian Pfennigwerth RAN (retd), have marshalled many of the naval historians in Australia behind the JANH. It is a worthy effort, and deserves to succeed, for too much of Australia's naval and maritime history is under-researched.

The League supports this effort. Subscription costs are (Australian) $40 per annum. Contact the Secretary Captain Pfennigwerth RAN (retd) on 61-2-4981 5551, or ipfennigwerth@kooee.com.au, concerning submission of papers, and The Secretary, Naval Historical Society, The Boatshed, Building 25, Garden Island, NSW 2011, or, secretary@navyhistory.org.au to subscribe.

OFFENSIVE ASW – THE RIGHT ANSWER FOR THE NEW AGE[1]

by Rear Admiral W. J. Holland, Jr., USN (Ret)

A condensed version of this article was published previously in The US Naval Institute's PROCEEDINGS. It is republished in the complete version with permission of the Naval Institute.

The current policy of deploying submarines as a part of surface groups represents a return to the post World War I concept of employing submarines as scouts for the battle line, a tactic denounced by Nimitz when he was a Submarine Force commander in the 1930s and generally discredited during World War II. While this form of submarine employment has the promise of educating non-submarine officers to the value and utility of submarines, the intrinsic advantage of a submarine, an ability to operate with impunity in waters otherwise controlled by an enemy, is sacrificed. Using submarines in direct support of battle groups when facing the Soviet Union enjoyed the promise of good success. But even in that kind of operation the submarines were to serve as a spearhead during the advance of the battle groups into enemy controlled waters as an adjunct to their fast and far forward deployment that was the basis of the Maritime Strategy.

Most naval officers and analysts have viewed anti-submarine warfare, ASW, as a defensive operation since late in World War I. The convoy system, adopted in May 1917 after many losses, became the model for the mission. In World War I and through most of World War II the technologies and resources that could be brought to bear against the submarines made defending targets more efficient than attacking the aggressors. This defensive model remains the image of ASW in the eyes of many even though, by the end of 1944, offensive ASW was achieving far more contacts and sinkings than convoy escorts

Offensive ASW succeeded in 1944 and 1945 for two reasons. Interdiction of the approaches to France through the Bay of Biscay by radar equipped Maritime Patrol Aircraft made that passage a difficult and dangerous one for U-boats. German attempts to defend

against this threat with anti-aircraft weapons were fruitless and the snorkel came too late to conceal transits through areas controlled by allied aircraft. At the same time on the open ocean, the Germans' operational procedures and the supporting radio communications allowed the combination of direction finders and code-breakers to furnish the intelligence needed to dispatch offensive ASW forces, hunter-killer groups, to the locale of their targets. In both of these scenarios, the hunters became the hunted. By 1945 the losses to the German Navy were staggering; only one boat in five returned from patrol.

In spite of these successes, and of the clear successes in offensive ASW operations late in the Cold War, the practice of routinely assigning long-legged ASW assets to accompany Carrier Battle Groups and Expeditionary Strike Forces demonstrates that this target protection model has been resurrected as the major approach to ASW. But ASW assets that have more speed and stamina than the Group's are wasted in attempts to sanitize the vicinity of high value targets. ASW platforms able to operate independently can be employed much more productively in offensive operations aimed at undersea control throughout the theater, not just the few hundred miles around the convoy, the transit lanes or the Sea Base.

This target protection mode is a faulty guide for operations against submarines today for a number of reasons. First, the number and capability of potential enemy submarines is lower than at any time since 1914. Second, while the value of today's individual targets is high, they are fewer and faster: much more difficult to find and hit than those eight-knot, hundred-ship Halifax to Liverpool convoys of 1943. Third, because submarines attacking surface ships can lay well off their target's track to launch missiles (though not torpedoes) from any azimuth, the area to be controlled in the protection model today is vastly greater than when submarines had to close their targets. Protecting a large and moving area is complicated by the limitations even moderate speeds impose on the effectiveness of active sonars and trailing antennae. Finally, the United States possesses an asymmetric advantage in capabilities and operational experience: if US forces are deployed early and employed offensively, they can be positioned to thwart or kill any submarines that may threaten US control of the sea.

While advocates must trumpet the potential dangers from the submarines of potential enemies in order to emphasize the need for continued expenditures for anti-submarine weapons, in reality today and for the forthcoming decade, the number of submarines that the United States is likely to face in any probable crisis is small and is made up of almost entirely of diesel electric submarines of limited endurance, low firepower and almost negligible agility. Few operate regularly or in realistic exercises. While each one could be a formidable threat if operated skillfully, submarining is not a casual skill like suicide bombing that requires only courage. As the Chinese demonstrated last year, when undertaken by the ignorant or unpracticed, submarines kill crews rather than enemies.[2] While this balance of forces will not last forever, it is likely to hold true for the foreseeable future.

These small numbers are further hobbled by lack of robust sea surveillance and intelligence support. Because submarines have a relatively small visual and electronic view and a battery powered one has a minuscule radius of action, without intelligence to optimize positioning, any submarine's ability to find or intercept targets is marginal unless at a choke point or at one of the ends of the transit route. Such intelligence is unlikely to be available to any realistic potential enemy in anywhere near a timely manner. Doenitz needed reports from the first sighting to concentrate his submarines against allied convoys—without these reports, encounters were singular chances even though the transit lanes between North America and Britain were well defined. In the American submarine campaign against Japan, most successes were along known narrow routes between the home islands and the conquered resources of Southeast Asia. Even so, radio intercepts then were invaluable in positioning submarines along their targets' tracks.

This narrow aspect of submarine warfare is concealed during multinational exercises that include conventional submarines. Such exercises are structured to ensure that all players get an opportunity to engage. When the Australian submarines steam thousands of miles to participate in RIMPAC off Hawaii, they do not do so just to serve as targets. So the carrier has to pass through submarine infested waters lest the Chileans or Canadians go home frustrated and discouraged.

These necessary arrangements create attitudes and opinions that generate a false sense of the capability of the battery powered submarine to locate and attack these high value targets.

These disadvantages, small numbers, limited mobility and lack of intelligence support, represent opportunities best exploited at the outset of any conflict. Should an enemy succeed in deploying even a couple of submarines, no matter how well or poorly operated, into the broad ocean approaches to the battlefield, the efforts to find and defeat him will require weeks. In World War II, this meant the resources ratio between ASW and the submarine tipped from about ten to one to about a thousand to one. The answer then is to plan, prepare and practice for ASW campaigns that take place in enemy controlled waters as close to the opponent's bases as possible starting long before any shooting is even contemplated.

This sort of offensive ASW requires more than warships and planes. An ASW campaign does not begin on day one of the battle or when the Fleet approaches enemy shores. Gathering intelligence, e.g. determining potential enemy dispositions, equipments, tactics and movements, and similar activities are essential precursors for an effective ASW campaign. While many of these are acknowledged roles for space based sensors and electronic surveillance aircraft, additional measurements are needed. The character of the ocean in the expected area of conflict is vital: the sound velocity profiles, the effect of fresh water contributions, the diurnal variations, the character of the bottom, and similar conditions that will determine the best depth to detect and avoid, the most likely locations for mines, the probable channels for dispersion and similar information. All of this must be gathered months and years before the likely conflict takes place. These are not measurements that can be determined by a glance at the chart.

By far the optimum tactic is to attack submarines while they are moored.[3] Submarines that never get underway are only a drain on resources of their mother country, not a threat to someone else. With today's precision-guided munitions, even the massive U-boat shelters still existing in the ports of Brittany would be of only marginal utility. The principal obstacle to such tactics comes from the political reluctance to start a conflict without an overt action on the part of the enemy. That precedent has been substantially eroded

but not entirely removed by America's preemptive actions in Iraq. Even in that conflict, permission to attack mine layers before they could get underway to lay their mines never came in spite of Admiral Stan Arthur's admonitions of that important lesson from the First Gulf War. Regardless of the likelihood of its political acceptance, the ASW intelligent commander should press for permission and be prepared to execute the tactic if allowed to do so.[4]

If attacking the enemy in homeports is not allowed, tackling the opponent's submarines as they deploy is the next best tactic. If shooting is not permitted, then escorting the enemy submarines from their diving point to their operating areas is certainly feasible. This requires ASW forces with long endurance to be present when the enemy submarine sorties. In the case of a diesel-electric submarine, the presence of an escorting maritime patrol aircraft or nuclear submarine will probably not be detected as the submarine transits to its operating area on the surface or snorkeling. If political authorities can be convinced to declare such maneuvers to be threatening before open war starts—as Roosevelt did in 1940 to U-boats west of Iceland —then such transits by potential enemies can be ended before they reach their initial diving points or operating areas with some degree of surety.

These sorts of tactics are possible because submarines operate in small numbers, ones and twos—not in dozens or fleets. Space based sensors allow submarines in port and underway to be counted. The result of this intelligence, the number of potential enemy submarines underway, is the entering argument for the plans of the ASW commanders. This knowledge lays the basis for deployment of forces to intercept, locate and track such submarines as they depart their homeports. Past performance has shown that such tracking can be accomplished covertly even when the target submarine is a relatively fast nuclear powered submarine. To do the same for a diesel electric submarine that must transit to an operating area is an easier task.

In these circumstances, the word escort gets a new meaning—a platform accompanying the target submarine. The escort can emphasize the vulnerability of the escorted openly or randomly by non-covert activities, perhaps an occasional radar or active sonar emission. The unnerving effect of such an action may not cause the potential enemy to defect, but it will certainly heighten his nervous-

ness and contribute to a feeling of low morale and potential disaster. Should a conventionally powered submarine shut down and *go quiet* as a result of such moves, it has effectively anchored itself in a spot that moves only a few miles a day, begins to use up battery capacity and is likely to remain stealthy only for as long as its captain is willing to forego aggressive action.

In the situation where shooting is not allowed and sufficient numbers of aircraft and submarines have not been deployed in a timely manner so that a one to one ratio of pursued and pursuer is not possible, the tradeoff between locating and searching becomes a command issue that is a theater wide one—not a local one. Not every enemy submarine needs to be trailed. Making the choices depends not only on the capability of the pursued and pursuer, but what other forces will be available and what other tasks portend. Only a theater wide view can evaluate these factors.

In the event that deployments have not been forehanded and the enemy submarines have left their homeports and headed for the open ocean without being intercepted, the ASW problem turns into a tedious search exercise, but not one that is unbounded. Knowing what submarines may be at sea, the geography involved, and the availability and capability of various search sensors, analysis can develop efficient search patterns. Mobilizing this information transforms the ASW search from random seeking of potential intruders to planned measures that narrow the locations of probable contacts. Such tools make offensive ASW more efficient as well as more effective than waiting for a flaming datum. They result as well in establishing locales that can serve as sanctuary for a Sea Base. Even with these tactics, however, if the enemy is allowed to deploy without detection or opposition, the resulting fray will be measured in weeks and months instead of hours or days.

On the offensive side of the equation, the technologies available for wide area search above and under the seas are vastly better than they were in the past—even as recently as 1990. Space based sensors, relocatable bottom mounted sensors, and wide area search sensors connected by long-range communications exist. When unmanned undersea vehicles become available as search devices the search rate for their mother ships will vastly increase. The command and control network for conducting theater wide offensive ASW was

proven twenty years ago. The ability to concentrate forces, to direct searches to the most likely areas or contact, to reduce attention to areas of no interest, and to route ships around locations where diesel electric submarines have been observed, can all be accomplished easily from a theater wide vantage. While the tactical situation in an ASW attack is always in the hands of the on-scene commander, central direction is needed to coordinate forces earlier and over areas much wider than that area about which the Battle Group or Expeditionary Strike Group commander is concerned.

Regardless of the resources devoted, once an enemy submarine reaches the ocean operating areas, the time needed to detect, contain or sink it multiplies exponentially. If suspected of being located in the nexus of an operation area to be used by American forces, the enemy submarine will force delays on whatever operation is planned. The penalty for delaying the decision to undertake the ASW campaign, or to refrain from any early or provocative action is not simply a minute-by-minute tradeoff later, but extends by orders of magnitude the time that will have to be invested to neutralize the submarine threat If a decision maker understands that failing to attack an opponent's submarines early results in a long delay in any further action, he may be more inclined to give a sympathetic ear to the suggestion to shoot them at the sea buoy.

Indisputably, the key ingredient in any ASW action is time. Having ASW assets deployed forward, operating under the authority of a theater command dedicated to ensuring access rather than handcuffed to a Task Group commander concentrating on a force movement and dependent upon a long logistics line, makes them an offensive arm long before hostilities are even contemplated. Obviously overwhelming superiority as envisioned here cannot be maintained constantly, so the ability to deploy fast is crucial. Both of these characteristics, endurance and speed, require long legs in each ASW vehicle. There must be enough vehicles to maintain the presence forward in areas of interest and concern, and enough space-based and wide area sensors to buttress them in the locating part of the problem. Maritime Patrol Air can play a part in these activities —particularly with those diesel electric submarines that have *gone stealthy* in some spot. They cannot escape the MPA and once located are sitting ducks for the helicopters. Surface ships have a role where

there are no air threats and only low speeds are required. But the offensive posture described here can be executed best by submarines.

The contribution of Maritime Patrol Air (MPA) in this design is vital but their search capability is limited by sonobouy inventories, their endurance and timeliness established by the proximity of an airfield and in those cases where ASW must be conducted in waters close to an enemy shoreline, the required mastery of the air may be problematical. However, MPA's ability to quickly close a datum and to localize quickly in the open ocean is the best of any ASW vehicle. Radar flooding an area by MPA, manned or unmanned, discourages repositioning of a diesel electric submarine on the surface or snorkeling further inhibiting its mobility. The combination of MPA and nuclear submarines was proven to be a most effective combination in the past and with the demise of mid-range ASW aircraft on the carriers will be the only feasible forward combined arms ASW activity for the future. The combination of surface ships with tails and ASW helicopters can provide a measure of close-in defense for the surface group to which the an escorting submarine adds only marginally.

These are not the tactics of traditional escort-centric ASW. Nor are they the techniques practiced by destroyer sailors or helicopter pilots. The command and control processes for this type of a campaign are more related to strategic bombing than to historic maritime sea control. The precedent here is not Jutland or Midway, but the Japanese offensive against the Port Arthur in 1905. There torpedo boats and mines took Russia's Asian Fleet off the board in the first actions of the war.

What are the immediate effects suggested by this analysis? The assignment of ASW vehicles, particularly submarines, as part of an expeditionary strike group or a carrier battle group is using tactics that were wrong fifty years ago, downplays our tactical expertise and fails to take advantage of our asymmetrical capabilities. Submarines, MPA and their supporting arms, TAGOS and intelligence assets, sensors and analysts, belong forward, operating independently in the areas of likely enemy submarine operations. The inclination to consider submarines as strike vehicles because they bring a substantial portion of land attack precision guided missiles into the theater

warps the view of the commanders who employ this unique weapons system. Land attack missiles are a sideline for subs. Even though strike is a mission to which they bring special attributes of short time of flight, prolonged endurance and stealthy presence, if enemy submarines may be around and about, it is secondary. Other ways are available to deliver strike weapons, but only the submarines can do ASW forward before command of the air and sea is established.

The combination of fewer targets going faster as the objectives for few submarines of limited mobility and scarce intelligence changes the tactical equation. When highly mobile pursuers with unlimited perseverance are aimed against these submarines, ASW changes from a vast open ocean search problem to a timed operation governed by the cyclic requirements for the conventional submarine to charge her batteries. The freedom of action gained by sinking the minelayers before they could sow their weapons, by *knowing* the enemy submarines at sea are eliminated, or pinned down, or precisely located is incalculable. The Sea Base becomes secure: carriers can operate freely governed chiefly by the weather, surface warships can focus on AAW and strike, submarines not engaged in the ASW operations can be stationed forward with their missiles ready to engage targets needing rapid response and short time of flight, amphibious assault ships can proceed to the most advantageous positions, all with little or no regard for the subsurface threat. None of these things happen if the ASW campaign waits for the arrival of the fleet in the Sea Base.

This operational concept is not without precedent. In 1941, unloosing US submarines had to wait until the battle line was demolished at Pearl Harbor. A year passed before the submarines developed what became their wartime Concept of Operations, deployment into enemy waters concentrating on Japan's logistic lines. In today's world, the National Command Authority, the Joint Chiefs and the other services, expect to have the initiative in ten days after the commencement of hostilities.[3] If the enemy possesses any submarines, offensive ASW is the only way that these expectations might be meet. But such a Concept of Operations cannot be simply the subject of essay, conjecture or even war plans.

ASW is a team game and needs to be practiced—in war games as well as in operations and exercises and at all levels. Practicing

offense now not only provides training that will be needed in the future but also allows people to see the challenges of the environment and tactics and the opportunities for exploitation. The reluctance to strike at probable mine layers in the Gulf Wars testifies to the difficulty of getting decision makers attention for what seems to be an exclusively maritime affair. Pressing decision makers for hard decisions in times of crisis is futile unless they have some previous basis in the issues. To obtain the ability to strike mine layers and submarines early in a conflict, the Navy as an organization must have not only experience in its own house and on joint staffs but also must build a foundation of understanding in policy makers at the upper levels of the Pentagon and the National Security Council. Such understanding can only be gained by involving these policy-makers and associated joint staff personnel in the games and exercises that demonstrate the benefits of early action as well as familiarizing them with the time lines involved with various component parts.

The proper ASW paradigm is not a random hunt over the broad ocean but it is not target escort either. Offensive, forehanded, aggressive, persistent attack, bringing all assets available to bear, is the characteristic of offensive warfare in anti-submarine warfare as in any medium. This offensive posture was the essence of The Maritime Strategy and meets the admonitions of Admiral Mahan,

"War, once declared, must be waged offensively, aggressively"[6]

ENDNOTES

[1] Expanded from "Strike Subs before They Are At Sea", U.S. Naval Institute PROCEEDINGS, October, 2004.

[2] "Submarine sinking skills seventy", BBC news World Edition, 5 May 2003, http://news.bbc.co.uk/12/hi/asia-pacific/3001099.stm

[3] "Landersman's First Principle of ASW." Winning the Stanley Cup is most easily accomplished not by outplaying the other team on the ice but by breaking their legs in the parking lot. Captain Stuart Landersman, USN(Ret), first CO, Tactical Training Group, Pacific, 1980.

[4] If the Joint Force Commander is not a sailor, he is unlikely to appreciate the importance of this need for early action.

[5] Rear Admiral Mark Kenney & Captain D. Yoshira USN, Remarks to the Washington Chapter, Naval Submarine League, April 23, 2004.

[6] Alfred Thayer Mahan, "The Interest of America in Sea Power" 1896, quoted in Robert Debs Heinl, Jr. Colonel, S.S. Marine Corps (Retired), Annapolis, Maryland, United States Naval Institute, 1966. Page 220.

COMMS AT SPEED AND DEPTH HOW, FOR WHOM AND WHEN?

by Captain James H. Patton, USN(Ret)

Captain Jim Patton is a retired submariner officer who is an active consultant in submarine matters to government and industry. He commanded USS PARGO (SSN 650).

Background

More and more one sees the word "agility" used to describe an extremely desirable military characteristic. Due to a unique combination of stealth, mobility and endurance, there is probably no weapons system more *physically* agile than a nuclear submarine. However, being physically agile does not necessarily relate to being *operationally* agile if impediments exist between the issuance of directions by senior commanders and the reception of those orders by those who must execute them. Historically, this impediment didn't affect the submarine's mission terribly, since it operated largely independently under general mission orders and Rules of Engagement (ROE), and the *time constant* of these operations has been such that it was not significantly detrimental that an order to start (or stop) something might not be received until 12-24 hours after given. Some submarine missions are still characterized by this allowably long Command and Control (C^2) latency, but they are becoming the exception rather than the rule. *Tight* C^2 loops that support rapid targeting of time-critical targets are more the norm now.

Because of its unique attributes described above, the Joint Commander needs the submarine as part of his military portfolio, and the Submarine Force is ready and willing to provide those services. However, in order to provide the tight C^2 loop required for operational agility, a submarine must presently forfeit much of its physical agility by loitering, at slow speeds, at periscope depth with a high data rate (HDR) antenna raised. There is virtually no one in the Submarine Community (or Navy, for that matter) who doesn't recognize that this lack of comms at speed and depth is perhaps the submarines most critical shortcoming. Just as if you don't own a computer the Internet doesn't really exist, if you can't *plug in* FORCEnet doesn't really exist.

There are people and funds tasked and targeted to *solve* this problem, but efforts seem diffuse and desultory. One device—a joint US-UK project called RTOF (Recoverable Tethered Optic Fiber buoy) is being planned for installation and experimentation on the first SSBN to SSGN conversion, where ample outboard space is available for stowage and handling equipment for what is not a small object. At best, however, RTOF will bring *periodic* comms at depth, but not at speed, and is not easily backfitable to current SSNs. Another near-term partial response to the issue is the under development Submarine Expendable Communications Device (SSXCD), a fiber-optic tethered buoy launched from the ubiquitous 3 inch signal ejector which will provide 15 or so minutes of active connectivity at nominal transit speeds. For a communications event to be initiated by other than the submarine, however, both RTOF and SSXCD would be dependent on some sort of *bellringer* that would initiate their launch. Other wonderful connectivity options are projected for future *Virginia*-class SSNs (*when* they get their advanced, larger sail). With the exception of SSXCD, most projected solutions to this dilemma are programmatically targeted for implementation no earlier than the beginning of the next decade.

Meanwhile, as Admiral Bowman, then the senior active duty submariner noted at a recent annual Naval Submarine League symposium, the Submarine Force effectively consists of *Los Angeles* class SSNs. Even in the year 2011, these 688s will account for 86% of Submarine Force levels, and there are as yet no meaningful efforts to provide these platforms with a credible, preferably persistent, ability to at least listen at meaningful data rates while at tactically significant speeds and depths. Admiral Bowman has also added an additional *get* to his original "get electric, get modular, get payload, and get connected". It is *get real*, stop creating Power Point shows, and work the difficult operational and hardware issues. In the spirit of that *get*, we need real efforts to develop real hardware and supporting concepts for the real fleet.

Discussion

As has been previously stated, it is almost universally recognized that there is an urgent requirement for the US Submarine Force to possess the ability to conduct higher data rate communications, both

transmission (active) and reception (passive), at significantly higher speeds and safe non-cavitating depths. In further definition of this general requirement, the following postulates are offered as elemental technical or operational truths:

- Since the Submarine Force will overwhelmingly consist of 688s for the next decade, any *solution* which does not include this class (plus non-*advanced sail Virginias*), does not adequately address the Force requirement.

- Since much of the issue involves connectivity while in transit or during on-station repositioning, comms at speed is more important than comms at depth; to be connected while at 75% max speed and 25% max depth is far more operationally significant than the same at 25% max speed and 75% max depth.

- Although *non-persistent* solutions (i.e. SSXCD or RTOF) represent temporary answers to mitigate the problem, they are dependent on speed and depth capable *bellringers* for non-submarine initiated connectivity.

If the above postulates are accepted, the following corollaries are proposed and subsequently discussed:

- Although the need for both passive and active connectivity modes have dramatically increased as regards quantity and quickness, properly operated stealth platforms such as submarines will remain far more heavily dependent on information *receipt* as compared with information *transmission*.

- In the active mode, the highest possible data rates obtainable are desirable to reduce the *time* of transmission rather than the *quantity* of information.

- Although true for all platforms, stealth platforms in particular should avoid the transmission and/or receipt of *data*, as opposed to *information* (processed data), and should furthermore strive to deal in *knowledge* (processed information).

- It is much more important for a submarine to be quickly *connectable* on-demand, than to be actually *connected* to a network.

- Persistent passive connectivity is essential for any credible near-real time C^2 of submarines at operational speeds and depths. Since the decision has been made to shut down ELF, a tethered lifting body for VLF reception capable of operations at tactically meaningful speeds would be required during transits or on-station repositioning (hereafter called *transition* phases).

Information receipt vs. information transmission

During the Maritime Strategy phase of the Cold War, a Carrier Battle Group (CVBG) Commander had at his disposal a tactical doctrine concept involving his acting as the *Composite Warfare Commander* and whose central precept was *Command by Negation* In other words, he and his subordinate commanders Anti-Submarine Warfare (ASW), Anti-Air Warfare (AAW) etc. would plan in advance what and how things would happen if a *tactical Armageddon* were to occur, with coordinated and simultaneous attacks from Soviet Naval Air, missile-firing surface combatants and submarine-launched torpedoes and cruise missiles. When this happened, the CWC would *monitor* the execution of pre-planned actions, injecting only *negative* directions if he saw an advantage in deviating from these actions in favor of some other more appropriate response. This almost Nelsonian approach of ". . . no Captain can do wrong by placing his ship alongside one of the enemy" allowed the CWC to manage the unmanageable, and caught the very essence of a combat Observe-Orient-Decide-Act (OODA) loop long before the late Air Force Colonel John Boyd coined the term and the concept. The underlying assumptions of this Command by Negation philosophy are identical to those imbedded in legacy submarine C^2 concepts—all action/reaction events needn't be orchestrated in real time via active communications.

Transmission data rates

If stealth is not an issue, there is no compelling reason to consider the employment of submarines. Stealth involves strict management

of *all observables* Perhaps the easiest of all observables to remotely detect and exploit as to source and geographic location is the emission of radio frequency (RF) energy. Since *truly* overt transmissions will not even be detected by the intended receiver, every effort must be made to deal with Low Probability of Intercept (LPI) transmissions. A key element of LPI transmission techniques is to dramatically reduce their footprint in the time domain. If such as video-teleconferencing and full-streaming periscope video are dismissed as non-essential options, then as Admiral Archie Clemens showed several years ago in the Pacific, there is nothing a submarine *needs* to communicate that cannot comfortably be handled with 128K 256K bps. As previously implied, it *is* true that faster is always better, but in the submarine case, fast is to reduce the time of transmission not just to permit more of it.

Data versus information versus knowledge

Before a nearly infinite degree of processing power was affordably available in virtually infinitesimal volumes with low power requirements, many distributed subsystems were committed to sending raw data to the next higher element of a hierarchy (i.e. sonobuoys, SURTASS, etc.). Submarines were an exception to this generality because of then insurmountable technical barriers (in addition to stealth considerations). This resulted in an operational submarine culture that (among other things) had the Commanding Officer of an on-station submarine lower masts, go deep and clear datum upon copying a message that simply said "Get out of there!" - without asking "Who says? Based on what? I want a second opinion!" In a very real sense, technology has enabled *more* naval platforms, if they choose, to vastly reduce the *quantity* of traffic initiated by them while increasing the *quality* of mutual self-synchronization and coordination. In fact, much of the interoperability could be managed passively through the space-based Global Broadcast System (GBS) a direct analogue to the VLF submarine broadcast.

Quickly connectable on-demand

Before such features as *call waiting* a clever and articulate father of three teen-agers convinced them, rightfully, that the primary

purpose of their home telephone was to permit anyone to contact anyone else at any time. Therefore, any time it was off the hook (i.e. in use), it was not fulfilling its primary purpose. In a similar fashion, being able to be quickly connectable on-demand while at operationally meaningful speeds provides the ship the ability to transfer information in a timely manner and (given a *bellringer* as described below) for those not aboard to direct the ship to establish a connectivity stance to receive important information.

Persistent passive connectivity

Being *quickly connectable* for ship-initiated connectivity events is relatively simple. The key to being quickly connectable when such an event is desired by an external entity requires some form of persistent passive connectivity a *bellringer*. For decades this was provided for the nation SSBN nuclear deterrent fleet by VLF or ELF transmissions received on either a floating wire or towed buoy. Since there was no need for an on-alert SSBN to be at any speed other than slow, these antennas were typically not designed to be employed or were they effective at transit speeds. Although ELF was also receivable throughout much of an attack submarine operating envelope through non-floating towed wires or on-hull antennas, the decision has been made to shut down the ELF system as a cost-saving measure. Now, if VLF is used as the means for persistent passive connectivity, the receiving antenna has to be placed within several tens of feet below the surface perhaps via a small deployable towed body designed for speeds in the order of 15 or so knots.

Conclusions

The submarine can meaningfully participate in a FORCEnet-like communications manner if adequate consideration is given to the platform unique nature due to the demands/limitations of its operating environment and the cost/benefit tradeoffs associated with exploiting its intrinsic stealth. With its operational agility enhanced through a means by which to be quickly connectable on-demand through persistent passive connectivity, it could be *virtually present* in any netted conglomeration of entities, and fully connected in near-real time when called upon to do so (accepting the resultant loss of *physical* agility). However, even given a technical solution (or set of

solutions) that significantly improved passive and active connectivity capabilities through a large portion of the submarine operating envelope, there would still remain significant *cultural* C^2 issues to address within the Navy as a whole.

What it is important for the Submarine Force to convey to the rest of the Navy is that, unlike a surface ship, a submarine has many different operating modes during the end-to-end course of a mission deployment. During the transit phase, it is most generally deep and fast. While *on station* it is typically at periscope depth and slow. When in transition phases, repositioning while on station or when a higher degree of readiness or weapons targetability is desirable as the submarine initially approaches or has just left station at mission end, the ship is likely to be at moderate speeds and moderate non-cavitating depths. What operational commanders then have the right to expect (and for which technology and procedures exist or are readily obtainable) is as follows:

- Transit phase (25+ kts)
  -Periodic passive, periodic active on demand

- Transition phase (~15 kts)
  -Persistent passive, readily connectable periodic active on demand

- On-station phase (P/D, ~6 or so kts)
  -Persistent passive, *capable of* persistent active

It should be apparent that given an HDR mast, the on-station phase is well covered. Also, in the absence of ELF and placing exotic ocean-wide *acoustically-wired sea bottoms* or space/aircraft-based Blue-Green laser systems in a *maybe someday* category, the transit phase will continue largely in the legacy manner by copying the VLF submarine broadcast a couple of times a day – connecting in an active sense when directed to or when the submarine has something important to say. Where a large improvement in operational agility is likely in the short to mid-range term through the use of expendables or small, persistent tethered VLF antenna bodies, is in the so-called *transition* phase.■

INNOVATING FOR A SAFER WORLD

BAE SYSTEMS

THIS IS NOT YOUR FATHER'S NATO

by William L. Norris

Captain Bill Norris is a retired submarine officer who had extensive experience in the nuclear weapons field while on active duty. In retirement he worked for the Sandia Corp. in Albuquerque specializing in nuclear force policy analysis.

One of the hardest things for people to do is to face change. It is even harder in the venue of international politics and international organizations. After nearly sixty years of general peace in Europe, many might say, "Why change what's working?" And on the surface NATO is working and there are many accomplishments to cite. Below the surface, the machinery is grinding along with less than adequate lubrication and the cracks are growing in its antiquated machinery.

For its first forty years, NATO was the world's preeminent collective defense organization. It weathered French secession from military participation and the addition of several new members. It lasted through very tough defense and political decisions on cruise missile deployments and force sizing that led to two major treaties with the Soviet Union on Intermediate Range Missiles and Conventional Forces in Europe. Consensus was achievable on almost all issues with the threat of a very real, and sometimes belligerent, Soviet Union to the East.

That all changed on the transformational day for Europeans, 11/9/1989, when the Berlin Wall came down and the ersatz barriers separating Eastern and Western Europe collapsed. The NATO march into Bosnia-Herzegovina in 1994 began NATO's era of acting outside the borders of its members. By the time that NATO had admitted their first three new members from the old Warsaw Pact and Soviet Union in 1999, NATO was carrying out an air operation against Serbia and then sending troops into Kosovo. The new Russia, while still possessing a nuclear arsenal capable of threatening the existence of any nation on the planet, was a decaying hulk of the old nemesis, the Soviet Union. The last five years have done nothing to change that trend or to change NATO's new outward looking focus.

The Prague Summit brought the birth of the Rapid Reaction Force, envisioned being capable of responding out-of area to new

threats and challenges with decisive force. This is a real attempt by NATO to move out of Cold War planning. Then NATO deployed its forces to Afghanistan and is now expanding its foothold outside of Kabul. Gone are the days when NATO was all talk and planning. Here are the days, as some would say, when NATO is bogged down with operations. Others would say NATO is now an alliance of interest vice an alliance of ideals. The Istanbul Summit brought seven new members from the states of the former Warsaw Pact along with lots of discussion but no consensus about what might best be done in Iraq. While its military power appears to be continuing to wane, Russia is facing a increasingly difficult situation in the Caucasus and a more authoritarian government appears to be emerging.

With this movement to operate outside its geographical borders, NATO is seeing cracks appear in its unity of purpose. Why should this move from defense against a monolithic threat to the noble causes of peace-making and peace-keeping cause such a strain? Why should Germany, France and Belgium protest so loudly? Why should Russia join with them? Why should the American Secretary of Defense declare that there is a new and old Europe? Why does the American President continue to challenge the world that "you're either for us or against us?"

At first glance, these out of area operations would seem to be a logical transition of the roles of NATO's military forces. But I believe that there are two changes that have taken or are taking place that put this transition at odds with the politics and the governments. First, the sixty years of peace and the economic revitalization of Europe have transformed national thinking. In general, no NATO nation today feels its borders or existence threatened. Yes the smaller, new members do still worry that their eastern neighbor might someday become his old belligerent self while at the same time realizing the world has changed.

While it might be deemed necessary to deploy NATO troops within Europe to stabilize new nations and stem the flow of refugees, sending those same troops to countries few citizens have heard of or who could have little economic effect on them is not. Democracies tend to be a check on national decision-making. While national leaders can make many decisions short of war, those decisions

eventually have to come to a vote either in the legislatures or by the public. It is clearly easier to make a decision that avoids a contrary vote, especially if that decision places a nation's soldiers at risk. In the Iraq case, even before the facts were fully known, one national leader made that decision to win an election.

Some may cite this as the sign of the new pacifist Europe, but I tend to view it as not much different than the American definition of national interest. Peace-making is different than peace-keeping. Europe does not want to be the policeman of the world anymore than America does. A big difference is that the United States might be able to make a stab at it alone, but neither NATO without the US nor the European Union could today. While establishing a European identity through initiatives like the Common European Security and Defense Policy is a desirable future, other than soft (economical) power, Europe is not going to be a counterweight to US hard (military) power. Europe is also more socialist and its aging population and promised benefits are strangling many countries' resources. It is ironic to note that these *graying* populations and nations actually may benefit from the influx of labor that might come from refugees of failed states or nations to keep their economies going and growing.

This brings us to the second change that challenges NATO. For years it seems all the nations of the world have characterized their forces as defensive and their military is known in governments as the Departments and Ministries of Defense. That has a very moral ring to it. There is no higher cause for a government than protecting its territories and its people. But if there is no monolithic threat to nations being at peace with one another, borders are not threatened and economies unaffected, then there should be a peace benefit, and by the way, what is NATO's mission?

Peace-keeping has for years been the venue for the United Nations. In general it could be supported by any member nation because the agglomeration of UN forces would be enough to keep the warring factions apart. But peace-making is totally different. In general it takes *offensive* forces to make peace. They must be capable of being inserted into an environment of war and then offensively defeat the warring factions. Once the warring factions are defeated and separated, then the mission can shift to peace-

keeping.

Two other changes have occurred which also place a premium on offensive forces and further throw defensive forces into a secondary role. First, terrorism seems to have found a foothold in several failing or failed states. Terrorism can threaten the safety of the world's people and has the potential, if not contained, to affect the world's economy. If terrorists can gain the acceptance of the government to exist unchecked, then essentially the government and the terrorist become a common force that must be unseated. Again offensive forces are needed to attack the combined forces of the state and the terrorist (Afghanistan is an example).

The second change is the preemptive attack clause that became a recent formal addition to the US National Security Policy and is mirrored in several other similar documents around the world. This was the vehicle used in making the case for the War in Iraq in 2003. In that case, significant offensive forces were utilized, first to win the war and today to put down the Iraqi insurgencies, foreign and domestic.

For military planners, it has traditionally been their practice to use two to three times as many forces when planning to attack a target as opposed to defending it. The force mix is also considerably different (and more expensive) for offense than defense. Mobility on the battlefield and maneuver capability, deep strike capability and the ability to deploy and sustain forces become dominant as opposed to predeployed, stationary forces. These types of requirements do not fit the make-up of, except the US or in limited cases, the UK or France, existing NATO forces of either new or old members. You can imagine that they really don't fit the capabilities of the EU either.

It should then be no surprise to anyone that for either NATO or the EU to come up with a viable, deployable and sustainable rapid reaction force is a significant challenge. It requires a military budget increase unacceptable to most of these nations. There is also a political dilemma in aligning yourself with an alliance that may use your forces to intervene vice defend yourself or your allies, or to maintain the peace. The bottom line, nations are being asked to transform themselves and their military to Departments or Ministries of *Offense* vice *Defense*.

Thus the challenges to forging the new NATO mission and strategy are bigger and more sweeping than many are willing to admit. Any decision that makes peace-making a key part of the mix is truly daunting to most nations and may well be beyond their means or their dreams. The new member of the NATO command structure, Allied Transformation Command, faces challenges that would beg for a similar political committee because this is not just a military matter. It is an important crossroads for all national governments and the decision will be most difficult.■

THE AN/BQQ-10(V) SONAR – MAINTAINING LEADING EDGE TECHNOLOGY FOR THE SUBMARINE FORCE

by Captain Gibson Kerr and LCDR Robert Miller

Captain Kerr is a Mechanical/Nuclear/Acoustic Engineer by training, nuclear submariner by qualification, combat systems Program Manager (PM) by assignment and systems acquisition professional by choice. He's done a little of everything: traditional jobs aboard submarines; flag officer's staff; repaired and built submarines and been a Fleet Repair Officer (repairing surface ships, submarines and one helicopter.) Since May 2003 he has been the Program Manager for Submarine Acoustic Systems (PMS 401) where he is responsible for all sonar arrays and processing systems (including the AN/BQQ-10). He has a B.S. degree in Mechanical Engineering, an M.S. Degree in Engineering Acoustics and an M.S. Degree in National Resource Strategy. He is DAWIA certified level III in Program Management and in Production and Quality Management.

Lieutenant Commander Miller is a retired submariner officer who served as both Engineer and Navigator prior to transferring to the Engineering Duty Officer community. Since retiring from the Navy, he has worked for Anteon Corporation providing engineering and program management consulting services to PMS 401 for the AN/BQQ-10 sonar program. He has a B.S. and M.S. degrees in Electrical Engineering and is a certified professional engineer.

PMS 401 is the Submarine Acoustic Systems program office under the Program Executive Officer Submarines. PMS 401 is responsible for all acoustic array development and in-service support as well as development and in-service support for all submariner sonar systems. The AN/BQQ-10(V) Acoustic Rapid COTS Insertion (A-RCI) sonar system is PMS 401's effort to field a high performance, easily upgraded, easy to maintain sonar system across all submarine classes.

The AN/BQQ-10(V) sonar system, commonly referred to as the Acoustic Rapid COTS Insertion (A-RCI) system, is the Submarine Force's answer to the detection challenges posed by increasingly quiet foreign submarines. Currently installed on 44 submarines and scheduled to be installed on all active submarines, the BQQ-10 uses COTS technology to provide a technologically up-to-date and sophisticated sonar at an affordable price. Most importantly, the BQQ-10 is designed to be periodically updated with new COTS hardware via a process known as technology insertion. The technology insertion process eliminates the two major pitfalls that would be present if a static hardware baseline was maintained. The first pitfall of a static baseline is its inability to take advantage of new detection algorithms that require ever-increasing amounts of computer power. The second pitfall is the difficulty in providing spares and maintaining a system operational when many of the internal components are obsolete. The disciplined technology insertion process used for the BQQ-10 has proven itself a success in mitigating these two pitfalls and is now the example for all COTS-based systems used in submarine combat systems.

Why is Technology Insertion Required?

Sonar signal processing applications are similar to other software programs in that each new generation requires increasing amounts of computer processing power. In the case of sonar signal processing, this need is driven by new operational requirements and the development of increasingly sophisticated algorithms to better find the quiet target signal in an ocean full of noise. Under the Advanced Processing Build (APB) process pioneered by the BQQ-10, annual software updates are developed to answer emergent Fleet needs, improve previously introduced functionality, and to add new functionality to make the sonar system more effective. Each APB is targeted for installation on specific recent BQQ-10 hardware baselines that provide the necessary processing power. If the hardware baseline for the BQQ-10 remained static, the APB process would soon grind to a halt due to a lack of headroom to accommodate the increased processing requirements. However, because of the ongoing technology insertion process, BQQ-10 systems installed in

the Fleet are capable of receiving new APB functionality when it is delivered.

The second rationale for technology insertion in the BQQ-10 is mitigation of COTS obsolescence issues. By its very nature, COTS technology is driven by the commercial marketplace, which demands ever increasing processing power, ever faster network speeds, ever larger storage, and ever cheaper prices. These demands force component manufacturers to constantly upgrade their products to remain competitive. However, this results in increasingly rapid obsolescence of their products. Once a component becomes obsolete, it becomes harder to obtain, and support for it by other component vendors disappears. The interrelationship between components means that a single obsolete component in a system will usually soon result in software incompatibility and an inability to update the system application software. In addition, a method must be in place to provide ongoing logistics support. For obsolete components, the only options are to buy large quantities of spares prior to shutdown of the manufacturing line or to repair failed components, a very expensive proposition for the inexpensive COTS products used. The BQQ-10 technology insertion process prevents these problems by eliminating obsolete components before they become unsupportable.

Establishing the Technology Insertion Process

One of the essential enablers for the BQQ-10 technology insertion process is the use of Multipurpose Transportable Middleware (MTM) to isolate the system application software from the underlying hardware. Developed and still maintained by Digital Systems Resources (DSR), now a part of General Dynamics Advanced Information Systems, MTM is a freely licensed set of software utilities that provide a standardized interface between the application software and the various generations of system hardware. This design limits the impact of any hardware change to the MTM that was specifically designed to handle it instead of impacting the large amount of complex system application software. Without MTM, any hardware improvements provided by the technology insertion process would be unaffordable due to the cost of updating the system software. With MTM, the BQQ-10 sonar system has been able to successfully upgrade the system hardware five times to

reduce system cost and complexity and improve system performance.

The key parameter of the BQQ-10 technology insertion process is the two-year cycle length. What this means is that the hardware baseline for new system procurements and for updates of installed systems changes every two years. It does not mean that every installed system is updated every two years – an impossible task. There are several reasons for the choice of two years for the length of the technology insertion cycle. Procurement of new systems is driven by an annual budget cycle and it is advantageous to have a common hardware configuration for all systems procured in a given year. This results in a cycle based on intervals measured in years vice months. Finally, it takes time to evaluate new technology and to update the equipment configurations and system software to use the new technology. This task is too difficult and expensive to accomplish every year. Instead, it is better done on a less frequent basis where the effort and costs are spread out over more system procurements. However, as discussed earlier, the short COTS obsolescence cycle precludes an excessively long technology insertion cycle. The experience of the BQQ-10 program has been that COTS components are typically available for purchase for about eighteen months, fixing the maximum lifetime for a given hardware generation. The two-year cycle now used by the BQQ-10 program has been shown to provide the best balance between these competing factors.

The two-year technology insertion cycle used by the BQQ-10 program also supports meeting the operational requirements levied by the Chief of Naval Operations. The fundamental requirement levied is that every submarine deploys with an updated APB software build. This requirement coexists with a groundrule of the APB process that each hardware generation be capable of supporting three APB updates. The first APB is delivered as the initial software baseline for the hardware generation allowing the system to receive two additional APB updates. Under the typical eighteen-month submarine deployment cycle, this results in the ship deploying once with its original APB and then receiving an updated APB software-only update prior to its next deployment. Four to six years after its initial hardware installation, the ship would get a technology insertion to allow it to receive the latest APB prior to its next

deployment. With the two-year technology insertion cycle, this results in a ship getting a hardware update every two or three generations, helping to keep the system procurement costs affordable and upgrade scheduling manageable.

For a two-year technology insertion cycle to work, the training, logistics, and contractor support infrastructures must be updated to support it. Instead of traditional crew training using shore-based sonar systems at the submarine training facilities, the BQQ-10 maintenance course is taught using Interactive Multimedia Instruction (IMI) where the system hardware is presented virtually and the student is taught common troubleshooting techniques and the skills to use the system technical documentation to find and fix faults. This troubleshooting technique must be supported by appropriate system level fault monitoring and localization functionality and an optimum lowest replaceable unit (LRU) selection. By sparing the COTS components at the relatively inexpensive box level, the technician does not need to troubleshoot to the lower board level, thereby reducing the time to correct faults. In addition, the system contractors' hardware design, production, logistics support, and software development infrastructures must be set up to rapidly implement the design changes to maintain a two-year timeline. This effort initially required a significant paradigm shift for the system contractors and it is still a difficult task for the submarine planning yards that develop the installation packages.

Once the infrastructure has been updated, a process for selection of new components must be put in place. Over the last eight years, the BQQ-10 team has developed a process that delivers the maximum capability while supporting system procurement timeline requirements. One of the unique attributes of the BQQ-10 team is that multiple organizations and hardware contractors work together to deliver the full system. The technology insertion process takes advantage of this broad based expertise by using an integrated product team (IPT) made up of members from each of the primary contractors and software developers to investigate new technology and make a consolidated recommendation to the program office. Involving each of the contractors in the hardware selection ensures that their specific concerns and requirements are addressed and that they buy in to the chosen technology. The process by which this IPT

chooses the next generation of technology takes approximately twenty-four months and, therefore, under the two-year cycle, usually commences as soon as the first system is delivered from the previous generation.

The Steps in the Process

The first step in the technology insertion process is to establish performance requirements, cost goals, and system environmental limitations for the next generation of hardware. As part of this step, the previous hardware generations are looked at to identify where the technology has fallen short and where significant improvements could be made. In addition, the current hardware procurement costs are analyzed to determine where significant cost savings can be achieved. Knowing that the first procurement of the next generation technology won't occur for about eighteen months, the IPT then conducts a market survey of current and upcoming technologies and selects candidate products for further investigation. Starting about twelve to eighteen months prior to delivery of the first system to the Navy, critical item performance testing of the candidate technologies is conducted as well as an evaluation of the impacts to system environmental characteristics (e.g., power, cooling, shock qualification) and system logistics. During this testing, the various system contractors port the system application software to the new hardware using MTM and verify that performance improvements are achievable. After conducting an iterative testing and evaluation process to tradeoff competing requirements, the IPT selects the most promising technologies for implementation. This is a very important part of the cycle as problems with potential candidates need to be discovered early and either resolved or the candidate technology eliminated from further evaluation. Final system testing of a fully built system is not the time to discover that a chosen technology has irresolvable issues as it is too close to Fleet delivery.

Approximately nine to twelve months prior to the date when the next generation system will be delivered to the Navy, the IPT makes its recommendations to the acquisition program office. Once the program office approves, the detailed design process starts where both cabinet physical design and system software porting is done. As

the cabinet design progresses, testing continues to ensure all environmental requirements will be met. Design information is also provided to the submarine planning yard to start development of the ShipAlt package that will install the upgraded system. In addition, development of the logistical package is started to help ensure its readiness at the time of system delivery. Although most aspects of the next generation hardware are determined at the time of the IPT recommendation, certain attributes such as processor clock speed and disk drive capacity are deferred in order to better capture current technology when the major production orders are placed. These deferred attributes are limited to items that do not affect the cabinet design work in progress. The last minute attributes are specified six months prior to the first system delivery to the Navy when production orders are placed with the component vendors.

What We Have Accomplished and Lessons Learned

The BQQ-10 sonar has undergone five technology insertions since it was first introduced in 1997. As an example of the improvements that have been achieved, the display console processor was originally a HP744 VME card. In 1998, it was upgraded to a commercial HP J5000 workstation to allow displaying the 3-D images used by the sonar system and, in 2000, further updated to an HP J5600 due to obsolescence issues. In 2002, the display processor technology was changed to a Dual 2.2 GHz Intel Xeon architecture using the Linux operating system. Finally, in 2004 the processor was again upgraded to a Dual 2.4 GHz Intel Xeon workstation. Although the 2004 processor variant has only a slightly higher clock speed than the 2002 processor, it is a more modern processor variant with other features that provide a higher throughput. However, it is not the fastest available processor because the shipboard power and cooling infrastructure is now at maximum capacity. The other processing components in the BQQ-10 system have also been updated as has the system network where obsolete Fiber Data Distribution Interface (FDDI) networks and complex Asynchronous Transfer Mode (ATM) networks have been replaced by the commercially ubiquitous Gigabit Ethernet network.

The last eight years have not been without many lessons learned. An early lesson was that an ongoing technology insertion process is a cost of doing business with COTS and must be incorporated as an essential component of the program budget. Failing to provide periodic system upgrades will soon leave a submarine worse off than it was with the old legacy MIL-SPEC equipment due to the lack of support for the obsolete COTS components. The technology insertion process and the associated hardware procurement and shipboard installation processes must also be disciplined and streamlined to support the two-year technology insertion cycle. Failure to hold to the required timeline will result in last-minute impacts to the shipboard installation design and late equipment deliveries to the ship. Another lesson is that the system contractors must be incentivized to explore new technology and to use the best performing and most cost effective technology available while providing a method for the Navy to share with any cost savings. This is difficult to do in a fixed-price contract so the BQQ-10 program now uses cost plus award fee contracts that provide for sharing between the contractors and the Navy of the savings / costs associated with implementing new technology.

The technology insertion process has also identified that the existing submarine power and cooling infrastructure limits the further introduction of new hardware. The increase in heat given off by new processor chips has outstripped the ability of the ship's fresh water cooling system to remove it. There is an initiative underway to upgrade the fresh water cooling system but it will be many years until all ships have been upgraded. In a parallel effort, advanced chip cooling methods are being investigated to allow for continued performance improvement.

Flexibility in component selection is also very important in the technology insertion process. Technology that seems like a good idea with an unlimited future one year may become a white elephant when abandoned by the commercial marketplace the next. The technology insertion team has to adapt and not feel locked into a previously chosen technology with no future. In the case of the BQQ-10, the original decision to go with modified 8-way Pentium III servers for the main signal processors was reversed in the next generation due to the high cost of the larger servers and the loss of

procurement flexibility associated with being tied to a single vendor. Instead of these relatively expensive semi-custom servers, signal processing is now done on more mainstream Dual Xeon servers at about one-tenth of the cost.

Although the BQQ-10 technology insertion process has been successful to date, the future holds many challenges. The cost per server has leveled off and there will be little procurement savings available to fund the efforts to implement future technology generations. In addition, the total cost of the COTS components is now only a fraction of the overall system cost so any savings are small compared to the total system cost. Both of these developments mean that less complex technology insertions will be the norm and additional funding may be required to support cabinet design changes. As discussed above, shipboard power and cooling limitations must also be overcome.

Despite the lessons learned and the challenges ahead, the BQQ-10 technology insertion process has been a well-received success and is the model for all submarine combat systems. The new AN/BYG-1 tactical control/weapons control system will use an identical technology insertion process and other submarine systems are in the process of leveraging the efforts of the BQQ-10 team. It is only by using this innovative process that the United States Navy will be able to maintain its superiority in anti-submarine warfare at an affordable cost. The men who sail in harm's way deserve no less than the best we can provide them.■

THE SPANISH SUBMARINE WHICH MIGHT HAVE WON THE BATTLE OF SANTIAGO

ISAAC PERAL

Brief life of a scorned inventor: 1851-1895

by Francisco Márquez

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That Spain in the late nineteenth century could have won the arms race to develop a military submarine may surprise many. But the genius of a modest naval officer, Isaac Peral y Caballero, might have brought that about.

Born into a naval family in Cartagena, home port for Spain's Mediterranean fleet, Peral entered the Spanish Naval Academy at 14 and went to sea at 16. He was decorated for bravery in Cuba and carried out hydrographical work in the Philippines. In 1883, his growing scientific reputation won him the chair of physics and chemistry at the naval academy. As an expert in the new field of electricity, he committed himself to the problem of submarine navigation—a common concern among the leading naval powers. By 1884, responding to the revolution in naval warfare caused by improved torpedoes, he had outlined a torpedo-launching submarine with an advanced device that controlled the depth of immersion while keeping the vessel level—a major breakthrough.

When Spain's diplomatic skirmish with Germany over the Caroline Islands in 1885 made it obvious the declining nation could never afford enough conventional warships to safeguard its over-seas territories, Peral's colleagues persuaded him to submit his project for a military submarine to the Spanish government. The minister of the navy, Manuel de la Pezuela, a practical sailor who immediately recognized its promise, offered funds for further research and for the construction of a prototype. The keel was laid under Peral's direction in the naval shipyards at Cádiz late in 1887, and the innovative submarine was launched in September 1888.

Roughly 71 feet long, with a 9-foot beam and a height of almost 9 feet amidships, with one horizontal and two small vertical propellers, Peral's "cigar," as the workers called it, was state-of-the-art both militarily and scientifically. It had a periscope, a chemical system to oxygenate the air for a crew of six, a speedometer, spotlights, and a launcher at the bow capable of firing three torpedoes. Its two 30-horsepower electrical motors, powered by 613 batteries, gave it a theoretical range of 396 nautical miles and a maximum speed of 10.9 knots at the surface.

Under Peral's command, the submarine operated almost flawlessly during a long series of trials carried out in 1889 and 1890 in the Bay of Cádiz, usually in plain view of thousands of spectators, awed and uncertain at the vessel's submersions and delirious when it resurfaced on schedule, flying its battle standard. On June 7, 1890, the "cigar" successfully spent an hour submerged at a depth of 10 meters, following a set course of three and a half miles. A simulated night attack on the cruiser COLÓN made it obvious that the most advanced warships were sitting ducks for Peral's submarine and its torpedoes. A wave of enthusiasm swept the country and much of the Spanish-speaking world; Peral became a national hero, acclaimed as the restorer of Spain's long-faded glories. The queen regent, Maria Cristina, who had ordered her naval aid-de-camp to ride in the submarine during the trials, sent Peral a jeweled sword.

But his star sank just as fast. From the start he had many hidden enemies who tried to delay the trials; his submarine was even sabotaged during construction. Then his patron, Pezuela, lost his post in a government shuffle. The official reports of the trials acknowledged his success, but dismissed Peral's idea of building a bigger, more advanced vessel, declaring the submarine a useless curiosity. The navy brass dreamed only of armored battleships and looked askance at this upstart lieutenant. Peral's popularity provoked envy from many quarters, and he and his submarine became targets of a campaign of slander. It is likely that the foxy arbiter of Spanish politics, Antonio Cánovas del Castillo, fretted that a surge in Spanish naval power might antagonize other European nations. (The United States did not then concern him.)

Heartbroken by the meanness of the intrigues swirling around him, Peral left the navy, which had been his life, in January 1891.

Newspapers refused to publish his account of his resignation. Finally he had it printed at his own expense, in a magazine with very limited circulation. Foreign offers came his way, but Peral, who had never accepted any income beyond his meager salary, nor taken out patents on his inventions (which he considered state property), rejected them all: his submarine would be Spain's, or nobody's. The navy, meanwhile, ordered his prototype stripped (the hull now graces a park in Cartagena); one of Perals' trusted friends smashed the precious depth-control device.

Peral next tried to enter politics, but was defeated in a rigged parliamentary election. An attempt to start an electrical business also failed. He had no skills beyond his patriotism, his science, and his seamanship. Then, in 1895, an old head wound turned malignant. Treatment by a famous surgeon in Berlin failed; Peral died after surgery. He was lucky at least to miss the Spanish-American War, in which Spanish fleets, hopelessly outgunned by the U.S. Navy, were sent to the slaughterhouse by the Madrid politicians. There has been speculation ever since about whether the outcome would have been different if Spain had had submarines in Manila Bay and Santiago de Cuba harbor in the late spring of 1898.■

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SEA MINE, THE SUBMARINE'S ADVERSARY AND WEAPON: 1775 TO 1918

by Mr. John Merrill

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

Part I—The Beginning

Stating with precision the beginning of a technology and identifying the exact time, place and inventor or discoverer is a challenge. The Greeks are credited with developing the first sea mine in the seventh century BC. Sulfur, naphtha, and nitre in a barrel were set afire and placed so as to have the tide or current move the barrel to an enemy vessel and set it on fire. They learned that the weapon, with the aid of a catapult, could be land-based or ship-based.[1]

With the sea mine (sometimes called submarine mine), Dutch roots are found in the 16th century "...when the Dutch loaded vessels with large amounts of explosives and sent these drifting mines against an enemy ship or an enemy's shore fortification." In 1585, Federico Gianibelli, an Italian working for the Dutch against Spain, sent two *bomb ships* to drift into a bridge over the River Scheldt at Antwerp, Belgium. The bomb ships exploded against the bridge, tearing a 200-foot gap in it. This was the first time a large explosive charge was used in naval warfare.[2] China is credited with using explosive powder for signaling and fireworks in the 10th century. It has been noted that the English may have used the first naval mines in 1627 at the siege of La Rochelle when they launched *floating petards* unsuccessfully against the French navy. Sea mines evolved through the years from the contributions of many professionals and some amateurs.

In the centuries following the Dutch efforts, gradual acceptance, evolution, and growth of the mine as an underwater weapon took

place. An accounting of mine usage at the end of the World War II determined that the Axis and Allied forces laid 500,000 submarine mines. This unique weapon with offensive and defensive capability also does not differentiate between friend and foe. Further, sowing mines and minesweeping are both considerable challenges. The results obtained with sea mines in World War I and World War II established the mine as a formidable offensive and defensive weapon.

Colonial Period

In 1751, Benjamin Franklin (with his usual prescience) advised regarding how to use electricity to discharge gunpowder but it was not until the Civil War that greater use of electrical detonation applied to sea mines was invoked.

David Bushnell, builder of the one-man submersible TURTLE, is known as the father of mine warfare. Bushnell's mines with flintlock detonators, adjusted for firing by a light shock, were oaken-staved kegs 14½ inches in height 13-inches in diameter filled with explosives.

In December of 1777, Bushnell set mines adrift on the Delaware River to be carried by the tide to the target enemy vessels at Philadelphia. However, erratic river currents and intervening ice floes prevented the mines from damaging the enemy vessels. During the Revolution limpet and floating contact mines used against the British ships on the Hudson and Delaware Rivers did not have great success other than deterrence. Mechanically detonated sea mines found their initial place in underwater warfare with these colonial designs. In some quarters sea mines were considered as sneak weapons and not chivalrous.

19th Century—Robert Fulton (1765-1815)

Robert Fulton, famous for his steamboats, was an artist, inventor, submarine advocate and underwater weapon innovator. During thirteen years of Fulton's nineteen-year stay (1787-1806) in England and France, the two countries were at war. He built and demonstrated sea mines and a submarine (NAUTILUS) with support at various times from both belligerents. Later, when he returned to the United States, his submarine proposal included a steam engine for

propulsion.

Fulton's mine designs included contact explosion, timed explosion, using clock mechanisms to trigger the mine, and mines attached at the end of long spars in close proximity to the enemy vessel. His clockwork mechanism for mine detonation was adjustable from 4 minutes to 4 hours. Extensive experimentation and modeling were hallmarks of Fulton's inventions and their demonstration. On October 15, 1805, Fulton, funded by the Royal Navy, demonstrated a mine's effectiveness off Walmer, England. The 200-ton Danish brig DOROTHEA was totaled with the explosion of Fulton's mine.[3] The mine (2 feet long and 12 inches in diameter), filled with 180 pounds of gunpowder and a clockwork mechanism set for an explosion to occur in 18 minutes, accomplished the complete destruction of the brig. He suggested that in case of war, plantings of 100 anchored mines would be required at the selected sites.

His recommendations to the Royal Navy included blockading British ports with mines to stem potential French intrusion. Fulton also proposed mining the harbors of Plymouth, Portsmouth, Tor Bay and the Thames River. Although he did not meet with complete success in negotiations with the navies of the governments regarding submarines and the use of mines to destroy enemy ships, his ideas were prophetic.

Later, in December 1806, he returned to the United States and promoted sea mines as weapons for the United States Navy. After discussions with Secretary of State James Madison, Secretary of State and Secretary of the Navy Robert M. Smith, he received support and in 1807 successfully blew up a brig in New York Harbor with sea mines but only after several failed attempts. This was due to problems with proper weighting of the mines that caused them to turn over and spill the load of black powder or miss the target.

During the War of 1812, Fulton suggested the moored mine concept that brought the enemy ship to the explosive rather than delivering the explosive to the ship. Fulton quoted a price of $150 per mine, including the powder, to President James Madison. Practical detonation of mines electrically was severely limited at the time due to corrosion of the wires and, significantly, when should they be fired.[4]

The War saw mine-related actions both in the Chesapeake Bay and along the southern shoreline of Connecticut. Some of the mines modeled after Fulton did not succeed in blowing up British ships, but Royal Navy officers assigned to the blockade grasped the significance of mines and their use as a deterrent.

Near New London, Connecticut during the War of 1812, an unsuccessful mine attack on the blockading British man of war *Ramilles* produced a strong impact. "So great is the alarm and fear on board the *Ramilles* that Commodore Hardy has withdrawn his force from New London."[5]

On March 13, 1813, Congress passed an act to encourage the destruction of the armed vessels of war of the enemy. The act, sometimes referred to as the Torpedo Act of 1813, legalized the use of torpedoes as destructive weapons. Fulton's *Torpedo War and Submarine Explosions* that he wrote, illustrated, and published in 1810 raised awareness of the torpedo and led to the Torpedo Act.[6]

> *Note about Terminology: Generically the word torpedo refers to any explosive charge including the type of weapon now known as the mine. However, Robert Whitehead's self-propelled underwater weapon invented in 1864 appropriated the name torpedo. Earlier, Robert Fulton experimented with naval mines during the Napoleonic wars and called them torpedoes. In some references, this may cause confusion.*

In the latter part of the 18th century and the first half of the 19th century extensive effort was directed toward the development and implementation of telegraphy. Telegraphy used wires and delivered an electrical impulse at a distance. An electrical impulse could also be sent along a wire to detonate a mine at a distance. Telegraphy required knowledge to make batteries, wire, wire insulation, and how to make wire waterproof while lying underwater below a river or in the water near a shore. Each of these items has application to mines detonated with an electrical impulse.

During the 19th century, the way was paved for the eventual development of the modern sea mine with the participation of many scientists, inventors, and entrepreneurs. Among those contributing to the related knowledge, experiments, and implementation were

Russia, Great Britain, Bavaria, United States, France, Italy, and Prussia. During the century, how to take advantage of underwater mine detonation was a primary pursuit.

Mine Detonation with Electricity Pre-Civil War[3]

Year	Scientist	Application
1777	Alessandro Volta	Pistols, muskets and submarine mines fired electrically
1782	Tiberius Cavallo	Gunpowder fired at a great distance by electricity
1812	Pavel L'vovich Schilling	In Russia, a mine placed on the Neva River was detonated electrically from the opposite shore
1839	Col. Charles William Pasley	Electricity used successfully for submarine gun powder explosion in conjunction with marine salvage
1848	Werner von Siemens	field of electrically controlled mines established in the approach to Kiel to deter Danish bombardment of that port during Schleswig-Holstein War. This was the first controlled moored minefield in history, and first installation in time of war. (He was one of the founding members of the Siemens Engineering dynasty)
1854-56	Moritz von Jacobi	Russia's newly-created blockade contact mines (also some shore-controlled detonation mines using chemical action for ignition) were successfully used in the defense of Kronstadt and Sveaborg in the Baltic and Sevastopol in the Black Sea in the Crimean War. The mines provided a major threat to the Royal Navy off Kronstadt.

Other work contributing to the evolution of the mine-related technology during the first half of the 19th century in Europe and United States included that of Bavarian Samuel Thomas Sommerring. In 1812, using wire insulated with India rubber and varnish, he telegraphed through 10,000 feet of cable.

Schilling, a pioneer in defensive mine warfare mentioned above, became aware of Sommerring's work and used insulated cables and a carbon-arc fuse in the mine's gunpowder for detonation. One of his demonstrations included the Tsar Alexander I as a witness.[8] By 1839, Russia institutionalized mine warfare by establishing a Committee on Underwater Experiments charged to determine the value of mines for harbor defense.[9]

In 1833 in the United States, Robert Hare (1781-1858) (a scientist, professor of chemistry at the University of Pennsylvania, and inventor) reported in the *Journal of the Franklin Institute* successfully using electricity to detonate gunpowder at a distance of 130 feet. In addition to using this method for rock blasting, he considered this method for exploding mines as a defense weapon for Fort Adams, then being built on the harbor in Newport, Rhode Island.

Fort Adams at Newport was one of dozens under construction and located at strategic waterways both along the coast and inland along rivers and lakes. The work on the forts was well along at this time, and there was significant vested interest in the forts and their role in defense: should exploding moored mines be considered as an assist for the forts or a replacement for them? National level interest In regard to the issue of forts versus sea mines as a means of defending against enemy sea forces seems to have been lacking.

Samuel Colt (1814-1862)

Colt is remembered primarily for his invention of the Colt revolver, the six-shot handgun, and later as a prominent successful mid-19th century New England gun manufacturer. His first United States patent for the revolver was obtained in 1832 when Colt was 18 years old. In the following years, as a result of his efforts to make sales of his revolver to the United States, he became known in Washington from his extensive lobbying for his guns with Congressional personnel. Colt with his broad interest in technical matters

was associated with Samuel F. B. Morse, telegraph inventor, in the years leading up to Morse's epic telegraph demonstration on May 24, 1843. The shared interest was concerned with the burgeoning development and manufacture of insulated cable for telegraphy.

In 1829, Colt, fifteen years old and working for a dye company in Ware, Massachusetts, demonstrated the electrical firing of gunpowder underwater. On July 4th, he posted announcements that he would blow up a raft in Ware Pond. The event took place. The raft was demolished by the blast and onlookers dampened. There is no further record of Colt's interest in underwater mines until 1836. At that time, the United States severed diplomatic relations with France and President Jackson recommended strengthening the Navy and coast defense. Considering this, Colt configured an extensive moored mine system, Submarine Battery, to protect harbors and other coast locations. The system involved electrical detonation of moored mines, heating the powder to create explosions. The explosion under transiting enemy men-of-war was directed by two visual observers. A full system at a given location would include 2500 mines. With the French diplomatic problem peacefully resolved, Colt's mine system did not receive attention.

Harbor defense improvement was again brought to Colt's attention in 1841 when the Maine boundary with New Brunswick dispute with England was ongoing. This time, Colt succeeded in obtaining support. With a $6,000 advance from a $50,000 government appropriation for ordnance development and some private support, he conducted four publicly attended demonstrations of electrical detonation of the gunpowder. Each demonstration achieved its goal; and, in addition. there were vast numbers of spectators and wide press coverage.

The 1842 Webster-Ashburton Treaty resolved the differences with England and removed stimulus for immediate improvement of harbor defenses. Colt's demonstrations were successful, but the system did not gain favor or acceptance as a weapon. In Washington, there were technical challenges regarding Colt's basis for a patent that he solicited in 1844. Electrical detonation of mines was reasonably well known by the scientific community both in the United States and abroad. For example, in 1841 the method was used in India to remove a wreck from a river.

Colt's Demonstrations

Date	Location	Target	Note
4 July 1842	New York Harbor	Gunboat *Boxer*	Broad attention to the concept
20 August 1842	Potomac River Washington, DC	Accomac Clam Boat (60 ton schooner)	President John Tyler and cabinet attended, 8,000 spectators; control 5 miles from target
18 October 1842	New York Harbor	Brig *Volta* (260 ton)	40,000 spectators
13 April 1844	East Branch Anacostia River, DC	Barque *Styx* 81 ft., (500 ton)	Control 2 miles from target, barque under sail at 5 knots

In his dealings with Washington, Colt maintained a level of secrecy that caused those in authority to challenge Colt and become suspicious of the system he wished to build. As the operation of a full-born system depended on observers to make the decision to explode the mines, there were challenges as to how the system would perform under conditions of fog or at night. Funding stopped and until the Civil War, development of the mine and mine countermeasures[10] in the United States were minimal. This curtailment of support for mines has been attributed to Colt's differences with those in Washington responsible for the development of the country's ongoing construction of coastal fortifications, the Third System forts.

The large number of spectators at Colt's four demonstrations and the ensuing newspaper coverage broadened the public's awareness of sea mines; but with no immediate government support, Colt's journey into moored mines concluded while his success as a gun inventor and manufacturer continued to grow nationally and internationally. In 1855, Colt had developed the world's largest armory in Hartford, Connecticut, where his manufacturing techniques with interchangeable parts, a production line to increase output, and a positive attitude towards employee welfare enhanced his fame.[11]

Commander Matthew Fontaine Maury (1806-1873)

From August 1825 until April 1861, the Virginian Matthew

Fontaine Maury served as an officer of the United States Navy. During the first years of his long naval career, he spent almost nine years at sea mostly in the South Pacific. From 1841 until his resignation to join the newly-formed Confederate States of America, he was Superintendent of the Navy's Depot of Charts and Instruments in Washington (later the U.S. Hydrographic Office). There he attained national and international acclaim for his advances in oceanography and his 1855 book *Physical Geography of the Sea*. The book, a first on oceanography, was in continuous print for 25 years in the United States and England and was printed in six continental languages.

A few days after the declaration of war, Maury resigned from the U.S. Navy and went to Richmond. His initial role with the Confederacy was his appointment by Virginia's governor, John Letcher, to the Advisory Council on Naval Matters. Maury addressed the Confederacy's challenge of how to enhance harbor and coastal defense with the limited number of Confederate naval vessels available.

One direction of his thinking was to build a large number of small steam vessels with low freeboard (making a difficult target) and heavy firing power. With limited resources for construction, priority was given instead to the building of the ironclad MERRIMACK. The other direction of Maury's thinking was implementing mines for coastal and river defense. A particular focus of his mine investigation was electrical detonation that he pursued during his brief tenure in Richmond. For the South, controlled mines electrically detonated saw limited use primarily because of lack of reliable waterproof cable suitable for planting

In June, Maury, as a Commander in the Confederate Navy, became Chief of the Naval Bureau of Seacoast, River, and Harbor Defense of the South. With $50,000 allocated for experiments, he focused on developing and implementing mines that floated, drifted or were towed to contact enemy shipping. Some mines were placed on rams on the bows of small torpedo (mine) boats. On July 7, 1861, a little more than two months since Maury's resignation, he unsuccessfully led an expedition to explode torpedoes against the Federal fleet in Hampton Roads.

US Navy Admiral D. D. Porter noted the effectiveness of Confederate mining later in 1878. "...the difficulty in of capturing

Charleston, Savannah, Wilmington, and Mobile, was in a measure owing to the fact that the approaches to these places were filled with various kinds of torpedoes, laid in groups something on the plans of Fulton and Colt, and fired by electricity."[12]

Of the various mines, the most significant and successful mines were those that were planted and detonated electrically with the aid of an observer. Limited availability of suitable electrical cable impeded broader implementation of this technique. For various reasons such as cost, and material shortages, the contact mine with its low cost and relative ease of manufacture and planting but with some operational limitations, became widely and effectively used by the South.

Torpedo stations were set up in Richmond, Wilmington, Charleston, Savannah, and Mobile. Maury remained with the Bureau until late June of 1862, when he was transferred to England. He did not return to the United States until 1868 and was not on hand to see the effectiveness of the sea mine investigations that he initiated.

Some Confederate Mines
Trip wire
Frame propeller trigger line
Beer-barrel torpedoes
Raft torpedoes with friction fuses
Buoyant torpedoes

After Maury left for England, the Confederate Congress in October of 1862 created a Torpedo Bureau for the Army and the Submarine Battery Service within the Navy's Office of Ordnance and Hydrography. The Submarine Battery Service mines accounted for sinking at least 40 Union ships. At the battle of Mobile Bay (4 August), 1864, a field of 80 mines, the first to be equipped with safety devices, was laid to defend the city. During the battle a mine destroyed the monitor USS TECUMSEH, the newest and most powerful of all the Federal ironclads. TECUMSEH, constructed at a cost of about one million dollars, was destroyed by a mine with a cost of less than one hundred dollars. Later on December 9, mines detonated from shore destroyed seven of 12 Federal vessels moving

up to the Roanoke River to capture Fort Branc, North Carolina.[13]

Maury was correct with his vision of mines as effective defensive weapons. During the War more Union ships were lost to mines than to any other weapon. Further, mines prior to the Civil War sometimes floated toward enemy shipping and provided opportunity for an avoidance maneuver. Mines now successfully being placed beneath the surface added a new dimension to their lethality and the consequent deterrent impact on coastal or river intruders. Neither of the navies overlooked offensive use of the mine. Both sides investigated drifting mines and the spar torpedo from torpedo boats and ironclads.

Similar to the case of other weapons, mine countermeasures slowly evolved. T. M. Melia in Damn the Torpedoes: A Short History of U. S. Naval Mine Countermeasures, 1777-1991 points out that earliest countermeasures included bow watches or personnel in small boats looking for mines. Contact mines, if located were sunk with a properly placed bullet hole. Later, other countermeasures developed.

With the Confederate Navy planting the mines, the Federal forces took the initiative to counter the mines. The 1997 book *Shades of Blue and Gray* points out that the Union Navy devised a defensive mechanism, the world's first *mine sweepers*. To assist Union ships transiting inland waterways of the South, first use of such a device occurred on 30 April 1862. The first countermeasure was attached to the bow of a monitor modified for minesweeping. A primary sweeping device consisted of a huge rake 65 feet long. Affixed to it were large numbers of grappling hooks, pushed ahead of a lead vessel. A symposium held in 2000 at the Navy Postgraduate School also referred to the device; "One invention was the wood and bamboo 'cow catcher'. It was designed to stand out from the Clad's bow 20 to 30 feet and acted as false front. One was attached to the monitor USS SAUGUS and used during the James River Operation. They called this device a 'torpedo catcher' or 'torpedo rake'. At the same time, the US Navy also experimented with fish nets extending from all sides of the ship to protect against contact mines." During the Civil War, of forty-three Federal ships struck by Confederate mines, twenty-seven sunk. The Confederacy's success with mines brought global attention to the mine as an effective weapon.

Post Civil War-1900

The first half of the 19th century brought improvements in mine performance and its utilization. Several European conflicts provided opportunities for implementation. This helped to establish the mine's credibility always as a deterrent even in cases where its performance was limited. Stealth quality of the mine when buried beneath the sea was recognized, an "invisible" weapon. This particular aspect of the mine brought contempt in some circles and a somewhat negative approach to its development and ultimate use. This opinion of mines persisted. Mines were judged as *"unworthy and improper to the conduct of wars"*.

Mines saw use in the Paraguayan War (1865-7-). Argentina, Brazil, and Uruguay War opposed Paraguay. Mines laid in the Paraguay River cost Brazil one monitor. Paraguay lost the war but interest in mine warfare was sustained in the Latin American navies.

European navies also began to regularly use mines detonated mechanically and electro-mechanically. For instance, during the Franco-Prussian War (1870)[14] with Franco-Prussian War 1870, the Prussians publicized the fact that they were laying mines in an attempt to keep the superior French fleet away from its ports. Realizing that merely the fear of mines might keep the French Navy at bay, the Prussians even laid dummy weapons when production of real mines ran behind schedule.

Hertz horn-50 year detonator

Developed in 1868 by the North German Defense Committee, the Hertz horn electrical detonator continued in use through the first quarter of the 20th Century. As it projected outward from the outer surface of the mine, the word horn was an apt description of its appearance. To insure contact by the passing warship (vessel) several horns were mounted. The invention is attributed variously to a person by the name of Herz or Hertz. It was adapted by Russia to trigger their contact mines. The lead horns several inches long contained a glass tube of bichromate solution that would break when bent and produce a chemical reaction, electrically detonating the explosive. A charge of 35-53 pounds of dynamite and later TNT made the uncontrolled contact mine a feared weapon. By 1907, the wide and successful use of sea mines led to an international

convention at The Hague concerning the laying of automatic submarine contact mines. The Hertz detonator, in addition to persisting as a dependable device, has also exhibited the characteristic of being operable even after years of submersion. Some modern mines in the 21st century are equipped with horns similar to those of the 18th century design.

Naval Torpedo Station (Newport, Rhode Island 1869)

In 1869, Civil War Admiral David Porter (1813-1891), appointed by President Grant as assistant to the Secretary of the Navy, was instrumental in establishing under the Navy's Bureau of Ordnance (BuOrd) a new experimental Naval Torpedo Station (NTS) at Newport, Rhode Island. Porter's Civil War experience included mines and his plan for the new station involved hands-on experiments with torpedoes, mines, explosives, electrical devices to detonate them, and countermeasures to determine how the new technology should be used. He pushed for mines to be a high priority in the Navy and formed a Torpedo Corps within the Navy's Bureau of Ordnance. Initially Naval defense mines were the responsibility of NTS. The mine cases were an outside contract with all parts and fittings manufactured and assembled at the Station.[15]

The original site for NTS included former Army buildings on Goat Island in Newport harbor and buildings used by the Naval Academy at Newport during the Civil War. Until the mid-1880s, primary attention at the Station addressed understanding and improving the spar torpedo (mine) and the towed mine. Both mining and countermining (MCM) were on the agenda of the original commanding officers at NTS.

Underwater use of electric lights to locate mines was examined, along with other ship self-protection measures. The underwater use of electric lights to spot mines was evaluated at NTS, and in 1884, the Navy ordered "torpedo searchlights" for installation on its new cruisers.[16]

Awareness and growing interest by the Navy in Whitehead's self-propelled torpedo, invented in 1866, placed new demands on NTS. After 1885, work on mines and MCM lessened and automobile torpedo efforts increased and became dominant. In the first years of the 1900s, all of the Navy's explosive development work at NTS was

transferred to Indian Head, Maryland. Later in 1915, the manufacturing of naval defense mines moved from NTS to Philadelphia, Pennsylvania, and Norfolk, Virginia, leaving the torpedo and related technology at Newport. This may have been due to budgetary considerations as well as the assignment of defensive mine work to the Army beginning in the 1870s. The broad acceptance of the mobile torpedo and the continuing improvement of its performance and accommodating it on the various types of naval vessels placed additional space requirements on the facilities at the NTS.

Russia and Mine Warfare

European Countries observed the United States Confederacy's defensive mining successes during the Civil War and in 1875, Russia established a mine warfare school in St. Petersburg for the Baltic and Black Sea fleets. In 1877, the Russian Naval Academy at Nikolaiev instituted new courses on strategy and mine warfare. Hertz horn contact mines and electrically controlled observations mines provided coastal defense in the somewhat shallow Baltic approach to St. Petersburg in the Gulf of Finland and along the Black Sea coast near Odessa.

During the Russian-Turkish War, (1877-78), a superior Turkish Navy opposed the Russian on the Black Sea. With mines and Whitehead's torpedoes, Russia immobilized the Turkish opposition. This victory provided further proof of the efficacy of the mine as an important weapon in offensive warfare.[17]

United States Army Mines

The United States Congress recognized sea mines as a method of harbor and coast defense when submarine mining was added to the activities of the Engineering Corps of the Army. In 1871, General Abbot conducted mine experiments at Fort Totten, Willets Point, New York at the west end of Long Island Sound. Later, an experimental floating controlled minefield was planted in the Potomac River near Fort Washington, just south of Washington, DC. The 147 electrically-detonated mines were held in place 10 to 20 feet below the surface by 1000-pound anchors.

During the Spanish-American war in 1898, live mines were activated at the Potomac River installation. At this time, an attempt

was made to develop a minefield for the New York harbor but failed due to poor condition of the equipment and a complete lack of technical knowledge. The laying of mines in harbors did not alleviate the safety concerns of the United States port cities. This situation continued through World War I and the U. S. Army was unable to plant any mines in the defense of the United States.[18]

During the nine month war (April 24, to December 10, 1898) the Spanish directed by Admiral Pascual Cervera effectively used electrically activated mines, the fort's guns, that overlooked the harbor at Santiago, Cuba, and log barriers. USN Captain William T. Sampson, acting Admiral in charge of the blockade of Cuba, was not able to enter the four-mile inlet leading into the port to attack the Spanish fleet.[19] The war exposed how limited were the U. S. Navy's mine warfare capabilities. Sea mines were still considered unconventional and not creatively used.[20]

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THE *ACE* OF THE ACES

by Dr. Robert Beynon

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Admiral Karl Donitz, commander in chief of the German U-boat force, was a leader who held the care of his men in high regard. He attended the weddings, the births of children, the birthday parties, and above all he kept the families informed of the well being of his submarine sailors.

The admiral was not a "sun-downer" as he held an informal change of command with a high degree of camaraderie among his submariners.[1] The men under the admiral always knew they had his support. He allowed them some degree of freedom but at the same time he was demanding. Upon reporting after a patrol, one of the aces was told "You must leave the boat."[2] This skipper was not of the same mind and let him know in no uncertain terms. Without saying, the admiral was to be obeyed.

An example of the support the men received is from this incident. One of his aces had been investigated by the Abwehn Intelligence Service for association with a Jewish woman and drinking with a black African man in a Hamburg bar. The climate within the nation was frenetic activity which could condemn a person for the slightest slur cast upon the nation's leadership. Upon receiving the dossier about the incident, the report was dismissed with an annotation which read... "Complete Rubbish."[3] This type of support was shared in turn by the men in the command who affectionately called him "The Lion."

Always looking for ways to improve the efficiency and effectiveness of his Submarine Force Dönitz demanded of his

skippers any bit of information they deemed valuable. He needed to have a first hand feel of the problems facing the boats at sea.

"U-boats must stay dived by day, so as to remain unseen at all costs. They need to try to attack as often as possible during the first night, since it is almost impossible to maintain contact on subsequent days, due to the bright lights as well as small patrol boats. There is considerable danger of being bombed by fast 'tractors'.

If there are too many boats in the convoy to be sunk, then a chosen U-boat must move at top speed so as to get in the convoy's path three hours before dawn. This boat then needs to travel underwater at three or four knots in the same direction as the convoy's course, so that it will have a good vantage point for the convoy three to four hours before dusk. The crew can relax during the other daylight hours.

This method of keeping contact can only hold good for suitable sea areas, and could be successfully employed with one of the convoys coming out of the Strait of Gibraltar. The delegated U-boat needs then, as a matter of course, to abandon an attack in order to move ahead.

The safety of the convoy is assured by air cover. Once the convoy is spotted, set a course at the furthest possible point from which it is visible and for thirty minutes take a parallel course with a speed which allows you to overtake the enemy.

Above the convoy, the planes have lights fitted, on their circuits and obviously travel over the boat. Since, however, their night vision is the same as yours, always keep sufficient distance. Then, at the edge of visibility, turn so that the convoy is at 0 degrees. With a running fix, mount the attack from ahead.

When the plane approaches, the boat must still move forward a little in the water and keep this up until the plane leaves the area. The aircraft will always first throw a star-shell, since till then it does not know whether it is dealing with the white spray around one of its own patrol boats. Once the ships are as far as possible all overlapping, shoot, turn and run. Save the next freighter in line for the stern tubes."[4]

The admiral was always at the ready to reward his submariners for service beyond the call, sometimes the rewards were medals but more importantly he had a standard procedure of offering staff

positions. He also rotated his highly decorated officers to staff and training positions. This allowed new recruits to benefit from front-line experiences.

Although in charge of his men as he tried to cajole or persuade them to bend to his will, the final choice always remained with the captain of the boat.

The admiral . . . The Lion . . . the beacon of light for all who served in his Submarine Force, was finally brought to justice by the war tribunal judging war-time criminals.

During his career, the fatherly submarine admiral chose four submarine skippers as his favorites. These men led the force in ships sunk and total tonnage. They in turn were called *ACES*. They were four distinct personalities. Rolf Mutzelburg was perpetually cheerful; Adalbert "Adi" Schnee was cautious but effective; Eric Topp was destined for a staff position and his ACE among aces was Teddy Suhren.

The chosen one was Johann Heinz Paul Anton Reinhard Suhren. Early in his career he came upon the nickname "Teddy." It came about because of his inability to march and conform to parade ground maneuvers. As a cadet in the rank behind Teddy remarked; "My goodness, Reinhard, your marching makes you look like a teddy bear."[5]

Teddy Suhren was destined for great things. His early youth found him displaying a kind of calm under pressure. His confidence was most unusual as was his unerring ability to make important decisions in moments of danger. On 5 April 1935, he enlisted as a trainee attached to the 2nd naval division of the Kriegsmarine. His father gave him advice which he used his entire career:

> "You can't do anything, you don't know anything; to start with make yourself out to be a dimwit and be grateful that you are in a position to learn so many new things that are important for your life. And that advice has never been proved wrong."[6]

This piece of wisdom served him well at each level of his career.

He used this fatherly admonition well at the Red Castle by the Sea (the German Naval Academy). It was here that he excelled in

artillery school; achieving a record 7.5 of a possible 9. Because of his passion for the wild-side of life, Teddy often times ran contrary to superior orders. He missed a 5 a.m. curfew from the Rose Monday Festival; the infraction threatening his Seaman Officer examination. The result was a 3.5 point reduction in his record. Although the action was disappointing Suhren remained his resolute self. He describes the scene as:

> "Apparently my mere appearance was tantamount to a provocation, especially since I was the smallest and didn't pussyfoot around and didn't allow myself to be browbeaten. I was myself, and determined to stay so."[7]

The reluctance to bow to authority continued as he served aboard boats U-1 and U-47. While serving on U-48, and under the eyes of Fuhrer der Unterseeboote (Admiral Karl Dönitz), he was dressed down for the use of profanity during gunnery practice. Although the reprimand was deserving, Suhren was widely acclaimed as an excellent marksman. His gunnery skills translated into his ability for torpedo accuracy. Of the 300,000 tons that the U-48 sunk, Teddy was responsible for 50% of the total. As first watch officer and being responsible for torpedo armament, the achievement earned him the Knight's Cross. Continuing on as watch officer and before he left the boat, for his own command, the boat had fired 119 torpedoes . . . 65 under orders from Suhren. . . with a strike ratio of 46 percent.

In February of 1941, U-564 was launched. This became his command on 3 April, 1941. In addition to adding his reputation to the new boat, Teddy incorporated a new Wappen. This was an emblem that graced the conning tower. For the boat, the sign was a large black cat, with the symbol "3 X" above an arched back with tail held high. In most countries, including Germany, one black cat is considered bad luck; but 3 would turn away misfortune.[8]

Under Commander Suhren, the new dermal schwarze kater went to find the enemy. Teddy had, in addition to the British enemy, opposition within his own country. Witness the following:

On 6 September, all German Jews had to wear the Star of

David. He was disturbed and asked a group what it meant? The reply; "My dear sir, this is the Star of David which we are obliged to wear."[9]

That was running through my mind when I sat down in a street café. Two members of the Hitler Youth crossed over to me. They wanted my autograph of something signing. I was pretty short with them and refused. It wasn't the young people to blame, and they were surprised and offended. So had I been, but for quite a different reason.[10]

Early in 1942, Captain Suhren was almost the victim of an accident. He had ordered a bootsmann (boatswain) to investigate a loud noise from the boat's upper deck. During the scene, the sea swells were practically drowning the officer. At the same time, Suhren overlooking the problem, went to the man's rescue without harness or life jacket. Suddenly a towering wave hit the boat causing the captain to be swept overboard. A life ring helped retrive him to safety. The only loss was his pride.

Teddy's statement describing the incident, which included loss of personal and issued equipment stated;

"One cannot blame bootsmann Webendorfer that the commander climbed down onto the upper deck to help repair the damaged hatch cover. Furthermore, I do not consider bootsmann Webendorfer to be responsible for what the commander carries in his pockets. All efforts to retrive the lost items remained unsuccessful, and I should like to request that the lost items be replaced. (signed Suhren)."[11]

Everything was replaced except the pistol and stopwatch. The report was circulated throughout the submarine service as a part of the "Humor in Wartime" series.

Teddy's last patrol was a run into the Caribbean Sea. As he was being briefed about the patrol he was told:

"Suhren, make sure you bring your boat safely back home and then come ashore, Prien, Kretschmer and Schepke would in theory have been ideal for the job, but they are all gone. Prien,

Schepke are dead, Kretschmer is a prisoner. Topp has already come ashore—and you are next."[12]

In addition to hearing this would be his last run, he had another problem. The Naval Branch of Propaganda Kompanie had ordered aboard a war correspondent to film the cruise. Teddy was most disturbed by the order as he resented the intrusion aboard *his boat*. He shunned publicity with a passion. He hated interviews as witnessed in a previous incident.

Indeed, he seemed inhibited, as if he knew he was being watched. I had the impression he was too clever to be able to relax and enjoy himself in his new found position of fame. He did not like himself to be praised by a public with whom as a U-boat man he was not likely to have much in common.[13]

The U-564 was an experienced crew of 44 men. Twenty-nine of which had served since the commissioning. Teddy Suhren was a skipper who exhibited deep loyalty. He had developed an intensive friendship with his chief engineer. . . Lietender Ingenieur Ulich Gabler. Teddy refused to accept an order and in fact negated by refusing to sail without Gabler. One more patrol was granted. Another example of leadership was showed when the captain found a decreasing amount of rum in the boat's medical cabinet. The navigating officer had been "tapping off" more than his share. A compromise solution was cut between the two sailors demonstrating the captain's ability as an effective and popular skipper.

German U-boats were supplied at sea by Milchkuh U-tankers called Milk Cows. En-route to his assigned station, Teddy requested a re-fueling with the thought that an extra day of fuel he could well extend his stay in the distant Caribbean.

Alerted by a radio message Suhren prepared his torpedoes (ETAS) for firing. The armament contained 8 foot long batteries, which were topped off with electrolyte and the pre-heating elements were energized. This plan extended the range of each torpedo by 60 percent. The prey was a convoy of 35 ships out of England. U-564 was ready for action. Keeping contact with Admiral Dönitz, the captain sent the following message:

"Convoy grid BD 9592, attacking. Surhen."[14]

Just as the boat was ready to fire her armament, the convoy turned starboard and was out of range. So the preparation had to begin anew. Her periscope had been sighted. As a British escort headed her way, the boat was ordered "secure all stations." Upon returning to periscope depth, a disappointed captain viewed a disappearing convoy. Constant enemy aircraft kept the boat on an up and down course which began to frustrate Suhren. He ordered:

> "LI, up to periscope depth—again. Up and down the whole time, it is like being in a lift. These fiendish air patrols of the Allies. . . Up above it is getting dark, night is beginning. First and second watch officers to the captain. Listen in, when we surface now, we'll split up the four sectors between us—and keep your eyes open. Wooden eye—stay alert."

Even the best of the submarine captains showed the stress and strain of war patrols. Teddy himself recorded:

> "I keep concentrating on the puffs of smoke and warn the watch not to startle me by shouting. They are to point out any occurrences in good time—and quietly. My nerves are not made of steel. I stay glued to the smoke cloud too, and don't dare close my eyes for a moment. Suddenly I hear lookout on my right say discreetly, Plane."[15]

Time after time she beat the odds against survival. On 19 July after three days of pursuit, the boat was in position to await to convoy. Because of the gloomy weather and absence of centimetric radar, the 564 while on the surface went undetected. In preparation for firing, Teddy positioned his boat so that the convoy ships were overlapping.

Finally after waiting three hours, the order "Rohre einer bisvier Los" was given. All four forward torpedoes (eels) were fired. The run of two minutes proved straight and true.

"Two flashes and billowing smoke clouds. After that a third ear-splitting bang, a massive burst of flame and an entire steamer flies into the air. It's the one with two funnels, it carried a load of munitions."[16]

The vessel carrying the munitions was SS EMPIRE HAWKSBILL. She was a DEMS (defensively armed merchant ship). The explosion totally destroyed the vessel with its crew of 46 men.

This success was not without mishap. As the captain ordered the bridge crew below, he remained top-side to view his work. Suddenly a blast of air was heard escaping from the boat's diving cells and she headed for the bottom. Teddy became confused as he left the bridge and inquired:

"What the devil is going on? Bucketsful of water are starting to crash on my head as I pull the hatch shut behind me . . . I'm furious. Have you all taken leave of your senses? Who gave this order? (Sturkor) is completely taken aback at being shouted at. But, Boss, you gave the order yourself.

"Who . . . what . . . how? Heavens what the poor chap has done is perfectly reasonable. When I send the bridge watch down, as I had done in this case because of all the debris running down, it's always a prelude to an Alarm. But I didn't shout alarm this time, but PK man . . . in fact PK, PK. Our bloody passenger from the Ministry of Propaganda."[17]

To avoid the onrushing escort and her depth charges, a newly installed evasive device was elected. The "Bold" was a fizzing sonar decoy launched from the stern. This action attracted the depth charge attack and the 564 once again crept silently away.

The use of the Bold (short for—Kubold—meaning goblin) was the most effective of the counter measure devices. It comprised a 15cm diameter capsule filled with 370g of calcium and zinc within a mesh bag. The compound was contained in a water proof aluminum canister. When it rose to 30 meters, a valve opened allowing a

trickle of sea water. The water started the action producing hydrogen gas creating a large mass of bubbles sufficient for 25 minutes. Resembling the echo caused by the contact of a submarine.

With this success for her effort's realization for all the destruction heaped upon them. Sensing no immediate danger, the captain ordered periscope depth. After an all clear, the boat surged forward into the safety of darkness.

> "We knew it was going to be a risky escape, but we also knew that on the surface, at night, end-on to the enemy were virtually invisible and able to use our top speed. Gabler could work wonders with those diesels."[18]

Captain Suhren was not expecting contact from the escort. As the enemy headed toward her, he ordered both electric motors and diesel engine power at 17 knots. This propulsion allowed the boat to slowly creep away from her pursuer. The gamble paid off as the escort was slowly lost in the darkness. Once more Teddy's fortune held fast. Escape was the reward.

As all submariners know safety is not a guarantee. Just as progress was being made the boat went into a violent vibration. Both exhaust valves were pouring out a heavy black smoke. Captain Teddy heard a report from the engine room "Boat unfit to dive. Starboard diesel out of action." In spite of the report, a dive order was given to take the boat to 30 metres. All hands raced to the forward compartment to hasten the dive. The action was described as:

> The boat manages to dive, and I can hear the electric motors starting up, but I can't believe my eyes. Standing in the center area, I can's see my hand in front of my face. Smoke everywhere; everyone coughing and choking. Has the lighting failed? Why hasn't the emergency lighting come on? The darkness persists, and the boat dives down. Judging by the sounds, we must be about 50 to 60 metres down.
>
> The LI is trying to get the boat level, but, as he trims her, U 564 goes up at the bow again. We can't go on like that,

sagging as the stern and in the end we get going with a dive. The air is full of smoke, thick enough to cut with a knife. We press handkerchiefs over our noses and mouths, and some grab the emergency breathing apparatus. Whilst we are all at sixes and sevens, the patrolling escort is closing in at top speed, with fire in her belly.[19]

On the surface two escorts were steaming down on the damaged boat. A total of 20 depth charges rained down around the escaping 564. She finally settled down and the charges did little damage.

Unaware that the boat had escaped total destruction, the escort HMS Gorleston's captain wrote in his proceedings report;

"Although it was not possible to attempt to obtain any evidence, U-boat's depth and movements were so well known that I find it difficult to imagine that he escaped destruction from such a heavy pattern."[20]

The U-564 with little damage but entirely consumed in smoke began a regular damage control procedure. The tension was eased somewhat by the Chief Engineer who bellowed in his loud voice; "That it was as dark as a bear's arse in here."[21]

Teddy Suhren called off any further attacks on the convoy; it had escaped. The crew went about the usual duty roster and the captain retired to his bunk completely exhausted. His after thoughts were described as:

"It had been a sight for the gods. Never again would I see the like of it at sea. The fireworks display of the blazing munitions ship was a unique experience. Pictures of that night etched themselves indelibly on my mind. The shadows of the escorts, the star shells above us. . ."22

Thus ended the 7th patrol of Teddy's boat.

In celebration of the patrol Teddy ordered a "celebration tea," the birthday party called Geburtstagfeier. All hands were in good health except the leading seaman Ernst Schlittenhand. He was suffering

from extreme rheumatism sufficient for the captain to radio for a transfer to the first returning boat. While enroute to the meeting with U-203, the boat sighted 2 Azore Island fishing boats. The two vessels were a screen for 2 British battleships and 3 destroyers. A crash dive and further surveillance was ordered. Five hours later Captain Teddy, a disappointed man, gave up as the British group disappeared from view. He determined a submerged attack was futile and a surface attack was too much against the firepower of the 5 vessels.

Continuing on patrol, the captain became very frustrated based on two problems; (1) lack of fuel and (2) the four torpedoes which were used were not available. He was headed to a fruitful hunting area lacking fuel and armament. Replacing fuel was not a problem. Torpedo supply became a major issue.

Teddy learned that boats were returning with unspent torpedoes. He planned with his crew a method to secure the armament. The idea was to wrap the "eels" in 16 life jackets to be guided by men in 2 rubber dinghies. From the sending boat, the stern was lowered until the torpedo was free-floating. The 564 semi-flooded tanks were blown clear and the boat rose beneath the torpedo. Block and tackle solved the problem of restoring the "eels" to the forward torpedo room. In a matter of 3 hours the problem of no torpedoes to full complement was solved. The exercise was quite a feat as each torpedo weighed 1.5 tons.

Continuing his patrol, the captain was in search of targets in the rich vessels of the Caribbean. In preparation for air attacks, a fifth look-out was added to the bridge watch. As the days passed with little action, Suhren radioed Dönitz for instructions. An order to proceed to an area North of Trinidad was given.

Little action was available but the closeness to land afforded many air-craft risks. The dreaded cry of "Flieger" was enough to drop the boat into a crash dive. She was being attacked from out of the sun on a 20 metre surface level. The U-564 went down on an angle so steep that all loose fixtures went flying bow-ward. With few metres of protection the planes depth charges, well placed, severely rattling the boat's hull. A fire was ignited in tube number 5 causing a bit of alarm. Quickly extinguished and with no water leakage all was under control.

During the final run by the plane, one depth charge exploded very close to Surhen's boat causing heavy damage. Men were thrown from their feet. Lights shattered, broken glass was everywhere. Captain Teddy in his usual calm manner went about assessing control damage. There was some concern about the seawater pressure against a damaged hull.

All quarters reporting no damage and no leaks created a calmer atmosphere. Still the concern of 90 pounds of sea pressure per square inch against an aging hull worried the captain.

With the boat at 60 metres, the trip procedure was put into effect. Suhren sensed something was wrong as the boat kept edging toward the bottom. The fear of silently going deeper until the sea pressure crushed the boat went throughout the boat. Orders to blow the forward ballasts and put the bow planes on hard rise was the only solution to the dilemma. During the action, the man responsible for operating the central panel turned the hand wheels in the wrong direction. Only the quick action of the captain reversing the procedure was the free fall gradually arrested. The depth was at 160 metres putting 240 pounds of pressure against the hull. The depth was 10 metres below the rated test depth; finally the boat settle at 200 metres.

The need now was to restore the boat after all the damage. Teddy supervised the activities assessing the damage. It was extensive but not serious. With no material damage, the problem was turned to personnel concerns. Being submerged offered safety but the ability to relax was hampered by the dampness and humidity. Witness Suhren's remarks:

> "We used to find it so hot in the Caribbean Sea that even when we were under water the temperature reached up to 60 degrees, which made it very uncomfortable for the whole crew. But even then, we made it possible to bring them all back to the mainland without having lost too much weight."[23]

Continuing the run and with all aboard back to normal, a message from U-108 reported the long awaited convoy traffic. Teddy readied his boat for action and then gave the crew time to relax and to await the exertion of attack energy and anxiety.

The quietness was suddenly interrupted by a message from the U-162. Captain Wattenberg informed the boat of the convoy's latest position:

> "KR KR; convoy in grid Ed9460, north-easterly course, steady speed, Wattenberg."[24]

Teddy's boat was only 35 nautical miles from the sighting. He converged with Wattenberg and operated a surface attack sinking the American ship SS WEST CELINA. Two hours later, the boat picked-up the laden ships of the convoy. In consultation with his bridge officers, the 564 was ordered to battle stations—surface attack. Just as the captain fired the torpedoes, an escort vessel appeared and caused the torpedoes to be released too early and too far from the targets. Five shots went astray, the stop watches counting the seconds turned into complete silence. Teddy the marksman had missed.

Teddy absorbed this disappointment as he ordered the reloading of the forward tubes secured from the armament kept in the bilges. After an hours work which included getting the boat into firing position, Captain Teddy was ready for his second attempt. A periscope glimpse revealed four ships. His selection was 2 large tankers, one freighter and one other vessel. The targets were worth 28,000 tons.

> "All four torpedoes hit as targeted. Two ships sank quickly, but it was impossible to tell a the time whether it was a tanker or freighter. The other tanker, glowing bright red with an internal explosion, at first made a slow getaway as if to wait for the sinking of the other two ships. Then she quickly sank to the sternposts and was . . . up to the bridge in water."[25]

The boat's escape pattern was altered as a British escort and an aircraft took chase. The hunt was finally abandoned by the escort but continued by a B-18 bomber. The alarming klaxon alerted the crew for a swift descent into the sea's dark waters. They were at least rewarded by the sounds of crushing bulkheads of the sinking tanker.

As Teddy took the boat deeper, she was going down at 10 metres every 30 seconds. Finally she trimmed out at 50 metres. Fifteen minutes later the boat surfaced into darkness sufficient to conceal her escape.

The report of the boat's efforts listed 2 sunk and 2 in a sinking mode. Once again, the on-the-scene report was changed to only 2 sunken enemy by someone who sat behind a desk.

U-564 remains submerged during the day to avoid heavy aircraft opposition. The warm Caribbean sea waters caused the boat's temperature to rise beyond human endurance. To relieve the fetid air and the human stench and to charge the batteries, the boat surfaced each evening. The captain was concerned about the health of his men. Complaints were being voiced about body sores and rashes. He was determined to avoid such conditions constantly found among his combat boats. He surmised:

> "We also made sure of hygiene, which was difficult. The men didn't receive a lot of water to wash themselves with. They grew beards, and none of this helped cleanliness. So then our chief engineer, Gabler, and his diesel officer, (Krah) decided that something had to be done. At the back of the diesel room one could remove the floor boards, and into that space they built a bath, just big enough for one to sit in and also have a shower. We were able to have a shower with warm water of the engine cooling system. In those days we had seawater soap. . . a marvelous idea! All we had to do now was to keep check on who was due, and then everyone received a litre of fresh water to rinse himself off with. That paid off very well, because the crew, even in this tremendous heat, felt very comfortable. We also had on board a freshwater producer, but it took one litre of diesel to produce one litre of freshwater.[25]

This captain, in addition for caring for his men, always had his mission in mind. He was always ready for news which would direct his latest move. U-boats were reporting successes but to Suhren's dismay his luck was running short. He was in search of a *new goldmine*. In the midnight hours of 27 August, he was directing the boat into calm seas, bright skies with heightened anticipation. Hard

work was rewarded; a solo tanker came into binocular view. The bright moon light ruled out a surface attack on the 8176 ton Norwegian vessel. Firing two air torpedoes, with an estimate hit in less than a minute. Thirty seconds later the report was heard: "A direct hit." Ten minutes later, the vessel was abandoned. Still afloat one more shot was made ready to put her on the bottom.

To the fear of all torpedo men, the *eel* was *running hot* and snagged within the tube. The danger of a pre-mature explosion was averted at the last moment as the shot finally was cleared and went astray. Teddy had missed again. He had to claim victory, so the gun crew put 35 shells into the Norwegian vessel. She was doomed as Captain Teddy ordered: "7750 hours, EE 9923. Shot our bolt. Head for home."

Headed for port, this victorious captain was surprised by the crew. A message had been received from the highest German hierarchy. Teddy heard the message.

> "In recognition of your proven heroism, I grant to eighteen men of the German Armed Forces the Oak Leaves with Swords to the Knight's Cross. Adolf Hitler."[27]

A second award was forthcoming: To Suhren: I am delighted to be able to inform you, with my heartfelt congratulations, of your promotion to Korvettenkapitan in token of your exceptionally distinguished service against the enemy. ObdM, Raeder. Heartfelt best wishes, Heil und Sieg. BdU.

The event was recorded by the assigned photographer as Teddy was given wider oak leaves for his cap and new *piston rings* for his sleeve. Teddy in response, congratulated his crew knowing full well they also deserved the accolades. He reminded them the captain was only as good as his crew.

As the boat approached her final rest, the crew was ordered to fresh haircuts and trimmed beards. This order was contrary to the usual but the captain wanted his crew looking spruce and healthy as they arrived.

The boat itself was decorated with victory pennants attached to the attack periscope. Nine flags were proudly flying. The U-564 finally had come to rest. Coming aboard was Dr. Richter, a surgeon,

who pronounced the crew in a healthy condition after 70 days at sea. The strain on the captain was described as:

> "I myself felt in some way a different person. The officers standing around me seemed more distant, their laughter more remote. But there was no reason why it should have been different. After previous patrols I hadn't felt the same way, this sensation of begin apart. Perhaps the stress of all those weeks of being responsible for them hadn't worn off yet. But the feeling of being isolated didn't go away."[28]

In spite of his mental condition, Suhren still retained his sense of humor. Spotting his friend Horst "Hein" Uphoff on shore he shouted: "Well Hein are the Nazi still at the helm?" Upon hearing they were, Teddy ordered all engines "full astern" as the boat slowly headed for the open seas again.

The final tie-up, the departing crew, and the mandatory briefing of the captain give us one more story. Admiral Dönitz had a gentle but firm rebuke for Teddy. As he was telling the story of the "dark as a bear's arse" he was cut short. Using his sternest voice, The Lion, reminded the captain of his vaulted position within the Wehrmacht and thus he should choose his language more carefully. In spite of the dress-down by the Admiral, the final version of the boat's War Diary read: "Excellent undertaking by this proven commander. The convoy attacks, both in conception and execution, were carried out in an exemplary manner."

Continued rewards were also given to Suhren. He met with Grofsadmiral Raeder:

> "This time I came up to Berlin on the overnight train in the proper manner as befits a soldier. I appeared at 1355 hours in the Kaiserhof. There I met the Oberbefehlshaber de Marine already there and said, apologetically so to speak, "Oh, Grofsadmiral, are you here already?' Where upon he replied with a laugh, "Yes, yes, and you without a trail of exhaust fumes today!"[29]

After a brief visit with Hitler to receive his decoration of the Swords to his Knight's Cross, he was invited to the private retreat of the Fuhrer. He rubbed shoulders with the heights of power and danced with Eva Braun and her sister.

Legends of Teddy's disrespect for authority and his prowess at the bar made their way as far as the United States Navy. As the story goes:

"Bargsten's most intimate friend and classmate was KK Reinhard "Teddy" Suhren. It was stated that Suhren, good looking, and popular, could considerably lower the alcoholic stocks of any port in which he found himself. . . On another occasion Suhren was stalking a convoy which he had previously reported. . . In due course he received an 'inspirational message' from Dönitz telling him to 'pursue relentlessly and fiercely.' Upon returning from this cruise, which was highly successful, Suhren was summoned to Dönitz' office to give his report. In the course of the interview, Suhren violated decorum by referring to the signal as unnecessary, if not insulting. Dönitz was momentarily taken aback by this impudence, but recovered in time to seize Suhren by the neck, lay him across a table and administer a sound spanking to the naughty boy."[10]

In retirement and enjoying a celebrated life, Teddy Suhren learned of his boat. U-564 being classified as Vermitz zwei Stern—"missing two stars." The German parlance for 'confirmed lost. . .' Two years later the war ended. This outstanding warrior was taken prisoner by the British Oslo in 1945. By 14 April 1946 he was released and traveled home to a defeated Germany. He prospered as a business man distilling 38 percent black rum from sugar. His "Schnapps Factory" was producing 'torpedo spirits.' The product was more valuable than the Reichmark notes.

On 25 January 1984 in his beloved Hamburg, the life of the ACE of Aces came to an end. Exactly 31 years after the U-564 had gone to the ocean's bottom, another man was laid to rest. Teddy had requested his ashes be released at the exact location of his beloved boat. At 46 degrees, 30 minutes N, 07 degrees, 18 minutes West, the ashes of Reinhard "Teddy" Suhren were scattered among the swells of the Atlantic Ocean.

There and no roses on a sailor's grave,
No lilies on an ocean wave,
The only tribute is the seagulls sweeps
And the teardrops that a sweetheart weeps.

—German Song

ENDNOTES

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27. Paterson, ibid., 162.
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USS SKATE AND THE FIFTH FLEET

by William P. Gruner

Editor's Note: Mr. Gruner left the Navy after World War II. He had command of SKATE toward the end of the war. His post-war career was with Lockheed in California. He wrote this article for the Naval Undersea Museum in Keyport, WA before his death several years ago. It is published here with permission of Mr. Bill Galvani of that Museum.

The year was 1943 and U.S. fortunes of war were improving. On September 5th, the new fleet submarine USS SKATE (SS305) arrived in Pearl Harbor for training, deperming and a sound survey to make her less detectable by Japanese MAD and sonar gear. She had been built at Navy Yard Mare Island, California, and placed in commission on April 15 under the command of Commander Eugene B. McKinney. McKinney was a veteran submarine skipper. He had commanded the fleet submarine SALMON for five war patrols in the South China Sea. In SALMON he had skirmished inconclusively with two Japanese destroyers and sent a large repair ship, a passenger-cargo ship and a converted salvage vessel to the bottom.

The new arrival found that the Pacific Fleet had undergone many changes since the Japanese attack on December 7, 1941. Early in the morning of that day, over 350 fighters, bombers and torpedo planes from six Japanese carriers had done their jobs and departed. Rendered *hors de combat* were eight of the nine battleships of the Pacific Fleet. Added to this loss were most of the military aircraft on the island. Fortunately, our three Pacific Fleet carriers were not in port that day. LEXINGTON and ENTERPRISE were at sea and SARATOGA was at San Diego for repairs.

Two days later Japanese land-based aircraft sent HMS PRINCE OF WALES and REPULSE to the bottom off the coast of Malaya, 6,000 miles away. Suddenly, both military and armchair strategists throughout the world were convinced that even large well armed surface ships were vulnerable to air attacks launched from hundreds

of miles away. Until the attack on Pearl Harbor, the keystone of U.S. naval strategy for over 100 years had been based on *control of the seas*, and in the early twentieth century it was the job of our battleships to exercise that control. Now, the time had come for a drastic revision of U.S. naval strategy. The new strategy was patterned after that first employed by Admiral Isoruku Yamamoto, CinC of the Japanese Combined Fleet. Almost a year before the attack, Yamamoto had ordered his staff to develop plans for a carrier air strike on Pearl Harbor. His instructions were clear. The operation was to depart from the generally accepted doctrine of employing carriers as a protective force for battleships and instead use them as an offensive air weapon.[1] With no battleships to form a new battleline, our naval command now had to look to aircraft carriers to carry the war to the enemy.

The attack on Pearl Harbor had other important effects. President Roosevelt had quickly appointed Admiral Ernest J. King to the post of Commander-in-Chief, U.S. Fleet, with headquarters in Washington. In turn, Vice Admiral Chester W. Nimitz became Commander-in-Chief of the Pacific Fleet. Significantly, both King and Nimitz were ex-submarine officers with an appreciation of how submarines could best be used. Prior to the attack, our submarines had been attached to the Scouting Force, Pacific Fleet to be deployed as advanced scouts for the battle force. Now, without a battle force to scout for, and without the speed to keep up with a fast carrier task force, the Submarine Force, Pacific Fleet, was formed. Its commander in 1943, Rear Admiral Charles A. Lockwood, Jr. reported directly to Commander, Pacific Fleet. Fortuitously, the long range, long endurance, speed, and large torpedo load design requirements for the scouting mission were nearly ideal for new submarine missions in the vast Pacific.

Actions had been rapidly implemented after Pearl Harbor to rebuild the Pacific Fleet. By mid 1942 repairs had been made to most of the damaged and sunken ships. In addition, new ships, planes and men began to join the fleet at an accelerating pace. Of particular importance to Pacific Fleet power was the addition of both large fleet carriers and smaller carriers converted from other hulls. By mid 1943 war production held promise of being able to provide sufficient resources to continue the offensive already underway in the South

Pacific, and to open a new offensive in the Central Pacific. Toward that end, CinCPac staff was busy creating plans to dislodge the Japanese from their mid-Pacific island outposts. By being at the right spot at the right time, SKATE had the opportunity to conduct her first three war patrols concurrently with Fifth Fleet attacks on Japanese held island groups from Wake to Truk.

It had so happened in the late summer of 1943 that Rear Admiral Charles A. Pownall, Commander Carrier Task Force Fifteen, had requested ComSubPac to assign submarines to patrol off the Japanese held islands of Wake, Marcus and the Gilberts during planned air strikes. They would be used to search for and rescue U.S. airmen forced or shot down at sea, and to provide navigational information to the airmen. Although such usage would divert submarines from their primary task of sinking enemy ships, ComSubPac agreed. Accordingly, SKATE and two other submarines were assigned to perform what became known as *Lifeguard Duty*.

Fleet operations to regain the Central Pacific began with an attack on Wake Island in early October 1943, and then rolled relentlessly westward. The strike on Wake had three objectives: to test new strategic concepts and tactics using the strengthened Pacific Fleet; to neutralize Japanese air power at Wake; and to regain an offensive posture. Before the war, the Japanese had viewed Wake as a stepping stone between the Japanese mainland and Midway, Hawaii and the U.S. west coast. Accordingly, like Pearl Harbor, it had been attacked on December 7, 1941, and occupied two weeks later.

At midday on September 25th SKATE departed Pearl with orders to patrol off Wake. Upon arrival on station on the morning of October 4th she closed the atoll and submerged to conduct phot-reconnaissance. Two days later Task Force 14 under the command of Rear Admiral A. E. Montgomery arrived off Wake to carry out a carrier air/cruiser bombardment. SKATE was on the surface west of the atoll ready to perform lifeguard duties. The strike commenced at early dawn. Quoting from SKATE's patrol report[2]

> "0448 (local time) — Sighted much flak and anti-aircraft fire from Wake. Many planes were in the air over Wake dropping bombs and there were several dog fights. Eight or ten planes were seen to fall and our planes were seen to form up." The

report continued with a sad note. "We were attempting to close on the surface toward the nearest crash when at 0545 what appeared to be a Jap Zero suddenly dove out of a nearby cloud and started strafing us. Plane was coming in low from the starboard beam. Made a quick dive. After getting below it was discovered that Lieutenant (jg) Willis Edward Maxson, III, U.S. Navy, junior Officer-of-the-deck, had been hit by a bullet . . ." He was very seriously wounded.

SKATE surfaced a half hour later to resume the search. Several U.S. and enemy planes were noted in the air, as was a trail of 25 cal. bullet holes through the STS armor plate protecting the bridge and conning tower. At 0808 SKATE was again forced to dive by two Jap planes making strafing runs from a distance of about two miles. Seconds later the planes flew over the disappearing periscope but loosed no bombs as SKATE passed 50 feet on her way down. At 0900 she surfaced to resume her rescue mission, but was again forced down. It appeared that our aviators had failed to gain control of the air that day.

It was squally and overcast the next morning, October 7th. Several squadrons of friendly aircraft were soon sighted, and at 0601 SKATE

"Exchanged visual signals with a squadron of friendly dive bombers. Four of them circled us several times and . . . asked the bearing and distance to the target. We informed them and they headed in the proper direction. Anti-aircraft fire and bombings started shortly thereafter." At 1043 "when about 6 miles from shore searching for downed aviators a heavy shell hit about 400 yards on the port bow. Another whistled over the bridge and hit about 800 yards astern and as we were diving the third hit about 200 yards on the starboard quarter." The Japs were getting closer, but no cigar that time.

Upon surfacing at 1128 word was received that three aviators were down. They were soon sighted about 2 miles off the beach. Trimmed low in the water, SKATE headed toward the beach with Ensign Francis Kay, gunner's mate William Shelton, and torpedoman Arthur G. Smith on the bow to make the rescue. Despite

the fact that, "The were firing at us from the beach and small and heavy shells were hitting all around us", Lieutenant Harold J. Kicker, USNR was snatched from the sea forty-five minutes later. Minutes after that Smith went over the side with a life ring and towed Ensign Murray H. Tyler, USNR to the submarine where torpedoman Frederick J. Lambert assisted in bringing the exhausted flier aboard. Further rescue efforts were interrupted by a Jap dive bomber. While submerging, a near miss damaged the bow buoyancy tank vent-operating mechanism but repairs were quickly made and SKATE soon surfaced.

At 1242 another aviator was reported down off Peacock Point. While closing the reported position "a heavy shell hit 500 yards on our port beam and ricocheted with a scream over the bridge, followed by two more close overs. Made a quick dive and heard three more shells strike the water and they sounded very close." SKATE surfaced forty minutes later to again resume searching. More Japanese planes were sighted and at 1459 SKATE was bombed while passing 60 feet on her way under. Two bombs exploded about a minute apart, but did only minor damage. Plane contacts continued to be observed through the periscope until the ship surfaced at 1822. Although Jap planes continued to be present during darkness, they made no further attacks that night.

By early morning of the 8th, Lieutenant Maxson's condition had worsened and in accordance with instructions, SKATE headed for Midway where medical help was available. Her return was interrupted by orders to return to Wake to rescue nine airmen adrift in the open sea. Unfortunately, Lieutenant Maxson succumbed to his wounds during the morning. He was buried at sea the next night.

The search for downed airmen was resumed during the early morning hours of October 9th, and at 1033 a life raft was sighted. However, another Jap plane forced SKATE to dive. She surfaced at 1119 and twenty minutes later Lieutenant (jg) Richard G. Johnson, USNR, was brought aboard. The search continued on October 10th, and early in the morning a red flare was sighted at what appeared to be about 5 miles distant. SKATE headed directly for it, but nothing was sighted until she had gone over 15 miles. Then a raft was sighted and soon SKATE rescued Lieutenant (jg) William E. McCarthy, USNR, and Paul T. Bonilla, AOM, USNR. Later the

same afternoon Commander Mark A. Grant, USN, an Air Group Commander was rescued. SKATE remained in the area until October 14th and continued to observe enemy air activity. As a parting gesture a VAL dive bomber made a bombing run that afternoon from a distance of 3 miles. Although the bomb detonated as SKATE passed 110 feet she escaped damage. Early on the night of the 14th, SKATE departed for a newly assigned patrol station. She encountered no significant action there and left for refit at Midway on the evening of the 23rd, and arrived five days later.

Altogether, SKATE had plucked six aviators from the sea during the strike on Wake. She also vectored one of our dive bomber squadrons to its target. In the process she was bombed three times, fired on by shore batteries three times, strafed twice, and lost one very fine young officer to the initial strafing. SKATE's persistence in searching for downed airmen in the midst of bombs, shells and bullets required great courage, coolness and determination on the part of the entire crew. In acknowledging SKATE's accomplishments, the Commanding Officer of LEXINGTON radioed, "Anything on LEXINGTON is yours for the asking. If it is too big to carry away, we will cut it up in small parts."

Although other submarines had previously stood by to rescue airmen during strikes, it was SKATE's successful performance that opened a new chapter in submarine operations. From that day until the end of the war, no important carrier strike was made without one or more lifeguard submarines on station. By the end of the war our submarines had rescued 504 airmen from the sea.

On to the Gilberts

While SKATE was engaged in performing life-guard duties, the Pacific Fleet staff was busy preparing plans and assembling resources for the next step across the Pacific. In planning an offensive to drive the Japanese from their islands, two major problems confronted the planners. First was the fact that over the years the Japanese had taken or fallen heir to island groups which gave them control of the Central Pacific. The keystone to that control was Truk, their fleet's main base. Providing a defense in depth were strategically located bases on island groups throughout the Central Pacific. A related problem was the manner in which land was

distributed throughout the vast expanse of the Central Pacific. Approximate distances to some of these bases are: Pearl Harbor to Wake 2050 nm; to Johnston Island 780 nm; to Kwajalein and Tarawa 2050 nm; and to Truk 3050 nm. The distance from Wake to Truk is about 1100 nm and from Kwajalein to Truk about the same. It was clear to the planners that if the Japanese bases were to be taken, attacks would have to be made by carrier based aircraft and surface ship bombardment, followed by amphibious landings.

By the time SKATE returned to Midway for refit in late October 1943, the fleet had been reorganized. Vice Admiral Ramond A. Spruance had been given command of Fifth Fleet. It was composed of 118 warships, including 13 battleships, 19 carriers, a large number of lesser combatants, plus transports, supply ships and auxiliaries. Its first major operation was *Operation Galvanic*. The objective was seizure of the Gilbert Islands, a group of coral atolls lying about 2,000 miles west-southwest of Pearl, and far to the east of Truk. Of the numerous bits of coral reef protruding above the ocean in the Gilberts, Tarawa, Makin, and Apamama were the main atolls to be taken. Of these, the primary objective was Tarawa. Fifth Fleet struck all three atolls on D-day, November 20, 1943. By that time Japanese defense forces in the Central Pacific had been greatly weakened by both ship and aircraft losses in the South Pacific. Consequently, reinforcement from there and from Truk were unavailable. Makin, the northernmost atoll was taken in two days by the Army's 27th Division following air attacks and bombardment by battleships of the invading force. Similar attacks were made on the islet of Tarawa, and that atoll was taken after bitter fighting by our marines on Betio islet. Within ten days of *Galvanic* objectives had been achieved.

Ten submarines participated in *Galvanic*. Of these, nine were placed along the route east of Truk to intercept reinforcements proceeding to the attack area. NAUTILUS, however, was more directly involved. She performed reconnaisance and lifeguard duties off Tarawa immediately prior to the attack, and then transported eight officers and 70 marines to assist in the taking of Apamama. In a case of mistaken identity during darkness while enroute with her marine detachment, her conning tower plating was holed by a five inch shell from a less than friendly destroyer. Nevertheless, she was able to dive to escape and carry out her mission.

An assessment of *Galvanic's* complete and rapid success proved the validity of the new coordinated carrier and land based air, surface ship, amphibious and support team strategy. With success in hand and a force in being, plans were made to accelerate the planned capture of the chain of Marshall Islands extending some 350 to 750 miles to the north-northwest, and closer to Truk. The date set for the new operation, *Flintlock*, was late January of the new year. While major segments of the fleet were bing readied, minor harrassing strikes were made against the Marshalls and as far west as Nauru, 350 miles beyond the Gilberts.

With activity heating up in the Central Pacific, more submarine operations were planned for that area. SKATE departed Midway November 15, 1943 to conduct her second patrol in the area to the north of Truk. She arrived on station a week later and commenced reconnaissance and a search for targets. It was during this patrol that SKATE began to earn her reputation as the "Big Game Hunter of World War II". A number of distant ship contacts were made off the north entrance to the atoll, but could not be approached close enough to permit an attack until mid-morning of the 30th. While patrolling on the surface, a task group was detected. Course was changed to intercept what was soon identified as a converted aircraft carrier escorted by two destroyers with heavy air cover. Two additional destroyers and two large carriers were soon seen to be following the first carrier. When the range to the large carriers had closed to about 9,000 yards, SKATE submerged and headed in for a bow shot. Coming to periscope depth at 1106, it was observed that the targets had zigged and that it would be necessary to fire from the stern tubes. Six minutes later when a look through the periscope showed the two large carriers to be overlapping, three torpedoes were fired at a range of about 1,500 yards. The patrol report read, "One minute and fifty seconds after firing a large geyser of water arose just forward of the center of the nearest carrier and the entire ship heeled to port. The explosion was heard but no smoke. The near carrier appeared to hold course and speed while the overlapping carrier turned sharply about 90° to port."[3] The escorts rushed in to drop a pattern of depth charges and then unexplainedly returned to their escort positions.

Suffering no damage, SKATE resumed her patrol. A number of

air and ship contacts were subsequently made, and although twice depth-charged, she was unable to get in any further attacks until the night of December 20th. At 2123 a single large ship with two escorts came within radar range. Running on the surface to gain position ahead of the group she submerged to attack at dawn. At 0620 four torpedoes were fired at the large ship. A mishap during the firing caused the submarine to broach in plain sight of the escorts and as the escorts closed for the kill the Captain ordered the Diving Officer to "take her deep". The torpedoes were still on their way as SKATE passed below periscope depth and no further visual observation could be made. However, the sonar operator soon reported three hits. Thirty-eight depth charges shook the ship during the next five hours. Specks of dirt were loosened in the periscope optics and the deck mounted JP sound head was knocked out, but no major damage was inflicted. When SKATE surfaced shortly after noon a glow of burning oil was reflected in the sky, and later that night a tremendous explosion was heard and flames shot high into the air. The 6,400 ton freighter of the TERUKAWA MARU class had carried her last cargo.

The patrol continued without undue excitement until early in the morning of Christmas Day. Contact with a small group of ships was made while patrolling on the surface. Unidentified at the time was a very large ship escorted by two destroyers. SKATE submerged to close the target and fired a spread of four torpedoes. Quoting from the patrol report, "After a (torpedo) run of about two minutes there was one definite explosion followed by another muffled explosion." A brief depth charging discouraged further observations and shortly thereafter the target group disappeared over the horizon.

Post-war disclosures by Japanese sources confirmed the identity of the target as the battleship HIJMS YAMATO. As she sped away her Commanding Officer reported by despatch, "On 25 December 1943 at 180 nautical miles north of Truk, at latitude 10° 5' N. And longitude 150° 32' E., one torpedo hit was received from a single enemy submarine. A hole about 5 meters depth, extending downward from the top of the bulge connection (at the armor) and 25 meters in length, between frames 151 and 173, was produced. Water flowed into the No. 3 (turret) upper magazine from a small hole in the longitudinal bulkhead caused by caving in of water-line armor."[4]

YAMATO was 863 feet long with beam 127 feet, draft 35.6 feet and displacement 73,000 tons. She mounted nine 18.1 inch guns in three turrets and had a top speed of 27 knots. YAMATO and her sister ship, MUSASHI, were the largest and most powerful warships built by any nation. Extensive design analyses and tests conducted prior to and during construction made them as unsinkable as the state of the art would permit. To that end the designers provided multiple longitudinal bulkheads which incorporated one armored bulkhead in addition to the normal heavy armor belt protecting vital engineering and ordnance spaces. Because of her defensive capability, YAMATO barely hesitated after being hit by SKATE's torpedo.

The torpedo that did the damage was the infamous Mk. 14-3A steam torpedo armed with a Mk. 16 warhead loaded with 600 pounds of Torpex. Although depth was set for 10 feet, the torpedo apparently ran at half that depth. The reason for failure of the other three torpedoes is unknown. However, in view of the size of the target and the position of the single hit along the hull, it is likely that the blame rests on the unreliable Mk. 14-3A torpedoes and their faulty Mk. 6 exploders.

SKATE returned to Pearl on January 7, 1944 to receive congratulations from ComSubPac for putting one Jap carrier and one battleship on the injured list and sinking one maru.

Operations Flintlock and Hailstone

After the Gilberts had been taken, CinCPac established *Flintlock* as the next major step in the Central Pacific. *Flintlock* entailed the capture of the Japanese held Marshall Islands including their major base at Kwajalein atoll. The Marshalls differed from the Gilberts in that there were many more coral atolls and islets occupied by military installations, and they were spread over a much larger area.

CinCPac's plan called for gathering forces from California, Hawaii, Samoa, the Ellice Islands and other bases, and set D-day as January 31, 1944. The three major bases to be seized were Roi-Namur, Majuro and Kwajalein. Seizure of Eniwetok was planned for later. In accordance with the plan, a massive armada descended on the Marshalls. Fifth Fleet's Task Force 58 advanced with 6 large carriers, 8 battleships, 6 cruisers and 36 destroyers. The landing force of 297 ships and 53,000 assault troops followed. Bombardment

of enemy air bases commenced on D-3 day in the area between Roi-Namur in the north, Majuro in the south and Eniwetok in the west. Kwajalein was quickly occupied after a *Spruance haircut* had obliterated all the palm trees and buildings on the atoll. Majuro offered no resistance, and by D-1 all bases were neutralized. By late February 2 the main objectives had been occupied, eight weeks ahead of schedule.

The following day a Marine Liberator flew from the Solomons to Truk and took the first photo-coverage of the great base since the Japanese had taken it over from the Germans after World War I. Perhaps more important than the photos was the warning given Admiral Koga that the Americans would soon attack major elements of the Combined Japanese Imperial Fleet at Truk. Faced with depleted resources, Koga decided not to risk a decisive engagement until his carriers could be replenished with planes and pilots, and wisely began a withdrawal to the west. His move was timely for Admrial Spruance's staff had planned *Operation Hailstone* for a carrier strike on Truk. D-day had been set as April 15.

In late January, Lieutenant Commander William P. Gruner relieved Commander E. B. McKinney in command of SKATE. He inherited an outstanding crew and a great ship. Gruner's seven war patrols as Executive Officer of PIKE, SUNFISH and APOGON made him well qualified for command. D-day for the Marshall operation, *Flintlock*, was just a week away when SKATE left Pearl to proceed once again to the Truk area. The date for Fifth Fleet's strike on Truk was still in the offing. When *Flintlock* went off like clockwork, CinCPac advanced D-Day for Hailstone to February 17 while SKATE was still enroute. ComSubPac had participated in the Planning for *Hailstone* and had assigned nine submarines to the operation. Near Truk were SEA RAVEN and DARTER, SEAL was off Ponape, and six other subs were placed along escape routes from Truk. Their objectives were reconnaissance and the sinking of Japanese ships attempting to flee Truk when Fifth Fleet struck. When the date for the strike was advanced, ComSubPac sent despatch orders to SKATE to take station about 150 miles northwest of Truk. SKATE's orders carried the proviso that she had to be west of Longitude 152° E. by midnight of the 16th. At that time the area to the east of 152° E. would become a "blind bombing zone" where

SKATE would be fair game for any aircraft–Japanese or U.S. That posed a problem. Stormy weather with head seas had set in, but it was necessary to maintain speed as best possible to avoid the blind bombing zone. That meant running on the surface with no opportunity to dive to "check the trim" (i.e. compensate for fuel used and other weight changes). To quote from the Patrol report[3] of February 12, "1000–Wind has shifted during the night from east to southwest, through the south. Sea is rough, wind about 25 knots, increasing." An attempt was made to hold to two engine speed, initially about 13 knots, but green water was coming over the open bridge. At "1048–A large wave coming over the port side almost knocked the starboard lookout out of his platform high on the periscope shears." The lookout was William A. Shelton, the gunner's mate who had helped rescue the airmen during the first patrol. Shelton's fingers clung to the platform supports while the green water strove to wrest him from the ship. When the water momentarily subsided, the deck watch helped him down to the bridge level and lowered him into the conning tower. His back had been badly wrenched in the ordeal and he spent the rest of the patrol in his bunk. Despite the casualty it was necessary for SKATE to keep plowing through the seas. "The control room is very wet from water pouring down the conning tower hatch. Speed has been gradually reduced until at 1100—We are able to make only 8 knots. The conversion of (ballast tanks) 4A and 4B to fuel ballast tanks has greatly reduced the sea keeping qualities of the ship. Seas from ahead sweep right over the deck although they are not unusually high. Safety and negative (tanks) have been blown dry with no appreciable improvement."

On the morning of the 15th the report noted, "Seas have shifted to the northwest and we have increased speed. If the wind stays where it belongs we should be able to make our schedule." Two radar contacts were made that day on planes that did not close. The next afternoon a plane contact at 13 miles forced SKATE to dive. Confident that she could now cross the critical longitude before midnight, the opportunity was taken to get a trim. Then with a good trim, SKATE descended to over 400 feet and unhappily found the water temperature in the area to be constant to at least that depth. That meant that no layer existed to hide under from enemy sonar should she get attacked.

Luck plays an important role in war as in life. Within minutes after surfacing at 1635 a lookout sighted the superstructure of a large ship, bow on, at a range of 12 miles. At the same time, a plane contact at 13 miles dictated immediate submergence. Due to the low height of the periscope lens above the surface, the target could no longer be seen. Meanwhile, somehow alerted, sporadic Jap depth bomb or charge explosions could be heard. None were close enough, however, to do any damage. At 1722 the foremast of a Japanese cruiser came into periscope view. She was accompanied by destroyers on either beam and had possible air cover overhead. It appeared that the group would pass beyond torpedo range, but thirteen minutes later the cruiser's luck ran out. She zigged toward SKATE to present a 30° angle on the bow at a range of 5,000 yards. She appeared to be a Kako class heavy cruiser with single stack, two turrets forward, one turret aft, and a scout plane at rest on the catapult between them. The starboard destroyer was well positioned for protecting her as it was headed directly for SKATE when she fired four torpedoes from the bow tubes at a range to the cruiser of 2,300 yards. Actions then accelerated. SKATE sought greater safety at depth as she rigged for depth charge. Three torpedo explosions were heard as she started down. A last look through the periscope showed the cruiser to be in a direct line with the setting sun so that only a smoke pall could be seen which extended from bridge to stern. Sonar reported a fourth hit as the starboard escort put on speed to attack. Seconds later the escorts started a heavy and continuous depth charging which lasted for the next 45 minutes. Their attack then slackened, but continued off and on for another hour as the submarine withdrew to the east.

It was important for SKATE to confirm the results of this attack on an important Japanese combatant so she surfaced at 2115 to return to the scene. Flames and explosions were sighted in the distance, so a course was taken to circle the target group to attain a down-moon position for a second attack should it be required. At 0240 the wounded cruiser, later identified as AGANO, gasped her last breath and sank beneath the waves. Midnight had now passed and the area had changed to a blind bombing zone. As SKATE sped west toward safe operating territory she transmitted a report of the sinking. A few hours later Task Force 58 finished the job by sinking the escort destroyer MAIKAZI with her load of cruiser survivors.

This attack became the finale of SKATE operations directly involved with the Fifth Fleet. However, she did make several more attacks on Japanese shipping during the balance of this patrol, but none resulted in confirmed sunk or damaged ships. In one night surface attack on a small escorted convoy off Palau she instilled the fear of the Lord into the enemy when another faulty Mk. 14-3A torpedo exploded prematurely shortly after being fired. Thereupon, every ship in the convoy participated in a fireworks display rivaling a Mexican Cinco de Mayo celebration. Colorful tracers and star-shells flew in all direction to illuminate the area.

To further her reputation as a big game hunter, SKATE, on her fifth patrol, sank the large FUBUKI class destroyer USUGUMO in the Okhotsk Sea. Then on her last patrol under the command Command Richard B. Lynch she penetrated the mine field protecting the Sea of Japan to sink the large submarine I-122. Finally, to end her career, this famous ship became a target for both air and underwater nuclear weapon tests at Bikini in July 1945. Although surviving with extensive damage, this fine warship was later intentionally sunk off the California coast.

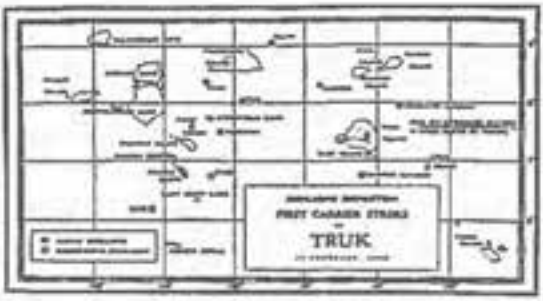

Figure 2 Submarine Disposition During Operation Hailstone

ENDNOTE

1. "The Simon and Schuster Encyclopedia of World War II".
2. ComSubPac Patrol Report No. 298 of 11/6/43, USS SKATE - First War Patrol.
3. ComSubPac Patrol Report No. 345 of 1/13/44. USS SKATE Second War Patrol.
4. Extract from a post-war report prepared by the Naval Technical Mission to Japan on the loss of major units of the Japanese Fleet.
5. ComSubPac Patrol Report No. 393 of 3/26/44. USS SKATE Third War Patrol.

REUNIONS

USS SEA LEOPARD SS-483 April 23-27, 2005
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USS SENNETT SS-408
27 Apr-02 May, 2005 Panama City, FL
Location: Edgewater Beach Resort
POC: Ralph Luther, P.O. Box 864, Summerville, SC 29484-0864
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USS CHOPPER SS-342
April 13-17, 2005 New Orleans, LA
Location: Radisson Hotel, 1500 Canal, New Orleans, LA 70112
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USS SEA DEVIL SS-400/SSN-664
April 14-17, 2005 Norfolk, VA
POC: Mike Martin, ETCS(SS), 2542 Deep Creek Road,
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Web site: www.seadevilssn664.org

USS STERLET SS-392
April 21-25, 2005 Chicago, IL
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E-mail: RJarenski@aol.com

SITE 1 HOLY LOCH SCOTLAND ASSOC.
May 12-16, 2005 Dunoon, Scotland
Location: Hunters Quay Holiday Center
Anyone, service member, dependent or civilian, if you lived, served in, or sailed from the Holy Loch you are welcome to come.
POC: Doug Ebert Phone: (207) 845-3188
E-mail: kdebert@midcoast.com Website: www.holyloch.org

SUBMARINE NEWS FROM AROUND THE WORLD

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From the October 2004 Issue

CANADA—The Future of the Victoria (Upholder) Class Submarine

On 06 October 2004, a fire broke out on the Canadian Navy (CN) submarine, the HMCS CHICOUTIMI (ex-UPHOLDER) as it transited from the United Kingdom (UK) to Canada. The cause of the fire is currently unknown, however, it is the latest in a series of setbacks for the CN submarine program.

The submarines, built from 1983 through 1988 were decommissioned by the Royal Navy (RN) in 1994 due to defense cutbacks associated with the end of the Cold War. Canada, lacking a submarine since the retirement of the Oberon class in the mid 1990s, decided to lease four units of the class under a lease/purchase program.

The agreement, formally announced on 06 April 1998, called for a US$525M eight-year lease-to-buy, interest free contract with the UK, with an option for outright purchase at the end of the lease for a nominal fee of one pound sterling with US$426M for the actual lease/purchase/reactivation of the submarines and the balance going to training, modifications, and spare parts.

The first three units were delivered to the CN from 2000 through 2003 with the final unit, HMCS CHICOUTIMI (ex-UPHOLDER), being transferred on 02 October 2004. The problems currently being experienced by the HMCS CHICOUTIMI continue with a trend that began since the deliveries started in 2000. It appears that the first three units (VICTORIA, WINDSOR and CORNER BROOK) have been plagued with problems since transfer. Some of the complaints by Canadian naval officers include overheating, leaking of valves and the hull as well as rusting.

This procurement has to be a dilemma for the sea service since it had planned to purchase all four of the units outright in 2006 when the lease expires and keep the vessels in service for at lest 25 years. The Navy also had plans to replace the Mk 48 torpedo system and procure a surface-to-air missile (SAM), as well as possibly adding an Air Independent Propulsion (AIP) system).

With 2006 approaching rapidly, the CN will soon have to decide on whether to stick with the Victoria class and procure the submarines outright in 2006 or cut its losses and move on to another submarine program, neither of which will probably be popular with the Canadian government.

DENMARK—Departing the Submarine Business, Who Will Take Them

In June 2004, Denmark's Ministry of Defense released the Danish Defence Agreement 2005-2009. One of the highlights of the agreement was the announcement that the Danish Navy would exit the submarine business with all four units (three Tumerlen and one Nackan class) to be retired. As of early October 2004, AMI has received information that all four units would be decommissioned by 01 January 2005. With the decommissioning of the four units, one must examine the potential for resale in the used ship market.

The single Nacken class (KRÖNBORG) was received from Sweden under a lease, buy or return program on 17 August 2001. The lease, buy, return contract is set to expire in 2005, which makes the Danish Navy decision easy. With the return of the Nacken to Sweden, it opens up new possibilities for the resale from Sweden. In September 2004, the USN began discussing with the Swedish Navy the lease of a Swedish submarine with crew to conduct training in the Baltic region. The USN, without any conventional submarines in inventory, wishes to shore up its training against non-nuclear submarines. However, it must be noted that there is some resistance in the Swedish government concerning the leasing of a submarine and crew to the US. It is possible that with the return of the Nacken from Denmark that the US could purchase the Nacken and forego the lease option for an active Swedish submarine. The purchase of the Nacken would have a drawback as the US has very limited experi-

ence in operating conventionally-powered submarines, but perhaps a Danish crew could bring the USN up to speed.

In regards to the three Kobben class, these vessels were originally built in the 1980s and will be very difficult to transfer, although possibilities do exist. There are several countries that do not have a submarine capability but wish to establish the capability and several nations that are transitioning their naval forces from the Soviet-era to a Western force. In regards to establishing a Submarine Force, it can be an extremely expensive endeavor especially considering the vessels are approaching 40 years of age. In regards to Bulgaria and Romania that are transitioning to a Western force since joining NATO, it might be an attractive option. Recent reporting suggests that the Bulgarian Navy is interested in possibly acquiring one of the Kobben class to replace its obsolete/non-operational Romeo class.

The countries that have expressed a desire to establish or reestablish a Submarine Force include Thailand, Phillippines and the United Arab Emirates. However, as mentioned above, purchase of the Danish Kobben class must be considered extremely remote for these three candidates.■

REUNIONS

USS ROBERT E. LEE (SSBN-601)
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A CONTINUING DISCUSSION

by Norman Polmar

At the request of the editor of The Submarine Review, Captain James Hay, I will not respond point-by-point to Jerry Holland's critique of my comments on the article *Really New SSNs* in the Naval Institute *Proceedings*. It is perhaps sufficient to say that even participants have differing opinions of events, while contemporaneous records—official and unofficial—also differ on several of the points raised.

Hopefully, our exchange fostered some thinking among participants in the current debates over future submarine designs and force levels. At the risk of being presumptuous, I would put forth a few assumptions related to our exchange that I believe can be accurately labeled as *facts*:

1. Larger does not always mean better.
2. Larger almost always means more expensive.
3. Many (most?) Americans prefer *larger*– a cultural characteristic–as evidenced by the growing sales of SUVs, the overly large portions in many popular restaurants, the trend toward larger homes (albeit with smaller yards), etc.
4. VIRGINIA (SSN 774) is a very good submarine, despite being significantly smaller than SEAWOLF (SSN 21).
5. The submarine community has not made a case for 55 or more SSNs to all of the key *players* in defense decision making; accordingly, a reduction in SSN force levels can be expected over the next few years.

Again, I hope that this exchange has been illuminating to at least some readers. As Benjamin Franklin is reputed to have said, "Agreement produces very little. Disagreement produces discussion and debate, and that leads to progress, invention, and innovation."

HOW A COMMANDING OFFICER OF USS NAUTILUS CAME TO LOVE THAT SUBMARINE

Rear Admiral Richard A. Riddell, USN(Ret)
Commanding Officer of USS NAUTILUS (SSN571)
December 1976 - March 1980

Golden Year Lecture Series
Historic Ship USS NAUTILUS
and Submarine Force Museum
Groton, Connecticut
November 17, 2004

Good afternoon. It's a great pleasure for me to be back in Groton, Connecticut, and a special pleasure to be involved in an event connected with USS NAUTILUS.

I really loved that old ship. Having Command of USS NAUTILUS was the best assignment I had in the U.S. Navy.

Having command of any nuclear submarine is a wonderful thing. But NAUTILUS was truly special because it had a lot of name recognition. This name recognition led to a lot of special treatment throughout its life. Visitors knew about the ship, and we hosted a large number of VIPs because of the ship's history. Even my mother had heard of NAUTILUS from news reports in the 1950s.

NAUTILUS was also special because it had a crew that had been specially selected for the ship. There was an understanding in Washington that NAUTILUS was a maintenance challenge, requiring a higher percent of technically capable officers and crew. Another factor making the ship special was that most of the crew was *stabilized* for the last several years of the ship's life. Because the officers and most of the crew were not transferred until the submarine was decommissioned, we had a stronger bond with each other than ship crews that had regular rotations.

Let me tell you a little about how I happened to be assigned to NAUTILUS. Then I want to share some stories and describe some of the unusual characteristics of the submarine.

When I completed my Executive Officer's tour, I received orders to command the new construction ship, NEW YORK CITY—the newest attack submarine. I was in heaven. I would be Commanding

Officer of the best submarine in the fleet.

However, when I arrived at Naval Reactors Headquarters for my three month Prospective Commanding Officers' Course, my door name tag did not have NEW YORK CITY on it—unlike the tags with names and ship assignments of the others in my class. Instead, under my name was "S3G-Core 3." I was told that I was being reassigned from the NEW YORK CITY to another submarine, and that I should study the "S3G-Core 3" manuals until the submarine was identified.

For a week, I studied the "S3G-Core 3" manuals and, in what would turn out to be ironic, joined the other members of my class in good natured kidding of the officer who was assigned to be Commanding Officer of USS NAUTILUS—the oldest of the old.

At the end of that first week at Naval Reactors, I was informed that I was assigned to USS NAUTILUS. The explanation was that the officer who was originally assigned to NAUTILUS was needed for a different submarine. This news required some attitude adjustment on my part.

Over the following three months at Naval Reactors and then three months at the SUBLANT Prospective Commanding Officers' Course, I found myself getting more and more excited about going to NAUTILUS. I was ready, in my own mind, to be a submarine Commanding Officer. And from what I could determine about NAUTILUS, the old submarine was still a sea-going ship, capable of shooting torpedoes, with a good crew, and an unusual but adequate engineering system. By the time I actually arrived on board NAUTILUS to conduct the required one month turnover of command, I was really *pumped* about this ship.

NAUTILUS operated like a *real* submarine, all the way until decommissioning. There was nothing that other submarines did that we couldn't do (or at least try to do).

In the beginning of my three and a half years in command of NAUTILUS, we were involved with the Mobile Acoustic Communications System, or MACS, which was a research project to obtain fundamental data on long range propagation of sound. This project required a huge antenna on the after deck of the submarine. The antenna would transmit an acoustic signal to a receiving submarine or surface ship well over a hundred miles away, with

multiple simultaneous signal frequencies, various antenna angles, different ocean bottom types, and a variety of weather conditions.

My most vivid memory of our time with MACS was the ability of the human body to adapt to the ear-splitting acoustic signals that were transmitted every few seconds. This went on for days and weeks at a time. Somehow, we learned to live with this noise—to sleep, watch movies, and even play poker on Saturday nights.

After MACS, we began getting the ship and ourselves ready for a full six-month Mediterranean deployment. From my perspective and from reports, our Mediterranean deployment was a great success. "We conducted important submarine operations, we were a key player in a number of fleet exercises, and we had a lengthy and successful maintenance and liberty visit alongside the submarine tender at LaMaddalena, Sardinia. On one occasion during a fleet exercise, I had reason to conclude that there is nothing more beautiful than an *enemy* aircraft carrier coming over the horizon at dawn, directly towards us, with our green flares (simulating torpedoes) filling the sky.

After the Mediterranean deployment, NAUTILUS conducted a variety of operations, including a proof firing of a warshot MK 48 torpedo, a trip to the Naval Academy at Annapolis for Homecoming Weekend, and participation in a big fleet exercise near Halifax, Nova Scotia.

In April 1979, NAUTILUS departed Groton and headed for Mare Island Naval Shipyard for inactivation. We stopped at Guantanamo Bay, Cuba; Cartagena, Columbia; Rodman, Panama; San Diego; and Oakland. At Mare Island Naval Shipyard, NAUTILUS was defueled, a number of engineering components associated with the propulsion plant were removed, and the crew carefully cleaned and painted the interior of the ship.

NAUTILUS was decommissioned on March 3, 1980, and the crew marched off the ship, each heading to his next assignment.

I have been discussing the operations of NAUTILUS, late in her life, because I find it astounding that this submarine, with its first-of-a-kind propulsion plant, could operate so well for almost 25 years. This is like the Wright Brothers aircraft being used for passenger service for 25 years, or the first Model T Ford being used as a taxi in a big city for 25 years. Although there have been many

improvements in the propulsion plans of subsequent submarines, NAUTILUS was good enough from the beginning to be a significant fleet asset throughout her life. My tour on NAUTILUS really made me appreciate the genius of Admiral Rickover and his team in building a propulsion plant that could run hard for 25 years.

Let me talk now about some of the unusual characteristics (or quirks) of NAUTILUS.

I believe that if you talked to members of any of the crews of this submarine, you would definitely hear the word, *hard*. The crew could tell you that many of the standard submarine things they had to do were just plain *hard* on NAUTILUS.

The simplest example of *hard* was cleaning the ship. The front end of NAUTILUS was difficult to keep clean but, in comparison to the propulsion spaces, the front end was a piece of cake. Many places in the engineering areas were essentially impossible to reach. Dirt or grease could be seen in the beam of a flashlight, but a hand and arm would not fit into the tight spaces. This cleanliness problem was aggravated by diesel and other oily drains going directly into the bilges and being spread by several inches of water in the bilges.

Other examples of *hard* include:

- NAUTILUS had motor-generator sets that were hard to maintain. These motor-generator sets required cutting out portions of foundations (with subsequent replacement) to provide access for changing bearings.
- Reactor Compartment access was hard, requiring chain falls to lift the access plugs. To enter the reactor compartment lower level, double protective clothing was required. This slowed down entry procedures, speed of work in the reactor compartment, and exit processing.
- The diesels required broaching the ship in order to start. In spite of advice from many experts, we never discovered why our diesels would not start at periscope depth, like other submarines.
- In the forward part of the ship, the radar would frequently go out of commission because of problems with the magnetic clutch in the mast. Lack of radar while returning to Groton in thick fog made for difficult choices—whether to continue inbound, using the ship's primitive electronic navigation plus visual observation

of the sea buoys, or to return to sea, on the surface until water depth increased, while hoping to avoid the numerous fishing boats in the area.

It was *hard* to back out of the New London Submarine Base piers without a tug. NAUTILUS' twin shafts were not parallel, but instead angled inward. This angle eliminated most of the moment arm between the shafts, resulting in little ability to twist the ship using her main engines.

Another difficulty was that in any sort of breeze, the ship would back into the wind. This backing confounded more than one Officer of the Deck during a man overboard drill, especially when the officer attempted to use the *wye backing* procedure.

It was *hard* to hear with the ship's sonar when NAUTILUS was making more than about four knots. Any sort of speed caused such rattling of the ship's superstructure that the resulting noise drowned out any sonar contacts. In spite of a lot of effort in looking for loose pieces of superstructure, the rattling persisted.

One final example of *hard* ways to do things involved our propulsion plant pre-underway sequence. Before getting underway after a maintenance period, with the reactor plant cooled down, we would use the reactor to heat up the primary plant to normal operating temperature. The reactor heat would cause the volume of water in the plant to expand, and we would discharge the extra water to an off-hull tank via a discharge pipe called a *gooseneck*. Here was the sequence. The gooseneck was welded to the hull, the off-hull valve lineup was established, the reactor was taken critical, the primary plant was heated up to normal operating temperature, the reactor was shut down, the off-hull valve lineup was changed, the gooseneck was removed, and the reactor should have been ready for lighting off the engine room. Now comes the *hard* part. When lining up the valves for completing this sequence, one of the key valves would usually stick and the reactor would cool down. This required us to do the whole sequence all over again. We went through this sequence two, three, or four times over the weekend before things would work right so we could get underway on a Monday. This sequence was great training for my crew, but it sure screwed up a lot of weekends for my Engineer Officer and his gang.

NAUTILUS had a perverse nature that made some of us wonder

whether the submarine was a bit human at times. The first day I was in command, we were at sea and I wanted to see some drills. The first drill was to be a *jam dive* drill, simulating the stern planes going to full dive. We were ready to commence this drill when the stern planes went to full dive. The planesmen took all of the correct actions and the recovery went well. I told the Executive Officer that the drill was excellent, but he should get my permission before commencing drills in the future. The Executive Officer told me that the jam dive was not a drill, but the real thing—happening just when we were ready to conduct the same drill.

NAUTILUS perversely bit us again, when we were having our first and only Family Cruise. (You'll see why this was our only Family Cruise). On a beautiful day, with a large number of wives on board, we sailed for Long Island Sound to dive several times and then return to port. On the way back, the Main Steam Stop Valves shut spontaneously, leaving the ship with only emergency propulsion and lighting. The Submarine Base scrambled to get two tug boats underway and headed for us. We began recovery steps for the Main Steam Stop Valves, but NAUTILUS wasn't through tormenting us, and we ultimately had to shut down one half of the engine room and one propulsion shaft. NAUTILUS limped into the Submarine Base with the help of the two tugs, and we disembarked the wives. I later determined that many of the wives felt they had received a glimpse of NAUTILUS that was consistent with some of the NAUTILUS stories their husbands had told to them.

Let me share with you a couple of stories concerning my communications with the Naval Sea Systems Command. During my first entry into the NAUTILUS Reactor Compartment, I noted salt stalactites hanging down from some valves in the overhead of the compartment. I questioned the petty officer with me about the stalactites, and he told me that they were from the saltwater side of coolant discharge valves. It was hard to stop external leaks from these valves, so the stalactites had been tolerated. We removed the stalactites, properly fixed the valves, and I submitted a report to Admiral Rickover. The report of the salt stalactites apparently created quite a stir at Naval Reactors, with the Admiral asking many questions of his staff. I received a phone call from the Admiral's staff requesting that I call them in advance of reporting such an

unusual problem, so that they could have an explanation prepared when the report arrived at the Admiral's office.

During one of my first periods at sea, the Engineer Officer told me that NAUTILUS had no way of getting rid of engineering waste water except for dumping the water down the ship's Trash Disposal Unit, which was near the crew's mess. Disposing of engineering waste water down the Trash Disposal Unit struck me as strange, but I saw no alternative. However, to document this unusual procedure, I submitted a report to the Naval Sea System Command. This report, like the one about the stalactites, also created a stir. This time, the phone call from Washington said that if we had to dispose of engineering waste water down the Trash Disposal Unit, do not report this to the Naval Sea System Command. I was told that the staff did not want to go through the pain of explaining this unusual procedure to their superiors ever again.

There was a fairly narrow passageway in the engineering spaces, between several reactor control panels. On a couple of occasions, someone had bumped into a switch on these panels, causing problems with the ship's engineering systems. We took a picture of the fattest sailor on board standing in the narrow passageway, illustrating the closeness of a person to the important switches in that area. I requested permission to install safety covers over these switches to prevent inadvertent shifting when bumped, and I enclosed the picture. Instead of receiving permission for the safety covers, Admiral Rickover called and asked me why I had such a fat guy on board. I was directed to get the sailor in shape or to get rid of him. I never did get permission for the safety covers.

During the final years of NAUTILUS, Admiral Rickover wanted to keep NAUTILUS in its original configuration, to show the world that the ship was designed right and could operate effectively all the way to its end of life. Meanwhile, I requested several modifications to NAUTILUS to improve this or that system or procedure, and Admiral Rickover called me and said words to the effect, "This system has worked properly for almost 25 years. Why do you need to change it?" Eventually, with some help from the Admiral's staff, I figured out what Admiral Rickover was doing and quit asking for modification, unless the problem was serious.

My last story began in Groton, when NAUTILUS was ready to

depart for the final time and head for Mare Island Naval Shipyard. Some press were invited on board NAUTILUS by the local Group Commander (an Admiral), but I elected not to talk to the press because of the training I had received at the Naval Reactors Prospective Commanding Officers' Course. The famous Naval Reactors line was, "If you don't talk to the press, that is bad; but if you do talk to the press, that is worse." The press eventually found one of my Chief Petty Officers on the pier and got him to talk a bit about the ship and the forthcoming inactivation. When the article was published, the Chief's comments were very restrained and accurate and I considered the situation to be closed. However, Admiral Rickover called me and asked why I let the Chief talk to the press. Before I could answer, the Admiral said "If anyone needs to talk to the press about NAUTILUS, it should be you."

After we went through the Panama Canal, we stopped in San Diego before going to the shipyard. In San Diego, the local Group Commander arranged for some press to come on board. I talked briefly to the press, and the resulting newspaper article was restrained and accurate, just like my Chief's had been. To my surprise, Admiral Rickover called me and said, "Why are you talking to the press. If anyone needs to talk to the press about NAUTILUS, it will be me." I now fully understand what I had been taught at the Naval Reactors Prospective Commanding Officers' Course.

As is probably apparent, I had a wonderful time as Commanding Officer of NAUTILUS. Things were never boring on that submarine.

I find it incredible that the NAUTILUS propulsion plant, designed and built over 50 years ago, is still the model for today's submarine propulsion plants. We've come a long way in every aspect of nuclear propulsion, but the plants are fundamentally the same. I am convinced that a graduate of the S1W prototype (if it were still operating) could be assigned to USS VIRGINIA, our newest submarine, and successfully make the transition.

I will also never get over my amazement that the first-of-a-kind propulsion plant would operate so well, allowing NAUTILUS to be a full member of the fleet for 25 years. Admiral Rickover and his people did something magical. As a result, the U.S. Submarine Force played a major role in winning the Cold War.

Thank You.

USS DRUM AT MARE ISLAND

by Kenneth Zadwick
President, Mare Island Historic Foundation

Congress has authorized the Mare Island Historic Park Foundation and the City of Vallejo to return USS DRUM, (SSN 677) to MARE ISLAND where she will become a museum at the Shipyard where she was built. DRUM will be the only Cold War frontline Sturgeon Class Nuclear Submarine to be placed on public display.

(Editor's Note: Preparations are underway to place NARWHAL on exhibit in Newport, Kentucky as part of the National Submarine Science Discovery Center. NARWHAL was not a Sturgeon class, but was a one-of-a-kind prototype for a natural circulation reactor. See THE SUBMARINE REVIEW of January 2004, page 92).

Now it is critical that we all invest in the process required by the Navy before USS DRUM can make the journey from the Puget Sound Naval Shipyard at Bremerton, Washington.

Much work has been done to prepare for the coming of DRUM to the place where she was built in 1970. DRUM was the last of 513 ships to be built at the yard founded by David Glasgow Farragut in 1854. The Foundation has in place long-term agreements to use berthing space at the Mare Island waterfront. Plans include final placement in the Historic Drydock No. I, opened in 1891 after 17 years of construction.

USS DRUM will be the centerpiece of the National Historic Landmark established in 1975 to honor Mare Island's illustrious history in the service of our country. Mare Island will celebrate it's 150th birthday in September 2004.

The investment in the DRUM project will bring many thousands of tourists to restore the economy lost when the Shipyard closed in 1996. A highly experienced consulting firm, Economic Research Associates, has confirmed these projections in a report about the DRUM display project.

DRUM will join the Historic Landmark properties managed by

the Foundation. These include the 1901 St. Peter's Chapel with it's 29 Tiffany Stained Glass windows, the Shipyard Commander's Mansion , the 1855, 50,000 sq. ft. Artifacts Museum, and the huge Mare Island collection.

There is only limited time to raise the needed funds. We must not miss out on the opportunity to save DRUM from the cutting torch. This historic submarine represents a very important era in our Country's history. The display will honor the submariners of the cold war, and the Shipyard employees who toiled to make her. Your generous donation or multiyear pledge will assure the success of the long efforts of all the donors and volunteers.

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LETTERS

Follow on to The Submarine 1886-1918

Thanks also for republishing my piece from the *Naval War College Review* in the company of all those interesting and usefully informative articles which make up the rest of the issue (see July 2004 issue). It is, indeed, an honor to have my work appear in the company of the work of those other authors.

My knowledge about what submarines did in the Cold War wouldn't fill a thimble, but the quality of the people I know who served in our submarines during that period says to me that whatever they did would have been (a) important and (b) well done.

Nowadays, however, it looks to me as if the whole USN is in trouble, and has been so since the end of the Cold War. Currently, there is no serious issue of command of the sea. Neither is there one in the foreseeable future. When that issue does reappear, it may do so in fashion quite different from anything we have experienced. That is, we might not recognize it when it appears, and thus be unprepared to meet the challenge. In the meantime the navy does what it did through much of the 19th Century: it goes to far-distant places and, when fighting develops ashore it acts, as Sir Julian Corbett once wrote, "as an adjunct to the army."

The August 2004 issue of *Naval History* carries a very good piece by Admiral J. L. Holloway about a raid made by a small number of surface ships under orders from the JCS against some not-so-important targets near Haiphong in 1972. At the time Holloway was Commander Seventh Fleet, and he thought his presence on the main firing ship, the heavy cruiser *Newport News*, might be useful.

Holloway was concerned that one of our ships might be sunk in the shallow waters off Haiphong: "The bombardment force would be making its run on a seven-mile leg in water 40 to 50 feet deep. A destroyer sunk at this depth would be salvageable but unfortunately not by friendly forces. The compromise would be very damaging. . ."

That episode came to mind as I read one of the articles in your July issue which discussed the use of SSNs in shallow, restricted

waters in support of, say, an information gathering expedition or a raid by SEALs. In an effort to do a little harm to the enemy we might be presenting the enemy an opportunity to do great harm to us by disabling or sinking a ship whose people, unlike those in Adm. Holloway's destroyer case, we probably could not rescue, and which itself would be a treasure house for the enemy of hitherto unavailable classified information.

In such cases will the trade-offs always be in our favor?

Let me quote another flag officer, one from long ago, Chester W. Nimitz. In his final instructions to Frank Jack Fletcher and Raymond Spruance, his tactical commanders at Midway, he told them that "you will be governed by the principle of calculated risk, which you will interpret to mean the avoidance of exposure of your force to attack by superior enemy forces without prospect of inflicting, as a result of such exposure, greater damage to the enemy.

Are we putting too much value into ever-smaller numbers of ever-more marvelous ships; ships for which we are unlikely to find missions worthy of their great qualities? In the air we seem to have done that with the B-2 stealth bomber. Submarines too? Ten-billion-dollar "destroyers" too?

So much for all that. What an excellent magazine you edit!

Sincerely,

Frank Uhlig, Jr.

DÉJÀ VU ALL OVER AGAIN

by Captain Jack O'Connell USN(Ret)

Recently CBS took a severe hit over its "60 Minutes (Wednesday)" story in which Dan Rather reported on President Bush's time in the Texas Air National Guard and allegations that then Lieutenant Bush didn't perform all the service required. It turned out that the documents that supported the story were very questionable. CBS has appointed a pair of highly regarded investigators to find out what went wrong.

It caught my eye not only because of the ongoing Presidential election campaign but because it brought to mind another 60 Minutes story of many years ago, involving the Mk 48 torpedo. I was OP 313 in the Submarine Warfare Division in 1969-1970, and had responsibility for Manpower, Training and Intelligence. There were several other tasks that went with the job that were not spelled out in the OPNAV organization manual. One was Public Affairs, and that brought me in contact with the specialists in the Chief of Naval Information Office. I was the Op-31 contact with CHINFO staff on any matters involving submarines and media stories.

One day a contemporary, Commander Don Ulmer, who handled weapons in the OP-312 branch, wandered by my desk and mentioned that he was going to be interviewed by Mike Wallace of 60 Minutes fame in connection with an upcoming story on the development of the Mk. 48 torpedo. I blew up because I was tired of being blindsided on matters that were supposed to be run through me, and here someone was scheduling an OP-31 officer to appear on 60 Minutes and I was finding out about it rather accidentally. I marched over to see the OP-31 Deputy, Captain Buck Dietzen, and started the conversation by saying "God damn it, Captain..."

It turned out that Buck didn't know anything about it either, and he then blew up rather more dramatically as he was wont to do. I was sent to summon Ulmer to report to Buck, and had to tell Don that I had apparently inadvertently placed a delicate part of his anatomy

"in the wringer". Needless to say Don was told that he would not be interviewed by Wallace about the Mk. 48 torpedo.

Although OP-31 remained adamant that none of its personnel would participate in the 60 Minutes story, the Navy Department wound up sending an Assistant Secretary of the Navy for Research and Development into the lions' den. He was a very bright, capable man and I am sure that senior personnel in the Navy thought that he could hold his own. The Mk. 48 torpedo development program was coming under serious fire at the time because it was way over budget and quite delayed.

The story as presented on television was a minor disaster, not for 60 Minutes—but for the Navy. The taped interview between Mike Wallace and the ASN had taken quite a while and the tape was then carefully and selectively edited to show Mike Wallace to advantage and his *victim* as an idiot who could not adequately respond to Mike Wallace's probing, thoughtful questions. The scene would repeatedly flash from Mike Wallace at his most thoughtful and accusatory posing a question, to his victim looking goofy and apparently unable to put two sentences together coherently.

OP-31 collectively was extremely happy that they had not participated. The Mk 48 torpedo went on to conclude a highly successful operational test and evaluation cycle, and became the world's premiere anti-ship and antisubmarine torpedo.■

U.S. SUBS DOWN UNDER BRISBANE 1942-1945

by David Jones and Peter Nunan
Publication Date January 2005
Naval Institute Press
Reviewed by Rear Admiral Maurice H. Rindskopf USN (Ret)

Editors Note: Mike Rindskopf is truly qualified to review this interesting submarine story. He arrived in Brisbane on 13 May 1943 after DRUM's fifth patrol; and departed for the third and final time on her eighth patrol on 2 November 1943. He worked with the authors for three years honing their submarine skills and reviewing their drafts. He served as on site liaison with the Naval Institute Press, and was the recipient of the first autographed copy of the book on 15 November 2004. His "I was there and did that" in the foreword says it all.

Authors need an attractive subject, preferably one that has not been overworked. They should have unique knowledge of their subject. They should be willing to conduct thorough and sometimes tedious, difficult research. It is desirable that they write in their native language which is also OUR native language. They should be amenable to critical comments.

David Jones and Peter Nunan meet these provisos in spades. No one has written of Australia's and Brisbane's contribution to the war effort as have they. They know their country, their city, and the bureaucrats who ran it. Their research, with the help of many, has included some 156 bibliographic references; and no fewer than 412 annotations. They write in Aussie English, but we can read that; and finally, I speak from experience when I say they listen when advice is offered.

U.S. Subs Down Under is a history, and like most, is chronological. There are many first-person anecdotes, but only one from any of the 57 skippers whose exploits are described, and that from Captain Bladen G. Claggett (CO DACE). Sadly, all but three have left us.

After describing how Australia, a country at war for more than two years, reacted to the Pearl Harbor attack, submarines came over

the horizon with the first tender, GRIFFIN, with her brood of S-boats arriving in Brisbane in April 1942. The travails of these World War I submarines can only evoke admiration in the reader. Every one of these boats had continuing serious materiel problems, sometimes during work-up for a patrol in Moreton Bay, sometimes enroute to the northern combat areas, sometimes during patrol. On the other hand, their Mk 10 torpedoes, although of relatively short range, were effective.

That these 11 boats sank six ships, including the heavy cruiser KAKO, with the loss of only one, S-39, at that by grounding, is an achievement of which every skipper, officer and man can be proud. The harrowing tale of S–39, impaled on the reef near Rossel Island, is well documented because the wife of a classmate of mine, Executive Officer Guy Gugliotta, wrote so well in PIGBOAT 39 of the efforts to get her off the reef, of the destruction of classified material, and the dramatic rescue by the Australian corvette HMAS KATOOMBA without loss of life.

As older Fleet boats came from other Asiatic areas, and then new construction submarines arrived, usually via Pearl Harbor, the S-boats were assigned special missions in support of Coastwatchers before being assigned training duties as U.S Forces island hopped to the north to be closer to their operating areas. Ultimately, they were sent to CONUS where they resumed their training function.

The Fleet boats brought with them a more effective fire control system, longer legs to reach farther into Japanese controlled waters and to stay on station for an effective period, and a reliable engineering plant. However, they also brought Mk 14 torpedoes with their Mk 6 Magnetic Exploders which together were atrociously inadequate. The reports of torpedoes running deep under targets without exploding, of torpedoes exploding prematurely, of torpedoes striking targets broadside and breaking up without exploding took two years to correct. It also involved CINCPAC, COMSUBPAC and the Task Force Commanders in Fremantle and Brisbane, Rear Admiral Ralph Christie and Commodore James Fife.

The continuing tug of war between these two veteran submariners with respect to assignment of forces and command relationships with COMSEVENTH FLEET and even General MacArthur is well documented by Commodore Fife's oral history completed later by

Columbia University. But there was another aspect of their divergent command concepts worth noting. Commodore Fife employed a truly hands-on system by ordering his boats to new positions nightly, in part based upon "Ultra" intercepts of Japanese traffic. The skippers who found and sank targets were in Fife's cheering section. During this period, DRUM received many "Fife to DRUM" messages, some of which resulted in sinkings.

The tales of the individual exploits of many of the Brisbane boats; and the later descriptions of several wolfpacks which scoured the seas north of New Guinea, and east to the vicinity of Truk are carefully selected to demonstrate the hard work involved in bagging targets, and the skill of skippers and their well-honed crews.

One of the significant contributions by the City of Brisbane to the well-being of the submariners was the establishment of rest camps in the mountains west of the city as well as along the seacoast. Although I stayed at Surfer's Paradise with its incomparable wide white beach, and even visited Sydney in a well shot up DC-3, my favorite was Toowoomba, with its golf course, its rum and milk at the turn, and its generally healthy environment. These camps flourished until New Farm Wharf was closed down in 1945.

In spite of the fact that losses of fleet boats mounted during 1943, the inexorable march to victory became visible when Brisbane's long-time friend FULTON departed for Milne Bay, New Guinea in late October1943, even while DRUM was refitting, and preparing to leave Brisbane for the third and final time. Subsequently, submarine advance bases were established at Manus Island, Mios Woendi, and Subic Bay.

Final success came during the move forward when DACE and DARTER together made one of the truly magnificent contributions to victory. As the titanic Battle for Leyte Gulf was unfolding, these two submarines detected and effectively reported to higher command one of the major Japanese Task Forces approaching to thwart the U.S. operation to retake the Philippines. During the 3-day battle, DACE and DARTER together sank two heavy cruisers and severely damaged another HIMJS TAKAO. Sadly, however, in a chase to finish her off, DARTER ran aground on Bombay Shoal and was lost. Commander Bladen G. Claggett, CO DACE immediately withdrew from the chase and successfully rescued the entire complement of

DARTER, commanded by his Naval Academy classmate, Commander David H. McClintock.

The story does not end with the closing down of Support Base 134 at New Farm Wharf in April 1945, and its return to Australian control by year's end. The British arrived with HMS BONAVENTURE and six XE-Class midget submarines which had had significant success by immobilizing for nine months the German Super Battleship TIRPITZ in Norwegian waters. It was not easy gaining command authority to send these pesky 4-man craft into combat, but in the waning days of the War, they used their lockout divers to cut vital Japanese undersea cables in Southeast Asia, forcing the enemy to resort to radio communications, which could be intercepted. I salute Lieutenant Commander Max Shean, RANR (Ret).DSO and bar, for his service in Royal Navy submarines, for commanding XE-4, and contributing a meaningful foreword. He is correct to state that U.S. Subs Down Under is accurate. In fact, I found but one technical misstatement. The Mk 14 torpedo armed closer to 400 yards than 800. This is a good read for submariners, veteran and active alike, and non-submariners as well. Enjoy!

THE SUBMARINE REVIEW

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

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

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.

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ULTRA ELECTRONICS/EMS DEVELOPMENT CORP.
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