Third Annual Undersea Warfare Photo Contest (pg. 15)

UNDERSEA WARFARE

U.S. Submarines ... Because Stealth Matt

Winter 2001

Arctic Challenge:
Rivers Delivers One Last Time

Submarine Commandos:
"Carlson's Raiders" at Makin Atoll

The SUBLANT Force Master Chief
In His Own Words

Winter2001 Vol. 3, No. 2

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On The Cover

The crew of the USS *Tucson* (SSN-770) stand lookout on the bridge as the sub pulls into Tokyo Bay during a recent deployment. The USS *Tucson* and her crew are stationed at Pearl Harbor, Hawaii. U.S. Navy photo by Photographer's Mate 3rd Class Lamel J. Hinton

UNDERSEA WARFARE

THE OFFICIAL MAGAZINE OF THE U.S. SUBMARINE FORCE

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UNDERSEA WARFARE is the professional magazine of the undersea warfare community. Its purpose is to educate its readers on undersea warfare missions and programs, with a particular focus on U.S. submarines. This journal will also draw upon the Submarine Force's rich historical legacy to instill a sense of pride and professionalism amongcommunity members and to enhance reader awareness of the increasing relevance of undersea warfare for our nation's defense.

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Welcome to the next 100 years of the United States Submarine Force, and to the Winter 2001 issue of UNDERSEA WARFARE. What a great time to be a submariner! Our services are in high demand, we are building new ships and making lasting improvements to the ones we have, retention and accessions are on the rise, and we are working hard to take care of our people. Our ships are ready, our people are ready, the Submarine Force is ready!

Congratulations are in order to RADM Al Konetzni and RADM John Padgett. RADM Konetnzi will be assuming duties as Deputy CINCLANTFLT, and RADM Padgett will assume the reins at COMSUBPAC. We know that RADM Padgett will do great things in the Pacific – he has big feet for those big shoes he'll find when he arrives in Pearl Harbor.

I trust that you will enjoy this issue of UNDERSEA WARFARE. It is my hope that you will walk away knowing a little more about our rich heritage, recent developments, and what the future may hold for our community. In fact, this issue features one man's unique view of that future. Dennis Bushnell, the Chief Scientist at the NASA Langley Research Center, will describe for us how warfare in the not-too-distant future may be conducted, and what role submarines would play in that future. For those of you who are now midshipmen, ensigns, or new graduates of boot camp, keep in mind that in the time it will take you to become our next Admirals and Command Master Chiefs, these visions could become realities.

This issue's featured Submarine Heroes are the brave Marines and submariners known as "Carlson's Raiders," who along with their leader, LT COL Evans F. Carlson, conducted a raid on Makin Island in the Pacific Theater during World War II from the submarines USS *Argonaut* and USS *Nautilus*. Theirs is an incredible tale of the challenges faced in transiting the ocean with 211 embarked Marines, and the bravery of the amphibious assault that followed. It is also a valuable lesson in working together.

Just as demanding as keeping our ships in step with the rapid pace of modern technology is keeping our people trained to operate the latest equipment. I recently had the privilege of speaking at the dedication of Bledsoe Hall, the new home of Officer Training in Groton, Connecticut. It was this visit that reassured me that the entire Submarine Force is moving in the same direction, towards flexibility. When I saw that there was a state-of-the-art computer for each student, and that each one was running interactive courseware and simulator software, with access to the SIPRNET, I knew the Submarine School was ready for whatever changes the future may bring.

Another training victory can be found with A-RCI, which is at the forefront of the challenges we will continue to face as we race ahead to "get modular" with commercial off-the-shelf (COTS) equipment. Look carefully at the lessons learned as CAPT Claude Barron and his team get traction on the training problem right where the rubber meets the road – onboard the ship.

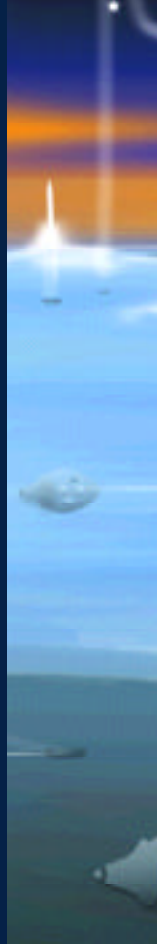
I am most encouraged by what I see in the Submarine Force today, not just because of your selfless dedication to a job well done, but because of the teamwork and unity of purpose you demonstrate, regardless of what fleet you are assigned to or from which corner of the world you operate. Keep it up, for the next 100 years of excellence rest squarely on your shoulders!

Malcolm Fages, Rear Admiral, USN
Director, Submarine Warfare

The Shape of Things to COME?

Top NASA Scientist Discusses The Future of Undersea Warfare

by Dennis M. Bushnell



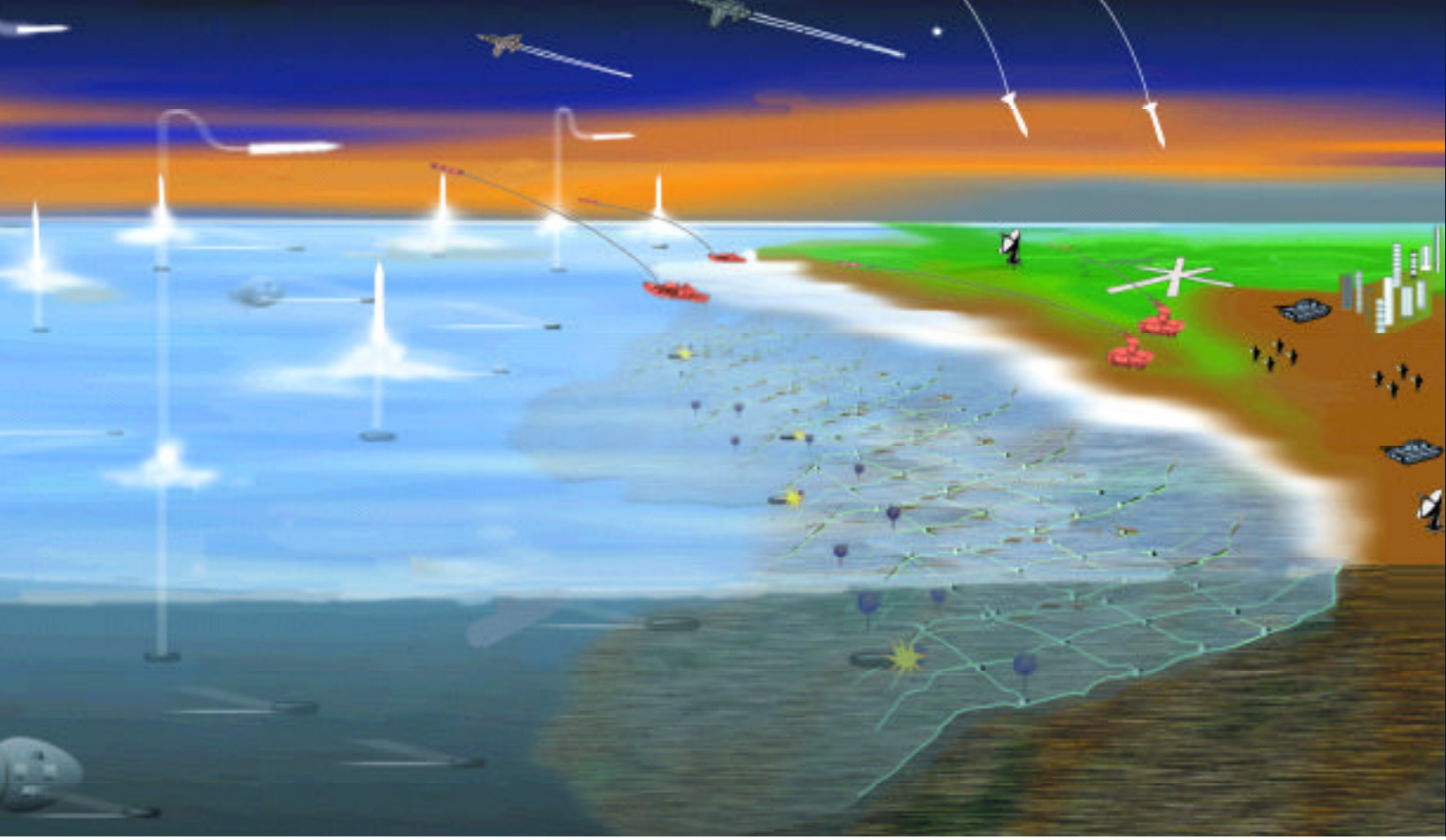
Since the 1950s, when more than 50 percent of the nation's work force became engaged in some type of "information-intensive," activity, the United States (and the world) have been in the midst of an unprecedented Technological Revolution, currently centered around Information, Biological, and Nanoscale technologies. These technologies are all pushing the frontiers of the miniscule in a synergistic "feeding frenzy" among each other, and are causing tremendous changes in all areas of human endeavor. One of these areas is warfare. The character of these new technologies is altering both the context of potential conflicts and the diversity, effectiveness, survivability, and affordability of the techniques and material applicable to waging war.

In today's environment, some 70 percent of all research is now conducted within a "commercial" framework outside the United States and is thus readily available to likely adversaries. In terms of sheer size, several economies (Japan, China, and the European Union, for example) are approaching the magnitude of ours, and may even exceed it. Moreover, inexpensive, highly-motivational, web-based distance learning on demand promises to greatly accelerate these trends. With respect to techniques and materiel, the Info/Bio/Nano-technology revolution(s) are providing:

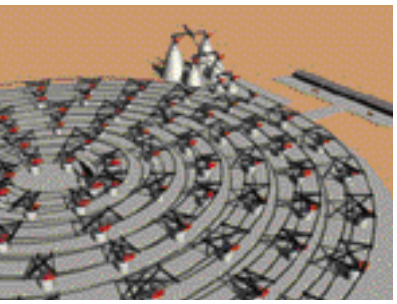
- Increasingly small, ubiquitous, inexpensive, networked, scientific and commercial, land-, sea-, air-, and space-based sensors applying multiple physics and hyper-spectral techniques
- Robotics and automation "in the large"
- Long-range precision strike
- Inexpensive mini/micro/nano"everything," including platforms, sensors, and weapons
- Wholly new classes of biological weaponry
- Hard-to-jam optical communication and navigation systems
- Greatly enhanced explosives and "volumetric" munitions... and finally,
- A fourth "weapon of mass destruction" in the form of physical or electronic information operations (IO)

Current estimates indicate that over the next 25 years, computing will increase in speed by some six orders of magnitude, and communication speeds will increase by four orders of magnitude as optical systems replace microwaves. Further, the use of large active-volume or broad-area techniques and advanced energetic materials in weaponry will increase their destructive power by up to four orders of magnitude.

The overall impacts of these largely-commercial and globally-available capabilities on the outlook for military operations are far-reaching. In particular, these technologies will enable much more effective "warfare on the cheap," in which "peer competitors" are no longer defined by their possession of megatons of Industrial Age artifacts in steel and aluminum. They create dangerous implications for any attempt to carry late-20th century



U.S. power-projection concepts into the 21st century. Numerous systems are emerging that could be used in tandem to wreak havoc on U.S. air and sea-surface logistic and strike platforms, both en route and in the operational theater. Non-stealth and undefended logistics platforms are particularly at risk. What will be "new" in this future threat environment are the omnipresent, omniscient sensor suites mentioned previously and the sheer number and variety of long-range and pre-positioned precision munitions that can be brought to bear. Unless platforms and weapons enjoy the sanctuary of the deep ocean, being targeted will be a "given" in the out-years. New age weapons and munitions will include:



The "Slingatron" launcher offers the potential for rapid-fire intercontinental bombardment using advanced boost-glide vehicles and unconventional payloads.

- Lurking, semi-submerged, anti-air or anti-surface missiles in the water column, with off-board targeting by netted sensor "webs"
- Transoceanic unmanned underwater and air vehicles (UUVs and UAVs)
- "Brilliant" mines
- Long-range cruise and theater ballistic missiles
- Very long-range "guns," using Blast-wave Accelerator and Slingatron technology

Just consider the last. The Blast-wave Accelerator was analyzed at the University of Texas/Austin by Professor Dennis Wilson and is under study by both the Army and NASA for inexpensive access to space. The concept involves sequential detonation of charges behind a projectile (without a barrel) yielding ICBM or IRBM speeds after only 100 to 200 feet of acceleration. Essentially this is a "rocket" in which the external structure and propellant never leave the launcher – only the warhead. The latter could be protected in flight by a technique test-flown by NASA in the 1960s at 18,000 to 25,000 feet per second – injection from the nose of a thin stream of liquid water, which can be thrust-vectored. The 1000-pound projectile would operate in a boost-glide, vice ballistic, trajectory and offer not only stealthy launch – no plume – but also exceptional flexibility, affordability, and survivability, while retaining the ability to be recalled. The Slingatron, also being studied for inexpensive space access, would use an oscillating horizontal tube – much like a "hula-hoop" – to accelerate projectiles in a spiral path until launch velocity is reached. Such an arrangement appears capable of lofting hundreds to thousands per minute of ten-kilogram projectiles over even intercontinental ranges.

As an example of progress in unmanned aerial vehicles (UAVs), the University of Washington recently flew a UAV across the Atlantic on only 1.5 gallons of fuel and intends to make a trans-Pacific attempt next. Increased precision, along with technology advances in materials, are also enabling a "mini-ICBM" option with terminal guidance for mid-ocean strike. Another potentially potent innovation is the Vortex Combustor under development at Penn State's Applied Research Laboratory, which burns nanoscale aluminum particulates and sea-water to provide inexpensive air-independent propulsion (AIP) for both submarines and very long range UUVs.

One way for the "Enemy-After-Next" to defeat or deter U.S. power projection with relatively little expenditure is to ensure that our forces do not "arrive at the party." The notional weapons

described above – and others – are all based on enabling technologies already "in the pipeline," and they will make crossing the ocean in the air or on the surface like running the gauntlet. Attrition by enemy action could well begin within the continental United States (CONUS) itself and then over the continental shelf, since we typically deploy from a relatively small number of ports and airfields, thus simplifying the pre-positioning of smart, "pre-need," anti-air and anti-surface missiles and a variety of mines. As we will discuss below, "kill" mechanisms will probably not be restricted to high explosives.

The "density" of the threat will grow even more dangerous with increasing proximity to enemy-held coastlines. This is the "area denial" problem discussed for some time now by the Defense Department's Office of Net Assessment, among others. Well before mid-century, "country-sized" magazines may be available to loose "hordes" of inexpensive, long-range precision weapons with advanced warheads bearing a "devil's brew" of lethal components: electromagnetic-pulse generators and radio frequency blankers, IW payloads, mines, fuel/dust/air or other volumetric explosives, chemical/biological/microwave anti-functionals and antipersonnel weaponry, as well as carbon fibers and "blades."

In the face of such an onslaught, friendly platforms will be hard pressed not to run out of "bullets" just defending themselves, thus causing both unacceptable attrition and the defeat of strike or power projection operations. Beam weapons are sometimes suggested as at least a partial counter to such a threat scenario, but even these have multiple and inexpensive counter-countermeasures available to an adversary. One quickly concludes that late-20th century power-projection or forced entry approaches could be gravely threatened by a determined opponent with access to these new, generally-available technologies.

What, then, might be some alternatives? Possibilities include global-range cruise missiles and exo-atmospheric precision-strike munitions, launched directly from CONUS on conventional or miniature ICBM's, and hypersonic boost-glide projectiles launched from the several types of global-reach guns mentioned above. The latter could be far less expensive and far more survivable than our current options for global precision strike – tanking B-2's and steaming aircraft carriers. Obviously, many information operations could also be prosecuted directly from CONUS.

For shorter time-of-flight munitions, a deep-water "arsenal" submarine deploying various "swim-ins" or "pop-ups" provides a survivable option. Deep-water standoff is necessary because of the danger posed by multi-static, low-frequency active (LFA) acoustics and increasing capabilities for sensing the many non-acoustic "indiscretions" associated with submarines in shallow water. These include hull detection by visual, lidar, infrared, or bioluminescent means; sensing the underwater wake by perturbations in the pressure field; and measuring salinity scars, chemical releases, internal and surface waves, turbulence, magnetic effects, radar returns, and other phenomena. In the context of swarms of inexpensive, omnipresent sensors, based on multiple physics, and operated on a "take-a-vote" sensor-fusion principle to minimize false alarms, survival of shallow-water submarines appears problematical.

Deep-water arsenal submarines would obviously need tremendous capabilities for loading out munitions. Thus, as almost a *reductio ad absurdum* approach in designing such platforms, "almost-spherical" configurations should certainly be investigated. This shape would yield several synergistic benefits, including minimum wetted area and friction drag, plus the smallest structural weight for increased depth capability. The serious pressure-drag issue with such a shape could be ameliorated to yield very low overall drag by using a fully-integrated "Goldschmied" pump-jet propulsion approach, with thrust vectoring for control. In this configuration, the pump-jet inlet provides potential flow "sinks" inside the body and should convert the back of the pump-jet shroud into a stagnation region instead of a stagnation point. For enhancing the affordability and survivability of such volumetrically-efficient platforms, a number of *ab initio* design features suggest themselves:

Deep-water arsenal submarines would obviously need tremendous capabilities for loading out munitions. Thus, as almost a reductio ad absurdum approach in designing such platforms, "almost-spherical" configurations should certainly be investigated.

Because of an increasing area-denial threat, "almost-spherical" arsenal submarines could well become our best land-attack option.

- Extreme automation for minimal crew size
- An on-board chemical plant for producing drag- reducing polymer from phyto- and zoo-plankton sieved from the power plant coolant intake
- Active acoustic masking to defeat LFA
- Inclusion of a replenishable, burst-speed "afterburner" system – perhaps a hydrogen-oxygen rocket as an adjunct to a down-sized main propulsion plant
- Manufacture of underwater platforms via robotic/magnetically-steered, electron-beam, free-form fabrication – essentially "virtual prototyping" of the final product

Admittedly, this concept submarine would be very different from what might result from continuing with our current and evolving design practice. However, along with affordability and survivability, volumetric loadout is the major issue for power projection from submerged platforms. An "almost-spherical," deep-water, arsenal submarine would have sufficient volume for many of the design options listed above; space for adjunct sensors, such as mini UAVs; and large capacity for storing munitions.

Other design alternatives for providing additional volume – such as simply "plugging" existing designs – have already been proffered. But in the opinion of this author, the revolutionary design approach suggested here has enough potential to warrant its inclusion in a design "runoff" for a future, submerged, deep-water "arsenal ship." It could well constitute the only survivable "close-in" strike platform for assuring naval power projection in the future.

Dennis M. Bushnell is the Chief Scientist of NASA's Langley Research Center, Hampton, Virginia. He hails originally from Westbrook, Connecticut, the hometown of David Bushnell of Revolutionary War "Turtle" fame, and they share a common ancestor in William Bushnell (1680-1733) of Saybrook, Connecticut. He is a member of the National Academy of Engineering, a Fellow of the AIAA, ASME, and the Royal Aeronautical Society and is the recipient of the NASA medals for Outstanding Leadership and Exceptional Scientific Achievement.

ARCTIC CHALLENGE: UNDER THE POLAR ICE CAP

by ETC(SS) Paul Beach, USN

On 20 September 2000, a U.S. Navy submarine pulled slowly away from her berth in Norfolk, Virginia to begin the final voyage of her 25-year career. The solemn faces of the well-wishers gathered on the pier, many of whom had served aboard the "Usta-Fish" in years past, reflected the one thought on all of their minds – the USS *L. Mendel Rivers* (SSN-686) would be missed. The days ahead were sure to prove bittersweet for the crew, and the mood on the pier echoed that onboard the ship. This mission marked not only the final voyage of a great naval vessel, but also the eminent demise of an entire class. USS *Sturgeon* (SSN-637), which first entered service in 1967 and was decommissioned in 1994, would have only USS *Parche* (SSN-683) to carry on the legacy of her class once the *Rivers* was put to rest. But first, *L. Mendel Rivers* had things to do.

We were well prepared and eager to perform the task ahead, which at first glance appeared to be a simple one – proceed to the Arctic Circle and operate submerged beneath the polar ice cap for several weeks. Along for the ride was a team from the Arctic Submarine Laboratory, who hoped to profile ice thickness in shallow uncharted areas of the Arctic basin and launch a large number of probes to gather scientific data on the ocean's properties. When the scientific portion of our mission was complete, we were to transit the Bering Strait and proceed to the Puget Sound Naval Shipyard (PSNS) at Bremerton, Washington for final deactivation. Our mission sounded straightforward, but we were quick to realize that the challenges that lay ahead would test the very limits of the crew's skill and expertise in managing this disappearing breed of ship.

This account of *L. Mendel Rivers*' transit under the North Pole reflects my own personal perspective, that of her Assistant Navigator. It's a tale focused on our challenges – and our victories – in navigating the ship from one ocean to another by way of the Arctic ice pack. *L. Mendel Rivers* was the last submarine on the East Coast still to be equipped with the venerable Dual Miniature Inertial Navigation System (DMINS). For years, this equipment has guided submarines safely in submerged transits, and has proven much more capable than the older navigation systems onboard USS *Nautilus* (SSN-571) or USS *Skate* (SSN-578) when they first transited below the Arctic ice. As this story will relate, however, there are serious hurdles to overcome when navigating a submarine in extreme northern latitudes. Gyros, which provide heading, and gyro-based inertial navigators, which provide position, do not function normally at the North Pole because the tangential components of the earth's rotational velocity are minimal. Even knowing this in advance, and looking forward to the unique challenges that lay ahead of us, we got more than we expected.

Our Captain, CDR David Portner, ensured that our training and certification were thorough. The schedule of our final upkeep was hectic – millions of dollars of specialized equipment had to be installed and tested. Additional training was also necessary to ready the crew for operation and maintenance of the new gear in a hostile and unforgiving Arctic environment. Furthermore, shipyard preparations had to be made to ensure a smooth transition for our arrival at PSNS. Moreover, *Rivers* Sailors were also busy at home closing the loop on last minute details in preparation for the lengthy separation from their families. Burning the candle at both ends was nothing new to the crew of the *Rivers*, and with a dedicated team effort we completed our installations and training right on schedule.

Having bid farewell to Virginia for the last time, our track took us northeast 1,500 nautical miles past the Flemish Cap before turning north for the Denmark Strait. We took advantage of our time in transit to conduct drills and training, all the way to the Marginal Ice Zone, just north of Iceland. With the last available satellite broadcast copied, we crossed under the polar ice cap.

Despite our preparations and training, isolated equipment problems on our 26-year- old boat kept us busy. The first bump in the road was the failure of our electromagnetic (EM) log's lower pit sword, which provides speed input to the ship's navigation systems. This required us to drive the 15,000-mile journey using what is known as a "dummy log" to input ship's speed manually. Operating DMINS in the undamped mode, which was necessitated by the loss of the normal EM log input, required frequent attention from the watchstanders. Surfacing through the ice every 3 to 5 days for fixes and system resets became common.

As predicted, navigation continued to pose a challenge as we proceeded north. The ship lost all heading reference when we surfaced at the North Pole, since the Mk-19 Gyro became unstable in the high latitudes, and DMINS began to operate erratically. We tried to restart both channels of DMINS, but that quickly proved impossible. While we had fixed our position using our Global Positioning System (GPS), the ship was left surfaced at the North Pole with no compass to guide it! We had to resort to more creative methods.

The crew of USS *L. Mendel Rivers* (SSN-686) digs through the ice in search of the ship's hatch.

"THE SHIP WAS LEFT SU
WITH NO COM
WE HAD TO RESORT TO

The captain calculated our heading by shooting a relative bearing to the moon and computed its Greenwich Hour Angle from the Nautical Almanac. This told us what longitude line the ship was pointing. We verified this by using a hand held GPS receiver topside, marking bow and stern waypoints and checking the bearing between them. With this information, we submerged the ship, executed a turn, recalculated our final course, and said a prayer as we headed south away from the pole to find another suitable place to surface the ship and restart our gyroscopes.

We drove 180 miles away from the pole at flank speed in deep water. We were able to of that position! That was tough to swallow. In hindsight, I was happy enough just being on the right chart. The Mk-19 gyro was re-started and provided the heading reference to start DMINS. One of the two DMINS channels came right up, but the other's inertial measurement unit (IMU) would not, and had to be replaced. Eighteen hours later, we were underway with three separate heading sources working well.

We completed our transit of the North Pole conducted drills and worked to qualify junior personnel for future assignments.

As we surfaced triumphantly in the Straits of Juan de Fuca and piloted into Victoria, British Columbia for a well-deserved port call, I finally had some time to reflect on the past seven weeks. PACSUBICEX 3-00 was a resounding success,

With their mission a success, the crew set out for some well-deserved liberty in Victoria, British Columbia.

RFACED AT THE NORTH POLE
PASS TO GUIDE IT!
MORE CREATIVE METHODS ..."

The crew of USS *L. Mendel Rivers* (SSN-686) quickly came to realize that their mission to the Arctic Circle would prove to be one of the most challenging experiences of their careers.

approximate driving a straight line by keeping the stern marker line on the sonar display centered on own ship's sound trace in relative display mode – in other words, we "looked" backwards to make sure our wake was straight. As the Assistant Navigator, I knew that our chances for a pinpoint, hand-calculated dead-reckoning (DR) position were slim after 180 miles. When you combine unknown currents and helm error, and compound this over time, your error grows continually.

After the 180-mile sprint was complete, we found a surfaceable feature and punched through. The moment of truth had come. The GPS fix indicated that we were on the exact latitude line the quartermasters had calculated by the hand DR, but the heading error placed us 145 nautical miles due east while the embarked scientific team accomplished their own goals, dropping 77 under-ice conductivity-temperature-depth probes along our track for collecting data. With the excitement of the scientific mission behind us, the only obstacle remaining was the Bering Strait passage, which would entail traveling submerged 1,000 miles inside the 100-fathom curve with ice pack overhead.

Extra watches were stationed for this slow speed transit, and a modified piloting team was manned for five days. Luckily, nothing unexpected occurred during the transit of the strait, and we chopped to our SUBPAC SUBNOTE after clearing St. Lawrence Island, setting course for our new home. We tried to make the last 1,000 miles of the voyage as uneventful as possible, even as we and our crew was walking tall from the realization of what they had accomplished in closing a long and impressive chapter in submarine history. For more than 40 years, the U.S. Submarine Force has reigned supreme in the Arctic regions, since *Skate* first surfaced at the pole in 1959. And, since 1975, the *L. Mendel Rivers* had been there regularly to do her own part in maintaining that supremacy. With *Rivers'* current decommissioning, only *Parche* will be left to carry on the legacy of the *Sturgeon*-class boats. Looking back over this proud tale, I have to ask myself: Will we ever enjoy the same success we had with the *Sturgeon* class again, or are we retiring our one true under-ice capability for good? I hope not; because after this experience, I am convinced more than ever that we can navigate anywhere, anytime, in spite of nearly any challenge. There is a lot more to learn about the Polar Regions and I, for one, would like to go back.

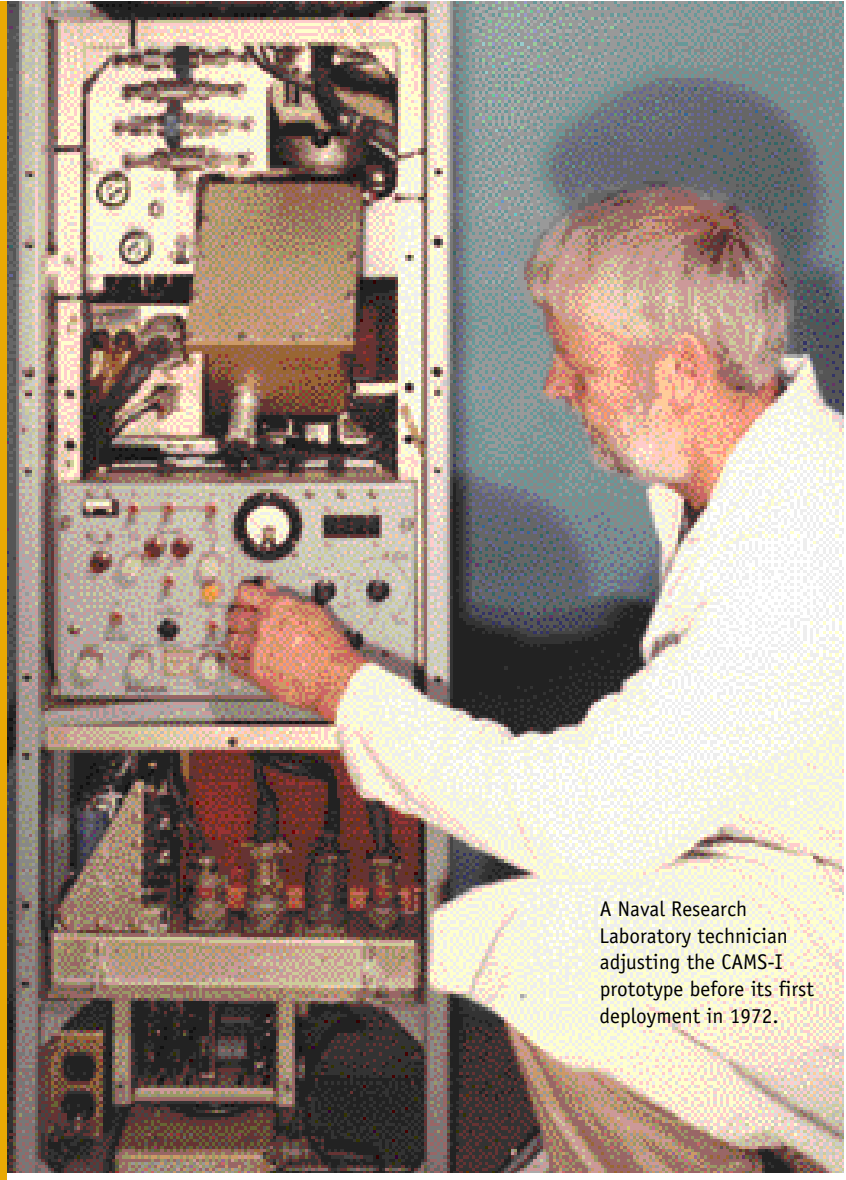
Chief Beach was the Assistant Navigator of *L. Mendel Rivers* during PACSUBICEX 3-00 and is now the Operations Chief at Submarine Squadron Support Unit, Norfolk, Virginia.

NO MORE LOOSE FILLINGS OR SLOW EMBALMING

HOW NAVAL SCIENCE HELPED SUBMARINERS BREATHE EASY

by Dr. Jeffrey R. Wyatt

From the moment submarines became serious weapons of war, naval officers have worked to turn them from submersible torpedo boats into true underwater warships – vessels that could operate and fight without having to come up for air. The diesel-electric boat that fought both world wars was like a marine mammal – albeit a very useful one – but submariners wanted their craft to evolve into something more like a fish.



A Naval Research Laboratory technician adjusting the CAMS-I prototype before its first deployment in 1972.

The big challenge was developing air-independent propulsion, and as everyone knows, the U.S. Navy achieved this in 1954 with the nuclear-powered USS *Nautilus* (SSN-571) and her successors. But little public attention has been drawn to the more basic problem of keeping the air in these latter-day submarines breathable. And even less is known about the way we answered a more fundamental question – how do we know when the air's any good?

That second aspect exposes a difficult problem. Bad air is often odorless and colorless, as we're reminded every winter when people die of carbon monoxide poisoning from defective heaters. Years ago, miners took canaries into the pits with them to detect lethal concentrations of carbon monoxide. The small birds were more sensitive to dangerous concentrations of gas than the men themselves, and when the birds took sick, the miners knew it was time to get out. A variety of chemical sensors later found their way into mine safety equipment and industrial monitoring devices – and into the breathalyzers used by traffic cops and solicitous bartenders. But they were narrowly specialized, detecting only the presence of a small, specific range of compounds.

None of these devices were a good fit with the submarine. Not only is space onboard at a premium, but the sheer variety of toxic, or at least unbreathable, substances that find their way into a submarine's enclosed spaces poses a problem of daunting complexity for atmosphere monitoring. My first experience with the subject came when I

arrived at the Naval Research Laboratory (NRL) in 1972 as a post-doctoral fellow to do basic research in a group headed by Dr. Fred Saalfeld, now the top civilian at the Office of Naval Research. At that time Saalfeld was involved in developing the Central Atmosphere Monitoring System, CAMS-I, for submarine air analysis.

From time to time, Saalfeld's group would analyze air samples taken onboard submarines. I still remember coming in over a weekend to analyze a set flown down from New London after one boat had had a fire in port. As it happened, this was the research submarine *NR-1*, and fortunately, there were no casualties. It was our responsibility to determine if it was safe to go back onboard without wearing protective breathing equipment. In those days, we used "old-fashioned" laboratory techniques to analyze and interpret data, and on my first actual submarine embark in 1975, riding USS *Snook* (SSN-592) from San Diego to Bremerton, I performed a specialized series of air measurements using wet chemistry. And I experienced firsthand the odor you inevitably pick up riding one of our boats.

Submariners have always needed atmosphere monitoring instruments, and it's important that the equipment be reliable – a monitor that breaks frequently or cries "wolf" with false positives is worse than useless. The crew will only mistrust and ignore it. On the old diesel-electric submarines, there was little you could do to refurbish the atmosphere except for short term, emergency fixes using chemical scrubbing, oxygen candles, or reserve air carried in tanks. The principal method of atmosphere control was surface ventilation, which you had to do anyway to recharge the batteries, so the requirement for atmosphere monitoring was minimal. An old diesel submariner told me once that you could always tell when the oxygen level was getting low when it became difficult to light your cigarettes. That may say as much about how the world has changed since those days as needs to be said.

It really changed when USS *Nautilus* put to sea in 1954, and it became clear that nuclear submarines would never realize their full potential without finding a way to keep the crew breathing while submerged. Suddenly a submarine could remain submerged for extended periods of time – as the *Nautilus* did when she transited the polar ice cap in 1958. But although nuclear-powered attack boats could in principle stay submerged indefinitely, their operational routines in the 1950s seldom required them to remain underwater for long intervals. They could and often did surface or snorkel to purify their air. Thus, in preparation for *Nautilus*' polar voyage, little more was installed than an emergency air breathing system that is still used today on all of our submarines – basically a network of compressed air lines with quick-connect points for emergency breathing masks. All this changed when ballistic missile submarines joined the fleet. From the deployment of USS *George Washington* (SSBN-598) in the early 1960s, long-term submerged operation was the rule, and atmosphere control became correspondingly more important.

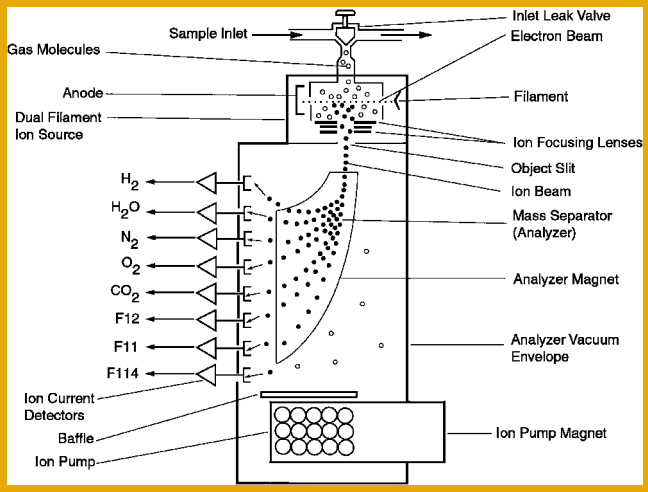
Not only did oxygen need to be supplied and carbon dioxide removed, but trace contaminants that previously could be ignored became a concern when submarines stayed submerged for long periods. *Nautilus* at first put to sea without effective means to remove carbon monoxide, hydrogen, and various organic chemicals – and the crew even painted while underway. But early air analyses showed the need for more comprehensive measures, and a catalytic burner was installed. This works by heating the submarine air and passing it over a catalyst that converts the contaminants to carbon dioxide and water. As valuable as these burners proved to be, there were still lessons to be learned, including the importance of keeping them properly adjusted. Fortunately, we no longer have incidents like the one depicted in a cartoon drawn by a *Nautilus* crewmember, in which formaldehyde in the air threatened to subject the crew to a slow embalming. Actually, the formaldehyde came from partial oxidation of methanol in a badly-adjusted burner, and the methanol was there because of its use as a solvent in shellac.

Catalytic burners remove many undesirable compounds from the air, but they're only one of the systems that maintain the quality of a submarine's atmosphere. Submarines produce oxygen by electrolyzing water – splitting the oxygen from the water it's bonded to. The boats also carry charcoal filters – good for absorbing large spills. And they remove carbon dioxide with a scrubber using the compound monoethanolamine ("MEA"), which absorbs the CO2 from the air. The MEA is then heated to drive out the gas, and the latter is compressed and ejected overboard.

The newer CAMS-II atmosphere analyzer allows software reprogramming to accommodate new compounds or to modify alarm thresholds.

When nuclear propulsion brought essentially unlimited electrical power onboard, air conditioning came with it. But air conditioning requires refrigerants, and the early systems occasionally leaked refrigerating gases into the submarine's living spaces. These would build up over time, and, while they were in themselves non-toxic, they would decompose in the burner to produce acidic gases that were both toxic and corrosive. The refrigerants would also decompose in the heat of lighted cigarettes, giving the smoke a characteristically unpleasant taste, probably from the phosgene gas that was a product of the decomposition. Tobacco smoke is bad enough in itself, but to combine it with phosgene – a poisonous gas used militarily in World War I – goes beyond adding insult to injury. During the 1960s, one of the most troublesome areas of atmosphere control was the atmosphere monitor itself. These instruments had no special name, but they went through six generations: from Mark I to Mark VI. To have this many versions of a nameless piece of military equipment in so short a time shows there were, in fact, serious problems, and the atmosphere monitor was always on the Submarine Force's top ten list of systems needing critical attention. Sometimes it topped the list.

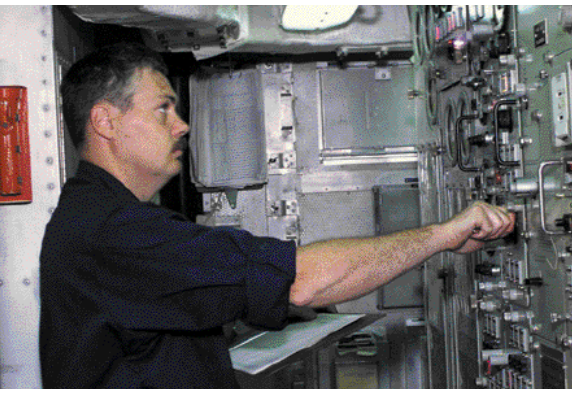
The Mark I through Mark IV, and the later Mark VI, all used an oxygen meter based on oxygen's distinctive magnetic susceptibility, a hydrogen meter that exploited hydrogen's high thermal conductivity, and infrared adsorption for everything else. In contrast, the Mark V used gas chromatography. The CAMS now uses infrared for carbon monoxide and mass spectrometry for everything else. The Mark I



Conceptual diagram of the CAMS-I mass spectrometer, which analyzes gases according to molecular weight. Lighter ions follow a more sharply curved trajectory through a magnetic field, heavier ones travel a less sharply curved path, and they are sorted by multiple detectors.

through Mark IV hosted relatively unreliable and insensitive infrared analyzers that had trouble detecting small refrigerant leaks, which then went unnoticed and built up larger concentrations. Then, in a typical vicious cycle, they further degraded the analyzer's reliability. Since the analyzer provided poor readings, crews mistrusted it – and not without justification: A submarine atmosphere analyzer is supposed to operate within the environment it is analyzing. To get around these problems, we then developed the Mark V – which attempted to analyze all the gases with an automated gas chromatograph. With today's microprocessors, we might have made that work, but not in the 1960s, and the Mark V turned out to be a real dog.

At this point, Dr. Saalfeld convinced the Navy to consider an analyzer based on what was then perceived as an exotic laboratory technique: mass spectrometry. The Perkin Elmer Corporation had built a small analyzer as a prototype for NASA's Skylab. It was mounted in USS *Hammerhead's* (SSN-663) torpedo room, and the crew was instructed to record and compare its readings with those from the Mark IV analyzer. After two days at sea, the Mark IV failed, but the Perkin Elmer instrument worked fine for the entire trip. Encouraged, we had two more prototypes built and installed on USS *Hawkbill* (SSN-666) and USS *Pintado* (SSN-672) in 1972. They performed so well that the crews asked to keep them after the trial period – always a good sign.



MM1(SS) Ron Brown makes a routine check of the oxygen generator on USS *Rhode Island* (SSBN-740).

Next, a production version of this Central Atmosphere Monitoring System (CAMS) was built and tested to all the rigorous acoustic, EMI, shock and vibration requirements for submarine equipment. Finally, in 1975, twenty years after the *Nautilus* reported she was "underway on nuclear power," the Navy had a reliable submarine atmosphere analyzer.

The good performance of the CAMS-I soon kept refrigerant leaks to a minimum. When a submarine crew saw CAMS indicate increasing refrigerant levels, they were confident that there really was a leak, and would find and fix it. A retired skipper told me once that early in his career he was aboard a pre-CAMS ship with a broken Mark IV analyzer and, coincidentally, a large refrigerant leak. As the refrigerant decomposed, it produced hydrochloric acid. This not only produced significant corrosion throughout the boat, but at the end of the patrol many of the crew (including himself) needed all the fillings in their teeth replaced.

One lesson we learned with the CAMS-I was to make the system drip proof. On the *637*-class submarines, the CAMS was installed near the main hatch used to load stores. Often water would come down the hatch and splash onto the top of the CAMS, which could cause electrical problems if the system weren't properly protected. This area also saw a lot of foot traffic in port. I recall visiting USS *Sunfish* (SSN-649) when a ten-pound bag of premixed cake icing with the consistency of confectioner's sugar was dropped next to the CAMS. At least it was lemon scented.

CAMS-I and its successor CAMS-II remain in use today. CAMS-II's big advantage over CAMS-I is ease of reprogramming. The newest version of CAMS-II allows the system software to be changed in the field using a laptop computer. This enables us, for example, to analyze for new compounds like ozone-safe refrigerants, or to change alarm levels based on new limits in the submarine atmosphere control handbook.

The success of the CAMS program is due to the skill and dedication of many people in the Navy and in industry. Some of them stayed with the program for many years, lending continuity and the positive effects of pride in ownership. Many scientists and engineers rode submarines and obtained a better appreciation for what the Fleet needed and did not need. It's important to know your customer. It was great that submariners were willing to accept what then amounted to experimental scientific apparatus aboard their ships and use it. The Submarine Force was far ahead of the rest of the Navy in that regard.

Will a new analyzer soon be designed as a successor to the CAMS-II? I tend to doubt it – the existing system is a good one, and there are few military or commercial pressures driving us to replace it. There is one area, however, in which atmosphere analysis will become increasingly important. As the International Space Station comes online, the astronauts and cosmonauts who live and work there will be using atmosphere analyzers based on CAMS technology. With new communities and converging lines of expertise, you often see surprisingly fruitful advances. If space is indeed the deepest ocean, submarine Sailors may find they have more in common with astronauts than they do with their brothers and sisters in the surface fleet.

Dr. Jeffrey Wyatt is senior member of the Corporate Staff at the Office of Naval Research (ONR). He came to ONR in 1999 after 17 years as a scientist at the Naval Research Laboratory (NRL), working in mass spectrometry and the related problem of submarine atmosphere monitoring.

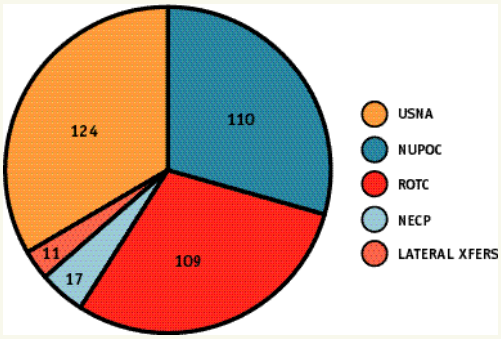
Nuke Recruiting:

NUPOC Offers Students Exciting Career Incentives

by LT Thomas H. Shugart III, USN

It's another beautiful summer morning in San Diego, and seven college students are preparing to get underway in USS *Florida* (SSBN-728) for an exciting day of submarining. Anyone serving on a submarine recently has probably seen these groups of wide-eyed college students onboard, shepherded around by several recruiters, and you may have wondered, "Who are these people? Why are they here?" Well, as a result of their superior academic achievements in various engineering and scientific disciplines, these students have qualified as prospective applicants for the Nuclear Propulsion Officer Candidate (NUPOC) program, and they're onboard to check us out.

Quite simply, the NUPOC program draws from the best and brightest of our engineering and science schools, pays students handsomely for committing to five years in the nuclear Navy, and then sends them through Officer Candidate School (OCS) into the nuclear pipeline to join their peers from the Naval Academy and Naval Reserve Officer Training Corps (NROTC).



NUPOC provided nearly one third of nuclear-trained officers in FY 00.

The program was established initially to recruit talented individuals with a strong technical background to man the Navy's rapidly growing Nuclear Propulsion Program, while providing them with the financial means to complete their studies in preparation for entering the nuclear Navy's demanding training pipeline. Over the years, the NUPOC program has provided approximately one third of the officers manning the Navy's nuclear-powered ships – over 3,000 since 1986. Without these men and women, and drawing only on traditional commissioning sources, the Navy would not have been able to man many nuclear billets aboard surface ships and submarines.

Most corporations recruit engineers and scientists with "plant visits," and the nuclear Navy is no different. Especially since nuclear propulsion officers are committed to the service for five years after commissioning, it is important that these candidates know what to expect in the submarine environment before reporting to their first boat. In addition, the ship visit may be a strong motivator for applicants who fear the drudgery that some civilian engineering jobs entail.

The lieutenants who accompany the students are Nuclear Trained Officers (NTOs) assigned to Navy Recruiting Command (NRC). The ten NTOs nationwide are post-JO sea-duty submarine and nuclear-trained surface warfare officers who recruit specifically for the NUPOC, Naval Reactors Engineer, and Nuclear Power School Instructor programs. They are responsible for planning applicant trips, preparing

(cont. on page 28)

Prospective NUPOCs underway on USS *Florida* (SSBN-728)

Teaming Up With Howard University

Admiral Frank L. "Skip" Bowman, Director, Naval Nuclear Propulsion, recently addressed engineering students at Howard University in a ceremony to officially launch a partnership between the Naval Nuclear Propulsion Program and the school. To symbolize the beginning of this new partnership, Admiral Bowman presented the university a photograph of USS *Nautilus* being christened in 1954. Featured during the ceremony was Patrick R. Price, the first Nuclear Propulsion Officer Candidate (NUPOC) from this prestigious, historically black university. Admiral Bowman emphasized that potentially "there are more Naval Officers sitting in this audience" and that the opportunity Price found in the nuclear Navy is available to other qualified students.

As a NUPOC, Price will receive enlisted pay prior to commissioning, attend Officer Candidate School, and proceed to nuclear power training, where he will learn fundamental principles and practical aspects of nuclear propulsion plant operation. He will then join the ranks of the Navy's finest officers aboard nuclear-powered submarines and aircraft carriers.

Photo courtesy of Howard University

Admiral Bowman presents a ceremonial check to Howard University chemical engineering junior, Patrick Price. The check represents the total amount Price will receive during completion of his college education for acceptance into the NUPOC program. Pictured from left to right: Dr. James Johnson, Dean, School of Engineering; Patrick Price; Dr. Mobolaji Aluko, Department Head, Chemical Engineering; and Admiral Bowman.

"We should always do whatever possible to say 'yes' to our people, and our people must be willing to do the hard jobs we ask of them."

The SUBLANT Master Chief

In His Own Words

By JOC Thomas E. Jones, Jr. and JO2 Starre Quinones, COMSUBLANT Public Affairs

MMCM (SS) Don Kultti has been in the Submarine Force for almost a quarter century – having served on SS, SSN and SSBN submarine types. Since first taking the oath in November 1978, the California native has seen a tremendous amount of change in the equipment, people and priorities of the Silent Service.

In 1978, "Quality of Life" was not a buzzword. In fact, there were no buzzwords to describe life in the military. You simply did your job, and life in the military was, well, life in the military. So what if sleeping accommodations were not up to Ritz Carlton standards? The focus was on the mission, not the crew's well-being. There was almost a mantra: every day was a holiday, every paycheck a fortune, and every meal a banquet (when in reality things were quite the opposite).

Fast forward to the present. This is the 21st Century – 2001 – and now people are our concern. The drawdown from the 90s, and the recent exodus of highly talented and highly trained people from the Navy, caused many across the service to say that we were (and in some cases, still are) in a personnel crisis. However, despite this "crisis," last year the Atlantic Submarine Force had the highest retention rate in the Navy. And with Kultti now at the pinnacle of his career, he has a unique opportunity to shape the force for tomorrow's generation of submariners.

As the Senior Enlisted Advisor to Commander, Submarine Force, U.S. Atlantic Fleet, Kultti's job is to let VADM John J. Grossenbacher know where the enlisted Sailors of the Atlantic Submarine Force stand, and to serve as our force's senior enlisted representative in the many forums where people and processes are discussed. For 22 years Kultti has seen the good with the bad. And when asked, he'll tell you his priorities: **Readiness, Force Alignment**, and **Relationships**.

We talked to Master Chief Kultti about all three.

Q: Describe our readiness. Why is it so important?

A: The American people can't afford for us to sacrifice readiness. Because of that, we have to do it right the first time, every time. Submarines are the most reliable and survivable weapons platforms the American people have. They are worth far more than what they cost to build and operate.

Q: How do we maintain our current level of readiness?

A: The submarine is already a smart ship. We need to continue making investments in the training of our people. In some areas, we need more investment in technical training. Things are changing in the electronics world very rapidly, and we need to do all we can to keep up with those changes. We also need to protect our investments. We need to make it fun, exciting, and important for our people to stay with us.

Q: There have been several reported instances of drug use. How is this affecting our readiness?

A: Losing people to drug abuse and other character flaws that fall into our Zero Tolerance policy are acceptable costs of doing business. People really need to think long and hard before they cross those lines of misconduct that are detrimental to serving in our Submarine Force. Our force is an excellent place for people to learn, grow, and serve while still raising their families. We extend to all an opportunity that should not be gambled away on a few nights of synthetic pleasure.

Q: The Atlantic and Pacific submarine forces have different priorities – missions are not necessarily the same, and personnel and materiel priorities are different. How does increasing the collaboration between SUBLANT and SUBPAC help?

A: The new SUBPAC Force Master Chief, Rick West, and I share many of the same concerns, and we are both committed to keeping the Submarine Force and its people on top. We are embarking on a tour of duty together, trying to make things that are applicable in the Pacific applicable in the

Atlantic. We are committed to sharing ideas and processes, and will work hard to make the right decisions for the men and women of our Submarine Force. We are seeing this kind of sharing Navy-wide. The Chief of Naval Operations is very big on this concept. Navy alignment is one of his top five priorities. Let's all get aligned, try to do business the same way and learn with and from each other. We truly need our people who ride submarines to be jacks-of-all-trades. This will make them better, us better, and our effectiveness will be greatly enhanced.

Q: Sailors have become the priority – we've heard of Quality of Life and now Quality of Service. But you look at it a little differently. You feel the relationships that are developed are important. How so?

A: One of the things I think that has made the Submarine Force as successful as it has been is the development of relationships on our boats. We really care about and take care of each other. We have a long history of "doing the right thing" and we will continue to protect that legacy. Taking care of our people from accession through retirement is the key to being the employer of choice. Taking care of our people is inclusive of just about every facet of what, when, and how we do things. Although tough assignment choices will have to be made, reflection on each person's history of assignments, potential, personal preference, and professional development will be the key to accomplishing our objectives collectively while meeting the needs of our force and those of our people. We should always do whatever possible to say "yes" to our people, and our people must be willing to do the hard jobs we ask of them. If we treat them well and listen to their concerns, they will always be there to answer the bell when we need them to. They will do this because we value and care about them and their families.

Q: What about the morale factor?

A: Life on a sub is hard work. Ships that are doing well typically have a very good command climate. We all work better when we are on the same team and we are achieving success. People who go to sea and have healthy job qualifications come back feeling good about themselves. When they feel good about themselves, they perform even better. When we send our ships to sea, we see that morale is high. People join the Navy to do things, to provide, protect, and achieve. Beyond the Submarine Force's responsibility to the American people for providing survivable strategic deterrence, promoting democracy, and protecting our surface combatants, we also have the responsibility to make Sailors from men and women. People come here to establish themselves in life. In my opinion, the Submarine Force is by far the best place to do that in all the services.

Q: Is Quality of Life still an issue?

A: In the case of the fast attack submarine, they're not going to get any bigger — we're not going to be able to do anything to significantly improve the physical quality of life. That's not what's key. The key is to provide the best quality product that we can, given the physical constraints that submarine configuration imposes upon us. Technological advancements that can improve our surroundings should continue to be explored, and implemented where feasible and deemed to be of value. We need not necessarily reinvent the wheel, but we must constantly be working to improve it.

"We truly need our people who ride submarines to be jacks-of-all-trades. This will make them better, us better, and our effectiveness will be greatly enhanced."

Q: What is the pulse of the Sailors on the waterfront today?

A: Our people are generally satisfied with the Submarine Force. There are many factors, like money, that keep people in a job. When it comes to the Submarine Force, the value of service is not just in a paycheck. Value of service comes, from among other things, readiness, force alignment, and relationships.

Master Chief Kultti is the Force Master Chief for Commander, Submarine Force, U.S. Atlantic Fleet.

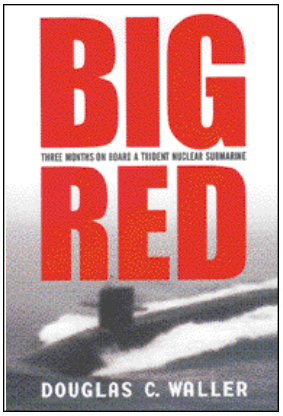
DOUGLAS C. WALLER'S

BIG RED

THREE MONTHS ON BOARD A TRIDENT NUCLEAR SUBMARINE

Reviewed by LCDR Jim Doody, USN

Big Red: Three Months On Board a Trident Nuclear Submarine offers a compelling portrait of both the technical complexity of an incredible vessel and of the personalities of the officers and Sailors who are entrusted to carry out its fearsome mission. Having enjoyed an unprecedented level of access, *Time* magazine diplomatic correspondent Douglas C. Waller follows the Blue crew of USS *Nebraska* (SSBN-739) as they prepare for and embark on a strategic deterrent patrol. Though not without its flaws, Waller's book makes a valuable contribution to submarine literature. His keen eye for detail and a readable style ensure that the book will be popular with submariners and non-submariners alike. Submariners will note that his characterization of life onboard rings true, while non-submariners will come to appreciate the dedication, talent, and sacrifice of those who stand the watch on strategic defense.



Big Red starts out with the ship moored pierside in Kings Bay, getting ready to get underway. The reader is introduced to some of the senior leadership on the boat. We see the frustrations of the COB in fighting all the little battles associated with getting the ship clean and the crew ready for sea. We see the Captain's anxiety after a tough refit and worrying over the inevitable material problems that always seem to creep up just before casting off the lines. These are the aspects of leadership we'd expect to have described, but we also see the mixed emotions of a junior officer who is leaving his new bride behind in an unfamiliar location – and hear about the Captain's divorce and the crew's speculation on how it might affect the patrol. These introductory sections show one of the best aspects of *Big Red*: Waller captures the fact that the people who operate this wonder of technology are every bit as complex as the awesome machine in which they serve.

Once underway, *Nebraska* suffers a close call while negotiating the channel out to sea. Material and personnel faults combine to produce an incomplete helm order that results in the boat being dangerously off-course within the narrow channel. Waller captures the chaos that attends such events, from the frantic actions of the Bridge team in averting disaster, to tense moments in Maneuvering as the crew responds. Although *Nebraska* misses a navigation buoy by only 20 feet, the watch is able to get her back into the middle of the channel and on her way.

After the ship submerges, the author gets to observe the crew being put through its paces. *Nebraska's* Sailors participate in a wide variety of drills, ranging from the usual assortment of simulated fires and flooding to dealing with a deranged man in the missile spaces. In a particularly detailed and well-drawn section, *Big Red* thoroughly covers the complicated and deadly serious business of processing Emergency Action Messages (EAMs) and performing the myriad steps required to execute a TRIDENT missile launch. Although the launch exercise is clearly a drill, Waller's careful observation of the crew's superb professionalism makes a profound impact on the reader.

Throughout *Big Red*, Waller skillfully weaves in the stories of people onboard, as well as providing a very accurate portrayal of submarine culture. Many of the topics discussed are ones that a reader might be somewhat surprised to see in print, in contrast to the somewhat antiseptic media exposure so often seen. For example, Waller remarks on the spirited rivalry between nuclear-trained and

non-nuclear enlisted men, quotes some pithy repartee, and airs the frequent perception that the nuclear engineering background of the officers makes them unreasonable nit-pickers. The revelation of these and other issues we submariners do not usually discuss in public make the book a "warts and all" portrayal that hasn't often been done before.

Other examples demonstrate the remarkably honesty by which Waller captures the essence of modern submarining. In describing the operational differences between attack submarines and their ballistic-missile counterparts, he notes the friendly disdain with which attack boat Sailors refer to their patrolling brothers. He tells about a Sailor who is compiling a list of reasons for getting out of the Navy – veteran submariners may not be surprised to learn that this disgruntled individual is a Sonarman. But perhaps truest of all are the characterizations of various meals served on the boat. All submariners will immediately know what's on the menu when they hear about "trail markers," "hockey pucks," "vent covers," or "three-by-fives."

The shortcomings of *Big Red* probably have less to do with Mr. Waller's journalistic skill than with the conditions of his access to *Nebraska*. It seems that only half the picture of a nuclear-powered submarine has been given – the front half. Though the book exposes the reader to a wide spectrum of non-nuclear personnel and their routine, there is precious little coverage of the nuclear-trained Sailors and the engineering aspects of nuclear power. A description of the action in Maneuvering during the near grounding and mention of a "rough inspection of its Engineering Department" are about the only references we find in *Big Red* to the nuclear technology and people aft. Given that Waller's eye for detail is so convincingly demonstrated elsewhere, it is unlikely that he simply didn't notice the unique ways of the people who work in the engineering areas. This is unfortunate, because the uniqueness of the "nuclear" culture is far richer than can be conveyed by mere passing references to the "nuke-versus-others" rivalry. Admittedly this criticism may reflect a bit of bias on the part of a reviewer who has served almost exclusively in engineering billets, but I think others would agree that the story told in *Big Red* is disproportionately short on the nuclear propulsion aspects of submarine operations.

Scanning the horizon before submerging to begin a typical TRIDENT deterrent patrol.

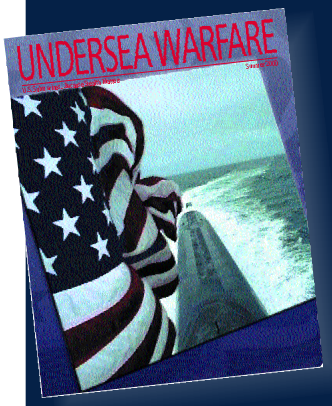
The other criticism of *Big Red* also reflects the bias of a reviewer who has served exclusively in attack submarines. Even though Waller's book covers the submarine experience in a unique way, I think that exciting and compelling stories could also be told about fast attacks, with the challenge of changing assignments in mid-deployment, doing charts on the fly, and coming to grips with OPORDS on short notice. It seems that SSN access during some exercise phase of a deployment could have been granted without raising any more security issues than are associated with embarking on a boomer, and it could have led to a more comprehensive view of who we are and what we do.

The criticisms, however, do little to detract from Waller's achievement. *Big Red* is an excellent book and highly commended to the attention of anyone interested in submarines. Much as the movie *Das Boot* succeeded because it presented an accurate portrayal of submarine Sailors, so it is with *Big Red*. In giving the people onboard equal emphasis with the technical marvels that form their backdrop, Waller has given us a richly drawn account that is eminently readable and can only make a submariner proud to be associated with our superb institution.

LCDR Doody is the former Military Editor of UNDERSEA WARFARE Magazine and currently the prospective Executive Officer of USS *Los Angeles* (SSN-688). *Big Red* is published by Harper Collins Publishers and will be available in book stores beginning March 6.

ANNOUNCING!

The Third Annual Undersea Warfare Photo Contest



The winning entry of the Second Annual Undersea Warfare Photo Contest

Undersea Warfare Magazine and the Naval Submarine League are pleased to announce their third annual ***Undersea Warfare Photography Contest.*** Each entry must be related to the activities of the Undersea Warfare community, such as underway or waterfront operations, ships, personnel, training, firing weapons, or recreation. We seek images that reflect the drama, excitement, and beauty of the undersea world.

Cash prizes will be awarded as follows: First Prize - $500, Second Prize - $250, Third Prize - $200, Honorable Mention - $50. Everyone is eligible to submit an entry, but the recipient of an award must be the person who took the photograph.

A limit of three entries per person is requested. Entries must be black-and-white prints, color prints, or electronic files of 300 dpi or higher. The minimum print size is 5"x7". Full captions, photographer's name, address, and affiliation must be attached to each entry.

Submit entries to: USW Magazine Photo Contest, Military Editor, Undersea Warfare (CNO N77C), 2000 Navy Pentagon, Washington, D.C. 20350-2000.

Entries must be received by 15 May 2001. All photographs submitted for the contest will become property of the **Undersea Warfare** magazine and may be used in subsequent issues of **Undersea Warfare**, regardless of whether or not they receive an award. Appropriate photographic credits will be given. Winners will be announced at the June 2001 Naval Submarine League Symposium in Washington, D.C., and publication of the winning entries will be in the Summer 2001 issue of **Undersea Warfare** magazine.

For further details, contact **Undersea Warfare** magazine at (703) 614-0915 or (703) 413-2148, or email: subwarfare_mag@hq.navy.mil.

NAVAL SUBMARINE LEAGUE

CONGRATULATIONS TO THE

2000 BATTLE EFFICIENCY WINNERS

Bangor, WA

SUBDEVRON-5
Parche (SSN-683)
CDR Myers (CO) (D)
CDR Gorenflo (CO) (R)
MMCM(SS) Pollard (COB)

SUBRON-17
Florida (SSBN-728) (Gold)
CDR Bruner (CO)
ETCM(SS) Starwalt (COB) (D)
ETCM(SS) Kerr (COB) (R)

USS Michigan (SSBN-727) (Gold)
CDR Barge (CO)
MTCM(SS) Benko (COB) (D)
MMCM(SS) Dessert (COB) (R)

Guam

Frank Cable (AS-40)
CAPT Spencer (CO)
FTCM(SS) Ford (CMC)

San Diego, CA

SUBDEVRON-5
Dolphin (AGSS-555)
CDR Kelety (CO)
ETCM(SS) Jones (COB)

SUBRON-11
Jefferson City (SSN-759)
CDR Steed (CO)
MMCM(SS) Taylor (COB) (D)
ETCM(SS) Jacques (COB) (R)

Arco (ARDM-5)
LCDR Little (CO)
HTCM(SW) Macias (CMC)

Pearl Harbor, HI

SUBRON-1
Charlotte (SSN-766)
CDR Tanaka (CO)
MMCM(SS) Hamilton (COB)

SUBRON-3
Honolulu (SSN-718)
CDR Richardson (CO)
MMCS(SS) Cramer (COB)

SUBRON-7
Tucson (SSN-770)
CDR Murphy (CO)
ETCM(SS) Harper (COB)

Groton, CT

SUBRON-2
Submarine NR-1
LCDR Merz (CO)
ETC(SS) Calkins (COB)

Dallas (SSN-700)
CDR McBrearty (CO) (D)
CDR Sykora (CO) (R)
MMCS(SS) Wierbonics (COB)

SUBRON-4
Providence (SSN-719)
CDR Bawden (CO)
FTCM(SS) McElhiney (COB)

SUBDEVRON-12
Memphis (SSN-691)
CDR Breor (CO)
MMCM(SS) Muller (COB)

La Madellena, Italy

Emory S. Land (AS-39)
CAPT Zingarelli (CO)
FTCM(SS) Jackson (CMC)

Norfolk, VA

SUBRON-6
Scranton (SSN-756)
CDR Carter (CO)
STSCM(SS) Paddock (COB)

SUBRON-8
Oklahoma City (SSN-723)
CDR Foggo (CO)
MMCM(SS) Declercq (COB) (D)
ETCS(SS) Danielson (COB) (R)

Resolute (AFDM-10)
CDR Duff (CO) (D)
LCDR Cole (CO) (R)
STSCM(SS) Swanson (CMC)

Kings Bay, GA

SUBRON-16
Louisiana (SSBN-743) (Gold)
CDR Ruff (CO)
SKCM(SS) Biller (COB)

Nebraska (SSBN-739) (Blue)
CDR Dittmer (CO)
MTCM(SS) Weller (COB) (D)
ETCS(SS) Keith (COB) (R)

SUBRON-20
Wyoming (SSBN-742) (Gold)
CDR Nicholson (CO)
ETCM(SS) Logan (COB)

West Virginia (SSBN-736) (Blue)
CAPT Parker (CO) (D)
CDR Cortese (CO) (R)
MMCM(SS) Clayton (COB)

Making the Operator a COMPONENT of the System

by CAPT Claude Barron, USN,
and Terence M. Stuckart, STSCM(SS), USN (Ret.)

The system is unsatisfactory, and the ship is not ready to deploy — Commodore sends.

What system? Sad to say, it's the Acoustic-Rapid Commercial Off-the-Shelf (COTS) Insertion (A-RCI) Phase I sonar, as implemented recently on a Pacific Fleet submarine. That certainly got the attention of those of us in the operational and acquisition world for whom A-RCI has been one of the most promising sonar developments in decades. What could have gone wrong? A-RCI Phase I was operational on another ship without serious setbacks. Factory training had revealed some growing pains and minor deficiencies, but had not been deemed "unsatisfactory." Traditional approaches to installing A-RCI and conducting subsequent crew training had been used. What was the problem – and what could be done to fix it?

USS *Jefferson City* (SSN-759) recently received an A-RCI Phase II upgrade.

Under the leadership of Team Submarine, A-RCI has been under development in industry to maintain the acoustic advantage that could be lost to likely adversaries by the deployment of increasingly quiet submarines. The A-RCI initiative is leveraging rapid advances in COTS information technologies to develop a new generation of sonar signal processing hardware based on an open architecture and commercial standards in hardware and software. By teaming fleet operators and industry engineers to define new processing approaches, design new displays, and optimize operator interfaces – and by revolutionizing traditional acquisition processes – we hope to get the best of the best to the fleet as quickly as possible.

In the 1990s, the acoustic advantage U.S. submarines enjoyed over foreign counterparts began to diminish as traditional narrow-band acoustic signatures evolved into more complex signal patterns much more challenging to detect and recognize. The A-RCI sonar system was designed with improved signal processing and display capabilities specifically intended to exploit these more subtle threat signatures, and the A-RCI designers did their job well. However, as in all our earlier systems, the final link in the chain of signal recognition is still the operator, and without operators who can recognize real-world threat signatures, the system is useless. And that's where we found the problem. Incorporating the operator as if he were a *component* of the system – training him to employ and maintain it – had not been successfully achieved in our initial A-RCI implementations.

A New Approach to Training for A-RCI Phase II

This sobering realization provided the impetus to develop an entirely new training approach in preparation for the first A-RCI Phase II installations, which took place in late April 1999. In essence,

Senior Chief Walker provides hands-on A-RCI shore experience at the dual Sun workstation simulators – with inputs from real world training tapes.

there were only six months to "make the operator a component of the system" and to ensure his proficiency in using it. Happily, we managed to carry it off, yielding extraordinary improvements in sonar watchstander performance and leaving high-quality training tools onboard each ship for follow-on use.

In achieving this success, we verified two old Navy watchwords: "It's the crew that makes the ship," and "Go ask the chief." The key was bringing in the Concept of Operations and Operator-Machine Interface (OMI) Support Group (COSG). The COSG is an element of the A-RCI Advanced Program Build (APB) Sonar Development Working Group (SDWG), and it consists of both senior Sonar Chief Petty Officers from the fleet and civilians from academia and industry. The COSG was established primarily to engage fleet operators in the design and development of A-RCI displays and OMIs, but when the requirement to address operational training surfaced, the COSG instantly recognized a new challenge and took charge.

Where Phase II install training pays off: The sonar team of USS *San Juan* (SSN-751) takes A-RCI to sea.

In September 1998, the COSG Chairman, Master Chief Terry Stuckart, convened an impromptu meeting with active duty and retired senior fleet sonarmen to analyze fleet-wide operator proficiency and training issues. In implementing the resulting recommendations, Master Chief Stuckart (of COMSUBDEVRON 12) and Master Chief Mike Clinch and Chief Frank Rule of ONI worked with Commander Submarine Force, U.S. Atlantic and Pacific Fleets (COMSUBLANT and COMSUBPAC) to resolve personnel requirements and justify the need for dedicated in-port and at-sea operator training time. In addition, they consulted with the NAVSEA Program Offices and the Submarine Warfare Directorate (OPNAV N779) to ensure that funding and hardware needs could be met.

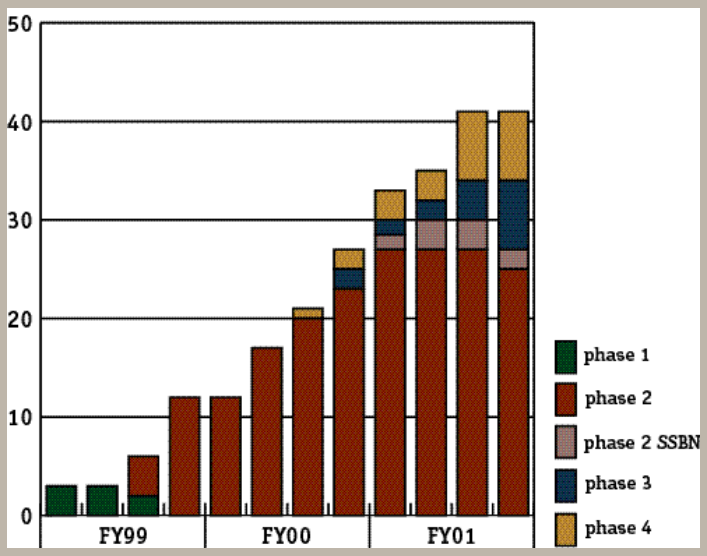
The COSG made their biggest impact in their role as teachers. In addition to their normal day-to-day duties and responsibilities at their parent commands, the chiefs of the COSG formed two-man teams and personally conducted shipboard training on a part-time voluntary basis, providing two weeks training in port and one week at sea for every A-RCI Phase II installation. The curriculum was based on a solid foundation of technical knowledge, and it used one-on-one/over-the-shoulder teaching in an operational, "on-watch" environment.

Diagnosing the Need

In developing the curriculum, it was first necessary to determine the extent of the training deficiency and to develop a benchmark to establish standards and measure improvement. Historically, sonar proficiency was measured operationally by comparing individual Sonar Shacks and assigning relative grades, such as "Average" or "Below Average," to determine readiness to deploy. These relative assessments were often subjective and are not particularly helpful in determining fleet-wide operational proficiency or overall training effectiveness. We needed an assessment tool that would put the sonarman into a repeatable simulation, where his capacity to recognize and assess what was evident in the data could be compared to known values and a ground-truth result.

Thus, Senior Chief Bob Willetts at ONI created an assessment "survey" that consisted of a standard series of validated lofargrams of real-world encounters derived from recordings of existing, legacy sonar systems. One hundred examples were created for the survey, including 20 with contacts of interest, such as foreign submarines and threat torpedoes, as well as 80 traces portraying merchants, fishing vessels, or no contacts at all. These were printed on paper for serial presentation to the sonarmen, much as they might be seen on a sonar display during normal search.

The sonarmen were instructed to work through the paper grams in a process similar to paging through towed array beams to search for sonar contacts. They were instructed to flag those they recognized as containing contacts of interest, to analyze the records for tactical information such as target speed and geometry, and finally, to classify the targets as accurately as possible. The 100 lofargrams were organized into five sets of 20 grams each, where each set represented a different ocean area of the world. Operators were given 2.5 hours to complete the task. The survey was distributed and administered to qualified sonar watchstanders onboard submarines, at training



The rapid introduction of A-RCI into the Submarine Force creates a difficult training challenge.

commands, and at submarine squadron and group staffs. Nearly 200 operators, including ACINT Specialists, were tested. The results indicated clear weaknesses, not only with the fleet operators, but also with the sonar instructors themselves.

Coincident with the lofargram survey, COMSUBLANT initiated a separate inquiry at the Naval Undersea Warfare Center (NUWC). Known as the "Lost dB study," its fundamental purpose was to determine why contact hold times observed in shore-based analysis of tape recordings from at-sea events were much longer than the hold times reported in real time. The study tested fleet sonarmen and ACINT Riders on both legacy and developmental sonar systems to determine if the signal excess actually displayed as "voltage" on the operators' screens was being fully exploited. This Lost dB Study clearly confirmed the results of the proficiency survey and showed that one of the primary causes of hold-time differences was the capability and training of watchstanders.

Since the success of our new sonar systems is still fundamentally dependent on the operators' ability to read lofargrams, it follows that no amount of improvement in display formats can overcome a lack of recognition proficiency. Given these realities, it became very clear that A-RCI Phase II Installation training had to teach skills in both operating the system and analyzing lofargrams. We turned next to developing the training tools and a focused curriculum that would yield major improvements in overall "system" detection performance by teaching both of these aspects.

Implementing the Training System

We needed to find an appropriate combination of engineering tools and acquisition practices to put key elements of a responsive training system into the right hands at the right time. The critical components included:

- The Towed Array Record/Playback Unit (TARPU), an element-level tape recorder/reproducer installed in the front end of the Towed Array processing string
- Transportable Sun workstations running A-RCI and Advanced Processor Build (APB) tactical software
- Training materials in the form of acoustic tape recordings of real-world contacts formatted for playback on the TARPU

The use of an instrumentation-grade tape player to feed recordings of real-world submarine contacts into the A-RCI system to evaluate algorithms and displays during earlier sea tests had shown what an invaluable training tool a tape recorder could be. When the decision was made to include a TARPU in A-RCI Phase II, the time available for choosing an affordable instrument that could also satisfy technical, environmental, and size requirements was highly compressed. Nonetheless, PMS-4252 and ONI managed to find one. Then, the COTS input signal conditioner intended for Phase II had to be accelerated for the first shipboard installation and interfaced with TARPU in only 16 weeks. They did that too.

To support the Sonar Division's classroom training while A-RCI Phase II was being installed on the ship, a portable shore-based processor with A-RCI's Phase II tactical software was needed. Two relatively inexpensive dual Sun workstation systems, one for each coast, were purchased by the Program Office for classroom training. These training systems might be called simulators, but in fact, they allowed for authentic presentation of real-world acoustic data for processing by real A-RCI tactical software. Moreover, they provided the flexibility needed to tailor training to the individual needs of each submarine crew and run and re-run sections of the curriculum as needed.

As basic training materials, ONI supplied real-world, element-level acoustic recordings – a major effort by Senior Chief John Leonatti and Senior Chief Jerry Behnken in searching the ONI data base, reviewing the data, identifying suitable acoustic events, and dubbing the 21 tapes needed for training. Supporting documentation that listed target signature characteristics and significant event times for both target and own-ship maneuvers was prepared by Mr. Dennis Bailey in the form of detailed ground truth reports. These became invaluable guidebooks for the training teams, just as the new tapes assumed a central role in onboard training. They provide the ships an organic asset to train new personnel and to practice gram-reading and system operation with real-world data. The tape series can be periodically refreshed and updated with more up-to-date data, as well as providing a source of near Op-Immediate intelligence. Ships preparing for deployment can obtain recently recorded TARPU tapes from other A-RCI ships returning from patrol and play them back immediately to prepare for their next assignment.

Developing Training Curriculum and Examinations

A senior member of the Pacific fleet TRE Team used to say…"Michael Jordan did not become a great basketball player sitting in a classroom calculating how to shoot baskets. He became a great basketball player by taking a ball out on the court and shooting baskets."

In other words, practice is the key to proficiency.

Learning acoustic signal recognition and analysis skills is like learning a language. Classroom basics are necessary, but real proficiency occurs when the student is placed

"in-country" and forced to use the language as part of his daily life. The same is true for the skill of obtaining tactical information from sonar displays. Training has to be accomplished using the ship's tactical sonar system, vice a laboratory signal analyzer, and if at all possible, onboard ship under simulated or actual at-sea conditions. Training both at sea and in port by simulating an at-sea watchstanding environment was key to the A-RCI Installation Training philosophy and its success.

The curriculum has three fundamental goals:

- **Operational Proficiency** – training the operators to operate the new system
- **Employment Proficiency** – teaching the operators, supervisors, and officers how to best employ the system for a given tactical scenario
- **Signal Recognition** – significantly improving each sonarman's proficiency in recognizing contacts of interest and using all available acoustic clues to exploit the target

Although, the classroom training emphasizes practical techniques, it was the unanimous opinion of the COSG that a Theory of Operation module be included to give students an appropriate understanding of rudimentary technical sonar concepts – an area of knowledge that had deteriorated throughout the fleet as badly as signal recognition. Thus, a System Overview and Theory of Operation are presented on the first day. Significant topics include towed array characteristics, adaptive beam-forming, and spectral analysis. The following day's syllabus covers A-RCI "knobology" and familiarizes students with display and system options by demonstrating the A-RCI modes on the Sun workstation, with individual sessions at the controls for each sonarman. Next comes a day devoted to signal recognition and acoustic intelligence, presented by an ONI ACINT Specialist. He demonstrates not only the appearance of signals of interest on the A-RCI displays, but also identifies appropriate options and display enhancements for maximizing recognition.

After the operators have become familiar with operating A-RCI and recognizing contacts of interest, a day is spent teaching system employment. This module focuses on current tactical doctrine and follows the published A-RCI Operating Guidelines, including recommended system lineups and some of the reasons for deviating from default settings. The last day of the classroom curriculum is spent reviewing salient elements of the week's training, testing, and making presentations to the ships' officers.

Although sharing the "head knowledge" of our best operators with the average sonarman was one of the most significant challenges in creating the A-RCI curriculum, it was even more difficult to make the expertise of the signal processing community accessible to our crews. To formulate an approach, an eclectic mix of sonar engineers and system developers from Navy, industry, and academia presented a three-day seminar for the COSG at the Naval Oceanographic Office in Mississippi. The presentations covered aspects of A-RCI from basic towed array theory to more arcane topics such as spatial vernier, adaptive beamforming, and frequency analysis. Master Chief Gero Shafer and Senior Chief Bill Koshoffer from COMSUBLANT then took on the four-month task of translating these high-level technical lectures into a series of briefs that virtually all sonarmen could digest.

Implementing A-RCI Phase II Installation Training in the Fleet

As shown in the accompanying graphic, A-RCI Phase II will be entering the fleet on an ambitious schedule, and adopting the new training plan has required maximum coordination with the Type Commanders to find both dedicated personnel and at-sea operational time to conduct the training. Wholehearted cooperation from COMSUBLANT and COMSUBPAC assured the quality of the result.

Although production and installation has always been the top priority in implementing A-RCI Phase II, training has finally assumed its rightful importance within the acquisition process, and we can say confidently that the operator is now "a component of the system." This accomplishment resulted from a mutually-supportive team effort in which participants no longer looked at operational training as if it were a relay race in which each member stepped off the track and out of the picture after passing the baton. Instead, A-RCI Phase II Installation Training was integrated into a total team effort from start to finish.

The results have included an improvement of 200% or better in sonar watchstander proficiency, as measured by our standard assessment survey, universal praise from Commanding Officers, and institutionalized procedures for the long term. Additionally, N77 has decided to expand the effort by making both the process and selected personnel a permanent part of the training infrastructure. Today, representatives from the Type Commander staffs and ONI, along with retired ACINT Riders hired for their operational and technical expertise, serve as the core team that will conduct A-RCI Installation Training now and in the future. In addition, preparations are under way to use this team to support the instructors in the schoolhouse and pipeline training programs and to accomplish periodic refresher training on ships at sea.

"Michael Jordan did not become a great basketball player sitting in a classroom calculating how to shoot baskets. He became a great basketball player by taking a ball out on the court and shooting baskets."

The bottom line is clear. Today, the A-RCI operator is acknowledged as a vital component of the system and treated as such. And in reaching this point, we have relearned three very important lessons:

- Training should take place in the operator's environment, using the right tools.
- Having a teacher – more than just an instructor – is critical.
- Performance must be measured against an absolute standard at every stage.

Our challenge now is to use our A-RCI training philosophy and lessons-learned to improve both acquisition processes and the fleet's operational proficiency in all of our warfare systems.

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A battle-weary LT COL Evans Carlson, USMC, back onboard *Nautilus* after the first blooding of "Carlson's Raiders."

After the Battles of the Coral Sea and Midway brought a halt to the Japanese advance into the central and southern Pacific in mid-1942, the Allies were keen to seize the initiative and strike back. Since securing the eastern approaches to Australia remained a key imperative, the threat to Port Moresby from a southerly, overland thrust across Papua, with covering support from Japanese bases in the eastern Solomons, suggested a counter-move in that direction. The Allied high command was particularly concerned about the tenacious Japanese seaplane base at Tulagi and positively alarmed by an enemy initiative to build a new airstrip on Guadalcanal in late June. These developments provided the impetus for the first American offensive of the Pacific war, the amphibious assault on Guadalcanal and Tulagi by U.S. Marines on 7 August 1942.

Guadalcanal was not fully secured until February 1943, and a key theme of the Solomons campaign was the seesaw struggle between the two sides to prevent the Japanese from reinforcing their island garrisons. Thus, to distract the Japanese resupply effort, Admiral Nimitz ordered a diversionary raid on Makin Atoll in the Gilbert Islands over 1000 miles to the northeast. The Gilbert Islands had been a British colony since 1915, but the Japanese occupied them early in the war, established an auxiliary seaplane base on Makin's largest island, Butaritari, and installed a small garrison to defend it – 43 Japanese soldiers under the command of Sergeant Major Kanemitsu.

Selected to make the attack in mid-August 1942 were Companies A and B of the Marine Corps' 2nd Raider Battalion – "Carlson's Raiders" – under then-Lieutenant Colonel Evans F. Carlson, USMC. Carlson and his men were to be transported from Pearl Harbor to Makin

SUBMARINE COMMANDOS

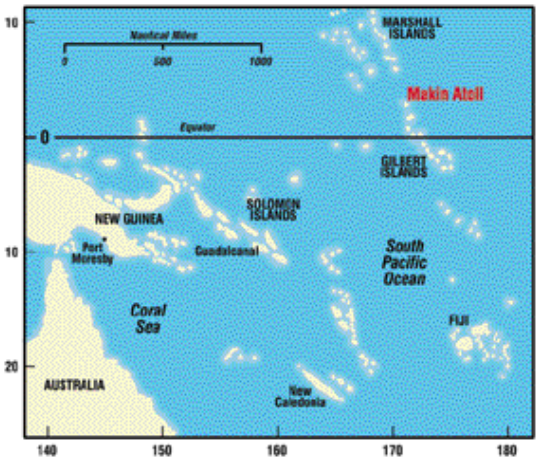
"Carlson's Raiders" at Makin Atoll

by Edward C. Whitman

onboard two large submarines, USS *Nautilus* (SS-168) and USS *Argonaut* (SS-166), and their objective was to destroy enemy installations, gather information, and divert Japanese attention from the Solomons.

Argonaut and *Nautilus* and were both unusual boats. [Ed. Note: See accompanying sidebar.] Laid down originally as *V-4* and *V-6*, respectively, the two submarines were second-generation members of the *V* class, conceived originally in the years after World War I as "fleet submarines" with sufficient speed and endurance to enable them to operate with the battle fleet. In the mid-1920s, the fleet submarine idea metamorphosed into the long-endurance submarine "cruiser," and the *V*-class design changed accordingly. *V-4* and *V-6* were thus very large ships for that time, with displacement in excess of 2,700 tons surfaced – 4,000 tons submerged – and an overall length of approximately 375 feet. Built originally as a minelayer, *V-4* was commissioned in April 1928, but later re-named USS *Argonaut* and redesignated, successively, SM-1 and SS-166. *V-6* was commissioned in July 1930 but renamed USS *Nautilus* a year later. Both were armed with two 6-inch deck guns and had been converted in the months preceding the raid to troop-carrying submarines by removing all torpedoes except those in the tubes and installing tiers of wooden bunks.

Similarly, Carlson was an unusual officer. He lied about his age to enlist in the Army in the First World War and won a commission, but he arrived in Europe too late to see combat. Finding civilian life uncongenial, he enlisted in the Marine Corps in 1922, earned a second commission, fought guerillas in Nicaragua, and spent several tours in China. During the last of these, in 1937, he was an eye-witness to the Japanese takeover of Shanghai, and – detailed as an observer – he accompanied the Chinese Communist Eighth Route Army in their battles with the invader. During this time, he developed his own distinctive ideas about guerilla warfare, small-unit operations, and the importance of ethical indoctrination for cohesion in combat. Eventually moved to resign his commission because of his impolitic – but strongly-expressed – view that the United States should aid China in resisting the Japanese, he spent two years speaking and writing on the subject, until six months before Pearl Harbor when he was permitted to rejoin the Corps as a major. Ten months later – amid some controversy within headquarters – he created the 2nd Raider Battalion, adopting as his unit's motto the Chinese phrase, "Gung Ho" – meaning roughly, "work together."



(top) The Makin raid was intended to draw Japanese forces away from the American attack on Guadalcanal in August 1942.

(bottom) Carlson's Raiders landed near the Japanese seaplane base on Butaritari, the largest island of Makin Atoll.

Nautilus and *Argonaut* departed Pearl Harbor in great secrecy on 8 August 1942 and proceeded separately to the Makin Atoll. In command of *Nautilus* was LCDR John Brockman, and commanding *Argonaut* was LCDR Jack Pierce, with the task force commander, CDR John Haines, riding the former. Between them, the two boats carried 211 Marines – 13 officers and 198 men – with 90 on *Nautilus* and 121 on *Argonaut*, all in addition to the ships' crews. With so many men and their equipment crammed into so little space, living conditions for the eight-day transit were barely tolerable. Crowding was so severe that the troops could do little more than stay in their bunks except for brief exercise periods on deck. Ventilation was inadequate, the heat and smell were stifling, and seasickness took a heavy toll. Even so, with so many mouths to feed, the galleys had to work around the clock to keep up.

Nautilus arrived off Makin early on 16 August, and spent most of the daylight hours in periscope reconnaissance. After rendezvousing with *Argonaut* at dusk, Haines ordered preparations to disembark the Marines in their rubber boats at 0300 the next morning. The initial plan called for landing at two points on the seaward side of narrow Butaritari Island, about five miles northeast of Ukiangong Point and just opposite the principal settlement, which faced the lagoon.

Despite repeated practice in Hawaii, the disembarkation quickly deteriorated into confusion. The effects of the swell on both the submarines and the rubber boats, the noise of the surf, and the need to transfer some of the *Nautilus*' troops into the *Argonaut's* boats all conspired against Carlson's original scheme for two separate landings, and he ordered all of his forces to head for the same spot. In the event, despite the swamping of many of their outboard motors, 18 of the 19 boats made it to shore near the intended location by 0500 on 17 August. The remaining unit, which had not received word of the change in plans, landed a mile to the southwest.

In the week before Carlson's raid, Sergeant Major Kanemitsu had not been idle. In response to a general alert from the Japanese high command, he had been preparing defensive positions – machine gun nests and sniper posts – and drilling his small garrison. Thus, he was not entirely surprised when fighting broke out soon after Carlson's men came ashore quietly on the morning of the 17th. (One account notes that it was the accidental discharge of one of the Marines' rifles that gave the alert.) Moving rapidly, Carlson's advance guard succeeded in reaching the opposite shore, seizing a building, and advancing along the island to the southwest, where an enemy

radio station was located on a pier in the lagoon. Japanese resistance soon stiffened, however, with soldiers arriving on both bicycles and trucks and snipers engaging the Americans from the tops of many of the coconut palm trees.

At this point, Carlson called for gunfire support from the submarines lying offshore, and although *Argonaut* never received the message, *Nautilus* put her big 6-inch guns to good use bombarding Japanese positions toward Ukiangong Point. When the Marines ashore spotted a small transport and a patrol boat heading southward in the lagoon, *Nautilus* shifted fire to them, and even though shooting practically blind with only minimal spotting, managed to sink both.

At mid-morning, with Kanemitsu's men hotly contesting the Marine advance, an enemy reconnaissance aircraft appeared, forcing both submarines to submerge. Then, around noon, the Japanese organized several aerial attacks, the second of which bombed and strafed the island, while covering the landing of two large "Mavis" flying boats in the lagoon to deliver reinforcements. Although both were destroyed, 35 fresh Japanese troops managed to get ashore. Meanwhile, however, LT Oscar Peatross and 11 men from the boat that had landed mistakenly to the southwest now found themselves – fortuitously – in the enemy rear. After decimating the Japanese from behind, they proceeded to destroy the radio station, burn enemy buildings and equipment, and then – with only three losses – escaped successfully back to their submarine that evening.

Two Marines prepare to disembark from *Nautilus* early on 17 August.

In the late afternoon, Carlson began a deliberate withdrawal back to the original landing site and launched his boats at 1900 for a return to the sea. Since morning, however, the surf had kicked up considerably, and with their outboard motors repeatedly swamped, relatively few of the boats could make it out through the breakers. Many capsized, equipment was lost, and most of the Marines were cast back onto the beach. All told, fewer than 100 – in seven boats – made it back to the submarines that night. This left half the force, including four stretcher cases, on the hostile shore.

The next morning, after only a brief skirmish with a Japanese patrol during the night, Carlson's Executive Officer, Major James Roosevelt, USMCR, son of the President, led four more boats out through the surf to the submarines waiting offshore. *Nautilus* manned up a boat with five Marine volunteers and attempted to send it to the beach with a line for pulling the remaining boats out to sea. Unfortunately, a Japanese aircraft forced both submarines under and strafed the boat, and it – and the volunteers – were never seen again. Further debarkation efforts were put off until nightfall on the 18th, but it emerged in the interim that except for the dead – surprisingly – the Japanese had disappeared. The remaining Marines spent the rest of the day searching Kanemitsu's headquarters, collecting intelligence, and wreaking more destruction on the Japanese installations. Then, after dark, four rubber boats were lashed to a native outrigger in the lagoon and sailed out to meet the submarines before midnight. Convinced that all the surviving Marines were on board, the two boats departed for the long return to Pearl Harbor. The thirty men who did not make it back were all assumed to have been killed in action. One of these, Sergeant Clyde Thomason, was the first enlisted Marine to be awarded the Medal of Honor in World War II.

To an American public hungry for good news, the Makin raid was proclaimed a brilliant exploit by the Navy and Marine Corps, and many of the participants were highly decorated, among them Carlson, Roosevelt, and CDR John Haines, who received the Navy Cross. In retrospect, there is little evidence that the attack succeeded in diverting any substantial forces from Guadalcanal, and by showing the Japanese how tenuously they held the Gilbert Islands, it led directly to subsequent reinforcements that exacted a terrible price from the Marines at Tarawa somewhat over a year later. As part of that same campaign, however, the U.S. Army's 165th Regimental Combat Team wrested Makin from the Japanese on 23 November 1943. Today, Makin Atoll is part of the island nation of Kiribati.

There are a number of other postscripts. *Nautilus* and *Argonaut* returned safely to Pearl Harbor, arriving on 25 and 26 August, respectively. Ultimately, *Nautilus* ended the war with 14 successful war patrols, including several in which she landed troops and supplies for operations similar to the Makin raid. *Argonaut* was less fortunate. Later in the year, her base of operations was transferred to Brisbane, Australia, and in late December, still under the command of Jack Pierce, she was diverted for a patrol near Bougainville in the northern Solomons. On 10 January 1943, Pierce attacked a heavily-escorted convoy of five freighters. The encounter was seen from a

(far left) During the surface transit to Makin, groups of Marines were rotated to the deck for fresh air and exercise.

(left) Both Sailors and Marines line the deck as *Argonaut* returns to Pearl Harbor on 26 August 1942.

U.S. Army aircraft that happened to be overhead, and it ended tragically with *Argonaut*, apparently mortally wounded by depth charges, breaking the surface steeply and falling back again. She was lost with all hands.

Despite Carlson's careful withdrawal, nine Marines were, in fact, left alive on Butaritari and captured by the Japanese. They were treated humanely at first and transferred to Kwajalein, with the intention of sending them on to Japan. However, after a murderous change of heart by the Japanese commander of the Marshall Islands, Vice Admiral Kose Abe, they were ceremoniously beheaded on 16 October, despite the objections of several of his officers. After the war, Admiral Abe was convicted of war crimes and hanged at Guam.

After an extensive search in 1998 and 1999 and an ensuing forensic investigation, the remains of 19 Marines killed on Butaritari Island were recovered, identified, and returned to the United States for burial just last year – nearly six decades after their being declared Missing in Action. An additional search effort will now attempt to find the remains of the nine Marines who were executed on Kwajalein, despite the fact that the island has been drastically transformed both by and since the war.

Carlson's Raiders fought again on Guadalcanal, where they operated behind enemy lines for 31 days in November and December 1942, apparently the longest such patrol in the Second World War. Carlson himself left the raiders in 1943 to become the Operations Officer of the 4th Marine Division and participated in the assaults on Tarawa, Kwajalein, and Saipan. He was severely wounded on Saipan dragging his radio operator from the line of fire, retired from the Marine Corps after the war, and died of heart trouble in May 1947. His successes on Makin and Guadalcanal and his seminal ideas on unconventional warfare have left a living legacy in the tradecraft and traditions of our Special Forces today. And the pioneering role of *Nautilus* and *Argonaut* in projecting power "...From the Sea" at Makin Atoll during 1942 was a clear forerunner of many of the expeditionary missions for which the U.S. Submarine Force is prepared even now.

Dr. Whitman is the Senior Editor of UNDERSEA WARFARE Magazine.

Legacy of the *Argonaut* and *Nautilus*

***Argonaut* and *Nautilus* were members of the loosely-defined *"V"* class, which eventually included nine submarines commissioned in the decade following 1924. Because the V-boats were originally conceived shortly after World War I as "fleet submarines" capable of operating with the Navy's battleships, their speed and endurance requirements demanded twice the displacement of earlier U.S. submarine designs. The first three – displacing approximately 2,100 tons and capable of 21 knots on the surface, were authorized in Fiscal Year (FY) 1919 and launched in 1924 and 1925. However, *V-4* (later *Argonaut*) and *V-6* (later *Nautilus*) were only authorized in FY 1925 and FY 1926, respectively, and by then, the growing power of Japan in the Pacific had become a serious strategic problem for the Navy. This factor – and the implications of the 1922 Washington Naval Treaty – created the requirement for long-range submarine "cruisers," or "strategic scouts," as well as long-range minelayers, for which long-endurance, not high speed, was most important. Thus, the next three *V*-class boats grew in displacement to over 2,700 tons (surfaced) and could only make 15-17 knots, or 8 knots submerged. (For comparison, consider that the later USS *Gato* (SS-212)-class, work-horse of the Pacific campaign, displaced only 1,525 tons.) Originally, the submarine cruisers were to include a small hangar for a scout aircraft, but that idea was dropped.**

(above) USS *Argonaut* (SS-166) at sea on her way to Makin Atoll.

(left) Her two big six-inch guns dominate this view of USS *Nautilus* (SS-168) at sea.

USS *Argonaut* (SS-166) was designed originally as a minelayer and launched at the Portsmouth (New Hampshire) Navy Yard in November 1927. On an overall length of 381 feet and displacing 2,710 tons surfaced and 4,080 submerged, she carried four 21" torpedo tubes forward and two 40" mine-laying tubes aft, with an elaborate mechanical handling system for moving the mines from stowage to the launching tracks. Considerable engine room volume was sacrificed to gain additional mine payload, which resulted in limiting the main propulsion diesels to a total of 2,800 horsepower, yielding only 15 knots on the surface. An over-large, under-powered boat, *Argonaut* was never entirely successful, but early in the war, she was re-engined at the Mare Island Navy Yard to increase her main propulsion horsepower to 3,600 and additionally received two external, aft-firing torpedo tubes. Then, on the way back to the theater, her mine-laying gear was stripped out at Pearl Harbor to make room for Carlson's Marines.

USS *Nautilus* (SS-168) was the second of the *V*-class "cruisers" and was launched at Mare Island in March 1930. Although virtually the same size as *Argonaut*, her main engines developed a total of 4,700 horsepower, and she could reach 17 knots surfaced. Instead of minelaying gear, she had two 21" torpedo tubes aft, and like *Argonaut*, carried two 6"/53 deck guns. *Nautilus* was also modernized and re-engined at Mare Island in 1941/42, receiving four external torpedo tubes, two forward and two aft. Soon thereafter, she was also converted to a submarine transport.

(right) The ship's bell of USS *Argonaut* (SS-166) – lost in combat in 1943 – still serves at the chapel of the Submarine base, Pearl Harbor.

(below) From the chapel's belfry, lost submarines are mourned by tolling *Argonaut's* bell.

BELLS
Left Behind

Article and photos by Colonel Charles A. Jones, USMCR

The year 2000 saw two occasions – one a celebration, one a tragedy – marking the role of the submarine in the modern world. The celebration was that of the Submarine Force of the U.S. Navy marking 100 years of service to the nation. The tragedy was the loss of the Russian submarine *Kursk*, a grim reminder of the dangers submariners face.

These occasions reminded me of two ship's bells I saw on Oahu in 1999 when I lived at the Submarine Base at Pearl Harbor while on a period of active duty in the Marine Corps. The bells – from the submarines USS *Wahoo* (SS-238) and USS *Argonaut* (SS-166) – were two unique reminders of the dangers submariners faced during another era, that of the submarine war waged in the Pacific in World War II.

The *Wahoo's* bell is in the USS Bowfin Museum. Anchored nearby is the *Bowfin* (SS-287) herself, one of several World War II submarines preserved as floating memorials.

Touring the *Bowfin* and the museum revived my interest in World War II submarines. Long ago, I learned that the Navy lost 52 submarines in that war, but the fact had no human dimension for me until I took the tours and started reading. What resulted was a new perspective on "the silent service."

First, submariners do not enjoy the publicity that other branches of service do. Many can name the pilot of the B-29 that dropped the atomic bomb or the photographer who took the famous picture of the Iwo Jima flag raising. But who can name the U.S. submarine with the most confirmed sinkings during the war? Also, who remembers that Admiral Chester Nimitz, a submariner himself, began his successful tour as Commander-in-Chief, Pacific Fleet, on 31 December 1941, at a ceremony aboard the submarine USS *Grayling* (SS-209)? A keen eye can make out the submarine's bell mounted on the conning tower in the photograph of the ceremony.

Second, the U.S. submarine campaign took a catastrophic toll of Japanese shipping and succeeded, while German and Japanese submarine campaigns failed.

Third, submarines did more than sink ships. They laid mines, delivered supplies, and served as lifeguards for downed aviators. Submarines saved numerous Army Air Forces and Naval aviators, including Navy pilot George Bush, our future president, rescued by a submarine in 1944 after his plane crashed.

Fourth, submarine attacks were not always carried out at a distance while submerged, with impersonal torpedo salvoes. The deck guns and

small arms onboard World War II submarines encouraged surface combat, which was fatal for many men, including Chief Pharmacist's Mate Arthur Beeman, killed while aiding a wounded officer during a surface attack. (Beeman Center on the Submarine Base, Pearl Harbor, is named for him.) LCDR Reggie Raymond, a Prospective Commanding Officer, was killed by an enemy bullet while on the bridge of the USS *Scorpion* (SS-278), firing a Browning Automatic Rifle at a Japanese ship.

Fifth, individual bravery was recognized by many decorations, including six Medals of Honor awarded to submarine commanders: Samuel Dealey, Eugene Fluckey, Howard Gilmore, Richard O'Kane, Lawson Ramage, and George Street. One wolfpack commander, Captain John P. Cromwell, also received a Medal of Honor. Three of these Medal recipients – Cromwell, Dealey, and Gilmore – were lost in action and received theirs posthumously. Their "tombstones" are in military cemeteries in the Pacific, where they are listed on tablets among the names of those missing in action.

Sixth, submarine duty was a lonely job with unique hazards. Aircrew have parachutes and crash landings; surface ship crews can abandon ship; infantrymen can find a hole or run. A depth-charged submariner had only one place to go: where he was.

The Submarine Base chapel, Pearl Harbor, Hawaii.

Finally, the casualties were great. Memorials at the Bowfin Museum and at the Submarine Base list the 52 submarines lost, implicitly marking the deaths of over 3,500 submariners, most of whom remain lost at sea in graves that will never be found. Many losses were the subject of a grim communique such as this one in 1945: "The Submarine USS *Bullhead* [SS-332] is overdue from patrol and presumed lost."

One of those lost was the USS *Robalo* (SS-273), and her Commanding Officer, Manning Kimmell. That was the second great tragedy of the war for his father, Admiral Husband Kimmel, former Commander in Chief, Pacific Fleet, who was relieved after the attack on Pearl Harbor.

A display case in the Bowfin Museum has a memorial to these losses: the bell of the USS *Wahoo*. For practical reasons, submarines left their bells behind when leaving on patrol. If a bell were left in its exposed topside mount behind the conning tower, it could make unwanted noise; if taken below, it would occupy space and present a hazard. The *Wahoo* exhibit notes a more ominous reason for leaving the bells behind: the ship's bell would be a memorial if the submarine never returned. The *Wahoo's* bell in fact serves as such a memorial: she was lost in 1943 with all hands, including her highly successful commander, Navy Cross recipient Dudley "Mush" Morton, credited with 19 sinkings in one year.

Argonaut's "bell left behind" rings for lost crews – including her own.

The story of the *Wahoo's* bell gave me some context when I read a sign at the Submarine Base chapel and learned that the USS *Argonaut* left her bell behind before leaving on patrol, and that very bell was eventually mounted in the belfry above. I suddenly realized that the haunting, dull sound of a bell I kept hearing on Sundays was the bell of the *Argonaut.* I attended a Sunday service at the chapel and learned that each Sunday, the congregation remembers one of the 52 lost submarines by reading its name and ringing the *Argonaut's* bell.

The bell has reminded them of Sam Dealey and the USS *Harder* (SS-257), killing several destroyers in one patrol; of John Cromwell stating that he would go down with the USS *Sculpin* (SS-191) rather than let himself be captured and risk divulging secrets under torture; and Howard Gilmore giving his famous order – "Take her down" – to ensure the safety of the USS *Growler* (SS-215) at the cost of his own life.

But the bell was also a reminder of the *Argonaut* herself. I learned more about her. She was commissioned in 1928 as *V-4*, becoming *Argonaut* in 1931. Shirley Temple and Mickey Rooney visited her. Richard O'Kane served on *Argonaut* before commanding the USS *Tang* (SS-306), where he earned a Medal of Honor. *Argonaut* and USS *Nautilus* (SS-168) took Carlson's Raiders to Makin Island in 1942, partly because they were our largest submarines – and they returned to a heroes' welcome at the submarine piers, not far from where the chapel would be built and dedicated in 1944.

Yet, my learning experience remained incomplete without seeing the bell itself, so I obtained the able assistance of Religious Program Specialist First Class Sam Prado, who indulged my intense, incurable interest in military history. He was as curious and determined as I was, so we made the difficult climb into the very small belfry and photographed a bell stamped "U.S.S. ARGONAUT 1928." Befitting a large ship, it is a large bell, perhaps two feet in diameter, weathered and stained by over 50 years of service. Sadly, this very bell rings on occasional Sundays for *Argonaut* herself. In December 1942, the submarine departed Pearl Harbor for what would be her third and final patrol, which ended when she was sunk attacking a Japanese convoy near Bougainville on 10 January 1943. The entire crew of 105 was lost.

Submarine warfare has changed much since then, as shown by a comparison of *Bowfin* with a modern submarine. Deck guns are gone. Man-to-man combat on the surface has yielded to more sophisticated, technology-oriented missions. At the piers near the chapel, however, modern submarines still have bells, but they ring for function and ceremony, not as memorials. At the chapel itself, a bell left behind does ring in remembrance, turning all Sundays into Veterans and Memorial Days as *Argonaut's* bell rings for lost crews, including her own.

Colonel Charles A. Jones is a writer living in Norfolk, Virginia and a judge advocate in the Marine Corps Reserve, serving as a drilling reservist at the Office of the Staff Judge Advocate, U.S. Marine Corps Forces, Atlantic. He is grateful to Chaplain (CDR) Dick Pusateri and RP1 Sam Prado, of Submarine Base Pearl Harbor, for their assistance in providing information about, and access to, *Argonaut's* bell. He also appreciates the assistance given by Charles Hinman and Nancy Richards of the Bowfin Museum.

NUPOC Offers Students Exciting Career Incentives

(cont. from page 11)

candidates for Naval Reactors interviews, and liaison with NRC headquarters.

The NUPOC program provides numerous benefits to successful applicants. Upon accession, the applicant receives a $12,000 bonus – $10,000 on signing, and an additional $2,000 on completion of nuclear training – and is enlisted into the Navy as an active-duty E-6 in the Naval Reserve. As such, he or she is now entitled to full active-duty pay and benefits and will accrue time in service and leave time while completing school, for up to two and one-half years. The member's only responsibilities until graduation are to meet monthly with his or her recruiter, pass the Navy Physical Readiness Test every six months, maintain satisfactory grades, and graduate on time.

Thanks to increased numbers of NTOs, support from the fleet, and greater emphasis within the NRC, the NUPOC program has succeeded in reaching its submarine and surface warfare officer recruiting goals in the face of one of the strongest economies and toughest recruiting environments in recent memory. This will result directly in improved quality of life for all future submarine junior officers, as the personnel shortages of the past are eliminated.

The program is vital to the future of the Submarine Force. It provides a substantial portion of the officers entering the nuclear training pipeline and supports the fleet by providing quality replacements for junior officers on sea duty. At the same time, the Recruiting Command's NTOs need the Fleet's continuing support to provide prospective NUPOCs a good look at what their Navy career would be like. Any of those wide-eyed, awe-struck students you've seen touring a submarine or surface ship could be the next O'Kane, Morton, or Ramage!

If you are a Nuclear-Trained junior officer interested in being a Regional NTO or NRD Officer Recruiter, contact your detailer.

LT Shugart is an NTO assigned to Navy Recruiting Region West, Oakland, California.

Three "Million-Dollar Submarines"

By breaking the million-dollar mark in Selective Re-enlistment Bonuses (SRBs), three submarines have shown convincingly they can keep Sailors in the Navy. USS *Tucson* (SSN-770), USS *Oklahoma City* (SSN-723), and USS *Houston* (SSN-713) all passed out over $1 million in SRBs, most of it tax free, since many Sailors re-enlisted while deployed within combat zones, such as the Arabian Gulf.

Sailors like SK3 Michael Lukachie, from San Dimas, CA, pushed *Tucson* over $1 million in SRBs during a re-enlistment ceremony at Singapore's famous Merlion statue on Sentosa Island, receiving a check for almost $20,000. Other re-enlisting members of *Tucson*'s crew cashed in on individual bonuses valued from $20,000 to $60,000. Most saved the extra cash for investment or college.

SK3 Michael Lukachie received a check for almost $20,000.

Some Sailors receive not only a check up front, but also a promotion through the Selective Training and Reenlistment (STAR) Program. This means a monthly pay raise and another chevron under their crow. ET3 Norman J. Chadbourne, also from *Tucson*, decided to stay in for an additional two years after only 30 days onboard, and now he's $45,000 richer and earns approximately $300 more each month. But re-enlistment isn't only about the money. Chadbourne, who also plans to apply for an officer candidate program, said, "The Navy offers us the chance to get extensive training in high-tech fields... It also gives us the chance to earn college credits while working and get leadership experience – all while defending our country."

ET1(SS) Mark Lopez, Command Career Counselor onboard *Oklahoma City*, where 32 of 149 crewmembers re-enlisted, said attending Navy schools and continuing education were major motivating factors. He went on to say, "Command support is the big ticket. Our command and the Navy's mission make this possible, and it was a unanimous decision among everyone who was eligible for re-enlistment."

Commanders are looking more carefully at what is important to Sailors these days, and family is a key issue. During a recent six-month deployment, nine babies were born into the families of *Houston* Sailors, and creative personnel scheduling made it possible for all of them to be present at the births! This is typical of a new realization that maintaining a skilled work force in the face of civilian competition for technical talent demands greater accommodation of each individual's needs.

"The attitude exists that the Navy's gone too far, but I don't think so," said *Houston* Commanding Officer CDR Dan Mack. "It's not a kinder, gentler Navy – it's one that's more realistic and listening more to its people."

Compiled from COMSUBLANT press releases by JO2 Starre Quinones, a Wire Service release by LT Leslie Hull-Ryde, COMLOGWESTPAC, and an Associated Press release by Dara Akiko Williams.

Flag Notes

COMSUBPAC RADM Albert H. Konetzni, Jr. has been nominated for appointment to the grade of Vice Admiral and assignment as Deputy Commander and Chief of Staff, U.S. Atlantic Fleet, Norfolk, Va.

RADM John B. Padgett, III is being assigned as Commander Submarine Force, U.S. Pacific Fleet, Pearl Harbor Hawaii. Padgett is currently serving as Commander, Navy Region Northeast/ Commander, Submarine Group TWO, Groton, Conn.

SUBLANT Radioman Wins Copernicus Award

By JO2 Starre Quinones

When it came time for SUBLANT's C4I section to submit its nominee for the fourth annual Copernicus Awards, there was no contest. Force Radioman ETCS (SS) Brian Mathis was the man.

"He's basically 'Johnny-on-the-spot' for anything that happens in the submarine community," explained LT Dennis Mohr, Force Communications Readiness Officer. He said Senior Chief Mathis, a native of Little Rock, Arkansas, stays involved with virtually everything related to submarine communications and local area networks (LANs).

Specifically, Mathis is responsible for reviewing communications programs during their design phase and ensuring the systems will function properly once deployed. Essentially, any new C4I system that is being installed on submarines has to be approved by Mathis or it doesn't get installed. He also plans, coordinates, and oversees the equipment's installation. "He makes sure that all the different program offices from Space and Naval Warfare Systems Command to Naval Sea Systems Command are communicating and sharing information," Mohr explained.

Mathis deals with hardware like the Miniaturized DAMA UHF Receiver, Submarine High Data-rate Antenna, Submarine Baseband Communications Switch, and the EHF-MDR Terminal. He also ensures that any integrated logistics support issues are aggressively pursued by the appropriate staff codes and Naval Inventory Control Point. "Ultimately," Mohr said, "this makes the submarine communication electronics technician's job easier on the boats."

ETCS(SS) Ted Knight, Tactical Force Readiness Training Communications Officer, said Mathis stays focused by enjoying what he does and remembering where he came from. "Mathis ... is a guy who has been there," Knight said. "He knows the issues that the Sailors on the deckplates and in the radio rooms have to deal with on a daily basis. His goal is to ease the burden of those Sailors."

Mathis joined the Navy in 1982 because he was unsure of where he wanted to go in life. "Prior to joining – and for my first two years in the Navy – I was the type of person who did the minimum required to get by – nothing more, nothing less," Mathis admitted. However, he soon learned from his first chief that there was more to life than just getting by. "He taught me that the amount of effort you apply to any task or goal directly affects the pride you get from your accomplishments."

Clearly, Mathis has learned from his experience and applied his knowledge to make a lasting contribution to submarine communications. The Commander of the U.S. Atlantic Fleet Submarine Force, VADM John J. Grossenbacher, said, "His influence will be evident on board every Atlantic Fleet submarine well into the next decade." Grossenbacher added, "He's exactly the person envisioned when the Copernicus Award was created."

The Copernicus Award is given annually by the Armed Forces Communications and Electronics Association (AFCEA) and the U.S. Naval Institute (USNI) for individual contributions to Naval Warfare in the fields of information systems and information warfare.

Changes of Command

USS Wyoming (SSBN-742) (BLUE)
CDR Jeff Hughes relieved
CDR John Pasko

USS Maryland (SSBN-738) (GOLD)
CDR Rusty Smith relieved
CDR Chris Hayes

USS West Virginia (SSBN-736) (GOLD)
CDR Paul Siegrist relieved
CDR Stephen Matts

USS West Virginia (SSBN-736) (BLUE)
CDR Mike Cortese relieved
CDR Greg Parker

USS Maine (SSBN-741) (GOLD)
CDR Joe Tofalo relieved
CDR Steve McShane

USS Pennsylvania (SSBN-735) (GOLD)
CDR Ken Perry relieved
CDR Brad Gehrke

USS Jacksonville (SSN-699)
CDR Michael W. Brown relieved
CDR James F. Caldwell, Jr.

USS Dallas (SSN-700)
CDR Charles Sykora relieved
CDR Joseph McBrearty

USS Annapolis (SSN-760)
CDR David Bartholomew relieved
CDR Daniel I. Nylen

USS Miami (SSN-755)
CDR Randall Richards relieved
CDR Jim Ransom

USS Augusta (SSN-710)
CDR Tim Galpin relieved
CDR Bill Gieri

USS Philadelphia (SSN-690)
CDR Emil Casciano relieved
CDR Douglas Biesel

USS Memphis (SSN-691)
CDR Richard Breckenridge relieved
CDR Mark Breor

USS Key West (SSN-722)
CDR Charles Merkel relieved
CDR William Hilarides

USS Charlotte (SSN-766)
CDR Tom Bailey relieved
CDR Reid Tanaka

USS Topeka (SSN-754)
CDR John Litherland relieved
CDR Mark Patton

USS Helena (SSN-725)
CDR Timothy C. Bertch relieved
CDR Douglas S. Prince

USS Henry M. Jackson (SSBN-730) (GOLD)
CDR Bob Aronson relieved
CDR Stephen L. Szyszka

USS Michigan (SSBN-727) (GOLD)
CDR Dietrich Kuhlmann
CDR Thomas H. Barge

USS Kamehameha (SSN-642)
CDR Edward B. Seal relieved
CDR Derrek H. Hesse

SUBSCOL Divers Continue "Install" Training of New Submarine Escape Equipment

Divers from Submarine School's (SUBSCOL) Escape Training Facility worked recently with crew members of USS *Providence* (SSN-719) to familiarize them with the new Mark 10 Submarine Escape and Immersion Equipment (SEIE) suits. The Mark 10, which will allow Sailors to escape from much deeper depths than currently possible with the Steinke Hood, is slated to be in place onboard all U.S. Navy submarines by 2007. The navies of 22 nations currently use SEIE units.

Five U.S. Navy submarines already have the system, with an ambitious installation and training schedule in place for the remainder of the Fleet. Certain internal modifications, such as installing compressed air valves in submarine escape trunks, are needed for fielding the Mark 10. As these are completed on each boat, training for the crew will begin. New Sailors will receive training at SUBSCOL as part of their Basic Enlisted Submarine Training while Fleet Sailors will receive "Install Training" in their homeports, with SUBSCOL divers coming to them.

For almost half a decade, planners in the Submarine Warfare Directorate of the Office of the Chief of Navy Operations (CNO N77) have been working to make the transition from the Steinke Hood to the Mark 10 as seamless as possible. Success will require significant effort and cooperation from Sailors in all areas of the Fleet.

BMC(DV) Barry Hurst notes that while the old and new equipment looks radically different, their underlying rationale and respective development paths are remarkably similar. "The British started working on a new escape appliance at about the same time the U.S. Navy adopted the Steinke Hood," he said. "The original model resembled our Steinke, except it had long sleeves for added buoyancy." In the years that followed, British submariners constantly improved and refined their design and tested successive prototypes until they reached the full-body Mark 10 Submarine Escape and Life-raft Equipment (SEALE) they now have.

As Hurst noted, "Progress has been evolutionary. The Mark 10's Mark 8 predecessor was a double-layer suit, with no life raft – you looked like the Michelin Man." The British Escape Instructors felt it was both uncomfortable and unsafe for floating on the surface for prolonged periods, and determined that eliminating one layer of the suit and using that fabric to build a life raft that would fit in the same package would expand the suit's capabilities.

Re-examining our submarine escape and rescue approach became necessary after the end of the Cold War, when U.S. submarines shifted their emphasis from deep-water to near-shore operations. "Because it's a full body suit," Hurst points out, "the Mark 10 provides thermal protection once you reach the surface, and the British Navy has successfully tested it at six hundred foot depths." But added capability adds size, says Hurst. "Something U.S. Navy submarine Sailors will notice is that the Mark 10 is about twice as large as a Steinke hood. That means it occupies more space onboard the sub."

The adoption of the Mark 10 and its associated installation and training program re-emphasizes a fundamental principle of the Submarine Force, notes Hurst. "The life of every Sailor onboard is worth every penny it costs to save it if the need arises. That's why escape-training programs are both intensive and expensive. If they save one life, all that expense is worth it."

Qualified For Command

LT Christopher Amaden, USS Dallas (SSN-700)
LT Scott Helberg, USS Springfield (SSN-761)
LCDR Bryan Klir, USS Maine (SSBN-741) (BLUE)
LCDR Dale Minich, USS L. Mendel Rivers (SSN-686)
LCDR Mark A. Prokopius, USS Hyman G. Rickover (SSN-709)
LCDR Scott Seal, USS Maine (SSBN-741) (GOLD)
LCDR Gerhard Somlai, USS Jacksonville (SSN-699)
LCDR Andrew St. John, USS Alexandria (SSN-757)
LT William Swanson, USS Jacksonville (SSN-699)
LCDR Chad Brown, USS Georgia (SSBN-729) (BLUE)
LCDR Steven Harrison, USS Tucson (SSN-770)
LCDR Neil Covington, USS Nevada (SSBN-733) (BLUE)
LCDR Alan Dorrbecker, USS Jefferson City (SSN-759)
LCDR Geoffey Hendrick, USS Michigan (SSBN-727) (GOLD)
LCDR Michael Lewis, USS Salt Lake City (SSN-716)
LCDR Daniel Brunk, COMSUBRON THREE
LT Glenn Godbey, USS Kamehameha (SSN-642)
LCDR William Greene, USS Santa Fe (SSN-763)

Supply Officer Qualified In Submarines

LT Chad Buermele, USS Greeneville (SSN-772)
ENS Donovan Coffey, USS Houston (SSN-713)
LT Gregory Lask, USS Michigan (SSBN-727) (GOLD)
ENS Samuel Riser, USS Columbus (SSN-762)
LTJG Aaron Sikes, USS Kamehameha (SSN-642)

Qualified Surface Warfare Medical Officer

LT Michael Jacobs, USS Emory S. Land (AS-39)
LT Sara Saltzstein, USS Emory S. Land (AS-39)

Qualified Surface Warfare Supply Officer

ENS Douglas Perkins, USS Frank Cable (AS-40)
LCDR Todd Washington, USS Emory S. Land (AS-39)

Corrections

LTJG Sean Duncan was erroneously listed as a supply officer on page 32 of the Fall 2000 issue. LTJG Duncan is a line officer who qualified in submarines. Congratulations again!

The FLEET ASSISTANCE telephone number printed on page 20 of the Fall 2000 issue is incorrect. The correct numbers are 1-703-602-SUBS, which is continually manned, or 1-703-602-4700, which is available during working hours.

Line Officer Qualified In Submarines

LTJG Joseph Abbott, USS Maryland (SSBN-738) (BLUE)
LTJG Alexey Abrahams, USS Topeka (SSN-754)
LTJG Samuel Adams, USS Tennessee (SSBN-734)
LTJG Thomas Aydt, USS Seawolf (SSN-21)
LTJG James Bae, USS West Virginia (SSBN-736) (BLUE)
LTJG Kurt Balagna, USS Kentucky (SSBN-737) (BLUE)
LT David Bonfili, USS Annapolis (SSN-760)
LTJG Edward Browne, USS Columbus (SSN-762)
LTJG Thomas Buecker, USS Miami (SSN-755)
LTJG Edward Byers, USS Scranton (SSN-756)
LTJG Kevin Carlisle, USS Pasadena (SSN-752)
LTJG Robert Carnell, USS Louisiana (SSBN-743) (BLUE)
LTJG Juan Casias, USS Florida (SSBN-728) (GOLD)
LTJG Michael Coen, USS Greeneville (SSN-772)
LTJG Don Cross, USS Memphis (SSN-691)
LTJG Kenneth Curtin, USS City of Corpus Christi (SSN-705)
LTJG Thomas Donohue, USS Kamehameha (SSN-642)
LTJG Cesar Dorantes, USS Louisiana (SSBN-743) (BLUE)
LTJG Matthew Dukette, USS Greeneville (SSN-772)
LTJG Steven Faulk, USS Tucson (SSN-770)
LTJG David Foreman, USS L. Mendel Rivers (SSN-686)
LTJG Stanley Freemyers, USS West Virginia (SSBN-736) (GOLD)
LTJG Allen Garner, USS Pasadena (SSN-752)
ENS John Gary, USS Maryland (SSBN-738) (BLUE)
LTJG Kjell Gjovig, USS Salt Lake City (SSN-716)
LTJG Todd Glidden, USS L. Mendel Rivers (SSN-686)
LTJG Joseph Goldbach, USS Florida (SSBN-728) (GOLD)
LTJG Jeffrey Gromatzky, USS Charlotte (SSN-766)
LTJG Richard Haas, USS Helena (SSN-725)
LT Christopher Handwerk, USS Jacksonville (SSN-699)
LTJG Edward Hanley, USS Montpelier (SSN-765)
LTJG Kurt Helgemoe, USS Wyoming (SSBN-742) (GOLD)
ENS James Hoch, USS Alabama (SSBN-731) (BLUE)
LT James Hodges III, USS Charlotte (SSN 766)
LTJG Christopher Horgan, USS Toledo (SSN-769)
LTJG William Juzwiak, USS Nevada (SSBN-733) (BLUE)
LTJG David Kaiser, USS Henry M. Jackson (SSBN-730) (BLUE)
LTJG Brian Kearns, USS Boise (SSN-764)
LTJG Marc Kennedy, USS San Francisco (SSN-711)
LTJG Robert Kerrigan, USS Henry M. Jackson (SSBN-730) (BLUE)
LTJG Ryan Kight, USS Maryland (SSBN-738) (BLUE)
LTJG Joseph Klapatch, USS Annapolis (SSN-760)
LTJG Richard Klein, USS Norfolk (SSN-714)
LTJG Bryan Levin, USS Columbus (SSN-762)
LTJG Christopher Lord, USS Annapolis (SSN-760)
LTJG Stephen Lytle, USS Nevada (SSBN-733) (BLUE)
LTJG Russ Mochizuki, USS Columbus (SSN-762)
LTJG Thomas Moore, USS Alexandria (SSN-757)
LTJG Christopher Murphy, USS Kamehameha (SSN-642)
LTJG Larry Myers, USS Rhode Island (SSBN-740) (BLUE)
LT Frank Nevarez, USS Connecticut (SSN-22)
LTJG Ryan O'Donnell, USS Memphis (SSN-691)
LTJG Christopher Osborn, USS West Virginia (SSBN-736) (GOLD)
LTJG Neal Osterhaus, USS Alaska (SSBN-732) (GOLD)
LTJG Michael Owen, USS Minneapolis St. Paul (SSN-708)
LTJG Daniel Patnoad, USS Memphis (SSN-691)
LTJG Albert Perry, USS Jacksonville (SSN-699)
LTJG Marc Picard, USS Dallas (SSN-700)
LT William Pritchett, USS Greeneville (SSN-772)
LTJG Brian Rauscher, USS City of Corpus Christi (SSN-705)
LTJG Jason Rhea, USS Michigan (SSBN-727) (BLUE)
LTJG Gene Severtson II, USS Henry M. Jackson (SSBN-730) (GOLD)
LTJG Albert Smith, USS Hyman G. Rickover (SSN-709)
LTJG Charles Spenceley, USS Nevada (SSBN-733) (GOLD)
LTJG Daniel Stauffer, USS Houston (SSN-713)
LTJG Leonard Talbot, USS Jacksonville (SSN-699)
LTJG Kevin Trexler, USS Salt Lake City (SSN-716)
LTJG William Walker, USS Maryland (SSBN-738) (GOLD)
LTJG Gerald Wilson, USS Louisiana (SSBN-743) (BLUE)
LTJG Jason Woodbury II, USS Michigan (SSBN-727) (GOLD)
LT Cale Young, USS Wyoming (SSBN-742) (GOLD)
LTJG Eric Zito, USS Tennessee (SSBN-734) (GOLD)

Qualified Surface Warfare Officer

ENS Jaime Brammer, USS Frank Cable (AS-40)
ENS John Dunne, USS Frank Cable (AS-40)
ENS Floyd Dyal, USS Emory S. Land (AS-39)
ENS William Edenbeck, USS Frank Cable (AS-40)
ENS Lawrence Edwards, USS Frank Cable (AS-40)
ENS Howland Enokida, USS Emory S. Land (AS-39)
ENS Alan Feenstra, USS Emory S. Land (AS-39)
CWO3 Robert Gilliam, USS Emory S. Land (AS-39)
LT John Goff, USS Emory S. Land (AS-39)
ENS James Hair, USS Frank Cable (AS-40)
ENS Kenneth Holland, USS Emory S. Land (AS-39)
CWO2 Andy Imm, USS Frank Cable (AS-40)
ENS Early Jackson, USS Emory S. Land (AS-39)
CWO2 John Kiessling, USS Frank Cable (AS-40)
ENS Randy Lee, USS Frank Cable (AS-40)
LT James Link, USS Emory S. Land (AS-39)
ENS Greg Mcgill, USS Frank Cable (AS-40)
ENS Brian Novak, USS Emory S. Land (AS-39)
LCDR David Peterson, USS Emory S. Land (AS-39)
ENS George Porter, USS Emory S. Land (AS-39)
ENS David Purkiss, USS Emory S. Land (AS-39)
CWO2 Martin Riley, USS Emory S. Land (AS-39)
ENS Lyle Spain, USS Frank Cable (AS-40)
LT Robert Stevens, USS Emory S. Land (AS-39)
ENS George Taylor, USS Frank Cable (AS-40)
ENS Steven Terreault, USS Emory S. Land (AS-39)
LTJG Terry Walton, USS Emory S. Land (AS-39)

2001 Capt. Edward F. Ney Awards For Food Service Excellence

CINCLANTFLT Submarine Awardees

First Place:
USS Kentucky (SSBN-737 (GOLD)
Runner Up:
USS Scranton (SSN-756)
Honorable Mention:
USS Albuquerque (SSN-706)

Congratulations also to USS Emory S. Land (AS-39), chosen as runner up in the Large Afloat category!

CINCPACFLT Submarine Awardees

First Place:
USS Ohio (SSBN-726) (BLUE)
Runner Up:
USS Asheville (SSN-758)
Honorable Mention:
USS Jefferson City (SSN 759)

Qualified Nuclear Engineer Officer

LTJG Charles Ackerknecht, USS Rhode Island (SSBN-740) (GOLD)
LTJG Timothy Allen, USS Alaska (SSBN-732)
LTJG Kelly Baker, USS Henry M. Jackson (SSBN-730) (BLUE)
LTJG Alexander Barbara, USS Miami (SSN-755)
LTJG Brian Basta, USS Olympia (SSN-717)
LTJG Robert Belcher, USS Georgia (SSBN-729) (BLUE)
LTJG Thomas Berres, USS Boise (SSN-764)
LTJG Shane Biegelson, USS Seawolf (SSN-21)
LTJG Nathan Boyden, USS Boise (SSN-764)
LTJG Thomas Bozarth, USS Albuquerque (SSN-706)
LTJG Steven Brabec, USS Connecticut (SSN-22)
LTJG Peter Brahan, USS Albuquerque (SSN-706)
LTJG Jeffrey Brown, USS Georgia (SSBN-729) (BLUE)
LTJG Jon Cakus, USS Salt Lake City (SSN-716)
LTJG Jeffery Carmody, USS Hymen G. Rickover (SSN-709)
LTJG Jeffrey Carrol, USS Maine (SSBN-741) (BLUE)
LT John Chauvin, USS Tennessee (SSBN-734) (BLUE)
LT Michael Chin, USS Memphis (SSN-694)
LTJG Nathan Clark, USS Florida (SSBN-728) (GOLD)
LTJG Andrew Clark, USS Newport News (SSN-750)
LTJG James Colston, USS Philadelphia (SSN-690)
LTJG John Craddock, USS Buffalo (SSN-715)
LT Phillip Cruz, USS Charlotte (SSN-766)
LTJG Theron Davis, USS Wyoming (SSBN-742) (BLUE)
LTJG Arian Dell, USS Pennsylvania (SSBN-735) (GOLD)
LT Jean Dube, USS Georgia (SSBN-729) (BLUE)
LT Anthony Duttera, USS Tennessee (SSBN-734) (GOLD)
LTJG Michael Eberlein, USS Hymen G. Rickover (SSN-709)
LTJG Daniel Eddinger, USS Pennsylvania (SSBN-735) (GOLD)
LTJG Hugh Edmonson, USS Bremerton (SSN-698)
LTJG Shane Eller, USS Alexandria (SSN-757)
LTJG Charles Ellis, USS Maine (SSBN-741) (GOLD)
LTJG Timothy Erickson, USS Parche (SSN-683)
LT Michael Evans, USS Florida (SSBN-728) (GOLD)
LTJG Shane Fentress, USS Hartford (SSN-768)
LTJG Jason Flemish, USS Columbus (SSN-762)
LTJG Rance Ford, USS Maryland (SSBN-738)
LTJG Erik Fox, USS Portsmouth (SSN-707)
LTJG Brian Freck, USS Alabama (SSBN-731) (BLUE)
LTJG Patrick Gallagher, USS Alabama (SSBN-731) (BLUE)
LTJG Robert Good, USS West Virginia (SSBN-736) (GOLD)
LT Peter Greene, USS Parche (SSN-683)
LT Chris Harrington, USS La Jolla (SSN-701)
LTJG David Hein, USS Alabama (SSBN-731) (GOLD)
LT Wayne Homan Jr., USS Santa Fe (SSN-763)
LTJG Adam Hudson, USS Nebraska (SSBN-739) (GOLD)
LTJG Brian Huntley, USS Pasadena (SSN-752)
LTJG Dennis Johnson, USS Ohio (SSBN-726) (BLUE)
LTJG Jeffrey Juergens, USS Ohio (SSBN-726) (BLUE)
LTJG Gerald Kasuba, USS Cheyenne (SSN-773)
LTJG Benjamin Kelsey, USS Norfolk (SSN-714)
LTJG Jeffrey Kremer, USS Augusta (SSN-710)
LTJG Marty Kuhl, USS Louisiana (SSBN-743) (GOLD)
LTJG Bradley Lacour, USS Kentucky (SSBN-737) (GOLD)
LT Robert Landis, USS Nebraska (SSBN-739) (GOLD)
LTJG Keith Lanzer, USS Norfolk (SSN-714)
LTJG Joshua LaPenna, USS Wyoming (SSBN-742) (BLUE)
LTJG Matthew Laser, USS Wyoming (SSBN-742) (GOLD)
LTJG Kenneth Lawrence, USS Hartford (SSN 768)
LTJG Aron Lewin, USS Key West (SSN-722)
LTJG Daniel Lombardo, USS Florida (SSBN-728) (BLUE)
LTJG Kevin Lowe, USS Kentucky (SSBN-737) (GOLD)
LTJG Richard Marchland, USS Florida (SSBN-728) (BLUE)
LTJG Benjamin Martin, USS Hampton (SSN-767)
LTJG Charles Mclenithan, USS Nevada (SSBN-733) (BLUE)
LTJG Robert Morrison, USS Philadelphia (SSN-690)
LTJG Melvin Naidas, USS Santa Fe (SSN-763)
LTJG Jason Neal, USS Maine (SSBN-741) (GOLD)
LTJG Thomas O'Malley, USS Maryland (SSBN-738) (BLUE)
LTJG Roger Onaga, USS Nevada (SSBN-733) (GOLD)
LTJG Christopher Osborn, USS West Virginia (SSBN-736) (GOLD)
LTJG Geoffrey Patterson, USS Dallas (SSN-700)
LT Maurico Perez, USS Louisville (SSN-724)
LTJG Jessie Porter, USS Michigan (SSBN-727) (BLUE)
LTJG Jonathan Retzke, USS Boise (SSN-764)
LTJG Eric Rozek, USS Florida (SSBN-728) (GOLD)
LT Todd Rupp, USS Helena (SSN-725)
LTJG Nathan Shiflett, USS Georgia (SSBN-729) (BLUE)
LTJG Keith Skubisz, USS Albany (SSN-753)
LTJG Melvin Smith, USS Oklahoma City (SSN-723)
LT Pasit Somboonpakron, USS Columbia (SSN-771)
LTJG Rolf Spelker, USS Asheville (SSN-758)
LTJG Jonathan Staley, USS Cheyenne (SSN-773)
LTJG Thomas Stephen, USS Rhode Island (SSBN-740) (BLUE)
LTJG Stanley Stewart, USS Parche (SSN-683)
LTJG James Thorp, USS Louisiana (SSBN-743) (GOLD)
LTJG Roland Tink, USS Jacksonville (SSN-699)
LTJG Nathan Toothman, USS Olympia (SSN-717)
LTJG Glenn Truitt, USS Tennessee (SSBN-734) (BLUE)
LT Richard Twilley, USS Annapolis (SSN-760)
LTJG Darren Womacks, USS Michigan (SSBN-727) (GOLD)
LTJG Christian Wunsch, USS Buffalo (SSN-715)

SUBSCOL Dedicates New Warfare Training Center

Heralding a revolution in submarine officer training, a new Submarine Warfare Training Center was dedicated on 2 February 2001 at the Naval Submarine School, Groton, Connecticut by RADM Malcolm Fages, USN, Director, Submarine Warfare Division (N77). Replacing the traditional whiteboards, "plotting palace," and overhead projectors familiar to graduates of SUBSCOL's venerable Cromwell Hall is a new complex of automated electronic classrooms, combat systems and information technology laboratories, and a classified distance learning center.

Flanked by CAPT Arnold Lotring and LT Ryan Peugh, Rear Admiral Malcolm Fages, Director, Submarine Warfare Division, cuts the ceremonial ribbon, opening the Submarine Officer Warfare Center.

The 51,000 square foot facility in Bledsoe Hall is a state-of-the-art warfare training center that will feature interactive courseware for individualized instruction, virtual reality simulation of both navigation and combat scenarios, and SIPRNET access to the Submarine Force's distance-learning initiative, SUBNET. With this concept, each student will now have access to an unlimited number of learning resources, both during his schoolhouse training and – with SUBNET – on his shipboard tours, to achieve SUBSCOL's goal of life-long professional education.

Submarine Forward Presence as of January 2001

PortVisits

The Republic of Singapore

The *Los Angeles*-class attack submarine USS *Helena* (SSN-725) recently visited the Republic of Singapore to participate in Exercise PACIFIC REACH 2000, the first cooperative submarine rescue exercise in the Pacific region. The exercise also included participants from the Republic of Singapore Navy, the Japanese Maritime Self Defense Force, and the Republic of Korea Navy. Pictured here, the Korean submarine *Choi Moo Sun* makes its way past *Helena* and into the Sembawang port facilities. PACIFIC REACH 2000 was conducted in the South China Sea approximately 200 nautical miles northeast of Singapore.

Sailors aboard the USS *Tucson* (SSN-770) made a port visit to Singapore at the beginning of the year. More than a quarter of the enlisted crew was able to enjoy the liberty with a few more dollars in their pockets, too. Since September 2000, *Tucson* Sailors have been awarded more than $1 million in Selective Re-enlistment Bonuses (see pg. 28).

Singapore has long been known as a sailor's paradise. While on liberty here, U.S. Navy Sailors have taken every opportunity to explore the island nation's exotic culture and scenery. Many have taken tours through its expansive metropolitan center, visited Sentosa Island, or followed a less traveled path in search the country's more traditional heritage. While Singapore offers many of the conventional attractions found in many port cities, including sports fields and an exciting nightlife, it also offers some truly unique experiences, like the chance to visit a night safari featuring the country's nocturnal wildlife.

U.S. Navy photo
by Senior Chief
Photographer's Mate
Terry Cosgrove

Conversation aboard USS *Nautilus* (SS-168) after her return to Pearl Harbor from Makin Island, Aug. 26, 1942. Those present are (from left to right): LCDR William H. Brockman, Jr., Commanding Officer, USS *Nautilus*; CDR John M. Haines, Commander, Submarine Division 42, and LT COL Evans F. Carlson, Commander, 2nd Marine Raider Battalion.

Navy Cross Citation for CDR John Haines, USN

"For distinguished service in conflict with the enemy in aggressive and successful conduct of a Marine-Submarine Raider Expedition from August 8, 1942. As Force Commander of naval units, he displayed great skill and courage in carrying out an untried and hazardous mission. Although harassed by enemy aircraft and maneuvering his vessels in immediate proximity to an enemy-controlled coast, he succeeded in effecting an undetected landing of Marines against an alert enemy and later effected a highly successful withdrawal. He also directed the ships in his command to fire on two enemy ships in the lagoon, which were sunk by gunfire. His courage and skill in the handling of the vessels of his command on this occasion were in keeping with the highest traditions of the naval service."

Navy Cross Citation for LT COL Evans F. Carlson, USMC

" For extraordinary heroism and distinguished service in actual conflict with the enemy in aggressive and successful conduct of a Marine Raider expedition against the enemy held island of Makin on Aug 17-18, 1942. As C.O. of the 2nd Marine Raider Battalion, he led his forces in the raid on Makin Island in the first operation of this type ever conducted by U.S. forces. While under fire of ground troops and aerial bombing, he personally directed his forces which inflicted great personnel and material damage on the enemy. In the withdrawal of his forces under adverse sea conditions he showed outstanding initiative, resourcefulness, and perseverance in evacuating all wounded and disabled men.

As Task Group Commander, he displayed splendid leadership and untiring efforts in organizing, training, and taking a Marine Raider unit into successful action with courage and resourcefulness, against an unexpectedly powerful enemy force. After overcoming all opposition and destroying all gasoline storage, important shore installations, and two enemy aircraft, he successfully withdrew his unit. His outstanding bravery, skill, and determination in attacking this strong enemy force, with utter disregard for his personal safety, are in keeping with the highest traditions of the naval service."