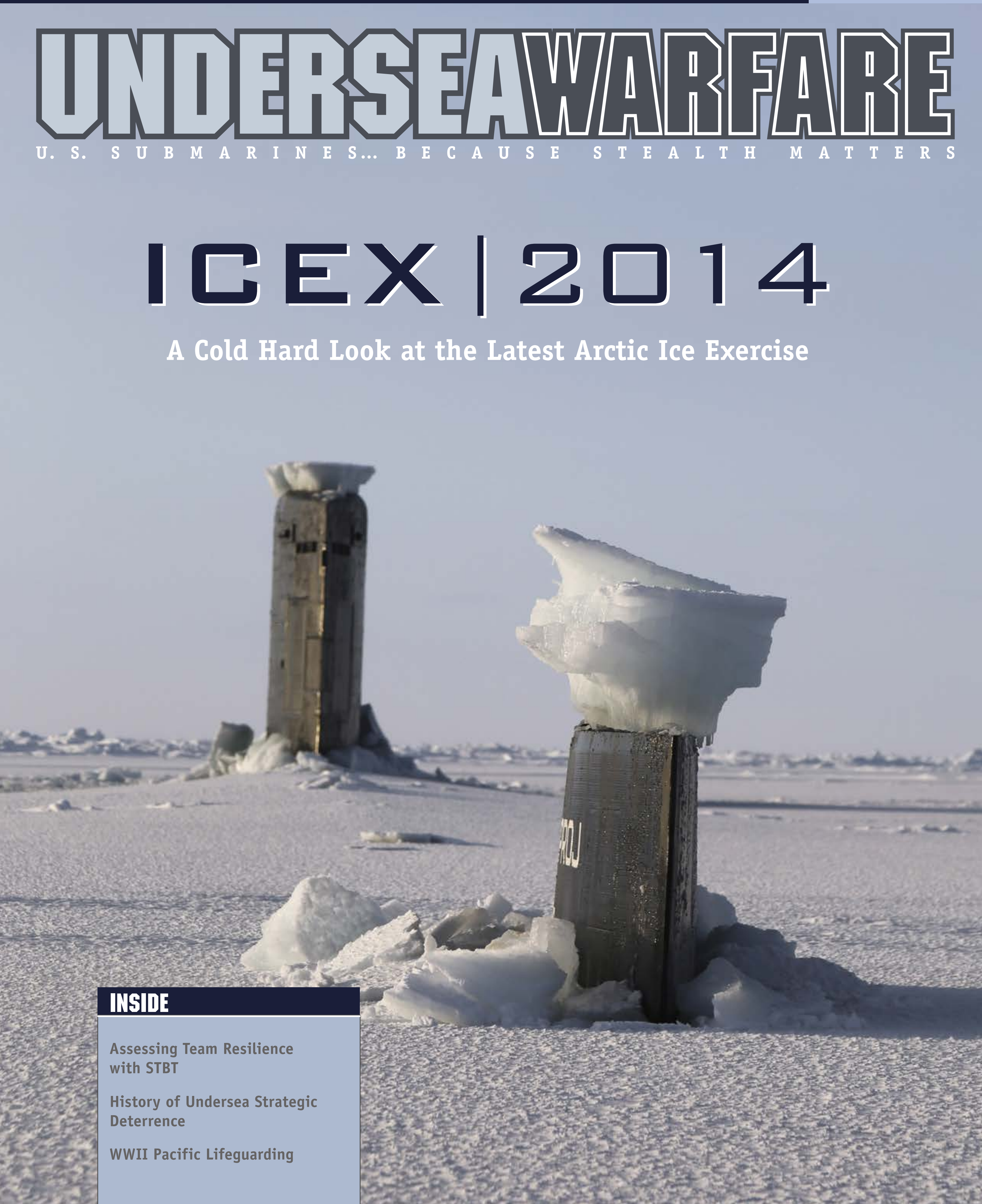
SUMMER 2014

UNDERSEA WARFARE

U. S. SUBMARINES... BECAUSE STEALTH MATTERS

ICEX | 2014

A Cold Hard Look at the Latest Arctic Ice Exercise



INSIDE

UNDERSEAWARFARE

THE OFFICIAL MAGAZINE OF THE U.S. SUBMARINE FORCE

ICEX 2014

A Cold Hard Look at the Latest Arctic Ice Exercise

On the Cover

The *Los Angeles*-class submarine USS *Hampton* (SSN 767) surfaces at U.S. Navy Ice Camp Nautilus, located on a sheet of ice adrift on the Arctic Ocean, as part of Ice Exercise (ICEX) 2014.

Photo by Dr. Amy Sun, Advanced Programs Lead, Lockheed Martin

Departments

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FORCE COMMANDER'S CORNER

Vice Adm. Michael J. Connor, USN
Commander, Submarine Forces

Team,

As the sizzling summer heat continues to grip most of the country, this edition of *UNDERSEA WARFARE* Magazine looks to cool things off by focusing on Ice Exercise 2014, which was held on and under the frozen Arctic Ocean just north of Alaska this past March.

The Arctic region has evolved into an area of prime military strategic importance. It has become a worldwide economic stronghold, which is why it is essential for our Submarine Force to remain at the forefront of mastering undersea warfare operations in this ever-changing and unforgiving environment. Navigating, communicating, and maneuvering are all different in an Arctic environment, more so than in any other ocean environment, as there are surfaces both above and below the submarine.

Since USS *Nautilus* (SSN 571) made the first Arctic transit in 1958, submarines have conducted under-ice operations in the Arctic region in support of inter-fleet transit, training, and cooperative allied engagements and operations for more than 50 years. The tradition continued with ICEX 2014 when two submarines, the *Los Angeles*-class USS *Hampton* (SSN 767) and the *Virginia*-class USS *New Mexico* (SSN 779), left their homeports in February and began their Arctic transits. Both submarines successfully transited under the ice to the Arctic conducting environmental data collection and demonstrating under-ice submarine operations while en route to Ice Camp Nautilus. Both submarines successfully demonstrated unique ship control evolutions and conducted several days of testing on the submarine tracking range at the Ice Camp.

Large shifts in wind direction created instabilities in the wind-driven ice floes of the Arctic Ocean, causing an early termination of operations at Ice Camp Nautilus, but the submarines continued transiting to other areas of the Arctic conducting independent operations and data collection before returning to their homeports. The success of ICEX 2014 was due to the hard work exhibited by all the Sailors and civilians from various commands who participated. I am extremely pleased with the training and testing completed. Job well done by everyone involved.

"The success of ICEX 2014 was due to the hard work exhibited by all the Sailors and civilians from various commands who participated. I am extremely pleased with the training and testing completed."

As summer comes to a close, the Submarine Force will complete one of its most monumental historical events—the 4,000th strategic deterrence patrol. Since the first fleet ballistic missile submarine, USS *George Washington* (SSBN 598) commenced the first strategic deterrent patrol in 1960, we have had 59 ballistic missile submarines in the last 50-plus years patrolling the waters worldwide providing the key element in U.S. National Security and the security of U.S. allies and partners.

Dual ceremonies at Kings Bay, Ga. and Bangor, Wash. will commemorate the Submarine Force's significant achievement and honor the efforts of all the men and women who made it possible.

With our deterrence posture, we have ushered in a new era of peace. From our "Forty-One for Freedom" to our aging *Ohio*-class submarines to our planned Ohio Replacement submarines, the most survivable element in the Strategic Triad—the SSBN—must continue. We must preserve and carry on the legacy of USS *George Washington* from more than 50 years ago, "Primus in Peace."

I am proud of the men and women of the Submarine Force. You conduct operations in the most challenging corners of the world, and you do it with professionalism and courage.

M J Connor

DIVISION DIRECTOR'S CORNER

Rear Adm. Joseph E. Tofalo, USN
Director, Undersea Warfare Division

Undersea Warriors,

It has been a very busy and exciting summer in the Submarine Force. Last month, USS *North Dakota* (SSN 784) was delivered to the fleet under budget and earlier than its contractual delivery date. She is the 7th consecutive *Virginia*-class to deliver ahead of schedule, despite a 20% redesign and being the first Block III boat. The delivery marks a culmination of over five years of work by the *Virginia*-class Program Office, the shipbuilders, Supervisors of Shipbuilding, and the rest of the Navy team including a crew of more than 135 Sailors who are training to operate forward in defense of our nation. This month we christened USS *John Warner* (SSN 785). Named after the five-term U.S. Senator from Virginia and former Secretary of the Navy, she will be the first of the Virginia-class to be homeported in Virginia.

"Each of these successes is made possible by each and every one of you. Thank you for your hard work and dedication. Keep charging ahead."

This month also marks a significant event for the submarine force and our nation—the 4,000th strategic deterrent patrol by our SSBNs. In this issue you will read about the origin of nuclear deterrence and the evolution of the Submarine Launched Ballistic Missile and how the first deterrent patrol by USS *George Washington* (SSBN 598) in 1960 began a legacy of uninterrupted sea-based nuclear deterrence starting with the "Forty-one for Freedom" and on to the current *Ohio* class of today.

Also in this issue we will take you to the Arctic for ICEX 2014. As the Arctic Ocean becomes increasingly accessible, it will have a more significant impact on U.S. security interests. In the 2014 Arctic Roadmap, the CNO has laid out a strategic approach that will support U.S. interests and prepare the Navy to respond to potential contingencies in the Arctic region. ICEX directly supports that vision, and you will get a behind-the-scenes look into the planning, coordination, and execution that goes into such an enormous undertaking.

Each of these successes is made possible by each and every one of you. Thank you for your hard work and dedication. Keep charging ahead!

J. E. Tofalo

UNDERSEAWARFARE
The Official Magazine of the U.S. Submarine Force

Charter

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 among community members and to enhance reader awareness of the increasing relevance of undersea warfare for our nation's defense.

The opinions and assertions herein are the personal views of the authors and do not necessarily reflect the official views of the U.S. Government, the Department of Defense, or the Department of the Navy.

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CHINFO Merit Award Winner

Silver Inkwell Award Winner

LETTERS TO THE EDITOR

In keeping with *UNDERSEA WARFARE* Magazine's charter as the Official Magazine of the U.S. Submarine Force, we welcome letters to the editor, questions relating to articles that have appeared in previous issues, and insights and "lessons learned" from the fleet.

UNDERSEA WARFARE Magazine reserves the right to edit submissions for length, clarity, and accuracy. All submissions become the property of *UNDERSEA WARFARE* Magazine and may be published in all media.

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FROM THE EDITOR

Oops! In the Winter 2014 issue we mistakenly identified the wrong individual in one of the photos in the 2013 Submarine Sailors of the Year article. The photo at right should have identified Electrician's Mate First Class (SS) Scott P. Koenig from USS *Jimmy Carter* (SSN 23) being recognized as the 2013 SUBPAC Senior Sea Sailor of the Year by Commodore Tom Ishee and COMSUBPAC Force Master Chief Cash Caldwell."

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SAILORS FIRST

Sailors stationed aboard the *Virgina*-class attack submarine USS *New Hampshire* (SSN 778) are greeted at Naval Submarine Base New London after the submarine returns to homeport after completing a scheduled six-month deployment to the U.S. European command area of responsibility.

Photo by Mass Communication Specialist 1st Class Jason J. Perry

SUBMARINE TEAM BEHAVIORS TOOL:

by Lt. Will Spears

The demands of operating submarines have long exceeded the capability of any one human being. It's not the skillful action of any single brilliant tactician that achieves the submarine's mission, but the coordinated effort of a well-honed team of operators. In the post-hoc analysis of serious mishaps like collisions and groundings, it is never the individual mistake of any one critical sailor that leads to a mishap, but a collective failure of the organization. Achievements are team achievements, and failures are team failures. We've known this for a long time.

Why, then, do we continue to rely on a training program that focuses on the technical skills of the individual? That's something the Submarine Force has begun to ask itself in earnest. The short answer is that individual skills are relatively easy to observe and measure. Team skills, on the other hand, are enormously complicated and difficult to quantify and require very specific circumstances to observe. The quality of teamwork depends not just on the skills of individual team members, but their personalities, as well as their efficiency and comfort in working together. That's a tough thing to measure directly, so we've historically inferred it through the results of team efforts.

ASSESSING WATCH TEAM RESILIENCE

U.S. Navy

The problem with results-based inference is that it does nothing to prevent catastrophes. After two avoidable collisions in 2012, the Submarine Force underwent a rigorous self-assessment effort, identifying force-wide deficiencies in the interactions of tactical watch teams. The lack of a consistent, formally endorsed model for team interaction was cited as a significant contributing factor. Despite the numerous models of teamwork and volumes of supporting literature in the business and academic worlds, the Submarine Force had no way to get everyone on the same page as to what great teamwork looks like or how to get there. It had become apparent that, however difficult it may be to measure, we can't afford to continue inferring the presence of good teamwork—we must come to understand it and observe it directly.

Enter the STBT, or Submarine Team Behaviors Tool. It is derived from a behavioral model developed by a multi-disciplinary team of consultants led by the Naval Submarine Medical Research Laboratory (NSMRL), including neuroscientists, behavioral experts, and "Greybeards," the retired submarine COs trained to systematically evaluate and provide feedback to tactical watch teams. The STBT is essentially a grading rubric that fits on the front and back sides of a single sheet of paper, with supporting literature. It is the product of deep analysis of submarine mishaps, the scientific study of Submariner team behavior, and the collective wisdom of tactical subject matter experts. The underlying model represents significant progress in the formal understanding of teamwork in submarines.

Levels of Resilience

The STBT classifies watch teams based on their resilience—their ability to absorb shocks and continue performing at a high level. A team's level of resilience essentially determines how much stress or complexity it can manage before it "fractures" and stops functioning. Approaching fracture, the team will become confused, informal, emotional, sluggish, myopic, or otherwise will cease to communicate as a cohesive unit. Somewhat ironically, the situations most likely to cause team fracture also happen to be the worst conceivable times for it to occur.

The STBT divides watch teams into four levels of resilience: Unstressed Battle Rhythm, Leader-Dependent Battle Rhythm, Team-Based Resilience, and Advanced Team Resilience.

Unstressed Battle Rhythm. A team at this level can perform basic functions and will adhere to standard checklists and procedures for simple problems. As long as nothing goes wrong, they will appear to be formal and proficient. Tested with an unanticipated event, though, elevated stress will cause them to struggle with basic functions and communications. Confronted with complex problems or casualties, they will quickly become overwhelmed. This is a brittle team.

Leader-Dependent Battle Rhythm. Sometimes a weak team can remain convincingly functional under the guidance of a strong coordinating presence, such as an experienced Contact Manager, Sonar Supervisor, Assistant Navigator, or Officer of the Deck (OOD). The team is able to maintain structure under stress so long as a leader acts quickly to prioritize objectives and refocus the operators when necessary. The operators will rely on the leader's direction not just for decision-making, but basic problem-solving as well. A team in this state is also brittle, as they will fracture if the leader becomes confused or distracted in a complex problem.

Team-Based Resilience. True resilience emerges when individual operators begin to naturally think beyond the context of their individual watch stations. Operators at this level process the information as well as the data and provide meaningful backup to tactical decision makers. Routine functions and formal reports are automatic, so they don't consume important mental resources and they continue to occur under elevated levels of stress and complexity. Importantly, a team operating at this level is aware of its own limitations and will take action to bring additional resources (such as extra watchstanders) to bear when appropriate.

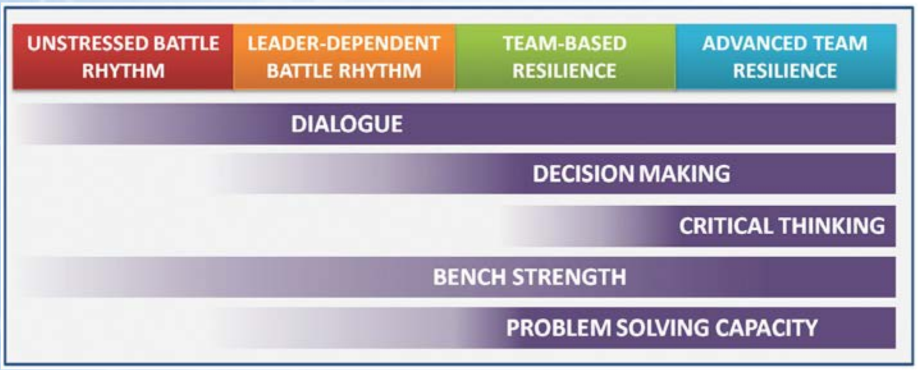


Fig (1): Relative influence of resilience-building practices

Advanced Team Resilience. An exceptionally proficient team may reach this level with sufficient effort and experience. Operators at the advanced level will have the flexibility and processing power to manage a variety of dynamic problems and unexpected events simultaneously. They will anticipate one another's needs for information and actively challenge their own and others' assumptions. Tactical decisions will emerge from deep within the team as sound recommendations, and senior leaders will become comfortably detached from the detailed problem-solving, instead providing big-picture oversight and mission focus.

Building Blocks of Resilience

To properly assess a team's level of resilience, evaluators must know what indicators to look for. The STBT's developers identified dozens of behaviors that a watch team may exhibit as it manages a challenging tactical situation. These behaviors each fall under one of five critical "practices" that are fundamental to the team's performance: dialogue, decision making, critical thinking, bench strength, and problem-solving capacity. Where any of these practices are deficient, overall team resilience suffers markedly.

Dialogue considers the overall communicativeness of the team and is the most revealing single indicator of the team's resilience. A team with good dialogue skills can quickly shift between formally structured reports and conversational exchanges as appropriate to the situation.

Decision making relates to the team's distribution of authority. Leaders of resilient teams push authority downward such that subordinate leaders or operators make critical decisions appropriate to their responsibilities and skills.

Critical thinking concerns the team's culture of questioning assumptions. An appropriately critical team will instinctively attack one another's theories and will be sensitive to the influence of cognitive biases in their analyses. Team members give voice to their intuitions so that the other operators can consider their perspective and incorporate it if appropriate.

Bench strength considers not just the skills of individual team members, but the team's approach to improving their skills. A team with good bench strength is deliberately inclusive of its least-developed members and will relentlessly work with them and push them to improve. The cultivation of specialized "A-teams" for high-risk evolutions is considered a dangerous practice since it can leave the other watch teams unprepared for unanticipated complexity.

Problem solving capacity describes the team's ability to handle a variety of problems without losing the big picture. Contributing to this practice is the team's propensity to develop efficient workflows and novel techniques or solutions, thereby freeing up resources for more pressing tactical concerns.

The resilience-building practices do not emerge all at once as a team develops. For example, dialogue is the most fundamental of team practices, and it has little room for improvement once Team-Based Resilience is achieved. Decision-making is the major determinant that brings a team beyond the Leader-Dependent Battle Rhythm level, and true critical thinking doesn't fully materialize until the team has achieved Advanced Team Resilience.

Not "Another Checklist?"

For the junior officers recoiling in horror at the prospect of managing yet another checklist, you can relax. In its current state, the STBT is promoted as a tool for those at the CO level or higher, not as a new set of grading criteria but as a means to standardize feedback from evaluators to commanding officers. The standards are not new; the best crews have operated at high levels of resilience since the dawn of the modern submarine. Crew evaluators have scrutinized team behavior for just as long, with a generally agreed-upon understanding of what good teamwork looks like. The STBT does not contradict that understanding, but formally codifies it, establishing a common vernacular for team behaviors and degrees of resilience.

U.S. Navy

Nobody wants to see a junior officer on the conn, laminated STBT in hand, training their team to recite certain "trigger phrases" calculated to elicit a desired "resilience grade." That kind of misdirected effort would do more harm than good. Instead, OODs should continue training to high standards and allow their teams to naturally develop resilience as a function of proficiency. Where the STBT may be useful to junior leaders is in self-assessment; specifically, it might help to identify hidden weaknesses. Whether or not the STBT eventually evolves into a training tool, the research that went into it provides several interesting points for consideration by OODs.

It's easy to think you're good and be wrong. Unfortunately, many of the indicators for discerning team resilience do not emerge without stress and chaos. In low-stress scenarios, a brittle team does not look especially different from a resilient one—they make formal reports, they give decisive orders, and they adhere to checklists and procedures. In other words, they make the routine look routine and are susceptible to the illusion that this basic functionality indicates proficiency.

An important concept in the model underlying the STBT is that of "reserve capacity," defined as the cognitive resources available for processing information and making decisions, beyond what the team has already committed to routine operations. In a low-stress situation, a marginally proficient team can appear decisive and professional, but they will have to think hard to do it. Operators may privately struggle to recall routine procedures or pause before giving orders or reports to ruminate on the proper phraseology. Such a team will have few mental resources available to accommodate the unexpected, such as a sudden contact maneuver or an equipment casualty. Events like this can cause brittle teams to freeze up or engage in dangerous tunnel-vision.

While some reserve capacity can be conserved through prudent team management, the only way to develop additional capacity is through deliberate practice. As the routines become automatic, more cognitive resources become available for the unexpected. Team leaders should strive to make every watch or training scenario "count" to the maximum degree possible, strictly adhering to operational discipline so that formal reports and procedures become effortless. Given the high OPTEMPOs and constrained training resources faced by today's submarine crews, operational watch teams cannot afford to waste any training opportunities.

A weak team led by a rock star is still a weak team. Commanding officers are naturally inclined to pair up their weakest operators with their most capable OODs. Analysis of collisions and groundings that have occurred under the leadership of strong OODs suggests that this intuitive practice can be dangerous if not carefully managed. The danger is that the commanding presence of a strong watch officer can lead even the most capable operators to feel comfortable "dropping the pack," so to speak, so that they become less aggressive in challenging assumptions or offering alternative courses of action. This effect is more pronounced with inexperienced operators, either due to their own lack of confidence or the watch officer's lack of receptiveness to their input. Most teams will transition through this phase naturally, but an overly commanding OOD can actually inhibit the progression of the team to a more resilient state.

The strong leader then becomes the single point of failure in a situation that requires the capabilities of an engaged, cohesive team. This can be especially dangerous when the CO takes direct control of the ship, such as emergencies or battle stations. However frequently the CO has reassured the crew that he expects forceful backup, fleet experience has repeatedly demonstrated that tactical watch teams are reluctant to interrupt or contradict their commanding officer.

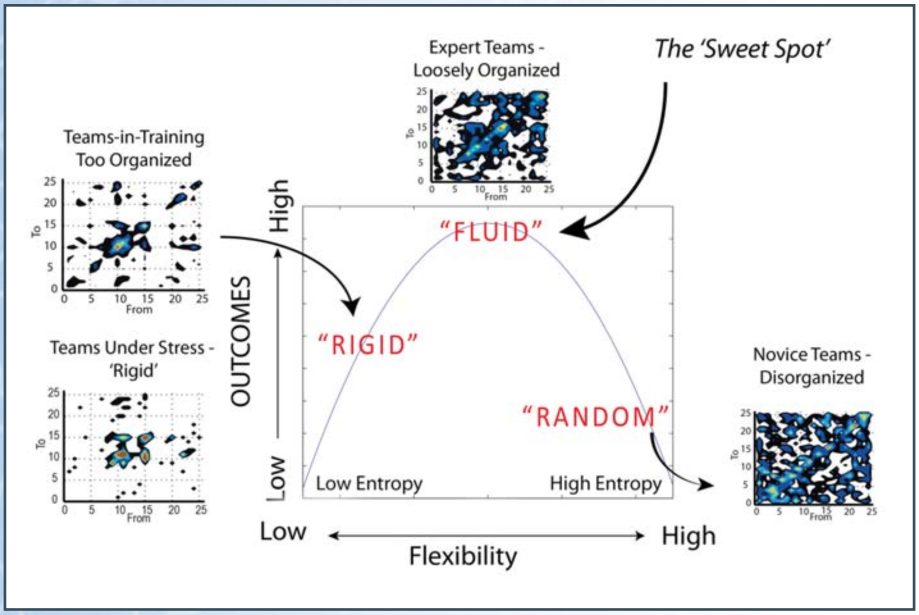


Fig (2): Team performance vs. neurodynamic entropy

There is such a thing as "too formal." Some of the more interesting research that has contributed to the STBT is an ongoing DARPA-funded study of submarine teams under stress. Contributing to the emerging science of Team Neurodynamics, a group of UCLA scientists studied the behavior of Submariners at various levels of proficiency in the Submarine Piloting and Navigation (SPAN) trainer. The subjects were outfitted with wireless electroencephalograph (EEG) monitors, enabling the scientists to record the neurological activity of the team throughout the scenario.

The scientists were specifically concerned with something called "NS Entropy," which basically signifies the flexibility and randomness in a subject's neurological state—the speed at which thought patterns change. Low entropy suggests a narrow focus, rigidly adhering to a specific set of thought patterns or routines. High entropy suggests a lack of focus and rapidly changing mental states. This is all very fascinating, but what does it have to do with operating a submarine? The findings might surprise you.

The worst-performing teams, those with essentially zero training, were those with the highest entropy levels, suggesting a general lack of structure to the team's thoughts and behaviors. Only slightly better, though, were teams with rudimentary training, who exhibited the *lowest* levels of entropy. These teams used formal language and adhered to their procedures, but they were so narrowly focused and rigid that they easily lost focus on the big picture. When something went wrong, the individual team members would all become fixated on the same problem, and it could take 10 minutes or more for the team to reorganize into a functional battle rhythm.

The best-performing teams, composed of experienced submarine piloting parties, exhibited *moderate* levels of neurological entropy. The scientists called this region of performance the "sweet spot," which they believe represents a transition point from an optimal state of mental flexibility into randomness. While the inexperienced teams were either too rigid or too random, the experts were *fluid*, and could quickly communicate concerns and priorities to one another with appropriately varying degrees of formality. When they encountered unexpected problems, the expert teams could quickly deal with them and recover without losing sight of the big picture.

The takeaway from this isn't that formality is bad for us in high doses, just that it alone will not get us home. The expert teams presumably had to transition through a state of mental and procedural rigidity to achieve a state of fluid proficiency. Part of what made them able to quickly transition between formal reports and procedures to efficient discussions and flexible action is that the formality was well-rehearsed and took very little mental effort to execute.

Reception

The COMSUBLANT Director for Training announced the STBT's initial rollout in December of 2013. Feedback from the fleet has been mostly positive, with a few voices of caution. Prone to charts and tables of unquantifiable concepts, behavioral models tend to get a skeptical eye from technically minded people, and organizations do not get any more technically minded than the Submarine Force. Critics may charge that the STBT attempts to metricize something that is better judged holistically through the lens of experience rather than a grading rubric. Introducing another evaluative tool necessarily draws from bandwidth that is already crowded with evaluative tools.

U.S. Navy

Proponents of the STBT would argue that it was never meant to metricize teamwork or make it a graded event and that using the STBT in such a fashion would be a fundamental misuse of the tool. It is designed for use by subject matter experts in shaping their feedback to COs, and a junior officer attempting to evaluate a watch team with it would probably come to a different conclusion than a Greybeard. Using the STBT is optional, so it only requires time and energy from those who deem it worthwhile.

The most salient criticism of the STBT is that it is really nothing new; that the best crews have demonstrated advanced team resilience for decades, and their evaluators have had no problem identifying excellent teamwork. That may be true, but sometimes the defining point of an idea's progress is that somebody took the trouble to write it down. If it is true that the best teams have always used the resilience-building practices identified in the STBT, then we must ask ourselves why it is only the best teams that do these things. Why not the average teams? Historically, where the Submarine Force arrives at an agreed-upon definition of what excellent performance looks like, we have a tendency to make it the standard.

The Submarine Team Behaviors Tool and supporting literature is available for download at the COMSUBLANT SIPRnet site.

Lt. Will Spears is an active-duty Submariner, a 2008 graduate of the United States Naval Academy, and a 2014 graduate of the Naval Postgraduate School. He will return to sea duty with SOAC Class 14060 in March of 2015.

References:

C.L. Lamb, J.C. Lamb, R. Steed, R.H. Stevens, "A Robust and Realistic Model of Submarine Tactical Team Performance," *Submarine Technology Symposium Proceedings*, Session 1, 2014.

C.L. Lamb, R. Steed, T. Smallidge, "Submarine Tactical Team Performance," *United States Naval Institute Proceedings*, 79-81, June, 2013.

R.H. Stevens, J.C. Gorman, P.G. Amazeen, A. Likens, and T.L. Galloway, "The Organizational Neurodynamics of Teams," *Nonlinear Dynamics, Psychology, and Life Sciences*, 17, 67-86, 2013.

ICEX 2014

by Mr. Ryan Hopper, Arctic Submarine Lab (ASL)

This past March, the U.S. Navy staged an Arctic Ice Exercise (ICEX) on top of and below the polar ice canopy in the Beaufort Sea. ICEX 2014 involved the participation of two modern nuclear attack submarines: USS *New Mexico* (SSN 779) and USS *Hampton* (SSN 767). COMSUBPAC DET ASL (Arctic Submarine Laboratory) coordinated the exercise with many outside organizations while using Sailors from COMSUBLANT, COMSUBRON 11, the Royal Navy, and Canadian Forces to man the watchbill for camp operations and logistical support. This was the first exercise of its kind since 2011, and it achieved a wide spectrum of initiatives including: Arctic scientific exploration, testing and evaluation of the newest sonar systems, expounding upon the role of *Virginia*-class submarines in the Arctic, refreshing the capability to conduct torpedo exercises and recoveries under ice, and testing new communications technology to respond to the demand for a growing infrastructure and capabilities in this harsh and unforgiving Arctic environment.

Photos by U.S. Navy

Ice Camp Nautilus

Navy Ice Camp Nautilus was named in honor of the first submarine to complete an under-ice voyage to the North Pole. USS *Nautilus* (SSN 571) completed the historic journey known as "Operation Sunrise" in 1958.

Ice Camp Nautilus was constructed as a temporary testing location on top of the ice, approximately 150 miles from the Northern coast of Alaska. It served as the headquarters to coordinate testing along with providing on-ice support to the deployed submarines in an otherwise uninhabitable region. Nautilus was constructed by Applied Physics Laboratory, University of Washington (APL-UW) personnel and consisted of a command hut, mess tent, berthing huts, and other equipment to support living on the ice for several weeks. A tracking range was installed on the ice and was manned by an international team of watchstanders to keep tabs on the submarines operating below and provide data for the tests that were taking place.

APL, University of Washington personnel constructing a hooch at Ice Camp Nautilus

Since Nautilus is a temporary station, all materials and supplies had to be flown to the location in preparation for the testing and arrival of the submarines. Prudhoe Bay, Alaska was used as the land-based logistics hub for transporting material and people from the mainland out to the ice. The Prudhoe logistics team was responsible for loading all of the supplies onto a plane capable of landing on the makeshift ice runways.

Ice Camp Nautilus

The construction effort took nearly two weeks to build Nautilus from nothing into a sustainable living community. Prudhoe Logistics Coordinator Charlie Johnson from ASL coordinated the effort of getting supplies out to the location. Johnson's team of volunteer Sailors and civilians worked out of the Deadhorse Aviation Center to load planes with the lumber, electronics, test equipment, and food required to support life on the ice.

ASL's Randy Ray held the position of Camp Field Operations Officer and compared the construction process to building a completely functional KOA campsite from nothing in two weeks while working in sub-zero temperatures. Of the construction process, Ray said, "After the initial pioneering of the prospective site for the camp, the camp build starts with day trips to the site with enough people to conduct runway improvements and commence building berthing huts. After there are enough living and messing quarters suitable to have personnel start staying overnight, the build gets supplemented for the next few days with as many as five U.S. Navy personnel from ASL and COMSUBRON 11. The augmentation team flies in to the camp on the first flight of the day and returns to Prudhoe Bay on the last returning flight. The construction is concentrated on building more living quarters, the main mess tent and galley, improving the runway, making a second runway, the command hut, a generator structure, and offloading the materials that were flown in by project aircraft multiple times daily."

As most of the structures near completion, the support personnel start to shift focus from a solely building mode to managing the day-to-day requirements of life on the polar ice cap. This includes maintaining the heating fuel, supplying fresh water from melted ice, and disposal of waste.

Prior to the arrival of both submarines, Nautilus transforms into a fully functioning remote camp capable of accommodating 64 people overnight in its eight berthing hooches. Electrical power is distributed throughout the camp thanks to two diesel generators to power everything from computers in the Command Hut to cooking equipment in the Mess Tent and general lighting.

Among the many challenges of conducting operations in this harsh environment is the ability to effectively communicate with the rest of the world. Lockheed Martin

demonstrated the Mobile User Objective System (MUOS) with great success. The MUOS system provided the capability to electronically transfer large data files from the Arctic to other land-based users through its satellite network. This enhanced communications network was a great improvement from past ice camps, which relied on iridium phone service to connect the camp with other support elements on land.

Distinguished Visitors

Due to the increased interest and awareness of the important role the Arctic region will have in the future, many distinguished visitors came to get a first-hand look at ICEX 2014. Chief of Naval Operations Adm. Jonathan Greenert hosted a delegation of guests that had the opportunity to spend the night submerged beneath the ice on USS *New Mexico*. Other distinguished visitors included Secretary of the Interior Sally Jewell, Undersecretary of Defense Frank Kendall, Senator Angus King (I-ME), Congressman Jeff Miller (R-FL), Congressman Steve Pearce (R-NM), National Security Council Designee Amy Pope, Undersea Warfare Director Rear Adm. Joseph Tofalo, New York Times Reporter Thomas Friedman, and Wall Street Journal Reporter Julian Barnes. "As we move to the *Virginia*-class submarine, it's necessary to continue to ensure our systems, our sensors, our weapons and our platforms are proficient to operate correctly in the Arctic," said Adm. Greenert. "And it's also to build the next generation of submarine folks who will operate in the Arctic."

COMALASCOM Gen. Handy was at Nautilus for two nights with the understanding that increased interest in the Arctic would require the future involvement of assets beyond the Submarine Force. If the predictions of increased activity in the region are realized, then the capabilities for search and rescue would need to be developed and matured to operate in the Arctic.

Torpedo Exercise (TORPEX)

One of the unique testing opportunities at the ice camp is the Torpedo Exercise, which provides the ability to evaluate torpedo performance and tactics when fired from a submarine under the polar ice cap. The last time the weapons were tested in this type of environment was during a similar exercise in 2009. ICEX 2014 provided the opportunity to improve on the existing fleet guidance while maintaining the proficiency of handling weapons in an extreme environment.

To recover a fired torpedo from under the ice, a field party is transported to the location of the torpedo, and its location is confirmed by an underwater camera that is lowered through a hole made in the ice floe. The next phase is to use an ice melter to remove two large-diameter plugs of ice. Specially trained divers then enter the frigid water to attach handling harnesses to the floating weapon and position the torpedo so that its nose floats in one of the melted holes in the ice. The next phase is to attach the torpedo to a hovering helicopter, which then transports the torpedo back to base camp so it can be shuttled back to the mainland for processing.

Diver conducting torpedo retrieval procedure

Chief of Naval Operations and other distinguish visitors in front of USS *New Mexico*

Photos by U.S. Navy

Submarines

For USS *New Mexico* and USS *Hampton*, the participation in ICEX 2014 began well before their arrival at Ice Camp Nautilus. Arctic Submarine Laboratory outfitted each submarine with temporary equipment that assisted in each submarine's safe transit beneath the pack ice. The submarine crews were required to become familiar with interpreting the displays of the new gear along with demonstrating the ability to detect and avoid deep ice keels along their path.

As described by the CNO, "In the back of your mind, if trouble ever emerges—if you

have flooding or a serious fire you head to the surface. You can't do that in the Arctic with ice all around and above you." As a result of this added dynamic, each submarine had to become familiar with how to detect potential areas for surfacing through the ice.

Once all preparations were complete, USS *Hampton* departed from San Diego and USS *New Mexico* left home port in Groton, CT to head to the icy waters north of Alaska. Following the nearly two-week voyage, the submarines rendezvoused at the tracking range beneath Ice Camp Nautilus to commence the coordinated testing of equipment, procedures, and tactics in the Arctic environment.

While operating on the Nautilus range, each submarine got the opportunity to surface on several occasions to facilitate the transfer of personnel and other military riders and guests. While surfaced, the submarines conducted "ice liberty," allowing the crews to step out onto the ice for the opportunity to enjoy fresh air and get a rare glimpse of the ice flow. *Hampton*'s CO, Cmdr. Lincoln Reifsteck, recently described the act of surfacing through the ice to the San Diego Union Tribune as, "It kind of sounds like a 40-car pile-up. You're trained for your entire life not to run your submarine into the ground. You don't run your submarine into another ship—into any other thing, really. But you kind of run it into the Arctic ice, very slowly, in a controlled fashion. The cracking and crackling gives you a perspective of what it would be like to run into another ship, and it makes you feel a little nauseous."

Because *Virginia*-class submarines are limited to surfacing through no more than six inches of ice, *New Mexico* had to search for a newly formed polynya, or opening in the ice. Surface wind conditions cause the pack ice to be in constant motion, which results in portions of the ice sheet piling up on itself creating ice keels and leaving behind open leads where the sheet has split apart. This shifting of the ice resulted in a large lead opening in the vicinity of the command hut through which *New Mexico* was able to surface to conduct the personnel transfers. The unique proximity to the center of camp allowed the submarine to moor within walking distance to the center of camp instead of having to rely on helicopters to shuttle people and supplies between the camp and the submarine.

USS *Hampton* surfaced through the ice

North Pole

Following the operations at Nautilus, both submarines headed farther north to rejoin again at the North Pole to conduct a joint POLEX. *New Mexico* completed the 1,000 mile journey first and succeeded in locating and surfacing in a lead at the North Pole. *New Mexico*'s CO, Cmdr. Todd Moore, was especially proud of the achievement and remarked, "Personally, I'll never forget surfacing through the ice. What a rush! It was amazing to watch the crew employ our sensors to find the right spot to surface through the ice, precisely inch a 7,800-ton warship to that spot, and work as a team to execute the complex vertical surfacing procedure. The exhilaration of a successful surfacing, followed by the joy of walking out over the ice—at the North Pole, no less—was the highlight of my career." *New Mexico*'s crew was able to enjoy a game of football on the ice before shifting ice conditions forced the submarine to dive once again. Shortly afterward, both submarines rendezvoused under water at the North Pole to search for a spot to surface together, but the heavy ice conditions in the area prevented a joint surfacing before they had to make the journey homeward.

Science Ice Exercise (SCICEX)

Since 1993, U.S. submarines have conducted scientific research to collect oceanographic data for the civilian science community. The original agreement slated five Arctic submarine cruises dedicated to the exploration of the Arctic Ocean and collection of scientific data. Since that time, the Submarine Force has accommodated the needs of the science community while operating within the confines of the Data Release Area (DRA) of the high latitude waters. The DRA is an area of the Arctic Region that is outside the boundaries of neighboring countries' economic exclusion zones and serves as an area for unclassified scientific data collection.

Both *New Mexico* and *Hampton* continued this scientific work while operating under the ice during ICEX 2014. The submarines

Chief of Naval Operations Adm. Greenert reenlisting sailors onboard USS *New Mexico*

were tasked with the most extensive data collection since the late 1990s, obtaining over 800 water samples and launching more than 50 Under/Ice (U/I) Submarine-launched eXpendable Conductivity, Temperature, and Depth (SSXCTD) probes while submerged beneath the pack ice. A U/I SSXCTD measures conductivity, temperature, and density as it travels downward through the water column while sending the data back to an onboard computer. Typically, the submarines would make a quick stop about every six hours to collect the water samples along with measuring the conductivity and temperature profile of the water column through the use of special U/I SSXCTDs. The samples will contribute to a database that tracks, among other things, salinity, total organic carbon, phytoplankton, dissolved oxygen, tritium, and helium concentrations throughout the Arctic Basin.

The scientific and oceanographic communities use the data to gain insights into the flow of water into the Arctic from the Pacific Ocean and subsequent mixing with Atlantic waters. The encompassing study of the Arctic Ocean deals with marine life concentration, biodiversity of organisms, and even the impact on weather patterns. The scientific work also builds on the work measuring ice thickness and ice keel draft along with contributing to the database tracking the bathymetry characteristics of the ocean floor.

The collaboration of the U.S. Navy with the scientific community has provided the analysts with invaluable data that could not be collected from any other source besides submarines operating under the multi-year pack ice.

Arctic Roadmap

In response to the increased interest in the Arctic and possible outcomes of climate change, the Department of Defense released its Arctic Strategy in November 2013, and the Navy released its newly updated Arctic Roadmap 2014-2030 last March. These documents have directed commands to assess and improve capabilities in the Arctic environment. The U.S. Submarine Force has a demonstrated capability of operating in the Arctic due to its history of under-ice operations since USS *Nautilus*' historic voyage in 1958. ICEX 2014 was an example of this level of sustained effort on behalf of the Navy to be able to use the Arctic and be prepared for contingencies of increased activity. Future ICEXs will build on the success of the ICEX program to improve Arctic capabilities.

Adm. Greenert summed up the experiences from ICEX 2014, saying, "We'll leverage what we've learned in this and future ICEX assessments to work with our partners in industry to develop technologies for our other platforms and personnel who will operate in this environment."

Accomplishments

ICEX 2014 saw a wide range of technical and programmatic accomplishments. One of the most basic was to support the Navy's and more specifically the Submarine Force's goal of being able to operate effectively in all oceans of the world to accomplish any mission tasking required. Maintaining these skills is made possible through the coordinated effort and testing range at an ice camp. Both submarine crews gained a tremendous amount of experience in the Arctic. ICEX 2014 provided a rare opportunity to perform the full spectrum of submarine procedures and evolutions unique to operating under the ice, surfacing through the ice, mooring, and ice liberty. For many of the sailors, ICEX was their first voyage into the Arctic region and the realm of the Bluenose. The skills and experience they gained will transfer with them to other commands throughout their careers.

Prolonged under-ice operations required the submarine crews to be truly independent operators. Since two-way communication is not possible while submerged beneath the ice, the crews were challenged to fight the ship through any issues that arose during the time deployed from home.

New technology was proven for the first time in this environment, such as the latest sonar configurations, communication circuits, scientific data collection devices, and new range tracking equipment.

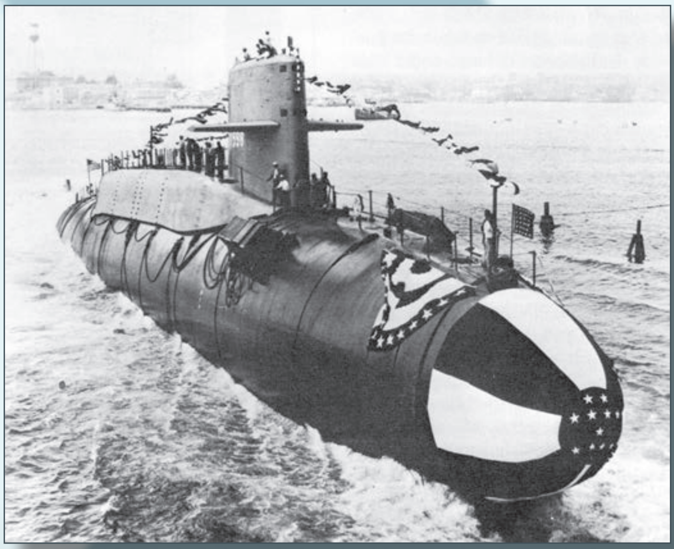
Hosting a variety of high-ranking military and government representatives showcased the Submarine Force's unique capabilities in a positive light while serving as Arctic ambassadors to encourage the development of future activities in the Arctic.

Mr. Ryan Hopper is one of five Arctic Operations Specialists (AOS) assigned to COMSUBPAC Detachment Arctic Submarine Laboratory (ASL) in San Diego, Calif. Mr. Hopper is a former submarine officer and was the assigned AOS onboard USS *New Mexico* during ICEX 2014.

Photos by U.S. Navy

by John M. Daniels, PAO Strategic Systems Program

POLARIS TO TRIDENT: The Evolution of the



This month, we observe a very special milestone in the undersea warfare community as we commemorate the 4,000th strategic deterrent patrol conducted by our Fleet Ballistic Missile (FBM) submarines. On July 20, 1960, USS *George Washington* (SSBN 598) performed the first submerged launch of a Submarine Launched Ballistic Missile (SLBM), firing two Polaris A1 missiles off Cape Canaveral, Fla. A few months later, on November 15, USS *George Washington* departed Charleston, S.C. on the nation's first strategic deterrent patrol. She was loaded with 16 Polaris A1 missiles, each with a range of 1,200 nautical miles. The patrol set a new record in time submerged for a submarine: 66 days, 10 hours. Since then, the SSBN and its associated weapons system continue to evolve to meet current and future threats and provide a credible, modern, and survivable strategic deterrence that can only be provided by the SSBN.

Undersea Strategic Deterrent

The Background

In 1945, the United States became the first nuclear weapon state when it developed and test detonated a nuclear device as part of the Manhattan Project. With an explosive power of 20 kilotons of TNT, the destructive capability that could be caused by this new weapon was fully realized.

After World War II, the alliance between the United States and the Soviet Union that had brought down the Nazi regime had ended. Between 1945 and 1947, tensions between the two world powers grew. Out of these tensions, two global alliances formed: the United States and its NATO allies, and the Warsaw Pact nations allied with the Soviet Union. In response to the U.S. atomic program, the Soviets detonated their first nuclear weapon in August 1949, thus kicking off what would become a nuclear arms race as part of the Cold War. In these early days, neither nation really had an effective means of weapons delivery, but that would soon change.

Second-strike and the Evolution of the Triad

The mere threat of the other side having nuclear weapons capability made both the United States and the Soviet Union nervous. In the 1950s, the concepts of the second-strike capability and nuclear deterrence emerged. To be considered viable, a second-strike capability is one that can survive a first-strike nuclear attack and be able to deliver a nuclear retaliation of sufficient magnitude. Initially, the United States' means of delivery was through the U.S. Air Force's fleet of bombers belonging to the Strategic Air Command. To meet the needs of second-strike capability, the Air Force kept nearly one-third of its bomber force either in the air or in an alert status with their crew ready to take off within 15 minutes. This proved to be very expensive and in reality wasn't a guaranteed second-strike capability. These bombers, while effective with their flexibility and overt posturing, could still be shot down by Soviet air defenses. In the late 1950s, the Intercontinental Ballistic Missile (ICBM) was introduced. Like the bombers, the ICBM has its advantages, especially for initial strike capability, but it's not the best choice for a second-strike capability. The solution would soon arrive and become the final leg of the Triad: the fleet ballistic missile (FBM) submarine.

The FBM Submarine and SLBM are Born

Submarines that could deliver strategic nuclear weapons became the answer to assured second-strike capability. Submarines would not only be hard to find, making them very survivable, but they could be deployed in such sufficient numbers that, even if they were discovered, there would be a low likelihood of them all being targeted.

On November 8, 1955, the Secretary of Defense directed the Army and Navy to jointly develop an Intermediate-Range Ballistic Missile (IRBM) that would have both a shipboard and land-based capability: the Jupiter. A few weeks later, the Secretary of the Navy established the Special Projects Office (SPO) (later renamed Strategic Systems Programs (SSP) to handle the problems associated with the ship-launched weapon system. By late 1956, it was decided that the Jupiter, which used a liquid-fuel propellant, was not suitable for use on submarines, and development began on a missile using solid-fuel rocket motors. Less than two years later, the Navy completed its first land-based test flight of the Polaris missile.

Concurrent with the development of the missile (the payload) was the development of the platform—the submarine. In February 1957, the Chief of Naval Operations issued an order to have a missile and a submarine capable of firing it ready for operational patrol by 1965. By that summer, he had approved the design of the submarine. In 1958, construction began on the first three FMB submarines. The first one, USS *George Washington*, had originally been laid down as USS *Scorpion* but was cut in two and had a 130-foot weapons system section inserted. USS *George Washington* completed the Triad in late 1960 and provided reliable second-strike strategic nuclear capability in accordance with our national security policy.

Forty-one for Freedom and Ohio

The original FBM submarine force consisted of 41 submarines, authorized from 1957 through 1963 and delivered between 1959 and 1967. The first two classes, the *George Washington* class and the *Ethan Allen* class, consisted of 10 submarines that carried the three generations of the Polaris. The next 31 FBM submarines of the *Lafayette* class were all originally constructed to carry the Polaris but were converted from 1969 through 1976 to carry the Poseidon C3 missile. Subsequently, 12 *James Madison* and *Benjamin Franklin*-class submarines were backfitted to carry the Trident I C4 from 1978 through 1981. The last of the original 41 SSBNs were retired upon the return of USS *Mariano G. Vallejo* (SSBN 658) from her final patrol on April 2, 1994.

This legacy of assured strategic deterrence would be carried on by the *Ohio* class. Commissioned between 1981 and 1986, the

Weapons of the Fleet Ballistic Missile Submarine Fleet, (left to right): Polaris A1, Polaris A2, Polaris A3, Poseidon, Trident I and Trident II.

first eight subs of this class were designed and armed with the Trident I C4 missile. The final 10 *Ohio*-class boats were designed for the Trident II D5 missile. Beginning in 2002, the first four *Ohio*s were removed from strategic service and ultimately converted to Guided Missile Submarines (SSGNs). The next four *Ohio*s were backfitted to accommodate the Trident II.

The Payload of the Platform

Just as we have gone through four classes of SSBNs, we have also gone through six generations of missiles and associated weapons systems. Each of these missiles provided greater range, which allowed for greater stand-off and added flexibility, both contributing to greater survivability. Each iteration of the missile has allowed the U.S. to continue to counter increasing or emerging threats. The Polaris I & II gave us that initial second-strike capability against Soviet ICBMs. The Polaris III's increased range enabled us to strike targets farther inland and from farther away. The multi-warhead of the Poseidon countered the anti-ballistic missile threat and allowed for effective engagement of dispersed targets. The increased range that came with the Trident I further improved survivability and target reach. Finally, the advancements in accuracy of the Trident II assured effective engagements of even the most hardened targets. As we look forward, we don't have a clear picture of what we will have to respond to, but we must be prepared.

USS *Ohio* (SSBN 726) with its missile tubes doors open.

The Future

The Forty-one for Freedom and the follow-on *Ohio*-class submarines have ensured that the United States has remained strongly committed to maintaining a capable, effective, safe, and secure nuclear deterrent. Since November of 1960, our Navy has played a critical role in this mission, as demonstrated through the recent completion of 4,000 strategic deterrence patrols.

The *Ohio* class is an aging asset. Originally designed with a 30-year service life, they have undergone a service life extension to remain in the fleet for 42 years. As the current SSBN fleet begins retiring in 2027, it will be replaced by the Ohio Replacement (OR). The current fleet of 14 *Ohio*-class submarines with 24 missile tubes will be replaced by 12 OR submarines with 16 missile tubes. This reduced fleet size and payload capability are tailored to meet the U.S. Strategic Command's mission requirements throughout the new boat's 42-year service life. Deterrence remains a cornerstone of national security policy in the 21st century. The United States' ability to maintain a strong, credible nuclear deterrent is a key element of U.S. national security and the security of our allies and partners.

The Trident II has demonstrated itself as an extremely reliable and effective strategic weapons system. Rather than develop a new missile system for the OR, extending the service life of the current system proved to be more cost-effective. The strategic weapons system is more than just a missile, it is a complex system of shipboard subsystems that include fire control, navigation, launcher, and missile subsystems that include solid rocket motors, numerous missile electronic packages, a guidance system, and reentry bodies. Each of these subsystems presents its own unique challenges in regard to life extension and modernization or replacement. Eventually, a new strategic weapons system will need to be developed. For now, though, a key benefit of Trident D5 life extension is that the Navy can avoid the risk of developing an upgraded or new weapons system at the same time it is building a new class of submarine.

Since the end of the Cold War, new countries have developed or acquired nuclear weapons, other countries are trying to develop nuclear weapons, and there are other, non-state players trying to acquire nuclear weapons. Even with the limitations of the current fiscal environment, we must continue to invest in our triad of nuclear forces for it to remain viable and credible. No mission is more important than maintaining nuclear deterrence to safeguard our nation. Ballistic missile submarines are infrequently procured and, because of this, they have not been a part of the Navy's shipbuilding plan for more than 20 years. Infrequent procurement, however, does not negate their importance. The shipbuilding plan notes that annual average shipbuilding expenditures will exceed historical funding levels by about $6 billion from FY 2025 to FY 2034. This is consistent with shipbuilding funding requirements during the two previous SSBN procurement periods. The OR will be in service for more than 40 years, longer than any previous submarine class. It is imperative to keep the designing and building on schedule. America's nuclear deterrent will remain a critical guarantor of our security. As long as nuclear weapons exist, the United States will maintain a safe, secure, and effective arsenal to deter any adversary and guarantee that defense to our allies.

John M. Daniels, Public Affairs Officer, Strategic Systems Programs

Question and Answer with . . .

by Rear Adm. Joe Tofalo

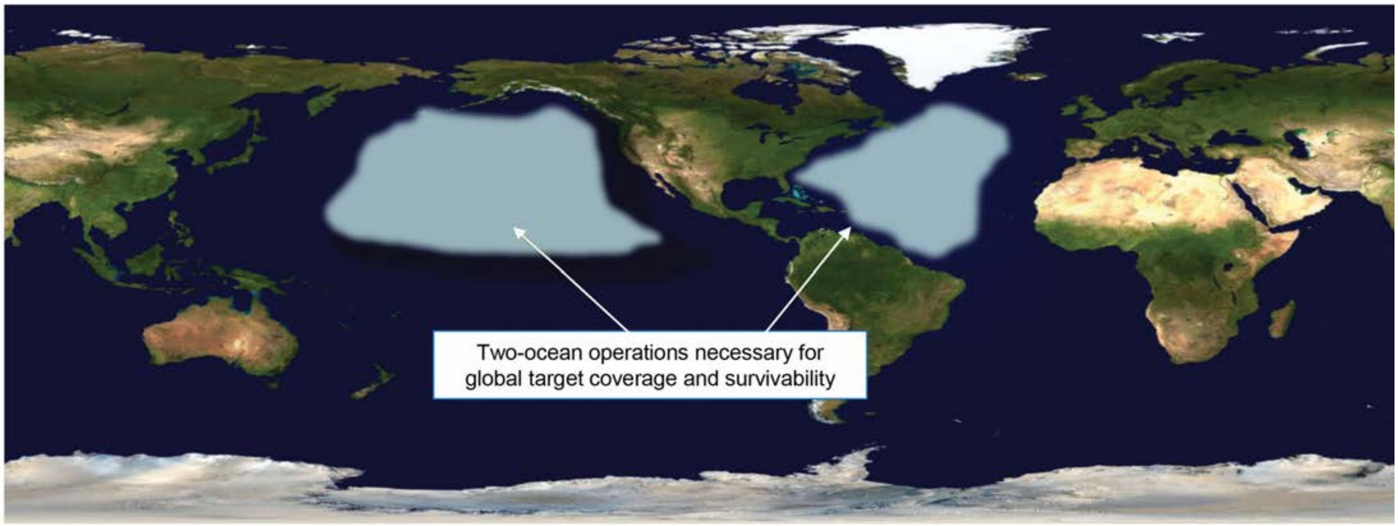
Rear Admiral Joseph Tofalo on SSBN Survivability

Rear Adm. Tofalo is the Director, Undersea Warfare Division on the Navy Staff (OPNAV N97) and is the resource sponsor for the Submarine Force. He has served aboard two *Ohio*-class ballistic missile submarines (SSBNs), including as commanding officer of USS *Maine* (SSBN 741), and was the commander of Submarine Group 10.

As the most survivable leg of the Nuclear Triad, the U.S. ballistic missile submarine (SSBN) force is required to maintain an at-sea presence capable of providing the President a credible, robust, and reliable assured response force.

Operating this survivable sea-based strategic deterrent is our Navy's number one priority. Our Sailors, Marines, Coast Guardsmen, and civilians perform superbly on a day-to-day basis to ensure this force remains at sea and survivable. While most understand the dedication that this takes, few are familiar with the essence and importance of survivability to our nation's deterrence posture.

U.S. Navy



Survivability is enabled by stealth, force size, and operations. Geography matters.

Why is survivability important to an effective deterrent?

In its most fundamental and stable form, a deterrent must be able to impose unacceptable costs on an adversary even after that adversary has been given the opportunity to strike first. Our survivable SSBN force, by assuring our ability to deliver a robust counterattack, ensures that there is no advantage for an enemy who strikes first.

Strategic stability is also important because it acts to reduce the need for hasty decisions – it "slows the problem down." In this way, our stabilizing strategic deterrent provides increased time for decision makers and further reduces the chance of error.

Maintaining the survivability of the SSBN force requires attention to three different but interrelated elements that we can control: the technical stealth of individual SSBN platforms, the number of SSBNs in the force, and the manner in which the SSBNs are operated. We must also remember that there are elements we do not control that must be considered as well; for example, the nature of potential threats to this SSBN force.

Why is the technical stealth of individual SSBNs important?

The technical stealth of an SSBN is almost exclusively a function of its as-built characteristics. There may be some minor issues that can be identified and addressed after construction, but those are rare. This means that careful thought must go into the kind of features put into the ship.

Stealth is not inexpensive, but at the same time it is the key attribute that drives the survivability of the force. If we make a mistake and decide to accept a degradation of stealth that an adversary is able to later exploit, we will have undermined the credibility and effectiveness of our deterrent. Just as important, we want it to be clear to our adversaries that our SSBNs are secure and that it is pointless for them to invest heavily in systems designed to hold our SSBNs at risk. Designing and building our ships to a high level of stealth carries this important message to our would-be adversaries.

Our SSBN force is sized so that we have the ability to vary our operations, to include the duration of patrols and the intervals between them, contributing to both individual SSBN and force-level survivability.

How does the number of SSBNs in the force impact survivability?

Of course, the number of SSBNs required in the force is driven mainly by the number of SSBNs STRATCOM needs at sea on a routine basis. We start with that number and use the ratio between at-sea and in-port ships (operational availability, or Ao) to determine how many ships we need in total. Hidden inside this way of thinking about SSBN requirements, however, is survivability. It is part of both how STRATCOM determines the required number at sea and part of the Ao ratio.

We need to maintain a sufficient SSBN force size to enable flexibility in the way we operate. To avoid exploitable predictability and the damage that it would do to survivability, we need some variation in SSBN schedules. A force structure that is too low is predictable, and predictability can be taken advantage of. This is why you routinely read that terrorists or criminals study their targets to learn their patterns to identify weaknesses to exploit. A fundamental rule for counterterrorism is to vary your patterns, and that principle applies to SSBNs as well.

Our SSBN force is sized so that we have the ability to vary our operations, to include the duration of patrols and the intervals between them, contributing to both individual SSBN and force-level survivability.

Additionally, our SSBN force structure is sized to provide a hedge against unforeseen occurrences such as natural disasters and equipment failures. Although our ships are highly reliable, we still consider reliability issues in our planning.

How does the manner in which the SSBNs are operated contribute to SSBN survivability?

In tandem with the number of SSBNs at sea and their technical built-in stealth, the manner in which we operate our SSBNs is critical to maintaining force stealth and survivability. SSBN crews focus on stealth as they stand watch and even as they move around the ship. Being quiet is an all-hands task all the time on a submarine.

But in addition to stealth, it is also important to make sure that adversaries must be concerned about having to look in a large operating area. SSBNs vary how they move around the ocean to make sure that the SSBN “needle” is hiding in a very large haystack. When we operate our force this way, we ensure that any adversary who wants to find our SSBNs would have to make an almost impossibly large investment in capability. This is a deterrent in its own respect.

Remember, too, that numbers matter. If our number of SSBNs gets too small, we lose flexibility in how we can operate. Either we would have to drive too fast and compromise our stealth, or we would have to follow a path that is straighter than we want. Our ability to operate our SSBN force securely is dependent on having enough ships and having them designed to be stealthy enough. All of the survivability parts are interconnected.

How do actions by our adversary impact SSBN survivability?

When we consider the threat posed by adversaries, we have to consider what they are capable of, not what their current policy is. Our SSBNs have long service lives and, during those long lives, policies can change many times over. Consider all the upheavals that have taken place on the global stage since World War II as to who our friends and enemies are. Now consider that our new SSBN force will have to provide a survivable assured response over a correspondingly long time into the future.

History and prudence dictate that we should focus on the capability of other states to inflict injury on the United States or our friends and allies. When we do this analysis, we place emphasis on proven capability and developmental technology trends instead of hypothetical but unproven capabilities. What becomes clear is that we have to make sure the *Ohio*-class SSBN force remains secure against the near-term threat (now through the 2030s) and that the Ohio Replacement SSBN force is secure against the longer-term threat (beyond the 2030s) using technical stealth, the number of SSBNs, and the manner in which they are operated.

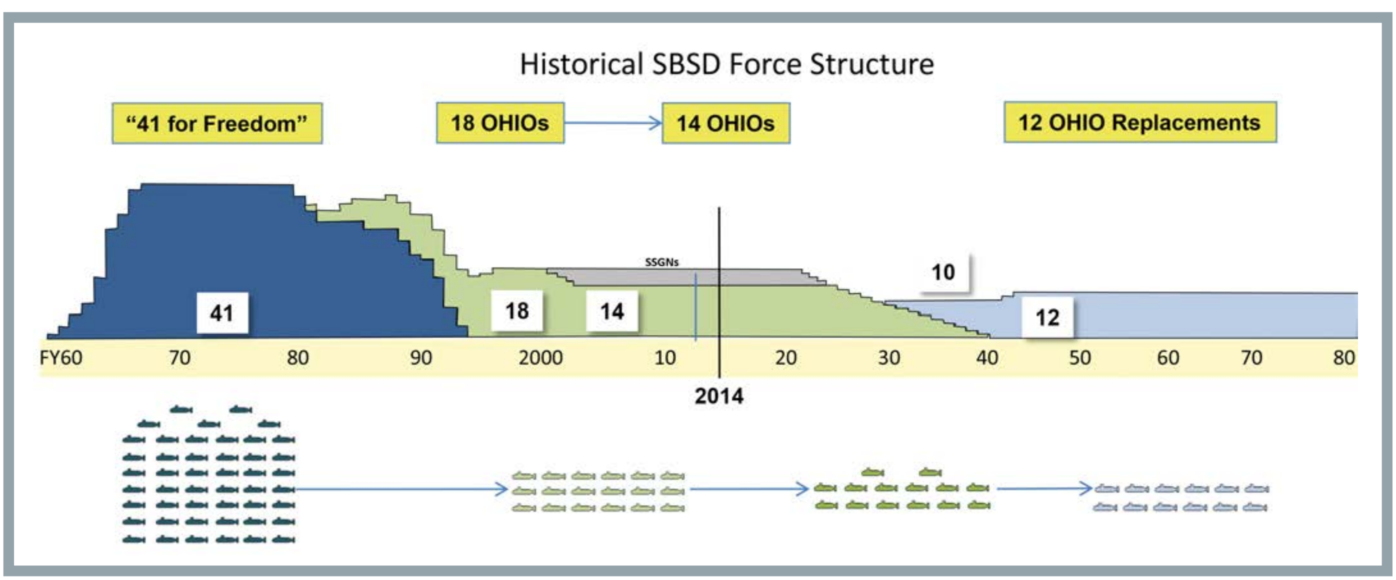
Maintaining the survivability of the SSBN force requires attention to three different but interrelated elements that we can control: the technical stealth of individual SSBN platforms, the number of SSBNs in the force, and the manner in which the SSBNs are operated.

How does the pressure to reduce the cost of SSBNs impact SSBN survivability?

As we face the potential of smaller defense budgets, there is an increasing incentive to save money by cutting SSBN technical stealth or cutting the number of SSBNs. The employment changes necessary to compensate are perceived by some—mistakenly—as having comparatively low risk.

But we must remember that there are natural limits to how far reductions can go in technical stealth and force structure. Every time we force ourselves to operate our SSBNs in a certain way, we reduce that operational flexibility that keeps us from being predictable. As we look to further reduce costs in industrial efficiencies, there are no further reductions possible in technical stealth or numbers that can be used to lower costs and at the same time preserve the survivability of our current *Ohio*-class force and the next generation Ohio Replacement force.

Today, our SSBNs are survivable and are operated from bases giving them access to the broad ocean areas in both the Atlantic and the Pacific. They are stealthy, both in transit and on station. They are operated using irregular schedules and in a manner that makes their locations unpredictable but makes clear to our potential adversaries that we have the ability to hold them at risk. This enduring, certain deterrent force acts as an important stabilizer; it is always there and always at the ready.

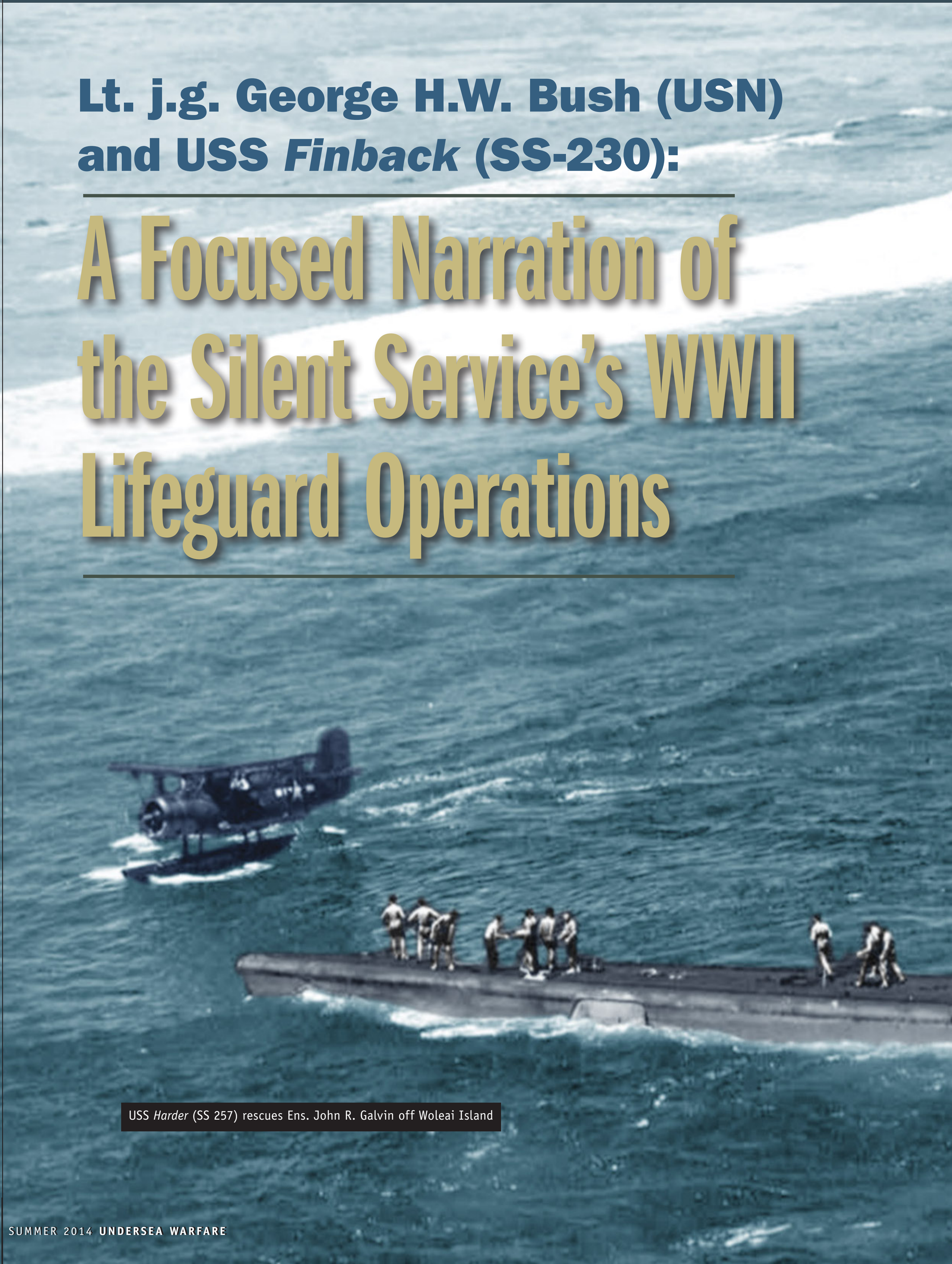


Improvements in stealth, availability, and missile performance have enabled us to meet mission requirements with a smaller force structure. Any further decrease in force size will challenge survivability and operations.

by Rolfe Hillman

Lt. j.g. George H.W. Bush (USN) and USS *Finback* (SS-230):

A Focused Narration of the Silent Service's WWII Lifeguard Operations



USS *Harder* (SS 257) rescues Ens. John R. Galvin off Woleai Island

One of the lesser known but equally important missions of the U.S. Submarine Force in the Pacific theater during WWII was lifeguarding—the rescuing of U.S. and Allied airmen who had been shot down over water. While this may sound easy, it was potentially quite dangerous.

Lifeguard operations began on September 1, 1943 at the direction of Adm. Charles A. Lockwood due to the need to have a method of rescuing downed pilots in the vast, hostile reaches of the Pacific Ocean.[1]

USS *Skate* (SS 305) made the first submarine lifeguard rescue on October 7, 1943 near Wake Island on her first war patrol,[2,3] rescuing Lt. j.g. Richard G. Johnson. *Skate* went on to rescue an additional five airmen during the same operation.

Lifeguard missions were planned in support of aerial attacks. U.S. submarines would arrive on station in the target area ahead of the attack, often providing last-minute weather and enemy movement information to the attacking forces. Aircrews were given the submarines' radio frequencies, location and bearing references, and code names. If a plane was hit and going down, the airmen or another pilot could transmit the location of the downed aircrew to waiting submarines.

Upon receiving information about downed aircrew, the responding submarine would have to surface, often before the combat had ended, potentially exposing themselves to fire from enemy aircraft, shore batteries, or ships. The crew had to go out on deck, throw lines to the airmen, haul them up on deck, and get them safely below. In some cases, members of the submarine crew had to use rubber rafts to retrieve downed airmen.

Of the 520 airmen rescued by the U.S. Submarine Force in the Pacific theater during WWII, perhaps the most noteworthy is the rescue of Lt. j.g. George H.W. Bush by USS *Finback* (SS 230) about 500 miles south-southeast of Tokyo.

On September 2, 1944, Lt. j.g. Bush put his TBM-2 Avenger torpedo-bomber into a steep dive over Chichi Jima Island and released his four 500-pound bombs on a Japanese radio-communications installation. The bombs destroyed the installation but the Japanese defenders' anti-aircraft fire riddled his plane and set it on fire.[4]

Bush successfully bailed out, but his two crewmates, Lt. j.g. William White, an intelligence officer making first-hand observations, and RM2 John Delaney, perished. Bush landed in the waters offshore of the island but within sight of the garrison, which was notorious for its brutal treatment of prisoners: beheading executions and cannibalism.[5]

Bush and his Torpedo Squadron VT-51 squadron mates were assigned to the Independence-class light carrier USS *San Jacinto* (CVL-30). The squadron's mission was to destroy the Japanese installations on Chichi Jima in support of the impending September 15, U.S. invasion of the Palau Islands of Peleliu and Angaur in the Western Caroline Islands.[6]

Fortunately for Bush, USS *Finback* (SS-230), a *Gato*-class submarine, commissioned on January 31, 1942, was stationed nearby on its 10th war patrol. The crew of the submarine, commanded by Cmdr. Robert R. Williams, Jr., rescued Bush.[7,8] The previous day *Finback* had rescued Lt. Thomas R. Keene, a TBF pilot and his crewmen, ARM3C J.R. Doherty and AOM3C J.T. Stovell, from USS *Franklin* (CV-14). The following day *Finback* rescued Lt. j.g. James Beckman, an F6F Hellcat pilot from USS *Enterprise* (CV-6).[9]

Finback's patrol objectives were two-fold: conduct lifeguard operations to rescue Allied airmen and destroy Japanese combatants and merchant shipping.[10] *Finback* had departed for its patrol in the Bonin Islands waters, which are approximately 600 miles south of Japan, from Majuro Submarine Base on August 16.[11]

After Bush and the other airmen were rescued, they were made "shipmates" for the 30 days left in the patrol until the sub docked at Midway and they returned to their respective ships. During their time onboard, the airmen stood the standard lookout watches. Bush stood the 4–6 AM and 6–8 PM watches. While Bush was onboard,

Images courtesy of George Bush Presidential Library and Museum

Above, the officers of USS *Finback* and some U.S. Navy pilots and crew they rescued. Kneeling second from the left is Lt. j.g. George Bush, whose plane was shot down by the Japanese near the Bonin Islands. September 1944.

At right, sailors of USS *Finback* throw Lt. j.g. Bush a line and pull him and his raft alongside the sub.

Finback sank the cargo ships *Hakuun Maru* (86 tons), and *Hassho Maru* (536 tons) on September 11.[12]

Bush commented on his time aboard in letters to his mother: "I am now standing Junior officer of the Deck watches and I really love them. I am not in any way a qualified submariner as you can well imagine, but armed with a pair of binoculars…" He also commented on the value of water aboard: "Water cannot be produced as abundantly aboard this boat, so naturally we have to conserve whenever and wherever possible."[13]

Lifeguard operations continued until the end of the war.[14] Crewmen were wounded and killed, and the subs suffered gunfire damage. New operational procedures were developed to ensure that aircraft stayed on station to protect the subs and the downed crews during the rescue operations.

In one particularly daring lifeguard rescue, USS *Harder* (SS 257) rescued Ens. John R. Galvin off Woleai Island in the Western Carolines. *Harder*'s CO, Cmdr. Sam Dealey, received a radio message that there was a downed pilot drifting toward the reef of one of the islets that make up the Woleai atoll. With dozens of U.S. fighter planes forming a comfortable umbrella overhead, some of *Harder*'s crew were treated to ringside seats—a couple miles off the beach—as the planes relentlessly bombed the main islets. With anti-aircraft fire from the atoll diminishing, fighter planes guided *Harder* to Ens. Galvin's position.

Cmdr. Dealey ordered battle surface stations, flooded down, and maneuvered to about 1,500 yards off the beach. White water was breaking over the shoals 20 yards ahead of the boat and the fathometer had ceased to record. Cmdr. Dealey ordered that a rubber raft be made ready despite not having any paddles and inched *Harder* forward until the forward torpedo room reported, "Bottom scraping forward!" Both of *Harder*'s screws worked to keep the bow against the reef and prevent her from getting broadside to the waves. Three volunteers from *Harder*'s crew swam the rubber raft toward the beach about 1,200 yards away, paying out a line back to the sub. Legs bloodied by the coral, the three volunteers reached the exhausted pilot, put him in the rubber raft, and began the swim back to *Harder*. All were eventually pulled back through the breakers and aboard *Harder* while pilots flew low strafing runs to divert the enemy's attention from the rescue effort. *Harder* backed away from the reef and headed out to sea.[15]

Another dramatic lifeguard rescue occurred on February 17, 1945 when USS *Pomfret* (SS 391), on her fourth war patrol, was guided into Tokyo's outer harbor by a U.S. fighter plane, about 15 miles north of Oshima Island, to rescue Ens. R.L. Buchanan, U.S.N.R., a pilot with USS *Cabot* (CVL 28). From a little after noon until about 2:00 p.m., the plane guided *Pomfret* through a surface haze to Ens. Buchanan's position. The plane, dangerously low on fuel, left as *Pomfret* pulled Ens. Buchanan from his life raft, just 10 miles from Joga Shima on the Miura Peninsula south of Yokohama. With five or six small Japanese vessels on the radar and no air cover, *Pomfret* headed south on the surface at flank speed for deeper and safer water.

During the war, 86 different U.S. submarines rescued 520 U.S. and Allied airmen.[16] USS *Tigrone* (SS 419) had the highest tally with 31 including the final rescued pilot picked up off the Japanese mainland on August 14, 1945.[17,18]

U.S. lifeguard operations were successful because of the superior number of U.S. submarines, ships, and aircraft available for search and rescue operations and the shrinking number of Japanese ships and aircraft that could interfere with them. Another factor was the ineffective Japanese anti-submarine operations and doctrine.19

The 520 lives saved by U.S. lifeguard operations stand as a permanent memorial to the heroism and professionalism of America's Silent Service.

Endnotes

1 *United States Submarine Operations in World War II*, Theodore Roscoe, US Naval Institute, Annapolis, MD, 1949, pages 475-490, and U.S. Submarines in World War II: An Illustrated History, Larry Kimmett & Margaret Regis, Navigator Publishing, Seattle, Wash, 1996, page 94.

2 *United States Submarine Operations in World War II*, pages 466-469, and Lifeguard League website.

3 Website: http://www.homeofheroes.com/members/02_NX/indexes/06_ncross_wwii-listAll.html, accessed July 16, 2014

4 Naval Historical Center/US Navy Website: "*Frequently Asked Questions-Vice President Bush Calls World War II Experience "Sobering*" http://www.history.navy.mil/faqs10-3.htm, accessed… July 15, 2014

5 *All the Best: My Life in Letters and Other Writings*, George H.W. Bush, Scribner, New York, NY, 2013, page 52.

6 *History of United States Naval Operations in World War II: Volume XII; Leyte: June 1944-January 1945*, Samuel Eliot Morison, Little Brown & Company, Boston, 1975, pg 50. The Assault on Peleliu, MAJ Frank O Hough, Historical Division Headquarters, U.S. Marine Corps, 1950, pg 36, and see Peleliu 1944, Dr Harry Gailey, Presidio Press, 1983.

7 USS *Finback* (SS 230) Ship Log, USN Microfilm Roll H-108, AR-231-77—accessed thru website: Historical Ship Association: http://hnsa.org/doc/subreports.htm, accessed July 7, 2014.

8 "*Allied Warship Commanders – Robert Russell Williams, Jr*" in website: http://uboat.net/allies/commanders/3383.html, accessed July 7, 2014.

9 USS *Finback* Ship Log, and "Submarine Lifeguard League" website http://www.subsowespac.org/the-patrol-zone/submarine-lifeguard-league.shtml, accessed July 10, 2014.

10 Website: Historical Ship Association: http://hnsa.org/doc/subreports.htm, see also USS *Finback* webpage-Wikipedia: http://en.wikipedia.org/wiki/USS_*Finback*_(SS-230), accessed July 15, 2014.

11 USS *Finback* (SS 230) Ship Log.

12 USS *Finback* (SS 230) Ship Log, and website http://www.valoratsea.com/lifeguard.htm.

13 *All the Best: My Life in Letters and Other Writings*, pages 52-54.

14 Lifeguard League website; and *United States Submarine Operations in World War II.*

15 *United States Submarine Operations in World War II*, pages 466-469.

16 Office of Strategic Planning/COMSUBSPAC Rescued Pilots Report, and website http://www.valoratsea.com/lifeguard.htm.

17 *U.S. Submarines in World War II*, pg. 95.

18 Office of Strategic Planning/COMSUBSPAC Rescued Pilots Report, and website http://www.valoratsea.com/lifeguard.htm.

19 *Kaigun; Strategy, Tactics and Technology in the Imperial Japanese Navy 1887-1941*, David C. Evans, Mark R. Peattie, U.S. Naval Institute Press, Annapolis, Md., 1997, pg 428-434 and see The Japanese Submarine Force and World War II, Carl Boyd & Akihiko Yoshida, Naval Institute Press, Annapolis, Md., 1995.

Qualified for Command

Lt. Cmdr. Edward Barry
USS *Henry M. Jackson* (SSBN 730) (G)

Lt. Cmdr. John Crumpacker
COMSUBRON 11

Lt. Cmdr. William Dull
COMSUBGRU 7

Lt. Justin Ivancic
COMSUBRON 7

Lt. Cmdr. Kevin Moeller
USS *Wyoming* (SSBN 742) (G)

Lt. Cmdr. Alan Roche
USS *City of Corpus Christi* (SSN 705)

Lt. John Ross
USS *Nevada* (SSBN 733) (B)

Lt. Carlson Schindler
USS *Wyoming* (SSBN 742) (B)

Lt. Randy Stack
USS *Alabama* (SSBN 731) (B)

Lt. Cmdr. Patrick Tembreull
USS *Nevada* (SSBN 733) (G)

Lt. Cmdr. Timothy Thurston
USS *Henry M. Jackson* (SSBN 730) (B)

Lt. Henry Wicks
USS *Scranton* (SSN 756)

Lt. Travis Wood
USS *Newport News* (SSN 750)

Qualified in Submarines

Lt. j.g. Michael Baitcher
USS *Louisiana* (SSBN 743) (G)

Lt. j.g. Nicholas Blair
USS *Louisiana* (SSBN 743) (B)

Lt. j.g. Colin Doherty
USS *Henry M. Jackson* (SSBN 730) (B)

Lt. j.g. Wesley Dunham
USS *Jefferson City* (SSN 759)

Lt. j.g. James Elsbree
USS *Henry M. Jackson* (SSBN 730) (B)

Lt. j.g. Kenneth Ekhart
USS *Henry M. Jackson* (SSBN 730) (B)

Lt. j.g. Jon Faile
USS *Virginia* (SSN 774)

Lt. j.g. Scott Ford
USS *Louisiana* (SSBN 743) (B)

Lt. j.g. Paul Gale
USS *City of Corpus Christi* (SSN 705)

Lt. j.g. Michael Guibas
USS *Albuquerque* (SSN 706)

Lt. j.g. Drew Hanessian
USS *Pasadena* (SSN 752)

Lt. j.g. David Johnson
USS *Pittsburgh* (SSN 720)

Lt. j.g. Cletus Ketter
USS *Dallas* (SSN 700)

Lt. j.g. Phillip McGinnis
USS *West Virginia* (SSBN 736) (G)

Lt. j.g. Jonathan Morrow
USS *Pasadena* (SSN 752)

Lt. j.g. Travis Nicks
USS *Santa Fe* (SSN 763)

Lt. Jake Payne
COMSUBRON 11

Lt. John Ross
USS *Nevada* (SSBN 733) (G)

Lt. j.g. Aaron Sponseller
USS *Jefferson City* (SSN 759)

Lt. j.g. Andrew Tribble
USS *Louisiana* (SSBN 743) (G)

Lt. j.g. William White
USS *Louisiana* (SSBN 743) (B)

Lt. j.g. Shawn Wilt
USS *Jefferson City* (SSN 759)

Qualified Nuclear Engineering Officer

Lt. j.g. Marcus Alexander
USS *Florida* (SSGN 728) (G)

Lt. j.g. Henry Barfield
USS *Boise* (SSN 764)

Lt. Jonathon Bice
USS *Alabama* (SSBN 731) (B)

Lt. j.g. Timothy Browning
USS *Oklahoma City* (SSN 723)

Lt. j.g. Kevin Campbell
USS *Virginia* (SSN 774)

Lt. j.g. Alexander Corpuz
USS *Maryland* (SSBN 738) (G)

Lt. j.g. Russell Dallas
USS *Oklahoma City* (SSN 723)

Lt. Freeman Davenport
USS *Topeka* (SSN 754)

Lt. j.g. James Elsbree
USS *Henry M. Jackson* (SSBN 730) (B)

Lt. j.g. Scott Ford
USS *Louisiana* (SSBN 743) (B)

Lt. j.g. Jordan Fouquette
USS *Dallas* (SSN 700)

Lt. j.g. Jordan Gates
USS *Tucson* (SSN 770)

Lt. j.g. Eric Gonzalez
USS *Pittsburgh* (SSN 720)

Lt. j.g. Jeffrey Guise
USS *Louisiana* (SSBN 743) (B)

Lt. Austin Hancock
USS *Hampton* (SSN 767)

Lt. Randall Hangartner
USS *Tennessee* (SSBN 734) (B)

Lt. Ian Hardey
USS *Asheville* (SSN 758)

Lt. j.g. Andrew Hardy
USS *Helena* (SSN 725)

Lt. j.g. David Hatch
USS *City of Corpus Christi* (SSN 705)

COs to Have Authority to Allow Ball Caps with NWUs

The Chief of Naval Personnel (CNP) announced July 11 a change to uniform regulations giving commanding officers discretion to authorize the wear of command ball caps with Navy Working Uniforms (NWU) Type I, II and III beginning Sept. 1.

Initiated by Secretary of the Navy Ray Mabus, this change is a result of Sailor feedback received at all hands calls and is part of Navy's efforts to further empower command triads.

Currently ball caps can only be worn with the physical training uniform, coveralls and flight suits; with NWUs only when standing bridge watch and by command training teams during a training evolution.

The 8-point cover remains part of a Sailor's sea bag.

The change in wear rules for the ball caps, which will include Fleet leadership input, will be released in a NAVADMIN later this summer and will include occasion of wear rules.

Photo by MCS 2C Andrew Jandik

USS *Nebraska* Gives to the Community

Sailors from the USS *Nebraska* (SSBN 739) interact with kids at an Omaha Boys and Girls Club in support of Navy Week Omaha. Our U.S. Navy Sailors protect and defend America on the world's oceans. Tens of thousands of America's finest young men and women are deployed around the world doing just that, and they are there around the clock, far from our shores, defending America at all times.

Lt. j.g. Neal Hutsell
USS *Jacksonville* (SSN 699)

Lt. j.g. Benjamin Kalkwarf
USS *Tennessee* (SSBN 734) (B)

Lt. j.g. Seth Kimball
USS *Chicago* (SSN 721)

Lt. j.g. Matthew Kloepfer
USS *Scranton* (SSN 756)

Lt. j.g. Matthew Libby
USS *Bremerton* (SSN 698)

Lt. j.g. Kristin Lyles
USS *Georgia* (SSGN 729) (G)

Lt. j.g. Max Mayo
USS *West Virginia* (SSBN 736) (G)

Lt. j.g. Bradford McDaniel
USS *Albany* (SSN 753)

Lt. j.g. Ralph Miller
USS *California* (SSN 781)

Lt. j.g. Jonathan Miske
USS *Michigan* (SSGN 727) (B)

Lt. j.g. David Nershi
USS *Connecticut* (SSN 22)

Lt. j.g. Jimmy Nguyen
USS *City of Corpus Christi* (SSN 705)

Lt. Christopher Norton
USS *Georgia* (SSGN 729) (G)

Lt. j.g. Niels Peterson
USS *Wyoming* (SSBN 742) (G)

Lt. j.g. David Phillips
USS *Houston* (SSN 713)

Lt. j.g. Joshua Pound
USS *Nevada* (SSBN 733) (B)

Lt. j.g. Benjamin Reed
USS *Springfield* (SSN 761)

Lt. j.g. Christopher Reilly
USS *Charlotte* (SSN 766)

Lt. j.g. Charles Robinson
USS *Santa Fe* (SSN 763)

Lt. Jon Rosenbaum
USS *Providence* (SSN 719)

Lt. j.g. Joshua Rothman
USS *Mississippi* (SSN 782)

Lt. j.g. Josheua Samuelson
USS *Seawolf* (SSN 21)

Lt. j.g. Karl Schrutka
USS *Nevada* (SSBN 733) (B)

Lt. James Sheahan
USS *Georgia* (SSGN 729) (G)

Lt. j.g. Aidan Sheerin
USS *Florida* (SSGN 728) (B)

Lt. j.g. Eric Spencer
USS *Rhode Island* (SSBN 740) (B)

Hagel Visits Kings Bay

During a visit to Naval Submarine Base, Kings Bay, Defense Secretary Chuck Hagel spoke with 14 female Submariners, toured the ballistic-missile submarine USS *Tennessee*, and took questions at an event with 180 Sailors, Marines and Coast Guardsmen.

The submarine base is home to Submarine Group 10, Submarine Squadrons 16 and 20, the Trident Training Facility, the Trident Refit Facility, the Strategic Weapons Facility-Atlantic, and other support-providing commands. More than 8,000 personnel work at the base, including nearly 5,000 active-duty Navy personnel, 2,322 civilian employees, and 1,298 contractors.

At the Kings Bay troop event, Hagel greeted an auditorium full of Navy, Marine Corps, and Coast Guard service members, bringing them greetings from President Barack Obama and everyone at the Defense Department.

"We thank you for what you're doing [and] what you have been doing here. I know occasionally you might wonder if anybody is paying attention or cares," the secretary said. "We are paying attention. We know what you do. We appreciate what you do."

Secreatary of Defense (SECDEF) Chuck Hagel speaks with Cmdr. Christopher Bohner, commanding officer of the Gold crew of the ballistic missile submarine USS *Tennessee* (SSBN 734).

Hagel also sent thanks to their families and said the department appreciates their sacrifices. "We understand their sacrifices and we don't take those sacrifices for granted," he told the service members.

Lt. j.g. William Stillman
USS *Nevada* (SSBN 733) (B)

Lt. j.g. Tabitha Strobel
USS *Georgia* (SSGN 729) (G)

Lt. j.g. Michael Stromeyer
USS *San Juan* (SSN 751)

Lt. j.g. Roger Terry
USS *Springfield* (SSN 761)

Lt. j.g. Austin Thompson
USS *Alabama* (SSBN 731) (B)

Lt. j.g. Ryan Tillman
USS *Texas* (SSN 775)

Lt. j.g. John Underhill
USS *Tucson* (SSN 770)

Lt. j.g. Jacob Webb
USS *Pittsburgh* (SSN 720)

Lt. j.g. William White
USS *Louisiana* (SSBN 743) (B)

Lt. j.g. Caleb Whitten
USS *West Virginia* (SSBN 736) (B)

Lt. j.g. Oliver Zufelt
USS *Alexandria* (SSN 757)

Supply Officer Qualified in Submarines

Lt. j.g. Justin Lemons
USS *Albuquerque* (SSN 706)

Qualified Strategic Weapons System Master Chief

MTC(SS) Brandon G. Bates
SSP Cape Canaveral

MTC(SS) Robert A. Campbell
SSP Cape Canaveral

MTC(SS) Toby J. Denton
USS *Alaska* (SSBN 732) (G)

MTC(SS) Kevin P. Lewis
USS *Henry M. Jackson* (SSBN 730) (B)

MTCS(SS) Rex Martin
COMSUBRON 17

MTC(SS) Charles B. McCadden, Jr.
USS *Tennessee* (SSBN 734) (G)

MTC(SS) Charles W. McDaniel
USS *Tennessee* (SSBN 734) (G)

MTCS(SS) Steven C. Riley, Jr.
COMSUBRON 20

MTCS(SS) Jason E. Simkins
COMSUBRON 20

MTC(SS) Derick M. Stonesifer
USS *Kentucky* (SSBN 737) (G)

Medical Officer Qualified in Submarines

Lt. Paul Algra
Navy Experimental Diving Unit

Lt. Timothy Bruce
Naval Diving and Salvage Training Center

Lt. Jason Fisher
Naval Health Clinic Hawaii

Lt. Matthew Haldeman
Naval Submarine Support Center, Bangor

Lt. Charles Sola
Naval Special Warfare Group 4

Lt. Adam Songer
Naval Diving and Salvage Training Center

2014 Chief Selections

CSC - Chief Culinary Specialist Submarine Qualified
R. Benitez
K. Caron
H. Felt
J. Green
K. Perdue
S. Safford
R. Sanchez
C. Smith
D. Souchon
S. Stachowicz
B. Wolfson

EMNC - Chief Electricians Mate Nuclear (Submarine)
J. Baggett
M. Ball
D. Bultman
C. Delp
A. Farrish
J. Gagnon
P. Golub
E. Gonzales
J. Hayghe
W. Herbst
B. Hooper
S. Koenig
S. Luley
D. Macomber
S. McMmanus
D. Miller
R. Mirrione
P. Peckham
R. Rhodes
A. Robinson
R. Romack
J. M. Ross
K. Schwalbach
J. D. Spyker
M. Stonehocker
M. Sunderland
J. Sword
A. Tinh

ETNC - Chief Electronics Technician Nuclear (Submarine)
R. Anderson
T. Bakker
S. Bandli
M. Bradberry
T. Brown
R. Buening
S. Carvalho
C. Casey
D. Chambers
D. Cooper
A. Delisle
A. Eastep
M. Fedele
R. Flores
T. Free
S. Garland
I. Gay
S. Gill
S. Good
K. Harms
Z. Hawkins
R. Hicks
S. Holbrook
J. Kinkade
E. Kratz
K. Liberacki
C. Manatad
M. Melia
M. Mol
C. Northern
J. Panciera
J. Patin
C. Poff
D. Potter
M. Ryan
E. Sirhal
J. Toth
S. White

ETRC - Chief Electronics Technician Submarine (Communications)
P. Abshire
B. Bradley
J. Brown
M. Creeden
W. Custer
M. Dlabaj
D. Dodd
T. Duncan
J. Eagle
N. Franklin
R. Gallinat
J. Goad
E. Grizzle
S. Huff
J. Huntington
R. Inman
T. Johnson
D. Jones
F. Kotlarsic
J. Kratt
K. Lindsay
T. Merritt
K. Monfort
M. Musella
N. Nalley
G. Newcomb
P. Otterbeck
T. Parker
R. Pereras
G. Roberts
C. Rulo
W. Ryan
T. Sanders
T. Scott
B. Sexty
D. Sine
J. Smith
K. Smith
C. Spradling
M. Stamps
A. Storkamp
C. Tapley
Q. Vedol

ETVC - Chief Electronics Technician Submarine (Navigation)
M. Astromowicz
C. Atiencia
B. Bashaw
C. Born
E. Butler
B. Carnes
C. Comer
M. Cox
M. Davenport
J. Evans
R. Fake
B. Freligh
K. Goodwin
J. Gregory
W. Hickman
L. Hutton
C. Jacobson
K. Jensen
D. Jimenez
B. Joly
S. Jones
M. Jordan
E. Jungclaus
B. Klein
N. Lacey
J. Lee
J. Marfield
A. Mooney
H. Pabon
P. Patrick
J. Perrone
J. Roberts
D. Scammon
S. Sebastian
J. Sisk
C. Speed
R. Stanley
J. Tarbox
C. Thompson
J. Voigt
Z. Walker
K. Walton
D. Ward
B. Wolff
C. Young

FTC - Chief Fire Control Technician
M. Amos
R. Clifton
P. Damuth
R. Ehmann

Photo by MCS 1C Rex Nelson

USS *Wyoming* wins Arleigh Burke Fleet trophy

Adm. Bill Gortney, commander of U.S. Fleet Forces Command, presents the command leadership triad of the *Ohio*-class ballistic missile submarine USS *Wyoming* (SSBN 742) (Gold) with the Arleigh Burke Fleet Trophy during a ceremony held at Naval Submarine Base Kings Bay. The crew was presented with a brass plaque that will be mounted on a bulkhead inside the sub.

The trophy is presented annually to the ship or squadron in the Atlantic and Pacific fleets that is considered the most improved. USS *Wyoming* also won the Submarine Squadron 20 Battle Efficiency Award during the same period.

Forty-two ships and submarines representing 15 international partner nations maneuver into a close formation during Rim of the Pacific (RIMPAC) 2014.

RIMPAC 2014

From June 21 to August 1, 22 nations, more than 40 ships and six submarines, more than 200 aircraft, and 25,000 personnel participated in RIMPAC 2014. RIMPAC is the world's largest international maritime exercise, which provides a unique opportunity to help participants foster and sustain the cooperative relationships that are critical to ensuring the safety of sea lanes and security on the world's oceans. The nations participating this year were Australia, Brunei, Canada, Chile, Colombia, France, India, Indonesia, Japan, Malaysia, Mexico, the Netherlands, New Zealand, Norway, the People's Republic of China, Peru, the Republic of Korea, the Republic of the Philippines, Singapore, Tonga, the United Kingdom, and the United States. This was the 24th RIMPAC exercise in the series, which began in 1971.

D. Fox
S. Goodner
A. Hustedde
S. Little
S. Malone
L. Martin
C. Pegram
T. Prudhomme
B. Schlieper
T. Sitz
T. Thomas
J. Viger
S. Wintink

ITSC - Chief Information Systems Technician (Submarines)

K. Adams
K. Bittinger
D. Boevers
A. Cleary
M. Dickinson
R. Doyle
W. Dumont
S. Fowler
I. Gomez
R. Henry
J. Highberg
A. Houston
J. Johnson
J. Johnson
J. Lowery
K. Martindale
J. Mccamey
A. Mcsparren
O. Miller
W. Miracle
E. Nieves
C. Pair
P. Parker
G. Perret
J. Rose
M. Sawchuk
O. Sotelo
B. Taylor
T. Tonsetic
S. Williams
S. Woods

LSC - Chief Logistics Specialist Submarine Qualified

A. Ballard
J. Bloch
P. Diers
J. Edwards
A. Hardardt
W. Hill
D. Jenkins
G. Lara
A. Martindale
T. Morris
C. Spencer
J. Thursby
A. Tyner
K. Welcher

MMEC - Chief Machinists Mate Submarine (Auxiliary)

A. Acebo
C. Arce
J. Bradovich
R. Caroffino
J. Clarke
J. Crotwell
K. Flores
R. Flynn
D. Garcia
J. Gimpel
J. Grubb
N. Hansen
T. Harkness
K. Hick
T. Houchin
Huffstickler
G. Knarr
J. Lachowitzer
A. Lezama
R. Maness
D. Marvin
Mendezvazquez
S. Mercer
J. Moats
C. Morgan
J. Nelson
W. Newman
V. Norgaila
G. Rhodes
J. Richards
M. Sands
L. Smith
G. Velezalicea
K. Warren
S. Waughtel
S. Williams
C. Wilson
B. Wissinger
R. Young

MMNC - Chief Machinists Mate Nuclear (Submarine)

C. Allen
S. Andrews
T. Andrews
S. Barfuss
J. Bennett
J. Bentley
Bunkerworley
B. Crawford
M. Diamond
G. Dove
M. Dowdell
E. Duer
M. Dykes
A. Egolf
J. Everett
N. Francis
B. Frieders
L. Fucini
D. Giuliano
S. Harris

PCU John Warner christened

In Newport News Va., on Sept. 6, Jeanne Warner christened the *Virginia*-class attack submarine Pre-Commissioning Unit (PCU) *John Warner* (SSN 785). Former U.S. Sen. John Warner, the boat's namesake, is on the far right. Photo courtesy of Huntington Ingalls Industries by John Whalen

S. Hasenwinkel
I. Heller
K. Hendrix
B. Johnson
B. Johnson
J. Lambert
C. Lanois
M. Ledestich
J. Leeds
D. Lewis
A. Livingston
D. Locke
J. Marchione
J. McDonald
B. Mctee
R. Mostrom
T. Muck
S. Nelson
S. Olesen
J. Powell
J.Primm
G. Ramos
N. Ranck
C. Reimer
C. Rust
M. Ryals
K. Santos
S. Scanlon
R. Schmitz
J. Schultz
G. Schwamb
R. Taggart
M. Tavis
A. Taylor
R. Thompson
T. Tillmon
W. Webb
B. White
J. Zerweck

MMWC - Chief Machinists Mate Submarine (Weapons)

W. Arnold
T. Boyer
C. Dunsworth
C. Early
E. Flanagan
D. Gladden
R. Glenn
T. Hanley
D. Horkey
T. Jeffers
K. Kaiser
W. McQuinley
C. Miller
R. Mullaney
C. Nachreiner
M. Nickel
R. Ortiz
J. Price
J. Ratliff
D. Reiland
J. Stitt
M. Wade
L. Wagner

MTC - Chief Missile Technician

S. Adamek
B. Barefoot
P. Boulanger
G. Bowman
A. Burgoyne
C. Costello
C. Courtney
J. Cushing
D. Ford
A. Geigel
A. Gomez
C. Groomes
R. Grossman
J. Hayes
D. Hoggard
R. Hurtado
C. Leedy
P. Miller
M. Olson
P. Schiro
A. Schumacher
J. Troeger
L. Tuggle

STSC - Chief Sonar Technician Submarine

R. Andrade
J. Barosh
R. Cacchiola
M. Goldsmith
G. Herbertson
G. Hessey
J. Lee
J. McGouyrk
W. Morris
J. Moss
B. Osborne
A. Packnick
J. Paulson
M. Phelps
E. Plew
C. Rieger
R. Sarvis
S. Winger

YNC - Chief Yeoman Submarine Qualified

M. Aguirre
M. Alsbrooks
D. Arevalos
M. Britt
J. Curren
D. Dean
C. Debode
G. Dodson
K. Fulmer
M. Galiszewski
T. Jones
K. Jun
J. Martel
M. Roberts
H. Serrano
W. Shelton
T. Threde
B. Whitehurst
D. Zehr

Photo by Retired Army Staff Sergeant Walter Duenas

Sailors from Commander, Submarine Force, U.S. Pacific Fleet, pose for a picture with guests at Fisher House, July 9, during a community outreach dinner. Fisher House is a non-profit organization that provides housing to military members and their families during times of medical crisis.

Naval Submarine League Presents

16th Annual Photo Contest Winners

1st Place: ETC(SS) Michael A. Dlabaj—"Last time through the Suez"

Each year, the Naval Submarine League (NSL) and *Undersea Warfare* Magazine team up to sponsor a photo contest. We congratulate the winners and thank all those who participated in this year's contest.

2nd Place: MC2 (SW/AW) Kyle Carlstrom—"Coming Home"

3rd Place: MC1(SW/AW) Steven Khor—"Warmth of Your Smile"

Honorable Mention: Cmdr. Michael Quan—"Did I Just Hear Santa… Arriving?"

Submarine Museums and Memorials

USS *Croaker* (SS 246)

Buffalo, N.Y.

USS *Croaker* (SS/SSK/AGSS/IXSS 246), a *Gato*-class submarine, was laid down on December 19, 1943 by the Electric Boat Co. in Groton, Conn. She was launched on December 19, 1943, and commissioned on April 21, 1944.

Croaker departed from Pearl Harbor on July 19, 1944 for her first war patrol, sailing to the East China and Yellow Seas. In a series of brilliant attacks that won her the Navy Unit Commendation, she sank the cruiser *Nagara* on August 7 and two freighters, *Daigen Maru* on August 14 and *Yamatero Maru* on August 17. During this patrol, she served as lifeguard during air strikes on the Bonins. On her second war patrol, she sailed from Midway on September 23 in a wolfpack for the same area. She sank the freighter *Shinki Maru* on October 9 and *Hakuran Maru* on October 23. The next day she sank *Mikage Maru*, a military cargo ship, and damaged another with her last torpedo. She returned to Midway and then to Pearl Harbor for refit.

On *Croaker*'s third war patrol, in the Luzon Straits and South China Sea from December 13, 1944 to February 12, 1945, she found no enemy ships but provided lifeguard service during air strikes on Luzon ahead of the Lingayen Gulf invasion. She refitted at Fremantle, Australia, and on March 12 sailed for a patrol off the coast of Indochina. *Croaker* refitted at Subic Bay, P.I., between April 22 and May 15 and then sailed for her fifth war patrol in the Java Sea. On May 30 she attacked a convoy of three oilers guarded by an escort with unconfirmed results, and on June 5 returned to Fremantle. Her sixth and final war patrol, between July 1 and August 13, found her assigned to lifeguard duties in the South China Sea and off Hong Kong for the final series of air attacks on Japan.

Returning to Subic Bay, *Croaker* sailed for Saipan and continued on to Galveston, Texas and New London, where she was decommissioned and placed in reserve on May 15, 1946.

Recommissioned on May 7, 1951, she served as a schoolship out of New London until March 18, 1953, when she was again decommissioned for conversion to a hunter-killer submarine. This involved the installation of long-range bow sonar, a new sail with a snorkel mast, machinery noise reduction, and the removal of all deck guns. USS *Croaker* was recommissioned as SSK 246 on December 11, 1953. Returning to active duty in February 1954, she operated along the east coast and in the Caribbean, visiting ports in England while taking part in NATO exercises in 1957 and 1958. In September 1960, *Croaker* departed on a cruise through the Mediterranean and Suez Canal to call at Karachi, Pakistan among other Near Eastern ports. She returned to New London in mid-December.

Along with the Navy United Commendation, *Croaker* received three battle stars during her WWII service, for which she is credited with having sunk 19,710 tons of shipping.

Croaker continues to serve today as a museum ship since her arrival in Buffalo, N.Y. on November 22, 1988. Visitors can see *Croaker* at the Buffalo and Erie County Naval and Military Park on the shore of Lake Erie. The park is home to several decommissioned U.S. Navy vessels, including the *Cleveland*-class cruiser USS *Little Rock* and the *Fletcher*-class destroyer USS *The Sullivans*. Along with the ships, there are a variety of smaller vehicles, vessels, and aircraft.

http://buffalonavalpark.org/exhibits/ships