U.S. Naval Strategic Deterrence:
An Unseen Global Force From the Ocean’s Depth

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Undersea Warriors,

Greetings from Norfolk! As I read this issue of UNDERSEA WARFARE and reflect on my first six months in command of the finest undersea force in the world, I was both humbled and proud.

I was first humbled by the sense of our history. We are and always have been a maritime nation. Our founding fathers clearly saw the importance of the maritime domain, for they stated in the Constitution that the Congress had the power “to raise and support armies”… but absolutely requiring it “to provide and maintain a Navy.” History has proven them wise. Approximately 70% of the world is covered by water, 80% of the population lives within a few hundred miles of an ocean coast, 90% of global commerce travels not by plane but by ship, and over 95% of intercontinental communications (including financial transactions) travel not by satellite, but via an underwater cable. Our nation collectively rose to the challenge by providing and maintaining the most powerful naval force the world has ever known. Our people rose to that challenge as individuals as well. Great, courageous Americans fought conflicts like World War II in boats like the USS Pampanito (SS 383). Ingenious Americans gave us our modern arsenal of submarine launched missiles. It is important to look back at the initiative and motivation of those who gave us the Force we operate today.

But our nation faces a number of rising challengers. Recent developments have dramatically altered the political, economic, and strategic environment for the United States and our allies. Some of these changes constitute immediate threats to our security, and all of them represent significant new challenges for our Navy. Traditional nation-state actors strive for increased power and maritime influence. Because we are a maritime nation, a large part of the responsibility to prevent challengers from using the sea to threaten the U.S. and its allies will fall on the Navy. As anti-access/area denial systems proliferate, the share of this Navy responsibility that falls on the submarine and undersea forces will only grow. As you’ll see when you learn about our budget in this issue, America continues to rise to the challenge of maintaining its Navy and its undersea forces.

And that brings me to how proud I am. I’m proud of the people who design, build, support, repair, and crew our undersea platforms and train our Sailors. I’m proud of the expertise, initiative, and toughness that they demonstrate every day. And finally, I’m proud to be part of the finest undersea force in the world during our time to continue the legacy of our great maritime nation.

Thank you for all you do – keep charging!

“Because we are a maritime nation, a large part of the responsibility to prevent challengers from using the sea to threaten the U.S. and its allies will fall on the Navy.”

Vice Adm. Joseph E. Toafalo, USN
Commander, Submarine Forces

On the Cover
A Trident D5 missile streaking over San Francisco launched by USS Kentucky in November 2015.

Photo by Abe Blair

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We have built an across-the-board reputation as professional warfighters operating on the frontlines and must continue delivering on our commitments and be ready for decisive operations and combat.

It is your daily contribution to our nation’s defense that validates the support we receive inside the Beltway. Let me give you several examples of how your efforts buy us street “cred” and how that credibility enables us to be the force the nation counts on. First, we must remain the best Submarine Force in the world. This is no small task given the challenges arising around the globe. We are dependent upon to access A2/AD environments as the leading edge of the fleet in almost every future scenario. We must continue to learn how to fight our submarines to their limits in supporting our national defense. Because of the forward posture we maintain through deployments and the lessons we learn in using our shipboard systems, we are able to prove that we make full use of the warships given to us. Adm. Harris, PACOM, recently testified before Congress saying, “As far as the Virginia-class submarines, it’s the best thing we have. It’s the best thing we have and I can’t get enough of them, and I can’t get enough of them fast enough.” I couldn’t agree with him more.

Second, we must execute new construction and shipyard availability times on time. We will continue to build two Virginia-class submarines per year, as well as beginning to build OR in FY 2021. We must become as good in executing shipyard availabilities as we are in fleet operations. Delays will hurt our ability to support combat and fleet commanders. I recognize that the job of a “shipyard” SuBo, in both NEWCON and Overhauls, is not glamorous, but you are the unsung heroes helping to maintain today’s submarines and build tomorrow’s submarine fleet faster than ever. We, along with our industrial partners, need to continue to look for innovative ways to improve our availabilities and avoid costly delays to deliver these brand new submarines to Adm. Harris and the other corners of the globe.

Third, read the Design for Maintaining Maritime Superiority and the Commander’s Intent, and remember I have a copy of each on my desk, and I use them every day. Do not forget that everything we do is done with the goal of being ready to conduct prompt and sustained combat incident to operations at sea.

Our value to this nation’s military is being recognized every day by our nation’s leadership. These same leaders entrust us to perform challenging tasks at the far ends of the world. It is being recognized because you operate our warships with skill, integrity, and commitment. If you pay attention to the news, combatant commanders and senior political leaders are calling out for more submarines and undersea capabilities. We bring credible and consistent deterrence against weapons of mass destruction, as well as significant offensive capabilities in theater operations. Let’s continue to understand and execute our roles, and let me know how I can help to make you and your boats stronger every day. Keep charging!
Discipline – Wrongly confused with punishment, discipline is how an individual or a team learns what to do, when to do it, and in what manner it should be done to protect the ship, the crew, and to achieve victory in battle. Discipline is how the Commanding Officer unleashes the individual talents of the crew toward a singular purpose. While punishment attempts to correct bad behavior after it has happened, discipline prevents the bad behavior in the first place.

**The Dicta of Attack**

These authoritative rules or dicta must be second nature to the Commanding Officer to win victory in battle:

1. **Seize the initiative to get the enemy in your clutch.**

   The Commanding Officer that can quickly assess, decide, maneuver, and attack will control the entire engagement. Keep the enemy on the surprise by aggressively maneuvering your ship.

   Closing the enemy should only be done to attack; there is no separate and distinct event, but a continuum to the end result—the accurate delivery of a torpedo onto its target to achieve a swift victory in battle.

   A disciplined crew can control the time and location of the engagement. Stealth is how the ship executes this surprise.

   Knowing the strengths, weaknesses, and capabilities of your ship and your foe, is critical. Through aggressive, disciplined, and purposeful maneuvers you can play to your strengths and avoid his. Victory favors brave initiative.

   Keep the battery at the ready and keep it warm—update weapons solutions continuously—the attack party should anticipate and act on your next move and be ready to adjust accordingly. Checking or delaying fire will lead to defeat.
UnDerSea WarF are platforms, and tactics. The work covers the evolution of ASW sensors, weapons, and strategic narratives of major ASW campaigns, the remainder of the first volume covers the first half of World War II’s Battle of the Atlantic, from September 1939 to the U-boat crisis in the spring of 1943. This section discusses the influence of intelligence, gained mainly through cryptography, on the Battle of the Atlantic. Norman Palmer and Edward Whitman have created a thorough, well-researched reference for anyone interested in the development of ASW.

**SUBFOR Commander’s Intent**

I released my Commander’s Intent for the United States Submarine Force and Supporting Organizations on December 11, 2015. This document provides essential guidance to submarine crews and the vital personnel and supporting organizations who keep them ready to deter and win wars at sea.

The Intent updates and supersedes the Design for Undersea Warfare, Commander’s Guidance of 2014, Undersea Dominance Campaign Plan and Vision 2025, and the Integrated Undersea Future Investment Strategy but preserves the essential direction of the previous documents. Our course is true, our traditions reinforce the right attributes, and we must be proud of this. The Force is less of a course change, but rather some small rudder to keep us in the middle of the channel as we face changes in set and drift.

The Force is on the right track, but the “currents” we operate in are definitely changing. For the past 10 to 15 years, we have primarily survived to not get worn out in the Middle East, emphasizing power projection ashore from uncontested sanctuary in the littorals. In contrast, over the next 10 to 15 years, the emphasis must instead be on high-end combat in contested blue water. A revitalization of U.S. sea power must increase our ability to decisively win high-end conflict at sea (thereby deterring conventional war) and maintain our strategic influence around the world.

The significance of the Submarine Force’s contribution to the nation’s maritime sovereignty is also in flux. Our SSBN force currently carries just over 50% of the nation’s strategic assets, will increase to approximately 70% of our accountable nuclear warheads under the New Strategic Arms Reduction Treaty. Consistent with our history as a maritime nation, the responsibility to prevent challenges from long-range shooters using the sea to threaten the U.S. and its allies will fall predominantly on the Navy. As anti-access/area denial systems proliferate, the share of this Navy responsibility that falls on U.S. submarine forces will only grow. Our SSNs and SSGNs uniquely enable all-domain access and hold critical adversary assets at risk by exploiting the advantages of undersea concealment.

Our response to this changing environment will evolve along four lines of effort. First, we will continue to provide ready forces to the fleet. This directly contributes to enhancing power both at sea and from the sea. Further, we will employ those forces effectively by aligning development of tactics and capabilities across the spectrum of operating forces, operational commanders, partners and allies, and future capability developers. However, effectively employing a force today is not enough to maintain our maritime superiority; we must be prepared for the future.

The undersea forces will only grow. Our SSNs and SSGNs uniquely enable all-domain access and hold critical adversary assets at risk by exploiting the advantages of undersea concealment. Future submarines will be an essential element of our strategic posture. This is why this Intent focuses on putting the fleet ready to operate as an all-domain force that can enable all-domain access and hold critical adversary assets at risk.

SUBFOR Commander’s Intent provides our vision of success in the following elements. We will know we’ve succeeded when we:

- Own the Best. We have the best undersea systems and platforms. For the Submarine Force, this means buying the best submarines and maintaining and modernizing them to ensure that we remain the best. This is also about buying, maintaining, and modernizing the best supporting systems, including off-board and surveillance systems, training infrastructure, etc.

- Grow Longer Arms. We maximize our effective reach from the undersea through increased weapon and sensor range, a broadened set of delivered effects in a wider variety of domains, and covering additional geographic area and missions through a network of manned and unmanned systems.

- Beat the Adversary’s System. We beat the adversary’s system by exploiting the undersea platform’s inherent and long-recongized advantages of surprise, confusion, and disruption.

- Protect our Strategic Assets… and Threaten Theirs. This includes protection from threats to our homeland, SSBNs on patrol, Carrier Strike Groups, critical undersea infrastructure, cyberspace, strategic ports and chokepoints, and submarines. Likewise, the main role of our Submarine Force is to hold the adversary’s strategic assets at risk from under the sea.

- Get on the Same Page. We are efficient in our pursuit of capability by avoiding redundant expenditures of effort and limited personnel, materiel, and fiscal resources.

- Get Faster. End-to-end, we must be “fast” in our operations, learning, processes, acquisitions, and innovation. This does not mean rushed decisions or isolated actions—we are bold, not reckless. Well-conceived, “fast” and efficient operations provide the adversary with less time to assess and react. A culture that includes the ability to quickly learn and adapt will always be better able to respond to threat and environment changes or an operational error. In our processes, we must aggressively pursue eliminating administrative procedures that do not add value and slow us down. In acquisition, the institutional inertia created by acquisition process habits must continue to be challenged. We must be faster in our innovation and also accept the fact that innovation involves some failure.

- The Be the Best. Our people—military and civilian—strive to be confident experts of the highest character, and we must enable their toughness, resiliency, and professional development. We must develop our people to be leaders, do everything with honesty and integrity, always be teaching and learning, tirelessly pursue excellence, and constantly look for ways to work better and smarter. Success also rests on the effective operation of accumulated experience, a key advantage of U.S. undersea forces.

This is only a summary of the Commander’s Intent. Please view it in full at http://www.public.navy.mil/subof/hq.
The History of America’s Undersea Strategic Deterrence: From V-1 to D5

The First Submerged Rocket Launch
The Germans were the first to explore the idea of launching a guided missile from a submarine. In seeking how Germany might strike the U.S. mainland, two brothers, Ernst and Friedrich Steinhoff—Ernst a rocket engineer and Director for Flight Mechanics, Ballistics, Guidance Control, and Instrumentation at the Peenemünde Army Research Center who later worked for the U.S. government with Werner von Braun, and Friedrich the CO of U-512 and later U-873 who died of wrist wounds in Boston after surrendering to USS Cusk—began discussing the possibility of launching an artillery rocket (aimed but unguided) from the deck of a submerged submarine. This concept was tested on U-512 in May and June of 1942 using a standard army launcher. The tests showed that the rockets could be successfully launched from a depth of 15m below the water’s surface. Germany never used these weapons against the U.S. mainland because the project was delayed due to concerns with the launcher. Launchers were, however, installed on three U-boats in May and June 1942, but there are no records indicating damage inflicted by rockets.

German engineers also conceived of placing a V-2 missile inside a watertight tube that could be towed by submarine to a location near the U.S. coast. The tubes could then be trimmed to a vertical position and the missiles launched. The submarine would have to remain submerged and the tubes would have to contain intact the subterranean Mittelwerk V-1 and V-2 production facility at Nordhausen. There they found a treasure trove of V-1 and V-2 parts and rockets in various stages of completion. The Soviet Union, however, had been given jurisdiction over Nordhausen at the Yalta conference. Between May 22 and May 31, the U.S. 144th Motor Vehicle Assembly Company loaded 341 rail cars with rocket-related materials and moved them to Antwerp, Belgium, for removal by ship to the United States. One of the most significant events of the war was the end of the V-2 project. It was a project that could have changed the course of the war. The United States was not first to conceive or develop submarine-launched missiles, but it was the first to capitalize on the concept and emerging technology, making it a viable reality. Stealth was always an integral advantage of submarines, but combining that stealth with the reach of missiles made a truly formidable combination. No longer would submarines be limited to seaborne and shoreline targets. While submarine-launched missiles are by their nature offensive weapons, they quickly took on the arguably more important strategic deterrence role of preventing wars between major powers.

American first successful submarine-launched missile was the Loon. The Navy didn’t begin experimenting with launching the Loon from a submarine until 1946, but that wasn’t the first missile launch from a submarine.

German Origins
German scientists began work in the 1930s to develop rockets to be used for space exploration. The German government later funded this research because it came to see that rocket technology could be applied to weaponry. Development of Germany’s first rocket-propelled weapon began in 1941, which eventually led to Germany’s V-1 flying bomb. The next step was to figure out how Germany might strike the U.S. mainland; two brothers, Ernst and Friedrich Steinhoff—Ernst a rocket engineer and Director for Flight Mechanics, Ballistics, Guidance Control, and Instrumentation at the Peenemünde Army Research Center who later worked for the U.S. government with Werner von Braun, and Friedrich the CO of U-512 and later U-873 who died of wrist wounds in Boston after surrendering to USS Cusk—began discussing the possibility of launching an artillery rocket (aimed but unguided) from the deck of a submerged submarine. This concept was tested on U-512 in May and June of 1942 using a standard army launcher. The tests showed that the rockets could be successfully launched from a depth of 15m below the water’s surface. Germany never used these weapons against the U.S. mainland because the project was delayed due to concerns with the launcher. Launchers were, however, installed on three U-boats in May and June 1942, but there are no records indicating damage inflicted by rockets.

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A Triad of Strategic Deterrence

After World War II, a new war was on the horizon. Rising tensions between the West and the Eastern bloc nations led to increased development and production of nuclear weapons. The first means of delivering these weapons were bombers, followed by intermediate-range and intercontinental ballistic missiles (ICBMs). The final piece of what would be known as the Triad was the submarine-launched ballistic missile (SLBM). While heavy bombers provide advance notice that action is being taken and the ability to be reassigned or re-tasked, and in-flight re-targeting, the SLBM would complete the equation. Nearly undetectable, the submarine-based capability offers stealth, survivability, and assured second-strike capability, thus upping the ante of true strategic deterrence. They could be deployed in such sufficient numbers that not all of them could be targeted.

February 12, 1947, and was the first to be re-designated as a guided missile submarine (SSG) on January 20, 1948. The missile was carried in a hangar attached to the deck behind the conning tower and would have to be maneuvered onto a ramp to be launched. The submarine had to remain surfaced for this procedure, making it vulnerable to attack if spotted.

Regulus

Entering the 1950s, the Cold War was just heating up. The U.S. government’s highest strategic priority was to develop a strong deterrent against a potential first strike by either side. One of the requirements was that the developments in submarines, the atomic bomb, and missiles converged.

Even while Rense saw the need to develop missiles, the Navy was already working with Chance Vought Aircraft Industries on specifications for its submarine-launched missiles. On August 7, 1950, former Pensacola naval aviator, later named Regulus I. The Regulus was about 39 m longer than the Loon and had a 1 m longer wingspan when its wings were in the deployed position. It was nearly twice as fast as the Loon, had a greater range of 500 NM, and carried a larger—and nuclear—warhead. Like the Loon, however, the Regulus required the submarine to be surfaced for launching, had to be launched from a ramp, and was guided by radio command. In addition to second-generation guided missiles, the Navy saw the need to re-task its submarines, to deploy them at sea, and to have them remain ready for war. The primary focus from the Triad’s inception was the Polaris A3. The A3 was not accurate enough for this task, so work began on an upgrade to the A3. As different warheads and re-entry body options were considered, the Triad would begin moving strategic assets into hardened underground bunkers to protect them from U.S. missile defense systems.

RusSian’s SLMB threat

Beginning in 1958, the U.S. nuclear submarine force was on the move. The Navy began commissioning its Golf II-class submarine, which had been partially constructed hull was cut across the ship’s middle to make room for a 40 m-long section containing two rows of eight launch tubes to house 16 Polaris A1 missiles and other associated equipment. The Navy's development of the nuclear-powered ballistic missile submarine, or SSB, took place concurrently with development of the Polaris. The advent of the SSBN in America was undertaken with a real sense of urgency due to the threat of a Soviet first strike. The first SSBN was originally laid down as a fast attack submarine (SSN) of the Skipjack class in 1953; three years after the Soviets conducted their first successful surfaced test launch of an SLBM. The vessel’s partially constructed hull was cut across the middle to make room for a 40 m-long section containing two rows of eight launch tubes to house 16 Polaris A1 missiles and other associated equipment. The first SSBN was the USS George Washington (SSBN 598), which was delivered to the Navy on September 20, 1959.

Polaris A3

The Polaris A3 was the first SM<sub>3</sub>-class submarine. The Polaris A3 was really a new submarine, a new missile, and a new nuclear deterrent. The Polaris A3 was a new weapon system designed to address: a missile that could be launched from a submerged submarine. This would require not only a new missile and launching mechanism, but a new type of submarine as well. As early as 1955, the Navy committed to developing this new missile, the Polaris. The Regulus II was successfully test launched in 1956, but the program was ended in 1958 because of progress being made on the Polaris. The Regulus II was never deployed, but the Regulus I was deployed on U.S. submarines from 1958 to 1964. During this period, seven Polaris submarines made 40 strategic deterrent patrols armed with the Regulus I. The number 41 was soon to have great significance to the U.S. Submarine Force and the nation’s security.

Polaris A1

While the Loon and Regulus were cruise missiles, the Polaris A1, developed by Lockheed Missiles & Space Co., was America’s first true submarine-launched ballistic missile (SLBM). In addition to solid fuel, Polaris A1s携带了更多 than the Polaris I, was more than twice as fast, and carried a warhead more than 12 times as powerful. Polaris, while becoming operational a year later than the Soviets’ first SLBM and having a range less than the Soviet’s 5,000 NM desired by the Navy, was nonetheless a game changer.

Headed up by the newly established Special Programs Office (now called Strategic Systems Programs) and the Polaris Program was Rear Adm. William “Red” Raborn, who was given exceptional authority and latitude to make it happen. The Polaris A1 missile team included the inventive and persistent Dr. John Craven, whose job it was to figure out how to launch the massive new missile from a submerged submarine. There were other advancements that came together at this time to make the Polaris a success. These included developing a new type of missile, the Polaris. The Polaris A1 was successfully test launched in 1956, but the program was ended in 1958 because of progress being made on the Polaris. The Polaris A1 was never deployed, but the Regulus I was deployed on U.S. submarines from 1958 to 1964. During this period, seven Polaris submarines made 40 strategic deterrent patrols armed with the Regulus I. The number 41 was soon to have great significance to the U.S. Submarine Force and the nation’s security.

Polaris A2

Well before the Polaris A1 became operational in 1960, the Navy knew that it was an evolutionary step toward getting a sufficient sea-based strategic deterrent in place. Even before the Polaris A1 went on patrol, the Navy and Lockheed Missiles & Space Co. began development of its successor, the Polaris A2. The Polaris A2 was the first successfully test launched from a submerged submarine, USS Ethan Allen (SSBN 608), in October 1961, and it became operational in June 1962. The Polaris A2 met the Navy’s original design parameters for the SSM-N-5 and was more accurate and more reliable due to improved electronics. The five Ethan Allen-class submarines were designed to carry the Polaris A2, which was almost a meter longer than the A1 but with the same diameter. As with the Polaris A1, the Navy didn’t stop development there. The Polaris A3 saw the number of Polaris submarines in the Navy reduced from 6 to 4, the Polaris A2 became operational, newer U.S. SSBNs began deploying with the Polaris A3.

Polaris A3

The first successful Polaris A3 test launch from a submerged submarine took place aboard USS Andrew Jackson (SSBN 619) in October 1965. This allowed for the new missile, Polaris A3, which was removed from service in October 1982. Beginning in the late 1960s, the U.S. government became concerned that the Soviet Union would begin moving strategic assets into hardened underground bunkers to protect them from U.S. missile defense systems. The three smaller warheads delivered greater destruction than the single large-yield warhead while maintaining the missile’s original throw weight.

While the first five SSBNs comprising the George Washington class were never re-tasked to carry the Polaris A2, they were retrofitted to carry the A3, with conversions taking place in 1967. The number 41 was soon to have great significance to the U.S. Submarine Force and the nation’s security.

Soviet’s SLMB threat

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Cuban Missile Crisis

In October 1962, President Kennedy was informed that the Soviet Union had been staging SS-4 medium-range nuclear ballistic missiles in Cuba, which led to the tense Cuban Crisis. For 13 days, from the 16th to the 28th of October, 1962, the whole nation feared that a nuclear exchange with the Soviet Union could begin at any moment. The Polaris A3 was removed from service in October 1982. Beginning in the late 1960s, the U.S. government became concerned that the Soviet Union would begin moving strategic assets into hardened underground bunkers to protect them from U.S. missile defense systems. The three smaller warheads delivered greater destruction than the single large-yield warhead while maintaining the missile’s original throw weight.

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The Poseidon C3, as it became known, was a half-meter wider than the Polaris, but it still had to fit into the Polaris launch tubes. The Polaris launch tubes had a liner that could be removed to accommodate the larger missile. What really distinguished the Poseidon is that it had multiple independently targetable re-entry vehicles (MIRVs), enabling a single missile to hold multiple targets at risk. The Poseidon C3 was first tested in 1968, and the first test launch from a submerged submarine took place in 1979 aboard USS James Madison (SSBN 627). USS James Madison set sail on the first Poseidon patrol in March 1971. Poseidon incorporated substantial improvements in accuracy and resistance to countermeasures over previous missiles, but its principal advantage was its targeting flexibility. Poseidon could deliver multiple warheads on multiple targets in multiple widely spaced target groupings (“footprints”). Greater accuracy allowed smaller warheads to be employed while achieving the target effects of larger, less accurate warheads.

Although the Department of Defense was working on a far more accurate, stel- lar-inertial, guidance system during the Poseidon’s development in the latter half of the 1960s, it decided not to use this on the Poseidon. Had Poseidon’s accuracy been improved significantly, it could have been viewed by the Soviets as a first-strike weapon capable of destroying Soviet missiles and related military targets. The DoD’s position was that Poseidon SLBMs would be strictly for second-strike retaliation after a Soviet first strike. The missile’s small improvement in accuracy over the Polaris A3 was more than sufficient for that task. The last Poseidon was offloaded in September 1992. Stellar-inertial guid- ance matured in the 1970s for use in Poseidon’s successor, the Trident.

**Trident I**

The Soviet Union lagged behind the United States in missile and submarine technology and development. The Soviets were deploy- ing liquid-fueled missiles aboard subma- rines until 1980 when they deployed their first solid-fueled missile, the R-31 “Stupe” (UK: NATO designation SS-N-17), which had a range of 2,100 NM. They lacked technology, however, they made up for it in the number of nuclear bombs, land-based intercontinental ballistic missiles (ICBMs), and SLBMs produced through the 1970s and 1980s. In the words of Mariat discourse, “Quantity has a quality all its own.” The Navy’s answer to this Soviet nuclear build-up was the Trident SLBM.

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Although the Department of Defense was working on a far more accurate, stel- lar-inertial, guidance system during the Poseidon’s development in the latter half of the 1960s, it decided not to use this on the Poseidon. Had Poseidon’s accuracy been improved significantly, it could have been viewed by the Soviets as a first-strike weapon capable of destroying Soviet missiles and related military targets. The DoD’s position was that Poseidon SLBMs would be strictly for second-strike retaliation after a Soviet first strike. The missile’s small improvement in accuracy over the Polaris A3 was more than sufficient for that task. The last Poseidon was offloaded in September 1992. Stellar-inertial guid- ance matured in the 1970s for use in Poseidon’s successor, the Trident.

**Trident I**

The Poseidon C3, as it became known, was a half-meter wider than the Polaris, but it still had to fit into the Polaris launch tubes. The Polaris launch tubes had a liner that could be removed to accommodate the larger missile. What really distinguished the Poseidon is that it had multiple independently targetable re-entry vehicles (MIRVs), enabling a single missile to hold multiple targets at risk. The Poseidon C3 was first tested in 1968, and the first test launch from a submerged submarine took place in 1979 aboard USS James Madison (SSBN 627). USS James Madison set sail on the first Poseidon patrol in March 1971. Poseidon incorporated substantial improvements in accuracy and resistance to countermeasures over previous missiles, but its principal advantage was its targeting flexibility. Poseidon could deliver multiple warheads on multiple targets in multiple widely spaced target groupings (“footprints”). Greater accuracy allowed smaller warheads to be employed while achieving the target effects of larger, less accurate warheads.

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A month before both sides ceased efforts on START II in 2002, the U.S. Offensive Reductions Treaty (SORT), also known as the Moscow Treaty, was signed by both the United States and Russia. SORT, which entered into force in June 2003, would limit the number of operationally deployed nuclear warheads to 1,700 and 2,200 per side. The parties also agreed that the terms of START would remain in force. SORT was superseded by the New START Treaty (NST) in February 2011.17

NST is the current strategic arms reduction treaty in force between the United States and Russia. The Senate ratified NST in December 2010 and the Duma in January 2011. It went into force on February 5, 2011, replacing START and superseding SORT, and will expire 10 years later. NST limits each side to no more than 1,550 deployed warheads on up to 700 deployed delivery vehicles and no more than 800 total delivery vehicles. Of the 4,900 warheads that are on the U.S. side, approximately 70% are planned for SLBMs. U.S. plans are for no more than 240 deployed SLBMs at any given time. These reductions are about 30 percent lower than the levels set by SORT. These reductions must be accomplished by September 6, 2017.

While the reduction in the number of Ohio-class SSBNs from 18 to 14 due to the conversion of four to SSNs, the number of Ohio Replacement submarines slams at 12, reduction of the number of the launching per SSBN from 24 to 20, and the reduction in the number of warheads may appear to reduce our deterrence posture, they don’t as long as both sides reduce their nuclear forces accordingly.

Life Extension of the Trident II

Today the Navy and the nation have in the Trident II a reliable SLBM that does everything required of it and is limited by treaty, not capability. It may at some point be limited by age, however. Tridents IIs were expected to have a service life of 25 years,18 but the Navy now believes that they haven’t lived up to their full life span. The Navy’s first Ohio Replacement SSBNs are expected to begin service in the early 2030s, but they will be carrying Trident IIs that first came online 40 years prior with warheads that were expected to have a service life of 10 years. To ensure that these missiles were kept safe, reliable, and affordable, the Navy began the Trident II Life Extension (LE) Program (D5 LE). D5 LE was begun in 2002 to identify and replace aging Trident II missile components, some with upgraded components based on new technology. The goal of D5 LE is to ensure that the fleet of Trident II SSBNs remains operational for another 25 years, into the first decade or so of the Ohio Replacement submarines’ patrols. Sometime around the first decade from the first Ohio Replacement submarine is commissioned, the Navy may consider replacing the Trident II with a new missile.19

The Only Constant Is Change

As the U.S.-Soviet arms race was gathering steam, the U.S. Navy, under the leadership of a handful of presidents and executive-capable men, quickly outpaced America’s Cold War adversary with technological advances in missile and submarine design and rapid building programs such as the 41 Fraser. Despite the sense of tranquility that came with the collapse of the Soviet Union, thus ending the Cold War, and the last commissioning of an SSBN taking place in 1997, U.S. submariners have remained vigilant, keeping the watch, as life went on worldwide without much thought given to the need for maintaining our strong strategic deterrent. Leading up to 2000, the United States faced a number of changes from nations-state. Beginning in 2000, America saw a sharp rise in asymmetric threats from non-state actors, against which a nuclear deterrence force has little deterrent effect, further reducing the apparent need for a strong strategic deterrence force. With all this suddenness, however, America now finds itself again facing challenges from nuclear-capable major power nations. With all the proverbial lines in the sand being drawn and redrawn, making for a shifting and uncertain future, it would seem that, despite whatever appearances may suggest to the contrary, maintaining a strong deterrent capability and posture is the wise course.

Navy personnel will soon hear on their cell phones updates nearly three-quarters of the nation’s strategic deterrence assets. U.S. Submariners on the Ohio-class boats—the first two of which have entered the Ohio class’ own life extension program—will have the nation covered. As our nation’s survivable and effective at-sea strategic deterrent, the Trident II D5 missile system is out there day after day to quietly prevent major power war and provide extended deterrence to our non-nuclear-capable allies.

End notes

3 Prüfstand XII: submarine-launched V2 rockets, http://up-ship.com/blog/?p=5728
15 Federation of American Scientists, START-2, Strategic Offensive Reductions Treaty (START II) http://fas.org/irp/world/arms/start-2.htm
16 Norman Friedman, US Navy Fact File.

Thomas Lee is a contractor at WB supporting U.S. Navy M-97 and is the managing editor of UNDERSEA WARFARE Magazine. He is a graduate of the E.B. Scripps School of Journalism at Ohio University.
It was a perfect Saturday off the coast of Southern California. The Blue crew of the Ohio-class ballistic missile submarine USS Kentucky (SSBN 737) eagerly waited to fire the Trident D5 missile. This launch was the culmination of months of training and preparation. The blue sky and calm seas created ideal conditions for mariners, and many pleasure craft were in the area taking advantage of the weather. Sailors sat at their battle stations for hours, waiting to be told that the area was clear for launch, and the launch window was closing quickly. It was starting to look like they wouldn’t be able to fire when, finally, with two minutes left, the crew was able to put its training to the test.
"The window opened and the guys executed flawlessly. The missile shot was a culmination of events for a ship that had just completed a years-long refit," said Cmdr. John Hale, Kentucky’s Blue crew commanding officer.

"It was a gloomy day, there was a rain storm pushing in and it was a Mushring day," said Chief Electronics Technician (ET) Matthew Hale. "So when the window to fire was supposed to open at noon, we were able to fire the missile one second after noon. It went out without a hitch and there were no pictures or fanfare. There was a calm professionalism and I felt like that second missile was for my guys; that missile was for Kentucky."  

Throughout the difficult process of returning to strategic service, it can be difficult to keep motivation and morale high among the crew. Smith used clear communication, family movie nights and picnics, command physical training, and time off. While the boat was underway, Kentucky Blue’s chief of the boat, Master Chief Sonar Technician Charles Barton, said that they had the ability to do things like swim calls and respite barbecues to help keep morale up.

These are activities that the crews aren’t usually able to do during strategic deployments, so allowing the Sailors to break tam,” said Capt. Mark Schmall, commodore, Submarine Squadron 17, Commander, Submarine Squadron 19, CSG 9, TTF, and Commander, Submarine Force Pacific Fleet provided additional support and oversight.

The highlight of DASO is the firing of the Trident D5 missile, but days of training and testing prepare the crew for the event.  "I was in a very junior division, we only had one fleet returner and one chief, so we were really starting from scratch," said Smith.  "It was great to finally get to sea and actually see the thing work for yourself.

We got up early and spent most of the day waiting at our stations. Most of us thought that it wasn't going to happen. Then it was time and the boat shook a little. Then it was over. It was really neat though seeing it all over the news and being able to tell my family that I was on the boat that shot that missile."

During the DASO test included plans to fire two missiles, which took place on two separate days.

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**NEW**

Submarines are critical to the United States’ strategic deterrent program for the United States, said Rear Adm. David Kriete, commander of the Submarine Force, U.S. Navy. "No other country in the world can do what we can," said Kriete. "We have the ship, the crew, and the sea, and the nation is dependent on us to be able to deter a major war."

Kriete and Correll wanted to evaluate whether or not the existing training guidelines were still valid. "We discovered that there were major gaps in the training and the crews were coming out of the shipyard and not being fully prepared," said Kriete. "The decision on manning each crew was care-fully and thoughtfully made, and the executive officers, balancing talent distribution between each crew along with consideration for personnel rotation dates. Once the crews were selected, they were evaluated on their ability to serve and test the limits of the boat. The crew operates the boat at the limits of design. During the ERO as routinely as operational. However, the Trident D5 weapons system is an incredibly complex beast. Unlike other missions, there is no margin of error. The strategic deterrence mission must be 100 percent perfect all the time."

Before returning to strategic service, Kentucky had to successfully complete three major certifications. The first was the Demonstration and Shakedown Operations (DASO), which was so steep that it was hard to get them to the level of proficiency that they needed to attain," said Hale. "Now the crews in the shipyard will be able to use the TTF to train more often to maintain their skills."

"I actually just revised the Training Guidance for Major Availability because there were no pleasure craft," said Hale. "So when the window to fire was supposed to open at noon, we were able to fire the missile one second after noon. It went out without a hitch and there were no pictures or fanfare. There was a calm professionalism and I felt like that second missile was for my guys; that missile was for Kentucky."

The boat split from being one crew to two, so we had one week in port, and then we were underway for six weeks to hone our skills in operating the ship at sea. This was a meaningful accomplishment for the crew needed after being in the shipyard for so long."  

"When I took command of the ship, I think the crew could see that something new, I am not sure if the crew really understood that coming out of the shipyard meant that the work was just really beginning," said Hale. "The next two months were mainly focused on getting the boat out of ERO, said Hale. "The focus after leaving the shipyard is operating the ship at sea, so we had one week in port, alternating, and refueling the boat’s reactor. This planned maintenance will extend the life of the submarine for another 20 years. The keel for Kentucky was laid December 18, 1987. Since its commissioning, Kentucky has completed 91 strategic deterrence patrols, which began as soon as the boat left the shipyard. This week-long testing period at sea is designed to prove the submarine’s ability to execute the mission and accomplish the tasking.

After returning from Strategic Deterrence Europe, the Gold crews of Kentucky had just completed a years-long refit," said Smith. "We had a lot of improvements, a lot of alterations, and refueling the boat’s reactor. This planned maintenance will extend the life of the submarine for another 20 years. The keel for Kentucky was laid December 18, 1987. Since its commissioning, Kentucky has completed 91 strategic deterrence patrols, which began as soon as the boat left the shipyard. This week-long testing period at sea is designed to prove the submarine’s ability to execute the mission and accomplish the tasking.

"If the people in the shipyard to the first strategic deterrence patrols is countless for the life of the boat, its crews, and for the sea-based leg of the nation’s nuclear triad.  "I view the process of returning Kentucky to strategic patrols to be among the most important elements of maintaining a credible nuclear deterrent program for the United States," said Rear Adm. David Kriete, commander, Submarine Group Nine (CSG 9).  "No other country in the world can do what they do." These guys volunteered to come out and serve their country and they might not have known exactly what that would mean, but they come to work, and they do their jobs, and we work hard, and I am so proud of what they do."

The Kentucky crew worked alongside hundreds of Sailors at Puget Sound Naval Shipyard (PSNS) to complete the comprehensive overhaul, which included routine maintenance, system updates and upgrades, during the overhaul while building your operational experience. Kentucky departed PSNS April 9, 2015 and started the critical step of returning to sea after a refit period. The first step to returning to strategic service was sea trials, which began as soon as the boat left the shipyard. This week-long testing period at sea is designed to prove the submarine’s ability to execute the mission and accomplish the tasking.

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The second major certification was DASO, which certified both the operational readiness of the Strategic Weapons System and the crew’s readiness to operate it. Finally, there was the nuclear weapons acceptance inspection, which showed whether the crew can keep the weapons safe and secure.’ve really understood that coming out of the shipyard meant that the work was just really beginning," said Hale. "The next two months were mainly focused on getting the boat out of ERO, said Hale. "The focus after leaving the shipyard is operating the ship at sea, so we had one week in port, and then we were underway for six weeks to hone our skills in operating the ship at sea. This was a meaningful accomplishment for the crew needed after being in the shipyard for so long."

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In March 2015, then Chief of Naval Operations, Adm. Jonathan Greenert testified before Congress on details of the Navy’s portion of what became the Department of Defense’s budget for next fiscal year, FY16. Along with all other federal spending requests, this makes up the overall President’s Budget for Fiscal Year 2016 (PB16). As the summer months quickly approached, congressional committees began their line-by-line review and debates over this defense spending plan, which ultimately became law through passage of both the National Defense Authorization Act and Department of Defense Appropriations Act for 2016.
As the resource sponsor, Rear Adm. Charles Richard, Director of Undersea Warfare (OPNAV N97), has a total obligated authority (TOA) of just over $19 billion to staff, train, and equip the Submarine Force with the resources it needs to meet future needs. To some, this may seem like a lot, but the Submarine Force’s budget makes up only about 12% of the Navy’s $161 billion and about 3% of the Department of Defense’s $605 billion budget. That is a huge return on investment considering that $19 billion goes into building two Virginia-class attack submarines per year and funds the Navy’s portion of nuclear deterrence that is responsible for more than half of the nation’s accountable nuclear warheads (will increase to 70% under New START treaty).

Almost as important as the amount of money is the “type” of money, or accounts, that this $19 billion is spread across. Each type has its own rules as to what the money can be used for, how long it is available for use, and how much, if any, can be moved from one program to another. The primary types of money that make up OPNAV N97 funds are: Military Personnel, and Reserve Personnel (MVPN & RPN), Operations & Maintenance Navy and Operations & Maintenance Reserve (OMN & OMNR), Weapons Procurement (OPN), Shipbuilding and Conversion (SCN), Research, Development, Testing and Evaluation, Navy (RDTEN), and Other Procurement (OPN).

Military Personnel, Navy (MVPN & RPN) – $5.9 Billion

MVPN is used for pay, allowances, individual clothing, subsistence, interest on deposits, gratuities, permanent-change-of-station travel, and expenses of temporary duty travel between permanent duty stations for members of the Submarine Force on active duty. RPN is for pay, allowances, and leave for future submarine billets. The amount N97 will spend on MPN and RPN is directly related to overall end strength authorized and accounts for nearly 14% of the TOA in FY16.

Weapons Procurement, Navy (WPN) – $1.3 Billion

WPN is for construction, procurement, production, modification, modernization or conversion of missiles, torpedoes, other weapons, and related support equipment including spare parts and accessories. For FY16, the Navy received $60 million to restart procurement of MK 48 heavyweight torpedoes to overcome a 50% inventory shortfall. This request procures 145 Mk 48 torpedoes over the next five years with fleet deliveries beginning in 2020, following three years of design, testing, and recertification. Additionally, another $63 million is budgeted to procure, certify, and deliver 81 Mod 7 Common Broadband Advanced Sonar System (CBASS) kits to upgrade current MK 48 torpedoes in inventory. These needed hardware and software upgrades are required to keep pace with evolving global threats and provide a basis for future capability upgrades.

N97’s WPN also received nearly $1 billion to support upgrades to Trident II ballistic missile guidance and missile electronic systems. These upgrades support the life extension of the Trident D5 missile, ensuring that it remains a viable and reliable weapon system for both the Ohio-class and Ohio Replacement.

WPN is also a shared resource sponsor for the Tomahawk cruise missile with N96 (Surface Warfare Division). N97 funds a portion of $185 million requested for FY16 to procure 100 Tomahawk missiles.

The remainder of N97’s procurement portfolio is shared with the other OPNAV resource sponsors to fund various other smaller procurement programs that support the weapon systems of the Navy.

Shipbuilding and Conversion, Navy (SCN) – $4.6 Billion

SCN is for expenses necessary for the construction, acquisition, or conversion of naval vessels. N97’s SCN account funds Virginia-class new construction and Moored Training Ship (MTS) conversions.

In FY16, $3.3 billion was received to complete the funding for SSN 796 and SSN 797, with an additional $2.0 billion going toward the advanced procurement of long-lead and modernization of four Ohio-class submarines. This funding strategy, in combination with the multi-year procurement (MYP) contracts, allows the Navy to deliver the Virginia-class at its most affordable rate. In April 2014, the Navy awarded the contract for 10 Block IV boats, resulting in over $5.4 billion in savings as compared to traditional single-ship contracts.

Continuing to build Virginia-class SSNs at a rate of two per year is critical to mitigate the SSN inventory shortfall at the Submarine Force structure falls below the 48 SSN minimum requirement from 2025-2041 due to the retirement of Los Angeles-class SSNs being decommissioned. Bottom line, the Virginia-class program continues to deliver whole warfighting capabilities ahead of schedule, within the budget, and modernize the Submarine Force’s fleet.

N97’s SCN also requested $138 million toward the conversion of USS San Francisco (SSN 711) into one of two new generation MTSSs for the Nuclear Power Training Unit in Charleston, S.C.

Operations & Maintenance, Navy (OMN) – $5.9 Billion

OMN is for expenses, not otherwise provided for, necessary for the operation and maintenance of the Navy and the Marine Corps. N97 is a supporting resource sponsor and shares funding responsibility with other OPNAV entities for ship maintenance, activations and inactivations, as well as the operation and maintenance cost for communication equipment, cruise missiles, Trident II ballistic missiles, torpedoes, and their associated systems. At 31%, OMN accounts for the largest portion of N97’s TOA.

Research, Development, Test and Evaluation, Navy (RDTEN) – $2.3 Billion

RDTEN is for expenses necessary for basic and applied scientific research, development, test and evaluation. N97 funds many different research and development (R&D) accounts. R&D not only assures that our submarine force remains on the leading edge of technology to pace the evolving threat of our potential adversaries, but it also reduces production cost and mitigates risk associated with the development of new systems or technologies.

Money for this effort is spread across almost every account within N97’s RDTEN portfolio and is shared with the other OPNAV resource sponsors to fund various other smaller R&D efforts that support the nuclear enterprise. Of the different RDTEN accounts that N97 funds, the largest are for the R&D for the Ohio Replacement, the Navy’s No. 1 programming priority. With a combined $1.4 billion received, these accounts fund Ohio Replacement whole ship design to include the Common Missile Compartments and the combat systems, hull, mechanical and electrical (HM&E), and propulsion technologies.

This R&D minimizes follow-on unit cost and ensures the design maturity (~43%) to mitigate risk of building a ship 2.5 times Virginia’s size in about the same time (~7 yrs).

In FY16, the Navy is also receiving $160 million in R&D for the Virginia Payload Module (VPM). VPM will add a new hull section aft of the sail (manned portion of the boat) that will accommodate the multi-megawatt (87-inch) payload tubes with multiple all-up round canisters, leveraging the existing common components and lessons learned from the Block III Virginia Payload Tube design and the SSN conversion program. This will provide up to 28 additional Tomahawk Land Attack Missiles per boat and will mitigate the 60% drop in underwater strike capability when all four SSGNs retire, and provide volume for future payloads including other missile, unmanned systems, and Special Operations Forces support. VPM affordably enhances the Navy’s underwater precision strike capability by delivering greater than three times the strike capability at less than a 15% increase in cost per SSN. R&D is not just for future platforms. $123 million in R&D will be used in FY16 for continued improvements to the Virginia class. This includes continued development of concepts and technologies for Reduced Total Ownership Cost, HM&E redesign for Blocks IV and V, and development of acoustic performance improvements such as the large Vertical Array and enhanced hull coating treatments.

The rest of N97’s requested RDTEN funds go toward several other R&D efforts including torpedoes ($42 million) and weapon system ($107 million) modernization. Los Angeles-class and Ohio-class modernization ($110 million), engineering technologies ($101 million), and submarine HM&E and combat system technologies ($87 million).

$96 million requested in FY16 will support submarine support control systems. This money procures new AN/BYG-1 hard- ware and software kits to transition legacy combat control system such as Block 1C on the Ohio class, to the T1APM system. This also funds the continued sustainment of AN/BYG-1 systems through hardware and software enhancements.

Similarly, $80 million will go to sustain and modernize the Submarine Force’s electronic warfare systems to include procurements of AN/SLQ-32(V)3 Electronic Warfare Support and Improved Communication Acquisition/Direction Finding (ICADF) systems and modernization kits for the legacy AN/SLQ-32(V)3 Electronic Surveillance Measures (ESM) and the legacy AN/BRD-7 direction finding systems.

Other Procurement, Navy (OPN) – $4.9 Billion

OPN is for the procurement, production, and modernization of support equipment and materials not otherwise provided for in other accounts. N97 owns and is the shared resource sponsor for many different programs that fall under OPN. N97’s OPN accounts go toward supporting the nuclear enterprise.

$296 million will go toward the procurement of nuclear reactor components and about $277 million toward the support of our strategic missile systems.

In FY16, N97 has requested $215 million for SSN/SSBN acoustics to keep all classes of submarines acoustically superior through the Acoustic Rapid COTS Insertion (ARCI) program that modernizes and sustains approximately 8-12 SSNs per year and 2-3 SSBNs per year through bi-annual software Advanced Processing Builds (APBs) and bi-annual hardware and software enhancements. This funding line also funds procurement and sustainment of towed arrays and the Low Cost Conformal Array on the Block III Virginia-class, replacing the traditional spurious array.

La Jolla (SSN 701), the USS San Francisco will replace the Sam Rayburn (MSTS 655) and Zanuck (MSTS 5) modernization. La Jolla’s size in about the same time (~7 yrs).

Virginia-class, replacing the Total Ownership Cost, HM&E redesign for Blocks IV and V, and development of acoustic performance improvements such as the large Vertical Array and enhanced hull coating treatments.

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“As the resource sponsor for our underwater systems, N97 is committed to delivering what the fleet needs while balancing competing priorities in this fiscally challenging environment to ensure that we maintain our undersea dominance.”
Located only a few miles from the first successful submarine attack in history lies one of the most challenging shore duty stations in the Navy. Originally conceived as a radical new way of training nuclear propulsion plant operators by using a converted Lafayette-class SSBN, Nuclear Power Training Unit Charleston (NPTU CHS) continues to improve and is currently breaking ground on a host of innovative changes to its training program.

NUCLEAR POWER TRAINING UNIT:
A Rewarding Assignment to Meet the Demands of the Nuclear Navy

Prior to the arrival of the Moored Training Ship (MTS) 635 (the ex-USS Sam Rayburn (SSBN 635)) on February 1, 1986 from its conversion in the now defunct Charleston Naval Shipyard just down river, the entirety of the Navy’s nuclear trained personnel completed their certification at one of the civilian operated prototype plants across the country. The Naval Reactors Facility in Idaho Falls operated three plants, NPTU Ballston Spa, N.Y. operated four, and one additional plant was located in Windsor, Conn. Of these three sites, only Ballston Spa continues to train Sailors today, operating the Modified Advanced Fleet Reactor (MARF) and S8G (submarine, eighth generation, General Electric) / AFR (Advanced Fleet Reactor) plants.
Constituting a large capital and maintenance investment, these plants served both as technological development and testing platforms for new designs and had the added benefit of offering a land-based location to certify Sailors for nuclear duty. The MTS model departed from this method, instead re-purposing a Navy-owned and operated (and already paid for) asset for dedicated use as a training platform. NPTU Charleston started with one MTS, a support barge, a parking lot, and floating classrooms. Now there are 970 Navy and civilian personnel operating the two oldest reactor plants in the world and certifying an average of 1,200 nuclear-trained Sailors per year.

Sea-going commands and forward-deployed units from the tips of the Navy’s outposts. The NPTUs from the far reaches of the globe will congregate in Charleston to receive refresher training. The MTSs are so long retired that the few remaining operators have a sense of nostalgia for the experience and the camaraderie they shared. The MTSs are retired but their impact remains. Many of the former crew members have gone on to have successful careers in the Navy and in the civilian sector.

Investing in the Future
NPTU Charleston broke ground in February 2015 on a $157 million facility expansion that will accompany two new Los Angeles-class training ships. The new facilities will house additional classrooms, training areas, a mechanic’s shop, and a clinic. The new facilities will double NPTU’s classroom space, providing greater flexibility to accommodate the increasing number of students and staff.

The charm of Charleston
Beautiful, historic Charleston is located near the middle of South Carolina’s coast at the point “where the Ashley River and Cooper River meet to form the Atlantic Ocean.” It is the state’s second largest city with a population of 127,999 (2013). Originally called Charles Town in honor of England’s King Charles II, its nickname is “The Holy City” due to the many churches visible in its skyline. Founded in 1670, Charleston is said to be the oldest city in the United States to have been continuously occupied by European settlers. It is also an important port city, with a rich history in the maritime industry. Today, Charleston is a major military and industrial hub, with a population of over 100,000.

Students receive valuable hands-on training from instructors using mock-ups of individual components for systems onboard nuclear plants. The expansion of NPTU Charleston will provide greater training opportunities for generations of nuclear trained officers and enlisted.
F or restoration experts such as Rich Pekelney, particularly those that engage in the painstaking task of restoring historical maritime vessels that have spent decades in one of the most corrosive environments in the world—the sea—the job can be a mixture of historical research, exhaustive documentation, parts scavenging, and even metalworking and coating. 

Such was the case for USS Pampanito, a World War II submarine museum and memorial on Fisherman’s Wharf in San Francisco that hosts over 100,000 visitors a year. The boat is owned and operated by the Maritime Park Association, a non-profit that is working to restore the Balao-class fleet submarine.

“The primary goals are to get its condition as close to summer 1945 as we can, while at the same time preserving as much of the historic fabric as possible,” says Pekelney, who, in addition to being a volunteer restoration expert, is a member of the Board of Trustees of the Maritime Park Association. “We owe it to future generations to preserve our history, and USS Pampanito is part of the history of the submarines.”

According to Pekelney, when USS Pampanito was donated to the museum by the Navy and opened in 1981, there were no guns on the boat. However, in 1945 the submarine had a 5-inch, 25 caliber wet-mount gun for shore bombardment and anti-ship combat, along with several other smaller guns.

The Maritime Park Association was able to acquire a stripped version of the same gun from the Navy that had been originally used on USS Piranha (SS 389). These are rare weapons, with only 11 in varying states of preservation surviving today.

The gun, however, was in very rough shape at the time. It was de-milled, rusty, vandalized, and incompletely reassembled. It was also missing a variety of parts including covers, bolts, seats, gears, handles, and fittings.

Although the gun will never be able to be fired, the effort focused on restoring the weapon’s training (movement left/right) and elevating (movement up/down) capability to preserve historical accuracy. After approximately 75 years, however, the training and elevating gears and other components were completely rusted and frozen due to paint in the bearings, hardened dirt, dust, gear mesh, corrosion, and possible material creep.

“With a gun, as far as we can tell, has not been operated or trained or elevated in decades, probably since the time of war,” says Pekelney. Because the gun was designed to be submerged with the submarine, hard bronze sleeve bearings were used throughout instead of traditional roller bearings. As part of the project, dozens of bronze sleeve bearings had to be cleaned by a sanding/honing process and incompletely reassembled. It was also missing a variety of parts including covers, bolts, seats, gears, handles, and fittings.

In the beginning, Pekelney engaged in a laborious and time-consuming hand-sanding and sanding process to restore the bearings. He also tried expanding spring-loaded hones that, although somewhat effective, wore out quickly and did not keep the sleeve bearing in some cases, small amounts of material removed to allow smooth operation.

Initially, Pekelney engaged in a laborious and time-consuming hand-sanding and sanding process to restore the bearings. He also tried expanding spring-loaded hones that, although somewhat effective, wore out quickly and did not keep the sleeve bearings absolutely round. In search of a better solution, he sought the advice of Charlie Butcher, a 40-year master diecast mechanic. “[Butcher] pulled out a Flex-Hone and told me not to fool with anything else,” says Pekelney.

The Flex-Hone Tool is characterized by the small, abrasive globules that are permanently mounted to flexible filaments. It is available in many sizes, abrasive types, and grits. “With the Flex-Hone there is good control over how much material is removed, and the holes remain concentric,” says Pekelney, adding that for the museum environment it was important they preserve as much original material as possible. “I was able to clean up these bearings pretty quickly. The hones have saved a huge amount of time compared to hand sanding.”

“The tool enabled me, an inexperienced machinist, to repair bearings that otherwise would have required journeymen help, and do so with very little risk of damage,” adds Pekelney. The hard work performed by the team helped bring USS Pampanito back to her former glory for all who visit her.

For more information, contact Brush Research Manufacturing, Inc., Phone: (323) 261-2193; Web site: www.brushresearch.com.

Volunteers Restore USS Pampanito (SS 383) to her former Glory

Naval COOL Mobile App Now Available

Sailors can now access several tools and resources found on Navy Credentialing Opportunities Online (COOL) via their mobile devices with a new Navy COOL application that launched Jan. 28.

The Navy COOL app, available for both Android and iOS/Apple devices, is designed to help Sailors, both enlisted and officers, to find information on credentialing, career development, and civilian crosswalks related to their military occupation.

“This new app provides an expanded capability for Sailors to help them translate the skills they’ve learned on the job into civilian credentials, career growth opportunities and related civilian occupations,” said Keith Boring, Navy COOL program manager. “The app is a great complement to our newly redesigned website and provides extra features that I think Sailors will find handy to have at their fingertips. Besides credentialing information, the app provides enlisted members with learning and Development Roadmaps (LD03s), which are rating-specific online guides that explain in detail what Sailors need to succeed at specific points in their career. Additional app features include snapshots of related civilian occupations and United Services Military Apprenticeship Program (USMAP) trades, along with generic joint service transcripts associated with each enlisted Navy rating. Rating Information Cards also provide summary information such as school locations, training times, qualifications and working environment. These and the other features within the app are particularly useful for recruiters and career counselors, especially when they are on the go, as they advise potential recruits and Sailors of professional options available to them. For enlisted Sailors and veterans who are not using Navy COOL to fund credentialing exams and fees, the app also provides a gateway to the Department of Veterans Affairs GI Bill funding options.

The Navy COOL app is a bring-your-own-device (BYOD) tool designed to work on personal devices outside of the INMCL domain. Users can download the Navy COOL app from the Apple store and Google Play store at no cost.

To find the free Navy COOL app, search “Navy COOL” in app stores or your web browser.

New OPSEC App is Out

The Navy has released its new mobile Operations Security app designed to make annual training requirements more accessible to Sailors. Sailors can now complete required training on the OPSEC app, but also access related resources and policies. The app gives Sailors an alternative to completing their required GMT.

The OPSEC app features:

- Policy/FAQs: Includes Joint DoD, Navy and Marine Corps Policies; Navy Tactics, Techniques, and Procedures; Marine Corps Warfighting Publication; and handbooks.
- Training: Features links to three computer-based training modules, as well as information on courses offered by the Naval OPSEC Support Team Norfolk and other OPSEC agencies.
- Products: Training videos/links on a multitude of OPSEC topics.
- Assessments: Information and resources to assist OPSEC program managers on how to conduct OPSEC assessments at their command.
- Favorites/FAQs: Highlight parts of the app that are most valuable.
- To find the free Navy OPSEC app, search “Naval OPSEC” in the app stores or your web browser.

Welcome Home!

Brandon Bright of the Ohio-class ballistic missile submarine USS Ohio (SSBN 741) was welcomed home by family at Naval Base Kitsap-Bangor, following a routine strategic deterrent patrol.

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The Los Angeles-class fast-attack submarine USS Anahit’s (SSN 758) Culinary Specialist 2nd Class Angela Kool, cooking with UTSA culinary students during the United States Navy’s (USN) 41st annual enlisted culinary competition at the Navy Exchange Scroll dietary challenge. The challenge tests the culinary skills of chef’s and active duty military personnel to create four different types of finger foods, a buffet platter, three-course meal, and a dessert. The challenge is part of the USN’s overall culinary program to improve the health and nutrition of the force and standardize food services across the Fleet.

The challenge culminates in a culminating culinary challenge where teams from across the USN compete to prepare the best four-course meal with the best nutritional value. This year’s challenge was held aboard the USN’s aircraft carrier USS Nimitz (CVN 68), and the winning team was the Navy exchange Scroll culinary team from the San Diego Naval Base, which was awarded a gold medal and a trip to the USN’s culinary competition in Washington, D.C.

The USN’s culinary program is designed to improve the health and readiness of the force, and the culinary competition is an important part of that program. The competition allows the USN to evaluate the culinary skills of its personnel and identify areas for improvement. It also promotes a healthy and nutritious diet for the force and helps to standardize food services across the Fleet.

The competition is open to all USN personnel, and teams are judged on a variety of factors, including the nutritional value of the meal, presentation, taste, and overall execution. The winning team is awarded a gold medal and a trip to the USN’s culinary competition in Washington, D.C., which is an opportunity for the team to showcase their culinary skills and compete against other teams from across the USN.

In addition to the culinary competition, the USN’s culinary program includes a variety of other initiatives, such as the USN’s dietetic technician program, which trains dietetic technicians to develop and implement nutrition programs for the force, and the USN’s culinary training program, which provides culinary training for personnel across the Fleet.

The USN’s culinary program is an important component of the USN’s overall health and readiness program, and the culinary competition is a key part of that program. The competition allows the USN to evaluate the culinary skills of its personnel and identify areas for improvement, and it promotes a healthy and nutritious diet for the force. The USN is committed to improving the health and readiness of its personnel, and the culinary program is an important part of that commitment.
CNO Releases ‘A Design for Maintaining Maritime Superiority’

Chief of Naval Operations Adm. John Richardson released ‘A Design for Maintaining Maritime Superiority’ Jan. 5, a document that addresses how the Navy will adapt to changes in the security environment and continue to fulfill its mission.

The term ‘design’ refers to the document’s built-in flexibility, recognizing the rapid rate of change occurring in both technology and the maritime domain.

‘This guidance frames the problem and a way forward, while acknowledging that there is inherent and fundamental uncertainty in both the problem definition and the proposed solution,’ said Richardson.

‘As we move forward, we’ll respect that we won’t get it all right, and so we’ll monitor and assess ourselves and our surroundings as we go. We’ll learn and adapt, always getting better, striving to the limits of performance.’

The CNO’s design reaffirms the Navy’s mission, describes the strategic environment, and identifies four lines of effort, each with corresponding objectives to guide the actions of the Navy and its leaders.

The four lines of effort are the following:

- Strengthen Naval Power at and from Sea
- Achieve High Velocity Learning at Every Level
- Strengthen our Navy Team for the Future
- Expand and Strengthen our Network of Partners

The document also details four ‘Core Attributes’ that serve as guiding criteria for command decisions in decentralized operations: integrity, accountability, initiative, and toughness.

To read ‘A Design for Maintaining Maritime Superiority’ go to: https://www.navy.mil/cno/docs/cno_stg.pdf

Washington Christening Ceremony

On a crisp, sunny March afternoon, in front of a crowd of approximately 2,000 people, Elizabeth Mabus christened the USS Washington (SSN 787). The Washington will be the 14th Virginia-class submarine built by Newport News Shipbuilding and General Dynamics Electric Boat.

USS Washington pays homage to the 42nd state and to the 35 Medal of Honor recipients dating back to the Civil War, and she is expected to be commissioned late 2016.

On March 16, 2016
Prior to her December 27, 1942 keel-laying, SS 310’s name was changed from USS Acoupa to USS Batfish for a small fish resembling the stingray. She was launched on May 6, 1943 by Portsmouth Naval Shipyard and commissioned on August 21, 1943, with Lt. Cmdr. W.R. Merrill in command.

From December 11, 1943 to August 26, 1945, Batfish completed seven war patrols and is credited with having sunk 15 ships for a total of 37,484 tons and damaging three others in the western Pacific theater. Batfish received the Presidential Unit Citation, a Navy Cross, four Silver Stars, and nine battle stars for her WWII service.

Batfish left Pearl Harbor on her first war patrol on December 11, 1943, four days after the second anniversary of the Japanese attack there. Cruising off Honshu, Japan, she damaged two freighters and sank the cargo ship Hidaka Maru before arriving at Midway on January 30, 1944.

Returning to sea on February 22, 1944, she patrolled for 53 days and saw no action before returning. On her third patrol, leaving Pearl Harbor on May 26, 1944, Batfish patrolled off the southern coast of Japan where she sank a Japanese training vessel and two cargo ships before surfacing and sinking a trawler and its escort vessel with deck gun fire.

On her fourth patrol, she sank the Japanese destroyer Samidare. It was the sixth patrol, however, that achieved lasting fame for the submarine. In 76 hours, Batfish attacked and sank three Japanese submarines RO-55, RO-112 and RO-113. No other submarine has since matched this feat.

USS Batfish made her final patrol in 1945. After shelling the coast of Japan, she rescued three downed American aviators and returned to Midway on August 22, 1945.

Batfish returned to the United States after the war and was placed out of commission in reserve at Mare Island Navy Yard on April 6, 1946.

On March 7, 1952, she was recommissioned and on April 21 assigned to Submarine Division 122 in Key West, Fla. to carry out training duty, operating between Key West and Caribbean ports.

A year later she was towed to New Orleans for use as a moored naval reserve training vessel until stricken from the Navy list in 1969.

In February 1972, Batfish was transferred to the Oklahoma Maritime Advisory Board and towed up the Arkansas River to Muskogee. There, she was placed in a dry berth and opened to the public as a memorial to Oklahoma combat Submariners.

Visitors to the Muskogee War Memorial Park can explore WWII history by touring the Batfish or a self-propelled howitzer, cannons, missiles, and a variety of other military artifacts for viewing.

www.warmemorialpark.org