American Submariners Inc.
4370 Twain Ave.
San Diego, CA 92120-3404

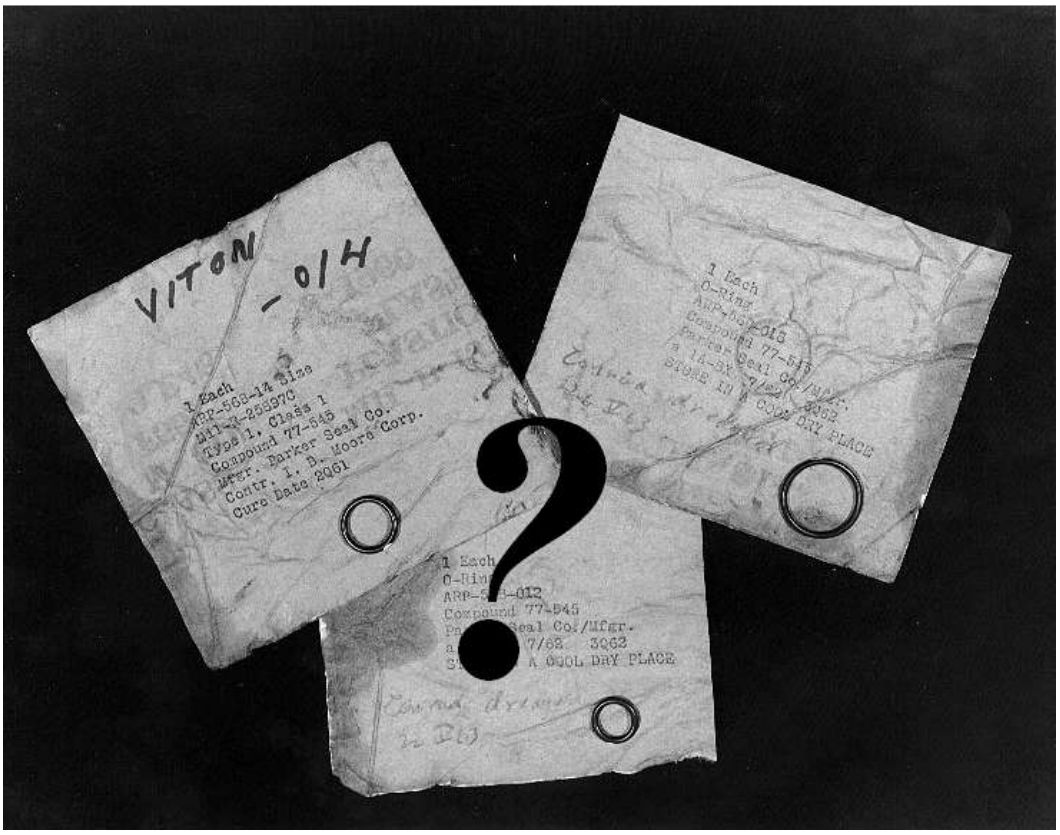
The Silent Sentinel
April 2018

Our Creed and Purpose

To perpetuate the memory of our shipmates who gave their lives in the pursuit of their duties while serving their country. That their dedication, deeds, and supreme sacrifice be a constant source of motivation toward greater accomplishments. Pledge loyalty and patriotism to the United States of America and its Constitution.

In addition to perpetuating the memory of departed shipmates, we shall provide a way for all Submariners to gather for the mutual benefit and enjoyment. Our common heritage as Submariners shall be Strengthened by camaraderie. We support a strong U.S. Submarine Force.

The organization will engage in various projects and deeds that will bring about the perpetual remembrance of those shipmates who have given the supreme sacrifice. The organization will also endeavor to educate all third parties it comes in contact with about the services our submarine brothers performed and how their sacrifices made possible the freedom and lifestyle we enjoy today.



See Page 7

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The Silent Sentinel via Email

To all of my Shipmates and families who currently receive our Great newsletter via the mail who would like it sent via email or continue to receive it via mail, please fill out the form and mail it to the base or myself. We are trying to cut the cost of the newsletter down from $3700 to about $1900 a year. By receiving the Silent Sentinel via email will cut down the printing and mailing cost. The other plus to receiving it via email is you can save it on your computer and not have the paper lying around the house.

A subscription to the Silent Sentinel newsletter will be available to surviving family members via internet email, at no charge, upon notification of the Membership Chairman. If a printed hard-copy is preferred, via US Post Office delivery, an annual donation of $5.00 will be requested to cover costs.

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c/o VFW Post 3787
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April 2018 Meeting

Our monthly meeting is held on the second Tuesday of the month at VFW Post 3787, 4370 Twain Ave., San Diego. Our next meeting will be on *April 10th*. The post is located one-half block West of Mission Gorge Road, just north of I-8. The meeting begins at 7 p.m. The E-Board meets one hour earlier at 6 p.m.

Check us out on the World Wide Web
www.ussvisandiego.org

Binnacle List
Joel Eikam and Frank Workman

Submarine Losses in April
Originally Compiled by C J Glassford

USS Pickerel (SS-177)
Lost on April 3,1943 with the loss of 74 officers and men, while on her 7th war patrol. She was lost off Honshu. The exact cause of her loss has never been determined, but her OP area contained numerous minefields.

USS Snook (SS-279)
Lost on April 8,1945 with the loss of 84 officers and men. Snook ranks 10th in total Japanese tonnage sunk and is tied for 9th in the number of ships sunk. She was lost near Hainan Island, possibly sunk by a Japanese submarine.

USS Thresher (SSN-593)
Lost on April 10, 1963 with the loss of 112 crew members and 17 civilian technicians during deep-diving exercises. 15 minutes after reaching test depth, she communicated with USS Skylark that she was having problems. Skylark heard noises "like air rushing into an air tank" - then, silence. Rescue ship Recovery (ASR-43) subsequently recovered bits of debris, including gloves and bits of internal insulation. Photographs taken by Trieste proved that the submarine had broken up, taking all hands on board to their deaths in 1,400 fathoms of water, some 220 miles east of Boston.

USS Gudgeon (SS-211)
Probably lost on April 18, 1944 with the loss of 79 men SE of Iwo Jima, but may have been sunk on May 12, 1944 in another attack on an unidentified submarine and heard by several other submarines in the area. Winner of 5 Presidential Unit Citations, Gudgeon was on her 12th war patrol and most likely due to a combined air and surface antisubmarine attack. Gudgeon was the first US submarine to go on patrol from Pearl Harbor after the Japanese attack. On her first patrol, she became the first US submarine to sink an enemy warship, picking off the submarine I-173.

USS Grenadier (SS-210)
Lost on April 22,1943 near Penang, with no immediate loss of life. She was on her 6th war patrol. While stalking a convoy, she was spotted by a plane and dove. While passing 130 feet, Grenadier was bombed, causing severe damage. She was lodged on the bottom 270 feet and the crew spent hours fighting fires and flooding. When she surfaced, she had no propulsion and was attacked by another plane. While she shot down the plane. When enemy ships arrived, the CO abandoned ship and scuttled the boat. Of the 76 crew members taken prisoner, 72 survived the war.

Minutes of March Meeting
In preparation

USS Pickerel (SS-177) - Perpetuating the Memory

by David Kauppinen

The USS Pickerel (SS-177) was a Porpoise Class submarine commissioned January 26, 1937 at Electric Boat Company, Groton, CT, with

Lieutenant Leon J. Huffman in command. After initially being based in San Diego she transferred to the Asiatic Fleet in 1940.

During the first week of December 1941, the Pickerel under the command of Lieutenant Commander Barton Bacon, Jr. along with several other submarines was conducting torpedo practice near Manila. When Pearl Harbor was attacked on December 7, she returned Cavite Naval Base, conducted needed maintenance, loaded torpedoes, took on supplies, and left again on December 8.

Her first patrol was along the coast of Indochina (Vietnam) looking for troop transport ships known to be there, but unfortunately they had already left the area. After failing to score on this short patrol, the Pickerel returned to Manila Bay on December 29 to resupply. Since the USS Sea Lion (SS-195) had been badly damaged in the December 10 Cavite attack, her crew was divided up among the other submarines, and the Pickerel compliment increased by one officer and nine men. Due to the dangerous conditions in the area, she left again on December 31 for her second patrol. On January 10 she sank a 2,929 ton armed cargo ship with two torpedoes in a submerged night attack.

Patrols 3 and 4 were frustrating for the entire crew due to the lack of targets in the assigned areas. On July 10, 1942 she departed Brisbane to her fifth patrol area near the Marianas Islands where on August 1 she damaged a 4,000 ton freighter. The patrol ended at Pearl Harbor on August 26 and she subsequently departed to Mare Island for a refit.

While undergoing maintenance and refit, the fairwater was cut down fore and aft of the conning tower, two 20mm anti-aircraft guns were installed on the new elevated decks, and two external torpedo tubes were added (see photo below). As constructed, the Porpoise class submarines originally had 4 torpedo tubes in the bow and 2 torpedo tubes in the stern, so the new external tubes were numbered 7 and 8. In addition, during the refit period Executive Officer Lieutenant Commander Augustus Alston, Jr. became the new Commanding Officer of the USS Pickerel. She headed back to Pearl Harbor in late December 1942.

The USS Pickerel left Pearl Harbor for her sixth war patrol on January 22, 1943 with orders to patrol the Kurile Islands area north of Japan. On February 15 she sank a 1990 ton auxiliary vessel and on the 20th she destroyed two sampans with gunfire. The Pickerel arrived back at Pearl Harbor on March 3. Below is an excerpt from the sixth patrol report detailing problems with the recently installed external torpedo tubes. Another issue identified in the sixth patrol report was crew member experience.

Hot Runs in Deck Tubes.

Early in the evening of February 7, 1943, the torpedoes were lost from both deck tubes through having hot runs in the tubes. Conditions surrounding the loss were as follows: On surfacing about 1900 February 7, the deck tubes were made ready. Moderate swells were running causing some pitching and rolling. At about 1906 the Commanding Officer noticed a hot run in progress in No. 8 tube and ordered that tube fired; the torpedo was ejected by impulse air in the normal manner. At about 2015 the torpedoman on watch in the forward room heard a whirring noise as of a running torpedo in the vicinity of No. 7 tube; subsequent investigation proved both tubes empty, the torpedo in No. 7 tube having been forced out either by its own exhaust or by a down angle on the submarine. The cause of the premature runnings is believed to be failure of the weakened shear pins to withstand the moderate pitching and rolling or the force of waves entering the open muzzle doors on the evening of the casualty.

The shear pins were probably weakened by the rough weather encountered from January 27 to February 6, 1943. It is believed the advisability of renewing shear pins after encountering rough weather should be investigated.

Recommendations.

(a) The Commanding Officer strongly recommends that only minor shifts be made in personnel at the end of this patrol in view of the fact that most of the men are new recruits having reported on board for duty a week or two before leaving Navy Yard, Mare Island, and have spent just about two months on board with only two weeks on station. Although every opportunity has been used for training dives and schooling, it is felt that more practical experience is needed by the new men before releasing any more of the old timers.

The USS Pickerel departed Pearl Harbor on March 18, 1943 on her seventh war patrol. After topping off fuel at Midway Island on March 22, she headed for the east coast of Honshu, Japan, and was never heard from again. During the post-war review of Japanese records, she was credited with sinking Submarine Chaser Number 13 on April 3. In addition, that same day aircraft and ships had dropped 23 bombs and 26 depth charges on a submarine off Shiranuka Lighthouse on the northern tip of Honshu. Large amounts of oil on the surface convinced the Japanese that the submarine had been destroyed. However, on April 7 a cargo ship was sunk by a submarine in the USS Pickerel's area and there were no other American subs in the vicinity, consequently she was credited with that sinking also. Some believed the boat may have escaped the depth charge attack, but was sunk several days later by one of the many mines the Japanese had placed in the waters around Honshu.

During her short career, the USS Pickerel sank 4 ships for a total of 6,472 tons and was awarded 3 battle stars. Eternal Patrol April 3 or 7, 1943, 74 men lost. "Sailors rest your oars"

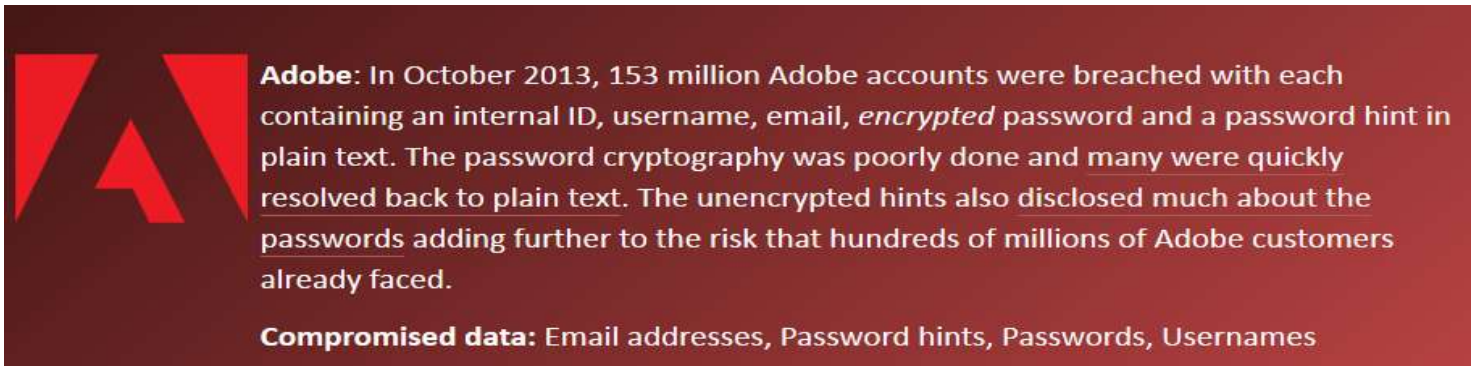
The following report signed by COMSUBPAC Admiral Charles A. Lockwood documents why the USS Pickerel (SS-177) was declared lost on May 12, 1943.

Computer Corner

Recently I discovered a legitimate website https://haveibeenpwned.com that determines if an account tied to your email has been hacked. I have two email addresses, one came back with this message:

The other email check came back with this one:

The identified account and stolen information associated with my email is:



It would be a good idea to check your own emails and change passwords accordingly. In addition, you may want to get on their notification list. David Kauppinen, Webmaster 4/1/2018

Current News

"Plataginet, I will; and like thee, Nero,
Play on the lute, beholding the towns burn" (*Henry VI*, Shakespeare)

USS Thresher Disaster Still Matters
Capt. Jim Bryant, USN (Ret), Fosters, April 3

On April 10, 1963, the American nuclear submarine USS Thresher (SSN 593), the world's most advanced hunter-killer submarine crushed at a depth of 2,400 feet killing all 129 onboard during a routine test dive.

Incredibly, more than a half-century later, details of the Thresher disaster remain poorly understood. Its shattered hull resides at the bottom of 8,400 feet of water east of Cape Cod, Massachusetts.

The underlying cause of the Thresher sinking 55 years ago and the collisions last summer involving the USS John S. McCain (DDG 56) and USS Fitzgerald (DDG 62) that killed 17 sailors was the failure to effectively integrate emerging technology into the training, procedures, planning and maintenance programs.

The world situation of then and now are similar as America rushes to maintain naval superiority with new weapons systems like the Littoral Combat Ship, Ford class nuclear aircraft carrier, and the Virginia class nuclear submarine. Insufficient crew training, manning and inadequate operating procedures and shipboard maintenance continue to cause avoidable, recurring at-sea incidents.

By 1963, Soviet submarines were a serious challenge to America's national security. Thresher offered innovative improvements over earlier submarine designs. It was faster, quieter, dived deeper, and with advanced sonar and weapons systems, a significant threat to Soviet submarines.

Built by Portsmouth Naval Shipyard, Thresher was commissioned Aug. 3, 1961, and spent the following year testing weapons and new equipment, measuring radiated sound, shock testing and conducting exercises with other submarines with outstanding results. The ultimate test was to challenge Soviet submarines would have to wait until after a lengthy maintenance period.

After shock testing using close-aboard explosive charges in July 1962, Thresher returned to Portsmouth Naval Shipyard for a series of upgrades and repairs.

On April 9, 1963, Thresher departed for sea trials, escorted by the submarine rescue vessel USS Skylark (ASR 20). After a shallow dive in the Gulf of Maine, the ships rendezvoused the following morning in deep water for a two-hour dive to Thresher's deepest operating or test depth (1,300 feet, nearly twice as deep as previous classes).

View photos all the men who died aboard the Thresher in our 129 Lives Lost, Part 1 and 129 Lives Lost, Part 2 photo galleries.

Thresher sank below its crush depth and imploded – raining its shattered hull, nuclear reactor and occupants onto the seabed below. The Navy's investigation concluded that major flooding from ruptured piping in the engine room was the probable cause.

The sounds of the Thresher's death throes were recorded by sound surveillance system (SOSUS) underwater hydrophones located around the world tuned to pluck machinery sounds of submarines out of all the noise in the ocean. SOSUS was a highly secret system designed to track Soviet submarine movements at long ranges. SOSUS hydrophone array Fox was located only 30 nautical miles from the site of Thresher's sinking.

Bruce Rule was a top naval acoustic and SOSUS expert who analyzed Thresher's death sounds and testified at the disaster inquiry.

After leaving the Navy in September 1963, Rule spent his next 42 years as the lead acoustic analyst for the Office of Naval Intelligence. Though Rule's testimony and findings remain classified, Rule recently revealed them in his book, "Why the USS Thresher (SSN 593) was lost," which helps us understand this mystery beyond the obvious, that Thresher slowed, and uncorrectable negative buoyancy caused it to sink to crush depth.

Rule is positive there was no flooding because the sounds of high pressure water hitting the inside of the submarine were not detected.

Low pressure steams or sprays of seawater (excessive leakage) from multiple sources would be quiet to SOSUS, increase negative buoyancy, and cause concern to the crew trying to isolate them.

Main coolant pumps (MCPs) moving heat from the reactor core to the steam generators were in fast speed and then stopped. Fast speed MCPs are required to reach maximum speed, but Thresher stayed at slow speed. Running MCPs in slow speed would have been more reliable.

SOSUS detected compressed air blowing seawater from the main ballast tanks (MBTs) twice. The MBT blow system that should have surfaced Thresher failed because of poor design and the unauthorized installation of strainers with a metal backing plate with a small hole, or orifice, that severely restricted air flow. Ice formed on the strainers as high-pressure air instantly cooled when released into a lower pressure environment through this orifice and strainer. This ice intermittently blocked the compressed air to the MBTs and the strainers, and orifice plates, restricted air flow preventing removal of enough seawater from the MBTs to surface the ship.

Slow speed MCPs would have been a more reliable lineup as they had an alternative source of power. Fast speed MCPs were run to use the tremendous power of the reactor plant to drive to the surface if there was a problem, but why did Thresher stay at slow speed?

There is plausible, circumstantial evidence that Thresher's stern planes used to control the angle of the ship for depth control likely became stuck in a dive position that required Thresher to stop to prevent a downward angle and depth excursion. Control surface failures were a fleet-wide concern on high-speed nuclear submarines.

Rule's analysis of Thresher's recorded acoustic signature and underwater telephone communications with the escort ship Skylark provides the following timeline of Thresher's loss.

At 0853, Thresher descended from 1,000 to 1,300 feet (test depth). Possibly already negatively buoyant from not taking the time to adjust trim as the dive proceeded, increasing sea pressure on Thresher's seawater systems boosted leakage.

Somewhere between 0853 and 0909, Thresher experienced the stern plane problem, stopped to counter its effects, and started to sink.

At 0909, SOSUS detected an electrical bus line-frequency instability, a symptom of an ongoing problem in the engine room, such as crew actions to stop excessive leakage from seawater piping.

Shortly after the electrical bus started to waiver, SOSUS detected the sounds of compressed air blowing into the MBTs. This means the primary means of going shallow, main propulsion was not usable. The blow stopped after 90 seconds due to ice blockage. This

MBT blow did not remove enough seawater from the MBTs to reverse Thresher's descent.

The submarine's fate was sealed at 0911 when SOSUS detected main coolant pumps stopping. This caused an automatic reactor shutdown (reactor scram) and by procedure, steam to be isolated to the main propulsion and power-generating turbines in the engine room. Even if the stern planes had become operational, shutting the steam stops prevented steam generated by decay and residual heat in the reactor from being used in the main propulsion turbines to drive to the surface. As Thresher continued to sink below test depth,

SOSUS did not detect the sounds expected for the reactor being restarted.

The Navy's investigative report describes communications at about 0913 using the conflicting testimony of four witnesses on Skylark,

"Experiencing minor difficulties. Have positive up angle. Am attempting to blow up. Will keep you informed." The "experiencing minor difficulties" phrase is an enigma because Thresher had exceeded test depth, by as much as 600 feet, the reactor had scrammed, main propulsion was lost, the ineffective MBT blow failed to stop the downward acceleration, and the crew could hear the guttural sounds of the pressure hull compressing.

As the ice blockage dissipated, Skylark and SOSUS detected another 30-second MBT blow before ice reformed and the blow stopped again, all while Thresher's rate of descent increased.

The garbled transmission at 0917 was interpreted to contain the phrase "900 North," understood to mean 900 feet below test depth or a depth of 2,200 feet. This is reasonable given that Thresher was reporting depth relative to test depth in case a Soviet submarine was listening.

SOSUS and Skylark detected hull collapse 0918.4 at a calculated depth of 2,400 feet with an energy pulse equal to the explosion of 22,500 pounds of TNT.

The 129 men did not die in vain. Their loss resulted in immediate changes to how the Navy built, maintained and operated its nuclear fleet.

Justifications for costly safety improvements are written in blood. In this case the Navy created the Submarine Safety (SUBSAFE) program that mandated the redesign of and strict quality control procedures for the manufacture, repair and testing of critical systems on submarines.

New SUBSAFE systems, like a separate emergency MBT blow and emergency, remote, hydraulic seawater hull valve closure systems.

On Thresher, SUBSAFE would have prevented the unauthorized installation of the strainers and orifice plates. These critical systems include hull, seawater piping, high pressure air and stern plane. Until a submarine was SUBSAFE certified, it is restricted to operating at half its test depth.

New reactor plant scram recovery procedures allowed residual and decay heat from the reactor to create steam for main propulsion to drive the ship to the surface and a faster restart of the reactor.

No SUBSAFE-certified submarines have been lost despite terrible accidents like the San Francisco (SSN 711) striking an underwater ridge in January 2005 at top speed that killed one sailor. The only other American nuclear submarine loss was Scorpion (SSN 589) in

May 1968, which had not completed SUBSAFE-certification and suffered a main battery explosion before it sank and imploded.

Pakistan Tests Nuclear-Capable, Submarine-Launched Missile With A Range Of 450km
Imtiaz Ahmad, Hindustan Times, March 30

Pakistan has conducted a test of its nuclear-capable, submarine-launched cruise missile (SLCM), Babur, which has a range of 450 km, with the country's military saying the weapon system provides it a "credible second strike capability". Pakistan has been working hard on developing this capability -- to carry out a retaliatory nuclear strike even after an enemy's nuclear attack destroys or neutralises its land-based nuclear arsenal -- which India already has.

The Pakistan military's media arm described Thursday's test of the indigenously developed missile as successful. The missile is capable of delivering various types of payloads and incorporates advanced technologies, including underwater controlled propulsion and sophisticated guidance and navigation features.

"SLCM Babur provides Pakistan credible second strike capability, augmenting the existing deterrence regime," the Inter-Services Public Relations (ISPR) said in a statement.

There was no official word on the development from India's defence ministry or the military.

Strategic affairs expert Kapil Kak, a retired air vice marshal, said Pakistan has been determinedly endeavouring to attain this capability with China's help. "We have to see if their claim is authentic," Kak added.

The first test of the Babur missile in January 2017 only "demonstrated ... scientific capability", the Dawn newspaper reported. Later tests confirmed the missile's "technical parameters" and the military's claim of a credible second strike capability indicated the Babur had "entered into service" in the Pakistan Navy as an "operational missile system", the report said.India, which has a no-first use policy for its nuclear arsenal, began working on second strike capability soon after its nuclear tests in 1998. It has completed its nuclear triad and has the capability to launch strategic weapons from land, air and sea.

Without naming India, the Pakistan military also sought to blame New Delhi for disturbing the strategic balance in the region by acquiring nuclear submarines and nuclear-capable missiles.

The development of second strike capability "reflects Pakistan's response to provocative nuclear strategies and posture being pursued in the neighbourhood through induction of nuclear submarines and ship-borne nuclear missiles, leading to nuclearisation of Indian Ocean region," the statement said.

The Babur missile was fired "from an underwater dynamic platform" and "successfully engaged its target with precise accuracy, meeting all the flight parameters", the statement said.

A brief video posted on the ISPR website showed the red and white missile emerging from water and cruising over the sea before hitting a target on land. At the time of its launch from the underwater platform, the missile was within a capsule which was jettisoned when the Babur rose above the sea surface. The military did not say where the test was conducted.

The test was witnessed by director general of the Strategic Plans Division (SPD), which is responsible for managing Pakistan's nuclear arsenal, the commander of the Naval Strategic Force Command, senior officials, and scientists and engineers from strategic scientific organisations.

This is only the second time that Pakistan has announced a test of the submarine launched Babur-III missile, with the first test being conducted in January 2017. During the first test, the Babur-III was launched from an unidentified "underwater mobile platform".

The Babur-III is the naval variant of the land-based Babur-II, which was tested in December 2016.

Navy Seeks to Rev Up to Building 3 Attack Submarines Per Year
Staff, Warrior Maven, March 30

The Navy hopes to increase its current submarine construction op-tempo and build as many as three Virginia-class submarines per year to more rapidly address the services' attack submarine deficit.

The previous status quo had been for the Navy to drop from building two Virginia-Class boats per year to one in the early 2020s when construction of the new Columbia-Class nuclear armed submarines begins. The service then moved to a plan to build two Virginia-class submarines and one Columbia-class submarine concurrently, according to findings from a Navy assessment.

The proposed idea now, currently being explored by the Navy, is to jump up to three Virginia-class per year when Columbia-class production hits a lull in "off years."

"I do believe there is a capacity to get to three a year in the off years for Columbia construction. We have gotten up to two per year and that is sustainable. There is capacity in the yard and as we negotiate this upcoming multI-year, we will look at pulling options in to add more submarines," James Geurts, Assistant Secretary of the Navy for Research, Development & Acquisition, told lawmakers at a Congressional House Armed Services Committee Seapower and Projection Forces Subcommittee.

Navy leaders have consistently talked about an expected submarine shortfall in the mid 2020s and that more attack submarines were needed to strengthen the fleet and keep stay in front of near-peer rivals such as Russia and China.

This assessment reinforces findings from a completed comprehensive Navy analysis last year, which found that producing more Virginia-Class attack submarines on a much faster timetable is "achievable" and necessary.

The Navy report, titled The Submarine Industrial Base and the Viability of Producing Additional Attack Submarines Beyond the Fiscal Year 2017 Shipbuilding Plan in the 2017–2030 Timeframe, was delivered to Congress last year, Navy officials said.

The completed study, however, maintained that the Navy and industry can produce two Virginia-Class boats and one Columbia-Class submarine per year, increasing the prior plan by one Virginia-Class boat per year.

The Virginia-Class Submarines are built by a cooperative arrangement between the Navy and Electric Boat, a subsidiary of General Dynamics and Newport News Shipbuilding, a division of Huntington Ingalls Industries.

Each industry partner constructs portions or "modules" of the submarines which are then melded together to make a complete vessel, industry and Navy officials explained.Virginia-Class Attack Submarine Technology -

Virginia-Class subs are fast-attack submarines armed with Tomahawk missiles, torpedoes and other weapons able to perform a range of missions; these include anti-submarine warfare, strike warfare, covert mine warfare, ISR (Intelligence, Surveillance,

Reconnaissance), anti-surface/ship warfare and naval special warfare, something described as having the ability to carry and insert

Special Operations Forces.Future Virginia-Class submarines provide improved littoral (coastal waters) capabilities, sensors, special operations force employment, and strike warfare capabilities, Navy developers said.

Virginia-Class submarines are engineered with this "Fly-by-Wire" capability which allows the ship to quietly linger in shallow waters without having to surface or have each small move controlled by a human operator. With this technology, a human operator will order depth and speed, allowing software to direct the movement of the planes and rudder to maintain course and depth. The ships can be driven primarily through software code and electronics, thus freeing up time and energy for an operator who does not need to manually control each small maneuver, Navy program managers have told Warrior.

Also, unlike their predecessor-subs, Virginia-Class subs are engineered with what's called a "Lock Out Trunk" – a compartment in the sub which allows special operations forces to submerge beneath the water and deploy without requiring the ship to surface.

Development of Virginia-Class submarines are broken up into procurement "Blocks." Blocks I and II have already been delivered.

The Block III subs, now under construction, are being built with new so-called Virginia Payload Tubes designed to lower costs and increase capability.

Instead of building what most existing Virginia-Class submarines have -- 12 individual 21-inch in diameter vertical launch tubes able to fire Tomahawk missiles – the Block III submarines are being built with two larger 87-inch in diameter tubes able to house six Tomahawk missiles each, according to Navy data.

Although the new tubes were conceived and designed as part of what the Navy calls its "Design for Affordability" strategy to lower costs, the move also brings strategic advantages to the platform, service officials say. Specifically, this means that the submarines are constructed such that they will be able to accommodate new technologies as they emerge - this could mean engineering in an ability to fire upgraded Tomahawk missiles or other weapons which may emerge in the future, developers said.

The Block III Virginia-Class submarines also have what's called a Large Aperture Bow conformal array sonar system – designed to send out an acoustic ping, analyze the return signal, and provide the location and possible contours of enemy ships, submarines and other threats.

For Block V construction, the Navy is planning to insert a new 84-foot long section designed to house additional missile capability.

"Virginia Payload Modules."

The Virginia Payload Modules, to come in future years, will increase the Tomahawk missile firepower of the submarines from 12 missiles up to 40.

The VPM submarines will have an additional (approximately 84 feet) section with four additional Virginia Payload Tubes, each capable of carrying seven Tomahawk cruise missiles, for a ship total of 40 Tomahawks.

Back From The Depths: A Century Of Submarine Rescue
Gareth Evans, Naval Technology, March 26

A century on from some of the world's first successful submarine rescues, dangers still abound despite massive advances in technology and international co-operation. This timeline explores how far we've come and how far there still is to go.

"Today's submariners recognise that the submarines they operate are not only safer, but also more effective, because we have learned from the experience of our predecessors," said Rear Admiral John Weale, Head of the UK Submarine Service at the centenary service for HMS K13

HMS K13, January 1917

The icy waters of Gareloch in Argyll and Bute, Scotland, saw one of the world's first successful submarine rescues in January 1917 when HMS K13 sank during sea trials, with an 80-strong assorted complement of crew, Royal Navy dignitaries and civilians aboard.

By 22.00hrs on the night of the 29th – roughly 10 hours after the K13 went down, the first rescue vessel arrived, and divers were sent down at daybreak, who managed to establish communication with the survivors using Morse code tapped out on the hull. Later that afternoon, an airline was attached to the vessel, enabling the ballast tanks to be blown and, by noon on the 31st, with the aid of a hawser, the K13's bows were brought above the surface, and supported by a barge on either side. A hole was then cut in her, and by 22.00hrs – 57 hours after she sank – the last of the 48 survivors had been safely rescued.

In 2017, a ceremony was held at Faslane Cemetery in Garelochhead to mark the centenary.

Adopting DSEA, 1929

In the early days of submarines, rescuing the crew aboard a stricken vessel tended to focus more on self-escape than external assistance, with a number of systems and devices being developed to help, based on the kind of breathing apparatus then available for use in coal mines.

One of the earliest types was the Davis Submerged Escape Apparatus (DSEA), which was invented by Sir Robert Davis in 1910, and adopted 19 years later by the Royal Navy, after a period of further development. DSEAs remained in service until a comprehensive 1946 Royal Navy inquiry found that there was no difference in the survival rates between those who escaped stricken subs with or without them. The DSEA, arguably the first re-breather escape system to be mass produced, was subsequently dropped in favour of the so-called 'blow and go' technique.

USS Squalus, May 1939

On the morning of the 23rd of May 1939, the Sargo-class submarine USS Squalus – the newest in the fleet – began a routine test dive off the coast of Portsmouth, New Hampshire that was ultimately to turn into the first successful deep-water rescue in history.

Within minutes, she began flooding uncontrollably as the engine room filled with water through the main induction valve, and sank in over 240 feet of water. Twenty-six of the crew, located aft, drowned immediately; the remaining 33, in the forward section, were located alive some hours later by her sister-sub, the Sculpin.

The next day, US Navy divers led by Charles 'Swede' Momsen – inventor of the Momsen Lung escape breathing device – successfully used a rescue chamber also largely of his own devising, to free the trapped submariners. It took four separate trips, with the last of the survivors reaching the surface a little after midnight on the 25th.

USS Thresher, April 1963

Test dives were to be at the centre of yet another incident, and one which still retains the dubious distinction of being the single highest death toll in submarine history.

On the 10th of April, the USS Thresher was engaged in a series of post-overhaul tests some 220 miles off the coast of Boston, Massachusetts, accompanied by the submarine rescue ship Skylark. As Thresher began to dive, travelling in circles beneath Skylark to maintain communications as the submarine moved towards her deep-diving test depth, the rescue vessel picked up garbled messages reporting "minor difficulties" and then heard no more.

An extensive underwater search later revealed the wreckage of the hull, broken into six sections and lying in 8,400 feet of water. The first nuclear submarine lost at sea, the sinking of the Thresher claimed the lives of all 129 aboard, but their deaths were to prove a defining moment for the US Navy that led to the new and rigorous submarine safety initiative, SUBSAFE.

Mystic and Avalon, 1977

The loss of the Thresher also kick-started the development of deep submergence rescue vehicles (DSRVs), with the US Navy instigating the Deep Submergence Systems Project in 1964. By the early 1970s, it had yielded two advanced and highly capable submersibles named Mystic and Avalon, which attained operational status in 1977 after extensive sea trials and formed the backbone of the US Navy's submarine rescue capability through to 2008.

Today, the DSRV has become a familiar and essential asset for submarine operators around the globe – perhaps a fitting legacy for those 129 lost in the dark waters off Boston in 1963.

K-141 Kursk, August 2000

The sinking of the Kursk during Russia's first major maritime exercise for over a decade came as an abrupt wake-up call to the Russian Navy, and a timely reminder to the rest of the 40 or so nations who operate submarines of just how badly things can go wrong.

On the 12th of August 2000, two explosions, two minutes and fifteen seconds apart, sank the Oscar-class submarine in the Barents Sea. Despite being registered by nearby ships, the Russian Navy remained unaware that the sub was in trouble for some hours and vital time was lost both in mounting a search and locating the downed vessel. Over the next four days attempts were made to reach the Kursk using submersibles and diving bells, while overly-optimistic official 'misinformation' was circulated at home and abroad about the rescue operation. On day five, having previously refused international offers of help, President Putin capitulated and accepted the assistance of Britain and Norway. However, by the time Norwegian divers reached where the survivors were thought to be located, it was already too late.

ISMERLO, 2003

There were many developments in the wake of the Kursk tragedy amongst the submarine-operating countries of the world, but arguably none more globally important than the establishment in 2003 of ISMERLO – the International Submarine Escape and Rescue Liaison

Office. Initially set up by NATO and the Submarine Escape and Rescue Working Group and housed in Norfolk, USA, its permanent HQ is now at Northwood UK.

Consisting of a multi-national expert team of submarine escape and rescue specialists, ISMERLO's goal is to help prevent accidents, establish agreed procedures to form the basis of an international standard for peacetime submarine rescue, and facilitate the rapid call-out of appropriate rescue resources as required. The organisation has now become an intrinsic part of global submarine rescue.

Priz AS-28, August 2005

Five years on from the Kursk disaster, which saw Moscow heavily criticised for refusing foreign help, lessons had obviously been learnt.

On the 4th of August, a Russian Priz AS-28 mini-submarine became caught up in sub-sea cables off the coast of the Kamchatka peninsula. Held fast in 190m of water and unable to surface, she issued a mayday, and this time assistance was swiftly sought from the UK, US and Japan. Three days after the Priz was first entangled, and with concern growing over how much oxygen was left, a British-owned-and-operated rescue submarine arrived and successfully freed the Russian sub, saving all seven on board.

ARA San Juan, November 2017

The disappearance of the San Juan at the end of 2017 stands as a stark reminder that despite a century of advances in rescue technologies, and massive multi-national cooperation, submarines do still sink and lives will be lost.

The Argentine vessel was last heard from on 15th of November, while on patrol in the South Atlantic, and her disappearance sparked a truly international search and rescue operation involving more than a dozen countries, which ran for a fortnight. Ultimately, however, it was abandoned after failing to locate the sub, which in any case only carried enough oxygen for seven to 10 days when submerged, and all 44 on board, including Argentina's first woman submarine officer, were declared lost.

Seismic listening posts on Ascension Island and Crozet Islands detected an 'acoustic anomaly' near to the sub's last known position a few hours after she last made contact. This was close to the edge of the continental shelf, leading to some speculation that the sound might have been the San Juan imploding under pressure.

US Nuke Sub Spotted In British Waters Amid Fears Russia War Coming
Nicholas Bieber, Daily Star, March 25

The UK's closest ally has sent its powerful nuclear submarine zooming into the waters of a Brit territory.

Missile-loaded USS John Warner poked above the surface in Gibraltar this morning as it arrived at the British naval base.

The Ministry of Defence said the appearance off the south coast of Spain is part of a "scheduled visit".

MOD Gibraltar tweeted: "#US Submarine John Warner arriving into BGTW earlier this morning.

"Let's hope the weather improves whilst they are alongside for a scheduled port visit."

But the US Navy's hook-up with the Royal Navy comes amid frightening tensions between the UK and Russia.

Prime Minister Theresa May has sparked Vladimir Putin's fury by pointing the finger at Moscow for the poisoning of an MI6 double agent Russian spy.

The nerve agent attack on Sergei Skripal and his daughter Yulia at a Salisbury shopping centre has even seen the EU join May in denouncing Russia.

Putin initially laughed off the claims, but things took a sinister turn when Russia accused the UK of actually carrying out the attack.

And responding to the claims Russia are behind it, Putin's spokesman said today: "We are stating that this is quite unprecedented – international affairs bordering, maybe, on banditry.

"What stands behind this? Is it Britain's internal problems, or the problems of Britain's cooperation with its allies or something else?

"It looks like this is not our business."

Navy Nuclear Reactor Boss: Highly Enriched Uranium is 'the Way to Go'
Richard R. Burgess, Seapower Magazine, March 20

ARLINGTON, Va. – The director of the Navy's nuclear power program said that highly enriched uranium (HEU) is more advantageous for propelling nuclear-powered ships than low-enriched uranium (LEU).

"Our view is that HEU is the way to go," Adm. James Caldwell, director of the Office of Naval Reactors, testified March 20 before the House Appropriations Energy and Water Development and Related Items subcommittee.

The Navy was asked by Congress to study the possibility of using low-enriched uranium to fuel the reactors of its nuclear-powered ships.

"In our reports to Congress, we've been pretty clear that the highly enriched uranium offers us significant military advantage over low-enriched uranium," Caldwell said. "Low-enriched uranium means that you put a lot less energy in the core and therefore you would have to refuel ships more frequently. It would take those ships offline. It would cost more money. The manufacturing rocess for low-enriched uranium is very different from what we do today. The handling of components at end-of-life is very different.

"HEU has served us well for over 60 years," he said. "To develop a low-enriched uranium core would take about 10 to 15 years and about a billion dollars. On top of that, it would take probably several billion [dollars] just to deliver the manufacturing, materials, [etc.] To get to an LEU-capable core would require a step change in our design. It is a significant difference from what we are using today in our cores. That's why it takes so long and why it would cost so much.

"That said, if money was available [and] targeted for LEU development, then Reactors would continue our work an advanced fuel system and we would move along that path. We're working on that as much as we can, but that is many decades away right now."

Russia Claims Its Nuclear Sub Went 'Undetected' On US Coastline
Staff, American Military News, March 19

Russia's nuclear submarine went "undetected" on its approach to the U.S. coastline during an exercise near American military bases, a submarine squadron commander recently told Zveda, Russia's Defense Ministry's official broadcaster, RT reported.

The news of the nuclear submarine activity was made in a military television series on Zveda. The episode's focus was Akula-class Shchuka-B nuclear-powered submarines.

"This mission has been accomplished, the submarines showed up in the set location in the ocean and returned to base," said submarine squadron commander Sergey Starshinov.

Starshinov said the submarine went "undetected" upon close approach to U.S. shores without violating maritime borders by staying in international waters. The date and location of the undetected activity was not been disclosed.

The U.S. Navy did not respond to a request for comment.

Russia's submarine activity is at a post-Cold War high, Gen. Curtis Scaparrotti – the Supreme Allied Commander Europe of NATO Allied Command Operations, said Thursday.

"They are deploying more and they are deploying at a higher rate," he said. "The forces they are deploying are being modernized, particularly with their weapons systems."

Scaparrotti told the House Armed Services Committee that the U.S. needs to invest more to keep up with Russia's naval activity.

Scaparrotti said last week that the Russian military may surpass U.S. military capability in Europe by 2025.

"Given their modernization, the pace that it's on … We have to maintain our modernization that we've set out so that we can remain dominant in the areas that we are dominant today," Scaparrotti said. "If we were not to do that, I think that their pace would put us certainly challenged in a military domain in almost every perspective by, say, 2025."

Scaparrotti also said Russia was doubling down on efforts to control Arctic sea lanes. "They would have the capability in some time, perhaps two or three years, to control the Northern Sea route if they chose to do so," he said, adding: "We're not keeping pace."

Emergency At Sea – The Crisis On A Nuclear Sub That Had To Stay Secret
Staff, The Scotsman, March 20

It was June 1978, the Cold War was in full swing and the Polaris submarine, HMS Revenge, was on patrol somewhere so sensitive that 40 years later we still cannot be told. A sudden roar that "sounded like a jumbo jet taking off" was followed by the cry of "Steam leak in the TG (turbo generator) room". The scene was set for the most serious crisis in the history of Britain's nuclear fleet – as far as we know.

The detailed story of that event is told for the first time in a book by Eric Thompson, the Senior Engineer on watch aboard HMS Revenge that day. He went on to become Commodore in charge of the Faslane base and the submarines it served. "I knew the emergency drill by heart," he writes. "'Shut Both Main Steam Stops'. That would shut off all steam to the engine room. At a troke, it would kill the leak… it would also scram the reactor, the pumping heart of the submarine; the plant would automatically go into emergency cooling and there was no recovery from that at sea. "We would have lost our power source, be reduced to a dead ship. We would have to surface and signal for a tug. Unthinkable… We were in our top-secret patrol position. Our number one priority was to emain undetected." The undignified prospect of Britain's nuclear deterrent limping back from wherever-in-the-world to Faslane on the end of a tug-line would, as Thompson points out, have had considerable political ramifications: "It would mean national humiliation. The credibility of our nuclear deterrent was at stake… Jim Callaghan's government was riven by anti-nuclear sentimen if the deterrent appeared to fail, Britain's nuclear strategy would be holed below the waterline."

In the end, crisis was averted by deploying an "obscure dockyard procedure never used at sea." This involved by-passing the main engines so that the steam was fed directly into the condenser. For the benefit of the lay audience, Thompson helpfully equates this to "emptying the domestic hot water tank straight into the toilet". He writes: "For what seemed like an eternity, nothing happened. The roaring of the steam continued. The humidity was unbearable. Then there was a mighty whoosh down the starboard steam range behind my back… The boiler had been deflated. The roar of steam had stopped." Damage had been done and the vessel lost much of its power. "We could launch our missiles if necessary but our maximum speed was severely reduced… For the next eight weeks we would be walking a tightrope; one machine failure could bring everything tumbling down. "Submarines on deterrent patrol do not break radio silence. No one knew of our plight. Nobody would for another eight weeks." One member of Thompson's team was given a bravery award for his efforts to isolate the leak. "He had been within three metres of it before being driven back by the heat… he had ripped his back open whilst squeezing through a jungle of pipework."

But let's cut to the chase. While steam leaks and the derring-do required to address them are all very exciting, they also beg a bigger question. Was there at any point a threat of a nuclear accident? Eric Thompson remains adamant in his denial. "Absolutely not. The worst that could have happened was that we would have had to surface – and maybe I would have been poached alive." You get the impression he might not have regarded this as a worse fate than being towed back to Faslane in the full glare of publicity and political outrage. Thompson grew up in Coatbridge and his destiny was set when his father spotted an advert for scholarships to Britannia

Royal Navy College, Dartmouth. In the face of intense competition, mainly from the public schools, he gained admission and embarked on a stellar naval career which coincided with the hottest years of the Cold War. Another of that Dartmouth intake later became Admiral of the Fleet, Lord Boyce. The two became lifelong friends and Boyce provides a foreword in which he encapsulates an argument which goes to the heart of the debate about nuclear weapons. "The secrecy of the Submarine Service means that few outsiders know what life was like or what kept us busy. Yet we were performing the greatest public service of all, making a hugely significant contribution to the prevention of a third world war. In this, history shows that we succeeded: the Cold War ended peacefully." Boyce continues: "It is no coincidence that in the first half of the 20th century there were two horrific world wars but none in the second half; one could argue that the difference was that in the second half, we had a strategic nuclear deterrent." One could also argue, of course, against that proposition. What is unusual about this book is that it provides a perspective that often goes unrepresented – that of a professional practitioner who lived for decades in close proximity to nuclear weapons, while regarding them as instruments of peace rather than war. In the aftermath of the crisis aboard HMS Revenge, Thompson recalls how he "staggered through the Reactor Compartment into the eerie tranquillity of the Missile Compartment, as if I had entered another world in which 16 one and a half metre diameter vertical tubes each containing a Polaris intercontinental ballistic missile stood like silent sentinels…The order of the day in the Missile Department was serenity." Eric Thompson, who now lives in Craigendoran, has spent much of his career in Scotland. He courteously sent me an advance extract from his book because of a nice reference, dating back to the early days of the West Highland Free Press and the decision to establish a torpedo testing range in the Sound of Raasay. His superiors thought that local opposition would be ill-informed and easily brushed aside. Thompson, whose father-in-law was from Lewis, knew better and probably enjoyed the spectacle as his superiors were taken apart at a public meeting in Kyle of Lochalsh, where the Commodore finally expostulated: "You should all count yourself damn lucky. If you were in the Soviet Union, you wouldn't be allowed to ask these questions!" The range was established and complaints these days are only heard if there is to be a loss of civilian jobs. In the same way, the public assimilate most of what the military want and decide, on balance, that it is probably for the public good. Thompson's down to earth memoirs and practical insights will probably help to reassure them. At root, nuclear weapons involve a moral issue more than a political one. The case against is that it is wrong to possess weapons which cannot, under any conceivable

circumstances, be used. The case in favour is Lord Boyce's – that it is possession which guarantees that they will never be used. Take your pick.

Thompson says that he has written the book because, at 75, he is one of a diminishing band who saw the Cold War from his end of the periscope. As international tensions threaten to return to Cold War levels, he remains confident about the power of deterrence. "There will always be surrogate wars," he says, "but ultimately, no regime is prepared to risk its own destruction."

Dod's Cost Of Low-Yield Nuclear Warhead For Submarines Set At $48.5 Million
Aaron Mehta, Defense News, March 19

WASHINGTON — The Pentagon expects to spend $48.5 million over the next five years developing a new low-yield nuclear capability for submarine-launched ballistic missiles.

That figure was included in written submissions to Congress, obtained by the Union of Concerned Scientists and shared with Defense News ahead of upcoming hearings about the defense budget. It represents only the defense department's expected expenditure for the new warhead, and does not include funding from the Department of Energy.

Per the testimony, there is $22.6 million set aside to help develop the warheads in fiscal 2019 and $48.5 million spread over the life of the Future Years Defense Program, or FYDP, a series of projected numbers that cover through FY23.

That includes $19.6 million in FY20, $3.2 million in FY21, $1.5 million in FY22 and $1.6 million in FY23. Those numbers are just projections and could change depending on need or changes in technical difficulty — notable, as the National Nuclear Security Administration has yet to figure out the full design and is still working out the technical requirements.

But the fact the money is largely up-front is in line with what has been said publicly by government officials about the timeline for the W76-1, the existing SLBM warhead design currently going through a life extension program.

That extension production line is scheduled to shut down in FY19, but NNSA director Lisa Gordon-Hagerty told senators at a March 14 hearing that the government is sorting through right now whether they would need to extend that production run to accommodate the lower-yield options.

The lower-yield option "shouldn't have a significant" impact on the current W76-1 production, Gordon-Hagerty said, adding that she did not expect any special testing or simulations would be required for the low-yield option as opposed to their more destructive cousins.

However, she also noted that there is currently no money in place from NNSA's budget to work on the W76 variant, signaling that the $48.5 million DoD expects to spend will not be the final cost of the weapon design. NNSA handles development and production on the warhead itself, while DoD handles the delivery systems.

Easy modification?

The Nuclear Posture Review raised eyebrows with its call for a low-yield warhead for the submarine-launched ballistic missiles. The plan involves a "near-term" solution in which the NNSA would modify a small number of existing W76 SLBM warheads to turn them into low-yield weapons. Just how many warheads would be modified is classified. The agency is already in the process of doing a life extension on the W76 warheads for those weapons, with Robert Soofer, deputy assistant secretary of defense for nuclear and missile defense policy, telling reporters ahead of the NPR's publication that the plan is to set aside a few of those warheads and make them less powerful, instead of developing a brand-new system.

"All this would require us to reserve the last X number, tens of warheads, and instead of doing a full [life extension], do the primary only. It doesn't require additional capacity," Soofer said of developing the capability. On the Navy side, the service would "just take that warhead and make sure they can qualify" an SLBM on a sub.

The Pentagon has argued that developing low-yield nuclear weapons is needed to counter threats from China and particularly from Russia, which has invested significantly in its own low-yield weapons in what U.S. officials believe is part of its "escalate to deescalate" strategy. Under that concept, Russia would be willing to use a small nuclear weapon, assuming NATO allies — when faced with using a strategic nuclear weapon or not responding at all — will back down in a conflict.

However, members of the nonproliferation community, such as Stephen Young, a senior analyst with the Union of Concerned Scientists, counter that a low-yield weapon will be destabilizing, particularly given the rhetoric from the Trump administration over nuclear weapons.

"Providing any president with new, more usable nuclear capabilities deserves serious contemplation at any time. The fact that it is this president, with his bellicose rhetoric and threats of 'fire and fury,' make it even more important," Young said. "This is not something that should be rushed through in a little over a year, even if such speedy action is nominally possible."

Russian Submarine Activity At Post-Cold War High
James Vandiver, Stars and Stripes, March 15

Russia submarine activity is at its highest levels since the 1980s as Moscow continues to invest heavily in its maritime capabilities, the top military commander in Europe said Thursday.

"They are deploying more and they are deploying at a higher rate," said Gen. Curtis M. Scaparrotti, adding that the Russian navy is regularly maneuvering from the Arctic to the Mediterranean. "The forces they are deploying are being modernized, particularly with their weapons systems."

While the U.S. remains dominant undersea, more investment will be needed to keep that edge, Scaparrotti told the House Armed Services Committee.

The Navy's fleet of fast-attack submarines is scheduled to dwindle from 52 to 42 by 2028, according to the Congressional Research Service, as Cold War-era boats reach their decommissioning dates.

The number wouldn't rise back to 52 until the 2030s under current estimates, even as the Navy plans to order two new Virginia-class submarines annually and considers extending the life of some of its aging Los Angeles-class subs.

In Europe, a more aggressive Russia is challenging the U.S. and its allies in conventional military ways that recall the Cold War, as well as with newer electronic methods.

For U.S. European Command, much of the focus has centered on deterring traditional threats.

U.S. patrols in the Black Sea have doubled, brigades are rotating regularly along NATO's eastern flank and efforts are underway to ensure the faster movement of forces in Europe, Scaparrotti said.EUCOM would benefit from more permanently based forces to deter Russia, such as a fires and aviation brigade, Scaparrotti said.

Still, much of the challenge lies outside traditional military areas of operation, such as Russian information operations that seek to undermine the West and NATO, the general said. EUCOM has a relatively new command group focused on disinformation, but more coordination across the U.S. government is needed to deal with the threat, Scaparrotti said.

While Russia poses a conventional military threat, "the one big area where they are acting on a consistent basis is their disinformation, cyber campaign," Rep. Adam Smith, D-Wash., said. "We are barely on the playing field at this point."

"We need a more robust effort," Scaparrotti said regarding a cyber campaign, but added that such an effort would be led by the State Department.

"Right now the State Department is not in a good place," Smith replied.

Meanwhile, it is too early to tell if the recent U.S. decision to provide lethal arms to Ukraine is altering Russia's calculus when it comes to backing separatists in the country's east.

"Ukraine is in what I would consider a hot fight right now, not a frozen conflict," Scaparrotti said. "It is not my belief Russia wants to resolve this conflict at this point."

A Chinese Shipbuilder Accidentally Revealed Its Major Navy Plans
Jeffrey Lin and P.W. Singer, Popular Science, March 16

For a brief moment, the China Shipbuilding Industry Corporation (CSIC), put online China's next big naval projects (but quickly pulled them down). The revelation, of which screenshots were taken before censors intervened, provided a picture of China's ambitions for a world class navy.

This new display at the Military Museum of the Chinese People's Revolution, was newly installed for the PLA's 90th anniversary.

While it has speculative features like four catapults, J-20 fighters and stealthy UCAVs, the nuclear powered Type 003 supercarrier probably won't enter service until after 2030.

CSIC is a major shipbuilder for the People's Liberation Army Navy, responsible for high ticket items like aircraft carriers and nuclear submarines. The biggest item in CSIC's not-so-secret portfolio is China's first nuclear-powered carrier. Popularly identified as the Type 003, it will be the largest non-American warship in the world when its launched in the late 2020s. CSIC's Dalian Shipyard, which refurbished the aircraft carrier Liaoning, and launched China's first domestically built carrier, CV-17, in 2017, will presumably build China's first "Type 003" CVN.

The Type 003 will displace between 90,000-100,000 tons and have electromagnetically assisted launch system (EMALS) catapults for getting aircrafts off the deck. It'll likely carry a large air wing of J-15 fighters, J-31 stealth fighters, KJ-600 airborne early warning and control aircraft, anti-submarine warfare helicopters, and stealth attack drones. When joined with Type 055 destroyers and next-generation attack submarines, it would provide the PLAN a highly capable task force for representing China on global missions.

The Type 095 SSN, seen in this speculative fanmade CGI, will likely have VLS cells for launching a wide range of cruise missiles, pumpjet propulsion and improved quieting technology. The first Type 095 will likely begin production in late 2017 at the giant new BSHIC factory, with many more to follow in the 2020s.

CSIC's website also boasted that it would build a new nuclear-powered submarine, likely the Type 095 nuclear attack submarine (SSN). The Type 095 SSN would be built at CSIC's Bohai Shipyard, which is China's sole nuclear submarine shipyard. Compared to the Type 093 SSN, the Type 095 SSN will include new noise reduction measures, like an integrated electric propulsion system and possibly a shaftless rim drive, single hull, and electronic noise cancellation. CSIC is also working on a separate 'quiet' submarine project, presumably to be built at its Wuhan conventional submarine shipyard. This submarine is presumably quieter than the air-independent propulsion (AIP) Type 039B Yuan submarine; it'll likely have quieting measures like a single hull, a new AIP system, and lithium-ion batteries. A new generation of Chinese submarines could help the PLAN remedy its historic technologic disadvantage against the submarines forces of the American and Japanese navies.

This large AUV, similar to the USN's LDUUV, is used for long term autonomous missions; its size allows for it to carry modular payloads of sensors, mine warfare and ASW. It could be the precursor to larger Chinese armed UUVs carrying torpedoes and missiles. The big CSIC announcement also covers 21st century naval wish lists, like autonomous robot submarines. This is the first official confirmation of China pursuing armed unmanned underwater vehicles (UUVs), in addition to unmanned surface vehicles already offered for exports. Autonomous UUVs, armed with torpedoes and missiles, could act as expendable scouts or wingmen for manned Chinese submarines and surface warships, such as undertaking dangerous missions like probing enemy minefields, launching sneak attacks, and drawing away enemy forces.

The Underwater Great Wall may be centered around stationary sensors on the ocean bed, but autonomous UUVs will be a critical enabler in not just tracking enemy submarines, but finding them.

To defend Chinese home waters and expand the anti-access/area denial umbrella underwater, CSIC is designing an underwater attack and defense system. It could likely be an armed variant of the "Underwater Great Wall" of UUVs, other maritime robots and seafloor sensors. With built in modularity, it could be tailored to defend naval bases with surveillance UUVs and counter torpedo defenses on one end, and at the other end of the spectrum; a networked minefield of armed and smart UUVs supported by automated underwater listening posts. These capabilities would require not just the platforms, though; CSIC would need to master emerging technologies like underwater high capacity datalinks, combat AI, and multi-spectrum sensors.

Russian Spy Ship Appears Off US Coast Near Ballistic Missile Base
Wade Bennett, AmericanMilitaryNews.com, March 12

A Russian spy ship has once again been spotted just off the coast of the United States, this time near a ballistic missile submarine base in Georgia, according to Navy officials, The Washington Free Beacon recently reported. The Viktor Leonov had been operating some 20 nautical miles offshore for the past several days.

This particular Russian spy ship has been monitored numerous times over the last several months. In January, it cruised within 30 miles of the Virginia coast, and just a few weeks ago, the ship ventured near a U.S. submarine base in Connecticut.

"We are tracking the Viktor Leonov's presence off the East Coast, much like we are aware of all vessels approaching the United States," said Navy Cmdr. Bill Speaks, a Navy spokesman. "We respect the right and freedoms of all nations to operate in international waters in accordance with international law."

The Leonov has been known for conducting annual reconnaissance near various U.S. military facilities off the East Coast, and its most recent target was the Naval Submarine Base Kings Bay off the coast of Georgia, which is home to U.S nuclear missile submarines.

On the spy ship's capabilities, Steffan Watkins, a Canadian security analyst who closely tracks Russian ship movements, said that "the most obvious purpose of the ship being off the coast is collecting signals intelligence."

"The ship is outfitted with more than antennas above the water line," he added. "Viktor Leonov is reported to have magnetic anomaly sensors, acoustic gear to profile American vessels, and have the capability to map the ocean's floor."

While the ship's activities appear to be relatively routine, its presence came just days after Russian President Vladimir Putin announced Moscow's new "invincible" nuclear weapons aimed at the United States. The weapons were featured in a video presentation during a speech that showed a simulated nuclear attack on Florida.

Russia's increased military efforts have continued to be a cause for concern for the Pentagon and President Donald Trump.