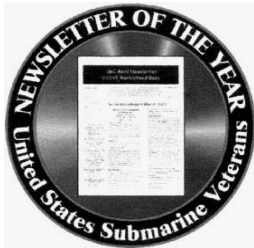


American Submariners Inc.  
4370 Twain Ave.  
San Diego, CA 92120-3404



## *The Silent Sentinel* JULY 2015



### *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.



# The "What Don't You Get?" Issue

# U.S. Submarine Veterans San Diego Base

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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.*

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY/STATE/ZIP: \_\_\_\_\_

EMAIL: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

Would like the SILENT SENTINEL emailed: YES \_\_\_\_\_ NO \_\_\_\_\_

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**DUE TO LOGISTICS CONSTRAINTS, ALL INPUTS FOR THE SILENT SENTINEL MUST BE IN MY HAND NO LATER THAN *ONE WEEK* AFTER THE MONTHLY MEETING. IF I DO NOT RECEIVE IT BY THIS TIME, THE ITEM WILL NOT GET IN. NO EXCEPTIONS! MIKE**

### ***July 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 14 July, 2015. 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**

Jack Lester, George Koury, Frank Walker, R.C. Thompson. on the binnacle list.

## ***Submarine Losses in July***

Originally Compiled by C J Glassford



Tolling of the Boats for July

USSS-28 (SS-133)

Lost on July 4, 1944 with the loss of 49 crew members. She was conducting training exercises off Hawaii with the US Coast Guard Cutter Reliance. After S-28 dove for a practice torpedo approach, Reliance lost contact. No distress signal or explosion was heard. Two days later, an oil slick was found near where S-28. The exact cause of her loss remains a mystery.

USS Robalo (SS-273)

Lost on July 26, 1944 with the loss of 81 crew members while on her 3rd war patrol. She struck a mine about 2 miles off the coast of Palawan. Four men survived and swam ashore, then were imprisoned by the Japanese. Unfortunately, they were put on a Japanese destroyer and lost when that destroyer was sunk.

USS Grunion (SS-216)

Lost on July 30, 1942 with the loss of 70 crew members while on her first war patrol near Kiska Harbor. She radioed that she sank two sub-chasers and damaged a third, but was never heard from again. Grunion's mangled remains were found in the Bering Sea in 2006 off the Aleutian Island of Kiska.



## ***San Diego Base, United States Submarine Veterans Inc. Minutes of Meeting - 9 June 2015***

1902 - Base Commander Bob Bissonnette called the meeting to order

Conducted Opening Exercises - Pledge of Allegiance lead by Secretary Jack Kane

Base Chaplain Russ Mohedano lead the prayer and conducted Tolling of the Boats lost in the month of June.

Base Commander recognized Past Commanders and dignitaries, welcomed Guests and new members.

Secretary Jack Kane announced 34 (30 members and 4 guests) present.

The minutes of the 12 May 2015 meeting were approved as published in the Sentinel.

Treasurer David Ball gave his report. Checking Balance \$5485.20 with total assets of \$20,728.00. A copy of the Treasurer's Report will be filed with these minutes.

Base Commander Called For Committee Reports

Chaplain Russ Mohedano reported the following on the Binnacle List: George Koury, Frank Walker, R.C. Thompson, and Jack Lester.

Parade Chair Joel Eikam announced the next parade is 27 June in Oceanside starting at 10:00 am. This parade will also feature the Bonefish Base float. Everyone is invited to lunch with Bonefish Base members at the Oceanside Elks Club. We will attend the Julian 4th of July Parade, on Saturday July 4th. The Parade starts at noon. The Julian American Legion will serve their famous BBQ immediately following the parade.

Membership Chair Ray Febrache announced 280 members. He also announced that National dues have been raised to \$25 a year.

Scholarship Chair Paul Hitchcock announced the scholarship award winners for 2015 are: Ryan Mohedano and Derek Gorton. Scholarship Chairman Paul Hitchcock and Base Commander Bob Bissonnette awarded Certificates and \$500 checks to both Ryan and Derek. Each recipient gave a short synopsis of their college endeavors, their plans for the future and how they would employ the funds. Neither proud Grandpa Phill Richeson or proud Dad Russ Mohedano were asked to comment as those speeches would have taken more time than we have allotted for this meeting. Congratulations to both Scholarship winners.

Storekeeper Phill Richeson has new key chains and vest chains for sale.

Breakfast Committee and 52 Boat Memorial Chair Warren Branges reported the Breakfast held 31 May netted \$266.31. Next Breakfast is 30 August 2015.

Warren reported that the 52 Boat Memorial plaque replacement is almost finished. All 52 Boat replacements are installed. The paperwork to convert the Memorial to a 501.3(c) Charity is finished awaiting approval by IRS. Next Full Flag Day will be 14 June.

1934 - Base Commander called for a break.

1950 - Base Commander called the meeting back to order. 50/50 drawing was held. \$70 was put into the operating fund.

1950 - Unfinished Business

Base Commander reported on the Laughlin Roundup. The Tolling of the Bells ceremony was held at the American Legion. It was well attended. The Commanding Officer of USS San Francisco was the Guest Speaker at the Roundup. Next year's Roundup will held 1-6 May 2016. Hotel cost is the same, \$34.00 per night.

Base Commander reported that the Memorial Day Services at The Roncador Memorial on Naval Base Point Loma, hosted by Scamp Base, was well attended. San Diego Base has volunteered to host next year's ceremony. A wreath laying ceremony was held immediately after the ceremony at The 52 Boat Memorial on Liberty Station.

Base Commander reported that San Diego Base Annual Picnic will be held 25 July at Smuggler's Cove on Naval Base Point Loma (fka SUBASE) from 0900-1900. Two submarine tours will be offered. One at 1000 and one at 1300 (depending on boat availability). Send your Base Access data and Sub Tour requests to Senior Vice Commander Warren Branges by 8 July. Anyone wanting to donate Door Prizes see the Base Commander.

Base Commander mentioned that our Submarine Float was judged best at show at the La Mesa Flag Day Parade. We were honored with the "The Jewel of Hills" Award for the second consecutive year.

Base Commander commented on the new fund raising initiative, recycling printer cartridges. Anyone who has

cartridges for recycle bring them to the next meeting. Some cartridges can be worth up to \$20 at recycle

- A suggestion made from the floor to solicit banks for used cartridges.

Any other suggestions for fund raising should be sent to the Base Commander. We need to find new revenue streams as over 75% of our membership are Life Members and therefore pay no annual dues. The Ways and Means Committee will take this subject up for discussion.

2013 - New Business

The monthly Warrior Social, hosted by SUBRON 11, will be held on 25 June at Smuggler's Cove, Naval Base Point Loma. Starts at 1100.

The VFW will host at Pork Chop Dinner on Friday, June 12th, 1700-1900. Come by and taste the Pork Chops. If enough people are impressed we may change the Christmas Party menu from beef to pork.

Base Commander briefed the possibility of obtaining a room for Submarine Memorabilia at Terri Ulmer's six acre Destroyer Wheelhouse WWII Tribute and Museum. Bob Bissonnette will look into touring Terri's compound.

2016 – Good of the Order

Shipmate Mike Hyman held an auction for the good of a shipmate. The Line Drawing bids did not meet the auction reserve. Mike will offer the drawing on line.

Our submarine Float will be featured on the Channel 5 Morning News in the 0700 half hour on Thursday, 25 June.

Send your Base Access information to Senior Vice Commander Warren Branges by 8 July for access to picnic on 25 July. Warren will send a message to everyone who was on the list last year asking for updates. If you don't get the message or weren't on last year's list contact Warren as soon as possible, but not later than 8 July.

The San Diego Base Christmas Party will be held on 19 December at the VFW Post 3787, 4370 Twain Avenue, San Diego, CA 92120. Mark your calendars.

The Meeting was adjourned at 2027

/s/ Jack E. Kane

Jack Kane, Secretary

Sailing List for 9 June 2015

Fred Fomby  
 Warren Branges  
 Phill Richeson  
 David Ball  
 Benny Williams  
 Juanita Williams (Guest)  
 Ed Farley  
 Bud Rollison  
 William Johnston  
 Mert Weltzien  
 Jack Kane  
 Bill Earl Russ Mohedano  
 Ryan Mohedano (Guest)  
 Peter Lary

Paul Hitchcock  
 Ray Febrache  
 W.J. (Joe) Sasser  
 Manny Burciaga  
 Mike Colombo (Guest)  
 Joel Eikam  
 Bob Farrell  
 Larry Dore  
 Dennis McCreight  
 Michael Hyman  
 Rocky Rockers  
 Derek Gorton (Guest)  
 Jim Harper  
 Tom Polen

Jim Bilka  
 Bob Welch  
 James Pope  
 David Montgomery??  
 (^^not legible^^)

## Current News

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

The Fading U.S. Nuclear Deterrent  
Robert R. Monroe, Wall Street Journal, July 13

The next president must restore America’s aging arsenal to face a world of new atomic threats.

None of the presidential candidates is talking about it, but one of the most important issues in the 2016 election should be the precarious decline of America’s nuclear forces.

When the Cold War ended in 1991 with the dissolution of the Soviet Union, the U.S. began a debilitating nuclear freeze, establishing ever-broader antinuclear policies and largely ignoring the growing threat posed by these massively destructive weapons.

Meanwhile, Russian President Vladimir Putin’s military strategy focuses on early use of these weapons in conflicts large and small. China is in the midst of an immense strategic modernization. India and Pakistan are expanding and improving their nuclear arsenals. North Korea issues nuclear threats almost weekly. The Mideast is dissolving into chaos, and Iran’s advanced nuclear-weapons program has been on the front pages for two years.

To address these multiplying threats, U.S. nuclear policy must undergo radical changes. Because policies as important as this require White House and congressional agreement and the support of the American people, a full-scale national debate is essential. I propose we begin with the following five changes:

- Discard President Obama’s goal of a “world without nuclear weapons.”

Such an impossible vision can be expressed as a hope, but as U.S. policy it is nonsensical and terribly damaging. America’s pre-eminent national goal – on which U.S. survival depends – must be paramount nuclear-weapons strength.

Since the dawn of the nuclear era, 12 U.S. presidents – six Democrats and six Republicans – have specifically stated nuclear superiority as U.S. policy. Mr. Obama reversed it upon taking office and has accelerated the deterioration of America’s nuclear arsenal.

- A return to legitimate deterrence in U.S. foreign policy.

Deterrence is based on fear. You threaten your adversary with intolerable consequences if he does not comply with your demands. Then, through reinforcing actions, you convince him that you have the will and capability to carry out your threat. For five Cold War decades the daily practice of deterrence kept the U.S. safe from Soviet attack and the devastation of nuclear war. But for the past two decades nuclear deterrence has been missing from the U.S. toolbox. Bring it back.

- Establish effective, rather than counterproductive, nonproliferation policies.

The proliferation of nuclear weapons is a threat like no other. Yet for decades U.S. nonproliferation policy has been misguided and inept. Our leaders have passively allowed the valuable Nuclear Nonproliferation Treaty, which entered into force in 1970, to be distorted into a useless nuclear-disarmament treaty.

Most important, we’ve failed to emphasize – nationally and internationally – that nonproliferation requires enforcement. Hand-wringing and sanctions won’t work. There must be a cop on the beat, and military force must be used if necessary. Finally, our attempted nuclear agreement with Iran is counterproductive; if signed it will trigger a global cascade of proliferation.

- Modernize America’s nuclear arsenal.

President Obama’s policy doesn’t permit research, design, testing or production of new, advanced nuclear weapons. Our current nuclear weapons – strategic and tactical – were designed and built decades ago to meet different threats, and have gone untested for decades.

With great urgency, the Energy Department’s National Nuclear Security Administration must be freed to produce an entirely new nuclear-weapons stockpile, including specialized low-yield advanced weapons. Production and testing facilities – atrophying for decades – must also be built on an accelerated schedule.

- Also with great urgency, recover the Pentagon’s nuclear-weapons capabilities.

These have also suffered from Mr. Obama’s policies. Hundreds of nuclear-weapons specialists have left the U.S. government without replacement. Research into the effects of nuclear weapons, a critical field of military study, is virtually nonexistent. Nuclear-weapons strategy and tactics are rarely included in military exercises. Worse, U.S. leaders have failed to plan and budget for the next generation of nuclear-delivery systems – intercontinental ballistic missiles, submarine-launched ballistic missiles and bombers.

If these policies seem tough, recall that the U.S. observed them all for a half-century, just a generation ago. Today’s nuclear threats are as dangerous as those during the Cold War. Change can’t wait. Even if reform begins in 2017 under the next administration, it will take decades to regain America’s once dominant nuclear capabilities and re-establish a viable policy of deterrence.

Mr. Monroe is a retired vice admiral in the U.S. Navy and a former director of the Defense Nuclear Agency (1977-80).

Analysts: Exploit 'Virtual Attrition' Wherever Possible In Dueling Battle Networks

Richard R. Burgess, SeaPower, July 9

WASHINGTON – Analysis of several 20th century historical campaigns offers lessons applicable to battle network competitions in the current century, two think tank analysts said.

Briefing reporters July 9 on their new report, "What It Takes to Win: Succeeding in 12st Century Battle Network Competitions," Bryan Clark and John Stillion, defense analysts for the Center for Strategic and Budgetary Assessments in Washington, presented several case studies from World War II, the Cold War and the Vietnam War to show how the fundamental attributes of submarines and aircraft shaped two long-running and currently running battle network competitions (BNCs): the competitions between submarines and anti-submarine warfare (ASW) forces, and between air strikes and integrated air-defense systems (IADS).

Clark, a former submariner, listed the enduring aspects of submarines (slow speed, limited sensor range and lack of self-defense) that produced "enduring aspects of the submarine-ASW competition:

- Submarines must preposition themselves for attack.
- Surface ships can avoid submarine attack.
- ASW ships and shore systems can establish a detection-range advantage.
- Submarines can "clear datum" if detected.
- Submarine utility is constrained by how the other side operates.
- Submarines predominantly provide capabilities for denial."

Clark discussed the progression of World War II's Battle of the Atlantic, in which allied ASW forces employed innovative technology and operational concepts to battle the German U-boat forces. New technology or operational concepts in turn were countered in an ever-escalating competition, in which the cycle time would steadily decrease over time, especially in the electro-magnetic spectrum.

He said his research showed that attrition of U-boats was not the key to victory in the Atlantic. More important was the operational concept of the convoy, which reduced losses of shipping dramatically even with attrition of U-boats remaining at a low level. He also discussed the example of the Allied effort to intercept and sink U-boats in the Bay of Biscay as they departed or returned to port. Although the U-boat losses were not substantial, they were forced to operate submerged for longer periods and forced to take more circuitous transits, thus reducing the time on station and the number of U-boats available for attack. This, he said, was an example of "virtual attrition."

Clark also noted the "saved by the bell" aspect of BNC, where other factors bring the war to an end and save the victor from having to develop further countermeasures. As an example, near the end of the war, Germans had developed the Type XXI U-boat which had a snorkeling capability. If the war had lasted longer, the Type XXI could have greatly increased the difficulty of ASW for the Allies.

Clark also used the Cold War between the United States and the Soviet Union to illustrate the BNC. The U.S. ASW forces started out with and maintained an acoustic advantage for most of the period, but the Soviets developed more quiet submarines in the 1980s and the U.S. forces were facing decreasing advantage, having to track submarines closer to the Soviet Union bastions and beginning to invest in non-acoustic methods. The end of the Cold War saved the United States from having to massively invest in a different path, another "saved by the bell" example.

Clark said it was imperative to select appropriate metrics and to align "actions, metrics, and overall objectives:

- Focus actions on the metric and focus metrics on the main objective.
- Look for ways in which fundamentals of the submarine could be changed [such as new counter-torpedo systems long-range sensors or combat systems].
- Understand how operational tempo relates to communications.
- Exploit virtual attrition wherever possible.
- Remember virtual attrition requires the threat of actual attrition."

Stillion used the Royal Air Force's Bomber Command night aerial bombardment campaign versus the German IADS and the U.S. Rolling Thunder bombing campaign against North Vietnam to illustrate his points. He points out that aircraft have speed and wide access to geography but relatively low payload and persistence and are fragile compared with ships or armored vehicles, and therefore air arms are more sensitive to attrition. In the report he details the BNC between Bomber Command and the German IADS and how technology countermeasure cycles became shorter over time. He notes how, over a six-month period, the probability of a bomber crewman surviving a tour of 30 missions increased from 20 percent to 80 percent, which he attributed to a defeat of the German radar and communications systems through several electronic measures.

In his discussion of Rolling Thunder, Stillion notes how the introduction of the SA-2 surface-to-air missile and the MiG-17 jet fighter in North Vietnam greatly complicated the U.S. air campaign and required it to devote increasing resources to suppression of enemy air defenses, to the point where half of a typical strike package of 16 aircraft would be devoted to protection of the other half from missiles and fighters. He cites this as another example of virtual attrition.

Stillion offers these insights for current planners:

- Unlike submarines, aircraft and their crews often are lost over enemy territory and are vulnerable to technological exploitation.
- Generally it is better to field innovative airborne systems in large numbers to achieve operational results before countermeasures render them ineffective.
- Air forces are extremely sensitive to actual attrition.
- The goal of an IADS is to minimize damage to important assets, not necessarily to shoot down aircraft.
- IADS can impose significant virtual attrition on attacking air forces by forcing them to operate less effectively.

India's Nuclear Powered Submarine To Undergo Missile Tests This Year (India)  
DefenseWorld.net, July 10

India's nuclear-powered submarine INS Arihant will undergo first underwater missile and deep diving tests this year.

"INS Arihant will go for deep sea diving this year and along with a series of tests, we would like to test B-05," Director-General of Defense Research and Development Organization (DRDO) and Secretary (Research and Development), S Christopher said to Indian media Thursday.

The submersible ballistic, nuclear (SSBN) submarine is capable of carrying medium range nuclear tipped missile 'B-05'.

DRDO is also proposing to develop a new long range nuclear capable Inter-Continental Ballistic Missile (ICBM), 'AGNI-VI' with a range of 10,000 km to the government.

India has successfully tested a range of 5,000 km (Agni-V) and is capable of delivering a 1,000 kg payload in April this year.

"It's at the thinking stage. We still do not have the sanction to make it but have the capability. We have to now present our case to the government explaining the need for such a missile," Christopher said.

"We are capable of developing ICBM that can hit targets beyond the range of 10,000 kms," Chairman of Armament Research Board, DRDO, S K Salwan had said on the sidelines of 6th National Conference themed 'Emerging Vistas of Technology in 21st Century' in April this year.

DRDO first made the plans for Agni VI public in a newsletter published in May 2011.

It is widely expected to be a four-stage ICBM with multiple independently targetable re-entry vehicles (MIRV) and a maneuverable re-entry vehicle (MaRV) capability.

How Many Ballistic Missile Submarines Will Russia Build? (Russia)  
Staff, The Diplomat, July 6

Russia will continue building Borei-class fourth generation SSBN (Ship, Submersible, Ballistic, Nuclear) submarines past 2020 the Russian Navy's Commander in Chief, Admiral Viktor Chirkov recently told TASS in an interview.

"Our shipbuilding program is devised in a way that does not envisage a stop to the construction of Borei-class submarines after 2020," Chirkov said at an international naval show in St. Petersburg last week.

Cherokee's statement could indicate that Russia's fleet of Borei-class submarines may increase from the currently planned eight to 12 by the 2020s. However, Chirkov emphasized that this is "depending on the situation and the development of international relations."

"Given the threats that we are facing today we say that we need eight (submarines), but tomorrow there may emerge other threats and we may need twelve submarines," he added.

Conversely, the admiral's remarks could also be interpreted as a vicarious acknowledgement that Russia's ambitious naval rearmament effort is encountering delays and setbacks including in its SSBN building program.

For example, as I reported last week (see: "Russia's Deadliest Sub Will Have a New Home by October"), construction of new docking and maintenance facilities for the new Borei-class vessels at the Rybachiy Nuclear Submarine Base in Russia's Far East will in all likelihood only be completed by October 2015 (the original plan called for a December 2014 completion date).

Also, only one Borei-class sub will join Russia's Pacific Fleet this year, according to Russian naval source quoted by TASS instead of two.

"In August-September this year only one Borei submarine, The Aleksandr Nevsky will make a voyage from the Northern Fleet to Vilyuchinsk. Just recently it joined the permanent combat readiness naval force. The submarine carries 16 inter-continental ballistic missiles Bulava. The original intention was two Borei subs would leave for the Pacific 2015," the source told TASS.

The other SSBN Vladimir Monomakh will join the Pacific Fleet in 2016 due to the need for additional tests and delays in arming the sub with Bulava missiles.

As I reported before (see: "Putin's 'Red October': Russia's Deadliest New Submarine"), the Russian Navy is currently operating three Borei-class SSBNs. The first, K-535 Yuriy Dolgorukiy, was commissioned in January 2014 and currently serves in Russia's Northern Fleet.

The Vladimir Monomakh was commissioned in December 2014, while the Aleksandr Nevsky entered the Russian Navy's combat



force this April. TASS quotes an anonymous source within the Russian Ministry of Defense who confirmed the combat ready status of the Aleksandr Nevsky:

The submarine has successfully passed all the trials with test firing of all types of weapons. The vessel, armed with 16 Bulava intercontinental ballistic missiles, has been commissioned with the Navy combat forces.

Delays in Russia's naval rearmament program were inevitable as one expert on Russian military affairs noted a few weeks back (see: "Is the 'World's Deadliest Tank' Bankrupting Russia?"), since Moscow may want to slow down its weapons procurement process until oil prices have recovered, because, "with cost overruns, the money allocated may not be sufficient to build what they want to build."

Additionally, he noted that "regarding what it is they want to build, they won't get as many of them, they may take longer to build, but the programs will keep running as they are now."

#### Russian Submarines To Receive New Sonar Absorbent Composites (Russia) Nikolai Novichkov, HIS Janes 360, July 5

Russia's Krylov State Research Center (KSRC) has developed innovative new technologies, which will reduce the ability of sonar to detect Russian submarines, according to Valeriy Shaposhnikov, chief of KSRC's endurance and shipping hull construction unit.

"We have developed the appropriate technologies and constructions made of composites," Shaposhnikov said. These new multilayer composites the company is using have a structure and consistency that absorb sonar signals, thereby preventing the detection of a submarine via hydroacoustics. "Such effect is provided by the extremely complex inner structure of the composite developed by KSRC," he added.

The innovative developments are currently undergoing stand trials, which include strength tests. According to Shaposhnikov, the control surfaces of a submarine can be made from the new composites.

Shaposhnikov's unit in KSRC is currently conducting trials of full-scale specimens of components from Russian diesel-electric submarines, in particular a Lada-class submarine (Project 677) rudder blade made of the special composites.

In his opinion, it is likely that the new composites will be integrated onto Russian submarines. "We have made great progress to this end," Shaposhnikov said. "The design bureaus take the decisions whether our innovations will be applied or not, as they have responsibility for their production ... The main advantage that our new technologies can bring is the reduction of probability of an underwater object's detection."

#### New Pacific Russian Nuclear Missile Submarine Facility Could Open By October Sam LaGrone, U.S. Naval Institute News, July 1

Upgrades to the Russian Navy's ballistic nuclear missile submarine (SSBN) base in the Pacific could be completed by October, Russian Navy chief Adm. Viktor Chirkov said on Wednesday according to Russian state-controlled media.

The improvements to the Russian Navy's boomer base on the Kamchatka peninsula will include improvements that will allow the operation of the new Project 955 Borei-class submarines.

"The system for basing the Borei-class strategic submarines in Kamchatka is moving along according to schedule and the work will be completed by October 1 of this year," Chirkov said in the Sputnik news service.

The new construction includes medical and recreation facilities for sailors as well as warehouses and a new crane used to install missiles on the Boreis.

At the height of the Cold War, the Russian Navy based more than a dozen SSBNs at the Kamchatka Rybachiy Nuclear Submarine Base but that number dwindled following the collapse of the Soviet Union.

The Russian Navy accepted the latest Borei-class boomer – Vladimir Monomakh (K-551) – in December.

The 19,400-ton boat is armed with 16 Bulava nuclear submarine launched ballistic missiles (SLBM) and is slated to replace the Project 941 Typhoon-class and Project 667BDRM Delta IV-class boomers.

The next Borei – Knyaz Vladimir – is designated as a Project 955A Borei II and could field up to 20 Bulava missiles, according to Naval Institute's Combat Fleets of the World.

The planned class of eight boats will serve as the backbone of the Russian sea-based nuclear deterrence force.

#### Vietnam Gets Fourth Submarine From Russia amid South China Sea Tensions Prashanth Parameswaran, The Diplomat, July 1

The fourth of six Kilo-class submarines Vietnam bought from Russia arrived on Tuesday amid continued tensions in the South China Sea, local media sources reported.

According to Thanh Nien News, the submarine, codenamed HQ-185 Da Nang, arrived at Cam Ranh Port in the south-central province of Khanh Hoa on Tuesday morning transported by the Dutch-registered cargo ship Rolldock Storm. It was part of a deal

Vietnam reached with Russia's Admiralty Shipyards for six Project 636 Kilo-class diesel-electric submarines for \$2 billion back in 2009. Under the agreement, signed during Prime Minister Nguyen Tan Dung's visit to Moscow, Russia agreed to provide the submarines, train Vietnamese crews and supply necessary spare parts.

The HQ-185 was reportedly launched on March 28, 2014 at the Admiralty Shipyards in St. Petersburg, Russia, and had a trial run on the Baltic Sea. It set sail for Vietnam in the middle of May this year.

The remaining two submarines are expected to be delivered to Vietnam by 2016. The fifth, codenamed HQ-186 Khanh Hoa, underwent a trial run in the Baltic Sea on June 8.

The latest delivery comes amidst simmering disputes in the South China Sea, where both Vietnam and China are claimants alongside the Brunei, Malaysia, the Philippines and Taiwan. In just this month alone, Vietnamese fishing craft have clashed with Chinese boats near the disputed Paracel Islands, while reports last week indicated that Beijing had redeployed an oil rig near contested waters. On Tuesday, China also announced that some of its land reclamation projects had been completed, and that the focus would now shift to the construction of facilities on these features, which, as I emphasized previously, would also include military equipment (See: "The Truth About China's South China Sea Land Reclamation Announcement").

The Kilo-class submarines are some considered to be one of the quietest diesel submarines in the world, and are designed for anti-submarine warfare and anti-surface-ship warfare. Several analysts, including Carlyle Thayer at The Diplomat, have explored how Vietnam People's Navy (VPN) may use them to counter Chinese naval capabilities in the South China Sea.

A 21st Century Submarines Arms Race Could See Numbers Exceeding  
The 1000 German U-Boats of WW2  
Staff, Next big Future, July 1

There were about 1000 German U-boats built over the course of World War 2.

The main German sub was the Type 7C which was about 800 tons and 67 meters (220 feet) long.

Currently the USA has about 55 nuclear submarines that cost about \$1-3 billion each. On average the cost of each submarine is about \$1.6 to 2 billion. The annual operating cost for any of these subs is approximately \$21 million. The typical service life of a nuclear sub is about 30 years. Refueling and modernizing at the half-life point costs about \$200 million. Near the end of the service life, another refueling and extensive overhaul for about \$410 million will extend the life another 12 years, for a total service life of 42 years. This totals to about \$3.6 billion in constant dollars over the lifetime of a Seawolf class sub.

Air independent diesel electric can cost about \$100 to 300 million. Operating costs are lower. Automation can reduce the crew required and further reduce costs. Mass production of robot submarines could see unit costs at \$50 million.

James Fanell (x- Navy captain and naval expert), predicted China's Navy would grow to include 99 submarines of all types, four aircraft carriers, 102 destroyers and frigates, 26 corvettes, 73 amphibious ships and 111 missile craft. All told, Fanell predicted, the Chinese Navy of 2030 will comprise 415 ships. This is up from about 300 ships now. This is based upon a projection of the current rate of production for the Chinese Navy. China building about 10 new submarines each year.

If there were an escalation of the submarine arms race that is currently beginning and the shift to low cost Air independent diesel submarines continued, then the 55 expensive US nuclear submarines could eventually be replaced by 1000 to 2000 robotic submarines and AIP diesel submarines. The USA and China could afford to spend \$5 to 15 billion per year building up to the 1000 to 2000 low cost and robotic submarine fleet levels over ten years.

'Picking up the quiet hum of a battery-powered, diesel-electric submarine in busy coastal waters is 'like trying to identify the sound of a single car engine in the din of a major city,' says Rear Admiral Frank Drennan, commander of the Naval Mine and Anti-Submarine Warfare Command.

Small but longer endurance submarines

China has a new midget submarine in the 400-500 tonnes size range (about 37 meters long.) It appears similar to the South Korean KS 500A.

KS 500A submarine specifications

- displacement — 510 tons;
- length of 37 meters;
- width — 4.5 m;
- maximum depth — 250 meters;
- max speed / economy — 20/7 knots;
- while the autonomous sailing — 3 weeks;
- range of up to 2 thousand miles.
- crew min / max people -5/10
- landing capacity — 14 people.

US Robotic anti-submarine ship

Speaking at a National Defense Association Event in Virginia, DARPA program manager Ellison Urban outlined why the Navy

needs sub-hunting boat bots.

DARPA has Robotic submarines in development. The Anti-Submarine Warfare Continuous Trail Unmanned Vessels (ACTUV) will be reportedly able to operate autonomously up to 90 days. The 132-foot autonomous boat will guide other US military vessels to the sub's location to destroy it.

The ACTUV prototype dubbed "Sea Hunter" will be ready for extensive tests in the fall of 2015.

Anti-submarine plane

The People's Liberation Army Navy (PLAN) has introduced into service a new maritime patrol and anti-submarine warfare (ASW) variant of the Shaanxi Aircraft Corporation (SAC) Y-8/Y-9 medium transport aircraft, national media reported in late June.

An unspecified number of the four-engined Y-8GX6 (Y-8Q) turboprops have now been inducted into the North Sea Fleet, which is responsible for the maritime domain that stretches from the North Korean border to Lianyungang (Jiangsu Province), some three-and-a-half years after the type was first revealed in late 2011.

No further details about the entry-into-service were revealed in the report, which appeared on a Chinese defence blogging site, except that the Y-8GX6 (Y-8Q) may be rolled out to the PLAN's East and South Sea Fleets at a later date.

Fund U.S. Deterrent Programs

Editorial, Defense News, June 29

The U.S. decision to move 250 tanks, armored personnel carriers and howitzers to the Baltics, Bulgaria, Germany, Poland and Romania is a welcome signal for NATO allies worried about Russia.

While new and existing gear is being moved forward, U.S. troops stationed in Europe will hardly increase. Rather, U.S. soldiers will be rotated through the region for training.

The message would have been more powerful had Washington also said it would stop withdrawing forces from Europe and start meaningfully increasing them. More equipment is reassuring, but more forces indicates a stronger commitment to allies on the borders of a bellicose Russia.

The reality is, stability worldwide often depends on the presence of U.S. forces.

South Korea and Japan just celebrated 50 years of peaceful post-World War II-relations that fostered unprecedented economic growth made possible by U.S. forces in both countries.

On the other side of the world, U.S. forces and diplomats were equally key in forging a prosperous Europe. While NATO's heightened activity in the wake of Russia's Ukraine campaign has been criticized by some as ineffective, even Russian President Vladimir Putin has said he'd be crazy to attack a NATO country and trigger wider war.

Still, Moscow continues to raise tensions, threatening NATO and European nations with nuclear weapons and violating the Ukraine cease-fire even as a new truce is negotiated. NATO's long-term Russia strategy must include more training and equipment, but also more troops. More shoes in offices are welcome, but in this case, there's also a need for more boots on the ground.

And as long as Russia resorts to nuclear intimidation, America and its allies must invest in deterrent capabilities. When Washington confirmed that it would – as it had hinted for months – return a token force of heavy weapons to Europe, Russia countered it would add another 40 nuclear ballistic missiles to its arsenal this year.

As Deputy U.S. Defense Secretary Bob Work recently noted, Russia's willingness to flaunt its nuclear capabilities is a scare tactic to intimidate the United States and its allies. While Russia's aggression is improving NATO solidarity, it also makes it clear the United States must take a far more strategic view of its nuclear modernization needs, given that each leg of America's nuclear triad requires either replacing or upgrade. According to Work, that will cost DoD "an average of \$18 billion a year from 2021 to 2035 in FY16 dollars," or about 7 percent of the projected DoD spending in the 2020s when these programs peak.

During that period, the Navy must replace its Ohio-class ballistic missile submarines, and the Air Force will acquire its Long-Range Strike Bomber while upgrading its Minuteman intercontinental ballistic missiles. That doesn't include the staggering costs of revitalizing the nation's nuclear weapons infrastructure that is quite literally crumbling after decades of underinvestment.

DoD's problem is that without relief from budget caps, it will have to cover the cost of these massively expensive programs within a fixed budget. That means the Air Force and Navy will have to gut other ship, aircraft and weapons programs that can manage escalation and deter conventional aggression.

For decades, nuclear systems have underpinned U.S. deterrent capabilities. They will be increasingly important in a world where competing powers are revitalizing their nuclear and conventional capabilities. The key to deterrence is convincing adversaries that America's nuclear arsenal is modern, capable, reliable and formidable enough to avoid a potentially devastating miscalculation. The right message is to properly resource these key programs as a strategic investment in the nation's security.

Meet China's New Submarine Hunter Plane

Franz-Stefan Gady, The Diplomat, June 30

The four-engined Y-8GX6 (Y-8Q) turboprop anti-submarine warfare (ASW) aircraft has purportedly finally entered service with the Chinese Naval Air Force after several years of testing, according to IHS Jane's Defence Weekly.

IHS Jane's bases its report on an article published on a Chinese defense site, which notes that the ASW variant of the Shaanxi Aircraft Corporation (SAC) Y-8/Y-9 medium transport aircraft has been inducted into the North Sea Fleet.

The report neither elaborates on the number of aircraft that have entered service nor the precise induction date. However, it notes that the People's Liberation Army Navy's East and South Sea Fleet's will receive the plane only at a later date.

Equipped with air-launched torpedoes (e.g., Yu-7), anti-ship missiles, sea mines, and sonobuoys the plane has an estimated maximum range of approximately 5,000 km and, according to Popular Science Magazine, can potentially carry over ten tons.

Popular Science Magazine also notes that due to the plane's size, it may act as a command center for Chinese underwater unmanned vehicles (UUVs) such as the Haiyan glider—China's first autonomous underwater glider that can dive up to 1,500 meters deep and boasts a range of 1,000 kilometers.

The Y-8GX6, partially based on the Soviet Antonov AN-12, was first revealed in November 2011 and is intended to replace three aging Harbin-SH 5 ASW planes, which first entered service in 1986. Up until the induction of the first Y-8GX6 the Harbin-SH 5 constituted PLAN's sole long-range aerial ASW capability.

Popular Science Magazine discusses some of the more noteworthy features of the plane:

The Y-8Q's most distinctive feature is its seven-meter-long Magnetic Anomaly Detector (MAD) boom, which detects the magnetic signature of enemy submarines' metal hulls as the Y-8Q flies over them. Since MAD performance correlates to size, and its seven-meter MAD boom is arguably the largest of its kind among airplanes, the PLAN would have a fine weapon for hunting otherwise stealthy submarines.

Two Y-8GX6 prototypes have been tested thoroughly for the past several years the article also states. In addition, Popular Science Magazine provides a succinct analysis of the long-term technological implications of China's most recent ASW asset and what the future may hold in store:

Since the Y-8Q is extending Anti-Access/Area Denial operations underwater, it is almost a given that China is going to invest in future ASW methods. In the future, the Y-8Q may be equipped with more exotic technologies like LIDAR (which uses laser beams to penetrate water to detect objects), hard kill anti-torpedo systems, acoustic signals intelligence and radiation detection (identify radiation from nuclear reactors) that Chinese scientists are already beginning to research.



## **SPECIAL SUPPLEMENT FOR SENTINEL EMAIL SUBSCRIBERS**

Before the construction of the World Trade Center, lower Manhattan was a collector's wonderland. Searching for an IFF transponder (BC-654) with dynamotor for a B-17, never used and in the original packing crate, unopened since General Electric packed it up in 1943? G&G Electronics on Leonard Street offered them for \$10 and ARC 5 Receivers for \$3 (I can't remember how I ever got that BC-654 boat anchor home on the Subway—but I did—I suppose that there's something to be said concerning the combination of determination and dumb brute force).

At the same time, I also held a significant interest in old books, WW-II German documents, and stamp collecting—three categories of stores that also made lower Manhattan fantasyland for me. On Cortland Street, there was a building called the House of Stamps (which we collectors nicknamed the Den of Thieves—but we won't go into this now). Bookstores, some there since the late Nineteenth-Century, were splattered throughout the area. And being one to not pass up good deals, I always found places to spend (my father at the time used the term “waste”) the money that I had earned from working in my friend's dad's hardware store after school.

Most of my radio equipment from that period is gone. Fortunately I have a photo to remember it. At the same time the majority of my German documents and collectible stamps are long gone too (when you have to eat you have to eat). Still, my beloved books are still with me—some things in life one just does not sell (of course, these days with the majority of the American adult population holding under a fifth grade reading level, there's no one to sell them to even if I wanted to do so).

I would like by means of the Silent Sentinel to share some of the interesting material contained in my collection with you! This includes fascinating accounts which were published in *St. Christopher Magazine*, a literary digest for children. It was published from 1873 till 1940. The story which I am presenting this month comes from a 1913 issue and concerns submarines. I think it's rather interesting for two reasons. First, this is prior to the First World-War (the US Navy began its official qualification program in submarines on January 1, 1916--it did not wait until 1922 to do it--so don't tell me otherwise by quoting Wikipedia (which is in error)--I have a copy of the actual document establishing it). And second, the average reader of *St. Nicholas Magazine* at the time was primarily eight to ten years old. Need I say more? The story follows.

*Cross.*

# ST. NICHOLAS:

AN

ILLUSTRATED MAGAZINE

## FOR YOUNG FOLKS.

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VOLUME XL.

PART II.—MAY TO OCTOBER, 1913.

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# WITH MEN WHO DO THINGS

BY A. RUSSELL BOND

Author of "The Scientific American Boy" and "Handyman's Workshop and Laboratory"

## CHAPTER XII

### TWENTY MILES UNDER THE SEA

"OH, Jim, look here! If that is n't, for all the world, like a squab on a turkey platter!"

We had gone over to the Brooklyn navy-yard, and there, at the bottom of a great big dry-dock, was a saucy little submarine.

We walked around to the gang-plank that ran across to the boat from about half-way down the stepped side of the dry-dock.

"Now, if that is n't tough!" I exclaimed. "The most interesting thing in the whole navy-yard, and they have hung a 'No Visitors' sign on it."

A happy thought struck me. "Suppose I ask Cousin Jack to try to get us a pass to go aboard one. He is a lieutenant-commander in the Navy, you know."

My request to Cousin Jack went off by the very next mail. Two weeks later, when we had almost forgotten the event, I received a letter with an official seal in the corner.

"Hurray!" I shouted, slapping Will on the back. "It 's from the Bureau of Navigation of the United States Navy, and signed by the chief of the bureau himself. He says that we may go aboard a submarine, and, what 's more, we can take a trip in one during manœuvres now being carried on off Provincetown."

That very night, we took a Fall River boat, and the next afternoon arrived at Provincetown. Armed with our permit, we took a steam-launch to the old monitor that was acting as "mother" for the fleet of submarines. The officer of the deck introduced us to the ensign who commanded one of the submarines, and he, in turn, sent for Mr. McDermott, the chief gunner's mate, and put us in his charge. The submarine was moored alongside the monitor, so he led us over the gang-plank to the narrow deck that emerged from the water. It was only five feet wide, and about sixty feet long. A steel rope ran around it and served as a hand-rail. An elliptical tower rose from the deck amidships, and from the top of this projected a hood, or conning-tower, protected with heavy plate-glass windows, for observation when the craft was running awash. There was a miniature navigator's bridge for use when sailing on the surface, and in front of this were two tubes that reached to a height of over twenty feet from the deck.

"Those are the eyes of the submarine," said our pilot. "A submarine does not wear its eyes in sockets, as we do, but on the ends of a pair of stalks, like snails or crabs."

Of course that excited our curiosity, and we fired a broadside of questions at him. "Come down below," was his response, "and you can see for yourselves how the eyes work."

We crawled through a manhole in the deck and down a ladder, while I wondered if there were fire exits anywhere. That hole in the roof would make an awfully tight jam in case of trouble.

I had always imagined that the submarine was divided into separate cabins by compartments or bulkheads, and that it had an upper and lower deck; but there were no bulkheads in this boat. Mr. McDermott explained that some of the larger boats had bulkheads, but the idea of two decks was manifestly absurd in a vessel whose extreme diameter was only about twelve feet. After taking out the space occupied by the water-ballast tanks and compressed-air reservoirs, there remained a very cramped interior. I had no idea the boat was so small. We could not walk erect without hitting our heads against valve wheels, brackets, rods, and other projections depending from the roof. The crew habitually walked with heads ducked to avoid obstructions. We could see from end to end of the boat, as there were no partitions of any sort. It was marvelous how every nook and cranny was utilized to the fullest advantage. Although there were no partitions, the boat was evidently divided off by imaginary lines into different quarters. Just forward of the main hatchway was plainly the galley, for the walls were hung with brightly polished cooking utensils. Forward of the galley was a table in what proved to be the captain's quarters, while at the extreme forward end of the boat, where the torpedoes were launched, there was a complicated assemblage of wheels, dials, levers, instruments, etc., that fairly dazzled one with their high polish. Aft were the gasolene engines and dynamos, and under the floor were the storage batteries. Projecting from the ceiling just forward of the hatchway were the periscopes, or, as our guide called them, the "eyes" of the boat. A system of lenses and prisms made it possible, by looking into the eyepieces here, to see out of the top of the tubes twenty-five feet above. The periscope could be turned around to bring any point of the com-

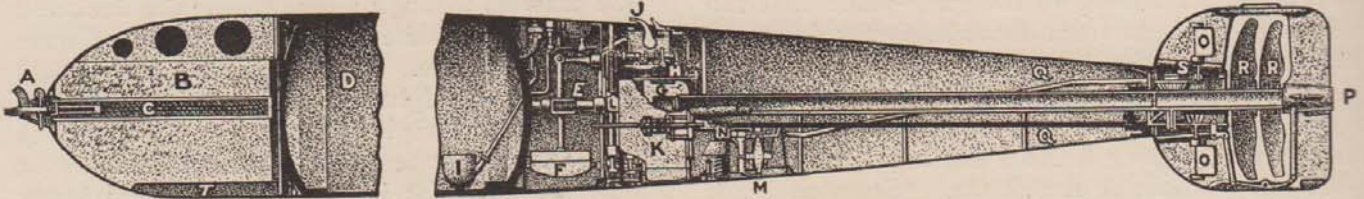
pass into view, while a scale in the field of vision showed in what direction the periscope was turned.

"You see," explained our guide, "we can run along twenty feet under water with only this tube sticking above the surface. It is such a small object that no one would notice it, and yet we can see perfectly all around us, and manœuver the boat in absolute safety."

"But don't you ever go deeper than that? I thought you went down to the bottom of the sea."

"Where the sea is no more than two hundred feet deep, we can go to the bottom; but below that the pressure grows too heavy, and eventually it

We had no sooner taken a good look at our surroundings than orders were given to strip the upper works. The masts at each end of the boat were on hinges, and they were swung down upon the deck. The bridge was dismantled and passed in sections down the hatchway. The hand rope and the stanchions that supported it were taken down, and presently the smooth, rounded back of the submarine was bare of every obstruction except the conning-tower and the periscopes. We all crept inside, and the hatch was closed behind us. There were eighteen men besides ourselves within the hold of that tiny vessel. The gasolene engines had already been stopped, and we were



LONGITUDINAL SECTION OF A TORPEDO ON A SUBMARINE BOAT.

A, plunger or striking-rod; B, guncotton charge; C, detonating charge; D, air-flask; E, hydrostatic valve; F, pendulum; G, turbine; H, submergence control mechanism; I, superheater; J, air-lever; K, immersion servo-motor; L, pressure regulator; M, gyroscope; N, servo-motor; O, rudders for horizontal control; P, rudders for vertical control; Q, rudder controls; R, propellers; S, shaft-gearing; T, ballast.

would be enough to crush the boat. After all, it is n't necessary to go very deep. If we run along at a depth of sixty feet, we are sure to clear all shipping, and no one could possibly find us."

"Can you see under water?" I asked.

"No, not more than one hundred feet or so, and then very dimly, as if in a fog. When completely under water, we have to go by dead reckoning."

Just then the captain came aboard. At the word of command the gang-plank was raised, the hawsers were cast off, and the crew took up their positions. The engines were started, and we were off. Those engines certainly were interesting. Powerful little fellows they were, too. Between them they developed over 500-horse-power. Each engine drove its own propeller. We squeezed down the narrow passageway between them, and saw that the propeller-shafts passed through the electric motors which drive the vessel when completely under water. The armatures of the motors were mounted directly on the shafts, and so they revolved with the shafts when driven by the engines. But the circuit of the field windings was open, and no electric current was generated, so the armatures made no load on the shafts, but merely took the place of fly-wheels.

We climbed up through the hatchway to see what was going on without. As I stuck my head out of the manhole, I was astonished at the speed we seemed to be making. With my eye so close to the water, the waves seemed to be racing by with the speed of an express-train.

now running with our electric motors. It was astonishing how quiet everything was. There was only the slight hum of the motors and the sound of the spray at our bow. The quartermaster continued navigating the craft from within the conning-tower.

"Fill the main ballast tank!" called the captain. "Fill the forward trimming tank!" A moment later, "Fill the after trimming tank!"

We could hear the water rushing into the big U-shaped tank that lay under our feet and extended part way up the walls at either side of us. The pointer of a large depth-gage told us just how fast we were sinking. When we were awash, the motors, which had been stopped while the tanks were being filled, were started again.

"Why don't you run the boat with gasolene engines?" I asked the chief gunner's mate.

"Why, man alive, we have n't air enough. Those little beasts would gobble up all our air in five minutes, and then they would stop working. As a matter of fact, the engines would suffocate long before the crew. We tried that once. Everything was closed air-tight and the engines were started. They had n't run five minutes before they stopped. But we could still breathe easily, although the sensation was not very pleasant."

"Where do you get fresh air from, anyway?" asked Will.

"Fresh air? We don't get any."

"But you have compressed air to live on while you're under water—have n't you?"



## WITH MEN WHO DO THINGS

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"Oh, we have lots of compressed air, but we use it for other things. We don't have any other air to breathe, except what is shut up in here with us. There is enough air in this hold to last us comfortably for twelve hours, and, on a pinch, we could get along for twenty-four hours."

"Never!" we both exclaimed.

"Does n't it ever make you sick?" asked Will.

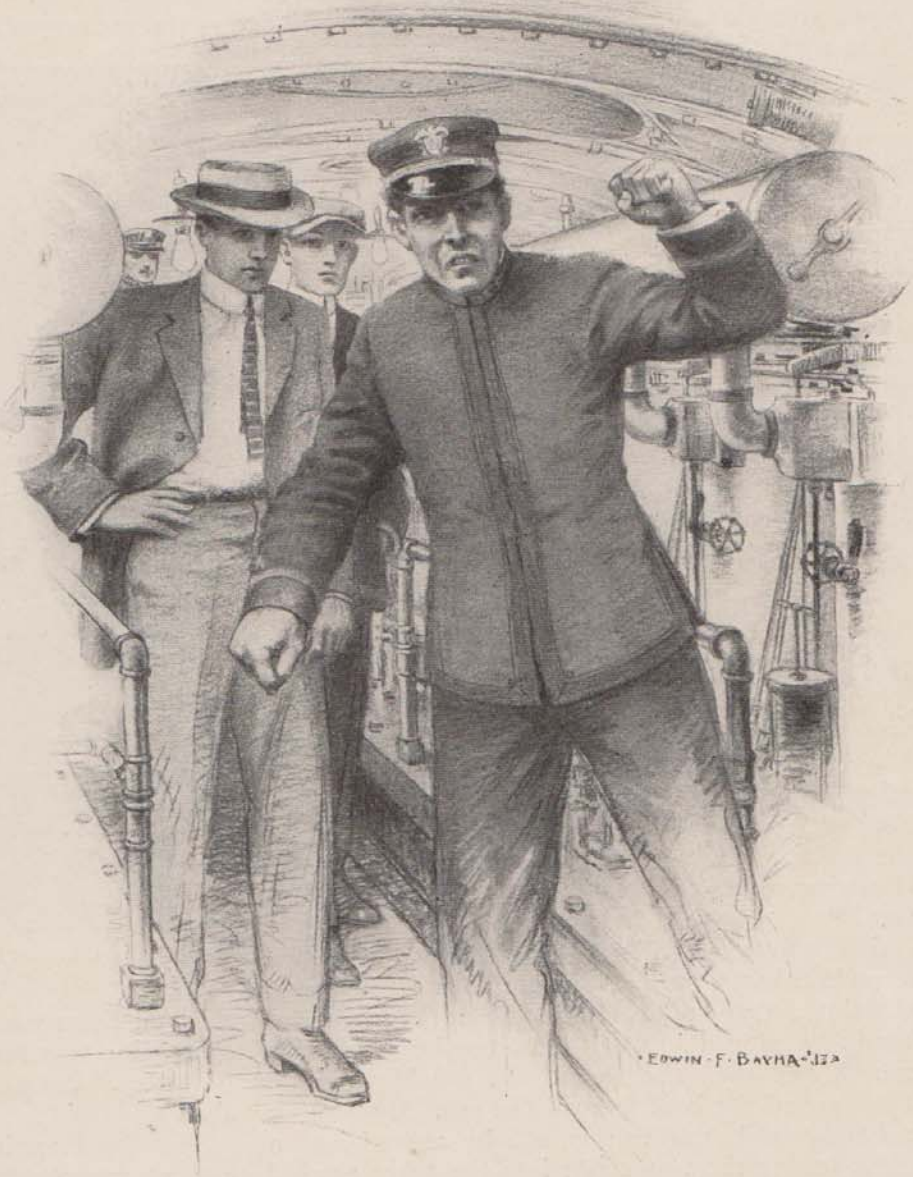
"Oh, no, this idea of having to have fresh air is all rubbish. It is n't the lack of oxygen that bothers us down here in the submarine, but the fumes of gasolene and oil, and particularly the gases from the battery."

There was a sharp command from our captain, in response to which the man in charge of the diving rudders turned a hand-wheel. The boat dipped and lurched forward. We watched the indicator hand travel slowly over the dial of the depth-gage. Five feet, ten feet, fifteen, eighteen, twenty—there we halted. We proceeded for a time at that depth below the surface. I climbed up into the conning-tower, but could see nothing but the dense green which completely covered us. However, the ends of the periscopes were well above the surface, and navigation was a simple matter. I was allowed to look through one of the submarine's eyes, and, while I was looking, the captain gave the command to dive. Presently, the water surged up over the top of the periscope, and instinctively I rose on tiptoes and drew in my breath, as if I were actually being submerged in the water. As we continued to sink, it was fascinating to watch the gage telling off the depth. At sixty-five feet below the surface, we came to an even keel.

"No danger of running into any boats now," said the chief gunner's mate as he looked at the gage. "I should n't be surprised if we were near

the enemy. Very likely we are going to run under them, and fire our torpedoes from the other side."

We hurried forward to witness the operation of



"MY, HOW ANGRY THE CAPTAIN WAS!"

launching the torpedoes. They were unusually interesting-looking objects, shaped like cigars, with blunt forward ends, and fins at the rear crossing each other at right angles. They weighed sixteen hundred pounds each. The explosive was packed in the "war-head," or "cap," at the forward end. We were relieved to find that dummy war-heads were used for target practice, and that there were no explosives aboard. The main body

of the torpedo was filled with air under high pressure, which drove the motor that ran the propeller of the torpedo. The rudders of the torpedo were kept pointed constantly in a given direction by a gyroscope.

"It is just like a top," explained our guide. "You pick up a spinning top on the palm of your hand, and watch it stand upright even though you slant your hand this way and that. That's how it is with the gyroscope: its axis keeps pointing in one direction, regardless of what goes on about it. To keep the torpedo at a constant depth under water, there is a rudder that is moved in one direction by a spring, and in the other by a plunger upon which the water presses. If the torpedo runs below the set depth, the water pressure will be sufficient to move the plunger up, compressing the spring and elevating the rudder. On the other hand, if it rises above a predetermined level, the water pressure is less, and the spring forces the plunger down, depressing the rudder.

"Our boat is coming to the surface now; we shall be ready to fire soon."

"Suppose we hit something," said Will, "before the periscope is out of water?"

"There is some danger of that, but this craft has 'ears' as well as 'eyes.'"

"Ears?"

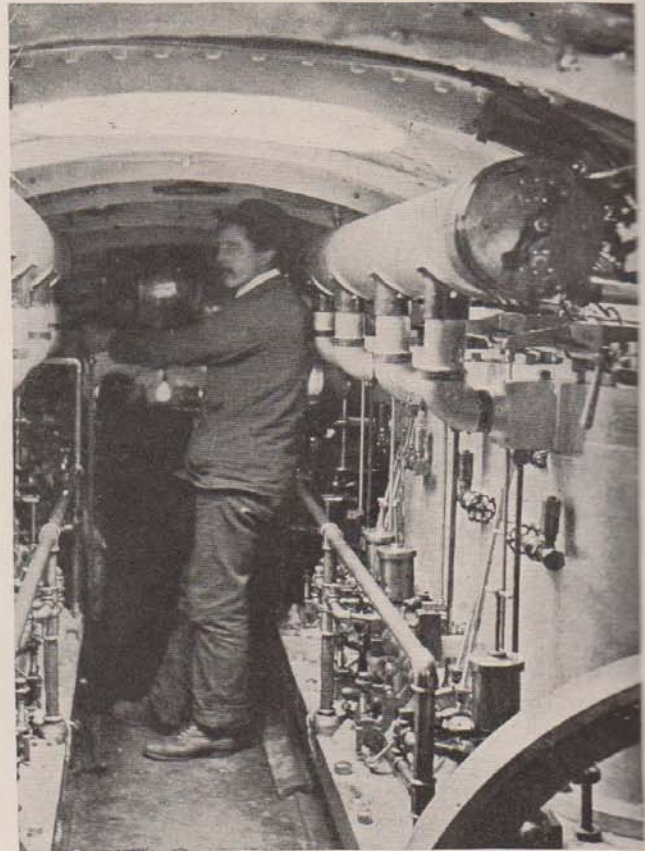
"Yes, ears. It's all but human. On each side, there is a diaphragm like that of a telephone. These are connected by wires to a receiver. If any sound is heard, there is a way of telling whether it is louder in one instrument than in the other, and so the captain can determine where the sound is coming from. He always listens for the noise of the propellers of a vessel or the chugging of its engines before rising to the surface."

At the forward end of the boat, there were four torpedo-tubes, two of which could be manipulated at a time. Our guide explained that the torpedoes would be placed in the tubes, the breech-blocks closed, and then the cap at the outside opened. The nose of the boat formed the cap. By turning a hand-wheel, the cap would be moved out a trifle, letting the water run into the tubes around the torpedoes, and then the cap would be turned on its axis so as to bring two holes in it into register with two of the torpedo-tubes. There was a plate inside which would indicate when the proper registry had been obtained.

The motors had been stopped for an instant, when the order came to unseat the cap and flood the tubes. Instantly, our bow tipped downward, and we lunged forward. Will and I knew there was some danger, by the look on the faces around us. We followed their gaze, and saw the

indicator hand racing around to 100, 110, 120, 135 feet. By that time the engine had been started, and the man at the diving rudder-wheel brought us up so smartly that the boat leaped almost clear of the water, betraying us to the "enemy," of course.

My, how angry the captain was! He kicked up an awful row. Some one had blundered. There were no torpedoes in the tubes when the order



THE CROWDED QUARTERS OF A SUBMARINE.

to flood them was carried out. The nose of our submarine was suddenly loaded with several tons of water. Naturally we had gone down like a shot.

We dived again, but this time under control, and we manœvered about under water for half an hour or more, so that the enemy would lose all track of us. Finally, we ventured to come up to the surface, and located the dummy vessel we were after, about three miles away. Again we dived, and headed toward the spot. When we had arrived within striking distance, the captain manœvered the submarine so that it would point in the proper direction, not at where the enemy then was, but at the point to which he would have traveled by the time the torpedoes reached him. The torpedo-tubes had been blown clear of water after

1913.]

WITH MEN WE

the blunder, and had been charged with four torpedoes. The cap was turned so as to open two of the torpedo-tubes. When all was ready, the captain pulled a cord that admitted compressed air into the tubes just behind the torpedoes, and started them on their way. At the same time, a lever in the tube sprang a trip on each torpedo that set the propeller motor running. The instant the torpedoes left us, our bow, relieved of their weight, which amounted to nearly two tons, sprang up, but was brought down very cleverly by the steersman, who manipulated the horizontal rudders. The other two torpedoes were then uncovered by turning the cap, and they were fired one at a time at the enemy. Then, having shot our bolts, we turned about, and beat a retreat to port.

***NEXT MONTH--THE CIVIL WAR--FROM THE ATLANTIC  
MONTHLY, CIRCA 1863***

