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

The Silent Sentinel
July 2017

Our Creed and Purpose

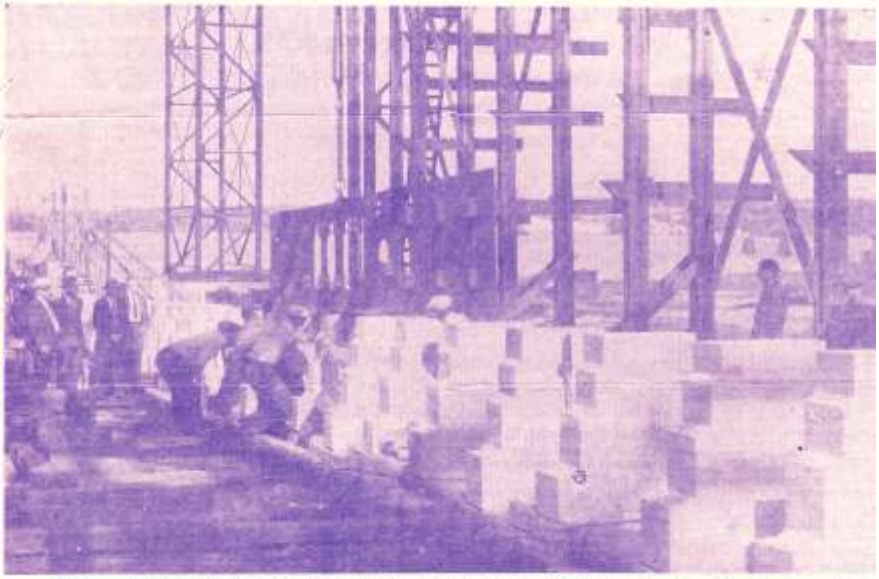
To perpetuate the memory of our shipmates who gave their lives in the pursuit of their duties while serving their country. That their dedication, deeds, and supreme sacrifice be a constant source of motivation toward greater accomplishments. Pledge loyalty and patriotism to the United States of America 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 DAY, NEW LONDON, CONN., THURSDAY, JULY 23, 1936

Taking the First Step in the Construction of an Undersea Fighter



Workmen are pictured placing in position the first vertical keel plate for the United States submarine Skipjack at the shipyard of the Electric Boat Co. at Groton. The keel-laying ceremony took place yesterday in the presence of navy officers and officials of the constructing company, and several are seen standing by.

SS-184 KEEL LAID, EIGHTY-ONE YEARS AGO THIS MONTH

*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 2017 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 *July 11th.* 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

Harry Humpreville, Frank Walker, Glen Gerbrand, Everett Mauger, and Marie Tate (Wife of WWII VET Charlie)

Submarine Losses in July

Originally Compiled by C J Glassford

USS S-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.

FUND RAISING PROPOSAL - 9 May 2017

For a fund raiser, this is a proposed raffle.....

30 books of chances
10 chances per book
$10.00 per chance

Prizes:
First Place: $500 cash or a 2 day ocean fishing trip for 2 people with 3 night stay at the Old Mill Hotel in San Quentin, Baja CA...includes breakfasts and dinners

Second Place: the remaining prize not chosen by the first place winner.

Third Place: $100 cash

The fishing trip would be donated by The Old Mill so there is not cost to the Base.

If all 300 tickets are sold, the Base should end up with $2400.

- of the $3,000 taken in:
  - Fishing trip is no cost to the Base
  - $500 - 2nd place prize winner gets either the fishing trip or $500
  - $100 - to the third place prize winner

Jim Harer's family owns the Old Mill in San Quentin, Baja CA, and in donating the fishing package.

Gents, July has been a rather "dry" month as far as inputs to the Sentinel go. To date I've received nothing. Nonetheless, deadlines and blowing sanitaries wait for no man—so what you see is it!

Current News

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

China's Submarine Dream (And Nightmare for the U.S. Navy): 'Hunt for Red October' Subs
Dave Majumdar, The National Interest, July 6

If China's rim-driven pumpjet propulsion technology works, it would be a significant advance for the People's Liberation Army Navy's undersea force.

In a recent article that appeared in the South China Morning Post, Beijing claims to have developed such a silent propulsion system—which some have compared to the so-called caterpillar-drive in Tom Clancy's Hunt for Red October.

With vastly improved acoustical performance, a new generation of advanced Chinese nuclear attack submarines (SSNs) could add another dimension to Beijing's anti-access/area denial (A2/AD) capabilities.

Further, new Chinese ballistic missile submarines hiding inside their heavily defended 'bastions'—like the Soviet boomer fleet before them—would be much more difficult to detect and eliminate, greatly enhancing Beijing's strategic nuclear deterrence.

But that's only if China can build an operationally relevant rim-driven pumpjet propulsor—American naval analysts are mostly convinced that the new Chinese silent propulsion system is a science project that may never make it to sea.

"If it is well-built, a rim-driven pump jet would be a quieter propulsion system than traditional propellers, and could be quieter than shaft-driven pump jets like those on some U.S. submarines," Bryan Clark, a retired U.S. Navy undersea warfare officer and analyst the Center for Strategic and Budgetary Assessments, told The National Interest.

"The question is whether the Chinese can build one with the fine machining necessary to achieve the degree of quieting possible. The article doesn't address that. The basic technology is straightforward, but building a good one is hard. Manufacturing precision equipment like turbines has been a challenge for China's shipbuilding industry."

Retired U.S. Navy submariner Thomas Callender, a senior research fellow for defense programs at the Heritage Foundation and former director of capabilities at the Office of the Deputy Under Secretary of the Navy (Policy) agreed with Clark's assessment.

"I agree that if engineers can develop a shaft-less rim-driven electric motor pump-jet, it would reduce the noise signature of the host submarine since without large traditional shaft with multiple bearings along its length (shaft must be long enough to connect propulsion motor inside the engine room to screw or pump-jet at the stern) and only having one bearing per pump-jet, the noise associated with the shaft would be reduced," Callender told The National Interest in an email.

"In addition, since the propeller is not driven by a traditional steam propulsion turbine, but by an electric motor, there is no need for large reduction gear which reduces RPM of steam turbine (in 1000's of RPM at higher speeds) to more efficient and quiet propeller speed (for submarine typically less than 200 rpm max)."

The improved quieting would also likely more than offset potential drawbacks such as a greater magnetic signature.

"A rim-driven pump jet would use an electric motor that is installed in the rim around the propulsor. Like any electric motor, it would generate a magnetic field. Because it's outside the hull, it might be easier to detect with magnetic anomaly detection, but it could be designed to shield some of the field," Clark said.

"It again comes down to how well they build the propulsion system. In any event, magnetic anomaly detection does not work at long ranges, and is not useful as a search capability. It is generally used to target a submarine once it has been located and tracked."

While there are advantages to a rim-driven pumpjet, there also some serious potential drawbacks. One problem is that such motors may not be able to generate the horsepower to drive a massive nuclear submarine.

"If China can put a well-built rim-driven pump jet on a submarine, the next question is how much thrust it provides," Clark said.

"With submarine propulsion, one of the tradeoffs is quietness versus speed. Most changes to the propulsion architecture that reduce noise also reduce sprint speed. One of the concerns I have heard from engineers is whether a rim-driven pump jet can deliver the horsepower needed to reach high sprint speeds for torpedo evasion or repositioning."

Callender noted that a single rim-driven pumpjet would probably be insufficient. The U.S. Navy's forthcoming Columbia-class SSBN design will incorporate a permanent magnet electric drive propulsion—eschewing the traditional steam-driven propulsion turbine. The new propulsion system will be much quieter, Callender said, but it will come at the price of being enormous.

"The electric drive motor with sufficient power to drive Columbia SSBN will be extremely large, partially contributing to its 43-foot hull diameter," Callender said.

"For example, similar sized Ohio Class SSBN produced 60,000 shaft horsepower. Virginia SSN produces 40,000 shaft horsepower to power a submarine."

Because of the sheer size and weight of the electrical motors, there are some size constraints that are inherent to a rim-mounted pumpjet.

"Bryan is correct and I agree that the most critical technical issue with the rimless electric motor pump-jet as the main propulsion for an SSN or SSBN is delivering sufficient power in size and weight limitations of a stern pump-jet," Callender said.

"As you can imagine, a 40-foot diameter rimless pump-jet would not be practical (current propulsors are less than 20ft in diameter) from both a size and weight standpoint. Having a huge and heavy motor and pump-jet at the extreme stern would also make hull stability near impossible."

As such, the Chinese would have to use multiple propulsors to design and build a practical submarine.

"A more likely solution to incorporate a smaller rim-driven pump-jet (and therefore less power) would be to have multiple pump-jets located on the stabilizing stern fins (2 or more likely 4)," Callender said.

"But the issue of size and weight is still a huge engineering leap and would likely not incorporate more mature but heavy permanent magnet motors."

Clark points out another potential problem even if the Chinese are able to solve all of the other technical issues. A rim-driven pumpjet would draw an enormous amount of electrical power and it is not clear that the Chinese can generate that kind of energy onboard their submarines.

"The last challenge I see with a rim-driven pump jet is the ability of the ship to provide the electrical power needed to drive the pump jet," Clark said.

"An electric propulsion system will be less efficient than traditional steam or diesel propulsion because the reactor or diesel generator is powering a generator that then powers a motor, compared to a diesel motor or steam turbine directly driving the shaft."

If the Chinese were to successfully develop and build a rim-driven pumpjet, there could be wider strategic implications.

"If they have developed a genuinely silent drive for SSNs, though, they could use those boats as a free-range element of their A2/AD network: SSKs could form a relatively static defensive cordon closer to shore while SSNs roamed ahead in an effort to detect, track, and target oncoming U.S. Pacific Fleet or Seventh Fleet task forces (and to notify A2/AD forces to the rear of U.S. forces' whereabouts)," James Holmes, professor of strategy at the U.S. Naval War College, told The National Interest.

"SSNs thus could comprise a forward defense of China's forward, layered maritime defense. And that leaves aside all of the more offensive uses for stealthy SSNs, such as forward operations in the Indian Ocean."

The new propulsion system could also be a boon for the Chinese SSBN fleet, which like the Soviet boomer fleet, uses the so-called 'Bastion' strategy.

"This type of propulsion would enhance what appears to be China's 'bastion' strategy for SSBNs in the South China Sea," Holmes said.

"Propulsion machinery is at its quietest when running slowly, while SSBNs crawl along on patrol. SSBNs based at Sanya and fitted with newfangled propulsion plants could get underway, dive quickly, and dawdle out to their patrol grounds--keeping their acoustic signature, and thus chances of hostile detection, to a bare minimum. That would make the anti-submarine challenge for U.S. and allied forces daunting indeed. We would be hunting Chinese subs in China's extended neighborhood, in proximity to an array of PLA A2/AD weaponry."

However, there are plenty of indications that the Chinese rim-power pumpjet silent propulsion technology is overblown. In the SCMP article, author Minne Chan quotes Collin Koh Swee Lean, a submarine expert from the S. Rajaratnam School of International Studies at Singapore's Nanyang Technological University as saying that: "In the long term, if the pump-jet propulsion is declared fully operational and tested successfully ... future [Chinese] submarines would be equipped with pump-jet propulsion as a standard design feature."

To Callender, that is an indication that the Chinese technology is still in the lab.

"To me this means that the rimless pump-jet is still very much in the Science and Technology phase of development and not a near-term mature technology," Callender said.

Ultimately, only time will tell if the new Chinese silent propulsion system proves to be genuine.

But some U.S. naval analysts believe the rim-driven pumpjet is simply Chinese propaganda. "I read this earlier this morning and concluded that the PLAN propaganda machine was busy on July 4th," Bryan McGrath, managing director of the FerryBridge Group naval consultancy, explained to The National Interest yesterday.

"Yes, something...if genuine. And there is no question in my mind that the undersea advantage we enjoy will come under increasing pressure from PLAN capabilities. But quieter that U.S. subs? No."

Why Chinese Submarines Could Soon Be Quieter than US Ones
Staff, South China Morning Post, July 4

The US Navy's Pacific fleet used to mock Chinese submarines for being too noisy and too easy to detect, but that has largely been remedied in recent years and China is now on the cusp of taking the lead in a cutting-edge propulsion technology.

Naval experts said the new technology would help China build more elusive submarines, but might also prompt the United States to ramp up anti-submarine warfare measures.

In a recent interview with China Central Television, Rear Admiral Ma Weiming, a leading Chinese naval engineer, showed a component of a new Integrated Electrical Propulsion System (IEPS) for naval warships in a laboratory. He said the system, which turns all the engine's output into electricity, and a rim-driven pump-jet had been fitted to the People's Liberation Army Navy's newest nuclear submarines.

"This is one of our work team's first world-leading projects, which has been used on [China's] next-generation nuclear submarines," Ma said in May. "[Our technology] is now way ahead of the United States, which has also been developing similar technology."

Ma's exalted status in the PLA Navy was highlighted by a photograph of then navy commander Admiral Wu Shengli holding an umbrella for Ma during an inspection of the PLA Naval University of Engineering in Wuhan,

where Ma works, on a rainy day in June last year. The photo, posted on the social media website of the PLA's Navy Magazine, sparked public curiosity about why the commander would give such "preferential treatment" to a rear admiral.

Ma told CCTV "the ultimate goal" of developing the new propulsion system "was aimed at solving the problem of deploying high-energy radio-frequency (HERF) weapons on board", hinting that China was close to emulating the US in that regard.

HERF, a form of directed-energy weapon, can fire highly focused energy at a target, damaging it accurately and quickly. Directed-energy weapons require vast amount of electricity – something IEPS can deliver – and can counter the threats posed by fast missiles such as ballistic missiles, hypersonic cruise missiles and hypersonic glide vehicles. Besides China, the US, Russia and India are also developing them.

The CCTV report did not say which types of Chinese submarines would use the pump-jet propulsion system, but mainland military websites said they believed Ma had hinted at the new-generation, nuclear-powered Type 095 attack submarines and Type 096 ballistic missile submarines.

Collin Koh Swee Lean, a submarine expert from the S. Rajaratnam School of International Studies at Singapore's Nanyang Technological University, said Ma's remark showcased the growing scientific and technological maturity of China's submarine development.

"In the long term, if the pump-jet propulsion is declared fully operational and tested successfully ... future [Chinese] submarines would be equipped with pump-jet propulsion as a standard design feature," he said, adding that the new technology would also benefit other naval shipbuilding projects, such as surface warships.

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China has built Asia's largest submarine base at Yulin, on the south coast of Hainan, near Sanya. The base features underground submarine facilities with tunnel access, shielding Chinese submarines that enter the South China Sea from the prying eyes of US reconnaissance satellites. That's prompted American warships and aircraft to conduct more close surveillance operations in the disputed waters, which are claimed wholly or in part by mainland China, Vietnam, the Philippines, Malaysia, Brunei and Taiwan.

Koh warned it was foreseeable that the US Navy would ramp up anti-submarine warfare measures to detect, classify and track Chinese submarines if they were harder to detect after being fitted with pump-jet propulsion and other stealth equipment.

"This more intensified cat-and-mouse game would also result in the risk of underwater accidents ... between submarines or with surface ships," he said. "The quieter the submarine is, the greater the likelihood of such navigational safety hazards and, potentially, they could cause diplomatic incidents in the context of those maritime disputes and of course, the persistent Sino-US divergence in views over foreign military activities in coastal states' exclusive economic zones. "

The Chinese navy is likely to begin construction of the Type 096 submarines, which will be armed with 24 JL-3 intercontinental submarine-launched ballistic missiles, in the early 2020s, according to the Pentagon's annual report to the US Congress this year.

Ma, 57, became a household name in 2011 when he announced during a speech to accept a national technology award that his team had successfully developed a Chinese electromagnetic aircraft launch system (EMALS).

Ma, a PLA deputy to the National People's Congress, has since been asked by the media at the annual sessions of the national legislature when his EMALS will be fitted to China's next-generation aircraft carriers.

"I am very unhappy because I have no power to decide when my EMALS will be used," a frank Ma told reporters on the sidelines of this year's NPC session in Beijing in March. "But I dare to tell you that the EMALS developed by my working team is more advanced and reliable than the US system to be used on their Ford-class aircraft carrier."

The first of America's Ford-class carriers, the first US vessel to use EMALS, completed sea trials in May.

Sources close to the navy told the South China Morning Post earlier this year that Ma's EMALS might be fitted on China's third-generation nuclear-powered aircraft carrier, the Type 003. However, the Central Military

Commission, chaired by Xi, has not decided when the Type 003 will be built, and construction work has not yet started on the second-generation Type 002.

The PLA Navy has two aircraft carriers, the Liaoning, a refitted Soviet carrier commissioned in 2012, and the domestically built Type 001A, which was launched on April 26. They are both conventionally powered platforms featuring ski-jump take-off ramps.

Xi has urged the PLA to pursue a "strong army dream", but when asked by the Post whether he hoped to see his EMALS fitted to a Chinese aircraft carrier one day, Ma said he "never has any dreams" and was focused on finding practical projects for his team that would release its potential.

"Whether the new technologies will be used never bothers me, because I've found that my task is to cultivate talent, meaning I have to create more opportunities for them and help them solve problems," Ma said. "For example, compared with the US, China couldn't devote as much funding to developing the electromagnetic aircraft launch system and advanced arresting gear (AAG) system, but I understood that our valuable resource was that I could mobilise my hundreds of talented students."

Russia to Launch its Deadliest Ballistic Missile Submarine in August
Franz-Stefan Gady, The Diplomat, June 27

The Russian Navy will launch the first advanced variant of the nuclear-powered ballistic missile submarine (SSBN) Project 955A Borei II-class ("North Wind") aka Dolgorukiy-class in August, the head of the Russian Navy, Admiral Vladimir Korolyov, announced on June 26 in Saint Petersburg, Russia.

The new boomer, christened Knyaz Vladimir (Prince Vladimir), will strengthen Russia's sea-based nuclear deterrent, according to the admiral. "In August this year, the Severodvinsk-based Sevmash Shipyard will flout out the new Borei-class strategic underwater cruiser, the Prince Vladimir, which will strengthen the potential of the nuclear component of the Navy's submarine fleet," he said, TASS news agency reports.

The Knyaz Vladimir, the lead boat of the improved Borei II-class, was laid down in July 2012 at the Sevmash Shipyards in Severodvinsk, a port city on Russia's White Sea, following a two year delay due to contract disputes between the Russian Ministry of Defense and the ship contractor, which pushed back the commissioning date of the ship from 2017 to 2018. The likely 2018 commissioning date was confirmed by Vice Admiral Viktor Bursuk, the deputy commander of the Russian Navy, in March.

The major difference between the Borei and Borei II-class is the latter's capability to carry a much bigger nuclear payload, as I noted elsewhere (See: "Russia Will Start Constructing New Ballistic Missile Submarine in December"):

In comparison to the Borei-class, Borei II-class submarines are fitted with four additional missile tubes, boast smaller hulls and cons, and feature improved acoustics and lower sound levels, next to a number of other technical improvements.

Both variants of Borei-class subs will be armed with Bulava (RSM-56) intercontinental ballistic missiles (ICBMs). The Borei-class will be capable of carrying up to 16 Bulava ICBMs, whereas the improved Borei II-class can carry up to 20 ballistic missiles.

The improved variant of the Borei-class will be capable of launching 96-200 hypersonic, independently maneuverable warheads, yielding 100-150 kilotons apiece.

The Russian Navy plans to operate eight Borei-class SSBNs–three Borei-class and five improved Borei II-class boats–by 2o25. As of new, three Borei-class SSBNs have been commissioned to date with one submarine, the Yuri Dolgoruky, serving with the Northern Fleet and the remaining two–Alexander Nevsky and Vladimir Monomakh—deployed with Russia's increasingly more active Pacific Fleet.

Next, to announcing the launch of the Knyaz Vladimir, Admiral Korolyov also told reporters on June 26 that Russia is developing a next-generation nuclear-powered submarines. "Along with this, work is already under way to develop fifth-generation nuclear-powered submarines," the admiral said.

As I reported in June 2015, the new sub class will likely consist of two variants specifically designed for anti-submarine warfare and anti-surface warfare missions. "The main purpose of the [underwater interceptor] is to protect groups of [ballistic] missile carrying submarines, and to battle with enemy submarines. The second ship will be a cruise missile carrier [used] for defeating coastal and surface targets," a senior Russian defense industry official said at the time.

Arctic Outpost Becomes Hotbed Of Russian Military Activity
Victoria Craw, News.com.au, June 26

A tiny stretch of Arctic water has become a hotbed of military activity amid fears it could become the next flashpoint in a global conflict between the US and Russia.

Locals on the tiny Norwegian island of Vardo have seen an increase in military action through the upgrade of a critical radar system, Globus III, due to be completed by 2020.

The windswept outpost is just 30 kilometres from Russia's Kola Peninsula, from where a fleet of nuclear armed submarines operates, in a bid to strengthen Russian presence in the Arctic region.

Norwegian author Bard Wormdal, who wrote The Satellite War, about the close and secretive military and intelligence alliance between Norway and the US, said there has been significant uptick in activity recently from both sides.

"This is connected to the tension [between] east west but it is also connected to the modernisation of Russian submarines. They do a lot of modernisation of this equipment," he told news.com.au.

He said Russian submarine activity in the "neighbourhood" has spurred the development of new Norwegian ships including the Marjata IV, described as the "most sophisticated military intelligence ship in the world".

"The foremost task for this ship is following Russian submarines and I'm quite sure this is the main reason why US in recent years has been more interested to follow this area," he said.

"There have been quite a lot of occasions that Russian nuclear attack submarines have been close to the coast of US and they come from this area and they want to know how they are moving."

'HONE THEIR SKILLS'

The $US120 billion Globus III project will improve monitoring capabilities for the US, but has been downplayed by intelligence officials in Norway, who simply say it will be used in the national interest.

A spokesman for Norway's military said the project is undergoing "undergoing upgrades and modernization".

"The purpose of the radar is to monitor and categorize objects in airspace, monitor our national sphere of interest in the high North and gather information on space activity."

Russian media claim "eavesdropping Norway" has become paranoid about a Russian "threat" that doesn't exist.

However it comes against a backdrop of increasing tension following Russian intervention in Crimea and the Ukraine leading to fears among Baltic States they could be next.

NATO has moved to bolster its defences and meet spending targets following chiding from US President Trump. In 2018 the military alliance will conduct a major exercise called Trident Juncture, involving 35,000 personnel from 30 countries to test ground, air and sea troops on a large scale.

Supreme Allied Commander Transformation General Denis Mercier said it's one of the "best places to train in Europe" with a cold climate for officers that "hones their skills".

Norway, France and the UK will also conduct submarine rescue training throughout 2017 to practice saving their troops from disabled submarines 600 metres below the surface.

Former Vardo Mayor Lasse Haughom, who is also a veteran of the Norwegian intelligence service, said Norway and Vardo in particular is hugely important so the US can "keep an eye on what the Russians are doing."

"Russia wants to look into our secrets, and the United States and Norway want to look into their business," Mr. Haughom told The New York Times. "That is the way the game is played."

Russia has criticised Norway for siding with the US, with Russia ambassador to Oslo, Teimuraz Ramishvili, saying the country "has to understand" it could become a target.

"Norway has to understand that after becoming an outpost of NATO, it will have to face head-on Russia and Russian military might," he told Norway's state broadcaster, NRK.

"Therefore, there will be no peaceful Arctic anymore."

Chinese Scientists Claim to Have Developed Most Powerful Submarine Detector
Staff, Business Standard, June 24

Chinese scientists have claimed a major breakthrough in magnetic detection technology which could find hidden metallic objects, including minerals and submarines.

The Chinese Academy of Sciences, China's largest research institute, said in an article this week that a "superconductive magnetic anomaly detection array" has been developed in Shanghai and passed inspection by an expert panel, Hong Kong-based South China Morning Post reported.

The device, which works from the air, could be used to pinpoint the location of minerals buried deep beneath the earth in Inner Mongolia, for example, with a level of precision as high as anything currently available around the world, the experts were quoted as saying by the report.

The device could also be used on civilian and military aircraft as a "high-performance equipment and technical solution to resources mapping, civil engineering, archaeology and national defence," the article said.

China's military may soon adopt the technology, if it has not already, said Professor Zhang Zhi, an expert in remote sensing with the Institute of Geophysics and Geomatics, China University of Geosciences in Wuhan, Hubei.

"The technology could be used to detect minerals on land, and in the ocean to nail down submarines," Zhang, who was not involved in the project was quoted by the Post saying.

Dr Lei Chong, an assistant researcher studying MAD technology at the Department of Micro/Nano Electronics, Shanghai Jiaotong University, said the Chinese device was different from conventional designs in at least two ways.

The first is the large number of probes the device uses. With this "array", it can collect much more data than traditional detectors, which tend to use just one antenna, said Lei, who was not involved in the project.

The new MAD also uses a superconductive computer chip cooled by liquid nitrogen. This super-cool environment significantly increases the device's sensitivity to signals that would be too faint for traditional devices to spot.

"I am surprised they made such an announcement," Lei said. "Usually this kind of information is not revealed to the public because of its military value," he said.