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China's Strategic Nuclear Submarines
Achieving Continuous Duty



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Guarantee of Strategic Security: Expert Discusses China's Strategic Nuclear Submarines Achieving Continuous Duty¹

Staff reporter

In April of this year, the U.S. Department of Defense released a China military power report, which stated that the Chinese Navy currently has at least six Type 094 ballistic missile nuclear submarines, and has the capability for at least one of them to be on continuous readiness duty. It also said that this is the first time it has been possible for the Chinese Navy to permanently maintain at least one strategic missile nuclear submarine at sea to perform strategic duty tasks.

So, what is “continuous readiness duty” (*quatianhou zhanbei zhiban*),² how can it be achieved, and why did the Chinese Navy only just now acquire this capability? With these questions in mind, we interviewed Professor Chi Guocang (迟国仓) of the PLAN Submarine Academy and asked him to give us a detailed explanation.³

Continuous Strategic Duty

Staff Reporter: Hello, Professor Chi, some time ago a report released by the U.S. Pentagon stated that for the first time, the Chinese Navy can permanently sustain at least one strategic missile nuclear submarine at sea to perform strategic duty missions. The report also said that this marks the first time that the Chinese Navy has achieved continuous readiness of strategic nuclear submarines. May I ask, what is continuous strategic duty?⁴

¹ 本刊记者 [Staff Reporter], 战略安全之保障——专家谈中国战略核潜艇实现全天候值班 [“Guarantee of Strategic Security: Expert Discusses China's Strategic Nuclear Submarines Achieving Continuous Duty”], 兵工科技 [Ordnance Industry Science Technology], no. 13 (2023), pp. 41-51.

² **Translator's Note:** The Chinese term for “continuous” (全天候) literally means “under all conditions.”

³ **Translator's Note:** Chi Guocang joined the PLA Navy in 1976. After a career serving as a submarine officer (including as a boat CO), Chi was posted to the PLAN Submarine Academy in 2001, mainly teaching courses on operational command. He retired from the Submarine Academy in 2017. Source: https://www.mva.gov.cn/fengcai/tyjrfc/tyjr/202405/t20240520_420140.html

⁴ **Translator's Note:** The staff reporter must be referring to the 2022 China Power Report, which states that “the PRC is conducting continuous at-sea deterrence patrols with its six JIN-class (Type 094) submarines (SSBNs).” See

Professor Chi Guocang: Continuous strategic duty refers to the national "triad" (including land-based, sea-based, and air-based) of strategic nuclear forces being able to operate 24 hours a day in peacetime at any time and under any weather and environmental conditions, with a certain number of nuclear forces able to maintain a high degree of combat readiness, capable at all times of implementing strategic nuclear deterrence against enemy countries at the direction of the supreme command. In wartime, they can conduct nuclear counter-attack against the enemy at any time, as directed by the supreme command.

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The domestic Type 092 strategic nuclear submarine failed to meet the technical and tactical requirements, so only one was built. It is now mainly responsible for crew training tasks.

The continuous strategic duty of strategic nuclear submarines usually means that multiple strategic nuclear submarines jointly ensure that at least one strategic nuclear submarine maintains a state of at-sea readiness duty 24 hours a day, 365 days a year, and under various complex weather and sea conditions, ensuring that at least one strategic nuclear submarine can complete nuclear deterrence and nuclear counterattack (also called second strike) against enemy countries upon an order from the supreme command.

Staff Reporter: Is it difficult to achieve continuous strategic duty? China has had strategic missile nuclear submarines for many years. Why has the PLAN only recently achieved continuous strategic duty?

Professor Chi Guocang: Whether strategic nuclear submarines can achieve continuous strategic duty is not only related to strategic nuclear submarine weaponry and equipment technology, but also to the quantity and support capabilities for strategic nuclear submarine

Military and Security Developments Involving the People's Republic of China (2022), U.S. Department of Defense, November 2022, p. 94.

weapons and equipment. And it has an even greater relationship to the level of readiness training of the strategic nuclear submarine force and its submarine command and control (C2) capabilities. It can be said that in all respects the standards are extremely demanding, and it was not easy for China to achieve it.

Staff Reporter: Is the technical threshold extremely high?

Professor Chi Guocang: For strategic nuclear submarine weapons and equipment, the technical threshold is indeed very high, and the stability and reliability requirements for each system are so stringent that they must ensure "nothing ever goes wrong." Because it involves the fate of a strategic great power and even the fate of mankind, there cannot be any shortcomings or flaws in the technology. So, for continuous strategic duty the technology must be advanced, stable, reliable, and easy to use.

Second, satisfying continuous strategic duty for strategic nuclear submarines places extremely high demands on submarine crew operating training levels and submarine command and control capabilities. It takes upwards of a hundred people to operate such a technically complex asset like a strategic nuclear submarine. From the captain on down to each individual crew member, everyone must undergo rigorous training and evaluation.

In other words, aside from the technical thresholds for the design and construction of the submarine itself, the caliber (*suzhi*) of the crew members is extremely important. Caliber does not just refer to their abilities to do their job; it also includes having good moral character, such as being steadfast, loyal to the motherland, etc. This is because strategic nuclear submarines carry nuclear missiles that can destroy a country, and once the boat enters a state of readiness duty it is nearly cut off from the outside world. Only by being absolutely



Strategic nuclear submarines must be on duty around the clock. In addition to the submarine, the requirements for the crew are also high.



Because strategic nuclear submarines are hidden under the deep sea, it isn't easy to communicate with the shore. To command strategic missile nuclear submarines, the U.S. Navy developed the 6B "Doomsday Plane". This aircraft can release a towed antenna thousands of meters long to provide underwater strategic guidance to Nuclear submarines.

loyal and reliable, can crew members live up to the mission when the country needs them.

Staff Reporter: Doesn't a strategic nuclear submarine have any contact with the outside world when it is on readiness duty?

Professor Chi Guocang: It's not that they have no contact, but to reduce the probability of exposure, the less contact, the better. Moreover, when submerged, submarines can only rely on low-frequency or ultra-low-frequency radios (commonly known as long-wave radios) to remedy the communication problems associated with being far away and deep underwater. This kind of communication system is massive and complex, with advanced technical content. The propagation distance can be as far as thousands or tens of thousands of kilometers, and the penetration of seawater by signal waves can be as deep as one hundred meters. The disadvantage is that the transmission efficiency is very low, and the amount of information is very small. It takes a long time to transmit a few bytes and numbers. So usually a signal is sent and a submarine comes up to release a communication buoy to receive messages sent by aircraft or satellites. However, this will increase the risk of exposure. So, aside from the necessary regular safety "check-in," the submarine will generally not make contact unless it needs to.

Staff Reporter: Apart from China, which other countries can currently achieve continuous strategic duty?

Professor Chi Guocang: Before China achieved this capability, only the U.S. and Russian navies could do continuous strategic duty with their strategic nuclear submarines. Aside from the fact that the number of strategic nuclear submarines operated by these two countries can meet the needs of continuous strategic duty, more importantly, these two countries both experienced the

fierce U.S.-Soviet confrontation for hegemony at sea during the Cold War period. The two countries refused to give in to each other, vigorously researching and developing nuclear submarine weapons and equipment and establishing improved and optimized combat procedures and C2 systems and mechanisms.

At the end of the 1980s, the Soviet Union/Russia had 110 strategic nuclear submarines, and the United States had 35. Although the numbers and types of Soviet strategic nuclear submarines were greater, their performance and quality of their nuclear submarines and submarine-launched nuclear missiles were not as advanced or as reliable. For example, the famous USSR "Typhoon" class strategic nuclear submarine cost a lot of money, but it did not match its missiles well. Therefore, after the collapse of the Soviet Union, Russia could not afford to maintain or repair it, and it ultimately became totally obsolete. Today, there are only six "Delta-IV" class strategic nuclear submarines from the Soviet period that are still operational.

However, Russia's current "Borei"-class strategic nuclear submarines and supporting "RSM-56 Bulava" missiles approach the U.S. "Ohio" class strategic nuclear submarine and the supporting "Trident" IID5 submarine-launched missile in terms of technological advancement, stability, and reliability. Four strategic nuclear submarines of this class have been commissioned, and 10 more are planned to be built. In addition, Russia also plans to build four "Khabarovsk" class strategic nuclear submarines carrying the "Poseidon" nuclear torpedo. The United States is even more impressive in this regard. Not only does it have 14 "Ohio" class strategic nuclear submarines, but it has also begun construction of a new generation of "Columbia" class strategic nuclear submarines. The United Kingdom and France have long maintained four strategic nuclear submarines and can only maintain a relatively low posture in terms of nuclear deterrence and nuclear strike capabilities. Although India is also developing and building strategic nuclear submarines, the technology of its nuclear submarines and loaded missiles is relatively backward and the construction speed is comparatively very slow. It is very far from reaching the necessary level of development for achieving continuous strategic duty capabilities. Therefore, strictly speaking, apart from China, currently only the United States and Russia can achieve continuous strategic duty of strategic nuclear submarines.

With Quality Must Come Quantity

Staff Reporter: China's strategic submarine force is a latecomer to achieving continuous strategic duty. Why is that? Was it constrained by the level of submarine equipment? The development level of submarine-launched missiles should also be one of the influencing factors, right?

Professor Chi Guocang: Yes, there are multiple factors. The first is that China's nuclear submarine equipment technology was not advanced enough, or not stable or reliable enough. The main manifestation is that the diameter of the submarine hull (*guke*) is not large enough, and the length of the submarine-launched missile exceeds the diameter of the hull by too much,

necessitating subs like the Type 094 nuclear submarine to add a "turtle-back" deck to the upper part of the missile compartment. This not only affects the submarine's control but also makes the hydrodynamic noise of the sub very loud,

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reducing the underwater concealment performance of the submarine. The "cross"-shaped rudder and propeller technology all seem inferior to the X rudder and pump-jet propulsion of the United States, Russia, Britain and France. Moreover, the lifespan of the nuclear reactor core and the output power of the reactor are not as good compared to those of the nuclear submarines currently in service in the United States, Russia, Britain, and France.

Second, it is equipped with only 12 missile tubes which can carry and launch 12 Julang-2 (JL-2) missiles. These missiles are not as advanced or mature enough in terms of comprehensive technology, so their development and construction speed is fairly slow, their quantity is fairly small, and their strategic status is not comparable to those of great powers.

Third, because strategic nuclear submarines and submarine-launched missiles are rarely used in practice, China has accumulated insufficient experience in submarine C2 and operational support, which restricts the progress and quality of China's strategic nuclear submarines with respect to achieving continuous strategic duty.

Staff Reporter: What is the level of the most advanced strategic nuclear submarine in the world today? How big is the gap with our own Type 094?

Professor Chi Guocang: Public information shows that the Type 094 nuclear submarine has a length of 133 meters and a beam of 13 meters, with a surface displacement of 9,000 tons, an underwater displacement of 11,000 tons, a crew of 120, a maximum submerged speed of 26 knots, and 12 JL-2 submarine-launched ballistic missiles. The missile has a maximum range of 8,000 to 10,000 kilometers, and each missile can be equipped with at least three to six MIRVs (*fendaoshi he dantou*). The explosion yield of each MIRV is estimated to be 200,000 tons of TNT.

In addition, the "turtle back" on the Type 094 is lower than that of the "Delta-IV" strategic nuclear submarine currently in service in Russia. Moreover, the 094 has been in service for a shorter time and is constantly undergoing technical upgrades, so each boat is better than the previous one, and thus may eventually be more technologically advanced than the "Delta-IV." However, compared with the U.S. Ohio class, Russia's Borei class, the British Avantgarde class, and the French Triumph class strategic nuclear submarines, there still exists a certain generational technology gap.

Staff Reporter: Continuous duty means that one submarine needs to be permanently maintained under the sea. Are there numerical requirements for equipment? What is the minimum number of submarines needed to satisfy the rotational requirements (*lunhuan yaoqiu*)?

Professor Chi Guocang: To satisfy continuous duty, strategic nuclear submarines must have a certain number replacement requirements (*tihuan yaoqiu*). According to the development and application practices of strategic nuclear submarines in the United States, Russia, and other countries, the United States maintains 14 strategic nuclear submarines in active service, while Russia maintains 12 strategic nuclear submarines. According to the mechanisms and capabilities of one-third of these submarines being operational, one-third in training, and one-third in maintenance, both the United States and Russia can maintain four operational strategic nuclear submarines at any given time. According to the principle that every boat has two crews that take turns managing the boat and serving duty, there are eight boat crews that are trained and qualified.

The two-ocean fleets of the United States and Russia must ensure that at least one nuclear submarine is at sea on strategic patrol duty. Each nuclear submarine has a voyage of roughly 75 days. After returning, the boat crew will be replaced by another crew to continue to carry out strategic patrol duty. Each crew is at sea 182.5 days a year. Such intensity places high demands on the reliability and stability of submarine weapons and equipment technology, as well as the crew's physical fitness and mental endurance.

According to this standard and practical experience, the United Kingdom and France each have four strategic nuclear submarines, and generally can only maintain one on continuous strategic duty. However, as members of NATO, the UK and France's main strategic opponents can only be non-NATO military powers such as Russia and other nuclear-armed countries. The British and French strategic nuclear submarine bases are both located in the north-central Atlantic Ocean.



Russia's current "Delta IV" class and "Borei" class strategic nuclear submarines

Moreover, these two countries are very close to the main strategic center cities in the European part of Russia. By deploying strategic nuclear submarines in waters close to home, they can effectively leverage nuclear deterrence and conduct nuclear strikes against Russia. Therefore, by having one strategic nuclear submarine operationally deployed at a time and without the need to deploy in remote waters, Britain and France can maintain limited nuclear deterrence and conduct nuclear counterattack against major nuclear-armed countries.

Staff Reporter: Can China's number of strategic nuclear submarines meet the criteria you just laid out?

Professor Chi Guocang: A recent U.S. Pentagon research report pointed out that the Chinese Navy currently has six Type 094 strategic nuclear submarines in service and has begun continuous strategic duty. Therefore, we can assume that based on the number of strategic nuclear submarines and the multi-year operational employment mechanism of the United States, Russia, Britain, France and other countries, if China's strategic nuclear submarine force wants to always have one submarine on duty, then it needs at least a total of four subs. Considering that there is still a gap in the technical level of China's strategic nuclear submarines, and the scope of the sea area [for SSBN operations] is much larger than that of Britain and France, one boat is not adequate assurance. Six is a more reasonable number to ensure that there is enough redundancy to deal with emergencies.



Type 094 strategic nuclear submarine 3D rendering (picture source Qianwang)

However, six SSBNs is less than half that of the United States and Russia. There is also an obvious gap in the technical level of China's nuclear submarines and weapons and equipment. Moreover, the at-sea duty of strategic nuclear submarines is a chief standard of evaluation for the

effectiveness and reliability of the comprehensive operational and command support system. This places high demands on strategic nuclear submarines, submarine weapons and equipment technology, on the overall training levels of the nuclear submarine force's crews, on the planning (*mouhua, jihua*) and command and control of the submarine command organization, as well as the submarine duty rate (*qinwulü*).

Duty Rate and Duty Cycle

Staff Reporter: What does boat duty rate mean, and what level can it generally maintain?

Professor Chi Guocang: Simply put, boat duty rate is the number of boats deployed within a certain time limit, the time limit for performing operational patrol duties at sea, and the frequency of subsequent deployments for a given number of boats. For example, the U.S. two-ocean fleet has always maintained the ability to operationally deploy two to four strategic missile



The Type 094 strategic nuclear submarine is equipped with 12 missile tubes and can load 12 Julang-2 missiles



France's "Triumph"-class strategic nuclear submarine

nuclear submarines at sea. Its strategic nuclear deterrence and nuclear strike capabilities are strong. The U.S. strategic missile nuclear submarine adopts a 15-month (455-day) periodic deployment rate, with 73 days of deployment at sea, 21 days for crew change, 73 days of deployment at sea, 21 days for crew change; 73 days of deployment at sea, 21 days for crew change, 73 days of deployment at sea, and 100 days for equipment maintenance. With the duty approach whereby crew members rest but the boat never rests and there are two sets of crews taking turns being deployed at sea, each crew goes to sea twice, 73 days at a time, for a total of 146 days (3504 hours).

According to the new "Strategic Arms Reduction Treaty," after 2018 the United States would no longer deploy more than 240 ballistic missiles on strategic nuclear submarines. Therefore, given the increased size and tonnage of the "Columbia"-class strategic nuclear submarines, the number of missile tubes has decreased to 16 from the 24 in the "Ohio" class, and the number of boats to be built (12) is also fewer than the 14 "Ohio" class boats. As a result, the number of launchable ballistic missiles has been reduced from 336 to 192. The U.S. Navy, the Department of Defense, and Congress all support [this decision]. They believe that by empirically coordinating submarine training, deployment, and maintenance plans and adjusting the number of nuclear warheads carried on submarine-launched ballistic missiles, strategic nuclear submarines can achieve a balance between capabilities, costs, and flexibility of usage.

Staff Reporter: The duty rate of submarines should be lower than that of surface ships, right? After all, physiological and psychological recovery for crew members after long-term underwater missions should be taken into consideration, no?

Professor Chi Guocang: The at-sea deployment of strategic nuclear submarines is not only different from surface ships, but also from nuclear attack submarines and diesel-electric

submarines. For example, the U.S. aircraft carrier strike group is generally deployed for at-sea duty for six months at a time, but during these six months it not only shows force and conducts combat readiness training in the deployment area, but also docks at NATO countries, or naval bases in Japan and South Korea in the Asia-Pacific, in order to show its military presence and [conduct] deterrence. In this way, personnel can take a short break, relax mentally, and recover physically.

Nuclear attack submarines and diesel-electric submarines generally go on duty for 30 to 50 days at a time. Sometimes they will stop at naval bases in other countries for a short replenishment and rest as needed during sea duty. However, strategic nuclear submarines are a special type of naval service with extremely high requirements for confidentiality and concealment. Once they go out to perform combat readiness missions, they will remain hidden underwater in the prescribed mission sea area according to the plan, and they generally do not take the initiative to communicate with any military force. Usually, they only accept instructions from strategic command, launching missiles against enemy strategic land targets at the order of the supreme command.

The crew members are highly concentrated while on duty at sea, and the psychological pressure is extremely high. Moreover, the three shifts disrupt the sleep clock. Also, given that submarines do not have fresh air and sunlight while submerged, food is stored for long periods of time, and crew members cannot get good exercise. After the boat returns to base, crew members truly do need longer periods for physical, physiological, and mental recovery.

Staff Reporter: How long does strategic nuclear submarine duty typically last?

Professor Chi Guocang: Sources show that U.S. strategic nuclear submarines are on at-sea strategic duty for 73 days, and Russian, UK, and French subs are typically on at-sea strategic duty for 70 days. However, the strategic duty of strategic nuclear submarines is a core national strategic secret and cannot be disclosed to the outside world. However, judging from the at-sea self-sufficiency index of 60-90 days for nuclear submarines, the at-sea readiness index for nuclear attack submarines is likely 60-65 days and the at-sea readiness index for strategic

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The huge side sonar array of the British "Vanguard" class strategic nuclear submarine is striking

nuclear submarines is likely 70-75 days at sea. Multiple practical tests have proven that within this time limit the physical, mental, and psychological endurance of the entire crew can reasonably, effectively, and reliably meet the capability requirements of the strategic nuclear submarine to maintain a high operational state.

Staff Reporter: What is the longest record of underwater duty time for a nuclear submarine?

Professor Chi Guocang: Several major naval powers have conducted tests in this area. The USS *Triton* nuclear submarine's underwater circumnavigation test lasted 84 days. It sailed around the world underwater along the equator. Two Soviet nuclear submarines sailed around the world underwater for 20,000 miles for a total of 52 days. Starting from the Northern Fleet, [the submarines] passed through the Atlantic Ocean - Drake Strait - Pacific Ocean - Kamchatka Peninsula nuclear submarine base strategic transition test [sic]. According to sources, a Chinese Type 091 nuclear submarine sailed at sea for 90 days to verify its maximum self-sufficiency, which is the longest, publicly-disclosed recorded time in the world.



China is currently equipped with six 094 improved nuclear submarines, which can realize the goal of having one in a state of combat readiness at any time.

Staff Reporter: The internal space of nuclear submarines is larger, and the living comfort is better. Will this be more conducive to extending the duty time, or not?

Professor Chi Guocang: Usually not. This is because strategic nuclear submarines are the top priority in the country's "triad" of strategic nuclear forces. One-half of the strategic nuclear forces of the United States and Russia are carried by strategic nuclear submarines. The United Kingdom and France only have sea-based nuclear forces. Today, the internal space of strategic nuclear submarines has increased, allowing crew members to exercise or take a bath. However, the crew members are on duty in a highly concentrated combat state for a long time, which has a great impact on their physical and mental health. Coupled with the lack of sunlight and fresh air, the crew members are easily fatigued. Therefore, the strategic duty time of strategic nuclear submarines in peacetime must be scientific, rigorous, reasonable, and efficient. In wartime, a strategic nuclear submarine's duty time may be extended as needed.



Figure 10: Bangor Submarine Base is the home port of the U.S. Pacific Fleet submarine force. You can see two Ohio-class strategic nuclear submarines docked on the famous triangular pier.



Figure 11: After completing a round of combat readiness duty, the strategic nuclear submarine needs to return to its home port for maintenance.

Strategic Bastion

Staff Reporter: Some analysis argues that China's nuclear submarines achieving continuous strategic duty indicates that the strategic bastion (*zhanlue baoleiqu*) China has established in the South China Sea has taken initial shape. What does this "strategic bastion" mean?

Professor Chi Guocang: The concept of the strategic bastion was first proposed by the Soviet Navy during the Cold War operational deployment of strategic nuclear submarines. Its actual intention was that strategic nuclear submarines of the Soviet Navy's Northern Fleet and Pacific Fleet were deployed underwater in the Barents Sea and the Sea of Okhotsk, where their missile range can cover the strategic targets of NATO countries such as the United States, Britain, and France. These two seas are Russia's near seas or internal waters, constituting a fairly dense aerial, undersea, and surface defensive system. Therefore, a strategic nuclear submarine's entry in and exit out of the sea area can receive fairly good protection, with their security guaranteed, just like being deployed in a "strategic bastion."

Staff Reporter: Are the strategic nuclear submarines of the United States, Russia, Britain, and France also operating in their respective strategic bastions?

Professor Chi Guocang: As mentioned earlier, the concept and application of strategic bastions came from Soviet strategic nuclear submarines during the Cold War. Today, the comprehensive performance of Russia's "Borei" class is close to or even surpasses the strategic nuclear submarines of the United States, Britain, and France. The range of the submarine-launched RSM-56 "Bulava" ballistic missile has reached 10,000 kilometers, and it no longer needs to rely on a "strategic bastion."

The performance of strategic nuclear submarines and submarine-launched ballistic missiles of the United States, Britain, and France are among the best in the world. Especially now that the number of Russian nuclear attack submarines is small, the threat to the strategic nuclear submarines of the United States, Britain, and France is not great. In addition, the strategic nuclear submarine bases of the United States, Russia, Britain, France and other countries are all located at higher latitudes. Submarines only need to be deployed underwater in their own near seas or internal waters to implement effective strategic nuclear deterrence and nuclear strikes against the enemy. Therefore, the concept of strategic bastion is no longer important to the strategic nuclear submarines of the United States, Russia, Britain, France, and other countries.

Staff Reporter: Why does China need to set up a strategic bastion in the South China Sea?

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Professor Chi Guocang: It can only be set up in the South China Sea, because the Bohai Gulf, the Yellow Sea, the East China Sea, and other sea areas are not only too narrow but also not deep enough. The average water depth of the Yellow Sea is only a few dozen meters, and while the average water depth of the East China Sea is bit deeper, it is still only 300+ meters. Conventional submarines operating are a bit cramped (*jucu*), and they are surrounded by the dense underwater monitoring networks set up by the United States and Japan. They are not at all suitable for strategic nuclear submarine operational deployment. The South China Sea, however, is different. The average water depth reaches 1,200+ meters, and the sea area is fairly vast. There are many islands, reefs, sand tables, and trenches. The underwater geographical environment is complex. It

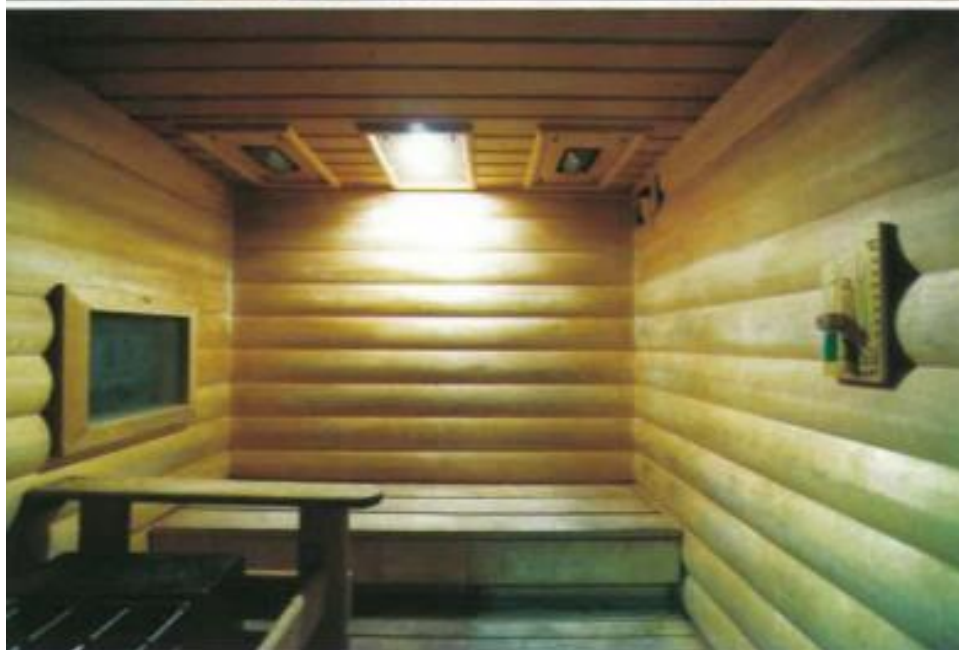
is a good place for strategic nuclear submarines to maneuver and hide. Moreover, with construction completed on the three large islands and reefs in the Spratly Islands, China can build a relatively complete reconnaissance and defense system in the South China Sea to meet the needs of setting up a strategic bastion. However, regarding the deployment of strategic nuclear submarines in the South China Sea, although their range does not meet the requirements for attacking anywhere [in the territory] of strategic opponents, they can hit most places, which is enough for strategic counterattacks.

Staff Reporter: Do strategic nuclear submarines need to be escorted by other ships when entering and exiting the bastion?

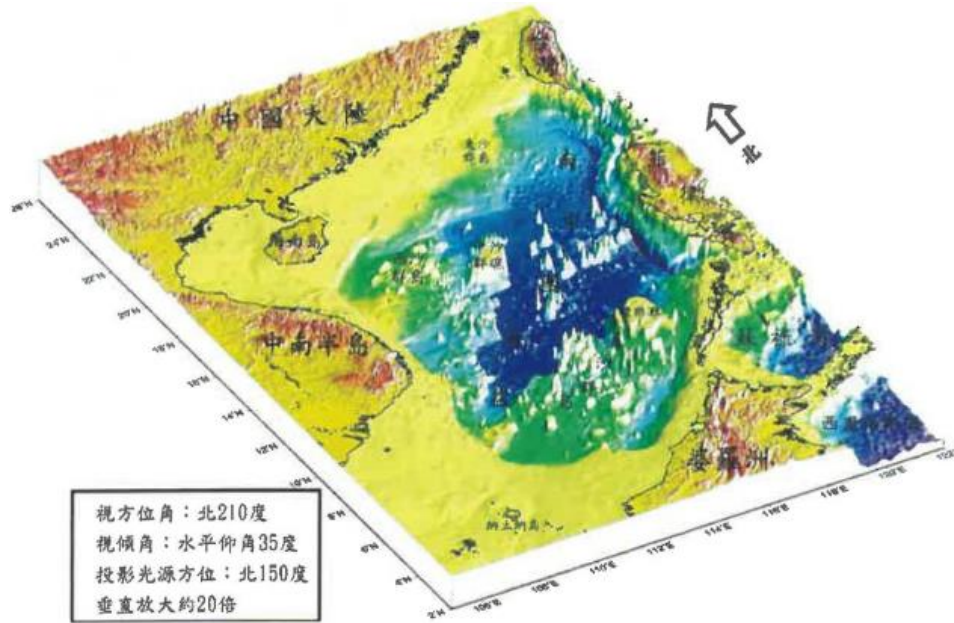
Professor Chi Guocang: Definitely. Building a strategic nuclear submarine maritime bastion requires not only the guarding [operations] (*jingjie*) of surrounding surface ships, but also air and underwater cover and guarding.

Staff Reporter: For the Chinese Navy and China, what is the significance of realizing the continuous readiness of strategic nuclear submarines?

Professor Chi Guocang: Achieving continuous combat readiness for strategic nuclear submarines is hugely significant and might even be called a milestone. [It means that] China possesses three types of strengths and capabilities, viz., mature comprehensive technology, skilled crew operation, and reliable submarine command and control. First, it shows that China's strategic nuclear submarines, the ballistic missiles they carry, and other weapons and equipment are reliable and compatible. All the systems aboard the submarine are adapted to operating in various complex meteorological and sea-state conditions, and the integrated technologies of the nuclear submarines and submarine-launched missiles have matured. Second, it shows that China's strategic nuclear submarine force maintains the strength and capability of at least two boats and four crews capable of skillfully operating strategic nuclear submarines and launching ballistic missiles. Third, [it shows that] the Central Military Commission and the Strategic Command (*zhanlue silingbu*) have the strength and capabilities for reliable command and control and combat support.



The internal environment of Russia's Borei-class strategic nuclear submarine has been improved a lot, and a steam room has even been installed.



The topography of the South China Sea both at longitude and latitude. The South China Sea has a complex underwater geographical environment and is a good place for strategic nuclear submarines to maneuver and hide.

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Russian "Belgorod" nuclear submarine capable of launching the "Poseidon" nuclear torpedo

Strategic Nuclear Submarine Technology Development

Staff Reporter: Some time ago, the last "Typhoon" class strategic nuclear submarine was officially decommissioned. Why did Russia decommission all the world's largest strategic nuclear submarines, but retain the older "Delta" IV type?

Professor Chi Guocang: The "Typhoon" class was once the most prestigious strategic missile nuclear submarine of the Soviet Navy, and its displacement still makes it the largest nuclear submarine ever built. This class of nuclear submarine was 173 meters long and 23.3 meters wide,

with an underwater displacement of 48,000 tons. It was equipped with 20 R39 missiles, which had a length of 16 meters, diameter of 2.4 meters, and a launch weight of more than 90 tons, giving it formidable nuclear strike capabilities. The "Typhoon" living facilities were well-equipped, with special dining rooms, reading rooms, and exercise rooms. It had a swimming pool. The living and working environment was good. However, Russia has decommissioned all submarines configured in this way for the following reasons:

First, the "Typhoon" class nuclear submarine is huge and has a complex design structure. Many of its structures and designs are outdated, and, as a result, make the "Typhoon" class subs very difficult to upgrade. For the cost of building one "Typhoon" class nuclear submarine Russia could build two "Delta IV" class nuclear submarines. But a "Typhoon" class nuclear submarine requires about 25 to 27 million US dollars per year to remain in service. Such high maintenance costs cannot be afforded by the current Russian Navy.

Secondly, the work units that were involved in the construction of a "Typhoon" class boat were dispersed throughout the Soviet republics. With the dissolution of the Soviet Union, many of the enterprises that manufactured component parts no longer existed. Even performing daily maintenance and parts replacement on the "Typhoon" class had become a very luxurious thing. In particular, the R39 missiles equipped with the "Typhoon" class have been decommissioned. And without such a large missile, there is no need to keep in service such a large nuclear submarine.

Third, the reason why the "Typhoon" class need not continue to serve is because the Russian Navy now has the "Borei" class nuclear submarine that is more advanced and more reliable than the "Typhoon" class.

The Russian Navy does retain six older "Delta" IV-class strategic nuclear submarines, not because of how advanced they are, but because the pros outweigh the cons. First of all, the current "Delta IV"-class submarines do have matching missiles, and they can also undertake certain sea-based nuclear strategic duty tasks. The six "Delta IV"-class strategic nuclear submarine deployed with the Northern Fleet can constitute nuclear deterrent and nuclear strike capabilities against NATO countries. Second, the Russian Navy's strategic nuclear submarines are currently suffering from a temporary lack of resources. At this stage, there are only four "Borei" class strategic nuclear submarine in service, which are far from being able to compete with the 14 "Ohio" class strategic nuclear submarines of the United States. For this reason, the Russian Navy not only retains six "Delta IV" class strategic nuclear submarines, but also one modified "Belgorod" class nuclear submarine that can carry "Poseidon" nuclear torpedoes. These 11 strategic nuclear submarines can barely compete with the 14 "Ohio" class strategic nuclear submarines of the United States.

Staff Reporter: What other breakthroughs does China need to make in its strategic nuclear submarine technology? How will it develop in the future?

Professor Chi Guocang: A breakthrough in the comprehensive upgrading of China's strategic nuclear submarine technology is on the near horizon (*zheng zai daolai*). At present, the main publicly-reported technologies include single-hull with large-diameter, 16 to 20 ballistic missiles, shaftless or short-axis pump-jet propulsion, electric propulsion system, X rudder, high-power integrated nuclear reactor with an ultra-long-life reactor core, and the "Julang 3" (JL-3) submarine-launched missile with a range of 8,000 to 10,000 kilometers and MIRVs increased to between 6 and 8. The breakthroughs, maturation, and improvements in these technologies will surely provide a reliable guarantee for the scaled development (*guimo fazhan*) of China's new-type strategic nuclear submarine force, in order to meet the needs for two-ocean employment (Pacific Ocean and Indian Ocean) of China's sea-based strategic nuclear force.

Staff Reporter: In the future, as China's nuclear submarine technology improves, will the strategic bastion no longer be limited to the South China Sea and can it be set up in the broader Pacific Ocean?

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Professor Chi Guocang: Yes. With the comprehensive improvement of its strategic nuclear submarine weapons and equipment—truly reaching the level of strategic nuclear submarine technologies utilized by the United States, Russia, and other countries—China will inevitably develop a certain scale of strategic nuclear submarine force directed at its strategic opponent(s). If China does not take back Taiwan island and control the surrounding waters, Chinese strategic nuclear submarines moving towards the Pacific will be subject to the surveillance of the 7th Fleet and U.S. forces stationed at military bases in the Asia-Pacific and near Japan and South Korea, especially the underwater sonar monitoring systems deployed in various straits and waterways of the first island chain. Also, there are the reconnaissance and surveillance systems of surface warships, submarines, and unmanned submersibles, all of which constitute a severe threat to Chinese strategic nuclear submarines entering and exiting the Pacific Ocean. Therefore, recovering Taiwan island and its surrounding affiliated islands is an inevitable requirement for a strong and prosperous China. Only by completing this historic mission can China's strategic depth be moved forward towards the Pacific Ocean. Only by doing so can [China] move beyond the first island chain and be less constrained by imperialist powers. Only then can China's strategic nuclear submarines form a truly powerful deterrent to strategic opponents.

Staff Reporter: Thank you very much Professor Chi for accepting our interview!



Achieving continuous combat readiness of strategic nuclear submarines shows that China's strategic nuclear submarine force has truly grown up



Two Type 094 strategic nuclear submarines are sailing side by side. There are subtle differences in the command platform enclosures of the two boats, indicating technical improvements have been made.