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# The Desirable Platform of the Republic of Korea Navy: Alternative to Nuclear Submarines

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**THE DESIRABLE PLATFORM OF THE REPUBLIC OF KOREA NAVY:  
ALTERNATIVE TO NUCLEAR SUBMARINES**

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# **THE DESIRABLE PLATFORM FOR THE REPUBLIC OF KOREA NAVY: ALTERNATIVE TO NUCLEAR SUBMARINES**

## **AIM**

1. Recently, it has been argued that South Korea needs its own nuclear armament to respond to North Korea's nuclear weapons and long-range missile threat. In particular, the introduction of nuclear submarines as a future force of the Republic of Korea Navy is continuously advocated for to prepare for threats from submarine-launched ballistic missiles and to improve anti-submarine warfare capabilities. However, the project to introduce nuclear submarines is an important issue that requires a lot of time and money. Also, considering Korea's geo-military and financial environment, there are obviously many concerns. Therefore, it is necessary to approach carefully by reviewing many factors to be considered. This paper will outline the specific limitations and problems of the ROK Navy's introduction of nuclear submarines and briefly suggest alternatives to them.

## **INTRODUCTION**

2. North Korea's evolving nuclear weapons threat is the greatest threat to South Korean security. North Korea withdrew from the Treaty on the Non-Proliferation of Nuclear Weapon (NPT) in 2003 and conducted its first nuclear test in 2006. Since then, the Kim Jong-un regime has conducted four additional nuclear tests. Meanwhile, throughout the test period, North Korea continued to pursue the miniaturization of nuclear warheads so that they could be mounted on missiles<sup>1</sup>. Thus, North Korea developed and completed the Hwasong-15 inter-continental ballistic missile (ICBM) under the disguise of a peaceful space launch vehicle program. It has a range of nearly 13,000 kilometres and can almost threaten the world. After the successful test launch of the Hwasong-15, North Korea's state media claimed that it had finally realized the historic cause of completing its nuclear force.<sup>2</sup>

3. As a supplement to North Korea's land-based nuclear missiles, it has developed submarine-launched ballistic missiles (SLBM). In 2015, the SLBM test began, and in 2016, four SLBM were launched and tested. In October 2019, the Pukguksong-3 type, SLBM with a range of 1,900 km was launched<sup>3</sup>. In January 2021, the appearance of the Pukguksong-5 type, SLBM was unveiled at a military parade by North Korean authorities. In addition, North Korea currently operates about 70 old-fashioned submarines and developed and deployed a Sinpo-class missile-launching submarine for the launch of the SLBM

4. North Korea's SLBM attack is the greatest threat to South Korean security and is the first military objective to be eliminated by the ROK Navy. In order to eliminate this threat, many military experts in Korea argue for the introduction of nuclear submarines into the ROK Navy as an asymmetric force. Supporters of nuclear submarines in South Korea argue that nuclear

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<sup>1</sup> "North Korea Overview" *Nuclear Threat Initiative*, 19.Oct.2021, [www.nti.org/](http://www.nti.org/).

<sup>2</sup> Uri Friedman, "North Korea Says It Has 'Completed' Its Nuclear Program," *The Atlantic*, 29 November 2017, [www.theatlantic.com/](http://www.theatlantic.com/).

<sup>3</sup> Jack Kim, "Explainer: North Korea's Suspected Submarine Missile 'Pushes the Envelope,'" *Reuters*, 2 October 2019, [reuters.com/](http://reuters.com/).

submarines are ideal for detecting and neutralizing North Korean ballistic missile submarines for two reasons. The first reason is nuclear submarines can stay underwater for months rather than days or weeks compared to diesel submarines. Second, while diesel submarines have difficulty sailing beyond 20 knots and must frequently surface to recharge their batteries, nuclear submarines can maneuver at high speeds of up to 40 knots even at great depths. It is an illusion of a nuclear submarine to think that these advantages such as extended underwater operating area and increased operational speed alone will eliminate all North Korean submarine and SLBM threats.

## DISCUSSION

5. **Operational environment issue.** The area in which the ROK Navy operates is limited to the waters surrounding the Korean Peninsula. In addition, the main arena for the ROK navy to deal with the North Korean navy is the West Sea and the East Sea. These waters are very close to the waters of neighbouring countries such as China and Japan and are very narrow, especially in the West Sea, where the water depth is very shallow with an average depth of 44 meters. It is thought that the general operational advantage of nuclear submarines is unlikely to be effective given the operating environment of the ROK Navy. Also, unlike the United States, the South Korean government does not have extensive geographically distant allies. While the advantages of nuclear submarines (extended underwater operating area, increased operational speed) make them suitable for global operations, the ROK Navy's operational domain is regional rather than global.

6. **Law issue.** The biggest obstacle to acquiring ROK Navy's nuclear submarines is the issue of nuclear fuel. South Korea has the ability to build nuclear reactors, but Korea cannot produce uranium itself. Most of the uranium fuel for nuclear plants is imported from the United States. Also, South Korea has 123 agreements with the United States<sup>4</sup>. The agreement allows South Korea to enrich uranium to 20% for civilian use only. The use of uranium for military purposes is prohibited. If South Korea wants to use the enriched uranium it purchases for military purposes, existing agreements will need to be renegotiated. Of course, it is possible to find alternative uranium suppliers outside the US, but it is not easy. As a last resort, it is possible to withdraw from the NPT and pursue an independent nuclear development course, but this is an act of total denial of the South Korean government's efforts to denuclearize the Korean Peninsula. Since the South-North Korea denuclearization declaration in 1992, the issue of denuclearization of the Korean Peninsula has been a major goal of every South Korean government. After all, if the South Korean government approves an enrichment program for nuclear submarines, it is certain that the issue of denuclearization and peace on the Korean Peninsula will become more difficult and complicated.

7. **Nuclear fuel supply and disposal issue.** Assuming that nuclear fuel can be secured by revising the nuclear deal with the United States, another problem South Korea face afterwards is the resupply and disposal of nuclear fuel. The ROK Navy's nuclear submarines can use either low-enriched uranium or highly-enriched uranium as fuel. If it uses 6% low-enriched uranium, it can typically operate for about 10 years without refuelling. After that, low-enriched uranium must be resupplied every 10 years, which requires advanced nuclear technology to ensure fuel

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<sup>4</sup> <https://www.state.gov/fact-sheets-bureau-of-international-security-and-nonproliferation/123-agreements/>

safety, as well as new port and military facilities<sup>5</sup>. If highly enriched uranium is supplied to a nuclear submarine, refuelling is not required until retirement. However, there is a risk of nuclear proliferation due to the handling of nuclear weapons-grade fuel, and the cost of building a ship will increase rapidly and advanced technology will be required. In addition, nuclear reactors and special facilities to dispose of radioactive materials are required when nuclear submarines are retired. In particular, it is necessary to safely remove the core, vessel, and coolant from the reactor, and to continuously store and manage them. It may be a dangerous idea to insist on the introduction of nuclear submarines without worrying about and resolving issues related to nuclear agreements and fuel acquisition/supply.

8. **Shipbuilding tech and time issue.** South Korea is a country with the world's No. 1 shipbuilding capacity. In addition, Korea is operating a nuclear power plant, and there are cases where it has secured its own nuclear reactor technology and exported the technology abroad. But designing and building nuclear submarines is a completely different matter. Quoting a 1995 report by the USN Reactor Design Community, "Applying nuclear power to a mobile military platform imposes unique functional requirements<sup>6</sup> on the reactor. Failing to satisfy any of them would make the reactor unusable in the ship or would compromise the safety and survivability of the ship and its ability to carry out its mission." endangering the crew. The U.S. Navy also experienced a tragic accident when the USS Thresher sank in 1963 due to design and construction errors. Also, considering the US Navy's nuclear submarine acquisition process, it took four years to create the basic design and an additional nine years to complete the detailed design. Even this is only a design consideration, and considering the above characteristics, it is not easy to predict how long it will take until it is put into operation after construction and test evaluation.

9. **Defense budget acquisition issue.** If South Korea ignore the various problems mentioned above and decide to introduce nuclear submarines, South Korea will face the next most realistic budget problem. According to South Korean media, South Korea's proposed nuclear submarines will consist of at least three ships. This is because, according to the basic concept of operation-repair-standby, 3 ships must be secured to continuously operate at least one ship. The estimated cost of the three nuclear submarines and supporting infrastructure is \$9 billion (excluding operating costs)<sup>7</sup>. However, the South Korean defence budget for 2022 is \$41.3 billion, of which \$13.1 billion was used to improve defence capabilities. In addition, the annual ROK-U.S. defence cost-sharing is \$1.06 billion<sup>8</sup>. The cost of introducing nuclear submarines is more than 70% of the annual cost of improving the defence capability of the ROK military and is equivalent to the amount of mutual defence cost-sharing between the ROK and the US over the next 90 years. In addition, it is not easy to proceed as planned for a long-term power introduction project that requires such a high cost. Because the ROK military's internal defence budget is limited, mutual containment for the reinforcement of each military force is more serious than expected.

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<sup>5</sup> Campbell, James. "Seoul's Misguided Desire for a Nuclear Submarine." *Naval War College Review* 74, no. 4. P.6

<sup>6</sup> Unique functional requirements : compactness, crew protection, public safety, reliability, Ruggedness, maneuverability, endurance, and quietness / Director, Naval Nuclear Propulsion, "Report on Use of Low Enriched Uranium in Naval Nuclear Propulsion," [fissilematerials.org](http://fissilematerials.org), June 1995.

<sup>7</sup> Franz-Stefan Gady, "Will South Korea Build Nuclear Attack Subs?," *The Diplomat*, 8 November 2017, [thediplomat.com/](http://thediplomat.com/).

<sup>8</sup> Ahn Sung-mi, "South Korea, US sign deal on shared defense costs", 8.Apri.2021, [koreaherald.com/](http://koreaherald.com/)

## CONCLUSION

10. As mentioned earlier, Korea is a country with regional security requirements that concentrates and maintains military forces on the Korean Peninsula and in the surrounding waters. And there are obviously various limitations and problems in acquiring nuclear submarines in Korea. In addition, it is necessary to consider whether the North Korean regime's nuclear armament and securing ICBM and SLM capabilities are aimed at attacking the South Korean government. Geographically, South and North Korea are too close to each other for North Korea to use nuclear weapons. As the regime has stated in numerous press statements, it represents the ultimate deterrent against the United States. Considering all of these points, nuclear submarines are not a clear military strategic requirement for South Korea. Producing and operating nuclear submarines does little to strengthen South Korea's national security, but it can be a costly and risky venture. I think it would be a wiser choice for Korea to consider other alternatives before further delay.

## RECOMMENDATION

11. As an alternative to introducing nuclear submarines, I propose additional securing and upgrading of existing anti-submarine warfare platforms. The ROK Navy has made significant progress through cooperation with the US Navy in its anti-submarine warfare capability. It already has several very capable anti-submarine warfare platforms that offer a greater return on investment compared to limited nuclear submarines. Destroyers, escort ships, diesel submarines, anti-submarine helicopters/aircraft, etc. The funding required to acquire nuclear submarines could further augment and improve the current mix of anti-submarine warfare platforms.

12. The Republic of Korea Navy's Sejong the Great destroyers, priced at \$925 million each, have anti-submarine warfare weapons and sensors, and 128 vertical missile cells for ballistic missile defence and land attack. In addition to the anti-submarine capability of King Sejong the Great, the anti-aircraft defence capability can be upgraded. Currently, the ship is operating the Standard SM-2ER missile, but it is thought that if the standard missile SM-3<sup>9</sup> is introduced in the long term, it will be able to provide multi-level defence capabilities against the North Korean ballistic missile threat.

13. The Daegu-class guided missile frigate carries anti-submarine missiles, torpedoes and sonar and has an integrated anti-submarine warfare system. The cost of building each ship is about 300 million dollars. Although smaller in size than a destroyer, it is capable of performing various missions and is not lacking in carrying out assigned missions in the waters around the Korean Peninsula. By acquiring more frigates, ROK Navy can continue operations.

14. With powerful anti-submarine warfare assets, the ROK Navy is preparing for introduction and operation in 2024. This is the result of the U.S. State Department's approval of

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<sup>9</sup> SM-3 : The RIM-161 Standard Missile 3 (SM-3) is a ship-based surface-to-air missile system used by the United States Navy to intercept short- and intermediate-range ballistic missiles as a part of Aegis Ballistic Missile Defense System. [Wikipedia.com/](https://en.wikipedia.org/wiki/Standard_Missile_3)

the sale of eight Poseidon units to Korea for about \$2.1 billion in 2018<sup>10</sup>. The Poseidon aircraft has a range of 1200 miles and can monitor up to 11 torpedoes and up to 64 sonobuoys. Anti-submarine helicopters can further increase the anti-submarine warfare capabilities of surface ships. Both destroyers and escort ships of the Republic of Korea Navy can operate anti-submarine helicopters from their decks. Currently, the British-made Lynx is operated as an anti-submarine helicopter, but the introduction of the US Navy's Mheich-60 will further upgrade its anti-submarine capability. The MH-60 can carry up to three torpedoes and 25 sonobuoys, costing about \$40 million per aircraft.

15. The ROK Navy's submarines consist of the Jang Bogo class, the Son Won-il class, and the Dosan Ahn Chang-ho class. All use a diesel-electric propulsion system and have eight torpedo tubes. The Dosan An Chang-ho class has a vertical launch pad and can fire submerged missiles. In addition, by introducing a larger air-free propulsion system than the previous class, it shows excellent operational sustainability and has the advantage of being less likely to be detected by enemy submarines due to lower noise compared to nuclear submarines. At about \$900 million each, the submarines are still cheaper than acquiring nuclear submarines, so more submarines can be acquired for continued operational missions in the area around the Korean Peninsula.

16. Combining air assets with surface ships and submarines allows the Republic of Korean Navy to effectively detect, track and destroy enemy submarines over a much larger area than is possible with a single nuclear submarine. In addition, if the Republic of Korea Navy chooses the proposed alternative, instead of wasting money on a nuclear submarine, it can improve and augment a platform that can provide various mission capabilities as well as improved anti-submarine warfare capabilities. The money used to acquire nuclear submarines could be put to better use by being reinvested into the air force, ground forces or the national economy. As a result, the balanced military capabilities of the ROK military can bring about a virtuous cycle that further increases the interoperability of the ROK-US alliance.

17. Having one nuclear submarine in the ROK Navy does little to reduce the North Korean missile-submarine threat. Certainly, the ROK Navy's introduction of nuclear submarines is irrational and inefficient response to the North Korean threat. The obvious alternative lies in expanding South Korea's limited defence budget to its current anti-submarine capabilities, such as destroyers, frigates, submarines and aircraft. These assets can be introduced at a fraction of the cost of nuclear submarines, and Korea already has the infrastructure to integrate and operate these assets. In addition, additional investments can be made in the fields of drones, artificial intelligence, and unmanned aerial vehicles based on Korea's leading technology industrial capabilities. This will be able to combine with the existing platform of the Republic of Korea Navy to create a synergistic effect while providing multidimensional capabilities and functions against the North Korean threat.

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<sup>10</sup> "The U.S. State Department has approved possible sale of six P-8A MPA to South Korea", 18.Sep.2018, /navalpost.com/

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