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THESIS

**WHAT CONSEQUENCES DO DPRK BALLISTIC MISSILE
SUBMARINE TECHNOLOGY DEVELOPMENTS POSE
FOR ROK AND U.S. SECURITY POSTURES NOW AND
IN THE FUTURE?**

by

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December 2021

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TECHNOLOGY DEVELOPMENTS POSE FOR ROK AND U.S. SECURITY
POSTURES NOW AND IN THE FUTURE?**

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ABSTRACT

The DPRK's WMD programs pose increasing threats to security in the region. To better understand that challenge, this thesis investigates specifically the consequences for U.S. and ROK strategic postures arising from current DPRK efforts to develop Submarine-Launched Ballistic Missiles (SLBM) and Ballistic Missile Submarines (SSB). This SLBM/SSB effort bears directly on the ROK Navy's current efforts to counter wider technology and capability improvements by the DPRK Navy in the undersea domain as well as broader ROK interests in adopting a more global focus for its military posture. The DPRK's SLBM/SSB ambitions also directly impact U.S. security interests on issues including extended deterrence assurances to the ROK, regional anti-submarine warfare capabilities, and wartime operational control of military forces on the Korean Peninsula. To address its focal concern, the thesis first presents the current status of the DPRK SLBM and SSB programs. The thesis then utilizes these details to estimate DPRK intentions in pursuing these programs. On this basis, the thesis then evaluates recent and prospective ROK responses. Overall, the thesis reaches two conclusions. On the one hand, given U.S. and ROK capacities, the potential threat posed by the DPRK's aim to deploy nuclear-capable SLBMs will be negligible. However, the DPRK leadership's overestimation of its SLBM/SSB capabilities could fuel risky provocative behavior eroding regional stability and deepen crisis dangers.

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LIST OF ACRONYMS AND ABBREVIATIONS

AIP	air-independent propulsion
AOR	area of responsibility
ASROC	anti-submarine rocket
ASW	anti-submarine warfare
BMD	ballistic missile defense
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
DAPA	Republic of Korea Defense Acquisition Program Administration
DPRK	Democratic People's Republic of Korea
DRP 2.0	Republic of Korea Defense Reform Plan 2.0
HVU	high-value unit
JMSDF	Japanese Maritime Self Defense Force
KPA	Korean People's Army
KPN	Korean People's Navy
KTO	Korean theater of operations
MND	Republic of Korea Ministry of National Defense
MPRA	maritime patrol and reconnaissance aircraft
NLL	northern limit line
OPCON	operational control
REBU	North Korean Reconnaissance Bureau
ROK	Republic of Korea
ROKN	Republic of Korea Navy
ROKS	Republic of Korea ship
SLBM	submarine-launched ballistic missile
SLOC	sea lines of communication
SOF	special operations forces
SSB	ballistic missile submarine
SSC	coastal submarine
TTP	training, tactics, and procedures
USN	United States Navy

U.S.
VLS

United States
vertical launch system

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I. INTRODUCTION

A. MAJOR RESEARCH QUESTION

The Democratic People's Republic of Korea (DPRK) and the Republic of Korea's (ROK) perpetual power struggle has taken on a new form as the ROK Navy attempts to counter recent strategic technology and capability improvements presented in the undersea domain by the DPRK Korean People's Navy (KPN) through the introduction of Submarine-Launched Ballistic Missiles (SLBM) and Ballistic Submarines (SSB). The ROK is on the verge of shifting its military focus globally to better defend its interests in areas other than the Korean Area of Responsibility (AOR). Similarly, ROK and U.S. forces have been heavily focused on the topic of Operational Control (OPCON) transfer during wartime. Taking these two developments together, it is essential to analyze the emerging threat presented by new North Korean SSBs to determine if current and future planned capabilities are robust enough to counter the threat given the new security requirements. Understanding key historical trends in submarine advances and understanding the impacts of new capabilities will help determine the future course of action for ROK navy Anti-Submarine Warfare (ASW) and subsurface advancement. This thesis addresses the following question:

What consequences do DPRK SSB developments pose for ROK and U.S. strategic security postures now and in the future?

B. SIGNIFICANCE OF THE RESEARCH QUESTIONS

Following the ROK Navy corvette CHEONAN's sinking by a North Korea midget submarine in 2010, the South Korean government adopted a new military strategy; shifting focus away from land-based threats that had previously dominated the military prioritization scheme towards countering the subsurface threat posed by the North.¹ Though the sinking was an embarrassment, it triggered substantial military reforms leading

¹ Ian Bowers, *The Modernisation of the Republic of Korea Navy* (New York, NY: Springer Berlin Heidelberg, 2018), 30–45.

to the development of new subsurface forces and doctrine to detect and counter the threat posed by North Korean submarines, as well as a reassessment of defense capabilities in the form of a Defense Reform Plan.² Given the roughly ten years since that incident, the South has acquired a significant technological superiority in its submarine force and has committed to expanding its ASW capabilities. The need to quickly detect and counter submarines of various classes led to reformations of naval command structure, the development and acquisition of new submarine technology and hulls and increasing ASW capabilities within surface combatants as well as maritime surveillance aircraft.³

In 2014, a paradigm shift in the undersea threat competition took place with the launching of a North Korean SSB and subsequent SLBM test launches in the years following. We do not know if North Korea is attempting to establish a survivable second-strike capability. However, the new submarine class suggests a more strategic mission set is being added within its submarine force.⁴ This is a significant departure from how we have historically understood North Korean submarines to operate: infiltration, anti-shiping operations, and attacking ROK SLOCs have been the primary missions observed, and for which U.S. and ROK forces have trained.

In 2019, the DPRK announced modification efforts of a ROMEO-class attack submarine were underway. According to a ROK Ministry of National Defense (MND) official, leading assessments indicate the ROMEO is being outfitted as a SSB, “capable of carrying three SLBMs.”⁵ Additionally, the construction of another large-diameter submarine was assessed as either an SSB or SSBN. North Korea’s actions suggest the

² Bruce W. Bennett, *A Brief Analysis of the Republic of Korea’s Defense Reform Plan*, Occasional Paper / Rand Corporation, OP-165-OSD (Santa Monica, CA: RAND Corporation, 2006), 5; Bowers, *The Modernisation of the Republic of Korea Navy*, 36.

³ Sukjoon Yoon, “Expanding the ROKN’s Capabilities to Deal with the SLBM Threat from North Korea,” 2017, 13–14.

⁴ Yoon.

⁵ Oliver Hotham, “New North Korean Submarine Capable of Carrying Three SLBMs: South Korean MND,” NK News - North Korea News, July 31, 2019, <https://www.nknews.org/2019/07/new-north-korean-submarine-capable-of-carrying-three-slbms-south-korean-mnd/>.

desire to threaten areas outside of its historic sphere of influence. With a more significant threat potential, a reassessment of ROK capabilities and priorities is necessary.⁶

The risk in a conflict involving maritime assets is high when the enemy possesses a submarine force, even if that force is obsolete.⁷ The uncertainty provided by even a single unlocated enemy submarine can significantly impact operations both on and off the Korean peninsula. The situation becomes even more grave when the enemy's fleet maintains numerical superiority; commanders may prioritize eliminating more threatening submarines if they do not possess the right holistic ASW capability to match all the threats. The potential for less threatening submarines to remain unprosecuted in the absence of adequate ASW capabilities can have resounding impacts on a war effort. Without the correct ASW capability in the ROK force, the arrival of KPN strategic submarines may negatively impact an already tricky ASW situation.

Moreover, the shift in the submarine mission set towards more strategic goals, such as a second-strike capability, may alter the impact these submarines have on the region's overall security environment.⁸ Even if what the DPRK has presented to date is only rhetoric to attempt to gain prestige, the combination of SLBM-capable submarines and even a potential for miniaturized nuclear warheads presents the need to conduct a holistic audit of current ASW capabilities and practices to determine how that new threat will impact the security environment.

These developments are taking place in the context of a transition in U.S.-ROK control over Korean peninsula military forces. Ever since the Armistice was signed in 1953, the ROK and USA have remained a solid bilateral alliance for the defense of the Korean Peninsula. The Mutual Defense Treaty signed between the two nations has been held to this day. The ROK armed forces were placed under the Operational Control of the U.S. since the war; peacetime OPCON was transferred back to the Korean armed forces in

⁶ Hotham.

⁷ Joseph C Lodmell, "The Impact of the North Korean Submarine Force at the Operational Level of War" (Newport, RI: U.S. Naval War College, June 14, 1996), <https://apps.dtic.mil/sti/citations/ADA312031>.

⁸ Yoon, "Expanding the ROKN's Capabilities to Deal with the SLBM Threat from North Korea."

December 1994 while wartime control remains with the U.S. The Commander of Combined Forces Command assumes the role of Commander of all forces, U.S. or Korean, in war.⁹ In 2006, both sides agreed to disestablish the Combined Forces Command and grant wartime control back to the ROK after October 15, 2009 but no later than March 15, 2012. Political and budgetary constraints led to a delay to 2015, followed by another delay with North Korea's nuclear tests. Finally, President Park and President Obama decided to delay the transfer indefinitely while adopting a new plan termed the Conditions-Based OPCON Transition Plan. Under this new plan, OPCON will only transfer once the ROK and alliance members develop specific capabilities that enable a peaceful transfer of power.¹⁰

This thesis evaluates the development trends of North Korea's SSB program taking an objective look at developments made in SSB-related infrastructure, missiles, and hulls in order to assess strategic goals of the program. This thesis analyzes reactions to these developments by ROK forces to date, and assess what further changes may be needed to adequately defend against the combined local and strategic threat of North Korean submarines ahead of the ROK obtaining OPCON.

C. LITERATURE REVIEW

In the years following the Korean War, North Korea has expanded its submarine fleet to become one of the world's largest. In the mid-1990s, the North undertook efforts to modernize parts of its Navy to offset obsolescence and increase serviceability, including the construction of newer coastal submarines and new submarine classes.¹¹ However, as it stands to date, most of the hulls still in service are Soviet-era vessels without significant upgrades. Their numbers remain high with 20–22 ROMEO-class attack submarines, 35+

⁹ Young S. Hwang, "Wartime OPCON Transition and the ROK-U.S. Alliance," Strategy Research Project (Army War College Carlisle Barracks, PA, March 1, 2013), <https://apps.dtic.mil/sti/citations/ADA589521>.

¹⁰ Johannes Nordin, "Taking Back Control: South Korea and the Politics of OPCON Transfer," Institute for Security and Development Policy, accessed March 16, 2021, <https://www.isdp.eu/publication/taking-back-control-south-korea-and-the-politics-of-opcon-transfer/>.

¹¹ "Korea, North - Navy," Janes, February 5, 2021, <https://customer-janes-com.libproxy.nps.edu/Janes/Display/JWNA0082-JWNA>.

SANG-O coastal submarines, 10+ YONO midget submarines, and one GORAE ballistic missile submarine.¹² The GORAE represents potentially a new direction the North is taking as it attempts to advance its subsurface capabilities further and present a strategic threat to its perceived enemies.

1. DPRK Submarine Development Efforts

Academic works detailing North Korea's efforts to develop nuclear weapons are numerous, with the consensus that North Korea has accomplished its goal of developing nuclear weapons. This came to pass following a series of nuclear tests of increasing intensity from 2006 to 2017.¹³ Experts are becoming more convinced the North has even gone as far as achieving the goal of miniaturizing a nuclear warhead for future use via missile; to date, there have been no publicly-aided tests to prove this theory.¹⁴ Kim Jong Un has even gone so far as posing with what appears to be a two-stage hydrogen bomb, though this could simply be a prop.¹⁵ In his article discussing nuclear hedging on the Korean Peninsula, Kim discusses the advances in nuclear and missile capabilities for the North stating "despite U.S. efforts to denuclearize North Korea for the past quarter century [sic], North Korea had already become a de facto nuclear-armed state."¹⁶

Other steps at improving military capabilities took place involving the launch of a new ballistic missile submarine, the GORAE, which scholars believe served as a testbed

¹² Janes.

¹³ Lami Kim, "South Korea's Nuclear Hedging?," *The Washington Quarterly* 41, no. 1 (January 2, 2018): 115–33, <https://doi.org/10.1080/0163660X.2018.1445910>.

¹⁴ Vann Van Diepen, "Cutting Through the Hype About the North Korean Ballistic Missile Submarine Threat," *Analysis*, 38 North, September 6, 2019, <https://www.38north.org/2019/09/vvandiepen090619/>; Laura Bicker, "Kim Jong-Un Pledges to Expand North Korea's Nuclear Arsenal," *News*, BBC World News, January 9, 2021, <https://www.bbc.com/news/world-asia-55598880>; Grace Oh, "N. Korea Beefs Up Missile Units, Special Forces Over Past Years: Defense Ministry," *Yonhap News Agency*, February 2, 2021, <https://en.yna.co.kr/view/AEN20210202003051325>; Joseph Trevithick, "North Korea's New Ballistic Missile Submarine Is a Refurbished Antique," *Analysis*, *The Drive*, July 23, 2019, <https://www.thedrive.com/the-war-zone/29122/north-koreas-new-ballistic-missile-submarine-is-a-refurbished-antique>.

¹⁵ Adapted from Jack Kim Park Ju-min, "Possible Two-Stage Hydrogen Bomb Seen 'Game Changer' for North Korea," *Reuters*, September 3, 2017, <https://www.reuters.com/article/us-northkorea-missiles-thermonuclear-ana-idUSKCN1BE0PT>.

¹⁶ Kim, "South Korea's Nuclear Hedging?," January 2, 2018, 118.

for submarine-launched ballistic missiles in the same timeframe as nuclear development.¹⁷ Following the launch of the submarine and several tests of SLBMs between 2015 and 2016, there was a lull in activity between 2017 and 2019 which coincided with peace negotiations that have since stalled.¹⁸ In 2020, a new SLBM was test-launched from a floating test barge, thought to be because the new missile is longer and wider than its predecessor.¹⁹ Two new missiles, the Pukguksong-4 and -5, thought to be SLBMs, were debuted in parades in October of 2020 and January of 2021 respectively. It is unclear if both are upgraded versions of what was launched in 2020, though the possibility exists that one or both could be land-launched variants similar to the Pukguksong-2.²⁰ The GORAE again returned to the sea in October, 2021 to launch a new, currently unnamed SLBM similar in design to the land-based KN-23.²¹ This continuation in the effort to deliver ballistic missiles via submarine suggests the North is trending towards strategic capabilities to hedge against threats over the horizon as well as within the Korean AOR.

On September 5, 2020, Kim Jong Un surprised the world with an announcement that North Korea was near completing a nuclear-powered submarine.²² According to Lee,

¹⁷ John Pike, "GORAE-Class Ballistic Missile Sub," *Global Security* (blog), July 23, 2019, <https://www.globalsecurity.org/military/world/dprk/s-gorae.htm>.

¹⁸ Theodore A. Postol and Markus Schiller, "The North Korean Ballistic Missile Program," *Korea Observer* 47, no. 4 (Winter 2016): 751–805.

¹⁹ Michael Elleman, "North Korea's New Pukguksong-3 Submarine-Launched Ballistic Missile," 38 North, October 3, 2019, <https://www.38north.org/2019/10/melleman100319/>; Joseph Bermudez Jr. and Victor Cha, "Sinpo South Shipyard: Preparations for a Pukguksong-3 SLBM Test?," Beyond Parallel, September 4, 2020, <https://beyondparallel.csis.org/sinpo-south-shipyard-preparations-for-a-pukguksong-3-slbm-test/>; Center for Strategic & International Studies, "Pukguksong-3 (KN-26)," Missile Threat, June 23, 2020, <https://missilethreat.csis.org/missile/pukguksong-3/>.

²⁰ H I Sutton, "North-Korean-Navy-SLBM-Pukguksong-5," January 25, 2021, <http://www.hisutton.com/North-Korean-Navy-SLBM-Pukguksong-5.html>; Vann Van Diepen and Michael Elleman, "North Korea Unveils Two New Strategic Missiles in October 10 Parade," Analysis, 38 North, October 10, 2020, <https://www.38north.org/2020/10/vdiepenmelleman101020/>; Masao Dahlgren, "North Korea Displays New Missiles in Nighttime Parade," Missile Threat, January 15, 2021, <https://missilethreat.csis.org/north-korea-displays-missiles-in-nighttime-parade/>; Masao Dahlgren, "North Korea Displays New Missiles in Parade," Missile Threat, October 14, 2020, <https://missilethreat.csis.org/north-korea-displays-new-missiles-in-parade/>.

²¹ Jeffrey Lewis and Joseph Dempsey, "North Korea's Small SLBM," accessed October 31, 2021, https://html5-player.libsyn.com/embed/episode/id/20963375/height/100/width//thumbnail/no/render-playlist/no/theme/custom/tdest_id/544855/custom-color/a1c4d4.

²² H I Sutton, "North Korean Navy Nuclear Submarine," January 14, 2021, 1, <http://www.hisutton.com/North-Korean-Navy-Nuclear-Submarine.html>.

the miniaturization of a nuclear powerplant and the requisite equipment is a far more complex task than developing nuclear weapons; it is unlikely the North has successfully done so in such a short time without external aid. The lack of empirical evidence to counter Kim Jong Un's claims makes it impossible to refute with total confidence, but it is challenging to take at face value.²³ What complicates the situation further is that besides the modified ROMEO under construction at Sinpo Shipyard on North Korea's east coast, there are indications of yet another submarine being constructed, though there are no clear indicators the submarine is nuclear-powered.²⁴ Kim may be strategically bluffing, but the fact that he publicly announced the pending debut means the possibility cannot be ignored. This provides an avenue for research into the impacts such a submarine would have on security in the region as there is little literature to date on the subject.

Beyond the introduction of new hulls and capabilities, Schmerler provides further supporting evidence the North is planning a more substantial, long-term goal of building up its submarine force. The North has built what is suspected to be a submarine training facility at Sinpo, replacing a smaller one located at Mayang Island aka Mayangdo. This new training facility complements the country's other large submarine training facility at Pipa-got naval base on the west coast of North Korea.²⁵ Further upgrades at Sinpo have taken place to expand and refurbish the submarine construction capabilities at Sinpo since summer of 2014. This includes construction halls, fabrication buildings, machine shops, and the extension of the launching ramp in front of the main construction hall.²⁶

2. Impacts of DPRK Submarine Development

Since the introduction of the GORAE and subsequent SLBM tests, scholars remain divided on whether the GORAE submarine remains in active service following a supposed

²³ Jeong Ik Lee, "Misunderstandings and Facts About Korea's Nuclear Submarine Development," *Journal of "Maritime Security,"* KIMS Periscope, 215 (November 21, 2020): 3.

²⁴ Bicker, "Kim Jong-Un Pledges to Expand North Korea's Nuclear Arsenal."

²⁵ David Schmerler, "Updated: North Korean Submarine Training Center," Arms Control Wonk, June 18, 2020, <https://www.armscontrolwonk.com/archive/1209565/sinpo-submarine-training-center-update/>.

²⁶ Joseph Bermudez Jr., "North Korea's Ballistic Missile Submarine Program: Full Steam Ahead," 38 North, January 5, 2016, <https://www.38north.org/2016/01/sinpo010516/>.

accident in 2016, though this debate has become difficult with the reported test-launch in October 2021.²⁷ Similarly, scholars disagree on whether this single-missile submarine represents the first in a line of this class or if it serves as a testbed for future, newer classes of SSBs. One submarine remains relatively easy to track, given the advances in regional ASW capabilities. However, as the North presses forward with the construction and development of newer possible strategic submarines, the impact on countering the threat becomes more and more substantial.

The literature on assessing potential threat impacts of DPRK submarine development can most easily be explained as a spectrum. The pessimists of the group feel it will be a significant and a qualitative phase shift, while the optimists assert that the impact will be negligible. Additionally, some scholars fall within the grey zone where relative threats and negated capabilities offer different threat potentials.

The obvious fear of ballistic missile attack from the sea, potentially with nuclear warheads, comes to mind when assessing the threat of the new strategic submarine concept for North Korea. From a strategic defense of Korea standpoint, Kim and Park represent the pessimist position effectively by showcasing how a critical vulnerability in South Korea's missile defense infrastructure and doctrine helps to provide the North with a threat avenue. With support of the U.S., South Korea utilizes the THAAD system as its primary source of missile defense; accompanying PAC-3 systems are used to defend critical installations. As the historic missile threat has been from the North, missile defense systems physically look north, as they do not have 360-degree detection capability. Due to limited radar azimuths, missiles launched from a submarine will not fall within the detection field of either missile defense system, leaving the entirety of South Korea a very limited means to counter the missiles once launched.²⁸

²⁷ Janes, "Korea, North - Navy"; Yoon, "Expanding the ROKN's Capabilities to Deal with the SLBM Threat from North Korea," 6.

²⁸ Inwook Kim and Soul Park, "Deterrence Under Nuclear Asymmetry: THAAD and the Prospects for Missile Defense on the Korean Peninsula," *Contemporary Security Policy* 40, no. 2 (April 3, 2019): 165–92, <https://doi.org/10.1080/13523260.2018.1558750>.

Another common theory in existence is that if North Korea's goal is to develop a survivable second-strike capability with the end goal of deterring U.S. or ROK aggression, the stability-instability paradox presented by Snyder supports the accompanying pessimist view held by Chull and Cowen: "The logic of the stability- instability paradox is that two competing nuclear powers are not likely to escalate to a nuclear war, but if this is true, then they are likely to conduct indirect or low- intensity attacks."²⁹ As a de facto nuclear power, if the North feels it is accomplishing deterrence through the deployment of its potentially nuclear weapon-capable submarines, the perceived deterrence ability may embolden more minor scale provocations to play out more frequently. While this doesn't guarantee a large-scale conflict in the region, it drastically changes the threat dynamic and increases the credible threat of low-level provocations in the future.

Postol and Schiller take a different approach while making a case for significant threats, focusing on two separate things: on the operational use of ballistic missile submarines and the fact that they avoid threats whereby attack submarines seek out shipping and enemy submarines. This operational policy on its own increases the survivability of this class in that it generally avoids threats.³⁰ In addition, Postol and Schiller and other scholars feel confident the North will restrict its ballistic missile submarine patrols to the bastion areas of the Sea of Japan in the event of war due to logistical constraints.³¹ Those same scholars suggest the DPRK may deploy large numbers of submarines to allow its SSBs to hide in the noise, which will serve to maximize the survivability of a potential second-strike capability if that is the goal.³² This position also focuses on the environment's ability to counter ASW capabilities, especially in the shallow waters of the Yellow Sea. The physical and acoustic characteristics of the Sea of Japan pose challenges to ASW operations, giving the North an advantage to the extent that these

²⁹ Sung Chull Kim and Michael D. Cohen, eds., *North Korea and Nuclear Weapons: Entering the New Era of Deterrence* (Washington, DC: Georgetown University Press, 2017), 197.

³⁰ Postol and Schiller, "The North Korean Ballistic Missile Program."

³¹ Postol and Schiller.

³² Bruce Klingner, "Save Preemption for Imminent North Korean Attack," *KRINS QUARTERLY* 2, no. 1 (March 31, 2017): 309–52, <https://doi.org/10.46322/KRINSQ.2.1.8>.

characteristics neutralize advances in technology or capability that the ROK, U.S., or Japan enjoy.³³

Holding the middle ground, Panda describes contrasting implications of command-and-control issues. On the one hand, the DPRK's general lack of C2 infrastructure for reliable communications between higher headquarters and submarines, along with a general lack of blue-water-capable support vessels, represents a significant limitation in any future strategic patrol or out-of-area deployment intentions for the North Korean submarines, which bodes well for ASW operations against them. On the other hand, if the North were to deploy nuclear-capable missiles on one of its strategic submarines, in the absence of robust C2 infrastructure, the crews would be required to operate off procedure rather than central command instruction. In the event of crisis or war, that puts Kim Jong Un out of the loop and provides the opportunity for an unauthorized but procedurally compliant launch.³⁴

Currently, the known missile ranges for the SLBMs do not allow North Korea to strike outside of the Sea of Japan without conducting an out-of-area deployment. Even with an out-of-area deployment, the effective range of the missiles plus the maximum range of the submarines without blue-water support shows that any attempt to strike U.S. territories would be a one-way trip.³⁵ If North Korea did intend to send the submarine on a one-way mission, it would have to use its noisy diesel engine the entire trip, or every 480km to recharge the battery banks, or more frequently if the submarine lost net battery space with

³³ Jimmy J Suh, "Effects of the Subsurface Domain on the Security of the Korean Peninsula" (master's thesis, Naval Postgraduate School, 2017), 36, <http://hdl.handle.net/10945/56818>.

³⁴ Ankit Panda, "Kim Jong Un's New Ballistic Missile Submarine: The Future of North Korea's Undersea Nuclear Deterrent," News, The Diplomat, July 24, 2019, <https://thediplomat.com/2019/07/kim-jong-uns-new-ballistic-missile-submarine-the-future-of-north-koreas-undersea-nuclear-deterrent/>.

³⁵ Van Diepen, "Cutting Through the Hype About the North Korean Ballistic Missile Submarine Threat," September 6, 2019.

the removal of the aft battery bay according to imagery.³⁶ Any communication attempts home, despite minimal infrastructure, would also pose a significant threat for detection.³⁷

In the optimist camp, Van Diepen presents the position that the assessed goal of the submarine advancements is not an attempt at altering the security scene but merely a vanity project for Kim Jong Un as he attempts to build credibility with a suffering population. He also suggests Kim Jong Un is attempting to strong-arm the U.S. as he grows desperate over the lack of movement on sanctions relief.³⁸ Even if Kim Jong Un's intentions are not vain, the timing required to roll each submarine out means the program will not be able to pose a significant threat for some time and will allow ROK and allied militaries enough time to counter the threat effectively.³⁹ A similar position is given by Son, through statements from North Korean trade workers that the developments in submarine technology, especially the SLBM tests, are simply a part of Kim Jong Un's nuclear brinkmanship policy. Kim Jong Un wants to push as far as he can without instigating conflict.⁴⁰ The stress of sanctions has been eroding the public's confidence in Kim Jong Un as a leader, leading him to return to the strategy of repeated provocation in an attempt to receive concessions from the U.S. and ROK.⁴¹

In a similar vein, Yoon discusses the significant lack of far-sea capabilities of North Korean subsurface forces and their current and projected SSB inventory. Yoon foresees the DPRK adopting the bastion-deployment theory, using Russia and China as examples. Lacking sufficient far-sea command and control, these nations have preferred to deploy their SSBs and SSBNs in a near-sea environment. The DPRK could also adopt a continentally oriented naval strategy, seeking to maximize the chances of operating an

³⁶ "North Korea's Sinpo South Shipyard: Recent Activity," 38 North, September 26, 2019, <https://www.38north.org/2019/09/sinpo092619/>.

³⁷ Van Diepen, "Cutting Through the Hype About the North Korean Ballistic Missile Submarine Threat," September 6, 2019.

³⁸ Van Diepen.

³⁹ Van Diepen.

⁴⁰ Hyemin Son, "North Korean Trade Workers See Through Submarine Missile Test Propaganda," trans. Leejin Jun, Global Security, October 7, 2019, <https://www.globalsecurity.org/wmd/library/news/dprk/2019/dprk-191007-rfa01.htm>.

⁴¹ Son.

effective second-strike capability.⁴² He suggests if DPRK submarines are confined and unable to depart the Sea of Japan, ASW prosecution will be easier, resulting in a higher success rate.⁴³

Outside of these camps of thought, Lodmell looked at the impacts of North Korean submarines on the operational level of war. He challenges the notion that the unsophisticated submarines in the North Korean fleet only offer a minimal threat. This study utilizes a case study of the Falklands War involving one Argentinian submarine and its ability to completely alter the British Battle Group Commander's mission plans and overall operational tempo simply by remaining unlocated. Lodmell showed that even partially sea-worthy submarines with poorly trained crew can disrupt war efforts; the British Commander had to divert vital resources towards locating the missing subs and avoid areas where submarine threat was assessed to be high.⁴⁴ In all, two ASW carriers, more than one dozen frigates and destroyers, four nuclear submarines, and one diesel submarine were all diverted from other missions to protect British forces from the threat. In doing so, the Commander lost the combat strength of those units towards other war efforts.

While Lodmell's article predates the introduction of the GORAE, his position presents an opening for continued analysis. Lodmell's work suggests that the qualitative superiority held by the South Koreans will not necessarily offset the numerical advantage of the North Koreans, especially in times of war. The insecurity provided by even a single unprosecuted submarine would have significant impacts on war efforts and SLOCs if a war were to break out. While pessimists hold that DPRK introduction of SSBs would pose a different kind of threat that would warrant prioritization in ASW efforts, Lodmell's assessment suggests that even if DPRK SSB ambitions are overblown, even a decidedly inferior DPRK submarine force could require ASW efforts that would sap overall war-

⁴² Yoon, "Expanding the ROKN's Capabilities to Deal with the SLBM Threat from North Korea," 35.

⁴³ Yoon, 57.

⁴⁴ Lodmell, "The Impact of the North Korean Submarine Force at the Operational Level of War."

fighting resources. This prospect spotlights a gap in existing assessments of the strategic implications of DPRK submarine development that this thesis aims to fill.

3. ROK Responses

Numerous literature sources capture how ROK Navy upgrades have responded to the ebb and flow of North Korean naval modernization.⁴⁵ Trends in the literature cover the notion of South Korean technological superiority to defend against North Korea's numerical superiority. Without the ability to defend hull for hull, and realistically without the need, Bowers presents the approach the ROK has adopted: rather than focusing on the ability to defeat the entire North Korean submarine force; it has focused on developing the "capacity to inflict substantial damage" to make any military action too expensive, thereby establishing deterrence.⁴⁶ This substantial damage aspect came in coordination with the increase in ASW capabilities in its surface and airborne fleets, along with an overall increase in ASW development over the last ten years.

The ROKN was behind in establishing its subsurface force because it prioritized combating the threat from the North's surface navy and land forces.⁴⁷ Following the ROKN corvette CHEONAN's sinking by a North Korea midget submarine in 2010, the South Korean government adopted a new military strategy, shifting focus away from land-based threats that had previously dominated the military prioritization scheme towards countering the subsurface threat posed by the North.⁴⁸ Though the sinking was an embarrassment, it triggered substantial military reforms leading to the development of new subsurface forces and doctrine to detect and counter the threat posed by North Korean submarines and a reassessment of defense capabilities in the form of a Defense Reform Plan.⁴⁹ Given the roughly ten years since that incident, the South has acquired a significant

⁴⁵ Bowers, *The Modernisation of the Republic of Korea Navy*, 86–100.

⁴⁶ Bowers, 58.

⁴⁷ Suh, "Effects of the Subsurface Domain on the Security of the Korean Peninsula," 36.

⁴⁸ Bowers, *The Modernisation of the Republic of Korea Navy*, 30–45.

⁴⁹ Bennett, *A Brief Analysis of the Republic of Korea's Defense Reform Plan*, 5; Bowers, *The Modernisation of the Republic of Korea Navy*, 36.

technological superiority in its submarine force and has committed to expanding its ASW capabilities. The need to quickly detect and counter submarines of various classes led to reorganizations of naval command structure, the development and acquisition of new submarine technology and hulls, and increasing ASW capabilities within surface combatants and maritime surveillance aircraft.⁵⁰

In 2004, a ROK defense review was conducted with the aspirations of ensuring future forces could meet the military intent of the ROK by the year 2020. The main priorities built into the force improvement were to significantly decrease the size of the Army and the Marine Corps, while maintaining the size of the Naval force, highlighting the expectations on the importance of the maritime domain in military conflicts of the future, according to the ROK perspective.⁵¹ In 2017, President Moon Jae-in issued what he called “Defense Reform Plan 2.0” (DRP 2.0) to further refine actions taken in the initial set of reforms. He further shrunk the military, increased military spending to grow capabilities, decreased conscription times, and condensed ROK Army command structures.⁵²

Following the defense reviews and subsequent reflections after the CHEONAN sinking, the ROK began a massive ship-building effort to create a networked, multi-role force. One of the highlighted capabilities the ROK prioritized was ASW to meet the threats posed by North Korean submarines.⁵³ To summarize the upgrades, the ROK government’s goal was to be able to field a total of three fleets, one for each coast, each including new destroyers, frigates, amphibious assault carriers, maritime patrol aircraft, and submarines. All these platforms would have the ability to conduct ASW in an integrated fashion that

⁵⁰ Yoon, “Expanding the ROKN’s Capabilities to Deal with the SLBM Threat from North Korea,” 13–14.

⁵¹ Bennett, *A Brief Analysis of the Republic of Korea’s Defense Reform Plan*.

⁵² Bruce Klingner, “Enhance South Korean Military Capabilities Before OPCON Transfer,” no. 3452 (Heritage Foundation, December 2, 2019): 22.

⁵³ Terence Roehrig, “Republic of Korea Navy and China’s Rise: Balancing Competing Priorities,” *CNA Maritime Asia Project*, CNA Maritime Asia Project, August 2012, 20.

would maximize South Korea's ability to deter North Korea, defend from Northern aggression, and pivot towards blue water operations.⁵⁴

In 2015, the ROKN established the Submarine Force Command, serving as the single commander of its submarines. Previously, the submarines reported to the one-star Admiral of Submarine Flotilla Nine in Jinhae on the southeastern coast. Creating the command elevates the status of the submarine forces within the overall Naval construct, indicating the significance the force holds in South Korea's future objectives. The responsibility for submarine operations shifted from the ROK fleet to the Submarine Force Command.⁵⁵

When looking at the defense reforms prior to the launching of North Korea's GORAE SSB and subsequent actions taken by the ROK to increase its ASW capabilities, Klingner explains that in 2005, the ROK expected the North Korean threat to be lower in the future and developed its force accordingly. This approach anticipated that by decreasing the overall size and complexity of the ROK force, the North Koreans would perceive decreased threat and take actions to decrease its military accordingly.⁵⁶ Unfortunately, the North appeared to take no action aimed at decreasing its military force composition, and in fact continued to develop more capable systems to complement its pre-existing units.⁵⁷

Klingner further observes that in more recent years the ROK has taken significant strides in terms of overall naval capabilities as well as its ability to integrate its units, which bodes well for the ROK assuming a higher degree of responsibility and control of the defense of the ROK. However, he cautions that currently, the C4ISR architecture is lacking and joint cooperation between different branches of the ROK military is poor. He anticipates that, as the ROK transitions to a more capable force and the future transfer of OPCON control, the focus on indigenously produced weapons and technology – which the ROK has developed to decrease external political issues – will serve as a limiting factor in

⁵⁴ Bowers, *The Modernisation of the Republic of Korea Navy*, 189.

⁵⁵ Suh, "Effects of the Subsurface Domain on the Security of the Korean Peninsula."

⁵⁶ Klingner, "Enhance South Korean Military Capabilities Before OPCON Transfer," 6.

⁵⁷ Klingner, 7.

the overall capability of the ROKs reformed military.⁵⁸ Additionally, Klingner identifies three deficiencies which need to be addressed before the ROK will reach a point where the military is capable of handling a more significant role in the defense of the ROK and OPCON can be transferred: establishing a better communications system between ROK and U.S. forces; establishing a better communications system across its military services, and establishing a sufficient force and logistics stocks for the first 60 days of conflict.⁵⁹

Klingner's assessment typifies recent evaluations that take a broad view in examining the sufficiency of ROK responses to recent developments in DPRK military capability. This thesis will supplement such analyses by focusing on ROK responses to DPRK developments in the maritime environment.

D. POTENTIAL EXPLANATIONS AND HYPOTHESES

This thesis will ultimately be attempting to determine the consequences of DPRK submarine technology developments for ROK and U.S. strategic security postures now and in the future as the U.S. transfers OPCON responsibilities to the ROK in times of war. Of the range of possible findings, one very simple finding could be that the North does not intend on developing an at-sea, survivable second-strike capability, or at least does not intend to use its developments to that end. Instead, the North may be developing these systems to showcase the ability to produce weapons systems for proliferation purposes.

If evidence that the North is attempting to develop a second-strike capability is found to be strong, another finding may be that despite the goal, the North will not be able to fully realize this capability due to limited support capabilities. Or, evidence may indicate that the joint ROK-U.S. ASW capabilities will be sufficient to counter such a threat. Conversely, the ROK's ambitions towards fielding a blue-water force despite a continuously shrinking military, along with assuming OPCON, may prove to be too much of a burden, yielding the inability to adequately counter any second-strike capabilities gained by the North.

⁵⁸ Klingner, 11.

⁵⁹ Klingner, 15.

Even if the ROK can defend against a second strike-capable submarine force, the joint efforts and capabilities may be found to be insufficient to meet DPRK submarine threats overall. This may lead to a need to prioritize ASW prosecution of DPRK strategic submarines, leaving significant gaps in DPRK submarine force coverage. Trading coverage of the conventional submarine force for coverage of the strategic force may prove to be the only option the ROK has if the DPRK produces a robust strategic submarine force.

E. RESEARCH DESIGN

The overall research design is presented in Figure 1. In this thesis's development, the first step is to establish an understanding of what SSB-related developments have taken place to date. The thesis undertakes to account for upgrades in physical infrastructure and establish its relation to the development of an SSB capability. Then, it reviews SLBM and SSB hull development to assess follow-on program potential.

With the trajectory of those force upgrades established, the thesis evaluates whether Kim Jong Un's submarine ambitions are clout motivated or if he wishes to establish a future operational SSB force with accompanied second-strike capability, as well as how that goal impacts the security environment, specifically both inside and outside of the Korean AOR respectively. The thesis also analyzes the viability of the DPRK achieving a meaningful second-strike capability, considering both the possible methods or courses of action the DPRK would take over time to realize that goal and the possible explanations separate from that goal for North Korean submarine developments, and the impacts of those decisions.

Finally, the thesis examines the planned ROK ASW force disposition to evaluate if that force is sufficient to counter the DPRK submarine threat as the ROK seeks OPCON transfer and a transition to blue-water capability. Trends in either of the above scenarios will have resounding impacts on the perceived threat of the North, and so on future ROK force disposition as well as. By conducting an audit of ROK ASW capabilities along with identifying deficits in the ability to manage a joint ASW effort, the thesis provides an overall assessment of force sufficiency to counter the DPRK submarine threat.

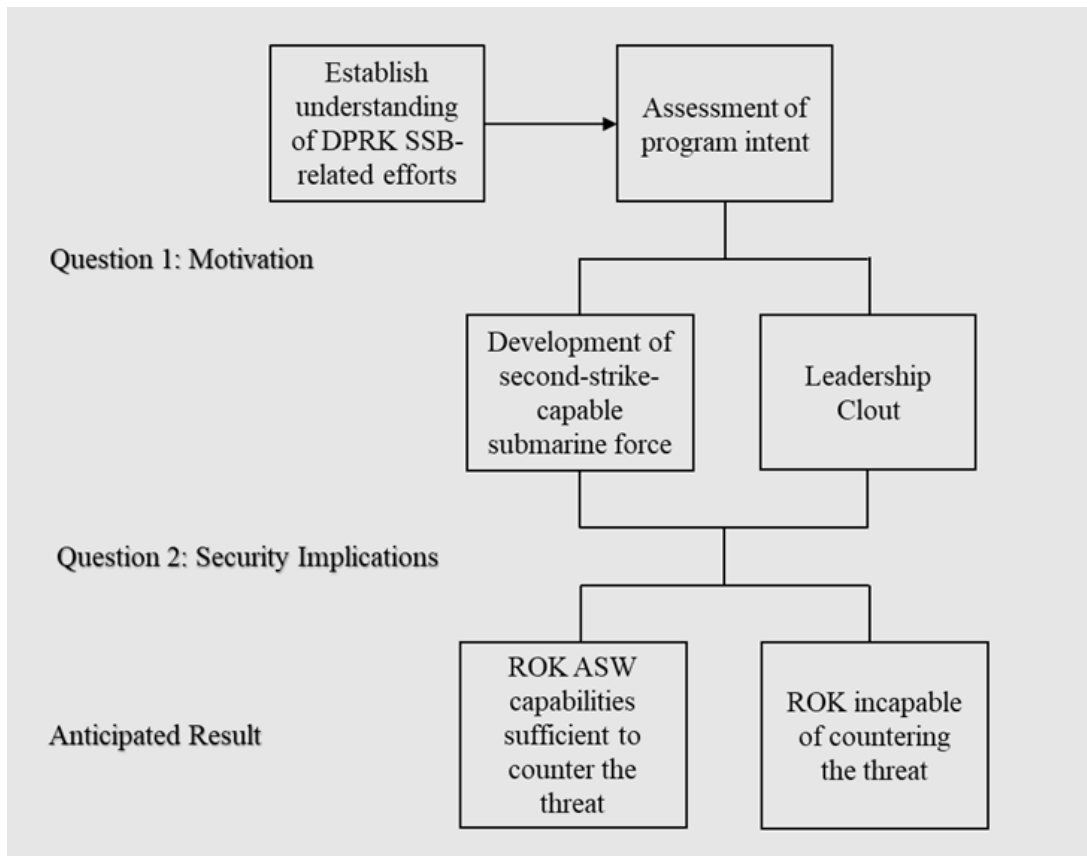


Figure 1. Thesis design for DPRK SSB motivations and security implications. Either motivation could result in either type of security implication; the resulting research is therefore carried out to determine the anticipated result.

II. NORTH KOREAN SSB-RELATED DEVELOPMENTS

A. INTRODUCTION

The purpose of this chapter is to outline the known status of North Korea's strategic submarine forces by detailing the status of its three ballistic missile submarines as well as nuclear submarine intentions, tying in the status of SLBM development, as well as covering infrastructure assessed to be related to the strategic submarine program. Although unclassified information pertaining to the status of North Korean submarine development, operations, and prospects remains limited, satellite imagery, public broadcasts by North Korean media, and other sources provide a means to generate sufficient information to make reasonable judgements about North Korea's submarine development trajectory.

The North Korean submarine force is composed of approximately seventy diesel-electric submarines of various classes and mission sets. These submarines are dispersed among the two coasts and its subsequent fleets: the Yellow Sea Fleet (West Coast Fleet) and the East Sea Fleet (East Coast Fleet). The North Korean Navy falls under the Korean People's Army, which is headquartered in Pyongyang, though the submarine force is decentralized in its command-and-control relationship.⁶⁰ Each fleet maintains a regional headquarters: the West Coast Fleet is headquartered in Nampo while the East Coast Fleet is headquartered in T'oejo-dong. The West Coast Fleet maintains six squadrons also known as naval commands, cutting up regions of the coastline as its regions of responsibility, while the East Coast Fleet has ten with a similar separation of areas of responsibility.⁶¹ Navy vessels and submarines do not move between coasts and rarely, if ever, travel between naval command areas of responsibility, except when relocating to the regional shipyards.⁶² Submarines are further assigned based on their mission set: standard coastal patrollers fall under the Navy while those charged with infiltration and reconnaissance fall under the Reconnaissance Bureau (REBU), specifically, the Maritime Department of the

⁶⁰ John Pike, "Korean People's Army Navy - North Korea," Global Security, accessed August 31, 2021, <https://www.globalsecurity.org/military/world/dprk/navy.htm>.

⁶¹ Pike.

⁶² Janes, "Korea, North - Navy."

REBU.⁶³ The lone completed ballistic missile submarine is based and operated out of Sinpo on the nation's east coast; this submarine will be discussed in length in a coming section.⁶⁴ Navy personnel make up the majority of submarine crew regardless of the mission as they possess the requisite training and seamanship to operate the vessels; if the sub operates under the REBU or for any specialized mission, additional crew trained in that specialty supplement the regular navy crew.⁶⁵

There is no standardized recipe of what is needed to develop a strategic submarine program. North Korea already has one ballistic missile submarine with associated infrastructure, but if North Korea intended on expanding its ballistic missile submarine program, it is conceivable that more infrastructure would be needed to support this expansion. Additionally, the infrastructure needed to support a strategic submarine force is difficult to distinguish from infrastructure needed to support a conventional submarine force. Because North Korean naval command structure and submarine placement remains very segmented and the North has the tendency to concentrate efforts to specific geographic areas, analysts have been able to keep tabs on the status of the North Korean submarine program and its related mission sets.

The next section of this chapter focuses on the current and suspected future ballistic missile submarines in the North Korean inventory. The following sections evaluate the ballistic missiles these submarines would launch and the infrastructure that would support these capabilities.

B. SUBMARINES

1. GORAE SSB

The poster child of what is thought of as North Korea's strategic submarine intentions is the GORAE-class ballistic missile submarine, which was first observed in

⁶³ Harry Dies Jr., "North Korean Special Operations Forces: 1996 Kangnung Submarine Infiltration," *Military Intelligence Professional Bulletin* 30, no. 34-04-4 (2004): 29-34.

⁶⁴ Pike, "GORAE-Class Ballistic Missile Sub."

⁶⁵ Dies Jr., "North Korean Special Operations Forces: 1996 Kangnung Submarine Infiltration."

unclassified imagery in 2014 by H I Sutton.⁶⁶ Rumors existed outside of intelligence agencies of the existence of such a submarine, but this is the first public confirmation.⁶⁷ Based on media releases from North Korea as well as analysis of satellite imagery, it is known that the GORAE houses only one missile tube, located in the sail. The design is very similar to that of the GOLF class or HOTEL class ballistic missile submarines, produced by the Soviet Union in the 50s and 60s. North Korea received several of these hulls in the 1990s which likely provided building materials and designs.⁶⁸ Analysis of imagery suggests the submarine lacks an Air-Independent Propulsion (AIP) system, which if installed, allows a diesel-electric submarine to operate submerged for significant amounts of time. Given the assessed crew size of 35–40 personnel, the relatively small size of the submarine, as well as what is known about North Korean submarine capabilities, this diesel-electric submarine is assessed to have an estimated 1,500-mile range with significant periods of time required for either snorkeling or being surfaced.⁶⁹

Throughout the known life of the GORAE, it has been berthed out of the secure boat basin at Sinpo Shipyard South and has not been known to stray too far outside of the surrounding area.⁷⁰ Kim Jong Un made a public visit to inspect the submarine; images were taken of him next to it while a missile was loaded into the single launch tube. He was also imaged posing with the crew in front of the submarine along the quay wall, as well as observing the first test-launch of the accompanied SLBM, the Pukguksong-1, from a submerged test barge during this visit.⁷¹ Media depictions suggested a launch from a submarine, but analysis of satellite imagery and analysis of the media images proved it in

⁶⁶ H I Sutton, “Korea’s Polaris: Goraе Class Ballistic Missile Submarine,” *Covert Shores*, August 27, 2016, <http://www.hisutton.com/Analysis%20-%20Sinpo%20Class%20Ballistic%20Missile%20Sub.html>.

⁶⁷ Sutton.

⁶⁸ Panda, “Kim Jong Un’s New Ballistic Missile Submarine”; Janes, “Korea, North - Navy”; Sutton, “Korea’s Polaris: Goraе Class Ballistic Missile Submarine.”

⁶⁹ “North Korea Submarine Capabilities,” Nuclear Threat Initiative, February 22, 2021, <https://www.nti.org/analysis/articles/north-korea-submarine-capabilities/>; “Korea, North - Navy.”

⁷⁰ Vipin Narang and Ankit Panda, “Command and Control in North Korea: What a Nuclear Launch Might Look Like,” *War on the Rocks*, September 15, 2017, <https://warontherocks.com/2017/09/command-and-control-in-north-korea-what-a-nuclear-launch-might-look-like/>.

⁷¹ Jack Liu, Jenny Town, and H I Sutton, “North Korea’s Sinpo South Shipyard: Recent Activity,” 38 North, September 26, 2019, <https://www.38north.org/2019/09/sinpo092619/>.

fact came from a submerged barge.⁷² Though North Korean media attempted to deceive the outside world in this instance, the GORAE did subsequently support the launch of four SLBMs.

Throughout the test launch period of 2015–2016, debate amongst academics grew regarding the actual hull count when talking about North Korean strategic submarines in existence at the time. Some believed the GORAE was one of two SSBs developed as test platforms, and that the launches were divided among the two. Yoon, for example, suggested the existence of two separate submarines, the SINPO submarine and the GORAE SSB as being two distinct submarines, both having test fired SLBMs through 2016, while others believe all tests came from a single submarine, the GORAE. Other scholars believe the GORAE is nothing more than a stage prop, with previous SLBM tests being faked for clout. These theories have developed due to the manipulation of imagery in a large majority of North Korean media releases that are related to SLBMs and SSBs; it has been common practice for North Korean media to insert different types of submarines in released video and images in an attempt to pass as the GORAE, as well as to photoshop test launches to suggest success when, in reality, failure resulted.⁷³ Over time, a consensus has developed that the GORAE is the only ballistic missile submarine which took part in the test launches in real life, despite the multiple attempts at deceit through imagery manipulation. This judgement emerged from analysts poring through the countless images and videos released by North Korean state media as well as through intensive satellite imagery analysis.

Of the four SLBM launches from the GORAE off the coast of Sinpo, at least one of those launches is known to have damaged the submarine, specifically the November 28, 2015 launch, in which the submarine was required to receive maintenance post-launch.⁷⁴ It is unknown if any other damage has taken place, though it is theorized the last launch on August 24, 2016 may have caused significant-enough damage to render the submarine inoperable. Following this test, the GORAE has remained inactive in terms of missile tests

⁷² Sutton, “Korea’s Polaris: Gorae Class Ballistic Missile Submarine.”

⁷³ Sutton.

⁷⁴ Center for Strategic & International Studies, “Pukguksong-1 (KN-11),” Missile Threat, July 31, 2021, <https://missilethreat.csis.org/missile/kn-11/>.

and underway periods.⁷⁵ Alternatively, the North Koreans may have tested the Pukguksong-1 missile enough for Kim Jong Un to be satisfied with its development, eliminating the need for further testing and operations.

The GORAE has been sitting almost motionless for several years, until a recent test launch in October 2021 following improvements to the area surrounding the submarine to conceal it as well as the installation of a new launch tube.⁷⁶ The single-launch capability, relatively small size of the submarine, as well as the very limited operational range suggests that this submarine was designed to fill the role as a SLBM test platform, or an experimental ballistic missile submarine (SSBA) rather than to serve as an operational submarine. This certainly has been supported by the lack of operation of the submarine since the last missile test was completed.

2. Modified ROMEO

In a media statement released by KCNA in July of 2019, Kim Jong Un inspected a large submarine in a construction hall as part of a self-proclaimed “great demonstration of the might of [North Korean] defense industry making a leap forward.” The statement contained many references to the nation’s “strategic intention,” and “strategic plan,” which North Korea experts say means North Korea not only intends on fielding missiles from this submarine, but also nuclear-capable missiles.⁷⁷ To further this assertion, images of the inspection as well as the written statement include the names of two aptly nicknamed “rocket men,” Kim Jong Sik and Jang Chang Ha, who have been heavily involved in North Korea’s nuclear and missile programs.⁷⁸

Kim Jong Sik has long been involved in the North Korea’s weapons development as a rocket scientist and is routinely at Kim Jong Un’s side during testing. Jang Chang Ha

⁷⁵ Pike, “GORAE-Class Ballistic Missile Sub.”

⁷⁶ Ankit Panda, “The Sinpo-C-Class: A New North Korean Ballistic Missile Submarine Is Under Construction,” accessed August 30, 2021, <https://thediplomat.com/2017/10/the-sinpo-c-class-a-new-north-korean-ballistic-missile-submarine-is-under-construction/>.

⁷⁷ Panda, “Kim Jong Un’s New Ballistic Missile Submarine.”

⁷⁸ Ankit Panda, “Pukguksong-3 SLBM,” *@nktpnd* (blog), July 23, 2019, <https://twitter.com/nktpnd/status/1153458029456760832>.

stands as the head of the Weapons Development and Procurement Center, as well as president of the Academy of National Defense Science, also showing up routinely at weapons-related testing events.⁷⁹ Both have been identified as specially designated nationals and targeted by sanctions for their role in weapons development, pursuant to the North Korea Sanctions and Policy Enhancement Act.⁸⁰ Their continued presence at nuclear-related weapons testing events, missile events, and now the debut of this submarine, accompanied by externally-facing rhetoric about strategic intentions, suggests the case can more easily be made that North Korean leadership intend this newly modified submarine to be SLBM-capable, possibly to include nuclear-capable SLBMs if and when they are available.

Furthering this assertion, by analyzing the images released by KCNA of the new submarine, and comparing it to previously known submarines, H I Sutton identified several distinct similarities between this submarine being inspected and ROMEO-class attack submarines, which have been established to be plentiful in the North Korean submarine inventory.⁸¹ The shown portions of the submarine in North Korean imagery resulted in an almost certain identification of the submarine as a modified ROMEO. North Korea received a large number of them from the Chinese and Soviets throughout the 1980s.⁸² Despite an attempt at blurring out portions of the photos, Sutton estimated the dimensions and capabilities of this new submarine combining the known internal features of a ROMEO submarine as well as dimensions of existing SLBMs. After analyzing the imagery, it is believed the newly modified ROMEO is configured with sail-mounted ballistic missile silos, like the GORAE as well as Soviet HOTEL and GOLF ballistic missile submarines.⁸³

⁷⁹ Natalie Wolfe, “North Korea’s Scientists Are Hailed As National Heroes In A Country Where Science Is King,” NZ Herald, December 18, 2017, <https://www.nzherald.co.nz/world/north-koreas-scientists-are-hailed-as-national-heroes-in-a-country-where-science-is-king/2HAT5QO6AKLFLHN6LHA4YATW7E/>.

⁸⁰ “North Korea Administrative Designations Updates,” U.S. Department of the Treasury, May 13, 2020, <https://home.treasury.gov/policy-issues/financial-sanctions/recent-actions/20200513>.

⁸¹ H I Sutton, “New North Korean Submarine: ROMEO-Mod,” July 23, 2019, http://www.hisutton.com/ROMEO-Mod_Submarine.html.

⁸² Trevithick, “North Korea’s New Ballistic Missile Submarine Is a Refurbished Antique.”

⁸³ Sutton, “New North Korean Submarine: ROMEO-Mod.”

Despite the blurred images, Sutton estimates the sail was raised and lengthened to support SLBM capability, which ROK and U.S. intelligence agencies agree with.⁸⁴ Additionally, based on the space available, it is assessed this submarine can hold a maximum of three SLBMs based on the dimensions of known SLBMs in the North Korean inventory.⁸⁵

A very interesting result of the analysis of the imagery, according to H I Sutton, is the modifications to the submarine did not include a widening or lengthening of the hull. The implication here is that internal space must have been sacrificed to accommodate the presence of these missile tubes.⁸⁶ The original placement of the aft battery bay on ROMEO submarines lies directly underneath where the tubes are assessed to have been installed; if missile tubes now fill the space in and below the sail, the aft battery bay would have had to be removed or relocated. If removed, this modified ROMEO will have a significantly shorter underwater duration due to a lower battery capacity, though it is possible the battery bays were relocated.⁸⁷ Sutton suggests that although three tubes are possible given the assessed modifications to the sail, two tubes appear more realistic, but that does not change the battery issue.⁸⁸ Because of the blurred regions on the released images, an alternate assessment on the modifications include an extension of the sail, which lowers the assessed missile tube count due to having a stepped portion aft of the sail, though the use of this step is unknown.⁸⁹

North Korean media announced the newly modified ROMEO “will perform its duty in the operational waters of the East Sea of Korea and its operational deployment is near at hand.”⁹⁰ Of course, there are many aspects of these statements that are yet to have been proven, to include the launching of this submarine. To date, there have been no indications

⁸⁴ Trevithick, “North Korea’s New Ballistic Missile Submarine Is a Refurbished Antique.”

⁸⁵ Sutton, “New North Korean Submarine: ROMEO-Mod.”

⁸⁶ Liu, Town, and Sutton, “North Korea’s Sinpo South Shipyard.”

⁸⁷ Liu, Town, and Sutton.

⁸⁸ Sutton, “New North Korean Submarine: ROMEO-Mod.”

⁸⁹ Sutton.

⁹⁰ Panda, “Pukguksong-3 SLBM.”

of a launch of a new submarine. Given the location of construction, as well as existing infrastructure in place on the east coast, an east coast deployment seems plausible.

3. SINPO-C SSB

Unnamed South Korean experts have claimed North Korea is in the process of constructing a third diesel-electric submarine capable of launching SLBMs. Very little information has been released, but their statements include the claim that it will be able to launch more missiles than the modified ROMEO.⁹¹

Looking back in time for clues to the development of this submarine, first mentions came about in 1995, when Kim Jong Il received a publicized briefing on a new ballistic missile submarine and a nuclear-powered attack submarine that were going to be indigenously put into production.⁹² Despite potentially two submarines being covered in this briefing, the focus was the ballistic missile submarine featuring the capability of launching ten or more SLBMs, as well as an option to increase the length to accommodate additional missiles.⁹³ The briefing included statements that many submarines of this class have already been deployed, which has never been supported by evidence. Such a submarine has not been observed or announced by North Korean media, nor has it been observed through satellite imagery as being launched. Besides the GORAE, no other ballistic-missile-capable submarines have been observed to be in operation.

In September 2014, the ROK Ministry of National Defense announced it, along with U.S. intelligence agencies, had observed the development of a vertical launch tube for submarines and assessed it was part of an ongoing SSB development program, a submarine dubbed the SINPO-C (SINPO-B was the GORAE and SINPO-A was a surface vessel developed at Sinpo).⁹⁴ The assumption that the SINPO-C is the realization of the displayed plans in 1995 is not unrealistic given timelines for developing new platforms and

⁹¹ Janes, “Korea, North - Navy.”

⁹² John Pike, “SSB - Ballistic Missile Submarine,” Global Security, July 23, 2017, <https://www.globalsecurity.org/military/world/dprk/s-ssbn.htm>.

⁹³ Pike.

⁹⁴ Pike, “GORAE-Class Ballistic Missile Sub”; Panda, “Kim Jong Un’s New Ballistic Missile Submarine.”

capabilities, though it is unknown if there is a connection. Other significant observations have been made through the analysis of satellite imagery from 2016 that suggest construction is in fact ongoing on a large-diameter submarine; large circular hull sections have been observed adjacent to the main construction hall at Sinpo, measuring roughly 10 meters wide, thought to be in support of the construction of a pressure hull for a new submarine.⁹⁵ U.S. and ROK intelligence agencies believe the overall diameter of this sub will be 11 meters and the sub will have an overall displacement of approximately 2,000 tons, making it the largest submarine ever built by North Korea.

Additional imagery taken throughout 2019 shows progression of what is assessed to be the construction of this submarine due to the continued production of circular rings and the continuous movement of equipment in the vicinity of the main construction hall.⁹⁶ The main construction hall at Sinpo has been shown to house the construction of the modified ROMEO, but with the building's length of 210 meters, it is possible that construction of both the modified ROMEO and the SINPO-C is taking place within this facility simultaneously.⁹⁷

4. SSN/SSBN Ambitions

With so little known about this possible third submarine, the thought goes back to the briefing Kim Jong Il received in 1995 regarding prospects for a nuclear-powered submarine. Despite this briefing, there has been no mention or evidence to suggest the existence of a nuclear-powered submarine program. The only other mention was made publicly by Kim Jong Un at the 8 Congress of the Workers' Party of Korea, on January 5, 2021, where Kim Jong Un announced his intention to construct and deploy a nuclear-powered submarine. Based on the wording of the statement, it appears the north is planning

⁹⁵ "North Korea Possibly Building Large Submarine, Says Report," Janes, October 3, 2016, <https://customer-janes-com.libproxy.nps.edu/Janes/Display/jdw63322-jdw-2016>.

⁹⁶ Jack Liu and Peter Makowsky, "North Korea's Sinpo South Shipyard: Continuing Submarine Construction and Minor Improvements at the Secure Boat Basin," 38 North, June 12, 2019, <https://www.38north.org/2019/06/sinpo061219/>.

⁹⁷ Panda, "The Sinpo-C-Class."

on developing this submarine and is not currently in the process of producing one at this time.⁹⁸

North Korea possesses nuclear weapons technology, but it should be understood that nuclear powerplant development, like what would be required for a nuclear-powered submarine, is very distinct from nuclear weapons development, according to Lee.⁹⁹ Lee explains the difficulty in developing nuclear power plants for submarines: “[i]f we compare nuclear weapons, commercial nuclear reactors, and nuclear submarine reactors from a technical standpoint, nuclear weapons development is the easiest of the three.” He continues to discuss that the technical requirements to include space limitation, safety of the crew, and a list of other difficulties makes nuclear technology for submarines “one of the most difficult technologies in nuclear engineering.”¹⁰⁰ However, North Korea does not have to necessarily develop this reactor on its own, or at all; they could utilize outside help for expertise or sourcing, which North Korea has a history of doing. Since the 1950s through to present day, North Korea has collaborated with the Soviet Union (more recently, Russia), China, Pakistan, and other third parties in the development of its nuclear capabilities, ballistic missile technology, and chemical weapons development.¹⁰¹

C. SLBMS

Evidence that North Korea was developing a SLBM first came to light in 2012 with the construction of a land-based ejection test stand in Sinpo on the east coast where a series of land-based ejection tests took place long before any missile launches occurred from sea, no launches are believed to have occurred from the land-based ejection test stand.¹⁰² Table 1 depicts the six test launches of the Pukguksong-1 and the assessed success rate.

⁹⁸ Sutton, “North Korean Navy Nuclear Submarine.”

⁹⁹ Lee, “Misunderstandings and Facts About Korea’s Nuclear Submarine Development.”

¹⁰⁰ Lee.

¹⁰¹ Eleanor Albert, “North Korea’s Military Capabilities,” Council on Foreign Relations, November 16, 2020, <https://www.cfr.org/background/north-koreas-military-capabilities>.

¹⁰² Janes, “Korea, North - Navy.”

To mitigate any risk of damage to the submarine while launching, the missile must first be ejected or lofted out of the launch tube and into the air before the engines ignite. Before testing can begin on a missile, the launching mechanism must first be tested to show it can effectively loft the missile out of the water. Initially, this is done from a land-based stand, which tests the ejection mechanism by compressing gas inside the launch tube, below the missile, and lofting the test missile into the air where it then falls to the ground. Next the missile is tested in a submersible barge to simulate conditions in a submarine, before testing from an actual submarine.¹⁰³ The purpose of the barge is similar to the land-based ejection test stand with the introduction of the at-sea environment. It allows the tester to simulate launching conditions from a submarine without risking damage to the actual submarine.

The Pukguksong-1 SLBM, the first SLBM produced by North Korea, was eventually put on display in a military parade on April 15, 2017, allowing for better analysis of the physical characteristics of the missile.¹⁰⁴ The Pukguksong-1 is assessed to be the result of reverse-engineering a Soviet R-27 missile.¹⁰⁵

Table 1. Pukguksong-1 test launch dates at-sea as North Korea pushed to develop a viable SLBM.¹⁰⁶

Date	Weapon Tested	Launch Platform	Outcome
May 9, 2015	Puk-1 Liquid Fuel	Test Barge	Success
November 28, 2015	Puk-1 Liquid Fuel	Assessed GORAE	Failure
December 21, 2015	Puk-1 Liquid Fuel	GORAE	Failure
April 23, 2016	Puk-1 Solid Fuel	Test Barge	Failure – Flew 30km
July 9, 2016	Puk-1 Solid Fuel	GORAE	Failure
August 24, 2016	Puk-1 Solid Fuel	GORAE	Success

¹⁰³ Sutton, “Korea’s Polaris: Goraе Class Ballistic Missile Submarine.”

¹⁰⁴ Sutton.

¹⁰⁵ Sutton.

¹⁰⁶ Adapted from Sutton.

Just as with the first test launch discussed previously, the April 23 launch was depicted in North Korean state media as having launched from a submarine, but analysis of the video shows it was in fact launched from a barge.¹⁰⁷ The December 2015 test was reported in media as a success but was ultimately judged by Korean intelligence agencies, confirmed by civilian analysis, to be a failure.¹⁰⁸ The first version of the Pukguksong-1 was fueled by liquid-propellant, while versions in 2016 utilized a new design featuring solid-propellant.¹⁰⁹

It is likely North Korea chose to make the shift from a liquid-propellant missile to a solid-propellant missile due to the hazardous nature of liquid-propellant; when ejecting the missile, the movement of the liquid fuel inside the missile can cause uncontrolled movement throwing off the launch or cause an explosion if any of the liquid-related pumps do not work properly.¹¹⁰ Imagery released by North Korean media in April 2016, depicted engines from two Russian R-27 solid-fueled SLBMs being test-fired, providing evidence of the likely course of action North Korea took to transition its SLBM program to solid-fuel. It is understood that Soviet missile scientists from the Soviet Makeyev Rocket Design Bureau made several trips to North Korea in the 90s. Russian solid-fueled missiles were also transferred to North Korea at unknown times in the late 90s, early 2000s – it was this expertise and weapons transfers that helped the North develop the Musudan IRBM.¹¹¹ It is unknown how the rocket motors came into North Korean hands, but history suggests the engines, and potentially the missiles themselves drove the transition of the Pukguksong-1 from liquid-fuel to solid-fuel.

In August 2017, North Korea released an image of an official standing in front of a diagram that depicted what was labeled as the “Pukguksong-3” SLBM along with 3D

¹⁰⁷ Sutton.

¹⁰⁸ John Schilling, “North Korea Tests a Submerged-Launch Ballistic Missile, Take Three,” 38 North, January 12, 2016, <https://www.38north.org/2016/01/jschilling011215/>.

¹⁰⁹ Center for Strategic & International Studies, “Pukguksong-1 (KN-11).”

¹¹⁰ John Schilling, “A New Submarine-Launched Ballistic Missile for North Korea,” Analysis, 38 North, April 25, 2016, <https://www.38north.org/2016/04/jschilling042516/>.

¹¹¹ Lewis, “Origins of the Musudan IRBM,” Arms Control Wonk, June 11, 2012, <https://www.armscontrolwonk.com/archive/205337/origins-of-the-musudan-irbm/>.

cutout renderings, as part of a press release for Kim Jong Un's visit to the Chemical Materials Institute. This was the first instance of any mentions of this new missile, but it was expected to be only a matter of time until the missile was fielded.¹¹² In September of 2017, a Japanese news outlet Asahi Shimbun reported on a failed solid-engine test that was meant for a new SLBM, though U.S. sources could not confirm.¹¹³

On October 2, 2019, a missile launch took place off the coast of Wonsan; North Korea had launched a new SLBM with capabilities that far exceeded the Pukguksong-1. U.S. intelligence services observed the missile at Sinpo Shipyard South in late September 2020 and shared the images with the ROK, while sharing vague details about the discovery with the public. Analysis of imagery released by North Korea showed this new missile to be a two-stage, solid-fueled missile with an estimated range of approximately 2,000 kilometers.¹¹⁴ Despite the extended range, the missile is similar in size to the Pukguksong-1 SLBM and may be compatible with the GORAE missile tubes.¹¹⁵ There has only been one test of this missile so far, which was thought to have been a success. If launched from a barge, the next expected progression should be a test from a submarine.

In a military parade on October 10, 2020, a new missile was displayed, among other new weapons systems, which was labeled as "Pukguksong-4," very closely resembling the Pukguksong-3, with what appears to be a similar first stage, but an overall shorter length.¹¹⁶ Based on the observables and what is known about the Pukguksong family of missiles, it is assessed this new missile is solid-fueled.¹¹⁷ In a follow-on nighttime military parade on January 14, 2021, yet another missile bearing the Pukguksong family name was displayed, this time it was the Pukguksong-5 which appeared to be an elongated Pukguksong-4 with a more swept nose cone.¹¹⁸

¹¹² Panda, "Pukguksong-3 SLBM."

¹¹³ Panda, "The Sinpo-C-Class."

¹¹⁴ Elleman, "North Korea's New Pukguksong-3 Submarine-Launched Ballistic Missile."

¹¹⁵ Center for Strategic & International Studies, "Pukguksong-3 (KN-26)."

¹¹⁶ Sutton, "North-Korean-Navy-SLBM-Pukguksong-5."

¹¹⁷ Dahlgren, "North Korea Displays New Missiles in Parade."

¹¹⁸ Dahlgren, "North Korea Displays New Missiles in Nighttime Parade."

Neither of these missiles have been tested, nor is it known if these missiles are anything more than stage props presented for clout. If these new missiles are real, there is no way of knowing at this time if either are intended for ground use or submarine use, despite their similarities. For example, North Korea debuted the Pukguksong-1 missile, along with a very similar land-variant called the Pukguksong-2, which has been operationalized as a Medium Range Ballistic Missile (MRBM).¹¹⁹ While there are little to no roadblocks to launching an SLBM from a ground-based launch platform, there are considerably more when launching a missile from a submarine. If the Pukguksong-4 and -5 missiles are in fact intended for submarines, it should be expected that multiple ejection tests from land- and sea-based stands should take place, as well as from a submarine.¹²⁰

In early October 2021, Kim Jong Un again surprised the world with a military weapons exhibition in Pyongyang where he put all his recently developed weapons on display. In the mix with the previously observed SLBMs was yet another new missile with a different conformation than any of the Pukguksong missiles.¹²¹ Initial skepticism as to whether this missile was in fact an SLBM were put aside after U.S., ROK, and Japanese sensors detected an SLBM launch in the vicinity of Sinpo later that month. North Korean press released several images of this new missile breaching the water from the GORAE and taking off. North Korea had presented and tested a new, currently unnamed SLBM in a single month. Statements by North Korea claim that the launch was a success.¹²² Very little is known about this new missile at the time of this writing, though the similarities between the shape and size of this missile with North Korea's recently developed KN-23

¹¹⁹ Center for Strategic & International Studies, "Pukguksong-3 (KN-26)."

¹²⁰ Sutton, "North-Korean-Navy-SLBM-Pukguksong-5."

¹²¹ "Showing Off Weapons, North Korea's Kim Jong Un Vows to Build 'Invincible' Military," NBC, October 11, 2021, <https://www.nbcnews.com/news/world/showing-weapons-north-korea-s-kim-jong-un-vows-build-n1281300>.

¹²² Peter Makowsky and Jack Liu, "Sinpho South Shipyard: Evidence of the SINPO-Class SSBA Participation in Recent SLBM Test," 38 North, October 21, 2021, <https://www.38north.org/2021/10/sinpho-south-shipyard-evidence-of-the-sinpo-class-ssba-participation-in-recent-slbm-test/>.

suggest this new missile may exhibit features. The KN-23 is a single-stage solid propellant SRBM with a demonstrated range of 600–700km and maneuverability.¹²³

D. INFRASTRUCTURE

On North Korea's east coast, a port city stands at the center of strategic submarine development. Sinpo has been the site of many projects either directly tied to or thought to be related to the development of North Korea's strategic submarines. The east coast submarine-related infrastructure projects appear to be geared to support the construction and operations of ballistic missile submarines, as well as training the crews to man them.¹²⁴

Sinpo's prominent role was first understood when Kim Jong Un was observed conducting a tour of an unidentified naval shipyard in November 2013, later identified as Sinpo Shipyard South. That same year, a new submarine was observed in the secure boat basin at Sinpo, to be identified as the GORAE ballistic missile-capable submarine.¹²⁵ Historically, Sinpo has served as the main construction site for the North Korean conventional submarine program, having constructed dozens of North Korea's SANGO class coastal submarines in the 1990s, which accounts for approximately 40 of North Korea's estimated 70 submarines.¹²⁶

From 2013 to 2016, Sinpo Shipyard South underwent massive renovation to the construction halls and associated infrastructure. The halls were significantly enlarged, and the vessel launch ramps to the water were also enlarged.¹²⁷ The significance of these upgrades is that by enlarging the facilities, the North will be able to build larger, more capable submarines to include ballistic missile submarines.

¹²³ Andrius Genys, "KN-23 Short-Range Ballistic Missile," *Military Today*, accessed October 23, 2021, http://www.military-today.com/missiles/kn_23.htm.

¹²⁴ Janes, "Korea, North - Navy."

¹²⁵ "The Sinpo South Naval Shipyard," *Nuclear Threat Initiative*, November 8, 2016, <https://www.nti.org/learn/facilities/945/>.

¹²⁶ Damen Cook, "North Korea's Most Important Submarine Base," *The Diplomat*, March 27, 2017, <https://thediplomat.com/2017/03/north-koreas-most-important-submarine-base/>.

¹²⁷ Joseph Bermudez Jr., "North Korea's Ballistic Missile Submarine: Probable Post-Missile Test Maintenance; Construction Hall Externally Complete," *38 North*, July 20, 2016, <https://www.38north.org/2016/07/sinpo072016/>.

As a production facility, Sinpo Shipyard South served a different role than the other naval shipyards that serve each fleet. Nearby, on Mayangdo, is the Mayangdo Navy Shipyard where the East Coast Fleet sends its submarines for repair.¹²⁸ This facility is the largest naval repair facility in North Korea and maintains multiple vessel anchorage points, docks, support structures, fabrication shops and halls, as well as an abandoned construction hall. Also present is a large graving dock and inclined repair way; both of which are commonly used in the repair and overhaul of submarines.¹²⁹ Sinpo shipyard (separate from Sinpo Shipyard South) houses a dry-dock which has supplemented the overhaul repair efforts for east coast submarines.¹³⁰ On the West Coast, Tasa-ri Navy Shipyard serves a similar but smaller role; this location has been the site of submarine repair and overhaul.¹³¹ At least one ROMEO and two SANGO submarines have completed refit during the period of 2002–2013, with a single ROMEO taking up the dry-dock since late 2013.¹³² Given the extreme tidal nature of the Yellow Sea, Tasa-ri is only accessible at certain parts of the day as the bay almost completely drains. Another repair facility exists in Nampo, but exclusively services surface vessels.

In July of 2019, Sinpo's connection to North Korea's ballistic missile submarine program was reaffirmed in a state media news release where Kim Jong Un was shown inspecting the construction of what has been identified as a modified ROMEO submarine. Internal features of the construction hall visible in the images were matched to features in satellite imagery of Sinpo Shipyard South.¹³³ Since the visit, movement of parts and equipment around the facility suggest continued submarine construction efforts are

¹²⁸ "Mayang Island Missile Base," Nuclear Threat Initiative, March 1, 2003, <https://www.nti.org/learn/facilities/213/>.

¹²⁹ Joseph Bermudez Jr. and Victor Cha, "Sharp Focus: A Unique View of the Mayang-Do Submarine Base," *Beyond Parallel*, July 7, 2021, <https://beyondparallel.csis.org/sharp-focus-a-unique-view-of-the-mayang-do-submarine-base/>.

¹³⁰ Joseph Bermudez Jr., "North Korea's Submarine Ballistic Missile Program Moves Ahead: Indications of Shipbuilding and Missile Ejection Testing," *38 North*, November 16, 2017, <https://www.38north.org/2017/11/sinpo111617/>.

¹³¹ Janes, "Korea, North - Navy."

¹³² Bermudez Jr., "North Korea's Submarine Ballistic Missile Program Moves Ahead."

¹³³ Liu, Town, and Sutton, "North Korea's Sinpo South Shipyard."

underway. Additionally, in 2019, a retractable awning was constructed on the quay wall where the GORAE has been parked inside the secure boat basin.¹³⁴ This awning is significantly larger than the GORAE, leading to suspicions that this awning may be used to cover more than one submarine as well as possible missile-loading activity through the retractable portion of the awning. In 2016, Kim Jong Un was observed in North Korean Media next to missile loading activity onboard the GORAE in the exact location as the new retractable awning. The creation of this awning not only provides the North with the ability to conceal its submarines, as well as limit our ability to observe one of the key indicators of a ballistic missile submarine getting underway with missiles onboard. This location is the only North Korean submarine base where a quay-side awning has been constructed.¹³⁵

Sinpo houses the only known land-based test stand for the launching of SLBMs. This test stand is thought to have been constructed in 2010. The stand is used to test the ejection mechanism installed on submarines for SLBMs.¹³⁶ In theory, this test stand could support an actual launch of an SLBM since it lofts the missile into the air allowing it to ignite its engines and fly away, but this is not the intended purpose. Throughout the development of the Pukgukson-1 SLBM, signs of ejection testing were observed from this test stand.¹³⁷

Despite a lull in activity through 2018–2019, the stand has continued to remain a significant feature in the continued development of North Korean strategic submarines with most recent ejection testing thought to have occurred in April of 2020, according to commercial satellite imagery analysis.¹³⁸ It is unknown if this testing was in support of a newly debuted Pukgukson-3 in 2020 or if it was still in support of continued testing on the Pukgukson-1, but the continued utilization of the stand signals the continued progression of the SLBM program.

¹³⁴ Liu, Town, and Sutton.

¹³⁵ Liu, Town, and Sutton.

¹³⁶ Bermudez Jr., “North Korea’s Submarine Ballistic Missile Program Moves Ahead.”

¹³⁷ Bermudez Jr.

¹³⁸ Peter Makowsky and Jack Liu, “North Korea’s Sinpo South Shipyard: Probable Ejection Testing,” 38 North, April 8, 2020, <https://www.38north.org/2020/04/sinpo040820/>.

An additional piece of infrastructure housed at North Korea's Sinpo Shipyard South facility is a towed underwater launch platform, also known as a towed ejection test barge which first was observed in 2014.¹³⁹ This barge appears to be like those used by the Soviet Union in the 1960s. This barge features a cylindrical ejection tube mechanism housed in the center of the barge, along with ballast tanks. The barge is loaded with a missile, and towed to sea where it is stabilized, submerged, and the missile is ejected. This Sinpo-based barge was used throughout the testing of the Pukguksong-1 and is thought to have been the test barge used for the Pukguksong-3. It is stored adjacent to the GORAE within the secure boat basin.¹⁴⁰

A separate towed ejection test barge is located on North Korea's west coast, despite all SLBM tests to date occurring from the nation's east coast. It first showed up in satellite imagery in early 2017 housed in a dry-dock.¹⁴¹ It is unknown if it was newly constructed or where it came from, but it was later moved to a quay wall near the port facility where imagery analysis suggests it completed its fitting-out process. Despite no launches occurring from this test barge, the thought is that the placement of this barge on the west coast will allow North Korea to test longer-range SLBMs by launching over the Korean Peninsula and into the Sea of Japan, or south into the Yellow Sea.¹⁴²

The barge sat without moving from 2018 until November of 2020, where it was moved back to the dry-dock, it appears the barge is undergoing an overhaul of some sort. Imagery from December 2020 through to the most recent Maxar image taken July 20, 2021, shows the continued presence of the barge within the dry-dock. There is no indication of what North Korea intends on doing with this barge, or if it will ever be used for the testing of an SLBM.

¹³⁹ Peter Makowsky and Jack Liu, "Sinpo South Shipyard: Repositioning of the Submersible Test Barge," 38 North, April 6, 2021, <https://www.38north.org/2021/04/sinpo-south-shipyard-repositioning-of-the-submersible-test-barge/>.

¹⁴⁰ Bermudez Jr., "North Korea's Submarine Ballistic Missile Program Moves Ahead."

¹⁴¹ Jeffrey Lewis and David Schmerler, "Will North Korea Test Another SLBM?," Arms Control Wonk, January 2021, <https://www.armscontrolwonk.com/archive/1210731/will-north-korea-test-another-slbm/>.

¹⁴² Lewis and Schmerler.

Since as early as 2009, North Korea has been building what is assessed to be a submariner training facility in Sinpo, according to satellite imagery analysis. Historically, the two fleets have been serviced by two known submariner training facilities; the West Coast Fleet's being in Pipa-got and the East Coast Fleet's being in Mayangdo off the coast of Sinpo.¹⁴³ North Korea's internal and externally focused news service, KCNA, featured a leadership visit by Kim Jong Un to Pipa-got's training facility in December 2014. Features identified in imagery for this facility match features identified being constructed within the new Sinpo facility, to include training pools and an assessed escape training tower. Training infrastructure such as these are common among submarine training facilities worldwide.

As of June of 2020, according to Dave Schmerler of the James Martin Center for Nonproliferation Studies, construction on the facility appears to be complete, at least on the externally visible features.¹⁴⁴ There are no clear indicators of the operation status of the facility at this time; construction has been slow and has exceeded ten years, but completion of the exterior in the last year accompanied by the lack of development at the other sites suggests a new focus at this location. It is unknown if this new training site will replace the training facility at Mayangdo or if it will operate in parallel.¹⁴⁵

The colocation with other strategic submarine program facilities may suggest an association of this facility, as well as signal the continued desire to expand North Korea's submarine capabilities, especially on the east coast. According to Schmerler, "[i]t is more than likely that this new training facility will play a crucial role in training submariners for their new series of ballistic missile submarines."¹⁴⁶

A final construction project in the vicinity of Sinpo began in 2012 and seemed to stall around 2016. The North Koreans excavated a portion of the mountain along the coast near Sinpo on the peninsula and laid the foundation for what appeared to be a possible

¹⁴³ David Schmerler, "Revealed: North Korea's Likely New Submariner Training Center," NK PRO, July 23, 2019, <https://www.nknews.org/pro/revealed-north-koreas-likely-new-submariner-training-center/>.

¹⁴⁴ Schmerler, "Updated: North Korean Submarine Training Center."

¹⁴⁵ Schmerler, "Revealed."

¹⁴⁶ Schmerler.

maintenance hall or graving dock. Given the location relative to the surrounding mountainside, it could have also been covered with dirt to provide protection.¹⁴⁷ Although it is unknown what this hall was being constructed for, the 119-meter length provided enough room to store more than one submarine, potentially a ballistic missile submarine and could have been intended for such use. It is impossible to know what the North Korean's intended with this structure or why construction ceased. An accompanied 197-meter L-shaped dock that was constructed at the same time has since broken up and is in the process of disintegrating. It is unknown if the North Koreans plan on completing this process, but given the long timelines displayed thus far in the completion of nearby submarine-related projects, the possibility still exists.

E. CONCLUSION

Adding to its fleet of approximately 70 conventional submarines, the first ballistic missile submarine, the GORAE, has been operating out of North Korea's east coast Sinpo Shipyard, housed in a secure boat basin. Based on the single-missile configuration and limited use, this submarine is thought to be a testbed for future ballistic missile submarines. Two additional ballistic missile submarines currently under construction at Sinpo Shipyard South present two possible directions the North Korean regime may take with regards to its SSB fleet. One, a modified ROMEO, remains in the construction hall where Kim Jong Un inspected it in 2019, having not been launched to sea at the time of this writing. This submarine is the result of retrofitting and modifying one of North Korea's ROMEO-class attack submarines which, if successful, presents an option for future retrofits on other hulls. The other submarine under construction is believed to be an indigenously produced sub which Kim Jong Un has said will be able to launch multiple SLBMs. It has not been publicly displayed and the awareness of its existence is the result of observations of construction materials outside the construction hall over several years. It is unknown when either the modified ROMEO or the SINPO-C will become operational.

¹⁴⁷ Joseph Bermudez Jr., "Sinpo South Shipyard: Is the GORAE Set to Sail?," 38 North, December 19, 2016, <https://www.38north.org/2016/12/sinpo111916/>.

Submarine-launched ballistic missile development has publicly progressed since the program first came to light in 2012. Some of these missiles have been tested from an at-sea submersible barge while others have been tested from the GORAE in the vicinity of Sinpo. The first SLBM debuted and tested was the first in a line of Pukguksong missiles, the liquid-fueled Pukguksong-1. After several tests with mostly failures, a new solid-fuel variant was produced and tested through 2016 with more failures than successes. The Pukguksong-2 was a land-variant of the Pukguksong-1 which was developed concurrently. In 2020, the Pukguksong-3, also a solid-fuel SLBM, was paraded and test-launched from a submersible barge near Sinpo a single time and was judged as a success, showing a further range than the Pukguksong-1. Having not been launched, the Pukguksong-4 and -5 were displayed separately in two military parades at the end of 2020; if fielded, based on the dimensions of the missiles, they will have a longer range than the Pukguksong-3. Finally, in 2021, another SLBM was displayed and tested. This new missile has not been named to date and displayed physical and flight characteristics that match North Korea's new KN-23 SRBM.

Sinpo's prominent role in North Korea's SSB aspirations has been on display with the continued infrastructure development and construction in the area. Besides the renovation of the Sinpo Shipyard South's submarine construction halls from 2013 to 2016, several other submarine-related construction and development projects have been completed in the vicinity. Since 2010, a land-based missile ejection tests stand has supported the testing of the missile ejection process within a submarine, as well as a submersible barge that fills a similar role at-sea. Another test barge also exists on the nation's west coast at Nampo but has not supported any known at-sea tests to date. Since 2009, construction has taken place on a new submarine training command within Sinpo which will expand on North Korea's training capacity beyond what it can provide with its preexisting two training commands. A final project, which appears to have stalled in the last several years, is an onshore construction hall or graving dock, excavated out of a mountain on the coast. The construction of these facilities has been time-coincident with the SSB program, providing the North with additional man, train, and equip capabilities as it moves forward with its SSB program.

This chapter has been a survey of North Korea's ballistic missile submarines, their missiles, as well as the infrastructure constructed to support their construction and operation. The next chapter will provide insights into what assessed role this SSB force will play in the future and what motivates the regime through this endeavor, given what is known currently.

III. ASSESSED NORTH KOREAN INTENTIONS

A. INTRODUCTION

Given the extreme technological differences between the Soviet-era military of North Korea and the militaries of its neighbors, Kim Jong Un recognizes the need to upgrade his forces. He has embarked his nation on a path to deliver capabilities that help to “control surrounding political situations, and give [its] enemies an immense and overwhelming strike of anxiety and fear,” according to claims he made at the 5 Party Plenary Session, released publicly on January 1, 2021.¹⁴⁸ Kim Jong Un’s desire to provide himself with ever-increasing strike capabilities and overall lethality may provide him with a sense of increased security, as well as communicate to the domestic population that he is able to protect them from the hostile external forces.

One of the actions taken to increase this perception of increased security has been the development of a ballistic missile submarine program. One of the questions focusing on these submarine upgrades is, to what end? Is Kim Jong Un developing this capability simply for clout and the perceived political gains, or is he working to develop an operational ballistic missile submarine force? If he does desire to develop a force, will it impact the overall security environment enough to matter?

This chapter evaluates the threats posed by the creation of the ballistic missile program with an objective approach analyzing key aspects of the program and what it means, building off information previously presented. This chapter will conclude that based on the evidence, Kim Jong Un does in fact desire to field a ballistic missile submarine force, instead of merely developing a handful of capabilities to put on a show. However, despite this desire, his ability to effectively deliver on this capability will be greatly limited due to vulnerabilities in the force and slow timelines of production. Despite this result, Kim Jong Un will have the ability to use the existence of the force and the production

¹⁴⁸ “North Korea Military Power” (Defense Intelligence Agency, 2021), 19, https://www.dia.mil/Portals/110/Documents/News/North_Korea_Military_Power.pdf.

capabilities that come with it to his benefit in the political arena, which create threats to the ROK and U.S. defense forces that still must be overcome.

B. PROGRAM DEVELOPMENT

North Korea has been pursuing the co-development of SLBMs and SSBs, which could offer Kim Jong Un other options in terms of weaponry to supplement his land-based nuclear force. Nuclear weapons present themselves as the shield with which North Korea will defend itself from the outside world, according to claims by Kim Jong Un.¹⁴⁹ Submarines provide a potentially more survivable method for delivery of nuclear weapons due to the ability to remain mobile and unlocated beneath the surface of the water, a capability which Kim undoubtedly wishes to harness.¹⁵⁰

At the 8 Workers' Party Congress in January 2021, Kim Jong Un made the following statement:

Building the national nuclear force was a strategic and predominant goal. The status of our state as a nuclear weapons state...enabled it to bolster its powerful and reliable strategic deterrent for coping with any threat by providing a perfect nuclear shield. New, cutting edge [sic] weapons systems were developed one after another...making our state's superiority in military technology irreversible and putting its war deterrent and capability of fighting war on the highest level.¹⁵¹

These words reinforce a continued strategy of the regime to develop nuclear weapons and ballistic missiles to serve in conjunction with its conventional forces to deter any perceived external aggression. In doing so, the sovereign integrity of the nation as well as the domestic population's perception of security remains intact, and with it, the ruling Kim family. Kim Jong Un's development of the SLBM and SSB programs show his desire to build an at-sea component of this strategy.

¹⁴⁹ "Military and Security Developments Involving the Democratic People's Republic of Korea," Congressional Report (Office of the Secretary of Defense, December 15, 2017), 10, <https://irp.fas.org/world/dprk/dod-2017.pdf>.

¹⁵⁰ Peter Brookes, "The U.S. Must Respond to North Korea's Emerging Submarine- Launched Ballistic Missile Program," *The Heritage Foundation*, no. 3538 (October 6, 2020): 3.

¹⁵¹ Defense Intelligence Agency, "North Korea Military Power," 4.

It is widespread knowledge that North Korea is a resource-poor nation with decreasing cash supplies. North Korea has maintained a system of simultaneous development of the economy and the nuclear weapons program, known as byungjin.¹⁵² As part of his nuclear weapons program, the continuation of this submarine-related development in terms of missiles, submarine hulls, infrastructure, and unknown other associated elements pose a very substantial cost to the regime. Based on analysis by the ROK government, it is estimated that North Korea's defense budget is roughly \$10 billion per year, a significant portion of North Korea's estimated \$30-to-\$40 billion-dollar gross domestic product.¹⁵³ North Korea's nuclear and missile program are estimated to account for close to \$3 billion of this spending; each SLBM launch is estimated to cost \$5 to \$10 million. Though the total cost of the ballistic missile submarine program and the associated missiles is unknown, analysis by the U.S.-Korea Institute at Johns Hopkins University suggests the North Korean elites are willing to absorb the cost in exchange for the security provided by the programs.¹⁵⁴ However, it is impossible to know how much money Kim Jong Un is willing to spend in order to earn domestic or international political points; therefore it is impossible to use defense spending to tell if his goal is a credible SSB force or simply clout.

Beyond looking at the cost of defense spending, the simple fact that North Korea has constructed a functional ballistic missile submarine with two others under construction makes it reasonable to assume that Kim Jong Un wishes to develop a ballistic missile submarine force as opposed to submarines to parade. The intended scale of this force is something which cannot be determined at this time. Perhaps even more suggestive than the number of submarine hulls under construction is the development of the requisite infrastructure to support the production and maintenance of these new submarines.

¹⁵² Secretary of Defense, "Military and Security Developments Involving the Democratic People's Republic of Korea," 7.

¹⁵³ "Less Than One Aircraft Carrier? The Cost of North Korea's Nukes," CNBC, July 20, 2017, <https://www.cnbc.com/2017/07/20/less-than-one-aircraft-carrier-the-cost-of-north-koreas-nukes.html>.

¹⁵⁴ CNBC.

The case can be made that the concentration of submarine facility upgrades to the area surrounding Sinpo is suggestive of a shift in strategy towards the creation of a ballistic missile submarine force as opposed to single unit production. Alternatively, the North could simply be trying to consolidate training and production facilities to better accommodate the future submarine force, regardless of class or hull-type. However, this alternative explanation seems less likely, since the Sinpo facility is under the ownership of the Academy of Defense Science whereas other naval facilities fall under the actual Navy.¹⁵⁵

To date, North Korea has maintained submarine maintenance and construction facilities that service both coasts, with one on each coast.¹⁵⁶ As stated previously, the legacy maintenance facility that services navy submarines for the east coast is on Mayangdo, an island off the coast.¹⁵⁷ For a heavy industry such as submarine maintenance, the logistical challenge is made more difficult when the supplies and resources must be transported to an island before it can reach the submarine repair yard, such as the case for Mayangdo. The fact that the North actively maintains this island repair yard and has not relocated it to the mainland to accompany the new facilities suggests they wish to continue to keep the Navy and the Academy of Defense Science facilities separate. There is no way to know if a switch like this is intended in the future, but the timelines involved in these facility upgrades means a relocation wouldn't be likely within the next several years even if the North Koreans intended it.¹⁵⁸ Keeping these facilities separate, despite the logistical costs, reinforces the perception that the SLBM and SSB programs are a special priority for the regime.

In October 2021, the GORAE returned to the sea and launched a new, currently unnamed SLBM similar in appearance to the KN-23.¹⁵⁹ This SLBM was first observed

¹⁵⁵ Makowsky and Liu, "Sinpho South Shipyard," October 21, 2021.

¹⁵⁶ Janes, "Korea, North - Navy."

¹⁵⁷ Nuclear Threat Initiative, "Mayang Island Missile Base."

¹⁵⁸ Cook, "North Korea's Most Important Submarine Base."

¹⁵⁹ Lewis and Dempsey, "North Korea's Small SLBM."

earlier that month in a military exhibition in Pyongyang that was publicly broadcast.¹⁶⁰ The missile was launched later that month from the vicinity of Sinpo from the GORAE, which was the first time the GORAE has gotten underway or launched a missile since 2016. It is unclear at the time of this writing what the specific characteristics are with this missile, but this is the fourth type of SLBM produced and launched by the North Koreans. Previous tested missiles included the Pukguksong-3, Pukgukson-1 solid fuel, and the Pukguksong-1 liquid fuel missiles.¹⁶¹

If Kim Jong Un were simply seeking ballistic missile submarine capabilities for political clout, development of one successful SLBM could have been enough. Certainly, the shift from liquid propellant in the Pukguksong-1 to solid propellant makes sense from a safety and security perspective, but the continued development of as many as four additional SLBMs suggests a greater desire. It could be that the limited range of the Pukguksong-1 was enough to strategically message to North Korea's enemies on the periphery, but not be able to reach the United States. The Pukguksong-3 showcased a significantly longer range than the Pukguksong-1, but even with the extension, it does not come anywhere near the range needed to strike Guam, Hawaii, or the continental U.S. without the submarine flushing out to sea and departing the protection of the Sea of Japan. The development of this newly launched, still unnamed missile does not provide a further strike distance to suggest the progression towards a capability to target the U.S.¹⁶²

The significant time and resources devoted to the overall ballistic missile infrastructure, the development of multiple submarine hulls with claims for future hulls, and the development and testing of multiple types of SLBMs are altogether highly suggestive of aims for a larger, more robust ballistic missile submarine force in the future. However, significant roadblocks exist for the programs that discredit any hopes for their strategic significance militarily.

¹⁶⁰ NBC, "Showing Off Weapons, North Korea's Kim Jong Un Vows to Build 'Invincible' Military."

¹⁶¹ Makowsky and Liu, "Sinpho South Shipyard," October 21, 2021.

¹⁶² Lewis and Dempsey, "North Korea's Small SLBM."

C. TIMELINES WILL LIMIT PROGRAM EFFECTIVENESS

With a diverse array of SLBM options, the issue of deterrence isn't simply a matter of missile capabilities; what Kim Jong Un lacks is a large enough force to ensure its survivability to deliver a meaningful number of missiles in any conflict, coupled with the inability to add to that force in any significant capacity in the near-term, regardless of any long-term intentions. With the introduction of SSBs, a nuclear-armed state can hope to safeguard its nuclear weapons and ward off any preemptive attacks simply by putting them in hiding or getting them underway; having submarines away from port complicates preemptive attack on North Korea due to the need to locate these subs. To provide any sense of survivability in a ballistic missile submarine force, one must be able to maintain persistent patrols sufficient to limit the enemies' chances of knowing the location of all the submarines at one time.

It is estimated that at least five SLBM-capable submarines are needed in order to maintain the capability for persistence patrols, something that would be necessary in order to limit the vulnerability of an at-sea nuclear force. This is a hard issue to make predictions on because actual deterrence lies in the mind of the those you wish to deter; but five hulls will allow for underway periods, training, and maintenance while always providing a hull to be underway.¹⁶³ Without the adequate number of SSBs, certainly with only one functional submarine at the time of this writing, North Korea does not possess a survivable second-strike capability.

Nor does North Korea appear on a path to achieve this minimum anytime soon. The construction timeline for the GORAE is unknown, though initial talks of ballistic missile submarine designs emerged in 1995.¹⁶⁴ Not knowing when the GORAE construction began, it is difficult to estimate construction timelines, though the production of two new SSB types suggests there will be no additional GORAE-class hulls. The modified ROMEO

¹⁶³ Mark Episkopos, "North Korea's Pukguksong-3 SLBM: A Step Towards Second-Strike Capability?," Text, The National Interest (The Center for the National Interest, October 20, 2020), <https://nationalinterest.org/blog/korea-watch/north-koreas-pukguksong-3-slbm-step-towards-second-strike-capability-171008>.

¹⁶⁴ Pike, "SSB - Ballistic Missile Submarine."

and the SINPO-C can provide a little better insight into timelines. Given the fact that both are thought to be under construction within the older construction hall at Sinpo Shipyard South and given the fact that that hall underwent largescale modifications through 2017, submarine construction probably didn't start until after that point.¹⁶⁵ At the time of this writing, it is nearing the end of 2021 with neither of these submarines being launched; based on observed parts outside the construction hall, the modified ROMEO is further along than the SINPO-C.¹⁶⁶ As with any construction activity, repetition helps to decrease timelines, but without either of the submarines being launched to date, the construction timeline for either nears a minimum of four years. That is before the significant time required for post-construction testing and training before a submarine becomes fully operational. Should both or one launch soon, reaching the requisite hull count to provide the capability to perform persistent patrols is still years away. The displayed pace of construction of the SSBs shows North Korea's construction timeline is too slow to change this scenario any time soon.

Any desires to further upgrade infrastructure are likely to meet delays. Developing its training facility, for example, appears to have taken at least 12 years since initial excavation took place within Sinpo. Even though multiple structures form what appears to be a campus devoted to submariner training, resource availability almost certainly plays a role in the prolonged timeline.¹⁶⁷

D. LOCATION AND CONCENTRATION INCREASE VULNERABILITY

Even after the launching of the modified ROMEO and the SINPO-C, and even if North Korea is able to expedite the construction of follow-on hulls, the survivability of the entire SLBM force remains in question. Given the centralized location of Sinpo and the concentration of ballistic missile submarine facilities, the GORAE and accompanied support infrastructure are especially vulnerable simply because they are all located within the same general area. If timed correctly, the program could be eliminated in a single strike

¹⁶⁵ Trevithick, "North Korea's New Ballistic Missile Submarine Is a Refurbished Antique."

¹⁶⁶ Liu, Town, and Sutton, "North Korea's Sinpo South Shipyard."

¹⁶⁷ Schmerler, "Updated: North Korean Submarine Training Center."

as the GORAE, modified ROMEO, the SINPO-C, ejection test barge, ejection test stand, submarine training facility, and construction halls are all within one kilometer of each other.¹⁶⁸ This location is within defensive range of two airbases as well as air defense systems, but the soviet-era systems would not likely be able to defend against an assault should conflict develop.¹⁶⁹ Similarly, the proximity to Mayangdo and Mayangdo-ri, an important location for North Korea's conventional submarine program, puts a major portion of North Korea's overall submarine force at risk in the event that a strike were conducted near the start of hostilities.¹⁷⁰ The location and unprotected nature of the ballistic missile submarine program as it exists currently severely degrades any hopes at survivability of the GORAE, or follow-on submarines as long as they remain concentrated in Sinpo.

This vulnerability will not exist forever should the North decide to relocate and disperse the program. North Korea possesses a vast number of underground complexes designed for concealing and defending its military sites, even naval bases have been constructed underground for this purpose.¹⁷¹ Several naval bases on North Korea's east coast exist as good candidates for a base of future operations should Kim Jong Un decide to relocate his ballistic missile submarines to minimize the vulnerability of the ballistic missile submarine program. These bases feature underground tunnels used to house submarines and surface vessels.¹⁷² Though seven such locations exist on the east coast, two stand out as more likely candidates due to their history as submarine bases.

Chaho, on the nation's central east coast, exists as a continuous submarine base housing large submarines to include ROMEOs. A large underground submarine base exists with two tunnel entrances. This site continues to use this tunnel system to house many of

¹⁶⁸ Nuclear Threat Initiative, "The Sinpo South Naval Shipyard"; Schmerler, "Updated: North Korean Submarine Training Center."

¹⁶⁹ Cook, "North Korea's Most Important Submarine Base."

¹⁷⁰ Nuclear Threat Initiative, "Mayang Island Missile Base."

¹⁷¹ Defense Intelligence Agency, "North Korea Military Power," 41.

¹⁷² Jacob Bogle, "AccessDPRK: North Korea's Underground Navy: A Review," *AccessDPRK* (blog), May 10, 2020, <http://mynorthkorea.blogspot.com/2020/05/north-koreas-underground-navy-review.html>.

its large submarines and if used in the future for the SSB program, would increase protection and secrecy. The GORAE has been towed to this location in the past following an SLBM test launch in 2016.¹⁷³ There may be no significance of that visit, but it is the only other base the submarine has been observed in.

To'ejo-dong is the fleet headquarters for the east coast fleet, and also contains two tunnel entrances for an underground naval facility. This location also maintains enough infrastructure to support the continued operation of a SSB force based adjacent to the naval tunnels, though the internal features of the underground base are unknown.¹⁷⁴ The proximity to the current site at Sinpo as well as the protected nature of the harbor makes this location an opportune site for future use.

Unless North Korea takes the step to spread out the support infrastructure as well as naval bases that support submarine-based ballistic missile operations, the SSB program at any size is vulnerable. It is unknown if or when the decision will be made to do so; without such action, the overall survivability of the program will be severely at-risk and present the ROK and U.S. with an easy ability to counter the threat.

E. EASILY PROSECUTED

A SSB that is difficult to find at sea and can at any time pop up off an enemy's coast serves as a good deterrent to ward off aggression.¹⁷⁵ Conventional land attack sites or missile silos are subject to attack due to their non-mobile state whereas a submarine provides a much more survivable means of deploying those missiles or weapons systems, at least in theory. In practice, any conflict would take place in a scenario, as Van Diepen puts it, "under conditions of allied air and naval superiority" giving the North Korean submarine difficulty escaping prosecution.¹⁷⁶

¹⁷³ H I Sutton, "North_Korean_Submarines," Covert Shores, March 18, 2017, http://www.hisutton.com/North_Korean_Submarines.html.

¹⁷⁴ Bogle, "AccessDPRK."

¹⁷⁵ Norman Friedman, "Submarine - Nuclear Propulsion," *Encyclopedia Britannica*, June 10, 2019, <https://www.britannica.com/technology/submarine-naval-vessel>.

¹⁷⁶ Vann Van Diepen, "Cutting Through the Hype About the North Korean Ballistic Missile Submarine Threat," 38 North, September 6, 2019, <https://www.38north.org/2019/09/vvandiepen090619/>.

Locating a single submarine can be a difficult task, even under conditions of air and naval superiority. If North Korea were to flush its submarines out to sea at the same time, and if the U.S., ROK, and allied ASW and surveillance assets were not able to track the SSBs from port, the task of identifying and locating the ballistic missile submarine in a sea of other submarines would be more difficult. North Korea showed the ability to flush its submarine force in 2015, when about 70 percent of the force deployed following a land mine incident that killed two South Korean soldiers on August 4, 2015. North Korean military units reportedly went into a “semi-state of war” but later recalled the subs following truce agreements made between both sides.¹⁷⁷

The issue is further compounded by the environmental impacts on ASW operations within the Sea of Japan; underwater features, water depth, and salinity make for a noisy environment that doesn’t propagate sound very well. Surface traffic at-sea will also help to hide any of the sound produced by the noisy North Korean SSBs. This complicates any effort to locate, track, and identify any submarine, let alone a force of submarines with a few ballistic missile submarines hidden in the mix.¹⁷⁸

However, these circumstances may not be sufficient for North Korea to have much confidence in the ability of its SSB force to remain hidden. Van Diepen claims the North is not likely to succeed. The GORAE as well as the Modified ROMEO are derived from 1950s-era technology. These diesel-electric submarines are “very noisy boats that are thus highly susceptible to acoustic detection.”¹⁷⁹ These boats must also surface regularly. The U.S. has had over fifty years of experience hunting these types of submarines and has become very skilled at locating them. To make matters worse for the North Koreans, its submarines are limited in their ability to even know they are being tracked in the first

¹⁷⁷ “North Korea’s 50 Missing Submarines Have Apparently Reappeared Following Truce,” VICE News, August 25, 2015, <https://www.vice.com/en/article/j59md7/north-koreas-50-missing-submarines-have-apparently-reappeared-following-truce>.

¹⁷⁸ Yoon, “Expanding the ROKN’s Capabilities to Deal with the SLBM Threat from North Korea,” 18.

¹⁷⁹ Van Diepen, “Cutting Through the Hype About the North Korean Ballistic Missile Submarine Threat,” September 6, 2019.

place.¹⁸⁰ Potentially, North Korean submarines could be tracked continuously from port departure without their knowledge. The extensive ASW experience the U.S. and allied nations would bring to any potential conflict combined with the limited capabilities by North Korean submarines should they evade destruction in the initial phase of conflict means they are extremely vulnerable to prosecution.

Given these realities, it is debatable whether North Korean ballistic missile submarines would be easier to hide than its land-based missile launchers, such as the TEL which North Korea is known to use for its mobile missile forces. Submarines should be better at concealing themselves than non-mobile missile silos or easily tracked airborne bombers, but how much better North Korea's force would be is an open question. Ballistic missile submarines offer the operating nation the potential for a survivable nuclear force, as one of the legs of the nuclear triad, but the success depends on many factors, most importantly the ability to keep them from being discovered. A sober North Korean leadership would have difficulty placing much confidence in that capability.

F. UNSUPPORTED DEPLOYMENTS

North Korea maintains a small coastal navy that is ill-equipped to support long-distance submarine operations; any submarine that travels outside the Sea of Japan must do so without the support of surface vessels.¹⁸¹ Though the intent when operating a submarine is to maintain a level of secrecy and stealth, it is routine for submarines on out-of-area deployments to be accompanied by support vessels, even if at a distance. The inability for the North to support an out-of-area deployment, even if it wanted to do so, would make an already difficult deployment outright hazardous for the submarine.

In the off chance the North chooses to attempt to threaten the United States with an SLBM strike, a ten-day cruise averaging of 10 knots would put the submarine in extreme range of Hawaii. A shorter-duration voyage would allow it to strike Guam whereas any

¹⁸⁰ Van Diepen.

¹⁸¹ Bruce Klingner, "North Korea's Nuclear Doctrine: Trusted Shield and Treasured Sword," The Heritage Foundation, accessed October 19, 2021, <https://www.heritage.org/asia/report/north-koreas-nuclear-doctrine-trusted-shield-and-treasured-sword>; Secretary of Defense, "Military and Security Developments Involving the Democratic People's Republic of Korea."

attempt to strike the continental U.S. would have to be a one-way trip. Significant portions of either of these voyages would be at snorkel-depth or surfaced, due to the lack of AIP, making the submarine very vulnerable to detection either by air, surface, or subsurface ASW platforms. These realities thus make the threat less probable. By Kim Jong Un's own statements, the modified ROMEO and the GORAE will operate off the east coast of North Korea without intentions of deploying elsewhere.¹⁸² The unlikelihood of being able to deliver a submarine within strike-range of U.S. further limits the threat potential of these submarines.

G. NORTH KOREAN NUCLEAR DOCTRINE

In 2013, North Korea's Worker's Party of Korea Central Committee held a plenary meeting, further elaborated by the 7 session of the Supreme People's Assembly, writing the laws governing North Korea's nuclear forces and how they will be implemented. The Articles stated that the aim was to deter and repel aggression through deadly nuclear force including retaliatory action, that North Korea would take steps to increase its ability to retaliate through quantity and quality improvements, that authority to launch nuclear weapons rested solely with Kim Jong Un, and that North Korean would limit nuclear use to only nuclear powers.¹⁸³

By Kim Jong Un's own statements, the modified ROMEO and the GORAE will operate off the east coast of North Korea. Based on the continued use of the word "strategic" in North Korean policy and statements related to nuclear programs, the continued use of the word "strategic" when talking about these submarines in official statements suggests the intent to place nuclear weapons onboard. Given the "Law on Consolidating Position as a Nuclear Weapons State" granting Kim Jong Un unilateral authority to launch nuclear weapons, a right granted to no other person, deployment of such weapons would need to remain within communications range of North Korea, for him to

¹⁸² Sutton, "Korea's Polaris: Gorae Class Ballistic Missile Submarine."

¹⁸³ Klingner, "North Korea's Nuclear Doctrine."

maintain adequate command and control.¹⁸⁴ This requirement is another reason the ballistic missile submarines would be easier to locate.

H. HOW THE CURRENT AND FUTURE PROGRAM COULD BE USED

The unfortunate aspect of any submarine operated by North Korea is the fact that by simply getting underway, South Korea is forced to react by allocating additional naval and reconnaissance resources to track it. In essence, this response leads to an increased state of alert within the South Korean Navy. This posture is the direct result of a lack of tracking the submarine that was involved in the sinking of the ROKS CHEONAN.¹⁸⁵ Outside of wanting to safeguard South Korean shipping, the government in Seoul does not want to relive the embarrassment of that event. Regardless of the assessed operational state of the GORAE alone, let alone any future ballistic missile capable submarines, North Korea will be in a position to use these ballistic missile submarines to its advantage by being able to trigger this ROK response.

North Korea has not used the GORAE for this purpose to date; however, the response by ROK forces presents an opportunity for the North. Instead of utilizing a ballistic missile submarine to threaten an attack against one of its neighbors or the United States, North Korea could use the submarine as a tool to earn concessions from South Korea and the U.S. simply by getting the vessel underway. It could use the fear caused by that submarine getting underway as a messaging tool or a bargaining chip.¹⁸⁶ In exchange for good behavior, such as returning the submarine to port, Pyongyang could win concessions through either political or monetary gains. Instead of conducting a missile test to communicate its external discomfort or frustration, it can simply send a ballistic missile submarine to sea. This also presents as a safer option in terms of potential loss of domestic support; every missile launch could result in failure at some point which damages the

¹⁸⁴ Klingner; Secretary of Defense, “Military and Security Developments Involving the Democratic People’s Republic of Korea.”

¹⁸⁵ Bowers, *The Modernisation of the Republic of Korea Navy*, 30–45.

¹⁸⁶ Defense Intelligence Agency, “North Korea Military Power,” 19.

North's credibility. Flushing a submarine to sea comes with fewer risks of catastrophic failure.

North Korea has a history of acting out aggressively both through physical violence, such as the sinking of the ROKS CHEONAN, as well as rhetorical statements made against the ROK and U.S., all aimed at manufacturing an artificial sense of insecurity within its perceived enemies.¹⁸⁷ By doing so, the North Koreans create the scenario where their neighbors must negotiate for North Korea's return to a state of normalcy, in this case being the return of the submarine to port. Though this pattern of behavior has existed for some time, this willingness to accept risk by acting out occurs because of the North Korean leadership's feeling the risk is worth the reward; their capability to deter counterstrikes makes the cost of action by the ROK and U.S. too great. The introduction of a ballistic missile submarine force will likely provide Kim Jong Un and the domestic population with an inflated sense of deterrence capability. In turn, this risks a greater willingness to conduct hostile actions against their enemies to convey anger and earn concessions.¹⁸⁸

There are obvious ways of determining whether North Korea is serious in its threats of a submarine ballistic missile launch. However, 100% certainty will likely never be reached in practice. Thus, even a visible North Korean SSB capability would require a president to decide whether the nation is at risk.

I. CONCLUSION

Building off the information presented in the prior chapter, this chapter has found that, in terms of resource allocation and the general level of infrastructure upgrades seemingly focused on the production of ballistic missile submarines, Kim Jong Un appears to have the intention of developing a full-fledged ballistic missile submarine force. However, due to construction timelines and other factors that cause delays, as well as inherent vulnerabilities in the submarines themselves that North Korea does not have the

¹⁸⁷ Brad Lendon, "S. Korea's Final Report Affirms Cheonan Was Sunk By N. Korean Torpedo," accessed June 6, 2021, <http://www.cnn.com/2010/WORLD/asiapcf/09/13/south.korea.cheonan.report/index.html>.

¹⁸⁸ Brookes, "The U.S. Must Respond to North Korea's Emerging Submarine- Launched Ballistic Missile Program."

technology to overcome, the current trajectory of the program will be unlikely to provide a survivable second-strike nuclear deterrent. Even if the U.S., ROK, and Japanese militaries were to halt any technology upgrades to their forces, the current level of military capabilities would far exceed any the North could muster even with an operational ballistic missile submarine force.

Despite this, the pursuit of this program will still provide Kim Jong Un with certain benefits that surpass what he had prior to the development of the new program. Perhaps the greatest danger is that SSBs would present him with the ability to use the mere existence of the submarines to his advantage by wielding threats for political gain. Such threat-making is inherently risky, presenting the prospect that the SLBMs could be utilized even in circumstances that would end disastrously for North Korea.

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IV. ROK RESPONSES

A. INTRODUCTION

As the ROK has developed to become a world power, with ample ability to control the direction the navy should go, naval planners have pushed for the development of a blue-water navy and the capability to defend against North Korean subsurface threats. During the current environment of uncertainty regarding North Korean intentions, the rise of power by China and the uncertain role it may play in the regional security sphere, as well as a gradual shift in alliance support and OPCON transfer, the ROK has developed an advanced, integrated force geared at serving both in a blue-water capacity as well as a Korean AOR defense with the expressed purpose of defending against North Korea's significant subsurface threat.

North Korean aggression and provocations, and developments in the undersea domain have pushed military planners to develop strategies to defend the homeland and counteract the threats discussed in the preceding chapter. Each section of this chapter focuses on key aspects of South Korea's development of a force capable of defending against North Korean ballistic missile submarines in addition to the North's conventional submarine force.

B. HISTORICAL OUTLOOK

With the signing of the Armistice and the creation of the United Nations Command, Combined Forces Command, and United States Forces Korea, South Korea's security, including maritime security, has been inextricably tied to the U.S. and allied nation support. To date, ROK forces have served as the 24/7 screen for the detection and initial defense against any North Korean aggression, with the expectation of U.S. and allied support of forces should conflict erupt.¹⁸⁹ In the event of a conflict, the U.S. is currently poised to take Operational Control of all units within the alliance, including ROK forces, as it leads the fight against the North.

¹⁸⁹ Bowers, *The Modernisation of the Republic of Korea Navy*, 44.

Although North Korea devoted significant resources to building up its massive subsurface fleet over the last fifty years, the ROKN did not, because it prioritized combating the threat from the North's surface navy and land forces and attempted to maintain minimal forces in the hopes the North would see this as neutralizing, hoping for a reciprocal draw-down.¹⁹⁰

Following the ROKS CHEONAN's sinking, the South Korean government adopted a new military strategy, shifting focus away from land-based threats that had previously dominated the military prioritization scheme, and towards countering the subsurface threat posed by the North.¹⁹¹ The CHEONAN was a ROK corvette that was sunk by a North Korean submarine in 2010; the lack of tracking the North Korean submarine allowed the sub to cross south into ROK territory and sink the vessel.¹⁹² Though the sinking was an embarrassment, it triggered substantial military reforms leading to the development of a new subsurface doctrine to detect and counter the threat posed by North Korean submarines and a reassessment of defense capabilities in the form of a Defense Reform Plan.¹⁹³ Taking the subsurface threat seriously, South Korea focused on developing its technological superiority to defend against North Korea's numerical superiority tied with the new challenge posed by the introduction of ballistic missile submarines. South Korea needed the capability to defend against the subsurface threat posed by the North, as well as combat any perception the North may possess about how powerful North Korean subsurface capabilities really are.

Without the ability to defend hull for hull, and realistically without the need, Bowers presents the approach the ROK has adopted: rather than focusing on the ability to defeat the entire North Korean submarine force; they have focused on developing the "capacity to inflict substantial damage" to make any military action too expensive, thereby

¹⁹⁰ Suh, "Effects of the Subsurface Domain on the Security of the Korean Peninsula," 36.

¹⁹¹ Bowers, *The Modernisation of the Republic of Korea Navy*, 30–45.

¹⁹² Lendon, "S. Korea's Final Report Affirms Cheonan Was Sunk By N. Korean Torpedo."

¹⁹³ Bennett, *A Brief Analysis of the Republic of Korea's Defense Reform Plan*, 5; Bowers, *The Modernisation of the Republic of Korea Navy*, 36.

establishing deterrence.¹⁹⁴ This substantial damage aspect came in coordination with the increase in ASW capabilities in its surface and airborne fleets, along with an overall increase in ASW development over the last ten years. In developing this strategy, the ROKN began to realize the ability to develop a force capable of fulfilling the desire to be a blue-water-capable force and the first line of defense against the North. Technological advancement was making single units more lethal and effective than previous, affording the ROKN the ability to dedicate fewer assets to the peninsula's defense without limiting effectiveness.

Initial defense reforms began in 2004, prior to the sinking of the Cheonan with the aspirations of ensuring future forces could meet the military intent of the ROK by the year 2020, to include the development of blue-water capabilities. The ROK policymakers wanted to increase the ROK global presence as it became a more significant global actor. With the sinking, the reforms took on a new urgency and required a change of direction; the ROK needed to partially shift its goals away from becoming a blue-water navy and instead increase local area defense capabilities.¹⁹⁵ What resulted was a mixture of each objective; by creating a more capable, integrated force, the ROKN aimed to be able to defend ROK interests at home and over the horizon.

The main priorities built into the force improvements were to significantly decrease the size of the Army and the Marine Corps while maintaining the size of the Naval force. This was a huge departure from previous defense plans; although the Navy wouldn't be changing in size, by decreasing the size of the other branches, it effectively increased the relative size of the Navy with respect to overall defense efforts. This highlights the expectations the ROK government held on the importance of the maritime domain in military conflicts of the future, according to the ROK perspective.¹⁹⁶ Then, in 2017, President Moon Jae-in issued what he called "Defense Reform Plan 2.0" (DRP 2.0) to refine further actions taken in the initial set of reforms. This new set of reforms maintained

¹⁹⁴ Bowers, *The Modernisation of the Republic of Korea Navy*, 58.

¹⁹⁵ Bowers, 60.

¹⁹⁶ Bennett, *A Brief Analysis of the Republic of Korea's Defense Reform Plan*.

similar themes as the previous in terms of increased priority on the maritime domain. He further shrunk the ground forces, increased military spending to grow capabilities, decreased conscription times, and condensed ROK Army command structures. By pursuing increased military spending towards advancing technology and capabilities, the ROK pushed to expand its airborne, surface, and subsurface capabilities to create a world class networked fighting force. Contained within the prioritized capability upgrades included an emphasis on ASW options.¹⁹⁷

Following the initial defense reviews, and further pushed by the DRP 2.0, the ROK began a massive ship-building effort to create a networked, multi-role force capable of defending against the North, conducting ASW operations, as well as maintaining a blue-water capability. To summarize the upgrades, the ROK government's goal was to field a total of three fleets, one for each coast, each including new destroyers, frigates, amphibious assault carriers, maritime patrol aircraft, and submarines. All these platforms would have the ability to conduct ASW in an integrated fashion that would maximize South Korea's ability to deter North Korea, defend from Northern aggression, and pivot towards blue-water operations.¹⁹⁸

In 2015, the ROKN established the Submarine Force Command.¹⁹⁹ Previously, the submarines reported to the one-star Admiral of Submarine Flotilla Nine in Chinhae on the southeastern coast. Creating the command consolidates the man, train, and equip aspects of submarine operations under one unit whereas they were previously shared by multiple commands in a haphazard manner. With the top officer shifting from a one-star admiral to a two-star, the command takes on more responsibility and elevates the status of the submarine forces within the overall Naval construct. The creation of this new command indicates the increased significance the force holds in South Korea's future objectives. The

¹⁹⁷ Bruce Klingner, "Enhance South Korean Military Capabilities Before OPCON Transfer," no. 3452 (Heritage Foundation, December 2, 2019): 22.

¹⁹⁸ Bowers, *The Modernisation of the Republic of Korea Navy*, 189.

¹⁹⁹ Kyong Chang Yoo and Eric Slavin, "South Korea Establishes Submarine Command," Military.com, October 31, 2017, <https://www.military.com/daily-news/2015/02/03/south-korea-establishes-submarine-command.html>.

responsibility for submarine operations shifted from the ROK fleet to the CSF, providing additional resources and weight in national planning.²⁰⁰

C. ASW CAPABILITIES

If the South Koreans failed to track the deployment of North Korean submarines from port, they would need to deploy ISR and ASW assets to locate and track the missing subs. Identifying the difficulty with locating submarines once they have left port, South Korea embarked on an ambitious plan to supplement its submarine prosecution capabilities by acquiring and developing additional ASW-capable units. Building and launching new South Korean submarines is costly and takes a significant amount of time. Because the ROK has developed a surface force capable of patrolling the waters off the coast and into the Sea of Japan, adding an increased ASW-focus to this force minimizes the need for the ROK to launch new submarines. Equipping its patrol forces with these capabilities also greatly speeds up the pace in which the ROKN can employ an effective ASW force capable of matching the North's numerical advantage. In 2013, the ROKN ordered the delivery of eight shipborne AW159 Wildcat ASW helicopters as step one of a two-step plan to acquire additional ASW-capable shipborne helicopters.²⁰¹ At the time of ordering, the ROK already had a fleet of ASW aircraft to include the P-3C Orion fixed-wing aircraft, Lynx ASW helicopters, and Super Lynx ASW helicopters, totaling 39 ASW aircraft. Further aircraft orders included the purchase of 30 KUH-1 Surion helicopters also equipped to conduct ASW missions.²⁰² Step two of the acquisition plan by the ROK Defense Acquisition Program Administration (DAPA) shifted from the AW159 to the MH-60R Seahawk ASW helicopter. A total of twelve of the Seahawks were ordered with these units expected to enter service by 2025.²⁰³

²⁰⁰ Suh, "Effects of the Subsurface Domain on the Security of the Korean Peninsula."

²⁰¹ "Seahawk Selected in Follow-On ASW Helo Buy For South Korea," Janes, December 16, 2020, https://customer-janes-com.libproxy.nps.edu/Janes/Display/FG_3847160-JNI.

²⁰² Dylan Malyasov, "South Korean NAVY Receives First Batch of AW159 Wildcat Maritime Helicopters," Defense Blog, June 19, 2016, <https://defence-blog.com/news/south-korean-navy-receives-first-batch-of-aw159-wildcat-maritime-helicopters.html>.

²⁰³ Janes, "Seahawk Selected in Follow-On ASW Helo Buy For South Korea."

With the inevitable aging of South Korea's P-3C Orion fleet, the choice was made in 2018 to expand the fixed-wing maritime patrol capabilities by purchasing P-8 Poseidons in a deal totaling \$1.7 billion dollars.²⁰⁴ In all, six airframes were purchased with a slated career life of 30 years, supplementing the 25 years of ASW experience provided by the existing P-3C Orions.²⁰⁵ It is unknown if South Korea intends on purchasing additional P-8s as part of its continued defense reforms. Part of this deal also included the purchase of 64 Patriot PAC-3 missiles to supplement the missile defense systems.²⁰⁶

South Korea DAPA also pursued the development and production of an indigenously produced ASW weapon system known as the Korean Anti-Submarine Rocket (ASROC) also known as the Hong Sangeo (Red Shark). This system adds a rocket stage to the ASW air-dropped torpedo Cheong Sangeo (Blue Shark).²⁰⁷ Development of these systems actually began in the early 1990s, but the continuation and expansion to include production didn't start until 2009.²⁰⁸ These torpedoes provide the ROKN with a very effective anti-submarine weapon capable of being launched from air platforms and vertical-launch systems onboard South Korea's growing surface fleet, expanding the ASW strike capability beyond submarines. The passive and active targeting capabilities of these weapon allow them to target subsurface threats in all environments, including areas with shallow water and difficult acoustic features.²⁰⁹ Given the difficult acoustic environment of the Sea of Japan, and the shallow waters of the Yellow Sea, these weapons provide the

²⁰⁴ Ankit Panda, "South Korea Opts for P-8 Poseidon Maritime Surveillance Aircraft in \$1.7 Billion Deal," accessed October 29, 2021, <https://thediplomat.com/2018/06/south-korea-opts-for-p-8-poseidon-maritime-surveillance-aircraft-in-1-7-billion-deal/>.

²⁰⁵ "US Approves \$2.6 Billion Sale to South Korea of P-8A Patrol Planes and Patriot Missiles," *The Defense Post* (blog), September 14, 2018, <https://www.thedefensepost.com/2018/09/14/us-south-korea-p-8a-patrol-aircraft-patriot-missile-sale/>.

²⁰⁶ "US Approves \$2.6 Billion Sale to South Korea of P-8A Patrol Planes and Patriot Missiles."

²⁰⁷ "Weapons: Naval - Hong Sang Eo (Red Shark)," Janes, January 28, 2020, <https://customer-janes-com.libproxy.nps.edu/Janes/DisplayFile/JUWSA308>.

²⁰⁸ "Cheong Sangeo (K745, Blue Shark)," Janes, July 15, 2021, <https://customer-janes-com.libproxy.nps.edu/Janes/DisplayFile/JALWA013>.

²⁰⁹ Janes.

ROKN with a good ASW weapon capability suitable for each of North Korea's submarine fleets, as well as other areas the ROKN patrols.²¹⁰

The ROKN surface fleet has undergone significant upgrades to match the threat. Pre-existing surface vessels such as the KDX-I-class destroyers have been undergoing significant upgrades to bring up the combat lethality of the vessels, including enhancing ASW capabilities with new towed array sonar systems and Link 16 networking capabilities.²¹¹ Other vessels not routinely known as ASW-capable units are being built; for example, the ROK has built minelayer vessels equipped with VLS and ASW systems, as part of its Future Frigate Experimental design. This new class of vessel also includes the ability to field ASW helicopters and launch ASW weaponry. Two such ships were ordered with one delivered at the time of this writing.²¹² Along with this FFX-variant, the ROKN has also equipped itself with a formidable number of ASW-capable frigates on order; over 30 hulls, though delivery won't be complete on all until well into the 2030s.²¹³

Existing KDX-II-Class destroyers, of which South Korea has six, began an upgrade program in early 2021 to increase their ASW and combat management system capabilities with a completion date by 2031. The newest class of destroyer, the KDX-III-Class, which has an overall design that matches the U.S. Arleigh Burke Class destroyer, comes equipped with advanced ASW capabilities to include hull-mounted sonar systems and towed sonar arrays.²¹⁴ Additional systems include VLS, integrated combat management systems, AEGIS, and other advanced capabilities.²¹⁵ Perhaps one of the most interesting

²¹⁰ Janes, "Weapons: Naval - Hong Sang Eo (Red Shark)."

²¹¹ "South Korean Navy Receives Second Upgraded KDX-I-Class Destroyer," Janes, October 22, 2021, https://customer-janes-com.libproxy.nps.edu/Janes/Display/BSP_7899-JDW.

²¹² Navy Recognition, "MADEX 2017: Hyundai Heavy Industries HDM-4000 MLS II-Class Minelayer of the ROK Navy," Navy Recognition, October 25, 2017, <https://www.navyrecognition.com/index.php/naval-news/naval-exhibitions/2017-archives/madex-2017/5656-madex-2017-hyundai-heavy-industries-hdm-4000-mls-ii-class-minelayer-of-the-rok-navy.html>.

²¹³ "Korea, South - Navy," Janes, September 22, 2021, <https://customer-janes-com.libproxy.nps.edu/Janes/Display/JWNA0083-JWNA>.

²¹⁴ "Sejong the Great Class / KDX-III Class Destroyer - Naval Technology," Naval Technology, accessed October 29, 2021, <https://www.naval-technology.com/projects/sejongthegreatclass/>.

²¹⁵ "HHI Lays Keel for RoKN's First KDX-III Batch II Guided-Missile Destroyer," Janes, October 6, 2021, https://customer-janes-com.libproxy.nps.edu/Janes/Display/BSP_6930-JDW.

capabilities this newest destroyer features is the capability to field the SM3 missile, which combined with the AEGIS platform allows the vessel to serve as part of an integrated missile defense system. Given the fact that South Korean missile defense systems point north, leaving its coastlines vulnerable to an at-sea launch from a North Korean SLBM, this added future capability will help to defend against such a threat vector.²¹⁶ Although the ROKN vessels are not currently equipped with the SM3, building in the capability to do so in the future provides the ROK with the ability to easily employ the missiles, or another BMD missile should they choose to do so.

Like its surface forces, efforts to modernize South Korea's nine older KSS-I-Class submarines has been underway as part of a three-phase submarine development program. Parallel to the upgrades, phase two encompassed the commissioning of nine advanced KSS-II-Class diesel-electric submarines. These submarines, in addition to all future submarines are outfitted with Air Independent Propulsion (AIP) allowing for longer-duration underway times without surfacing, greatly increasing stealth capabilities and operational range.²¹⁷ In addition, phase two includes the purchase of at least nine of the newest KSS-III-Class submarines with the intention of ultimately replacing the aging KSS-I-Class hulls. Phase three will encompass the creation of a new midget submarine fleet to replace the current KSS-I midget variants in service.²¹⁸

D. INTEROPERABILITY

In a contested environment, the ROK will not be alone in its prosecution of North Korea subsurface threats. As part of a series of messaging campaign towards North Korea, as well as training opportunities, the U.S. and South Korea began conducting a series of joint Navy ASW exercises, starting in 2010 following the sinking of the ROKS CHEONAN.²¹⁹ The first of such exercises was INVINCIBLE SPIRIT which involved

²¹⁶ Naval Technology, "Sejong the Great Class / KDX-III Class Destroyer - Naval Technology."

²¹⁷ "South Korea Submarine Capabilities," *Nuclear Threat Initiative* (blog), September 27, 2015, <https://live-nuclear-threat-initiative.pantheonsite.io/analysis/articles/south-korea-submarine-capabilities/>.

²¹⁸ Janes, "Korea, South - Navy."

²¹⁹ "US and South Korea Focus on ASW," Janes, August 2, 2010, <https://customer-janes-com.libproxy.nps.edu/Janes/Display/idr13293-idr-2010>.

over 8,000 joint personnel onboard approximately 200 aircraft and 20 vessels, to include a U.S. aircraft carrier. The focus of the exercise was on the sinking of a mock North Korean submarine, as well as eliminating surface and airborne threats. The exercise was conducted in a highly publicized manner, with the expressed purpose of warning the North Koreans. Joint ASW exercises have continued biennially since between the ROK and the U.S. with increasing levels of complexity, offering both sides the opportunity to prosecute each other's submarines with subsurface, surface, and airborne ASW units.²²⁰

Beyond simply providing each Navy with the training for individual units, the exercises provide the ability for the two Navies to work together and increase interoperability.²²¹ Over time, these exercises have expanded to include additional partner nations; in 2019, the ROKN took part in a U.S.-led ASW exercise called SEA DRAGON involving ASW units from the U.S., ROK, Royal Australian Air Force, the Japanese Maritime Self Defense Force, and the Royal New Zealand Navy.²²² By expanding the ability to coordinate with other Navies, the ROKN obtains a method to overcome some of the gaps in its capabilities as well as strategically message to Kim Jong Un the countervailing capabilities North Korea would face should a conflict develop, especially involving submarines.²²³

The underdeveloped security relationship between South Korea and Japan is a remaining gap. Both the ROKN and the JMSDF possess very capable navies with effective ASW capabilities; each has defense relationships with the U.S. and trains in the defense of the Sea of Japan. The fact that they have done little to coordinate training and execution of ASW missions together, as well as in any other domain involved in the defense of the Sea of Japan, results in an overall less effective response capability should conflict develop in

²²⁰ Janes.

²²¹ Franz-Stefan Gady, "US and South Korea Conduct Anti-Submarine Warfare Drill," June 12, 2015, *The Diplomat*, accessed October 29, 2021, <https://thediplomat.com/2015/06/us-and-south-korea-conduct-anti-submarine-warfare-drill/>.

²²² "South Korea Sharpens ASW Interoperability With Allies Amid SLBM Threats," Janes, January 23, 2020, https://customer-janes-com.libproxy.nps.edu/Janes/Display/FG_2652689-JNI.

²²³ Erik French and Jane Chung, "ROK-Japan-U.S. Anti-Submarine Warfare Cooperation: An Urgent Priority," *Real Clear Defense*, March 10, 2017, https://www.realcleardefense.com/articles/2017/03/10/rok-japan-us_anti-submarine_warfare_cooperation_110945.html.

the area.²²⁴ Political issues between the Japan and South Korea are among one of the many reasons cited for a lack of good ties between the two.²²⁵ South Korea did not participate in the 2021 rendition of the multilateral ASW exercise SEA DRAGON involving the U.S., JMSDF, Royal Australian Air Force, the Royal Canadian Air Force, and the Indian Navy.²²⁶ Without continuous trilateral cooperation as well as the continued political and social divides between Japan and South Korea, the security scene is complicated, which may result in awkward and uncoordinated attempts at defending the area in conflict.²²⁷

Hope remains, however. As part of efforts to develop this missing trilateral partnership and improve overall joint response effectiveness, EXERCISE PACIFIC TRIDENT serves as an example of how the three nations are attempting to improve collaboration to counter the threats together. Though this event was simply a tabletop exercise, it identified key areas of concern of which the three nations must overcome to effectively counter North Korean aggression as a joint effort. Of the identified issues, the establishment of a trilateral leadership coordination mechanism, the alignment of accepted ROE, alliance solidarity, and the need for continued joint exercises are the most pressing needs before the ROK and Japan can effectively work in cooperation together to defend the Sea of Japan against North Korean hostilities.²²⁸

Fine-tuning the interoperability between Korean forces and its partner nations is especially important as it relates to Korean OPCON. The Mutual Defense Treaty signed between the U.S. and the ROK has been held since 1953. The ROK armed forces were placed under the Operational Control (OPCON) of the U.S. since the war; peacetime OPCON was transferred back to the Korean armed forces in December 1994 while wartime

²²⁴ French and Chung.

²²⁵ Cheol Hee Park, Daniel Sneider, and Hannah Fodale, “RESOLVED: The United States Can Fix the Japan-South Korea Problem,” July 9, 2021, <https://www.csis.org/analysis/resolved-united-states-can-fix-japan-south-korea-problem>.

²²⁶ “Multilateral Anti-Submarine Warfare Exercise (Sea Dragon 2021),” Japanese Ministry of Defense, March 2021, <https://www.mod.go.jp/en/>.

²²⁷ French and Chung, “ROK-Japan-U.S. Anti-Submarine Warfare Cooperation.”

²²⁸ Michael McDevitt and Yoichi Kato, “Testing Trilateral, U.S.-Japan, and U.S.-ROK Responses to North Korean Provocations: Tabletop Exercise Pacific Trident,” February 14, 2018, 36.

control remains with the U.S. The Commander of Combined Forces Command assumes the role as commander of all forces, U.S. or Korean, in war.²²⁹ In 2006, both sides agreed to disestablish the Combined Forces Command and grant wartime control back to the ROK after October 15, 2009, but no later than March 15, 2012. Political and budgetary constraints led to a delay to 2015, followed by another delay with North Korea's nuclear tests. Finally, President Park and President Obama decided to delay the transfer indefinitely while adopting a new plan termed "Conditions-Based OPCON Transition Plan." Under this new plan, OPCON will only transfer once the ROK and alliance members develop specific capabilities that enable a peaceful transfer of power.²³⁰ As the ROK improves its overall force capability, it moves closer to the transfer of OPCON from the U.S. With that shift comes the increased need to synchronize their actions in time of conflict with the other nations who will be charged in the defense against North Korea.²³¹ In the current state of trilateral defense ties between the U.S., the ROK, and Japan, as well as limited ties with other partner nations, South Korea is not yet poised well to fully maximize these international relationships.

E. COUNTERING NORTH KOREAN PERCEPTIONS OF DETERRENCE

There is a continuing debate between the ROK government and the United States towards South Korea's goal of developing a nuclear-powered submarine to counter the recent nuclear threat posed by the North and specifically, as stated by President Moon, to counter the threat posed by North Korea's SLBMs.²³² Due to their ability to remain on station for significantly longer periods of time than standard diesel-electric submarines, nuclear submarines provide an advantage when trying to counter other submarines.²³³ Despite ROK President Moon stating he wanted to achieve this feat before leaving office,

²²⁹ Hwang, "Wartime OPCON Transition and the ROK-U.S. Alliance."

²³⁰ Nordin, "Taking Back Control."

²³¹ Klingner, "Enhance South Korean Military Capabilities Before OPCON Transfer," 11.

²³² Steven S Choi, "ROKN's Nuclear-Powered Submarine Acquisition" (master's thesis, Naval Postgraduate School, 2020), 1, <https://calhoun.nps.edu/handle/10945/64843>.

²³³ Choi, 45.

it appears unlikely given the lack of U.S. consent to the program, and little headway is being made in the pursuit of nuclear submarines at the time of this writing.²³⁴

An interesting development took place in September 2021, when the ROKN test-fired its indigenously produced SLBM from one of its KSS-III-Class submarines; South Korea currently has three subs with SLBM capabilities. The fielding of this missile, according to ROK President Moon Jae-in, provides a “reinforcement of [ROK] missile capabilities,” and serves as a “clear deterrent to North Korea’s provocations.”²³⁵ Strike capabilities from South Korean submarines isn’t a new concept, as previously they possessed the ability to launch cruise missiles; the introduction of an SLBM capability provides the ROK with additional options for its deterrence architecture.²³⁶

Historically, the development of SLBMs has resulted from a desire to develop second-strike capabilities as part of a nuclear triad.²³⁷ As a party to the Nuclear Nonproliferation Treaty (NPT), South Korea does not possess nuclear missiles or weapons, and its nuclear activities are further constrained by defense agreements made with the U.S., which restrict the ROK from developing a nuclear-powered submarine.²³⁸ As part of these agreements, South Korea is instead protected by a U.S. extended nuclear deterrence commitment – the nuclear umbrella – that is the backbone of the alliance relationship. But with continued testing of multiple missile systems by North Korea, skepticism of the reliability of U.S. nuclear deterrence has risen, and domestic support for the reintroduction of U.S. tactical nuclear weapons, or conversely the development of a South Korean nuclear weapons program, reached an all-time high of 61% in 2020.²³⁹

²³⁴ Kim, “South Korea’s Nuclear Hedging?,” January 2, 2018.

²³⁵ Kelsey Davenport, “South Korea Tests Submarine-Launched Missile,” Arms Control Association, accessed October 30, 2021, <https://www.armscontrol.org/act/2021-10/news/south-korea-tests-submarine-launched-missile>.

²³⁶ Timothy Wright and Joseph Dempsey, “South Korea’s Possible Problematic SLBM,” International Institute for Strategic Studies, July 30, 2021, <https://www.iiss.org/blogs/military-balance/2021/07/south-korea-slbm>.

²³⁷ Davenport, “South Korea Tests Submarine-Launched Missile.”

²³⁸ Lami Kim, “South Korea’s Nuclear Hedging?,” *The Washington Quarterly* 41, no. 1 (January 2, 2018): 115–33, <https://doi.org/10.1080/0163660X.2018.1445910>.

²³⁹ Davenport, “South Korea Tests Submarine-Launched Missile.”

While the introduction of a ROK SLBM to the security scene doesn't play a part in ASW activities or capabilities, it does fall in line with the significant military upgrades taking place within the ROK government. In response to the WMD developments in North Korea and with the goal of preventing or responding to an attack by the North, a set of three defense strategies have been developed to work together to counter the North Korean threat.

The first of these strategies is known as the Kill Chain preemptive strike system, which was created to identify key WMD locations as well as leadership locations, and strike them either after a North Korean attack or preemptively should there be indications of a pending attack.²⁴⁰ In carrying out this plan, South Korean air, naval, and ground strike platforms plan and train to strike these key locations without ever crossing into North Korean territory. The SLBM adds to this capability.²⁴¹ In the event of conflict, possessing the capability to strike targets such as Sinpo will provide the ROK with the ability to neutralize the North Korean SLBM threat before the submarines are deployed.

The second strategy ties in all of the Korean missile defense systems, known as the Korean Air and Missile Defense.²⁴² South Korea aims to expand its missile defense radars to a total of four, and integrate them in with Korean ballistic missile defense platforms, linking ships, air units, and ground-launch systems.²⁴³ With this effort, the ROK aims to supplement existing U.S. ballistic missile defense (BMD) infrastructure.²⁴⁴ Where Korea loses out with this goal, however, is the fact that the Koreans chose to not allow its missile defense system to be integrated with the U.S. network due to complaints from China.²⁴⁵

²⁴⁰ Bruce W. Bennett et al., *Countering the Risks of North Korean Nuclear Weapons*, Perspectives / Rand Corporation, PE-A1015-1 (Santa Monica, Calif: RAND Corporation, 2021), 57.

²⁴¹ Jun Ji-hye, "3 Military Systems to Counter N. Korea: Kill Chain, KAMD, KMPR," *The Korea Times*, November 11, 2016, https://www.koreatimes.co.kr/www/nation/2021/10/205_217259.html.

²⁴² Bennett et al., *Countering the Risks of North Korean Nuclear Weapons*, 57.

²⁴³ Jeff Jeong, "South Korea Moves to Kick Its Missile Defense Shield Up a Notch," *Defense News*, August 14, 2019, <https://www.defensenews.com/global/asia-pacific/2019/08/14/south-korea-moves-to-kick-its-missile-defense-shield-up-a-notch/>.

²⁴⁴ Ji-hye, "3 Military Systems to Counter N. Korea."

²⁴⁵ Joshu Pollack, "Ballistic Missile Defense in South Korea: Separate Systems Against a Common Threat," *Missile Defense, Extended Deterrence, and Nonproliferation in the 21st Century*, no. 4 (n.d.): 12.

What results are two separate BMD systems that are not directly linked together which decreases the overall effectiveness of both.

The third strategy is called the Korea Massive Punishment and Retaliation plan.²⁴⁶ The very publicly advertised goal of this plan is that in the event of a conflict with North Korea utilizing nuclear weapons, the South Korean military will annihilate sections of Pyongyang with ballistic missile and cruise missile strikes, followed by SOF attacks to ensure the entirety of the Kim regime and military leadership are killed.²⁴⁷ It is unclear if South Korea's SLBMs will be intended for this plan, but the capability will exist should they choose to leverage it.

In the end, the ROK does not want to fight a war with North Korea under any circumstances.²⁴⁸ North Korea's developing ballistic missile submarine program accounts for a very small portion of its overall missile force, and its strategic contribution is debatable, as discussed in the previous chapter. But its existence may provide Kim Jong Un and his domestic audience with a degree of comfort based on the perceived capability such a force provides. For South Korea, by continuing to develop advanced strike capabilities and associated strike plans against the North Korean WMD locations and forces, the ROK government wishes to limit any perceptions in the North that its capabilities are safe and secure, especially if those perceptions are exaggerated. Despite the SSB threat being less substantial from the ROK perspective, an overconfidence on the North Korean's part can prove dangerous and alter the calculus in how the North Koreans attempt to leverage the program.

Just as important as developing capabilities to defend against the physical threat of the SSB program, the South Koreans have simultaneously developed systems to discredit the overall capability perception within the North Korean regime. If the North Koreans are less confident in its ability to credibly field a SSB force, or fire SLBMs at South Korea successfully, they may be less inclined to attempt to use those options in the first place.

²⁴⁶ Bennett et al., *Countering the Risks of North Korean Nuclear Weapons*, 57.

²⁴⁷ Ji-hye, "3 Military Systems to Counter N. Korea."

²⁴⁸ Bennett et al., *Countering the Risks of North Korean Nuclear Weapons*, 62.

Following the degradation of perception, having the ability to follow up with a credible ROK counterstrike capability further serves to limit any perceived gains the North Koreans may have through the development of its SSB program. Through degrading these perceptions, South Korea aims at communicating to North Korea that any action that could lead to conflict would either be too expensive or lead to the destruction of North Korea through denial capabilities and punishment.²⁴⁹

F. CONCLUSION

Following the sinking on the ROKS Cheonan in 2010, the ROK military underwent a series of reforms and strategic shifts in focus aimed at countering the threat posed by North Korea's large submarine fleet. In 2014, a paradigm shift in the undersea threat competition occurred with the launching of a North Korean Ballistic Missile Submarine and subsequent SLBM test launches in the years following.²⁵⁰ By already shifting the military focus to countering the submarine threat, the ROK found itself in a good position to counter the threat posed by the new ballistic missile program. What has resulted in the roughly ten years since is a very capable ASW force utilizing airborne, surface, and subsurface units in an increasingly networked capacity that provide the ROK with the capability to locate, track, and neutralize the threat posed by North Korean submarines.

Tied with this new ASW capability has been the development of deterrent and punishment measures to degrade any perception of survivability within the North's leadership and domestic population. By possessing the ability to strike at the heart of the ballistic missile program before any submarines are launched, the ROK possesses a powerful capability to mitigate the threats of a North Korean Ballistic Missile program. In recent years, the South Koreans have also taken strides to improve their ability to work with other nations in the joint defense against North Korea, but significant roadblocks exist which limit its ability to maximize net defensive capabilities with allied forces.

²⁴⁹ Bennett et al., 60–65.

²⁵⁰ Yoon, "Expanding the ROKN's Capabilities to Deal with the SLBM Threat from North Korea."

The overall ROK response to the SSB developments in North Korea has been a series of physical capability upgrades as well as psychological campaigns aimed at cutting away at any excess North Korean confidence in its own abilities. The ROKN has and continues to develop more advanced ASW and defensive capabilities which can counter threats posed by North Korean SSBs. The advancements in counterstrike capabilities by the ROK strategically communicate to North Korean leadership that even if they do choose to take any military action against the South, the cost of doing so will be too great.

V. FINDINGS AND ANALYSIS

A. OVERALL ASSESSMENT

As part of Kim Jong Un's desire to build and field a nuclear force capable of deterring outside aggression and provide regime elites, as well as the domestic population, with the perception of security, Kim Jong Un has successfully delivered an operational SSB, with more under construction. This places North Korea within the very small group of SSB-bearing countries. Though North Korea's SSB program is in its infancy and is based of Soviet-era technology, the threat should not be taken lightly.

The purpose of this thesis was to conduct an inventory of North Korea's SSB-related development to assess the motivators which are influencing the direction the force will take and provide a review of ROK responses to the threat, to assess the overall security implications for the region. Is Kim Jong Un pursuing the development of an actual SSB force capable of providing him with a second-strike capability, or are his actions simply motivated by a desire for clout? A second purpose of this thesis was to assess ROK responses and whether these developments even matter in terms of regional stability. Given the direction North Korea is taking with its SSB program, will the threat be negligible due to the ROK and U.S. response?

Chapter II has described a series of long-term projects related to North Korea's developing SSB capabilities. North Korea's ballistic missile program is in the process of expanding, two hulls are under construction which will soon join the lone GORAE. Running parallel to the creation of these submarines is a robust SLBM development program. To date, four SLBMs have been test-launched to date, with two other potential SLBMs remaining to be tested. To accompany these developments, North Korea has entered a series of long-term construction projects in Sinpo to expand its man, train, and equip capabilities to include the refurbishment of construction halls, construction of a new training command, and the construction of SLBM testing infrastructure.

Chapter III has assessed the overall intent of the program. In the development of this thesis, two hypotheses existed for the drivers behind the SSB development. One

hypothesis was that in the absence of a capability to field a reliable SSB force, Kim Jong Un was developing piecemeal capabilities for clout in that he wanted the prestige of developing the capability without the actual intention of having a credible second-strike capability. The other hypothesis was that he in fact wanted to develop a credible second-strike capability by fielding an operational SSB force. This thesis has found that, in terms of resource allocation and the general level of infrastructure upgrades seemingly focused on the production of ballistic missile submarines, Kim Jong Un appears to have the intention of developing a full-fledged ballistic missile submarine force. However, due to construction timelines as well as inherent vulnerabilities in the submarines themselves that North Korea does not have the technology to overcome, the current trajectory of the program will be unlikely to provide a survivable second-strike nuclear deterrent.

Chapter IV has conducted a review of South Korea's defense reforms and overall military responses to the modernization of North Korean submarines as well as the development of North Korean SSBs. With the need to develop a sizeable submarine fleet to match the North Korean fleet unnecessary, the ROK instead has embarked on a force-wide modernization effort which has drastically improved the nation's overall ASW capabilities over the last ten years. Leveraging air, surface, and subsurface ASW assets in a networked fashion, as well as developing weaponry and capabilities to counter the poor acoustic environments of the Sea of Japan and the Yellow Sea, the ROK has created a formidable ASW force capable of holding its own. Though efforts to increase multinational training have taken place in recent years, political issues and other factors have resulted in a very limited willingness and ability to conduct coordinated ASW efforts with neighboring Japan. This lack of integration and muscle memory will severely limit the ROK's effectiveness should conflict develop against North Korea in the near future.

ASW capabilities provide the ROK with the ability to counter the SSBs once they are flushed to sea, which is important, but ROK military developments have taken it further. These developments focus on the desire to destroy the SSB threat preemptively, counter any potential attacks, as well as increase the risk associated with a North Korean provocation, attempting to shift the calculus of any future North Korean action. Realizing they must develop strategies and capabilities beyond the ASW arena, the ROK has also

taken aim at the perceived security the SSB program may provide to North Korea's elite and domestic audience. Beyond the ASW realm, but very applicable to the threat, the defense policies of Kill Chain preemptive strike, Korean Air and Missile Defense, and the Korea Massive Punishment and Retaliation plan deliver capabilities to counter the North Korean SSB threat before or after the start of hostilities, defend the peninsula against any attack, as well as threaten key military targets and the ruling elite within the regime. The very public development of these policies and capabilities severely increases the cost of any North Korean military action and aims to erode any perception of security by the North Korean leadership that would be gained by the eventual development of a SSB force.

This thesis finds that although North Korea has the intent to develop a SSB force, with the goal of fielding nuclear-capable missiles to complement its land-based missile forces, this threat will be negligible. Efforts undertaken by the ROK to counter the threat through force improvements mean that even if the resource-stricken North Korean could realize its goals, the SSB force will be vulnerable to ROK prosecution, and ROK punishment capabilities will make the resulting cost of action too great.

B. IMPLICATIONS

1. Assessment

Significant portions of this thesis detail how the ROK has chosen to respond to the developments within North Korea in the subsurface domain. The sinking of the ROKS Cheonan was a wake-up call for the South Korean government both in terms of the inability for ROK forces to detect and counter an incursion by the North, as well as a political nightmare that resulted given the need for ROK leadership to ensure security for the population. Even though North Korean submarines are Soviet era in design, for the most part, the large number presented a significant threat that wasn't being matched. ROK ASW developments were not designed initially to focus on countering the SSB threats, as those did not exist at the initial phases of defense reforms. Instead, they were in response to the large conventional submarine threat that the North possessed. Fortunately for the ROK, it just so happened that the newly developed capabilities also present a good defense against a future SSB force.

When assessing if the ROK is trending in the right direction to counter the SSB threat, the integrated response through the development of ASW-capable air, surface, and subsurface units, rather than attempting to match North Korea's submarines hull-for-hull, is appropriate. This especially applies in that each unit developed can fulfill additional roles outside the ASW arena and most are able to shift to either coast depending on the threat, affording the ROK military with flexibility to adapt to future threats. This is especially important when considering the gradual push the South Koreans have taken towards a blue water-capable force. As the South Koreans expand their area of influence deeper into the global domain, these added capabilities will help them to participate more effectively in the multinational arena, as well as meet the threats of the future that do not come from North Korea.

Where the ROK lags is in the multinational cooperation arena. It is important that the ROK continues to train with other navies to learn how to better integrate its forces in a multinational cooperative. But by not aggressively pursuing increased defensive ties with Japan, its neighbor, the ROK severely limits itself. In the event of a conflict, timing will be very important in mounting a response; especially when attempting to defend against stealthy submarines. Despite being able to count on the U.S. for support in the defense against North Korea in a conflict, it will take time for the U.S. to arrive in the AOR. Japanese forces, on the other hand, operate near Korea and present a more rapid response option to the threat simply due to its proximity. If the ROK and Japan were able to see past their differences and work to develop stronger military ties, as well as train to develop the necessary muscle memory needed to conduct multinational ASW operations, both nations would stand to benefit. The alternative puts both in a more strained position; by working separately, both are required to bear more of a defensive burden individually and stand to complicate any ASW operations in the Sea of Japan simply due to unpracticed deconfliction methods.

2. Perception Management

This thesis found in Chapter III that the North Korean regime likely believes the SSB force, with potential nuclear capability, increases the overall security of the nation.

Meanwhile, through developments in ROK capabilities and policies, Chapter IV shows that there is in fact no increase in North Korean security due to the ability of the ROK to counter the threat. From the ROK and U.S. perspective, the threat seems minimal, but the risk comes into play when the North Korean leadership doesn't have the same perception.

Perhaps one of the most important aspects of the introduction of an SSB force isn't the actual capability it brings in terms of being able to launch SLBMs; with the large land-based missile force, the SSB force will not pose a significant additional threat. What presents as even more dangerous is a gained sense of security perception the force may give the North Korean elite. Despite being the Supreme Leader, Kim Jong Un does not make decisions in a vacuum and acts in ways that sustain the support of the elite. There is a long history of brinkmanship strategies to earn concessions from China, South Korea, and the U.S.²⁵¹ If there is an increased perception of security because of the SSB force, Kim Jong Un and/or the elite may be more willing to participate in risky behavior to attempt to pressure further concessions.

This prospect is magnified insofar as the U.S. and ROK have shown they are both hypersensitive to any action taken by the North Korean regime, especially in the military realm. With the likely continuation of the pattern of bad behavior and crisis instigation as a form of political bargaining, Kim Jong Un may find himself in a position where he can gain political leverage simply by flushing his SSBs to sea. Despite such actions being risky to the regime, Kim Jong Un gains a risk-leveraging opportunity he didn't possess prior to the creation of the SSBs.

What presents itself, as mentioned broadly earlier, is an instability-stability paradox in that the risk of low-level provocations increases as North Korea feels they have established at least some degree of nuclear deterrence.²⁵² As Chapter IV presents, the ROK has taken action to develop policies to undermine any perceived security gains, but sending

²⁵¹ In-bum Chun, "The Eight Steps of North Korean Brinkmanship: Is This Time Different?," AsiaGlobal Online, June 25, 2020, <https://www.asiaglobalonline.hku.hk/eight-steps-north-korean-brinkmanship-time-different>.

²⁵² Fathali M. Moghaddam, ed., "Stability-Instability Paradox," in *The SAGE Encyclopedia of Political Behavior* (2455 Teller Road, Thousand Oaks, California 91320: SAGE Publications, Inc., 2017), <https://doi.org/10.4135/9781483391144.n364>.

the message and ensuring the message is received are two separate issues. In the future, if the North Koreans wished to communicate their anger or frustration over the status of negotiations, such as pressing for sanctions reductions, and they chose to conduct another provocation like the sinking of the Cheonan, the resulting situation could be disastrous. The ROK has new capabilities aimed at stopping such an event, but the risk of escalation of force is high, especially if the ROK is unable to stop the provocation. Tit for tat responses have the potential to take a small event and blow it out of proportion, leading to a real security crisis.

Similarly, the risk of North Korean action because of misperception increases as well as part of the instability-stability paradox. Should an event unfold such as a multinational military exercise with the ROK and USFK or another multinational exercise, and the North Koreans were to misjudge the intentions of the exercise, the risk of low-level conflict may be higher if North Korea thinks it has the ability to deter a counterstrike.

As North Korea continues to field additional SSBs and develop additional weaponry, it will be crucial for U.S. and ROK policymakers and military leadership to look at more than just the capability differences between the North Korean forces and friendly forces. They must consider North Korean perception of security gains to more accurately anticipate how the North will respond, especially in a perceived crisis.

C. LIMITATIONS AND FUTURE RESEARCH

The inherent issue with reporting on North Korea is the level of information security within North Korea itself. Unclassified reporting must rely on imagery, government information releases, defector testimony, and a small pool of other resources. North Korea does not publish any government data, military or otherwise. Therefore, accurate reporting gets more difficult as researchers attempt to dive deeper into topics. Utilizing classified information may provide additional insights into activities, perceptions, capabilities, etc. Having access to such information has the potential to modify or refine some of the details used to reach conclusions or may refine the confidence in overall findings, but does not necessarily fundamentally challenge the basic overall conclusions.

Due to the continuation of construction on North Korea's second and third SSBs, and the unknown timeline for construction, research is more reliant on anecdotal evidence and assumptions made off related observations. Once the two submarines are launched and the true capabilities of each become more evident, better assessments of North Korean intentions will be able to be made, as well as how that development impacts the overall security environment, especially when it comes to matching North Korean capabilities with South Korean defenses.

While this thesis looked at the overall program development of the North Korean SSB program and touched slightly on security perceptions within North Korea, there is significant room for additional research. With the creation of the SSB program, it would be rewarding to analyze just how security is perceived between the elite class and the lower ranks of society. Do these differences matter in terms of how Kim Jong Un makes defense decisions in the development of such a program? How heavily does each class within the population weigh on Kim Jong Un's security decisions?

Since the introduction of sanctions as well as border closures because of COVID-19, it would be interesting to investigate just how much North Korea's defense supply chain is impacted and how that impacts the ability for North Korea to continue to develop and build new submarine hulls and SLBMs. As resources become scarcer, is North Korea making decisions based on the availability of certain resources versus others? Stated otherwise, could the limited supply chain be impacting how North Korea chooses to design and build its SSBs and missiles, or are they having to develop new versions of each due to resource limitations? Is North Korea choosing to modify the ROMEO because they lack the resources to build such a submarine indigenously on a larger scale? Certainly, the creation of the SINPO-C would poke holes in that question at least somewhat but determining how resource constraints are impacting North Korea's defense capabilities would provide value in assessing how the North will equip a future force.

Finally, discussions in this thesis included issues with North Korean nuclear command and control at-sea. With Kim Jong Un holding supreme authority over nuclear weapons use, understanding how Kim Jong Un aims to maintain control over his nuclear-capable SLBMs while at sea would be crucial to understanding how to target his C2

capability in the event of crisis. Understanding how Kim Jong Un will deliver instructions to launch nuclear weapons from a submarine, especially one out of communications range, will be necessary to better defend from such a threat.

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