Should the United States Support a Republic of Korea Nuclear Submarine Program?

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In response to the progress of North Korea toward a functional submarine-launched ballistic missile (SLBM) and the growing maritime assertiveness of China, South Korea has expressed a strong interest in acquiring a fleet of nuclear-powered attack submarines (SSNs). The United States now faces a difficult debate: it must choose whether it will oppose or support the Republic of Korea’s emerging SSN program. This article contributes to this debate, discussing how a Republic of Korea (ROK) SSN program could result in strategic risks or benefits, or both, for the United States. The risks of such a policy are readily apparent. First, the project might undermine already-fragile Sino-allied and ROK-Japan relations, damaging regional stability. Second, it might create nonproliferation concerns by expanding the ROK’s latent nuclear capabilities. Third, an ROK SSN program would involve major opportunity costs; the resources necessary to fund it inevitably would siphon ROK resources away from investments in other crucial capabilities.

Despite these significant risks, however, this article argues that the United States should support and assist its ally if South Korea pursues acquisition of SSNs. First, if the United States works with South Korea, it will have a greater ability to ameliorate the aforementioned risks that the program poses. Second, U.S. assistance would bolster intra-alliance cohesion by reinforcing U.S. commitment and allowing South Korea to bear more of
the burden for allied security. Third, support for ROK SSNs would improve the coercive diplomacy of the United States toward North Korea by enhancing allied capabilities and signaling allied resolve. Fourth, an SSN fleet would strengthen the ROK’s power-projection capabilities, improving the allies’ ability to cooperate on security contingencies beyond the peninsula.

ALLIED REGIONAL INTERESTS

Any discussion of the strategic implications of ROK SSNs for the United States must begin with an overview of the allies’ shared interests in the Indo-Pacific. First, the United States and South Korea have an interest in preserving their national security against military aggression. The allies seek to maintain a strong deterrent and defense against potential aggressors—most notably North Korea. They aim to dissuade challengers from direct attacks, as well as less-conventional aggression such as hybrid warfare and state-sponsored terrorism. They also endeavor to remain prepared to defeat aggression should deterrence fail.

Second, the allies are committed to preserving the economic growth and prosperity that has allowed their respective nations to flourish. Both recognize that this prosperity is dependent on the peace and stability of the Korean Peninsula, which in turn depends on the alliance’s ability to deter North Korea. The allies also appreciate that their continued economic vitality hinges on regional stability more broadly; instability in the Indo-Pacific undoubtedly would undercut the economic interests of both allies. In particular, the ROK economy depends on sea lines of communication (SLOCs) that run through the South and East China Seas. If these SLOCs were threatened or interdicted the prosperity of South Korea would suffer significantly. Regional security and stability are undergirded by the existing rules-based international order, which provides for freedom of the seas and the peaceful resolution of international disputes. This order, in turn, is underpinned by the U.S. hub-and-spoke alliances in the Indo-Pacific, including the vital U.S.-ROK alliance.

Third, the allies share common values. Both understand the importance of democratic governance and human rights. Similarly, the allies are committed to the rule of law, both domestically and internationally. This provides both allies with an additional incentive to resist the aggressive designs of the Democratic People’s Republic of Korea (DPRK) on the Korean Peninsula, defending the ROK’s successful democracy against the authoritarian regime in the north.

These allied interests face significant challenges in the Indo-Pacific. First, the DPRK’s accelerating nuclear weapons, intercontinental ballistic-missile (ICBM), and SLBM programs pose a major threat. These capabilities greatly increase the destructive potential of a peninsular war for both South Korea and the United States. If North Korea is able to use these capabilities to establish a secure nuclear
deterrent, it also might become emboldened, undercutting the allied ability to deter DPRK aggression short of war. These capabilities also make it far more difficult for the allies to defend against North Korea, should deterrence fail.

Although the allies have taken steps to offset the DPRK’s ICBM threat, such as strengthening the ROK’s Korea Air and Missile Defense systems and deploying terminal high-altitude area-defense (THAAD) batteries, the DPRK’s development of diesel-electric ballistic-missile submarines (SSBs) and SLBMs threatens to circumvent these measures. North Korea already has tested a Pukkuksong-I SLBM fired from a Sinpo-B-class SSB successfully and is developing new, more-capable versions of both the Pukkuksong and Sinpo. Estimates suggest that North Korea will be able to field the Pukkuksong by 2020. Once deployed, these systems will complicate significantly the allies’ ability to prosecute their “4D” operational concept: detecting, disrupting, destroying, and defending against the DPRK’s nuclear and missile capabilities.

The growing maritime assertiveness of the People’s Republic of China (PRC) poses an additional, major obstacle to both allies’ security and economic interests. China claims special privileges outside its territorial seas, both in its exclusive economic zone and within its nine-dash line in the South China Sea. These claims contradict the principle of freedom of the seas. China has become increasingly forceful and provocative in asserting these claims, harassing USS Decatur in the midst of its freedom-of-navigation exercise near the Spratly Islands on 30 September 2018. Furthermore, China steadily has militarized the South China Sea, developing a host of new military facilities throughout this important waterway. Simultaneously, China has expanded its regional antiaccess/area-denial (A2/AD) capabilities, strengthening its ability to hold maritime traffic at risk. These developments could threaten regional stability, the security of key SLOCs, and the rules-based international order.

Furthermore, the integrity of the U.S.-ROK alliance itself faces challenges rooted in uncertainty and ROK fears of abandonment. The rhetoric that candidate Donald J. Trump used on the campaign trail in 2016 subsequently created significant concern in South Korea over whether President Trump and the United States would maintain a strong commitment to the alliance. Subsequent questions over host-nation support, the funding of THAAD, and U.S. trade pressure only have compounded these concerns. Finally, the unilateral decision to cancel major U.S.-ROK military exercises as part of Washington’s efforts to negotiate denuclearization with Pyongyang has caused substantial alarm in Seoul.

**SUBMARINE PROPULSION: AN OVERVIEW**

Modern conventional attack submarines (SSKs) rely on diesel-electric propulsion systems rather than nuclear power. SSK propellers are driven via an electric...
battery, which in turn is connected to and charged by a diesel engine. These propulsion systems depend on regular refueling for the diesel generator, which limits SSKs’ range. The system also prevents SSKs from remaining submerged for extended periods; SSKs must “snorkel” regularly at periscope depth to run their diesel engines to recharge their batteries. This feature limits their endurance and renders them vulnerable and easy to detect. The recent introduction of air-independent propulsion (AIP) systems to augment the diesel-electric system has improved the undersea endurance of SSKs, but even the most advanced SSKs must snorkel to recharge at least once every few weeks.

Nuclear submarines, in contrast, are propelled by onboard nuclear reactors. These reactors use enriched uranium to provide the power needed to drive the submarines’ propellers. This system gives SSNs and nuclear-powered ballistic-missile submarines (SSBNs) virtually unlimited range and endurance, allowing them to remain at sea or underwater almost indefinitely; neither diesel fuel nor air are required to propel these boats. The only limitation on the range and endurance of an SSN is food for the crew. Nuclear reactors also generate more power, supporting a faster and larger boat capable of carrying more extensive weaponry and sensors. This added endurance, range, speed, and equipment comes at a price, however. SSNs are noisier and less maneuverable than many modern SSKs. The reactors also require enriched uranium as fuel, creating proliferation concerns. Indeed, many SSNs use highly enriched uranium (HEU), which is over 20 percent uranium-235 (U-235) and can be used to provide the fissile material for a nuclear weapon.

Development and subsequent operation of the SSN are technologically challenging and financially costly endeavors that only a few maritime powers have mastered. Presently, the United States, Russia, China, France, the United Kingdom, and India are the only states that operate SSNs. Brazil also is developing its own SSN, with assistance from France. The significant technological and financial hurdles to acquiring an SSN suggest that the club of states operating these boats will remain relatively small for the foreseeable future.

The United States fields a sizable fleet of SSNs; indeed, the U.S. submarine fleet is exclusively nuclear powered. The Submarine Force Pacific under U.S. Pacific Fleet operates thirty-one SSNs. As highlighted in table 1, these comprise twenty-four of the older but formidable Los Angeles–class SSNs and seven of the newer and more powerful Virginia- and Seawolf-class SSNs. They are based in Guam, in Hawaii, and along the West Coast.

North Korea possesses a range of diesel-powered submarines (see table 1). While many of these SSKs are antiquated and small, they can be used to lethal effect, as was demonstrated in 2010 with the sinking of the ROK ship Cheonan. While North Korea has taken steps to develop diesel-powered SSBs capable of
launching nuclear missiles, it has not made any noticeable progress toward a nuclear-powered submarine.

During the Cold War, South Korea primarily fielded “midget submarines”; the Korean attack submarine (KSS) program began the process of modernizing the submarine fleet in 1989.\(^1\) As displayed in table 1, South Korea currently possesses only conventional diesel-electric SSKs. It operates nine Type 209 (Chang Bogo–class, KSS-1) and nine Type 214 (Son Won-il–class, KSS-2) SSKs. It also is developing nine new three-thousand-ton SSX indigenous (Jangbogo III–class, KSS-3) diesel-electric submarines, the first of which deployed in 2018.

ROK president Moon Jae-in repeatedly has expressed an interest in developing SSNs.\(^2\) Many current and former ROK government and military officials claim that ROK SSNs would dramatically improve the ROK’s ability to both deter and defeat the DPRK’s emerging SLBM capability and to secure the maritime commons. In the past the United States has been unwilling to transfer the sensitive technology necessary for nuclear naval propulsion to South Korea, but the Moon administration’s renewed interest in this technology should spark a new debate in the United States on the merits of assisting South Korea in developing its own SSNs.\(^3\)

### THE RISKS POSED BY AN ROK SSN PROGRAM

#### Sino-Allied Relations

An ROK SSN program could create a number of significant strategic challenges for the United States. First and foremost, it might damage already fragile Sino-allied relations. The logic of the security dilemma suggests that if South Korea

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**TABLE 1**

REGIONAL SSKs, SSXs, SSNs, AND SSBs

<table>
<thead>
<tr>
<th>DPRK Submarines</th>
<th>PRC Submarines</th>
<th>ROK Submarines</th>
<th>USINDOPACOM Submarines</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Yugo class (midget sub)</td>
<td>12 Song class (SSK)</td>
<td>9 Chang Bogo class (SSK)</td>
<td>24 Los Angeles class (SSN)</td>
</tr>
<tr>
<td>5 Yono class (midget sub)</td>
<td>13 Yuan class (SSK)</td>
<td>9 Son Won-il class (SSK)</td>
<td>4 Virginia class (SSN)</td>
</tr>
<tr>
<td>40 Sang-o class (SSK)</td>
<td>12 Kilo class (SSK)</td>
<td>1 Jangbogo III class SSK/SSX (8 more planned)</td>
<td>3 Seawolf class (SSN)</td>
</tr>
<tr>
<td>20 Romeo class (SSK)</td>
<td>13 Ming class (SSK)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Sinpo class (SSB)</td>
<td>3 Han class (SSN)</td>
<td>2 Shang I class (SSN)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Shang II class (SSN)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: DPRK = Democratic People’s Republic of Korea; PRC = People’s Republic of China; ROK = Republic of Korea; SSB = diesel-electric ballistic-missile submarine; SSK = conventional attack submarine; SSN = nuclear-powered attack submarine; USINDOPACOM = U.S. Indo-Pacific Command.
strengthens its military capabilities, even for defensive purposes, nearby states such as China may see these improvements as designed to undermine their security.24 Furthermore, China increasingly views the U.S. alliance system in the Indo-Pacific in adversarial terms and has responded poorly to previous advances in allied military capabilities.25 China likely would see an ROK SSN fleet as part of a broader effort by the United States and its allies to contain growing Chinese power. Worse still, it might interpret this program as a deliberate attempt to degrade the PRC’s second-strike nuclear capability. China fields a relatively small—and therefore vulnerable—nuclear arsenal and its SSBNs are not particularly capable or stealthy.26 In theory, new ROK SSNs in the region could be used in conjunction with U.S. capabilities to hold PRC SSBNs at risk.

Tensions between the allies and China are mounting already. In 2018, the United States disinvited China from the annual Rim of the Pacific naval exercises, employed sanctions against the PRC’s agency for military procurement for purchasing Russian weaponry, and imposed several significant tariffs on PRC exports.27 China, meanwhile, refused to allow a USN vessel to dock in Hong Kong, canceled several high-level military talks with U.S. officials, and amplified its challenges to U.S. freedom-of-navigation operations in the South China Sea.28 ROK-PRC ties also have been on the decline following a significant diplomatic spat over the ROK’s purchase of THAAD batteries in 2016 and 2017. An ROK SSN program might only compound further the growing hostility between the allies and China.

Growing Sino-allied tensions could create several challenges. First, it could lead China to expand and enhance its undersea arsenal further.29 This could trigger an unnecessary arms competition and spiraling tensions that would destabilize the region and leave all parties worse off.30 The character of SSNs may make them particularly apt to provoke arms races. A number of strategic theorists have pointed out that offensive capabilities—those assets that are uniquely well suited for offensive operations—are the most likely to create insecurity among neighboring states.31 SSNs’ virtually unlimited range greatly enhances the deploying states’ ability to project power, and their stealth and endurance make them difficult to defend against; this makes SSNs particularly effective for offensive naval operations.

History is replete with examples of problematic naval arms races. The German decision to acquire a large fleet in the early twentieth century triggered a major naval arms race with the United Kingdom in the lead-up to World War I.32 The U.K. decision to develop a dreadnought—a large, advanced warship with only heavy guns—acted as a critical catalyst for the escalation of this arms race; not long after Britain introduced this platform, the Anglo-German arms race intensified further, with both sides acquiring many new capital ships.33 Around the same
time, Brazil’s purchase of several British dreadnoughts touched off a local arms race with the Argentine and Chilean navies.

The Indo-Pacific itself already may be in the midst of a nascent submarine arms race, with various regional countries acquiring new attack submarines. In the aftermath of the 1995–96 Taiwan Strait crisis, China rapidly began acquiring a larger fleet of SSNs as part of an A2/AD approach to challenge U.S. ability to operate in the region. These acquisitions and fear of Chinese intentions in turn provoked a broader regional undersea race, with a number of states enhancing their undersea capabilities qualitatively, quantitatively, or both. These steps raised tensions further, and inspired additional states to seek their own SSKs, often from China. As table 2 demonstrates, states across the region are acquiring more-powerful undersea fleets. Singapore’s defense ministry recently highlighted that the number of submarines in the western Pacific may rise from 200 to 250 by 2025.

Setbacks in Sino-allied relations could create other challenges. Rather than developing new antisubmarine warfare (ASW) or subsurface capabilities, China might retaliate with economic coercion against South Korea. The PRC’s recent reaction to U.S.-ROK cooperation on THAAD is illustrative of this risk. China accused the allies of developing capabilities that would threaten strategic stability by undermining the PRC’s second-strike capability. Following the ROK’s decision to acquire the system, China issued a formal diplomatic protest and suspended high-level security dialogues. It also deployed its own long-range radar systems to Inner Mongolia in a thinly veiled tit-for-tat maneuver. Just as problematically, China initiated a campaign of economic coercion targeting South Korea. Korean pop music events in China were canceled, several Korean television shows were taken off the air, and PRC regulators cut off Korean video game manufacturers from the Chinese market. China also prohibited travel agencies from offering package tours to South Korea, which cut Chinese tourism to South Korea by 20 percent. The Korean firm Lotte was targeted by PRC government investigations, and the bulk of its stores in China were shut down “for safety violations.” Given the potential for China to see ROK SSNs as a threat to its SSBNs, it is possible that China might respond in a similar fashion should South Korea develop this capability.

<table>
<thead>
<tr>
<th>Planned and Recently Completed SSK Acquisitions in the Indo-Pacific</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
</tr>
<tr>
<td>Taiwan</td>
</tr>
<tr>
<td>Australia</td>
</tr>
<tr>
<td>Vietnam</td>
</tr>
<tr>
<td>Indonesia</td>
</tr>
<tr>
<td>Thailand</td>
</tr>
<tr>
<td>Singapore</td>
</tr>
<tr>
<td>Bangladesh</td>
</tr>
<tr>
<td>Philippines</td>
</tr>
</tbody>
</table>

Note: SSK = conventional attack submarine.

China also might respond to this system by threatening key U.S. interests across the Indo-Pacific. For instance, it could relax further its implementation of sanctions against North Korea. This would undercut U.S. (and ROK) attempts to compel North Korea to denuclearize. Alternatively, China might intensify its militarization of the South China Sea. It could ramp up its interference with U.S. freedom-of-navigation operations and surveillance flights and deploy new capabilities to its expanding network of military facilities throughout the disputed waterway. This would undercut the allies’ efforts to maintain free and open access to the South China Sea.

**U.S.-ROK-Japan Trilateral Cooperation**

An ROK SSN program also might threaten delicate ROK-Japan ties, undercutting recent U.S.-led trilateral cooperation. Relations between Japan and South Korea have been beset by numerous challenges, including a territorial dispute over the Liancourt Rocks (known as Dokdo in Korea and Takeshima in Japan) and contention related to Japan’s imperial history. Given these tensions, Japan might see an ROK SSN program as a threat to its own maritime security. In particular, Japan could grow concerned that South Korea might deploy its SSNs to assert control more actively over the Liancourt Rocks.

ROK-Japan relations already are relatively poor. Despite a recent bilateral agreement between Japan and South Korea over compensations for former “comfort women” in Korea—women who were forced into sexual slavery for the Imperial Japanese Army during the Second World War—this issue has continued to disrupt positive relations between the two states. Similarly, South Korea and Japan have become locked in a dispute over whether Japanese firms should be compelled to provide compensation for forced labor during the country’s colonial rule over Korea.

Overall, the publics in both countries have largely negative perceptions of one another; a Genron-NPO survey found that 48.6 percent of Japanese and 56.1 percent of South Koreans had negative impressions of the other state in 2017. Japanese fears over an ROK SSN program might serve to exacerbate bilateral tensions further.

Damaged relations between South Korea and Japan could undercut the significant U.S. interest in stronger U.S.-ROK-Japan trilateral cooperation. The United States long has sought to strengthen coordination between its two most important allies in the Indo-Pacific despite their historical animosity. Trilateral coordination improves the allies’ ability to pursue key common objectives, including protecting shared SLOCs and the maritime commons, confronting the DPRK’s growing nuclear capabilities, and maintaining a stable regional balance of power. The 2016 General Security of Military Information Agreement, which improved intelligence and information sharing among the three militaries, represented a major improvement in trilateral cooperation. Nevertheless, progress toward
trilateral cooperation remains tenuous at best and could be disrupted by an ROK SSN program.

**Nuclear Proliferation Concerns**

A nuclear propulsion system could improve the ROK’s latent nuclear capabilities, undermining U.S. nonproliferation objectives. Joseph Pilat defines *nuclear latency* as “the possession of many or all of the technologies, facilities, materials, expertise (including tacit knowledge), resources and other capabilities necessary for the development of nuclear weapons, without full operational weaponization.” If South Korea were to fuel SSNs independently, its latent nuclear capabilities would be enhanced in several ways. SSN reactors require enriched uranium. Uranium enrichment, currently restricted under the U.S. Atomic Energy Act, section 123 (also known as the 123 agreement), is a key prerequisite for a functional nuclear program. Still more problematically, the most powerful SSN reactors use HEU containing over 20 percent U-235. As table 3 emphasizes, many of the leading global navies rely on SSNs fueled by HEU. HEU is fissile material—often 90 percent or more U-235—that can be used to develop a nuclear weapon. That being the case, ROK production of HEU would strengthen substantially the country’s latent ability to produce nuclear weaponry and would pose serious nonproliferation challenges.

SSN reactors also would produce uranium waste that would need a disposal plan. Some in South Korea have argued that reprocessing (including pyroprocessing) is required to manage the ROK’s dwindling storage space for spent fuel. As with uranium enrichment, reprocessing—a process that can be used to produce plutonium—can serve as the basis for a nuclear weapons program. Overall, fueling and operating SSN naval reactors would bring South Korea closer to mastering the full nuclear fuel cycle, which would advance its latent nuclear capabilities.

Other states have used naval reactor programs for this purpose. In the 1970s, for instance, Brazil used work on its naval reactor as part of a broader push to conquer the nuclear fuel cycle and potentially develop a nuclear weapon. Iran similarly has threatened to use work on a naval reactor to advance its latent nuclear capability. In 2012, during negotiations over the Iranian nuclear accord,

<table>
<thead>
<tr>
<th>Country</th>
<th>SSN Fuel: Level of Enrichment (% U-235)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>HEU (93–97.5)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>HEU (93)</td>
</tr>
<tr>
<td>Russia</td>
<td>HEU (40)</td>
</tr>
<tr>
<td>India</td>
<td>HEU (40)</td>
</tr>
<tr>
<td>Brazil</td>
<td>LEU (18–19)</td>
</tr>
<tr>
<td>France</td>
<td>LEU (5–7.5)</td>
</tr>
<tr>
<td>PRC</td>
<td>LEU (3–5)</td>
</tr>
</tbody>
</table>

Notes:

HEU = highly enriched uranium; LEU = low-enriched uranium; PRC = People’s Republic of China; SSN = nuclear-powered attack submarine.

a. Third- and fourth-generation SSNs.
b. Experimental reactor.

Iran announced it would be developing an SSN; this constituted an attempt to strengthen its bargaining position by threatening to advance its latent nuclear potential. Similarly, in 2017, Iran resumed its work on this naval reactor to put pressure on the new U.S. administration.

**Opportunity Costs**

An ROK SSN program also would bring with it sizable opportunity costs. The ROK’s planned budget for 2019 was roughly $415 billion and included around forty-two billion dollars in defense spending—an 8.2 percent increase year over year. Yet although ROK military expenditure is increasing, it is far from unlimited. While an SSN fleet would provide a dramatic and powerful new capability for the ROK Navy, the funds required for the project would have to be diverted away from other programs that could advance allied interests. More specifically, this qualitative improvement could come at the expense of quantitative increases to the ROK naval arsenal. Alternatively, this funding could be used for missile defenses, air forces, or ground forces, or it could be invested in the ROK economy.

A simple comparison illustrates the opportunity costs of an ROK SSN. Table 4 highlights some of the potential alternative systems and equipment in which South Korea could invest to strengthen its ability to deter and defeat North Korea and better secure the maritime commons. If we assume that an ROK SSN would have a per-unit cost similar to that of Virginia-class SSNs—around $2.5 billion each—this would mean that for the price of a single SSN South Korea almost could acquire three of its most advanced guided-missile destroyers (of the Sejong the Great, KDX-III class) to augment its growing blue-water capabilities.

<table>
<thead>
<tr>
<th>Name of Equipment/Platform</th>
<th>Type of Equipment/Platform</th>
<th>Cost per Unit (U.S.$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Virginia class</strong></td>
<td>Nuclear attack submarine</td>
<td>$2.5 billion</td>
</tr>
<tr>
<td><strong>Sejong the Great class</strong></td>
<td>Guided-missile destroyer</td>
<td>$923 million</td>
</tr>
<tr>
<td><strong>Jangbogo III class</strong></td>
<td>Diesel-electric attack submarine</td>
<td>$900 million</td>
</tr>
<tr>
<td><strong>THAAD battery</strong></td>
<td>Ballistic-missile defense system</td>
<td>$800 million</td>
</tr>
<tr>
<td><strong>Son Won-il class</strong></td>
<td>Diesel-electric attack submarine</td>
<td>$300 million</td>
</tr>
<tr>
<td><strong>Dokdo class</strong></td>
<td>Amphibious assault ship</td>
<td>$288 million</td>
</tr>
<tr>
<td><strong>P-8 Poseidon</strong></td>
<td>Antisubmarine warfare aircraft</td>
<td>$256.5 million</td>
</tr>
</tbody>
</table>

Note: THAAD = terminal high-altitude area defense.

Alternatively, to improve its ASW capabilities, South Korea could use this money to increase the quantity of its undersea assets vastly. For the price of a single SSN it almost could acquire three new advanced Jangbogo III–class SSKs or as many as eight smaller Son Won-il–class SSKs. South Korea also could upgrade its missile-defense capabilities significantly, adding three new THAAD missile defense batteries for around the same price. The allies could benefit significantly from the addition of any of these other capabilities.

The preceding section emphasizes that an ROK SSN program may create some significant challenges for key U.S. interests in the Indo-Pacific. Several of these hazards might make the United States think twice about supporting an ROK SSN program. Nonetheless, U.S. coordination with South Korea can help offset some of those risks. More importantly, as will be highlighted below, U.S. assistance with an ROK SSN program could benefit both countries’ interests in several important ways.

THE CASE FOR U.S. SUPPORT

Managing Risks

If the United States provides support and assistance to South Korea in developing an SSN fleet, it is likely to have greater influence over how South Korea pursues the program. In particular, the United States would be better positioned to dampen potential ROK-Japan tensions and address nonproliferation challenges. In contrast, if the United States refrains from supporting an ROK SSN program it sacrifices any leverage it might be able to exercise over how South Korea designs or uses its SSN fleet.

U.S. participation in an ROK SSN program could improve America’s ability to prevent unnecessary tensions between Japan and South Korea. First, as Japan’s closest ally, the United States is well positioned to reassure Japan that U.S.-ROK cooperation on an SSN program is not intended to threaten Japan’s maritime security. Indeed, given the substantial overlap between Japanese and ROK interests in deterring North Korea and preserving a secure, stable Indo-Pacific, Washington could work to convince Tokyo that Japan stands to gain from enhanced ROK naval capabilities. Second, the United States could leverage its support for the ROK’s SSN program to encourage South Korea to amplify its maritime cooperation with Japan. This could include expanding existing trilateral naval exchanges, maritime exercises, and intelligence-sharing arrangements. If the United States chooses to remain uninvolved in the ROK’s SSN development, however, Japan likely will see the program as more threatening and South Korea may be less willing to work more closely with Japan on maritime security.
U.S. leverage also should improve Washington’s ability to mitigate nonproliferation concerns created by an ROK SSN program. In particular, the United States could work to convince South Korea to use low-enriched uranium (LEU) rather than HEU. LEU is not fissile and would be more difficult to convert into a nuclear weapon, so it would pose far fewer proliferation concerns. The United States also could offer to provide South Korea with the fuel necessary for an LEU SSN, removing the need for South Korea to enrich its own fuel. This would dampen further the effect of an SSN program on the ROK’s latent nuclear capabilities. However, if the United States withholds support for the ROK’s SSN development it may find it more difficult to persuade South Korea to address U.S. nonproliferation concerns.

**Alliance Cohesion**

A U.S.-assisted ROK SSN program would have substantial ramifications for the strength of the U.S.-ROK alliance relationship. First, support would serve as a clear and credible signal of U.S. commitment to the alliance, reducing the ROK’s fear of abandonment.\(^5\) Public affirmations of alliance commitment are relatively “cheap” and therefore not particularly credible unless accompanied by costly signals that uncommitted states would be unwilling to issue.\(^5\) Since U.S. support for an ROK SSN program would involve transferring sensitive technology and expertise, it would serve as a credible signal of U.S. commitment to its alliance with the ROK. Second, the transfer of sensitive technology and expertise would help highlight the enduring benefits of the alliance for South Korea. By reducing the ROK’s fears of abandonment and increasing the direct benefits of its partnership with the United States, assistance would shore up the strength of this critical alliance.

Conversely, a U.S. decision to oppose an ROK SSN program likely would cause significant damage to the U.S.-ROK alliance. Several ongoing trends have weakened this important alliance already. President Donald Trump’s transactional perspective on U.S. alliance relationships, expressed both on the campaign trail and while in office, has caused some concern in South Korea over the strength of the U.S. commitment to ROK security.\(^5\) The recent decision to cancel ULCHI FREEDOM GUARDIAN and other major military exercises with South Korea to accommodate DPRK demands has contributed further to the ROK’s fears of abandonment. Alarming, polling data indicate that ROK citizens increasingly believe that the United States does not take the ROK’s national interests into consideration when determining policy.\(^5\) Were U.S. policy makers to oppose the ROK’s SSN program actively, this likely would reinforce these growing fears of abandonment in South Korea. This in turn might lead South Korea to hedge against abandonment by jumping on the PRC bandwagon, appeasing North
Korea, or balancing against these threats by initiating a nuclear-weapons program. None of these possible courses would advance U.S. national interests.

The United States has used the transfer of military technology to reinforce its alliances and security partnerships successfully in the past. U.S.-U.K. cooperation on naval nuclear propulsion in the late 1950s provides a telling example. The U.S.-U.K. dispute during the divisive Suez crisis in 1956 left President Dwight D. Eisenhower looking for a way to reinforce the shaken alliance with the United Kingdom. At the same time, Eisenhower hoped to build up British military capabilities so that the United Kingdom, and NATO more broadly, could assume more responsibility for the growing burden of deterring an increasingly powerful Soviet Union. To accomplish these objectives, Eisenhower sought to transfer naval nuclear technology to assist the United Kingdom in developing its own SSN.\(^{55}\) Under the leadership of Admiral Hyman Rickover, USN, and Admiral Louis Mountbatten, RN, the allies began sharing technological knowledge about naval nuclear propulsion to strengthen their alliance and reinforce the United Kingdom’s independent capabilities.\(^{56}\)

Although U.S. domestic politics complicated this process, in 1958 the allies succeeded in creating the U.S.-U.K. Mutual Defense Agreement, which authorized the transfer of nuclear propulsion technology between the allies. This included the sale of an American-made Westinghouse S5W naval nuclear reactor to the United Kingdom and the training of British submariners in the United States. This allowed the United Kingdom to develop its first SSN—HMS *Dreadnought*—powered by the S5W. It also facilitated the development of the United Kingdom’s first fully indigenous SSNs, the *Valiant* class, powered by the “son of S5W,” a Rolls-Royce pressurized-water reactor.\(^{57}\) This cooperation had a major impact on the strength and cohesion of the U.S.-U.K. alliance. On completion of HMS *Dreadnought*, U.K. leaders praised the U.S. contribution to British naval capabilities.\(^{58}\) Two leading RN officers later remarked that the “UK’s debt to the U.S. Navy, and to Admiral Rickover in particular, is incalculable.”\(^{59}\)

Just as importantly, U.S. decisions to withhold capabilities from allies have undermined alliance cohesion in the past. In the 1970s, for instance, President Jimmy Carter’s decision to block the sale of the F-16 fighter jet to South Korea further compounded the ROK’s concerns about abandonment amid an intra-allied dispute over the ROK’s human rights practices.\(^{60}\) Similarly, Japan’s attempt to acquire the F-22 fighter jet from the United States late in the first decade of the twenty-first century came to be seen as a litmus test of U.S. commitment to the alliance.\(^{61}\) The reluctance to transfer the F-22, because of the sensitive technology involved, was framed in Japan as a sign that the United States was less than fully committed to Japan’s defense. This contributed to Japan’s emerging concerns
about abandonment amid the American financial crisis and its decision to delist North Korea as a state sponsor of terrorism.

**Coercive Diplomacy with North Korea**

An SSN program also could strengthen the allies’ coercive diplomacy toward North Korea. *Coercive diplomacy* here refers to the allies’ efforts to convince North Korea to comply with their will through threats to use force. The United States and South Korea use coercive diplomacy to deter DPRK aggression and compel an end to the DPRK’s advancing nuclear and missile programs, including its SLBM program. An ROK SSN program could assist with this task by serving as a signal of resolve, strengthening deterrence by denial, and providing a useful asset for gunboat diplomacy.

An SSN program could be employed as a powerful signal to North Korea of the allies’ resolve to secure the Korean littoral and prevent the continued advancement of the DPRK’s nuclear and missile capabilities. SSNs are expensive, controversial, and technically challenging platforms, given the nuclear technology required for their development and operation. The ROK’s willingness to bear the costs of acquiring and operating this platform would serve as a credible signal reinforcing the ROK’s unwillingness to tolerate the DPRK’s illicit weapons programs. Furthermore, as mentioned above, support by the United States would serve as a credible signal of its resolve to defend South Korea against emerging challenges. By sinking funds into their defenses that irresolute states would be unwilling to commit, the allies would reduce the chances that North Korea will underestimate their commitment to their defense.

ROK SSNs also could help dissuade North Korea from developing, deploying, or using SLBMs and SSBs through the threat of denial. Current ROK ASW capabilities are relatively limited, despite the recent acquisition of new ASW helicopters. An SSN fleet would provide a strengthened ASW capability, improving the ability of the ROK fleet to track and eliminate DPRK submarines. In peacetime, SSNs could rely on their exceptional endurance (see table 5) to loiter for extended periods concealed beneath the surface at a safe distance from DPRK submarine bases such as Mayang Do to monitor SSB activity using passive sonar. In contrast, SSKs would struggle with this task, as they are required to surface periodically; even with AIP technology, the ROK’s most advanced submarines can transit for only two weeks or so without snorkeling. If a DPRK SSB were to deploy, the ROK SSN also could tail and monitor the SSB indefinitely, with or without the assistance of allied destroyers and U.S. P-3 Orion aircraft.

Just as importantly, in the event of a conflict ROK SSNs could eliminate pre-emptively the threat that DPRK SLBMs posed. As highlighted in table 5, SSNs’ superior speed would give them an edge over the ROK’s current SSKs in finding and eliminating the DPRK’s SSBs at sea before they could surface to deploy...
SLBMs—“killing the arrow.” Alternatively, if the SSNs were equipped with vertical-launch systems and cruise missiles, they could target DPRK ports directly before DPRK submarines put to sea—“killing the archer.”

SSNs would amplify the ROK’s ASW capabilities significantly and thereby reduce the DPRK’s incentives to continue pursuing an SLBM capability or to deploy any SSBs that it develops. If North Korea appreciates that SSBs will be unable to provide it a secure second-strike capability, given the allies’ ability to destroy this capability preemptively, it may be less willing to bear the significant cost of further developing this challenging technology. Furthermore, if North Korea understands that any SSB it does develop is likely to be tracked and could be eliminated if it puts to sea, it may be less likely to deploy these assets. If South Korea can deny North Korea the ability to use its SSBs, North Korea also will be less emboldened by any SLBM capability it acquires. Without the secure second-strike capability offered by an SSB, North Korea will find it riskier to engage in “salami-slicing tactics” or other steps short of war designed to undermine allied security.

Finally, ROK SSNs could be particularly useful as a tool for gunboat diplomacy. Gunboat diplomacy refers to states’ deployment and maneuvering of naval assets to signal capabilities and resolve to an adversary during a dispute. SSNs, able to move stealthily and remain concealed for extended periods, can be surfaced in sensitive areas as implicit threats. This gunboat diplomacy would highlight the ROK’s ability to strike key DPRK maritime capabilities, serving as a useful reminder of the costs of conflict with the allies.

States frequently have relied on naval capabilities to bolster coercive diplomacy. President Ronald W. Reagan used a major naval buildup coupled with the publicly released 1986 Maritime Strategy (work on this began in 1982 with a classified briefing) to signal U.S. resolve to resist Soviet revisionism and maintain maritime supremacy. As one of the strategy’s key architects, Secretary of the Navy John Lehman, argued, “a key element of the 1982 Strategy was signaling America’s renewed commitment to naval power to both our adversaries

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**TABLE 5**

**THE ADVANTAGES OF NUCLEAR PROPULSION FOR ASW**

<table>
<thead>
<tr>
<th>Platform</th>
<th>ROK Jangbogo III Class</th>
<th>USN Virginia Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propulsion</td>
<td>Diesel-electric with AIP</td>
<td>Nuclear: S9G reactor</td>
</tr>
<tr>
<td>Endurance</td>
<td>2 weeks</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Top speed (submerged)</td>
<td>20 kt</td>
<td>35 kt</td>
</tr>
</tbody>
</table>

Notes: AIP = air-independent propulsion; kt = knots; ROK = Republic of Korea.

and allies.”

The Maritime Strategy also bolstered deterrence by denial through strengthening naval war-fighting capabilities, allowing the United States to deny to the Soviets the ability to interdict U.S. supply lines to Europe. Furthermore, it augmented U.S. ability to hold Soviet SSBNs at risk, raising the cost to the Soviet Union should it engage in conventional escalation in Europe.

British military operations around the Falkland Islands provide particularly useful insights into the utility of SSNs for deterrence. In 1977, Operation JOURNEYMAN saw British SSNs deployed to the waters surrounding the contested islands successfully deter Argentine encroachment. Again, in 1982, during the Falklands War, the presence of several British SSNs helped deter Argentina from operating in the British-delineated military exclusion zone. Furthermore, after a U.K. SSN, HMS Conqueror, sank an Argentine light cruiser, ARA General Belgrano, the entire Argentine navy remained consigned to port, unable to put to sea for fear of being destroyed by British SSNs. Subsequently, Britain was able to secure control of the sea and cut off Argentine ground forces on the Falklands from sea supply.

Russia’s frequent use of SSNs for gunboat diplomacy during the Cold War similarly highlights the platform’s usefulness for coercive signaling. As Brent Ditzler argues in a 1989 thesis, “In what has become a standard pattern, a portion of the Soviet submarines involved in exercises and other diplomatic shows of force, routinely surface for prolonged periods and/or subsequently make highly visible port calls to friendly nations in the vicinity. This exposure is tactically unnecessary, and can therefore be assumed to have some diplomatic meaning.”

Reinforcing this argument, a retired Russian admiral argues that during the 1971 Indo-Pakistani War, the Soviet navy used SSNs for the express purpose of gunboat diplomacy: “The Chief Commander’s order was that our submarines should surface when the Americans appear. It was done to demonstrate to them that we had nuclear submarines in the Indian Ocean. So when our subs surfaced, they recognized us. In the way of the American Navy stood the Soviet cruisers, destroyers, and atomic submarines equipped with anti-ship missiles.”

Allied Blue-Water Collaboration

SSNs also would offer South Korea the ability to bolster its emerging blue-water naval capabilities, strengthening the U.S.-ROK alliance’s global maritime potential. Presently, South Korea is limited largely to green-water capabilities; it prioritizes the defense of Korean littoral waters rather than operations on the high seas or in foreign littoral waters. Its primary existing blue-water assets are the advanced Chungmugong Yi Sun-shin (KDX-II) and Sejong the Great-class (KDX-III) destroyers, as well as the Dokdo-class amphibious assault ship, which was designed as the centerpiece of a future rapid-response fleet. Currently, the underwater support for Dokdo and the KDX destroyers
is limited to the Son Won-il– and Jangbogo III–class SSKs, which would limit the range and speed of the rapid-response fleet. As highlighted by table 6, an SSN could provide better support for this blue-water fleet, allowing it to move faster and farther from friendly ports. Just as importantly, the SSN fleet could operate independently in blue-water environments, given SSNs’ speed and virtually unlimited range and endurance. Overall, an ROK SSN program would constitute a key step toward a more effective rapid-response fleet and a stronger blue-water capability.

The greater blue-water capabilities conferred by an ROK SSN fleet could allow the U.S.-ROK alliance to contribute more actively to regional and global security beyond the Korean Peninsula. South Korea could employ these assets to assist the United States in patrolling and protecting SLOCs throughout the Indo-Pacific. Indeed, South Korea already has demonstrated its interest in assuming a broader role in global sea-lane security alongside the United States, contributing forces to protecting shipping lanes against piracy in the distant Gulf of Aden. South Korea also could use its strengthened blue-water capabilities to track and interdict illegal shipments bound for North Korea, in line with the Proliferation Security Initiative. Furthermore, rapid-response fleets escorted by SSNs could contribute more quickly and effectively to peacekeeping, humanitarian, and counterpiracy operations abroad. ROK SSNs also could support USN operations throughout the Indo-Pacific by escorting and assisting carrier strike groups.

These contributions would serve to strengthen the allies’ expanding “global partnership.” As Presidents Moon and Trump highlighted in their joint statement in June 2017, “United States–ROK cooperation on global issues is an indispensable and expanding aspect of the Alliance.” A U.S.-ROK partnership with a greater blue-water capability and focus would represent a significant step toward the collaborative approach to maintaining global maritime security envisioned by A Cooperative Strategy for 21st Century Seapower, first published in 2007, updated in 2015. The USN strategy emphasizes “the potential for a global network of navies that brings together the contributions of like-minded nations and organizations around the world to address mutual maritime security challenges and respond to natural disasters.” To help move toward this network, the strategy document states that the United States will “support our allies and partners through training, exercises, and the provision of capabilities, via foreign military sales and financing, to increase their capacity to address maritime security challenges.” The rationale behind the Cooperative Strategy’s “global network,” which builds on the “1,000-ship navy” coalition concept advocated by Admiral Mike Mullen, USN (Ret.), is sound. The United States needs stronger partnerships with more-capable regional navies to help defend against the emerging threats to the maritime commons. The PRC’s growing assertiveness throughout the
Indo-Pacific maritime commons is of particular concern. Friendly navies willing to assume greater responsibility and acquire more-robust capabilities are a welcome prospect; while the United States will continue to bear much of the burden for maritime security throughout the world, it cannot carry the load alone. South Korea is uniquely well positioned to form a key part of this partnership in the Indo-Pacific, strengthening and broadening the U.S.-ROK alliance.

The role of SSNs in enhancing a maritime power’s blue-water and power-projection capabilities is recognized widely. The Soviet Union relied on SSNs as the basis for its blue-water fleet, rather than a large surface fleet or naval aviation. Brazil’s fledgling SSN program is viewed similarly as the centerpiece of a new blue-water navy. The United States also regularly uses SSNs as part of its forward-deployed naval presence—both independently and as support for its carrier battle groups—far from its shores.

U.S.-U.K. cooperation on the U.K. SSN program in the 1950s helped the United Kingdom assume a bigger role in allied blue-water operations to counter the Soviet Union at sea. The United Kingdom was able to contribute more to allied intelligence, surveillance, and reconnaissance on the Soviet navy farther from U.K. shores because of the added endurance and sensor capabilities of its SSNs. As Anthony Wells highlights, the two countries used their advanced capabilities to great effect: “[T]he United States and United Kingdom together built a data base on every Soviet submarine class and every hull within each class. . . . Speed, depth, operating characteristics, and crew performance could all be observed and recorded. . . . The superior stealth of well-handled U.S. and U.K. submarines permitted penetration of the most sensitive and dangerous areas to observe and record weapons trials.” The U.K.’s SSNs not only strengthened the country’s contribution to its own defense; they also contributed directly to the defense of the United States by guarding the Iceland-Greenland gap. Similarly, the United States.

### TABLE 6
**THE ADVANTAGES OF NUCLEAR PROPULSION FOR POWER PROJECTION**

<table>
<thead>
<tr>
<th>Boat</th>
<th>ROK Son Won-il Class</th>
<th>USN Virginia Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propulsion</td>
<td>Diesel-electric with AIP</td>
<td>Nuclear: S9G reactor</td>
</tr>
<tr>
<td>Top speed (submerged)</td>
<td>20 kt</td>
<td>35 kt</td>
</tr>
<tr>
<td>Range (submerged)</td>
<td>420 nm at 8 kt</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Top speed (surfaced)</td>
<td>12 kt</td>
<td>25 kt</td>
</tr>
<tr>
<td>Range (surfaced)</td>
<td>12,000 nm at 6 kt</td>
<td>Unlimited</td>
</tr>
</tbody>
</table>

Kingdom was able to use its SSNs to project power across the Atlantic Ocean during the Falklands War.

Overall, an ROK SSN program presents a host of potential benefits and risks for the U.S.-ROK alliance. As this article argues, such an SSN program could undercut Sino-allied and ROK-Japan relations, lead to fears about ROK latent nuclear capabilities, and incur sizable opportunity costs. These costs merit serious consideration. Nonetheless, the United States would stand to gain significantly by assisting its ally in acquiring this capability. Such a policy would strengthen the U.S.-ROK alliance’s cohesion, coercive bargaining position, and blue-water capabilities. Playing an active role in the development of the ROK’s SSN program also would give the United States more leverage over the way in which this capability is developed, helping it better offset some of the program’s risks.

The underlying question—whether South Korea itself should pursue this program—is still up for debate. There is little doubt that such a project would be a truly herculean undertaking. Its advisability depends on the ROK’s strategic vision for itself. If South Korea is content with securing only its immediate territory using a powerful land force and a green-water navy well suited for littoral operations, then an SSN fleet may be superfluous. If, however, South Korea wishes to become a blue-water power, capable of projecting power and contributing to the security of far-flung SLOCs, SSNs may be indispensable.

NOTES
1. The Moon administration has emphasized repeatedly that South Korea “needs nuclear submarines in this era.” South Korea has mentioned its desire for this asset several times in high-level talks with the United States, has commissioned a civilian study of the feasibility and desirability of the project, and has developed a military task force to consider the development of an ROK SSN. Jun Ji-hy, “South Korea Moving to Build Nuclear-Powered Submarines,” Korea Times, 20 September 2017, www.koreatimes.co.kr/.
2. The authors are grateful to an anonymous reviewer for highlighting this point.
4. Ibid.


35. Groll and De Luce, “China Is Fueling a Submarine Arms Race.”


40. Swaine, “China’s Views on South Korea’s Deployment of THAAD.”


57. Ibid.


67. Snyder, *Deterrence and Defense*.

68. Schelling, *Arms and Influence*.


75. Ibid.


79. Arthur Dominic J. Villasanta, “Another of South Korea’s Largest Warships Set to Launch

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https://digital-commons.usnwc.edu/nwc-review/vol73/iss1/6

81. Sukjoon Yoon, “Expanding the ROKN’s ASW Capabilities to Deal with North Korean SLBMs,” PacNet, no. 31 (28 May 2015).


88. Sanchez, “The Status of Brazil’s Ambitious PROSUB Program.”
