Navigating Security Dilemma: South Korea's Space Program during President Moon Jae-In's Administration (2017-2022)

Himmalia Dewi Alya Rahmah
Universitas Airlangga

ABSTRACT

Research about South Korean space programs is quite challenging to find among other spacefaring nations such as the US, Russia, China, and even India. It contrasts with its achievements in space missions and programs over the past five years, particularly during President Moon Jae-in's leadership. For instance, it finally launched its domestically built space launch vehicle, KSLV-II. South Korean space programs are especially interesting when juxtaposed with the volatility of the Korean Peninsula. Nonetheless, analysis of systemic constraints that limit South Korean space programs to pursue military-focused space programs is greatly overlooked. Hence, this research asks why South Korea avoids developing security/ military-focused space programs and instead opts for peaceful space programs amid the presence of space threats in the region. This research uses two theoretical frameworks to answer the question: (1) the middlepowermanship approach by a middle power in a security dilemma, (2) post-Cold War space programs, and the logic of space economy. Two hypotheses are presented: (1) South Korea employs middlepowermanship by facilitating orderly change in dealing with the space threat in the Korean Peninsula (2) In manifesting the peaceful approach, South Korea is thus focusing on improving its civil space program, that is, the space economy to prevent worsening the tension in the region.

Keywords: *South Korea, space programs, space threat, middle power, space economy*

Dibandingkan dengan negara spacefaring *lainnya seperti Amerika Serikat, Rusia, Tiongkok, bahkan India, penelitian mengenai program keantariksaan Korea Selatan cukup sulit ditemukan. Hal ini kontras dengan prestasi yang telah dicapai oleh Korea Selatan dalam kurun waktu lima tahun terakhir, khususnya pada era Presiden Moon Jae-in. Misalnya, keberhasilan peluncuran KSLV-II sebagai kendaraan peluncur antariksa pertama yang secara keseluruhan diproduksi secara domestik. Menilik lebih lanjut mengenai program keantariksaan Korea Selatan semakin menarik jika dikontraskan dengan ketidakstabilan Semenanjung Korea. Namun demikian, analisis hambatan sistemis yang membatasi opsi Korea Selatan untuk menempuh program keantariksaan yang berfokus pada bidang militer cenderung tidak banyak dibahas. Oleh karena itu, penelitian ini mempertanyakan mengapa Korea Selatan menghindari program keantariksaan yang berfokus pada aspek militer, dan justru memilih trajektori damai di tengah keberadaan ancaman-ancaman keantariksaan di kawasan. Untuk menjawab pertanyaan tersebut, ada dua kerangka teori yang digunakan (1) pendekatan middlepowermanship oleh middle power dalam dilema keamanan, (2) program keantariksaan pasca Perang Dingin, dan logika ekonomi keantariksaan. Dua hipotesis kemudian muncul, (1) Korea Selatan menggunakan middlepowermanship dengan memfasilitasi perubahan yang teratur guna mengatasi ancaman keantariksaan di Semenanjung Korea, (2) dalam memanifestasikan pendekatan damainya, Korea Selatan kemudian fokus dalam meningkatkan program keantariksaan sipilnya, yakni melalui ekonomi keantariksaan guna mencegah memburuknya ketegangan di kawasan.*

Kata-kata Kunci: *Korea Selatan, program keantariksaan, ancaman keantariksaan, middle power, ekonomi keantariksaan*

South Korea recorded a new achievement by launching its first domestically manufactured space launch vehicle on 21st October 2021. The Korean Space Launch Vehicle (KSLV)-II launch is meaningful because the first generation of this rocket launched in 2013 was a product of a collaboration between South Korea and Russia. The Korean space agency, Korea Aerospace Research Institute (KARI), explained that KSLV II marked South Korea's endeavor to achieve another important milestone in its space-related program. In its mission, KSLV-II was tasked to launch a dummy satellite with a 1.5-ton payload to the low Earth orbit, 600-800 km above the Earth's atmosphere (KARI 2021a). Despite its failure to meet the objective on its first try, President Moon Jae-in expressed his appreciation for the hard work in putting this launch in place. In addition, he firmly stated that South Korea would be able to launch its rocket right to the target in no time, and he claimed that "The Korean Space Age is approaching" (Smith 2021).

Previously, after South Korea successfully launched the CAS5001 observation satellite on 25th March 2021, President Moon also noted that:

> *"We will actively push for challenging space exploration projects that build on the foundation achieved by developing a Korean launch vehicle…. by 2030, we will achieve our dream of landing on the moon using our vehicle. The technological prowess, experience, and confidence gained from exploring the moon, the first step in space exploration, will provide a solid foundation for space development"* (Park 2021).

The ambition to revitalize the nation's space program has been renowned for being the "new era" for South Korea's astropolitics. According to Moltz (2012), South Korea's space research and development capabilities have slowly helped it to overcome its total dependency on big states such as the United States (US) and Russia. The new era is also happening at the right juncture, as the US has just lifted missile restrictions on South Korea that were meant to limit the missile range it can develop to prevent it from potentially abusing it for the proliferation of nuclear weapons. Prime Minister Chung Sye-kyun regarded this as South Korea's success in gaining its full missile sovereignty for the first time after

42 years (Kim 2021).

However, South Korea's ambition in space needs to be scrutinized, as Hickman (2019) claimed that we are entering "the Second Space Race," pitting the US against China. The race is said to have even higher stakes than the previous space race during the Cold War; not only is it about the showdown of the level of technological advancement, but it also includes the race to increase one's prestige to boost the nation's economy. South Korea is in a predicament since space-related activity is a sensitive issue, considering it is located in one of the most unstable regions in Asia. While South Korea has a lot of space-related cooperation with the US, it cannot isolate China since having close relations with China means so much to help resolve the North-South Korean issues (Lee 2021). The North Korean space program itself is suspected to be developed in tandem with its nuclear weapons. Considering the dual-use nature of space technologies, it is not easy to verify the intention of North Korean space programs (Lele 2013). On the other hand, North Korea repeatedly warned that regional stability could be jeopardized once South Korea keeps increasing its defense budget, weapons, and technology (The Guardian 2021)

To lay the ground for this research, the author reviewed several literatures discussing South Korean space programs during President Moon Jae-in's administration. Kim (2018), An (2020), Shin (2021), Lee (2021), and Kim (2020) writings mainly cover their expectation for South Korean space programs. The writings come up with a similar conclusion that the non-military aspect, i.e., the space economy, has now become the linchpin of the South Korean space programs. Although the security aspect of space programs is not entirely dismissed, all of them tend to see the redirection to the space economy as a necessity instead of a choice based on a rational calculation of South Korea's limited options amid systemic pressure of the current space-related challenges. With this knowledge gap, this article will answer why South Korea chose to develop a peaceful space program instead of a security-focused or military approach to defending against the existing space challenges.

Following this introduction, the next section will explain the theoretical frameworks underlining this article, map the current

space threat South Korea faces and how it approaches the situation as a middle power. Continuing the previous explanation, the next part will examine Moon Jae-in's space programs and what South Korea must address to build a competitive space economy.

Middle Power Approach in A Security Dilemma: Dealing with Post-Cold War Space Dynamics

The overall argument of this paper will be based on two theoretical frameworks. First, the middlepowermanship approach as one of the possible solutions for a middle power in a security dilemma. Second, post-Cold War space development, covering the space 2.0 and the space economy

Middlepowermanship Approach of a Middle Power in a Security Dilemma

John Herz (1950) coined the term "security dilemma" to illustrate the condition where states are unsure of one another's intention. In discussing the security dilemma, however, most literature significantly overlooks the relevance of middle power caught at the crossroads of great powers' struggle. Organski (1958) provides a theoretical basis for understanding the position of the middle powers within the international system. Middle powers should be understood through a spectrum and relativity. Although it is neither great nor small, his typology suggests that middle powers can play a significant role regionally and exercise some degree of influence on global affairs beyond that of small states (Cooper 2011).

In the later theoretical development, Chapnick (1999) suggests three models of middle power—functional and behavioral, which are politically motivated, while the hierarchical model is based on their relative international standing. Emmers and Teo (2015) argue that resource availability and strategic environment determine whether a country is a functional or behavioral middle power. States with a high level of resource availability and a high-threat strategic environment will likely become a functional middle power, characterized by their eagerness to play a role in a specific area they specialize in to facilitate orderly change. Considering

the threshold above, South Korea can be safely categorized as a functional middle power.

In facing a security dilemma, Cox (1989) presented *middlepowermanship*—a middle power's tendency to pursue a peaceful approach, such as employing multilateral solutions, embracing compromise in disputes, and adopting the notions of "good international citizen" in diplomacy (Cooper et al. 1993). A middle power will seek to minimize risk by expanding the area of common ground; hence, a middle power will have at least (1) the ability to distance themselves from being directly involved in a conflict, (2) possess a sufficient degree of autonomy vis-à-vis major powers, and (3) a commitment to maintaining and facilitating order (Cox 1989). Furthermore, Spero (2009) extends the traditional concept of self-help to 'other-help' where middle power will act as a bridge-building pivot to reduce the regional great power security dilemma. Some bridging strategies may involve effective negotiation, state-to-state cooperation, and niche diplomacy in a particular issue concerning their security (Emmers and Teo 2015).

Post-Cold War Space Development: Space 2.0 and Space Economy

After the end of the Cold War, the space program is no longer dominated by and for military purposes. Space's lucrative value is now becoming a new driving force behind the involvement of civilians in space programs (Logsdon 1982). By bringing civilian and commercial actors into the frame, a "New Space" or Space 2.0 revolution is born (Moltz 2019).

Graphic 1.
Cold War and Post-Cold War Space Program Comparison

Cold War Space Model	Post-Cold War/Space 2.0 Space Model
• National • Secret • Military-led • Independent • Few and large platforms (vulnerable) • Slow, top-down innovation	• International • Transparent • Commercially-led • Networked • Many, small platforms (resilient) • Rapid, bottom-up innovation

Source: Moltz (2019)

The space program is, however, a resource-and knowledge-intensive endeavor, highlighting the relationship between scientific and technical human capital and the state's economic resources (Early 2014). Besides having a strong community of scientists, engineers, universities, and laboratories, states also need abundant economic resources to obtain space capabilities. As space programs no longer depend on state funding, non-state and commercial actors emerge to maximize value creation and provide cheaper means and technology. According to Dobos (2019), the "New Space," which comprises a range of space-related activities based on the capitalist logic of supply and demand, has surpassed the "Old Space" logic of military and prestige competition. Therefore, this article will explore the pursuit of the space economy—a wide range of commercial activities to use and create value that benefits human beings through space exploration, management, and utilization (Shin 2021). In this paper, the pursuit of the space economy will be seen through the proliferation of the space industry in all sectors related to the production and operation of space devices, such as manufacturing launch vehicles and satellites, and developing services utilizing information from those devices (Shin 2021).

Two arguments are presented in this writing: (1) South Korea performs *middlepowermanship* by becoming a bridge-building pivot to facilitate orderly change in dealing with the space threat in the Korean Peninsula, and (2) in manifesting the peaceful middle power approach, South Korea is thus focusing on developing its civil space programs, that is the space economy to prevent worsening the current tension in the region.

Space Threat Around the Korean Peninsula

Dolman (2002) defines astropolitics as a grand strategy to conquer space; hence, the state justifies using military policy and instruments to ensure no intervention from others. Consequently, space has become a domain for competition, creating an inevitable paradox—that the increasing need to secure space would only produce more threats and insecurity (Al-Rodhan 2012). This writing will focus on intentional space threats that are deliberately enabled and have more grave political consequences among involved parties.

Graphic 2.
Intentional Space Threat

Intentional Space Threat		
Types of attack	**Definition and mechanism**	**Example**
Kinetic physical attack	Direct attack to shut down a missile, creates a collision and destroys satellites. Fast, hard to identify, and produces an irreversible effect	Ground station attack, direct-ascent ASAT (Anti-satellite weapon), and co-orbital ASAT
Non-kinetic physical attack	Produces impact without having direct physical contact	High Altitude Nuclear Detonation (e.g., Terminal High Altitude Area Defense/THAAD), laser, and microwave
Electronic	Create disruption such as jamming and fake signal (spoofing) to communication radio and satellite transmission frequency	Uplink and downlink jamming, spoofing
Cyber attack	Targeting data and system that uses that data	Data interception/monitoring, corruption, and seizure of control
Nuclear weapon	A mutually assured destruction with various range of destruction using ballistic missile	Intercontinental Ballistic Missile (ICBM)

Source: Webb (2009); Al-Rodhan (2012); Harrison et al. (2020)

South Korea's geographic location distinguishes between competing states wanting to advance their respective interest in the Korean Peninsula. In the latest 2020 Defense White Paper published by the Ministry of National Defense, South Korea recognizes the changing space security landscape. It acknowledges that the uncertain situation has aggravated the regional security situation. This section will further explain the current space threat surrounding the Korean Peninsula: the US-China competition in space and the most challenging task of taming North Korea's nuclear ambition.

China's Challenges in Space versus The US Persistence

After launching its first unmanned spacecraft in 1999, China began to release a White Paper on Space every five years starting in 2000. The White Paper shows that China takes pride in its

indigenous space capabilities as a vital part of its path to national development (Moltz 2012; Harvey 2019). President Xi Jinping has also thoroughly supported the space ambition in his campaign for "the Great Rejuvenation of the Chinese Nation." China's ambition to pursue space-related achievements is backed by the perception of space as a source of tremendous international prestige and domestic patriotism (Kueter 2007). It is also evident that there is a strong connection between the Chinese space programs and its military strategy doctrine. China believes that 'whoever controls space can control the earth.' Space is assumed to be the warfighting domain that must be seized to retain victory (Lele 2013). Hence, the overall space rejuvenation goal under President Xi's leadership aims to make China a "strong space power" that surpasses the US (Pollpeter 2020).

The US has been cautious about China's rapid space development. In 2011, Congress passed the Wolf Amendment to prohibit the use of government funding for NASA, the White House's Office of Science and Technology (OSTP), or the National Space Council to collaborate with China without prior approval and certification from the Federal Bureau of Investigation (FBI). The US is concerned with the dual-use nature of space technology, and close cooperation with China would only advance its military development in space. For instance, the US was alarmed when China became the first country to successfully launch an anti-satellite weapon (ASAT) in January 2007. Although similar technology has existed since the Cold War, the US and Soviet Union have never deployed them (Kueter 2007).

The US is convinced that China is fundamentally driven by the desire to counter the overall US military capability and weaken the space-enabled advantage of US conventional forces. After the Chinese ASAT test launch in 2007, the Air Force Space Command recognized that space superiority is essential to winning a war (Zhang 2011). The primacy of space control was also strengthened when the US extended the space-related agency branch by establishing the United States Space Force (USSF) in 2019. The USSF is tasked to defend and protect US interests in space, deter aggression in, from, and to space, and organize, train, and equip space operations (Air & Space Forces Magazine 2020).

New Pattern of Space Race

The situation between China and the US leads us to ask the most critical question: whether there is an ongoing space race and what patterns differ from the previous space race. Those who believe there is no space race today argue that growing international cooperation surpasses the logic of competition in space. Moreover, they claim that there is no substantive danger; hence, it is nothing but a self-fulfilling prophecy (Cross 2019). Although it is not wholly wrong to describe that there has been close cooperation among spacefaring nations, the author reckons it is quite a denial since China and the US are heavily militarizing space and not in a position to cooperate. Citing Hickman (2019), space races are still races despite their differences in goal or intensity, just like no two arms races or crises need to be alike.

In addition, officials from both states share the same perception regarding the situation. China National Space Administration (CNSA) Director Zhang Kejian said that China aims to build a research station at the moon's south pole and realize manned lunar exploration in ten years (Xinhua 2019). Vice President Mike Pence firmly stated that they are engaged in a space race with China. Upon the competition on the moon, he also noted that "the first woman and the next man on the moon will be both American, launched by American rockets, and from American soil" (The White House 2019).

Summarizing Lele's (2013) words, the Cold War and the current space race are different because the investment in space technology by the US and USSR back then was only to balance and monitor each other's nuclear assets. Furthermore, the quest for scientific and technological development was greatly overlooked by the ambition to gain the symbolic impact of space achievements (Gorman and O'Leary 2007). Meanwhile, the current space race is not only about security; it also involves important shifts concerning how they value science and technology, which are valuable for military power but also help to enhance relative international prestige—an essential prelude to boosting economic growth (Hickman, 2019).

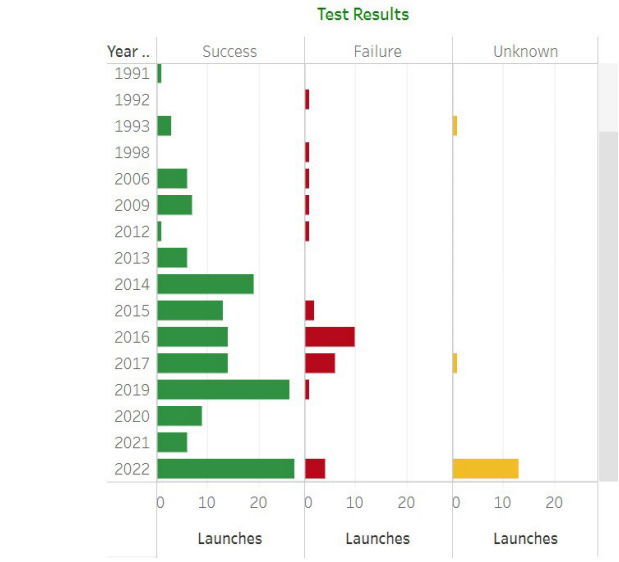
North Korea's Pressing Threat

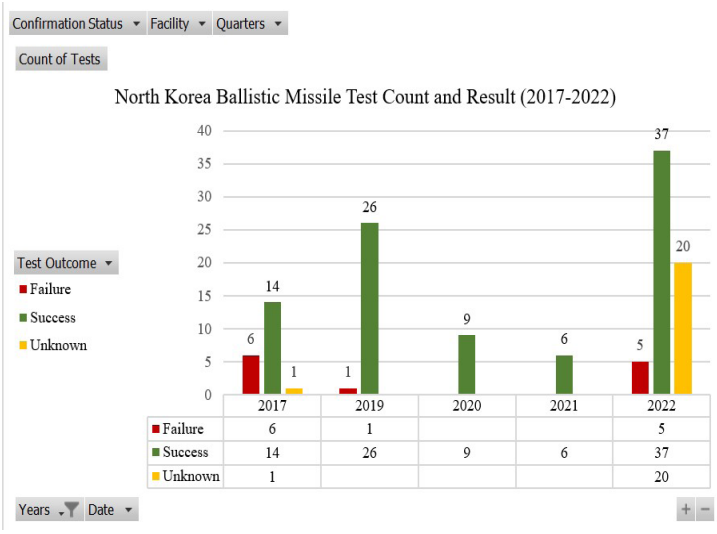
Perhaps the most pressing threat felt by South Korea comes from North Korea's nuclear weapons. Being an isolated state, arms expansion can provide a strong regional presence and deterrence. North Korea considers missile programs the foundation for its national defense and the ultimate symbols of scientific nationalism. Space programs enjoy a large portion of funding from the government since they are also part of the effort to sustain the doctrine of building a "strong and prosperous country" (Lele, 2013). The investment in space should be seen in conjunction with the military influence on North Korean policymaking. North Korea takes full advantage of the dual-use nature of space technology, making it almost impossible to separate its space and missile programs.

Woo (2022) found that Kim Il Sung's initial vision was to build North Korea's industrial economy. Since then, North Korea has associated atomic energy with economic efficiency, a powerful modality for state survival. Subsequently, an emerging *juche* or self-reliance ideology emerged in North Korea around the 1960s. It became the core slogan of atomic energy and nuclear development (Howell 2020). In 1980, Kim Il Sung affirmed the importance of nuclear power plants to support the self-reliant socialist regime (Woo 2022). The same year, North Korea initiated the Korean Committee of Space Technology, which is responsible for RnD, satellite manufacture, and launch (Lele, 2013). However, it was officially terminated and replaced by the National Aerospace Development Administration (NADA) as its official space agency in 2013.

Before the agency's establishment, the 7th session of the 12th Supreme People's Assembly had enacted the Law on Space Development, which is meant to be the foundation of [sic] *peaceful development of space programs* (Pearlman, 2014). Nonetheless, the data curated by NTI (2013) finds that except in 2018, North Korea carried out 125 ballistic missile tests from 2017-2022. This figure surpassed the number of tests conducted from 1984 to 2016, with only 97.

Figure 1.
North Korea Ballistic Missile Test Results





Source: Nuclear Threat Initiative (2023)

South Korea's *Middlepowermanship* in Dealing with Space Threat

Managing the Space Race's Impact on the Korean Peninsula

South Korea-US alliance expands its scope of cooperation to adapt to the changing nature of the security landscape. For instance, the 4th ROK-US Space Policy Dialogue in 2021 resulted in two countries pledging to strengthen cooperation in space at all levels and take action against emerging space threats (Lee 2021). However, South Korea's alliance with the US does not equal completely abandoning its relationship with China (Lee 2021). During the White House Summit 2021, South Korea affirmed that the relationship with both countries is equally important (Kuhn 2021). As a functional middle power, South Korea is trying to maintain its autonomy and relevancy by engaging both sides in the most niche issues that concern its security—space threats and challenges.

For instance, South Korea has carefully resisted the proposal to form trilateral relations with the US and Japan and the invitation to participate in the QUAD. Even in sensitive issues such as the deployment of THAAD, the Moon administration also carefully tried to maintain a balanced position between the US and China. President Moon has made several attempts to settle the disagreement over the THAAD. For instance, South Korea dispatched Lee Hae-chan as the President's special envoy to Beijing to improve the bilateral ties between the two countries (Han, 2019). It was followed by the South Korean Foreign Minister's announcement regarding the "Three Nos": no additional THAAD deployment, no use of further missile-defense systems, and no military alliance between Korea-US-Japan (Han 2019; Watanabe 2018). The restoration of the South Korea-China relationship culminated in President Moon's first state visit to China on December 13, 2017, to rebuild trust and lift the economic sanctions in light of the THAAD deployment (Han 2019).

South Korea as Bridge-Building Pivot

South Korea's balanced relations with the US and China serve a greater purpose: handling North Korea. Although South Korea has allied with the US, a good relationship with China is still

very important since China shares close political, economic, and geographic ties with North Korea. South Korea strategically positions itself as a bridge-building pivot whose role is to facilitate effective negotiation, state-to-state cooperation, and niche diplomacy. For instance, South Korea invited the US and China to multilateral forums such as the Six-Party Talks. The talks were initiated in 2003 to denuclearize North Korea; however, they were deemed to have failed after North Korea's abrupt withdrawal in 2009 (Hur 2018). After taking office, President Moon thus designed South Korea to be a bridge-building pivot by setting up a new series of negotiations. 2018-2019 marked the most fruitful and substantial diplomatic series between the two Koreas and other countries (Kyu 2018). This series of negotiations and talks resulted in a satisfying improvement as North Korea had no recorded ballistic missile test (see Figure 1).

Another effort made by the Moon administration is to resume the Inter-Korean Summit after a decade of diplomatic setbacks due to conservative presidents' policy from 2008-2017. In 1998, President Kim Dae-jung took office and initiated the Sunshine Policy as a rapprochement and appeasement toward North Korea, emphasizing dialogue and cooperation. The most important principle of this policy was flexible dualism, where they prioritize easy tasks, economics over politics, non-governmental organization over government, and give-first-take-later (Lee and Moon 2016). The first Inter-Korean Summit took place in 2000 and was carried on by his successor, President Roh Mo-hyun (2003-2008) (Kyu 2018). These liberal-leaning presidents believe prioritizing politics over the economy would only create temporary improvements since it is very volatile. The Sunshine Policy, hence, tried to promote economic exchanges and cooperation regardless of the military and political provocation. It resulted in rapid inter-Korean trade growth, supported by the establishment of the Kumgang Tourist Project (2002) and Kaesong Industrial Complex (2004) (Lee and Moon 2016).

However, inter-Korean relations deteriorated after presidents from conservative parties assumed the role. President Lee Myung-bak (2008-2013) emphasized "principled engagement," which made denuclearization a prerequisite for economic aid for North Korea. President Park Geun-hye (2013-2017) even unilaterally

shut down the symbol of inter-Korean cooperation, the Kaesong Industrial Complex (Lee and Moon 2016). President Moon is the first to reopen the initiative for the inter-Korean Summit. The April 2018 Summit resulted in the historical Panmunjom Declaration for Peace, Prosperity, and Unification of the Korean Peninsula, underscoring the commitment to open a new era of reconciliation, peace, and prosperity (Ministry of Foreign Affairs 2018).

Following the first summit, the second Summit was held in May 2018 to reaffirm both sides' commitment to the swift implementation of the Panmunjom Declaration. Before this Summit, the China-North Korea Summit also took place on May 7. Furthermore, the South Korea-China-Japan Summit, the meeting between Chairman Kim Jong Un and Secretary Mike Pompeo, and a telephone conversation between President Moon and President Trump happened on May 9. This dialogue series served as a stepping stone to the historic DPRK-US Summit in Singapore, which concluded in a joint statement to build a new relationship for peace and prosperity. The joint statement also underscored North Korea's progress toward denuclearization, as stated in the Panmunjom Declaration (Inter-Korean Summit Preparation Committee 2018)

President Moon emphasized "putting South Korea in the driver's seat" (Kyu 2018) despite its status as a middle power. Even during his presidential campaign, he already stated that it is not desirable to see South Korea take the back seat while watching the US and China decide their fate. He wishes for South Korea to take the lead in navigating the security dilemma in the Korean Peninsula. Aside from the Inter-Korean Summit, President Moon's administration also facilitated the historical 2019 Koreas-US DMZ Summit. The Summit was held because the North Korea-US summit in February 2019 in Hanoi did not produce satisfactory results. The Summit initiated by South Korea is thus meant to continue the discussion in hopes of fruitful results (Al Jazeera 2019).

South Korean Civil Space Programs: Alternative Options to Dealing with The Security Dilemma

This section will explore how South Korea develops and uses its civil space program for peaceful purposes. The key takeaway is that South Korea is prioritizing its civil space programs to improve the quality of life of its citizens instead of using them for military purposes. Otherwise, it would exacerbate the regional tension and increase the gravity of the space threat in the Korean Peninsula. In short, this article sees Moon Jae-in's outlook on developing space programs as a safe middle power approach amid the security dilemma.

South Korean Civil Space Programs under Moon Jae-in

In 2018, the government announced the "Third Basic Plan for the Promotion of Space Development, 2018-2022," aimed to improve public safety and quality of life by implementing "challenging but reliable" space development. The plan mapped out four strategic goals for the next five years (An 2020). First, the plan focuses on developing the indigenous launch capabilities—the KSLV-II to place a satellite into low-Earth orbit and advance the satellite application service and development in South Korea. President Moon said that the development of KSLV-II will be the foundation for South Korea's future space exploration project (Park 2021). Building domestic launch capabilities is related to the plan's second goal: to continue the lunar exploration project. The first step in ensuring and verifying the feasibility of space exploration will be conducted by South Korea's first lunar orbiter, the Korean Pathfinder Lunar Orbiter (KPLO), known as Danuri (KARI, 2021d). KARI noted that moon exploration would help develop strategic and advanced space technologies. Hence, successfully orbiting the KPLO means enhancing deep space exploration missions and supporting the domestic space industry to accelerate and generate new job opportunities. KARI also estimated KRW 3.8 trillion worth of tangible/intangible value from the lunar exploration (KARI 2021b).

South Korea's determination to improve the quality of life through space technology is expressed through the plan's third goal, building the Korean Positioning System (KPS). KPS is expected

to provide a stable positioning, navigation, and timing (PNT) service so that South Korea does not have to depend entirely on foreign positioning systems such as the Global Positioning System (GPS) (An 2020; Choi et al. 2020). Only four countries/regions, including the US, Russia, the EU, and China, own and operate their global navigation satellite system. Meanwhile, India and Japan have also built regional navigation systems (RNS). KPS is intended to be an RNS covering the Asia-Oceania region and is planned to fully operate in 2039 (Choi et al. 2020). KARI said that the KPS is developed to strengthen the existing GPS service by providing a more precise and reliable satellite navigation system, such as reducing the error range from ten meters to one (An, 2020). The Ministry of Science and ICT (2022) noted that a high-precision PNT information system is essential to sustain the fourth industrial revolution. In South Korea, PNT information is needed for various services such as self-driving cars, urban air mobility, mobile networks, take-off and landing, smart ports, and smart farming. Therefore, interference, such as broken signals, should be mitigated at all costs.

Building the Space Economy in South Korea

The fourth goal of the plan is to start a gradual transition from government-led to private-sector-led activities to help flourish innovation in the space industry (An 2020). Schwab (2016) argues that the world is going toward the fourth industrial revolution, characterized by the omnipresence of technology as the primary determinant of progress. To answer the fourth industrial revolution challenges, President Moon offered 'innovation-driven growth' as the central theme for economic growth (Kim and Choi 2019). South Korea thus launched the Innovative Platform Program (IPP) as a comprehensive framework for future industry ecosystems and infrastructure. Although the IPP framework does not mention space programs, leading industries such as smart farms, future vehicles, and smart cities, as well as the strategic investment area of the data economy, are impossible to obtain without a solid and advanced space-related infrastructure such as the positioning system, internet satellite, and other components to launch these tools and missions to space. Therefore, it boils down to the need to establish a reliable space industry and infrastructure.

Graphic 3.
South Korea's Innovative Platform Program Framework

Dimensions	Contents
Four Policy Directions	• Innovation of the Social System • Innovation of Science & Technology • Innovation of Human Resources • Innovation of Industries
Three Strategic Investment Areas	• Data Economy (Block Chain & Sharing Economy) • Artificial Intelligence • Hydrogen Economy
Eight Leading Industries	• Smart Factory • Smart Farm • Smart City • Future Vehicle • Fintech • New Energy • Bio-Health • Drone
Source: [Korean Government, 2018].	

Source: Kim & Choi (2019)

The next step South Korea must address is how to turn its space industry into a competitive one. Jung (2022) argues that while the *chaebols* (huge family-owned conglomerates) have helped provide the foundation for industrialization, there is a changing landscape where the industry is becoming more welcoming towards small private companies. This implies that while the *chaebols* have been and will continue to be the primary drivers of the South Korean economy, the key to thriving amid the competitive fourth industrial revolution will rest on the proliferation of small corporations. In resonance with the 'innovation-driven growth' goal, President Moon thus supports the rise of start-ups, which is expected to spur job opportunities and create a more balanced growth away from the *chaebol* domination (Klingler-Vidra and Pardo 2019).

With rapid change happening in the industry, the government is transitioning to private-sector-led activities. Regarding readiness, the South Korean space ecosystem is specialized and can be divided into upstream and downstream sectors. The upstream comprises the provision of technology such as R&D, component suppliers, and insurance. Meanwhile, the downstream encompasses the utilization of space technology such as satellite broadcast services, satellite communication, Earth observation, and so on. The OECD has also assessed that South Korea has the capabilities needed

in most space industry segments. They are able to manufacture light, medium, and heavy systems for national and international customers (ESPI 2021).

Additionally, the Korea Space Survey of 2019 recorded that the overall scale of the space industry in South Korea has grown, with the number of active players increasing from 93 to 449 within a decade (Shin 2021). Nonetheless, Kim and Choi (2019) argue that the Korean government should allow easier access for new businesses to enter the market to foster technological innovation. The government has tried to enact a regulatory sandbox where new goods and services are tested before launching on the market. Along with this deregulation, Shin (2021) noted that leading venture capitalists are also competing to develop an unexplored rocket launcher market section. In his observation, although start-ups in the space industry are still in their early days, they have started to build their business models for a wide variety of space technologies (Shin 2021).

Conclusion

President Moon was very optimistic with his claim that "the Korean Space Age is approaching." However, South Korean space development becomes more noteworthy if we look at it against the backdrop of the regional security situation in the Korean Peninsula—the space race between the US and China and North Korea's nuclear threat. Studies on South Korean space programs during President Moon's administration arrived at a similar conclusion that the non-military aspect will be its cornerstone. Nevertheless, they failed to explain why focusing on the space economy is only a necessity instead of a choice due to systemic pressure. This article completes the gap by explaining why South Korea deals with the space threat by employing middlepowermanship instead of arming itself. During President Moon's term, this was notably exhibited by creating a balanced engagement with the US and China to help accelerate the progress of peace with North Korea.

Due to this commitment to be the bridge-building pivot in deciding the future of the Korean Peninsula, its space programs should also embody such spirits. South Korea successfully transitioned

to Space 2.0 by focusing on civil space programs such as space applications and launch capabilities. Coincidentally, the rising demand for technology and information prompted President Moon to adjust the industrialization policy. The space economy is a fundamental foundation for progress in many strategic areas. The government thus eased the regulation, inviting more private actors to participate in the space industry. To conclude, South Korea's choice to foster its civil space program and the space economy signifies its strategic move in navigating the security dilemma in the Korean Peninsula. Instead of building arms capability and militarizing its space programs, South Korea safely developed them without provoking others.

About the Author

Himmalia Dewi Alya Rahmah earned her bachelor's degree in international relations from the Faculty of Political Science at Universitas Airlangga. She currently works as the lecturer assistant for the Department from which she graduated. Her research interests are ASEAN and East Asian politics and security. Himmalia Dewi Alya Rahmah can be reached via email at himmarahma08@gmail.com.

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