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Navigating the Arctic-Space Nexus: Norway's security in a new era of great power rivalry

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Takeaways

- **As great power rivalry intensifies, maneuvering Arctic tensions is likely to remain a challenge for Norwegian security- and defense in the coming years. Changed Arctic dynamics also happen to coincide with developments in another domain, outer space, similarly impacted by great power competition.**
- **Norwegian space efforts are closely tied to its location, and the country's northernmost regions hosts a significant portion of its space infrastructure. Likewise, the nation's long coastline has provided several opportunities for the space sector. Previous and current projects demonstrate the significance of security considerations in Norway's approach to space.**
- **Norway's status as a small state has been central to its approach to the space domain. Norway considers it necessary to leverage relevant assets in a bid to make itself attractive for international cooperation and valuable within NATO, and over time, space capabilities have emerged as a means to do so.**
- **The interconnection between the High North and space reinforces the usefulness of this approach – the Northern Flank is already strategically important to NATO, and possessing valuable space assets in the High North will make it more critical for NATO and the US to defend Norwegian territory in a conflict scenario.**

Scholars have frequently drawn a parallel between outer space and the Arctic. For example, a recurring analogy refers to the governance of the two regions. Another resemblance lies in the perception of both space and the Arctic as peaceful and cooperative areas at one end, and as growing in strategic value and laden with opportunities for conflict at the other. In any case, the two domains are inherently interconnected owing to the utility of space systems in remote and climatically harsh areas, as well as the advantages of greater access to polar orbit. Equally as important, however, is the proliferation of great power rivalry in the Arctic and in space.

As the prevalence of rivalry continues to affect both domains, it becomes timely to examine how increased space competition might impact the Arctic in general, as well as smaller Arctic states in particular. In this paper, Norway will serve as an example of one such state. With this in mind, this *Insight* has a twofold goal: first, to shed light on the strategic significance of the Arctic, space, and the interconnectedness between them. Second, to examine Norway's approach to space and the challenges and opportunities it faces when navigating the nexus between space, security, and the High North.

INTRODUCTION

Roughly a decade ago, the US National Security Space Strategy described space as "congested, contested and competitive" for the first time. In the midst of growing geopolitical tensions, this string of words has been reiterated time and again by policymakers, industry representatives and scholars alike. Several developments have made the three C´s increasingly reflective of the contemporary space domain, such as the surge in commercial space actors and the proliferation of counterspace weapons. More specifically, NATO now considers space an operational domain, Space Commands have been incorporated into many national defense structures and space is featured more prominently in security- and defense doctrines. In a more general sense, these changes relate to how nations fundamentally understand space – oftentimes portrayed as a dichotomy between either "sanctuary" or "battlefield"-thinking. The inherent idealism of sanctuary sentiments in a domain of enduring military relevance is comparable to many perceptions of the Arctic. In fact, notions of the strategic importance of the Arctic are frequently accompanied by descriptions of the region as uniquely cooperation-oriented and conflict-free. Analogously, many of the drivers that have intensified space competition – such as improved accessibility and great power rivalry – also affects security in the Arctic. Another similarity often emphasized in research relates to the governance of both regions. In addition to sharing certain characteristics, the convenience of satellite technology in remote and climatically harsh areas means that there is an intrinsic connection between space and the Arctic.

While great powers have traditionally dominated the space domain, small Arctic states have always needed to navigate between the interests of their major peers. One example of this is Norway, historically making up NATOs northern flank and, until recently, one out of only five NATO-countries bordering Russia. A small but strategically located Arctic state, Norway is affected by competition in both space and in the Arctic. Still an emerging field, however, little scholarly attention has been given to the potential consequences of space competition on a small Arctic state and similarly, few have examined how the increased strategic importance of space might affect the Arctic in general. Therefore, this *Insight* has two main goals: first, to shed light on the strategic signi-

ficance of the Arctic, space, and the interconnectedness between them. Second, to examine Norway's approach to space and the challenges and opportunities it faces when maneuvering the nexus between space, security, and the High North. It begins by outlining the present state of the Arctic and recent developments, focusing on the US, Russia, China and Norway. Then, it sheds light on the increasing relevance of outer space for security and defense purposes and provides an overview of relevant Arctic space activities. Lastly, it looks at Norway's approach and discusses the material - as well as the opportunities for future research - in the concluding remarks.[1]

RIVALRIES IN THE ARCTIC

Arctic security has been a vibrant scholarly topic for decades, generating a multitude of ideas about the prospects of both conflict and peace in the region. For instance, a considerable body of literature has portrayed the Arctic as a uniquely low-tension region unfettered by conflict elsewhere, commonly referred to as "Arctic exceptionalism". At the same time, scholars have argued that the Arctic is an area of competition where national efforts are primarily driven by strategic concerns.[2,3] In any case, the Arctic eight have generally pursued cooperation despite conflicting interests on other matters. This is underpinned by the multifaceted nature of Arctic governance, where structures like the United Nations Convention on the Law of the Sea (UNCLOS) and the Arctic Council have helped encourage regional collaboration.[4] As of now, however, Russia's invasion of Ukraine and the following suspension of cooperation across numerous issues has made it hard to picture the Arctic as shielded from great power politics. Regardless of how the war may affect the Arctic in the coming years, trends indicating increased regional military activity and -presence precede the invasion. In the following section, this Insight will offer a brief overview of the state of the Arctic and recent events, with a focus on Norway and major powers Russia, China, and the US.

The Arctic has occupied a peripheral position within the larger context of US security policy, demonstrated by a lack of investments, infrastructure, and military presence in the region.[5] Today, several advancements suggest that the US is, at least partially, moving away from its historically modest posture. First, Arctic issues have been featured more frequently in both hearings and official documents: over the past couple of years, the US has updated and issued Arctic strategic documents at multiple branches of the military, including the Air Force, the Navy and Marine Corps, the Army, and the Coast Guard.[6] Second, the US has undertaken various measures to increase its military presence in the region. This includes the re-establishment of the 2nd Fleet in 2018, intended to strengthen US involvement in the Arctic and North-Atlantic. Within the same year, USS *Harry S Truman* became the first US aircraft carrier to enter the Arctic Circle since the nineties as part of Trident Juncture.[7,8] More recently, US aircraft *RC-135 Rivet Joint* conducted a surveillance mission over the Barents Sea in late 2022. A few days later, the first live fire of the *Rapid Dragon* weapon system was demonstrated by the US and Allies in Northern Norway and this June, *USS Gerald R. Ford* trained with Norwegian forces in Arctic waters.[9,10,11] These are just a handful of incidents that align with the larger trend of increased regional US activity in air and on sea. The US has also strengthened bilateral defense cooperation with Nordic countries through a set of agreements that will improve the US' ability to operate in the Arctic.[12] Logically, increased US activity should be expected in the foreseeable future as Sweden and Finland join NATO.

The US' increased Arctic focus must be considered relative to the perceived military and strategic supremacy of Russia in the region. Although de-prioritized after the disintegration of the Soviet Union, Russia resumed its emphasis on Arctic investments in the 2000s. In particular, the past decade has witnessed the modernization and construction of military infrastructure along several parts of the Russian Arctic.[13,14] Two decisive factors typically explain Russia's regional military interests. The Kola Peninsula hosts the Northern Fleet alongside Russia's sea-based nuclear deterrent, and the need to protect and sustain this second-strike capability largely shape the country's strategic imperatives. Additionally, the Arctic

is considered to play a key role in Russia's ambitions of re-establishing its great power status.[15] Despite its full-scale invasion of Ukraine, Russia does not appear to have lost sight of its Arctic objectives. In 2022, *Ural* became the latest addition to the country's continuous modernization of its nuclear icebreaker fleet.[16,17] Satellite imagery from the same year also revealed that several Arctic runways and radar bases have been improved over the last 12 months.[18] This spring, Russia amended its Arctic Policy, emphasizing "national interest" whilst omitting previous references to Arctic cooperation.[19] Furthermore, exercises and drills in the region have persisted amidst setbacks in Ukraine. Russia's increasingly offensive posture in the Arctic has alarmed US and Norwegian officials, with the commander of the 2nd Fleet affirming that the Arctic is now Russia's "number one priority".[20]

Adding to the complexity of Arctic geopolitics is the emergence of China. Proclaiming itself a near-Arctic state in 2018, China's ambitions in the region have preoccupied scholars and policymakers alike. Although legitimate interests in scientific research is frequently portrayed as a core component of its Arctic objectives, the dual-use potential of China's research activities and infrastructure investments blurs the distinction between civilian and military ventures. Likewise, non-military investments help normalize and reinforce regional influence.[21] Multiple scholars have also stressed the strategic dimension of China's Arctic pivot. For example, Doshi, Dale-Huang and Zhang find that Chinese documents describes the Arctic as a new strategic frontier and a potential site of military competition.[22] Along the same lines, Wright argues that China's strategy is driven by its goal of employing "… the region as strategic space from which to threaten the security of North America…", while Burke and Jahara claim that the polar zones represent one of several regions where China can pursue its power-as-resources approach.[23,24] While other assessments are far less alarmist, China's presence has been closely monitored by Arctic nations for the past years, and concerns about the Arctic being a part of China's broader effort to expand its global reach has bred suspicion. The US has been particularly skeptical, dismissing Chinas self-proclaimed status as a near-Arctic state and highlighting the risks associated with its increased engagement in the region.[25,26] For the Arctic eight, the potential for deepening Sino-Russian relations is an additional concern arising from China's regional involvement. Despite a resilient partnership, it is essential to emphasize that China and Russia do not always see eye to eye. For example, Russia initially appeared hesitant to China's polar endeavors, demonstrated by its opposition to China's application for observer status in the Arctic Council. Currently isolated in the Arctic after its attack on Ukraine, however, cooperation with China seems necessary to safeguard its interests in the region.[27] Decades of Chinese investments in the Russian Arctic have also paved way for the strengthening of Arctic ties. The most recent result of regional Sino-Russian efforts includes a MoU on maritime security opening for joint military exercises, as well as plans to create a joint organization for the development of the Northern Sea Route (NSR).[28,29]

With half of its territory in the Arctic and a shared border with Russia, changes in how the Arctic is perceived and approached greatly impact Norwegian security. Since the end of the Second World War, Russia has been the key determining factor for Norwegian security policy considerations, and the small states´ approach to its eastern neighbor is customarily described as "twofold": at one end, Norway's NATO-membership and close bilateral relationship with the US provides the basis for deterring Russia. At the other end, cultivating cooperation and restricting Allied activity in Norway's northernmost regions forms the bedrock for reassuring Russia.[30,31] Put plainly, balancing deterrence and reassurance is a fine-tuned strategy for maintaining low tensions whilst displaying resolve. When criticizing Norwegian policy, official Russian rhetoric often revolves around the country's facilitation of NATO and US activity near its borders. As Finnish and eventually Swedish NATO-membership adds fuel to accusations of Arctic encirclement, similar allegations should be expected to flourish.[32] Alongside other factors, complex regional security dynamics has led Norway to officially recognize the High North as its most important strategic area.[33,34]

The above allows for one broad, but important point: aggravated great power rivalry in general - and the deterioration of Russia's relations with the West in particular - have increased the vulnerability of the Arctic. This heightens escalation risks and raises the likelihood of the Arctic becoming a pawn in a broader conflict.[35] Under the current international situation, maneuvering Arctic tensions is likely to remain a challenge for Norwegian security- and defense in the coming years. Added sources of concern arise from issues such as the possible effects of climate change on regional resource competition, managing the interests of other Arctic newcomers (Like India and the EU) and preserving the traditionally beneficial modes of governance. Of most relevance here, however, is the fact that changed Arctic dynamics coincide with related developments in another domain: outer space.

THE ARCTIC AND OUTER SPACE

Against the backdrop of heightened geopolitical tensions, states are increasingly coming to recognize the military-strategic importance of outer space. This does not represent a drastic shift from the past by itself: space has been militarized since the beginning of the first Space Age, featuring prominently in Cold War competition. The combination of renewed great power rivalry and the development of more complex technology, however, has altered the dynamics of contemporary space-related defense and security. In the US, developments such as the creation of the Space Force and the re-establishment of the Space Command are telling of a strategic reorientation.[36,37] Furthermore, rhetoric has changed, illustrated by a stronger tendency towards depicting space as a war-fighting domain in official US documents and doctrine. Russia and China are aware of the nexus between space and military services as well, perceiving space as a domain that enables the pursuit of asymmetric advantages, facilitates competition with stronger adversaries, and that permits the targeting of US vulnerabilities. Although US dominance in space persists, the rapid expansion of Chinese capabilities represents a real challenge to the current state of affairs. For the time being, Russian capability development has fallen short of initial predictions: nevertheless, the country has already demonstrated that it is in possession of most relevant counterspace weapons. This, in combination with an inclination towards military aggression, creates additional concerns for space security overall.[38,39]

When linking space and great power politics to the Arctic, two main facts deserve special mention. First, harsh environmental conditions have restricted Arctic infrastructure development, making space services and -capabilities especially useful - by limiting the need for physical infrastructure, space systems offer a feasible way of fulfilling regional surveillance and communication needs.[40] Second, Arctic locations offer certain intrinsic advantages for space activities because northern latitudes are optimal for accessing and retrieving data from satellites in polar orbits. These orbits provide near-global coverage, rendering them particularly suitable for reconnaissance and earth observation satellites.[41] In sum, Arctic regions both benefit from and provide good grounds for space activities. Consequently, it is hardly a surprise that several Arctic nations are taking steps to close gaps in Arctic awareness by utilizing space services.

Echoing the above, Norwegian space efforts are closely tied to its location, and the country's northernmost regions hosts a significant portion of its space infrastructure. To start, SvalSat, the largest satellite ground station for communicating with satellites in polar orbits, is located on Svalbard. Exempting TrollSat, The Kongsberg-owned station is the only ground station with the ability to deliver all-orbit-support - i.e. the capability to spot polar-orbiting satellites at every revolution.[42] The Archipelagos geostrategic location, as well as legal disputes regarding its maritime zones, makes Svalbard a sensitive area. In addition, the idea of Svalbard as demilitarized territory has become widespread following restrictions in military activity in accordance with the 1920 Svalbard Treaty. These restrictions have fueled frequent Russian accusations of treaty violation, repeatedly dismissed by Norwegian authorities. In 2021, foreign ministry spokeswoman Maria Zakharova explicitly criticized SvalSat, suggesting that the station can serve dual-use purposes.[43] The Globus radars in Vardø, a city in Norway's norther-

nmost county, have been subject to similar skepticism from Russia. The radars are a collaborative effort between the US Space Force and the Norwegian Intelligence Service and, alongside other tasks, the system collects SST-data through surveilling, monitoring, and characterizing space objects.[44,45] Russia suspects that Globus is a part of the US missile defense system and has signaled its dissatisfaction with the system on several occasions. This culminated in 2018, when Russian bombers simulated an air attack against the radars. More recently, military official Rudskoy voiced his conviction that the stations' ability to monitor Russia is being enhanced, and that its missile defense capabilities are also being modernized.[46]

Norway also houses an active rocket launch site and -range on Andøya in Nordland. Beginning with the launching of sounding rockets for scientific purposes in the 60s, the site has expanded its area of activity to include testing of missile- and rocket technology for the defense industry, including foreign military authorities.[47,48] In 2021, Norway placed itself in the running to become the first country to launch satellites from the European mainland when the government approved of funding Andøya Spaces' establishment of a Spaceport on the island.[49] According to the Norwegian Minister of Defense, Allies have already shown interest in using the Spaceport for "responsive space" capabilities, referring to the ability to rapidly replace damaged satellites in a conflict scenario.[50] Similarly, being able to launch new satellites that fulfill previously uncovered needs will provide Norway with a key advantage. Moreover, Andøya Spaceport represents one step towards autonomous space access and will, once functional, become another key strategic asset in Norway's space catalogue.

Furthermore, the Norwegian government aims to bolster its space defense cooperation with the US. A timely example of the latter is the Space Norway-led (a government-owned company) *Arctic Satellite Broadband Mission* (ASBM), a joint effort between the US Department of Defense and the Norwegian Ministry of Defense.[51] The project will provide broadband to the Arctic through two satellites constructed by Northrop Grumman, planned for launch in 2023. Once finalized, ASBM will strengthen NATOs ability to maneuver in the Arctic regions, from Alaska to the High North. Within the Norwegian context, a project that involves US payloads being carried by satellites that are operated by a Norwegian company is unparalleled.[52,53] In terms of security, however, this design could produce different effects. On one hand, few nations will be tempted to interfere with a US venture below the threshold of war. On the other hand, possessing shared capacities with the US might make Norway more vulnerable in the event of a full-blown conflict.

Both Norway and the US have responded to the need for increased Arctic connectivity with additional national projects. In 2020, the Norwegian Defense Research Establishment (FFI) announced the launch of a project for exploring tactical SATCOM in the Arctic through a nanosatellite.[54] A year later, the US Department of the Air Force allocated 50 million USD to the testing of polar satellites. Rather than building or owning them, the department intends to lease services from commercial partners.[55] In 2022, the department partnered with OneWeb and Starlink to examine the prospects for integrating military networks with commercial communication satellites, improving its Arctic communication capability.[56] This is in line with the objectives of the US *Department of the Air Force Arctic Strategy,* which maintains that the Space Force will modernize assets and "… work closely with allies, partners, and the private sector to establish mutually beneficial relationships that address common goals in space and the Arctic region".[57]

Likewise, Russia is striving to address gaps in its regional domain awareness. The country started improving its satellite communications capacity in 2019 with the launch of Meridian-M, intended to eventually replace older systems. Two years later, Russia launched the first satellite of the Arktika-M network, with a second satellite planned for 2023. The Arktika system will enable Russia to monitor the NSR and the North Pole-area at continuous 15-minute intervals. Furthermore, three radar surveillance satellites are planned for 2024, and four dual-use communications satellites for 2026.[58,59] Like Norway, Russia has built key space infrastructure in the Arctic. The *Plesetsk* cosmodrome in Archangelsk oblast is particu-

larly advantageous to Russian space efforts, and the *Nudol* anti-satellite missile system, first trialed in 2015, has been tested from *Plesetsk* several times. Russia finally confirmed the operationality of the *Nudol* system in 2021 with its first direct-ascent anti-satellite (DA-ASAT) test, generating thousands of larger pieces of space debris. *Nudol* is thought to ultimately become integrated with a weapons program focused on destroying adversary's satellites in a conflict scenario.[60,61] In addition to new satellite systems and ASAT-tests, Russia's Space Agency Roscosmos revealed last year that it is exploring the possibility of establishing a space tracking station at Svalbard.[62]

Just like with broader Arctic matters, space is becoming another likely venue for Sino-Russian partnership. While announcing greater cooperation on the NSR this March, Russia proclaimed that it is also seeking to partner with China for access to satellite data as sanctions have limited access to foreign satellite imagery.[63] China's regional space initiatives have not been limited to bilateral cooperation, however. In 2016, the People's Republic established its first overseas satellite ground station at the Esrange Space Center in Sweden. The *China Remote Sensing Satellite North Polar Ground Station* is controlled by the Chinese Academy of Sciences and operated by the Swedish Space Corporation.[64] Although China has stated that the Esrange receivers are used solely for civilian purposes, experts quickly begun voicing concerns about its dual-use nature. In 2020, the Swedish Space Corporation declined to renew contracts with China over these concerns. The expiry date of the contracts and whether China still has access to the station is uncertain.[65,66] Other Chinese efforts include plans to launch an imaging satellite for monitoring shipping routes in the Arctic, bolstering safety of navigation across the NSR.[67]

There are many ways to interpret these developments. An optimistic assessment will stress that improving Arctic communication and infrastructure is a legitimate and necessary way of addressing regional challenges. Moreover, China's presence is still modest, the progress of Russian projects appears tardy, and US initiatives have a great deal of development left. A more pessimistic evaluation will highlight that more activity in general, combined with the dual-use properties of space assets, contributes to uncertainty that in turn heightens the risk of inadvertent conflict. When tied to an already sensitive region, efforts to prevent spiraling could also be less productive. Either way, Norway is a small state facing great power interests in its immediate neighborhood in tandem with the advancement of space competition: what challenges and opportunities are Norway presented with when navigating the nexus between space, security, and the High North?

NORWAY, SPACE AND THE HIGH NORTH

The preceding sections of this paper has outlined Russian, Chinese, American, and Norwegian strategic interests in space and in the Arctic, recent developments, and the interconnectedness between the two domains. It has also shown that Norway's room for maneuver is shaped by its proximity to the interests of great powers. This chapter will focus more explicitly on Norway by discussing the challenges and opportunities that the country faces when navigating the nexus between space, security, and the High North. To examine this subject, the next sections will begin by introducing current Norwegian satellite projects and relevant policies. Then, it will explore the Norwegian approach to space, finishing with a discussion of new challenges and opportunities within the realm of Arctic space.

Parallel to how Norway's Arctic location has shaped its space efforts, the nation's long coastline has provided several opportunities for the space sector. With jurisdiction over vast maritime areas comes a need for greater maritime situational awareness to counter illegal fishing, pollution, and sovereignty violations. Currently, Space Norway is building a new radar satellite system, MicroSar, with the first satellite scheduled for launch in 2025. This satellite will be part of a constellation enabling near real-time surveillance through high-resolution photography of vast areas. Like Norway's older satellites, MicroSar is equipped with Automatic Identification Signals (AIS) receivers and will mainly provide services pertaining to vessel detection. However, whereas AIS-receivers

rely on data provided by the ships (that are sometimes incentivized to relay faulty data) the MicroSar system will be able to locate vessels regardless of AIS.[68,69] Other projects include *Arctic Ocean Surveillance* (AOS), financed by the Norwegian Ministry of Trade, Industry and Fisheries and the fully commercial, Kongsberg-led *NX3* initiative. Propelled by the Norwegian- and European Space agency, AOS will consist of three satellites intended to be operational by 2026. NX3 is anticipated to be up and running by 2027, with the Norwegian Armed Forces as its main customer.[70] Norway has employed microsatellite technology for years to surveil maritime areas in the High North and ultimately build a national space capability, a pattern that persists in newer projects.[71] Dual-use assets also account for a significant part of Norway's military space ventures.[72]

The Norwegian government's key objective for public space activities is for them to "function as a tool to advance national interests". In the Norwegian Space Policy, this objective is broken down into multiple broader goals: first, that space activities encourage growth, profitable businesses, and employment. Second, that the sector fulfills important societal needs. Third, that it safeguards critical infrastructure and lastly, that space activities secure Norwegian security-, defense- and foreign policy interest in space.[73] The Policy underlines that it aims to ensure that Norway occupies a key role among Allies in the development of space infrastructure, as well as in leveraging the space sector for supporting military capabilities in the Arctic and the High North.[74] In parallel, The Norwegian Space Agency states that it intends to turn Norway into the leading European space nation in the Arctic.[75] Within the sphere of national security, Norway's Long-Term Defence Plan emphasizes that it will strengthen the Armed Forces' access to national, space-based maritime surveillance. The Armed Forces' access to satellite communications will also be boosted to improve communication, control and command in the High North. The document underscores the feasibility of cross-sectoral cooperation, and stresses that national space -capabilities, -services and situational awareness are meaningful contributions to NATO.[76] Additionally, Norway is working on a new space law, with the one currently in place dating back to 1969.[77] The law will factor in national security interests along with international legal obligations.[78]

Current satellite projects and relevant national policies demonstrate the significance of security considerations in Norway's approach to space. By fulfilling national needs through improving surveillance and communication in the High North and across its territorial waters, space utilization has emerged as a method of addressing the nation´s unique geographical challenges. In turn, this has led to a substantial reciprocity between Norway's security- and space policies. Furthermore, Sundlisæter argues that Norway´s "… aim to use all its space capabilities as security policy tools to increase its status as a space power and reinforce its relations with its closest allies has emerged as an explicit strategy…".[79] Such goals are perhaps the most apparent in Norway´s cooperative efforts with the US, and are reflected in the proclaimed goal of benefitting NATO in both space and the Arctic. The general trend of increased civilian-military- and commercial cooperation in space has also influenced Norwegian policies and its capability development.

Finally, Norway's status as a small state has been central to its approach to the space domain. Being a small state, Norway considers it necessary to leverage relevant assets in a bid to make itself attractive for international cooperation and valuable within NATO. Over time, space capabilities have emerged as a means to do so, and Norway has taken advantage of this by focusing on adding value to the Alliance. The interconnection between the High North and space reinforces the usefulness of this approach for two main reasons. First, the Northern Flank is already strategically important to NATO. Second, possessing valuable space assets in the High North - as space becomes more strategically significant - makes it more critical for NATO and the US to defend Norwegian territory in a possible conflict scenario. Taking all of this into consideration, Norway's space efforts and goals should be understood as a small state´s attempt at fine-tuning strategy to its defense needs.

In light of the above, what challenges and opportunities are Norway faced with when na-

vigating the nexus between space, security and the High North? The most immediate challenge is for Norway to avoid unnecessary escalation by effectively signaling the defensive purposes of its space activities to Russia. This is also related to a mid-term issue: comprehending the specific challenges that might arise from conducting space activities in, to and from the Arctic regions. When maneuvering space and the Arctic, Norway should devise a method of minimizing risk to prevent heightening tensions. For example, it is essential to evaluate the scale of US and NATO involvement in space initiatives that is necessary to deter Russia, *without* triggering escalation dynamics. In the longer term, Norway needs to assess the possibility of entrapment as well as the probability of losing important assets following attacks or capture. SvalSat, Globus, and eventually Andøya Spaceport are strategically valuable assets that it would be sensible to attack, or seize control of, in the event of an extensive conflict. In addition, attacks on Allied space assets covering the High North area could severely impair Norway's access to Allied reinforcements.

On a lighter note, the growing importance of space also presents Norway with several opportunities. For instance, Norway has effectively branded itself a "peace nation" (although much debated) and is likely to consider its influence in space as positive. The national attributes that follow are frequently accompanied by a perception of Norway as extraordinarily good at keeping tensions low. In turn, such attributes can give Norway added legitimacy in multilateral space fora and strengthen its appeal as a partner for cooperation. At the same time, Norway has not been at the forefront of promoting a norms-based approach to space: becoming a member of UN *Copuos* as late as 2017, several other nations have instead spearheaded the UN-track. This could, of course, be linked to the fact that Norway has a relatively high stake in space and, consequently, puts more at risk by investing too much effort towards regulatory matters. Improved access to satellite data is also vital to the planning and reception of Allied reinforcements, and bettering the ability to monitor strategically sensitive areas can lessen the chances of unwanted escalation by providing a more precise representation of events for all parties involved. Lastly, the space sector provides plenty of economic opportunities and could, for example, create positive ripple effects if job opportunities help attract more residents to Northern Norway, which struggles with out-migration. Because a more heavily populated North helps promote territorial integrity, reinforce sovereignty, and provide early warning purposes, this is crucial from a security perspective.

CLOSING REMARKS

The space domain is expected to play a more central role in future warfare. As adversaries bolster their capabilities whilst progressively incorporating space into their military doctrine and strategy, major space powers cannot risk falling behind. Additionally, some of the most space-capable countries happen to be Arctic (or self-proclaimed near-Arctic) nations that can benefit from the association between the region and space. As of now, the US, Russia and China have displayed a varying degree of interest in improving their Arctic space capacities: but despite the relatively limited developments, the potential for increased activity is very much present. In light of these new circumstances, Norway should be prepared for more space-related activity in the Arctic region in the coming years.

It is worth repeating once more that non-military reasons also explain the interconnectedness between space and the Arctic, and consequently the need for improved capabilities. At the same time, polar orbits are advantageous for reconnaissance satellites serving crucial military functions, such as gathering intelligence and monitoring enemy deployments. Norway is a small state with many important space assets, making great power rivalry in space acutely relevant for its security and defense. Furthermore, the Norwegian government is well-aware of the progressive coupling of security, defense, and space, and has – when faced with the challenges that emerge from this - opted for an approach to the domain that focuses on benefitting both Allies and national needs. Ultimately, this strategy should be interpreted as a reflection of Norway's small state status and a need to preserve flexibility of action.

In the interim, the most urgent challenge for Norway is assessing its ability to signal its motives. Ensuring transparency (within the limits of feasibility) when communicating motives and intentions is the most efficient way of avoiding misunderstandings that could trigger escalation. Given the dual-use nature of space technology, managing this in the space domain is likely to demand extra diligence. These dynamics point to a well-known hurdle in international politics: managing the security dilemma. Regardless of how this is addressed in time to come, the risks arising from great powers showing more interest in both the Arctic and space should not be overlooked. As is the case for other states, Norway too needs to assess its space dependency. Vulnerabilities emerge as critical functions are dependent on space systems, making it crucial that they function properly and that an adequate degree of redundancy is maintained. Lastly, it is entirely possible for Norway to promote its space interests in international fora to a greater extent than it currently does. Such efforts could, for example, help foster a greater understanding of challenges and opportunities that are unique to the Arctic region within the context of outer space utilization.

This *Insight* has shed light on the strategic significance of the Arctic, space, and the connection between the two. It has also concentrated more specifically on Norway by discussing its approach to space and the challenges and opportunities it faces when navigating space, security, and the High North. To finish, the challenge of differentiating necessary developments from concerning ones should not hinder embarking on this topic - more research is needed on both the possible consequences of space competition on small states, and how the increased strategic importance of space might affect the Arctic region. For example, possible topics for future research include the role of the Arctic in China´s space endeavors, the environmental effects of Arctic space ventures, as well as a theory of spacepower that deals specifically with the polar regions.

END NOTES

1 I would like to thank Hans Morten Synstnes and Per Høyland for constructive feedback and frequent discussions.
2 Hoogensen Gjørv, G., & Hodgson, K. K. (2019). Arctic Exceptionalism' or 'comprehensive security'? Understanding security in the Arctic. *Arctic Yearbook*. Available at: https://bibsys-almaprimo.hosted.exlibrisgroup.com/permalink/f/14fha3m/TN_cdi_cristin_nora_10037_17564
3 Østhagen, A. (2022). Unboxing Arctic Security Relations and Dynamics. In Andrey Mineev, Anatoli Bourmistrov and Frode Mellemvik (eds), *Global Development in the Arctic: International Cooperation for the Future* (pp. 47-62). Routledge.
4 Sacks, B. J., Stephenson S. R., Pezard, S., Tingstad, A. & Sørensen, C. T. N. (2021). Exploring Gaps in Arctic Governance: Identifying Potential Sources of Conflict and Mitigating Measures. Santa Monica, CA: *RAND Corporation*. Available at: https://www.rand.org/pubs/research_reports/RRA1007-1.html.
5 Bye, H. (2020). Leaving its Arctic reluctance behind: the reemergence of U.S. security policy focus towards the European High North and its implications for Norway, *The Polar Journal,* 10(1), pp. 82-101, DOI: 10.1080/2154896X.2020.1757831. p. 86.
6 Congressional Research Service. *Changes in the Arctic: Background and Issues for Congress* (R41153), prepared by Ronald O'Rourke. Washington: Library of Congress, March 24, 2022. Available at: https://sgp.fas.org/crs/misc/. p. 45.
7 Depledge, D. (2021). NATO and the Arctic. *The RUSI Journal, 165*(5-6), pp. 80–90. https://doi.org/10.1080/03071847.2020.1865831, p. 86.
8 Humpert, M. «U.S. Navy Ups Arctic Engagement, Establishing Temporary Presence in Iceland». High North News, Sep. 27, 2019. Available at: https://www.highnorthnews.com/en/us-navy-ups-arctic-engagement-establishing-temporary-presence-iceland (Accessed May 13, 2023).
9 Nilsen, T. «US aircraft flew Norwegian airspace on surveillance mission outside Russia's nuclear sub bases». The Barents Observer, Nov. 2, 2022. Available at: https://thebarentsobserver.com/en/security/2022/11/us-surveillance-aircraft-flew-over-norwegian-airspace-after-mission-outside-russias (Accessed May 26, 2023).
10 Nilsen, T. «US Special Forces will showcase first ever live fire of airdropped cruise missiles off Northern Norway». The Barents Observer, Nov. 5, 2022. Available at: https://thebarentsobserver.com/en/security/2022/11/us-special-forces-will-showcase-first-ever-live-fire-rapid-dragon-airdropped-cruise (Accessed May 11, 2023).
11 Edvardsen, A. «US Gerald R. Ford Carrier Strike Group to Operate in the High North». High North News, May 26, 2023. Available at: https://www.highnorthnews.com/en/us-gerald-r-ford-carrier-strike-group-operate-high-north (Accessed August 14, 2023).
12 Edvardsen, A. «The Nordic Region Strengthens Double-Edged Defense Cooperation With the US». High North News, Feb. 17, 2023. Available at: https://www.highnorthnews.com/en/nordic-region-strengthens-double-edged-defense-cooperation-us (Accessed May 11, 2023).
13 Depledge, D. (2019). Russia's Military Posture in the Arctic Managing Hard Power in a 'Low Tension' Environment. *Chatham House Research Paper*, (June 2019). Available at: https://www.chathamhouse.org/sites/default/files/2019-06-28-Russia-Military-Arctic_0.pdf (Accessed May 10, 2023), p. 4.
14 Kjellén, J. (2022). The Russian Northern Fleet and the (Re) militarisation of the Arctic. *Arctic Review on Law and Politics*, *13*, pp. 34–52. Available at: https://www.jstor.org/stable/48710657
15 Nicole Bayat Grajewski, N. B. (2017). Russia's Great Power Assertion: Status-Seeking in the Arctic, *St. Antony's International Review* 13(1), pp. 141-163. Available at: https://www.jstor.org/stable/26229126 (Accessed May 4, 2023).
16 Boulègue, M. (2022). The militarization of Russian polar politics. *Chatham House* 9(11). Available at: https://www.chathamhouse.org/sites/default/files/2022-06/2022-06-06-militarization-russian-polar-politics-boulegue_0.pdf (Accessed May 12, 2023) p. 5.
17 Humpert, M. «Russia Launches New Nuclear Icebreaker as it Looks East for Northern Sea Route Shipping». High North News, Nov 23, 2022. Available at: https://www.highnorthnews.com/en/russia-launches-new-nuclear-icebreaker-it-looks-east-northern-sea-route-shipping (Accessed May 12, 2023).
18 Dean, S. & Walsh., N. P. «Russia's militarization of the Arctic shows no sign of slowing down». CNN, Dec 22, 2022. Available at: https://edition.cnn.com/2022/12/21/europe/russia-arctic-military-intl/index.html (Accessed May 12, 2023).
19 Humpert, M. «Russia Amends Arctic Policy Prioritizing 'National Interest' and Removing Cooperation Within Arctic Council». High North News, Feb 23, 2023. Available at: https://www.highnorthnews.com/en/russia-amends-arctic-policy-prioritizing-national-interest-and-removing-cooperation-within-arctic (Accessed May 12, 2023).
20 Humpert, M. «Arctic Now Number One Priority for Russia, Norway Looking to Allies for Increased Deterrence». High North News, Feb 21, 2023. Available at: https://www.highnorthnews.com/en/arctic-now-number-one-priority-russia-norway-looking-allies-increased-deterrence (Accessed May 12, 2023).
21 See e.g. Doshi, R., Dale-Huang, A., & Zhang., G. (2021) «Northern expedition: China's Arctic ambition and activism.» *Foreign Policy at Brookings*. Available at: https://www.brookings.edu/research/northern-expedition-chinas-arctic-activities-and-ambitions/, Koivurova, T., & Kopra, S. (Eds.) (2020). Chinese Policy and Presence in the Arctic. Brill Nijhoff., and Funaiole, M. P., Hart, B., Bermudez Jr., J. S. & Powers-Riggs, A. (2023) «Frozen Frontiers: China's Great Power Ambitions in the Polar Regions». *CSIS.* Available at: https://features.csis.org/hiddenreach/china-polar-research-facility/.
22 Doshi, R., Dale-Huang, A., & Zhang., G. (2021) p. 1.
23 Wright, D. C. (2018) The Dragon and Great Power Rivalry at the Top of the World: China's Hawkish, Revisionist Voices Within Mainstream Discourse on Arctic Affairs. Canadian Global Affairs Institute. Available at: https://www.cgai.ca/the_dragon_and_great_power_rivalry_at_the_top_of_the_world%3E p. 2.
24 Burke, R. & Jahara., M. (2021). The Polar Trap: China, Russia, and American Power in the Arctic and Antarctica. T*he Journal of Indo-Pacific Affairs,* 4, pp. 36-66. Available at: https://www.airuniversity.af.edu/JIPA/Display/Article/2820739/the-polar-trap-china-russia-and-american-power-in-the-arctic-and-antarctica/ p. 54.
25 Wu, F. (2022). Shaping China's Engagement with the Arctic: Nationalist Narratives and Geopolitical Reality, *Journal of Contemporary China,* DOI: 10.1080/10670564.2022.2124353, pp. 13-14
26 Sengupta, S., & Myers, S. L., «Latest Arena for China's Growing Global Ambitions: The Arctic». New York

Times, 24 May 2019. Available at: https://www.nytimes.com/2019/05/24/climate/china-arctic.html (Accessed May 9, 2023).
27 Wu., p. 7.
28 Humpert, M. «Putin and Xi Discuss Further Deepening of Arctic Partnership». High North News, 23 March, 2023. Available at: https://www.highnorthnews.com/en/putin-and-xi-discuss-further-deepening-arctic-partnership (Accessed May 9, 2023).
29 Nilsen, T. «FSB signs maritime security cooperation with China in Murmansk». The Barents Observer, 25 April 2023. Available at: https://thebarentsobserver.com/en/security/2023/04/fsb-signs-maritime-security-cooperation-china-murmansk (Accessed May 9, 2023).
30 Østhagen, A., Sharp, G. L., & Hilde, P. S. (2018) At Opposite Poles: Canada's and Norway's approaches to security in the Arctic, The Polar Journal, 8(1), pp. 163-181, DOI: 10.1080/2154896X.2018.1468625
31 Bye, H. (2020) p. 94.
32 Wilhelmsen, J. & Hjermann, A. (2022). Russian Certainty of NATO Hostility: Repercussions in the Arctic. *Arctic Review on Law and Politics*. 13. pp. 114-142. DOI: 10.23865/arctic.v13.3378
33 To be clear, this is not synonymous with the Arctic as Norway generally differentiates between the Arctic and the High North. The former is defined as "everything north of the Arctic Circle", while the latter usually refers to the more populated regions of Svalbard and Northern Norway, along with the land and maritime areas in the European Arctic.
34 Østhagen, A. (2021) «Norway's Arctic policy: still high North, low tension?». *The Polar Journal*, 11(1), 7pp. 5-94. DOI: 10.1080/2154896X.2021.1911043, p. 77.
35 Østhagen, A. «For Norway, the risk of conflict in the Arctic has increased». The Arctic Institute, 20 Oct 2022. Available at: https://www.thearcticinstitute.org/norway-risk-conflict-arctic-increased/ (Accessed May 10, 2023).
36 Harrison, T., Cooper, Z., Johnson, K., & Roberts, T. G. (2017). *Escalation and deterrence in the second space age*. Rowman & Littlefield. Available at: https://www.csis.org/analysis/escalation-and-deterrence-second-space-age.
37 Lambakis, S. (2022). Space as a warfighting domain: Reshaping policy to execute 21st century spacepower, *Comparative Strategy,* 41(4), pp. 331-369, DOI: 10.1080/01495933.2022.2087419
38 Pollpeter, K. (2021). China's Role in Making Outer Space More Congested, Contested, and Competitive. *China Aerospace Studies Institute.* Available at: https://www.cna.org/archive/CNA_Files/pdf/chinas-role-in-making-outer-space-more.pdf
39 Bingen, K., Johnson, K., & Young, M. (2023). Space Threat Assessment 2023. *Center for Strategic and International Studies.* Available at: https://www.csis.org/analysis/space-threat-assessment-2023
40 Bjørkum, K. (2021). Arctic Space Strategy: The US and Norwegian Common Interest and Strategic Effort. *Strategic Studies Quarterly,* 15(20), pp. 89-112. Available at: https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-15_Issue-3/Bjorkum.pdf, p. 88.
41 Pozdnakova, A. (2022). Space Infrastructure for a Sustainable Arctic: Opportunities and Challenges of Spaceport Development in the High North. *The Arctic Institute.* Available at: https://www.thearcticinstitute.org/space-infrastructure-sustainable-arctic-opportunities-and-challenges-spaceport-development-high-north/ (accessed May 12, 2023).
42 Dobson, J. «Norwegian minister of Trade and Industry, Torbjørn Røe Isaksen, visited Kongsberg Satellite Services' ground station at Svalbard and highlighted the strategic importance of the station, both for Svalbard as a community and for Norway». Kongsberg Magazine, February 2018. Available at: https://www.kongsberg.com/kmagazine/2018/2/arctic-space/ (Accessed May 12, 2023).
43 Nilsen, T. «Moscow dissatisfied with Norwegian navy visit to Arctic archipelago». The Barents Observer, 12 Nov 2021. Available at: https://thebarentsobserver.com/en/security/2021/11/moscow-dissatisfied-norwegian-navy-visit-norwegian-arctic-archipelago (Accessed May 19, 2023).
44 Haugli, B. «Byen med Norges fremste bombemål føler seg lite verdt». Dagsavisen, 20 Jan 2023. Available at: https://www.dagsavisen.no/nyheter/2023/01/20/byen-med-norges-fremste-bombemal-foler-seg-lite-verdt/ (Accessed May 19, 2023).
45 Etterretningstjenesten. «Oppgradering av GLOBUS-systemet». Etterretningstjenesten, 10 June 2022. Available at: https://www.etterretningstjenesten.no/aktuelt/aktuelt/oppgradering-av-globus-systemet (Accessed August 28, 2023).
46 Nilsen, T. «B-52 on Arctic mission with Norwegian fighter jets». The Barents Observer, 4 June 2020. Available at: https://thebarentsobserver.com/en/security/2020/06/b-52-arctic-mission-norwegian-fighter-jets (Accessed May 19, 2023).
47 Meld. St. 9 (2020-2021) *Mennesker, muligheter og norske interesser i nord,* p. 109.
48 Meld. St. 10 (2019–2020) *Høytflyvende satellitter – jordnære formål — En strategi for norsk romvirksomhet,* p. 33.
49 Fallmyr, S. S., & Karlsen, A. K. «Jobber på spreng for å bli Europas første romhavn». NRK, 8 Jul 2022. Available at: (https://www.nrk.no/nordland/andoya-spaceport-bygges-for-at-norge-skal-vinne-romkapplopet-1.16031606 (Accessed May 19, 2023).
50 Elvevold, E. B. «Forsvarsministeren mener Andøya Spaceport kan bli en «strategisk viktig ressurs». E24, 10 May 2020. Available at: https://e24.no/teknologi/i/50KMom/forsvarsministeren-mener-andoeya-spaceport-kan-bli-en-strategisk-viktig-ressurs (Accessed 16 June 2023).
51 Meld. St. 10, pp. 76-77.
52 Edvardsen, A. «Taking Network Coverage in the Arctic to New Heights." High North News, 22 Sep 2022. Available at: https://www.highnorthnews.com/en/taking-network-coverage-arctic-new-heights (Accessed May 16, 2023).
53 Space Norway. «Important test of the ground stations for ASBM". 29 June 2022. Available at: https://spacenorway.no/en/important-test-of-the-ground-stations-for-asbm/ (Accessed May 19, 2023).
54 Norwegian Defence Research Establishment. «Norway to develop nanosatellite for military tactical communication in the Arctic". Available at: https://www.ffi.no/en/news/norway-to-develop-nanosatellite-for-military-tactical-communication-in-the-arctic (Accessed 1 June, 2023).
55 Liquori, B. & Ferguson, I. «How the US Space Force plans to improve Arctic communication».C4ISRNET, 14 Jul 2021. Available at: https://www.c4isrnet.com/opinion/2021/07/14/how-the-us-space-force-plans-to-improve-arctic-communication/ (Accessed 1 June, 2023).
56 Tirpak, J. A. «A Space Internet Experiment for the Arctic is Among VanHerck's Priorities», Air & Space Forces Magazine, 5 May 2022. Available at: https://www.airandspaceforces.com/a-space-internet-experiment-for-the-arctic-is-among-vanhercks-priorities/ (Accessed 1 June, 2023).
57 United States Air Force, «Department of the Air Force, Arctic Strategy». July 21, 2020, p 8.
58 Kjellén, J. (2022) p. 46.

59 Humpert, M. «Russia continues to develop its Arctic infrastructure detailing plans to place nine additional dual-purpose satellties into polar orbits.» High North News, 4 Nov 2022. Available at: https://www.highnorthnews.com/en/russia-plans-launch-nine-polar-orbiting-satellites-monitor-arctic-2026 (Accessed May 16, 2023).
60 Kelley, B. W. and Chow, B. G. «Lessons to learn from Russia's Nudol ASAT test». Spacenews, 17 Nov 2021. Available at: https://spacenews.com/op-ed-lessons-to-learn-from-russias-nudol-asat-test/ (Accessed May 16, 2023).
61 Nilsen, T. «Russia hit own satellite with missile from Plesetsk». The Barents Observer, 16 Nov 2021. Available at: https://thebarentsobserver.com/en/security/2021/11/russia-hit-own-satellite-missile-plesetsk (Accessed May 16, 2023).
62 Nilsen, T. «Russia considers establishing space tracking station at Svalbard». The Barents Observer, 13 Feb 2022. Available at: https://thebarentsobserver.com/en/security/2022/02/russia-considers-build-space-tracking-station-svalbard (Accessed May 16, 2023).
63 Humpert, M. «Lacking Own Satellite Coverage Russia Is Looking to China For Northern Sea Route Data». High North News, 30 Mar 2023. Available at: https://www.highnorthnews.com/en/lacking-own-satellite-coverage-russia-looking-china-northern-sea-route-data (Accessed 1 June, 2023).
64 Robinson, J. «Arctic Space Challenge for NATO Emerging from China's Economic and Financial Assertiveness». JAPCC, Sep 2020. Available at: https://www.japcc.org/articles/arctic-space-challenge-for-nato-emerging-from-chinas-economic-and-financial-assertiveness/ (Accessed 2 June, 2023).
65 Jåma, S. & Olofsson, D. «Swedish Security Experts: We're too naive about China». SVT Nyheter, 15 Jan 2019. Available at: https://www.svt.se/nyheter/utrikes/swedish-security-experts-we-re-too-naive-about-china (Accessed 1 June, 2023).
66 Funaiole, M. P., Hart, B., Bermudez Jr., J. S. & Powers-Riggs, A. (2023) «Frozen Frontiers: China's Great Power Ambitions in the Polar Regions». *CSIS.* Available at: https://features.csis.org/hiddenreach/china-polar-research-facility/
67 Humpert, M. «China to Launch Satellite to Monitor Arctic Shipping Routes». High North News, 8 Dec 2020. Available at: https://www.highnorthnews.com/en/china-launch-satellite-monitor-arctic-shipping-routes (Accessed 3 June, 2023).
68 KSAT. «KSAT adds new satellite to its multi mission vessel detection service KSAT, available at: https://www.ksat.no/no/news/news-archive/2022/ksat-adds-new-satellite-to-its-vessel-detection-service/ (Accessed 1 June, 2023).
69 Jarstad, L. «Bygger nytt satelittsystem for overvåking av havområder». Finansavisen, 28 Aug 2022. Available at: https://www.finansavisen.no/nyheter/teknologi/2022/08/26/7920412/bygger-nytt-satellittsystem-for-overvaking-av-havomrader?zephr_sso_ott=z60mOT (Accessed 1 June, 2023).
70 Hofoss, E. «Det nye mulighetsrommet». FFI, 16 June 2023. Available at: https://www.ffi.no/aktuelt/feature-artikler/det-nye-mulighetsrommet (Accessed 26 June, 2023).
71 Sundlisæter, T. «Space Power in the High North—Perspectives from the Kingdom of Norway». (PhD thesis, University of St Andrews, 2022), https://research-repository.st-andrews.ac.uk/, p. 114
72 Ibid., p. 12.
73 Meld. St. 10, p. 8.
74 Ibid., p. 52.
75 Norwegian Space Agency. «Norsk romstrategi 2020. Strategiske satsinger og prioriteringer utarbeidet av Norsk Romsenter for perioden 2014-2020.» Available at: https://www.romsenter.no/content/download/10559/75595
76 (Prop. 14 S (2020) *Evne til forsvar – vilje til beredskap. Langtidsplan for forsvarssektoren,* p. 109 and p. 13.
77 Ellingsen, B. «Lager ny norsk romlov». Norsk Romsenter, 28 Jan 2019. Available at: https://www.romsenter.no/Aktuelt/Siste-nytt/Lager-ny-norsk-romlov (Accessed 20 Jul 2023).
78 Personal communication with Hans Morten Synstnes.
79 Sundlisæter, T. "Space Power in the High North—Perspectives from the Kingdom of Norway", p. 171.

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