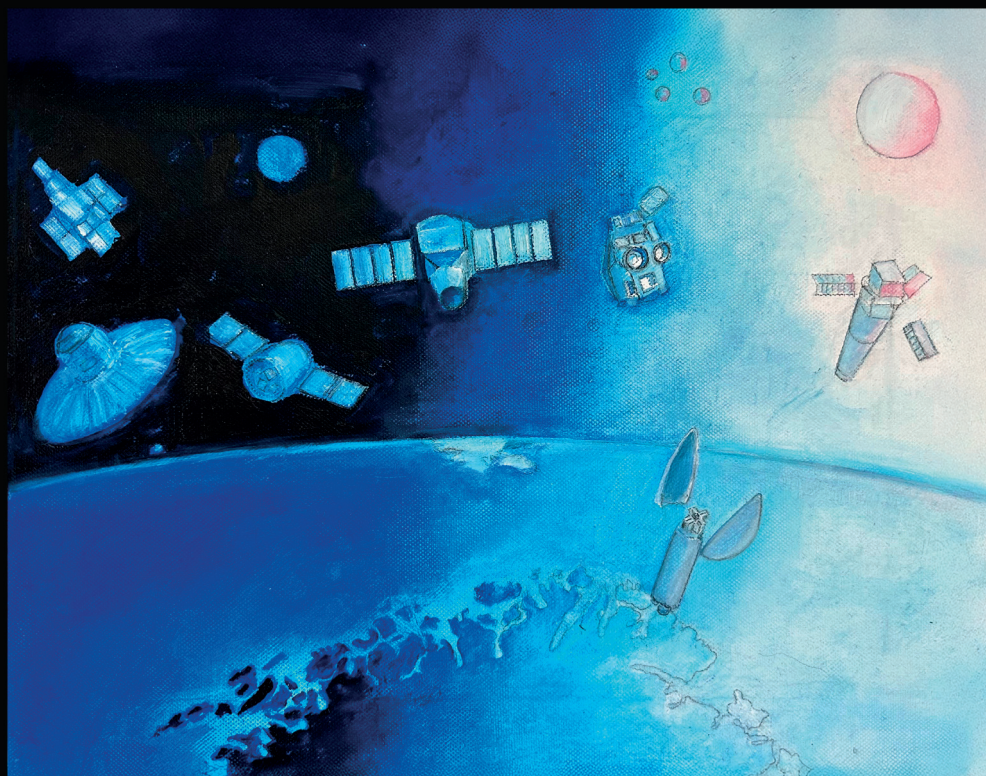


Space Power in the High North

Norway's Arctic Space Strategy (Unscripted)

Tale Sundlisaeter and Gjert Lage Dyndal



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For Josephine

Innhold

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Introduction

Norway has a long, but little-known history within the field of space research and as a contributor as a space power. The early history goes back to ground-based research on space phenomena and subsequently as part of the US networks from the early days of the Cold War. Gradually, Norway developed some space capabilities within research communities, but foremost with an important ground-infrastructure. During the first decade of the 2000s, the Norwegian Government matured ideas of developing a full, national value-chain for space competence and industry. Following a pivotal military space strategic review in 2014/2015, the Norwegian Armed Forces developed a function-oriented management structure and incorporated space as a new military domain. National security implications of space were finally incorporated into Norwegian space policy, and Norway has since developed a wide range of national space capabilities, all of which support the nation's defence and security objectives. Since the launch of the first, national surveillance satellite in 2010, Norway has continued to develop national competence, infrastructure and satellites. Single satellites are now being integrated into grids of surveillance satellites, and communications satellites for the High North and national launch capabilities have been put into operation. Norway, a small state but with a unique geographical position, a strong economy and substantial technical communities, is about to become a small, yet considerable Space Power.

This book is based on the research conducted by Tale Sundlisaeter for her PhD Degree in International Relations at the University of St Andrews and incorporates historical and contemporary developments in Norway within a security policy and strategic framework. It is constructed around the chronological and thematic examination of Norwegian military space activity and its role in Norwegian defence and security policy. This book tells the story of Norway's rise as a space power until the present day, with pointers to the future.¹

¹ Tale Sundlisaeter, "Space Power in the High North: Perspectives from the Kingdom of Norway," PhD diss., University of St Andrews, 2022.

To understand Norway's current position, ambitions, and possible future developments, it is important to acknowledge the historical development and trends that have influenced and defined where we are today.

Part I describes the formative years of Norwegian military space activity, dating back to the late 1800s. It takes us through the cold war, where Norway tried to adopt to international developments, ranging from laws and agreements to foreign policy issues. In the aftermath of US President Reagan's 1983 'Star Wars' speech, Norwegian parliamentarians refused to acknowledge the concept of Norwegian military space activity, as the term 'military space' developed a politically sensitive and negative connotation. From the 1970s until circa 2000, Norway's military space activities were carried out in a seemingly ad hoc and improvised manner, although Norway consistently developed indigenous military satellite-based capability, principally centred around the need for surveillance technologies. The national official space policy was industry oriented and did not explicitly address national space development and activity in a military context.

Furthermore, Part I covers the period from the late 1990s until 2014, where Norway continued to conduct military space activity with no clear organisational approach or overarching strategy for the Armed Forces. Progressively throughout the 2000s, the Armed Forces focused increasingly on satellite communications (SATCOM). This part covers key points such as Norway's decision *not* to develop a national military surveillance satellite in 2004, *not* to develop a national SATCOM capability but to partner with Spain in 2009 and the launch of Norway's first national satellite: the civilian, dual-use Automatic Identification System (AIS) satellite in 2010. It portrays the first comprehensive, albeit unsuccessful, attempt to establish a national military space strategy in 2011 and the launch of Norway's second AIS satellite in 2014. With that, the stage was set for things to come in 2014 and beyond.

Part II covers the period from 2014 until present day. Major changes took place from 2014, where the short period 2014–15 may be described as a 'pivotal year' in the history of Norwegian military space activity as Norway, under the auspices of Chief of Defence Admiral Haakon Bruun-Hanssen (Navy), undertook its first comprehensive military space strategic review and wilfully decided that space was essential for the Norwegian Armed Forces. This part of the book provides a detailed presentation of the review and an in-depth bureaucratic analysis of how Norway thinks

about organising its national military space affairs, as well as portraying the subsequent establishment of the Norwegian Ministry of Defence's (MoD) Program Space from circa 2015 until 2020. Finally, this part describes how the Norwegian Armed Forces chose to organise their newfound space investment under the Chief of the Norwegian Intelligence Service (NIS) from 2020.

Part III too covers the time frame from circa 2014 up to the present day. However, here we discuss the key activities and capability developments that took place in parallel with the bureaucratic processes within the MoD and the Norwegian Armed Forces during this time. It depicts how Norway rose as a space power, both in terms of capability development and how the country significantly developed its thinking on national security space affairs. Norway climbed the steps towards the apex of the 'Space Club' from the opportunistic to the inadequate and finally incorporated national military and security concerns into its overarching, national space policy.

Part IV is the final part of the book. Here, we review status and provide some future thoughts on where Norway is or may be heading, providing a forward-looking discussion on opportunities and challenges ahead.

The book has a geopolitical focus on the High North.² We have predominantly focused on the military use of satellites, particularly the intelligence, surveillance and reconnaissance (ISR) and communications functions, as opposed to positioning, navigation and timing (PNT), ground-based space surveillance activity and space domain awareness (SDA). This activity is examined within a framework of existing views on space power whilst considering Norway's security policy, including foreign and domestic affairs. Norway's military space activity over the course of nearly 80 years is traced through different historical eras. Until 2014, this activity was not formally considered or institutionalised in the Norwegian defence structure but was largely managed and conducted on an ad hoc basis. The book is therefore oriented around the military space *activity*, including capability development and organisation.

² 'The High North' is a notion that was taken into use by the Norwegian authorities in the 1970s. Whereas 'the Arctic' is understood in geographical terms, the High North is principally a political concept pertaining to areas of political priority. See Odd Gunnar Skagestad, *The 'High North': An Elastic Concept in Norwegian Arctic Policy*, (Fridtjof Nansens Institutt, 2010) 5–7. For background, motivation and a definition of the Arctic, see Tale Sundlisæter et al., "GNSS and SBAS System of Systems: Considerations for Applications in the Arctic" (Stanford University, 2012).

The ambition of the research has been to examine the role of Norwegian military space activity in Norway's defence and security policy, considering the complex intersection of rapid technological change and the transforming geopolitical landscape. National space capability development has emerged as a strategic asset in Norwegian alliance policy. It reflects the relations between Norwegian policymakers and practitioners, and contributes to obscuring the nation's traditional, strong separation of civil-military affairs. Norwegian military space activity demonstrates the existence of two competing, unofficial space doctrines, which is incoherent with the nation's military joint doctrine. In fact, it shows there is a significant detachment between the nation's actual military space activity and how space is addressed in Norwegian military joint doctrines which questions the purpose of these doctrines entirely.

The northern frontier: Norway's geopolitical landscape and strategic theatre

More than 80 percent of Norway's maritime territory is situated north of the Arctic Circle; the High North is Norway's most critical area of responsibility. In this area, Norway shares a nearly 200 km long land border with Russia, in addition to maritime borders in the Arctic Ocean and the Barents Sea. Norway's discovery of petroleum resources in 1969 and the introduction of the Exclusive Economic Zone (EEZ) in 1977 enriched the country tremendously and it became responsible for monitoring maritime areas five times the size of the Norwegian mainland.

Norway's surveillance mission includes monitoring fisheries and petroleum activities, in addition to the threat that dates to the onset of the Cold War when Russia established its strategic nuclear forces in Norway's immediate vicinity. In 1977, Norway established the Coast Guard and started to develop indigenous space capability for the Norwegian Armed Forces to use satellite-based capability to fulfil its surveillance and situational awareness requirements. Satellites have a unique capability to cover enormous maritime and land areas at high speeds, and by the first decade of the millennium, Norway had increasingly relied on satellite surveillance as a key defence research area to ensure that national decision-makers were well informed of activity in Norway's areas of interest. Although Russian



Figure 1. Norway's main areas of interest.³

behaviour has consistently demonstrated that it is in Russia's interest to maintain stability in the Arctic, in recent years Russia has modernised its strategic forces in the area, especially to compensate for its conventional inferiority in relation to the US. The Russian annexation of Crimea in 2014 was a turning point, upon which Norway thoroughly strengthened its surveillance mission and holistically assessed the role of satellites as key assets in its first line of defence and in reinforcing national and allied defence capability. Unquestionably, Russia's invasion of Ukraine in February 2022 further expanded Norway's surveillance requirements and prompted the Norwegian Government to further bolster its military space investments.

³ Rolf Tamnes et al., *Expert Commission on Norwegian Security and Defence Policy* (Forsvarsdepartementet, 2015), Figure 2, 15.

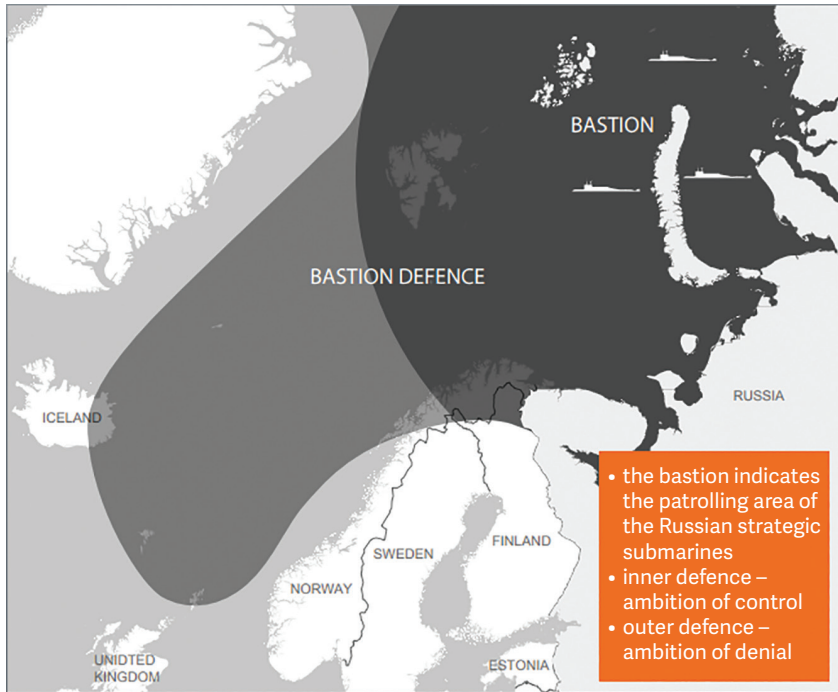


Figure 2. The Russian bastion and the patrolling area of Russian nuclear ballistic missile submarines (SSBN).⁴

Theoretical framework

As a structure and foundation for the empirical parts and in-depth discussions in the chapters of the book, this short introductory subchapter reviews existing debates and perspectives on space power which set the stage for the historical developments seen in Norway.

During the Cold War, military space power was largely reserved for a few nation-states.⁵ Although there is no consensus on the concept of space power and what it entails, it can be understood that space power relates to national security objectives and the military dimension.⁶ For the purposes of this research, this is how the concept should be understood. It originated in the US during the Cold War era, and several authors have claimed that

⁴ Tamnes et al., *Expert Commission on Norwegian Security and Defence Policy*, Figure 4, 21

⁵ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse* (2015).

⁶ While the concepts are related, space power differs from space security, which concerns international governance of the space environment: Michael Sheehan, "Defining Space Security," in *Handbook of Space Security*, ed. Kai-Uwe Schrogl (Springer Science+Business Media, 2015).

there is a lack of thought on the subject.⁷ In the 1970s, military leaders in the US addressed the military potential of space in securing the future of the nation, but the discourse was limited because it was politically inappropriate to openly advocate such views.⁸ In the late 1980s, the lack of thought on space power was attributed to humankind's limited military experience in the space domain and its status within the US national security community as a 'peaceful sanctuary' that was to be void of offensive military activity.⁹ In the 1990s, it was claimed that 'space power' lacked a binding concept to understand it fully. Military professionals remained 'less than enlightened on what space power is and does, how it works, and how it can and should function synergistically with other players in the joint military team.'¹⁰ The interplay between space and information and communications technology was now incorporated into the space power concept. In terms of 'space age information warfare', space systems were said to provide the most vital data for military effectiveness.¹¹

By the end of the millennium, it was still the case that '[e]xplanations of space power are nearly as varied as the authors and speakers that present them', and there was 'virtually no consensus' on what constituted space power. How to organise military space forces and define space power was a pressing issue that required addressing actors, capabilities, functions and purposes.¹² The concept known as 'network-centric warfare' (NCW) was coined,¹³ and space power was to 'explore the interconnectedness, indeed interdependence, of the different geographical environments. If a revolution

⁷ James E. Oberg, *Space Power Theory* (Government Printing Office, 1999); Peter Lang Hays, *Struggling Towards Space Doctrine: U.S. Military Space Plans, Programs, and Perspectives During the Cold War* (Fletcher School of Law and Diplomacy, Tufts University, 1994); Robert Frank Futrell, *Ideas, Concepts, Doctrine. Basic Thinking in the United States Air Force 1907-1960*, Vol. 1 (Air University Press, 1971), 549-50; David E. Lupton, *On Space Warfare: A Space Power Doctrine* (Air University Press, 1988); Peter L. Hays, "Spacepower Theory," in *Handbook of Space Security*, ed. Kai-Uwe Schrogl (Springer Science+Business Media, 2015).

⁸ Futrell, *Ideas, Concepts, Doctrine. Basic Thinking in the United States Air Force 1907-1960*, Vol. 1, 549-50.

⁹ Lupton, *On Space Warfare: A Space Power Doctrine*.

¹⁰ Colin S. Gray, "The Influence of Space Power Upon History," *Comparative Strategy* 15, no. 4 (1996): 307.

¹¹ Gray, "Influence of Space Power," 293, 99.

¹² Judson J. Jusell, *Space Power Theory: A Rising Star* (Air University, 1998), 27, <https://spp.fas.org/eprint/98-144.pdf>.

¹³ David S. Alberts, John J. Garstka and Frederick P. Stein, *Network-Centric Warfare: Developing and Leveraging Information Superiority* (Command and Control Research Program, 1999); In 2004, Berglund examined the applicability of NCW for smaller nations and accounted for Norwegian implementation within Norway's strategic environment. He introduced the Norwegian adapted terms 'Network-Based Defense' and 'Net-Centric Defense'. See Jan Berglund, "Network Centric Warfare: A Realistic Defense Alternative for Smaller Nations?" (Master's thesis, Naval Postgraduate School, 2004), xvii.

in military affairs was under way, it was noted that ‘most probably it is in spacepower.’¹⁴

By 2000, the role of space over the past 30 years had been viewed ‘with a degree of scepticism by most within the military community’ and ‘military commanders and defence departments, of whatever country’ had acknowledged at best that space was useful for intelligence and enhanced communications capabilities. At worst, they saw it as ‘fanciful’ and ‘wasteful’, and preferred to allocate their scant resources to ‘immediately useful projects’. Now, however, these sceptical views were increasingly being perceived as archaic and even the former ‘sceptics’ were starting to ‘appreciate the range of benefits which the utilization of space can bring to the military.’¹⁵

Commercial space capabilities became increasingly integrated into conceptions of space power. State and non-state actors could acquire commercial satellite imagery of progressively improving quality for their own purposes, increasingly closing the gap between civilian satellite remote sensing and military satellite reconnaissance.¹⁶ Now, ‘anyone’ could ‘distinguish between trucks and tanks, expose movements of large groups such as troops or refugees, and identify the probable location of natural resources.’¹⁷ In 2001, it was proclaimed that ‘Commercial space assets make all actors Space Powers,’¹⁸ and the concept of space power was overall receiving increased attention.¹⁹ The integration of traditional military functions on non-military (space) platforms was altering the notion of what space power is, who has it or who could obtain it.²⁰

In 2008, it was observed that several nations were ‘rushing’ to develop space capabilities, presumably civilian, dual-use capabilities that ‘will have profound effects on the balance of power.’²¹ Another writer in 2009 denounced the great powers’ space power discourse and argued that proliferating commercial space technologies brought about a variety of options

¹⁴ Colin S. Gray, *Modern Strategy* (Oxford University Press, 1999), 13.

¹⁵ Alasdair McLean, “A New Era? Military Space Policy Enters the Mainstream,” *Space Policy* 16 (2000): 244.

¹⁶ Jusell, *Space Power Theory: A Rising Star*, 23–24, 36; Oberg, *Space Power Theory*; John C. Baker, Ray A. Williamson, and Kevin M. O’Connell, *Commercial Observation Satellites: At the Leading Edge of Global Transparency*, ed. John C. Baker, Ray A. Williamson and Kevin M. O’Connell (RAND and ASPRS, 2001).

¹⁷ Ann M. Florini and Yahya A. Dehqanzada, “Commercial Satellite Imagery Comes of Age,” in *Intelligence and the National Security Strategist: Enduring Issues and Challenges*, ed. Roger Z. George and Robert D. Kline (Rowman & Littlefield Publishers, Inc., 1999).

¹⁸ M. V. Smith, “Ten Propositions Regarding Spacepower” (Master’s thesis, Air University, 2001), <https://apps.dtic.mil/sti/pdfs/ADA407810.pdf>.

¹⁹ John M. Logsdon, “Just Say Wait to Space Power,” *Issues in Science and Technology* 17, no. 3 (2001): 33.

²⁰ Brian E. Fredriksson, *Globalness: Toward a Space Power Theory*, Air University Press (Air University Press, 2006).

²¹ Trevor Brown, “Soft Power and Space Weaponization,” *Air & Space Power Journal* 23, no. 1 (2009): 71.

to the extent that if one country refused to cooperate, you could just turn to another.²² Commercial space capabilities were also said to interfere with ‘traditional space missions’, which complexified and obfuscated military space affairs.²³ In Europe, multinational civilian and ‘non-military’ space programmes were subject to ‘militarisation’ by EU member states.²⁴

In 2015, commercial space capabilities raised issues such as how to protect ‘quasi-military systems’, and security implications for dual-use space capabilities and products were deemed unclear.²⁵ To France, the proliferation of high-resolution satellite surveillance data directly undermined the diplomatic value of their national satellites.²⁶ It was proposed that ‘space middle powers’ could pursue national security objectives with commercial space-based services, presuming these middle powers could not justify investing in dedicated military systems. This represented an opportunity that middle powers might otherwise not have had but it came at the price of not having national control or authority over this component of national security.²⁷

In 2019, the increasing space commercialisation spurred ‘net-centric space power’ marked by resiliency through multiple small platforms and rapid innovation.²⁸ Despite the increase in commercially available space systems, however, even ‘small nations’ strived to establish indigenous and sovereign space capabilities.²⁹ Despite the multitude of definitions of space power, most definitions of them were still capability oriented; while non-state actors can play a significant role in space, the space power concept principally relates to nation-states.³⁰

²² Anna Burzykowska, “Smaller States and the New Balance of Power in Space,” *Space Policy* 25, no. 3 (2009): 189–90.

²³ Peter L. Hays, “Space and the Military,” in *Space and Defense Policy*, ed. Damon Coletta and Frances T. Pilch, Space Power and Politics (Routledge Taylor & Francis Group, 2009), 150.

²⁴ Michael Sheehan, “Profaning the Path to the Sacred: The Militarisation of the European Space Programme,” in *Securing Outer Space*, ed. Natalie Bormann and Michael Sheehan (Routledge Critical Security Studies, 2009), 171.

²⁵ Hays, “Spacepower Theory,” 69, 73.

²⁶ Peter B. de Selding, “Imagery Proliferation has Diplomatic Cost for France,” *SpaceNews*, 2015, <https://spaceneews.com/imagery-proliferation-has-diplomatic-cost-for-france/>.

²⁷ Daniel Golston and Ben Baseley-Walker, *The Realities of Middle Power Space Reliance*, (UNIDIR, 2015).

²⁸ James Clay Moltz, “The Changing Dynamics of Twenty-First-Century Space Power,” *Journal of Strategic Security* 12, no. 1 (2019): 78–79, <https://www.jstor.org/stable/pdf/26623076.pdf>.

²⁹ Galen Ojala, “Opportunity Realized: Review of “Ten Propositions Regarding Space Power: The Dawn of a Space Force”, *Air and Space Power Journal* 35, no. 4 (2021).

³⁰ Zaem Shabbir, Ali Sarosh and Sheikh Imran Nasir, “Policy Considerations for Nascent Space Powers,” *Space Policy* 56 no. 101414 (2021).

Space as an element of national power

Building on the statement that space power relates to nation-states, space power is furthermore tied to several elements within a nation.³¹ It includes national, military, civilian and commercial capabilities, which are further divided into space-based, ground-based and launch systems.³² There is presumably also a relation between the nation's overall space capability and its ability to use space for military affairs.³³ According to Jon Bingen, space actors can be categorised in a hierarchical structure based on national space capability.³⁴ Presuming that Norway's overall space capability serves as a foundation for its military space capability, we can assess the development of Norwegian space power until the present day.

Bingen categorised 'self-sufficient' actors as those who have or soon will attain an independent knowledge base, industry and infrastructure to handle the entire 'space complex'. The US dominated this level, and China was rapidly making its way in; in time, 'maybe India' would join too. Russia was also in this category, albeit with one foot on the lower level due to financial instability.³⁵

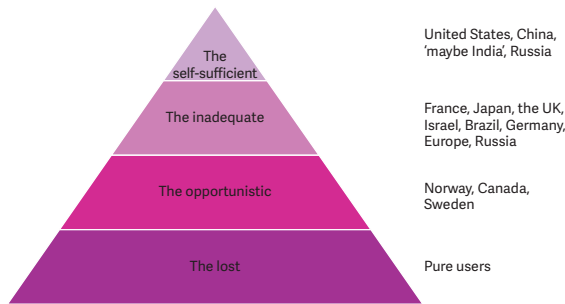


Figure 3. Visualisation of hierarchical classification of space actors.³⁶

³¹ Lupton, *On Space Warfare: A Space Power Doctrine*, 6–7; Oberg, *Space Power Theory*; Joan Johnson-Freese, "China's Manned Space Program: Sun Tzu or Apollo Redux?" *Naval War College Review* 56, no. 3 (2003); John J. Klein, *Space Warfare: Strategy, Principles and Policy* (Routledge, 2006); Deganit Paikowsky, *Clubs of Power: Why Do Nation-States Join the "Space Club"?* (Tel Aviv University, Department of Political Science, 2009); Marco Aliberti, Matteo Cappella and Tomas Hrozensky, *Measuring Space Power*, (European Space Policy Institute, 2019), <https://espi.or.at/publications/espi-public-reports/category/2-public-espi-reports>; Shabbir, Sarosh and Nasir, "Policy Considerations for Nascent Space Powers."

³² Jusell, *Space Power Theory: A Rising Star*, 23–30.

³³ Shabbir, Sarosh and Nasir, "Policy Considerations for Nascent Space Powers."

³⁴ Jon Bingen, *Det nære verdensroms strategiske dimensjoner*, Europa-programmet (Europa-programmet, 2004), 27–28; Paikowsky, *Clubs of Power: Why Do Nation-States Join the "Space Club"?* XI.

³⁵ Bingen, *Det nære verdensroms strategiske dimensjoner*.

³⁶ Bingen, *Det nære verdensroms strategiske dimensjoner*, 27–28.

At the second level were the ‘inadequate’, who could only keep up with the ‘self-sufficient’ through alliances with other ‘inadequate’ actors or with one or more of the ‘self-sufficient’. Along with other middle powers, Bingen placed ‘a united Europe’, represented by the European Space Agency (ESA) or the European Union (EU), within this category. At the third level were the ‘opportunistic’, who identified and developed key capabilities in global high demand. Norway was in this category, considering Norway’s satellite ground station capability. At the lowest level were the ‘lost’ actors, mere users of existing systems developed, owned and operated by other nation-states.³⁷ As we shall see, this review of Norwegian military space activity depicts how Norway starts out as a ‘lost’ space actor, transcends the level of the opportunistic and is reaching towards the level of the ‘inadequate’ at present.

Paikowsky’s model is similar, where Norway gradually rises from the lowest level of the ‘Space Club’ and up to the third, and even sets one foot on the second highest level of the pyramid:

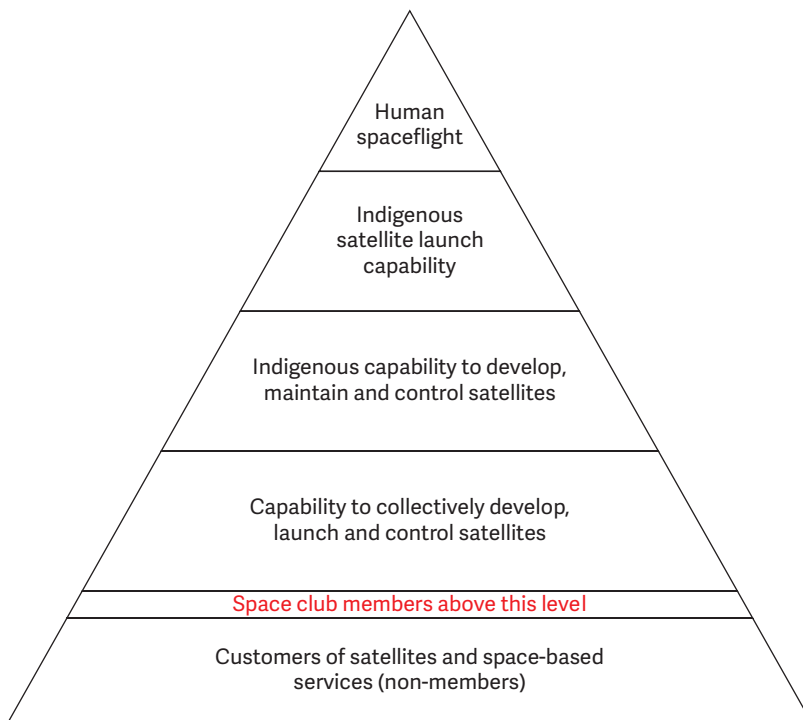


Figure 4. Levels of membership in the ‘Space Club’.³⁸

³⁷ Bingen, *Det nære verdensroms strategiske dimensjoner*.

³⁸ Reproduction of Paikowsky’s visualisation of the “Space Club”, retrieved from: Paikowsky, *Clubs of Power: Why Do Nation-States Join the “Space Club”?* 19.

A three-level model for military access to space capability

Considering that space power is constituted by military, civilian and commercial capability accessed through national, bilateral or multilateral collaboration, the French Joint Space Command in 2016 presented a three-level model to ensure access to space-based services (Figure 5).³⁹ Examining the extent to which a nation-state bases itself on the three respective access points indicates the nation's level of ambition and self-sufficiency.

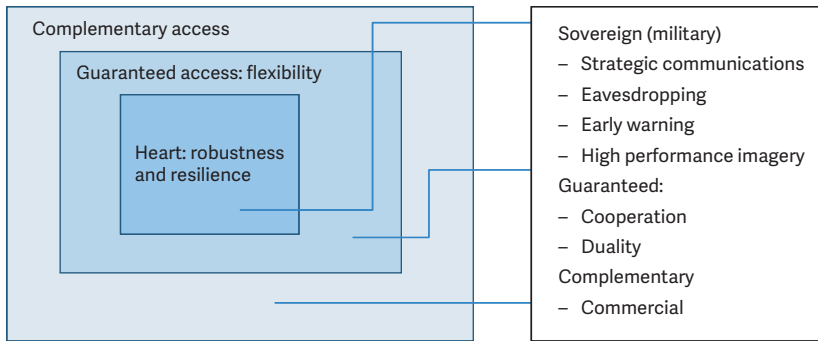


Figure 5. The French three-level model for access to space-based services.

The core of the French model is based on fully sovereign space capability under military ownership and control, whereas the middle square is based on dual-use and partner nation space capability. The de Gaullean notion of full sovereignty as it pertains to the French⁴⁰ is not transferrable to Norway, but the Norwegian MoD's Program Space in 2017 adapted the model to Norway by basing core capability on national self-sufficiency and control considering dual-use capability. This approach presumes that the satellite payload or data are under military control or guaranteed and prioritised through national agreements. Like the French, Norway can partner with other nation-states for access to dual-use or military space capability, and supplement with commercial offers. We can then use this model to evaluate the Armed Forces' access to space-based services, its robustness, resilience and flexibility.

³⁹ Jean-Daniel Testé, "SSA: First Priority of French Military Space Policy 2025" (paper presented at the International Symposium on Ensuring Stable Use of Outer Space, Tokyo, March 2016), 7.

⁴⁰ Testé, "SSA: First Priority of French Military Space Policy 2025," 7.



Figure 6. Norwegian military access to space-based services.⁴¹

Two levels of analysis

Norwegian space activities have been conducted within a region of considerable natural resources and geopolitical and strategic significance for Norway as well as for great powers such as the US, the USSR/Russia⁴² and, increasingly, China.⁴³ The NIS, with various systems, and the Norwegian Maritime Patrol Aircraft (MPA) have for decades played an important role in Norwegian, as well as allies' surveillance efforts in the High North. The MPA has served as a strategic asset to the Norwegian authorities in intelligence and maritime air power.⁴⁴ It therefore provoked a reaction when Norway's Chief of Defence in 2015 formally recommended replacing Norway's MPA capability with a combination of satellites, lightweight aircraft and unmanned aerial vehicles,⁴⁵ implying that satellites can partly replace MPA capability in the High North.⁴⁶ Norway developed space capa-

⁴¹ Stig Nilsson, *Forsvarssektorens satsing på space: «Nøkternt og trinnvis»*, (Forsvarsdepartementet, 2017).

⁴² Håvard Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk,» (PhD diss., University of Oslo, 2011).

⁴³ Tamnes et al., *Expert Commission on Norwegian Security and Defence Policy*, 23.

⁴⁴ Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk.»

⁴⁵ Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd* (Forsvaret, 2015).

⁴⁶ Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*, Prop. 151 S (2015-2016); Forsvarsdepartementet, *Proposisjon til Stortinget (forslag til stortingsvedtak)* (www.regjeringen.no: Forsvarsdepartementet, 2016).

bility supporting maritime surveillance missions in this region to optimise the use of the more flexible capabilities, including Squadron 333 and the Coast Guard.

Space power entails military and civilian space capabilities, which brings dual-use considerations into play. Military use of civilian satellites means that the satellites in question may constitute legitimate military targets, and it diversifies the ways in which satellites can be used for military purposes. Financial considerations drive even the major space powers towards developing governmental space assets serving civilian and military purposes in conjunction.⁴⁷ Norway's military space activity largely incorporates civilian or dual-use assets.

Norway's use of space-based capacity to attain situational awareness in the High North can be regarded as a form of continuous preparation for war. The activity of maritime surveillance is similar, although Norwegian military space activity has not been conducted continuously by one military unit. Rather, it has been carried out in an ad hoc manner and has never been institutionalised in the Norwegian military organisation. (In addition to information collection, space-based capabilities support functions such as communications and PNT.)

The deal-breaker in this case is that satellite and Unmanned Aircraft Vehicle (UAV)-based ISR is inadequate in the search for submerged submarines.⁴⁸ Although satellites are becoming an integrated element of maritime surveillance, MPA continue to be Norway's most essential instruments to monitor and counter Russian submarine and naval activity.⁴⁹ Unlike satellites, MPA provide for surveillance of and intelligence collection on submarines and anti-submarine warfare capability, and the aircraft provide physical presence in the airspace. MPA have a more flexible platform considering manoeuvrability, whereas satellites typically move in highly predictable orbits.

Orbiting satellites are not confined by national boundaries, airspace or water; they have the particular advantage of free overflight and global

⁴⁷ Steven Freeland, "The Laws of War in Outer Space," in *Handbook of Space Security* (Springer Science+Business Media, 2015).

⁴⁸ John Olav Birkeland, "Maritime Airborne Intelligence, Surveillance and Reconnaissance in the High North – The Role of Anti-Submarine Warfare – 1945 to the Present" (PhD diss., University of Glasgow, 2020), 154, <https://theses.gla.ac.uk/81995/>.

⁴⁹ Birkeland, "Maritime Airborne Intelligence, Surveillance and Reconnaissance in the High North," 2.

coverage, and the Norwegian Armed Forces have utilised space capabilities in international military operations far from Norwegian territory and the High North. This primarily concerns the communications function, where Norway has used allied and commercial SATCOM capability. This also means that, in principle, Norway has employed space capability in wartime to a limited extent.⁵⁰

Military space activity and international affairs

Norway's alliance policy can be modelled based on varying degrees of trust, confidentiality and technological adaption between allies and partners. The original model, used by Håvard Klevberg, is composed of three concentric circles corresponding to the circles A, B and C in Figure 7⁵¹ and is used here to evaluate Norwegian alliance policy as it pertains to military space activity.

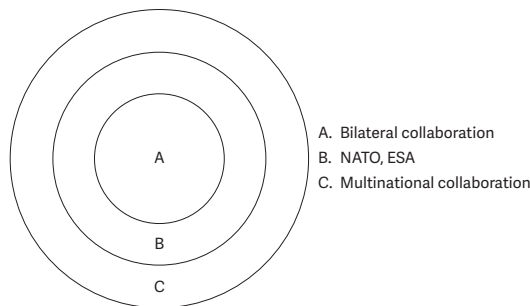


Figure 7. Three circles for Norwegian collaboration in military space activity.⁵²

Dual-use considerations entail that the model above incorporates an added layer of complexity when considering military space activity. It poses the question of whether Norway chooses civilian or commercial capabilities for military use based on the national origin of these capabilities. It also allows for the evaluation of how Norway's national security establishment relates to the notion of dual-use and civil-military separation.

⁵⁰ See Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk" (2011), 3.

⁵¹ Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk,» 8–9.

⁵² Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk,» 9.

The inner circle, A, represents Norway's closest and most confidential bilateral partnership, which since the 1950s has been dominated by the US. Circle B represents the North Atlantic Treaty Organization (NATO), the other cornerstone in Norwegian security policy.⁵³ Although Norwegian space activity has largely been conducted in peacetime, Norway has relied on NATO for access to space-based capability and not vice versa.⁵⁴ As for Europe, Norway first started developing national space capability predominantly through civilian channels by leveraging Norway's membership in the civilian, intergovernmental organisation ESA. Norway also advanced its military efforts through the Western European Union (WEU), although Norway's relations with the WEU and the EU were complexified due to Norway's non-EU membership.⁵⁵

Nordic defence cooperation (NORDEFECO) in space has not been identified.⁵⁶ NORDEFECO has been referred to as a possible 'mini-NATO', but the Nordic states have historically not been prepared or willing for such an undertaking.⁵⁷ This is now changing due to Russia's invasion of Ukraine on 24 February 2022, which prompted Finland and Sweden to apply for NATO membership.⁵⁸ Finland became a member of the alliance in April 2023 and Sweden finally followed in March 2024.⁵⁹

Space as a security policy tool

Small nations can benefit to a greater extent from relations with more powerful allies and their space capabilities than vice versa.⁶⁰ Furthermore, power relations between actors are partly shaped by one's ability to provide something of use to the other, and differences in size or interests

⁵³ Torgeir Larsen, *Sikkerhetspolitiske rammebetingelser i bevegelse* (Norwegian Institute of International Affairs, 2018); Considering intelligence collaboration, the US has over the past decade moved Norway into their next concentric circle after Five Eyes. See James R. Clapper and Trey Brown, *Facts and Fears: Hard Truths From a Life in Intelligence* (Penguin Random House LLC, 2018), 256.

⁵⁴ Forsvaret, *Romvirksomhet for sikkerhet og forsvar – situasjonsbeskrivelse og analyse*, 62–63.

⁵⁵ FFI, *Satellittovervåking* (FFI, 2006).

⁵⁶ Forsvaret, *Romvirksomhet for sikkerhet og forsvar – situasjonsbeskrivelse og analyse*, 61.

⁵⁷ Håkon Lunde Saxi, *Nordic Defence Cooperation After the Cold War*, ed. Anna Therese Klingstedt (Institutt for Forsvarsstudier, 2011); Håkon Lunde Saxi «Nordisk forsvarssamarbeid de siste 20 årene: vekst, fall og reorientering.» *Stratagem*, 2020, <https://www.stratagem.no/nordisk-forsvarssamarbeid-de-siste-20-arene-vekst-fall-og-reorientering/>.

⁵⁸ Forsvarsdepartementet, «Finsk og svensk Nato-medlemskap vil øke potensialet for nordisk sikkerhets- og forsvarspolitisk samarbeid.» (Forsvarsdepartementet, 2022), accessed 17 June, 2022, <https://www.regjeringen.no/no/aktuelt/fellesuttalelse-fra-de-nordiske-forsvarsministrene-pa-bornholm/id2914117/>.

⁵⁹ NATO Parliamentary Assembly, "Ratification of Finland and Sweden's accession to NATO" (NATO PA, 2024), accessed 22. March, 2024, <https://www.nato-pa.int/content/finland-sweden-accession>.

⁶⁰ Klein, *Space Warfare: Strategy, Principles and Policy*, 60–68, 116–26.

can allow for smaller powers to take advantage of the larger.⁶¹ The US, the USSR/Russia and other nations have benefitted from free overflight in space for decades,⁶² while Norway has relied on others for access to space-based information. When Norway started to develop space capability in the late 1970s, the small state strategised to develop niche capability to provide something of use to its allies.⁶³ Norwegian military space activity and capability development, largely uncoordinated, was at least aligned with Norway's alliance policy.

Deterrence and reassurance

The Cold War terms *integration* and *screening* explain Norwegian alliance policy and relations to the West bloc⁶⁴ and are known to be applicable beyond the Cold War era.⁶⁵ Likewise with the corresponding pair of concepts, *deterrence* and *reassurance*, which describe the balance of Norway's relations with the Communist bloc. By demonstrating military power and alliance affiliations, the aim was to reduce the likelihood of Soviet military aggression towards Norway. At the same time, Norway strived to reassure the Soviets by keeping allied activity on Norwegian territory to a minimum to prevent such activity from provoking Soviet military aggression.⁶⁶ Norway sought collective security as part of a wider integration process between the US and Western Europe. Screening corresponds to reassurance and entails that Norway sought to limit allied activity on Norwegian territory without reducing the effect of integration.⁶⁷

Towards the present day, the overall tendency is that Norway increasingly emphasises alliance policy and integration over reassurance, especially following the invasion of Ukraine. This tendency is also reflected in Norwegian military space activity.

⁶¹ Gudmund Hernes, *Makt og avmakt. En begrepsanalyse* (Universitetsforlaget, 1975), 40–52.

⁶² Walter A. McDougall, ... *The Heavens and the Earth - A Political History of the Space Age* (Basic Books, Inc., 1985).

⁶³ FFI, *Satellittovervåking*.

⁶⁴ Rolf Tamnes, *Integration and Screening: The Two Faces of Norwegian Alliance Policy, 1945-1986* (National Defence College Norway, Research Centre for Defense History, 1986), 60–61. Cited in Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk,» 6.

⁶⁵ Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk,» 491.

⁶⁶ Johan Jørgen Holst, «Norsk sikkerhetspolitikk i strategisk perspektiv,» *Internasjonal Politikk*, no. 5 (1966): 465; Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk,»

⁶⁷ Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk,» 5–8.

Military space activity and domestic affairs

Within Norway there are various interplays to consider, such as:

- The MoD's relations with the Ministry of Trade, Industry and Fisheries (MTIF), which governs the Norwegian Space Agency (NOSA);
- The Norwegian Defence Research Establishment (FFI)'s role and influence on the MoD;
- The interplay between the MoD, the FFI and the Armed Forces;
- Military inter-service relations.

The key military operating units mostly involved in space activity are: the NIS and the Norwegian Military Geographic Service (FMGT), which since 2009 has been subordinated to the NIS; the Norwegian Cyber Defence Force (CYFOR); the Norwegian Joint Headquarters (NJHQ); and the Norwegian Navy.

The review of Norwegian military space activity also reflects upon relations between political and military authorities and their understanding of this activity. The development has largely been a bottom-up approach, with less awareness at the political level. The political establishment has, at times, been detached from comprehending the political implications of national military capability development, and the national security aspects of space have generally been poorly understood. In addition, the budding space industry in Norway brings up the notion of the military-industrial complex.

Space power doctrines

When examining the Armed Forces' principal ideas, affiliations, ownership and views on space power, it is worth considering how inter-service rivalry related to the MPA 333 Squadron was tied to the question of where maritime air operations belong in the military structure. Was it an element of sea power, belonging to the Navy, or air power, belonging to the Air Force?⁶⁸ Internationally, space power has been derived both from air and sea power analogies,⁶⁹ and due to the many functions provided by space assets, there is no clear consensus as to whom the domain and its capacities belong or

⁶⁸ Klevberg, «Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk,» 266–306.

⁶⁹ Hays, «Space and the Military,» 151–52; Klein, *Space Warfare: Strategy, Principles and Policy*.

how it should be organised.⁷⁰ National security space aspects can also be understood in terms of ‘space and the military’⁷¹ and ‘space and intelligence,’⁷² implying that there is a delineation between the two.

In 1988, Lupton presented four space power doctrines, where the ‘concept of doctrine’ was based on Professor I. B. Holley’s definition that ‘[m]ilitary doctrine is what is officially believed and taught about the best way to conduct military affairs.’ Principal doctrines governing space forces were neither published nor taught.⁷³ Moreover, the ‘inherent links between doctrine and organizations’ are ‘almost always inextricably woven together.’⁷⁴ In other words, the different space doctrines represent different perspectives on how to organise ‘space forces’ and which technologies they should focus on.⁷⁵

In 2019, Rumbaugh derived three ‘survivability’ doctrines, all of which acknowledge the significance of space capabilities but see them as subordinate to and serving other priorities.⁷⁶ Two of Rumbaugh’s modern derivatives of Lupton’s Sanctuary and Survivability doctrines are ‘Frictionless Intelligence’ and ‘Keep the Plumbing Running.’⁷⁷ These doctrines, contained within the orange square in Figure 8, are identified as relevant to Norwegian military space activity. They also serve as examples of the relevance of US doctrine to a much smaller state.⁷⁸

⁷⁰ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 55; Russell Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space* (The Aerospace Corporation Center for Space Policy and Strategy, 2019).

⁷¹ Hays, “Space and the Military.”

⁷² David Christopher Arnold, “Space and Intelligence,” in *Space and Defense Policy*, ed. Damon Coletta and Frances T. Pilch, Space Power and Politics (Routledge Taylor & Francis Group, 2009).

⁷³ Lupton, *On Space Warfare: A Space Power Doctrine*, ix.

⁷⁴ Peter L. Hays, Russell Rumbaugh and Michael P. Gleason, *Developing a Foundational Spacepower Doctrine: Fostering an Independent Space-Minded Culture and Identity* (The Aerospace Corporation Center for Space Policy and Strategy, 2020), 2.

⁷⁵ Lupton, *On Space Warfare: A Space Power Doctrine*; Colin S. Gray, *American Military Space Policy: Information Systems, Weapon Systems, and Arms Control* (Abt Books, 1982); Hays, Rumbaugh and Gleason, *Developing a Foundational Spacepower Doctrine: Fostering an Independent Space-Minded Culture and Identity*.

⁷⁶ Hays, Rumbaugh and Gleason, *Developing a Foundational Spacepower Doctrine: Fostering an Independent Space-Minded Culture and Identity*.

⁷⁷ *Ibid.*, 1, 3, 4, 10–14; Lupton’s Sanctuary and Survivability doctrines are described in Lupton, *On Space Warfare: A Space Power Doctrine*, 29–51.

⁷⁸ Tale Sundlisæter, “Space Power in the High North: Perspectives from the Kingdom of Norway,” 17–18.

School	Vision of Future War	Role of Space	Technological Preferences	Most Common Organizational Affiliation
Space Control First	Space-based conflict	The dominant military capability	Small numbers of defensible assets, maneuverability, and exquisite custody	Air Force Space Command
Enable Global Missile War	Long-range and lethal missiles sweeping away all other forces	Key to providing necessary sensor net	Persistent, global coverage; proliferated, low-earth orbit constellations	Under Secretary of Defense (Research and Engineering)
Keep the Plumbing Running	Traditional military units fighting like units	Empowering, but not decisive	Incremental improvement and availability	Military services
Frictionless Intelligence	Constant awareness of adversary activities not limited to wartime	The premier collection platform to populate the President's Daily Brief	High-quality sensors	Intelligence Community
Nukes Matter Most	Potential catastrophe of nuclear war	Critical to warning and command and control	Dedicated warning and hardening	U.S. Strategic Command
Galactic Battle Fleet	Threats to humanity beyond those known today	Superseding all existing weapons	Beyond what is possible today	No specific affiliation

Figure 8. Schools of operational thought in space.⁷⁹

However, the two US doctrines in question are not directly applicable to Norway. Compared to the US, Norway’s military activities and capabilities are very limited, and Norway’s military ambitions are much less extensive, predominantly focusing on Norwegian territory and its vicinity. Adapted to the small Nordic state, ‘Frictionless Intelligence’ becomes the unofficial ‘Strategic Intelligence’ doctrine, and ‘Keep the Plumbing Running’ becomes ‘Force Enhancement’. This book hereby proceeds using these conceptions of unofficial Norwegian space doctrinal thinking, summarised in Figure 9.⁸⁰

Doctrine	Vision of future war	Role of space	Technological preferences	Organisational affiliation
Strategic Intelligence	Constant situational awareness of adversary activities in peacetime and wartime	Situational awareness, strategic warning, strategic, operational and tactical intelligence supporting senior decision-makers and military operations	Sensors, satellite data processing and dissemination capability	The NIS and tactical level intelligence units
Force Enhancement	Traditional military units fighting like units	Supporting other parts of the Norwegian Armed Forces	Incremental improvement and availability	Military tactical-operational units, supporting services and the NJHQ

Figure 9. The unofficial Norwegian military space doctrines, ‘Strategic Intelligence’ and ‘Force Enhancement.’⁸¹

⁷⁹ Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 9.

⁸⁰ Sundlisaeter, “Space Power in the High North: Perspectives from the Kingdom of Norway,” 17–18.

⁸¹ Sundlisaeter, “Space Power in the High North: Perspectives from the Kingdom of Norway,” 17–18.

Norwegian unclassified military space history portrays the dominance of intelligence as the original and overarching impetus for national space capability development. Accordingly, Stractic Intelligence is deemed the primary, unofficial Norwegian space doctrine and Force Enhancement the secondary.

Stractic Intelligence can be understood as fitting into the ‘space and intelligence’ discourse.⁸² The corresponding US doctrine has largely focused on supporting senior policymakers with strategic intelligence and is associated with the US Intelligence Community (IC).⁸³ Another strand emerged following a US Presidential Decision Directive in 1995 that instructed the US IC to support military troops and operations.⁸⁴ This corresponds to post-Cold War developments in Norway. Whereas the main function of the NIS during the Cold War was strategic warning, the organisation evolved from the 1990s onwards to add intelligence support for the Armed Forces in military operations abroad.⁸⁵ In the US, the IC accepted the given direction, but continued to prioritise strategic intelligence.⁸⁶ As for Norway, the NIS was central in developing Norway’s first indigenous space capabilities supporting strategic intelligence and space support in the High North.⁸⁷ Norway does not have an IC comparable to that of the US, but has one foreign intelligence service organised as a joint military operating unit subordinate to the Chief of Defence.⁸⁸ Additionally, the Norwegian Army commands a tactical intelligence battalion.⁸⁹ The NIS has focused more on military operations and identified that it does not necessarily matter at which strategic level information is collected or applied. Stractic Intelligence therefore values space for its intelligence functions supporting all levels of strategy, from strategic to tactical level, hence the name.

⁸² Arnold, “Space and Intelligence.”

⁸³ Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 13.

⁸⁴ Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 13.

⁸⁵ Jan Blom, Major General and Director of the Norwegian Intelligence Service, “Closing Address: The Norwegian Intelligence Service in a Time of Change” (Intelligence After World War II: Organisation, Role, and International Cooperation, Oslo, Norwegian Institute of Defence Studies, 2000).

⁸⁶ Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 13.

⁸⁷ FFI, *Satellittovervåking*.

⁸⁸ Forsvarsdepartementet, *Evne til forsvar - vilje til beredskap. Langtidsplan for forsvarssektoren, Prop 14 S, 107* (Forsvarsdepartementet, 2020); Friis and Hansen proposed in 2021 that to enhance the NIS’ function as a strategic intelligence service, one solution could be to organise it as an independent agency directly subordinated to the MoD. See Karsten Friis and Vegard Valther Hansen, «Kronikk: Etterretningstjenestene må reformeres,» *Dagens Næringsliv* (www.dn.no), 2021.

⁸⁹ Rune Jakobsen, “Interview with Lt. Gen. Rune Jakobsen (Norwegian Army), Commander of the Norwegian Joint Headquarters, 26 November 2015, Norwegian Defence Command and Staff College, Akershus Fortress, Oslo, Norway. [In Norwegian],” interview by Tale Sundlisæter, 2015.

Force Enhancement corresponds to the legacy term with the same name,⁹⁰ which constituted a mission area known to ‘increase joint force effectiveness...’⁹¹ It encompasses military satellite communication (SATCOM), ISR, PNT, missile warning and environmental monitoring.⁹² Hays argued that SATCOM is ‘probably ... the single most important military space capability’, as it binds commanders and forces together, and enables network-centric operations.⁹³ The Force Enhancement doctrine is understood as part of the ‘space and the military’ discourse⁹⁴ and focuses on terrestrial forces and existing space capabilities used by traditional military services. Modern military operations largely depend on functioning space capabilities, and space capabilities are first and foremost important because they support operations on land, at sea or in the air. Force Enhancement anticipates that future wars will occur like before, with ‘traditional military units like ships, soldiers, and planes...’ and it is therefore associated organisationally with the military services, which do not prioritise space.⁹⁵ This doctrine supports incrementally approving existing and available space capability, which because it already exists is often taken for granted. Albeit they value advancing space technologies, the proponents of this school are only occasionally interested in space capability.⁹⁶

Space and Norwegian military doctrine

In a critical review of Norwegian joint doctrine in 2007, Sir Hew Strachan identified a discrepancy between the context in which Norwegian doctrine was developed and the purpose it was meant to serve, that is, in peace, crisis, conflict or war. While the Norwegian Armed Forces have mostly operated in the state of peacetime since WWII, the national military doctrine was based on three approaches ‘developed specifically in the context of war’. It was based on principles originating in the US, ‘the most committed of the NATO powers to the centrality of war-fighting.’⁹⁷ Bjerga and Haaland later observed that ‘concepts developed for the use of force of a great power,

⁹⁰ Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 11.

⁹¹ US Joint Chiefs of Staff, *Space Operations*, Joint Publication 3–14, xi (US Joint Chiefs of Staff, 2013).

⁹² Hays, “Space and the Military,” 160–69.

⁹³ Hays, “Space and the Military,” 160.

⁹⁴ Hays, “Space and the Military,” 160.

⁹⁵ Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 10.

⁹⁶ Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 11.

⁹⁷ Hew Strachan, “Norwegian Armed Forces Joint Operational Doctrine,” *Norsk Militært Tidsskrift*, no. 4 (2009).

may not be directly applicable for a small state like Norway, for which peacetime security is its primary concern. They identified a detachment between Norwegian military doctrine and operational activity, noting that the academic communities responsible for writing Norwegian doctrines 'were far more influenced by international trends originating in the great powers than by experiences gathered from concurrent Norwegian military engagements.' Inversely, 'the operational part of the organization showed scant interest in bringing their experiences into doctrinal development.'⁹⁸ With these aspects in mind, we observe whether there is a detachment between how space is addressed in Norwegian military doctrine and the nation's military space activity.

⁹⁸ Kjell Inge Bjerga and Torunn L. Haaland, "Development of Military Doctrine: The Particular Case of Small States," *The Journal of Strategic Studies* 33, no. 4 (2010).

The formative years of Norwegian military space activity (late 1800s to 2014)

Space research, star wars and European partnerships (late 1800s to ca 2000)

Ionosphere research and radio communication

Norway is geographically situated partly beneath the electrically charged ionosphere near the Earth's magnetic North Pole, and the correlation between the light phenomena and the ionosphere at high latitudes led the geophysical sciences to develop particularly long-standing traditions in Norway. The first International Polar Year in 1882–1883 coincided with the revival of Norwegian nationalism, when Norway's will to claim independence was on the rise after centuries of Danish and Swedish rule. In pursuit of honour and prestige, Norway strived to build its national image as an independent, civilised nation by asserting itself in polar exploration and geophysical sciences, which was largely achieved through the works of Kristoffer Birkeland in the early 1900s.⁹⁹ It became known at this time that the ionosphere and its properties were of great importance to wave propagation and therefore to land-based radio transmission, which over flat seas can reach approximately 300 kilometres. Over alpine terrain with poor conductivity, which is not unusual in Norway, it might be limited to a few tens of kilometres. The first earthbound radio communication and

⁹⁹ Robert Marc Friedman, "Civilization and National Honour: The Rise of Norwegian Geophysical and Cosmic Science," in *Making Sense of Space - The History of Norwegian Space Activities*, ed. John Peter Collett (Scandinavian University Press, 1995).

navigation systems therefore depended on having their signals reflected by the ionosphere. Because the northern lights zone covers the northern parts of the country, it became necessary for Norway to understand how phenomena related to the northern lights impacted radio communications and navigation in the High North.¹⁰⁰

In the late 1920s, Norway built an auroral observatory in Tromsø, and geophysical scientist Leiv Marius Harang (1902–1970) was appointed as its first managing director in 1928.¹⁰¹ Thanks to American funding, the observatory was well-equipped and attracted internationally renowned scientists, which ensured Norway a head start in the practical understanding and implications of geophysics for global radio communications, navigation and detection.¹⁰² When German forces invaded Norway during WWII, their troops seized control of the observatory and German scientists conducted ionospheric research in Tromsø. The Germans also built an observatory at Kjeller, outside Oslo and used data collected from these observatories in long-range radio communications, command and control of the Wehrmacht.¹⁰³

At the onset of the war, Norway established an exile government in London and acquired insight into British thinking on power politics, alliances and geostrategic assessments, consolidating Norway's long-standing affiliation with the British and the nation's strategic thinking.¹⁰⁴ In 1946, Norway established the Norwegian Defence Research Establishment, modelled on British and American organisations, and focused on applied science and technology development to modernise the Norwegian Armed Forces.¹⁰⁵ The FFI was from its conception largely led by Norwegian scientists who had worked in allied war research laboratories, developed close relations with the allies and maintained contact with the Norwegian political and military leaders in exile. Post-war, the FFI's mission was to keep the Norwegian Armed Forces up to date on military-technical developments.

¹⁰⁰ FFI, *Satellittovervåking*, (FFI, 2003).

¹⁰¹ Alv Egeland and William J. Burke, "Auroral research at the Tromsø Northern Lights Observatory: the Harang directorship, 1928 - 1946," *History of Geo- and Space Sciences* 7, no. 1 (2016).

¹⁰² FFI, *Ionosfæreforskning*, (FFI, 2003).

¹⁰³ Egeland and Burke, "Auroral Research at the Tromsø Northern Lights Observatory: The Harang Directorship, 1928–1946," *History of Geo- and Space Sciences* 7, no. 1 (2016): 3.

¹⁰⁴ Torbjørn L. Knutsen, «Diskusjonene om norsk utenriks- og sikkerhetspolitikk,» in *Utenrikspolitikk og norsk krisehåndtering*, ed. Gunnar Fermann (Cappelen Damm AS, 2013).

¹⁰⁵ Olav Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," in *Making Sense of Space - The History of Norwegian Space Activities*, ed. John P. Collett (Scandinavian University Press, 1995).

Conversely, the institute developed a close working relationship with the Norwegian military to ensure a mutual understanding of military affairs.¹⁰⁶

The WWII years had brought about several breakthrough technologies. The British had developed the radar, the Americans a nuclear fission bomb and electronic computer technology, whereas the Germans had established the *Vergeltungswaffe 2* (V2) ballistic missile. At the end of the war and in its immediate aftermath, the Americans and Soviets plundered German missile sites and know-how. Both sides of the bloc continued to develop missile technology, resulting in long-range missile capability and access to earth orbit and outer space. The British and the French, too, acquired German technology and personnel post-war, and started their own, national missile and space programmes. The era that followed would be labelled with inextricably linked concepts such as ‘the missile age’, ‘the space age’, ‘the satellite age’ and ‘the nuclear age’. Old and new technologies merged in the great powers’ pursuit to dominate the new high ground and, they hoped, the earth below.¹⁰⁷ This post-war era turned into a competition for power and ideological superiority through technological achievements, and space activities developed as an interplay between scientists, military organisations, defence research institutes and politicians under tense geopolitical conditions.¹⁰⁸

Norway’s wartime service in allied laboratories provided the nation with considerable know-how on these new technologies. Of the approximately 40 Norwegians who participated, about one half worked in radio-wave propagation and communication technology.¹⁰⁹ Illustrating its military connotations, the national ionosphere research community too was largely centralised at the FFI after the war. Organised under the FFI’s Division for Telecommunications, internally known as ‘Division T’, Leiv Marius Harang led this research community in Kjeller.¹¹⁰ The FFI also established an anti-submarine warfare department, popularly known as the ‘sonar division’, and radar, physics and chemistry research divisions.¹¹¹

¹⁰⁶ Olav Njølstad and Olav Wicken, *Kunnskap som åpen: Forsvarets forskningsinstitutt 1946-1975* (Tano Aschehoug, 1997), 56, 64.

¹⁰⁷ McDougall, ... *The Heavens and the Earth - A Political History of the Space Age*.

¹⁰⁸ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics.”

¹⁰⁹ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics.”

¹¹⁰ Wicken, «Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,» 47.

¹¹¹ Njølstad and Wicken, *Kunnskap som åpen: Forsvarets forskningsinstitutt 1946-1975*, 50.

A thorough understanding of the ionosphere remained essential in developing communication, radio detection, guidance, and missiles and aircraft control technology. In fact, the FFI realised in 1951 that the only product their international partners showed any real interest in was the institute's geophysical data collection, and ionospheric research became an important research field considering the institute's international relations.¹¹² Within the nation, Division T worked closely with the Norwegian Telecommunications Administration's (NTA) *Televerket*, developing frequency warnings for shortwave radio communications to support military and civilian radio communications, serving the Norwegian Armed Forces as well as the kingdom's global merchant fleet.¹¹³ The merchant fleet also served as an instrument to the Norwegian military intelligence service by providing comprehensive mapping and situational awareness worldwide, especially in the Baltic Sea and the Kola Peninsula area.¹¹⁴

As Division T Director, Harang hired Finn Lied (1916–2014), an army captain who served as a high-frequency-band communications officer in England during the war. At the FFI, Lied started an observation programme to measure absorption in the ionosphere. It was particularly important to map Polar Cap Absorption, where the ionosphere covers the entire polar cap down to 60 degrees north and absorbs all radio signals in the low-frequency, medium-frequency and high-frequency bands. In a military context, such a complete paralysis of all shortwave radio communications in the High North was dramatic, and possible predictions of such disturbances were of significant strategic value. During the first fifteen years of ionosphere research, the only experimental methods available were ground-based measurement techniques.¹¹⁵

Becoming a launching state

Basic space technology, primarily controllable missiles, and space launch vehicles were developed during the 1950s. The International Geophysical Year, an international scientific project that lasted from 1957 till 1958, flamboyantly demonstrated these technologies when the USSR launched

¹¹² Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics"; FFI, *Ionosfæreforskning*.

¹¹³ FFI, *Ionosfæreforskning*.

¹¹⁴ Rolf Tamnes, *Norsk utenrikspolitisk historie 1965-1995: Oljealder* (Universitetsforlaget, 1997), 69–74.

¹¹⁵ FFI, *Ionosfæreforskning*.

the world's first earth orbiting satellite, *Sputnik I*, on 4 October 1957. The space launch vehicle was a slightly modified version of the world's first intercontinental ballistic missile (ICBM), the R-7, which the Soviets had launched only two weeks prior from the same launch complex in Tyuratam (Baikonur Cosmodrome).¹¹⁶

Like many countries, Norway took its first steps towards participating in space-borne activities during the International Geophysical Year. These activities were originally rooted in the ionosphere research community at the FFI and served as part of the institute's efforts to solve the practical problems related to radio communications in the High North. Specifically, the unwanted Polar Cap Absorption events originated in the ionosphere's lowest layer, which could not be thoroughly investigated with ground-based measurements. To stay ahead in this imperative field of research in which Norway regarded itself as a leading nation, it had to start using rocket technology. This was already being done by the Americans to investigate how the ionosphere and magnetic phenomena impacted radio communication and detection and, by extension, the guidance and control of missiles and planes.¹¹⁷

Applying space technology shifted ionosphere research from the discipline of geophysics into 'space research'. However, space technology, such as rockets and satellites, was much more costly and complex than the relatively inexpensive ground-based instruments used by the older generation of scientists and required substantial investments in technological infrastructure on Norwegian territory to launch sounding rockets and communicate with satellites.¹¹⁸ Furthermore, although Norwegian scientists were well-versed in instrumentation for scientific research, space technology introduced new and considerable challenges. They now had to construct and implement instruments that could operate unfailingly under extreme conditions, such as the very high gravitational forces during rocket launch and the hostile environment of outer space. Once launched, the instruments could not be readjusted.¹¹⁹

¹¹⁶ McDougall, ... *The Heavens and the Earth - A Political History of the Space Age*, 212.

¹¹⁷ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics."

¹¹⁸ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics."

¹¹⁹ John Peter Collett, "The Emergence of a National Space Policy Between Science and Technology," in *Making Sense of Space - The History of Norwegian Space Activities*, ed. John Peter Collett (Scandinavian University Press, 1995), 124.

To overcome monetary as well as practical obstacles, the Norwegians again looked to the US.¹²⁰ After Sputnik, American strategic reviews withheld from the public at the time warned that Soviet missile tests showed ‘unusually high reliability’ and ‘extremely high proficiency’ in guidance and that the US was now ‘in a period of grave national emergency’. Eisenhower claimed in a radio-TV address on 7 November 1957 that satellites had no direct military significance but that they nevertheless represented a capability that had to be tackled. The US would therefore be constructing a continental defence system based on surface-to-air missiles and, at the same time, seek scientific cooperation with their allies.¹²¹ US public policy on the matter emphasised that this international scientific cooperation was to maintain a civilian profile and that countries interested in cooperating ought to establish their own, national civilian space research organisations.¹²²

Norway was one of several invited countries and discussed possible participation in the NATO Advisory Group for Aerospace Research and Development in September 1959. Afterwards, in January 1960, a national briefing committee including Finn Lied, now Director of the FFI, Svein Rosseland, a distinguished astrophysicist, and Robert Major, Managing Director of the Royal Norwegian Council for Scientific and Industrial Research (NTNF), formally requested the NTNF to establish a Norwegian space organisation.¹²³

In fact, several countries were establishing national space committees during this time, whilst two European physicists, Edoardo Amaldi and Pierre Auger, were lobbying intensely to build European capability to conduct science independently of the Americans. Amaldi believed it was an ‘urgent necessity’ for Europe to break away from the American-Soviet monopoly on advanced satellite technology and access to space. Throughout 1959, the duo gathered support for a European collaboration on sounding rockets and satellite activity, as well as space science, which by the mid-60s

¹²⁰ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 56–59.

¹²¹ McDougall, ... *The Heavens and the Earth - A Political History of the Space Age*, 150–51.

¹²² Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 56–59.

¹²³ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 56–59.

turned into the European Launcher Development Organisation (ELDO) and the European Space Research Organisation (ESRO), respectively.¹²⁴

On 22 January 1960, Norway established its national ‘Interim Committee for Space Research’ organised under the NTNF. This would later be described as the moment ‘when the adventure began’, in the sense that it was the first formal step towards the inauguration of Norway as a launching state.¹²⁵ Finn Lied had supported creating the committee so that Norway would be ‘mentally prepared when it comes to the time when we shall have to make decisions.’¹²⁶ The space committee was tasked with shaping Norwegian space policy, including the formal national space organisation and its cooperation with US agencies.¹²⁷

Although this committee was formally organised under the NTNF, it has been described as ‘in fact an FFI committee’, supplemented with two individuals who ‘for long had worked closely with military organizations and in defence-related research.’ It was in total composed of six people, of whom four worked for the FFI, including its director, Finn Lied, Lied’s mentor Leiv Harang, ballistic missile technology expert Hans Christensen and ionospheric researcher Bjørn Landmark. One of the other, non-FFI members was Odd Dahl, a researcher at the Christian Michelsen Institute, who had worked extensively with American scientists in the 1930s. The committee’s chair was Svein Rosseland, who had worked at various research establishments for the British Admiralty during the war.¹²⁸ Many of the same people had also been central in Norway’s nuclear research programmes in the late 1940s. Rosseland, for one, served in 1947 as Chairman of the NTNF’s Nuclear Committee, which advised the Norwegian Government on its civilian nuclear programme. Odd Dahl constructed the nuclear reactor itself, while Finn Lied took over as Chairman of the Norwegian Institute for Nuclear Energy (IFA) in 1960.¹²⁹ Dahl and Rosseland had also taken part in a meeting initiated by Pierre Auger in autumn 1950 that led to the establishment of the European Organisation for Nuclear Research (CERN). The head of the NTNF, Robert Major, was also a member of the so-called

¹²⁴ Collett, “Space in a European Context: The Making of a National Space Research Policy,” 79–88.

¹²⁵ Kolbjørn Adolfsen, «Forord ved administrerende direktør Kolbjørn Adolfsen,» in *Historien om Andøya Raketttskytefelt*, ed. Alv Egeland (Boksenteret Erik Pettersen & Co AS, 2000).

¹²⁶ Collett, “Space in a European Context: The Making of a National Space Research Policy,” 82.

¹²⁷ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 56–59.

¹²⁸ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 56–59.

¹²⁹ IFE, *IFE History*. <https://ife.no/en/about-ife/ife-history/>

‘CERN lobby’.¹³⁰ In fact, scientific projects of national prestige at this time were reserved for Norway’s national nuclear research programme, which was allocated considerable resources.¹³¹

Albeit the FFI was the only actor capable of taking the actual lead in the Norwegian space programme at the time, the Americans’ demand for a civilian interface led Odd Dahl of the Michelsen Institute to handle the initial talks with the top management of the National Aeronautics and Space Administration (NASA) in February 1960.¹³² Eisenhower had established NASA primarily to ensure civilian and budgetary control of human spaceflight and to create a public and political perception of outer space as a weapons-free sanctuary and a domain for scientific achievement. The political civil-military separation also became useful with respect to international arms control initiatives.¹³³ When Odd Dahl brought up the FFI’s role in the Norwegian space programme, NASA made it clear that if there were too many military connotations, Norway should instead cooperate with US military agencies.¹³⁴

On a seemingly separate initiative shortly thereafter, the FFI did exactly that. In fact, the FFI issued a request to the MoD to launch two sounding rockets from an unspecified location in northern Norway already in February 1960, which the Ministry approved the following month. Towards the end of March 1960, Karl Holberg, who was then Director of Division T, travelled with Bjørn Landmark, one of the FFI’s leading ionosphere researchers, to visit the US Air Force (USAF) Air Research and Development Command (ARDC), where they proposed a bilateral scientific sounding rocket project.¹³⁵ The USAF ARDC was also a young research institute, established in 1950 as part of the US Government’s response to the Soviet nuclear weapons programme. Much like the FFI, the ARDC was built upon ideas rooted in the recognition of mutual dependencies between scientific development and military strategy.¹³⁶

¹³⁰ Collett, “Space in a European Context: The Making of a National Space Research Policy,” 86–87.

¹³¹ Collett, “The Emergence of a National Space Policy Between Science and Technology,” 120.

¹³² Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 56–59.

¹³³ Roger Handberg, “Dual-Use as an Unintended Policy Driver: The American Bubble,” in *Societal Impact of Spaceflight* (Government Printing Office, 2007).

¹³⁴ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 56–59.

¹³⁵ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 56–59.

¹³⁶ Futrell, *Ideas, Concepts, Doctrine. Basic Thinking in the United States Air Force 1907-1960*, Vol. 1, 275–78.

At the same time, Fred Singer had already expressed interest in polar atmosphere research and launching sounding rockets from Norwegian territory, and he travelled with Bjørn Landmark to northern Norway during summer 1960 to find an appropriate launch site on Norwegian territory.¹³⁷ Singer, whose doctoral committee at Princeton included Robert Oppenheimer, was one of few at the time who argued the case for polar orbit satellites with a minimum number of ground stations placed near the poles as opposed to equatorial orbit satellites, which required several tracking stations.¹³⁸

The ARDC ultimately supported the FFI with USD 50,000 and surplus missile systems, and the FFI forwarded their finalised space research plan to the MoD for approval in August 1960.¹³⁹ Consistently, the FFI's space programme was oriented around sounding rocket experiments to collect data on the ionosphere D-layer to advance radio communications in the High North.¹⁴⁰ Furthermore, with Singer's help they had identified an ideal launch site on Andøya Island southwest of Tromsø. Andøya already had a well-established military infrastructure including several military installations and since the 1950s, NATO been funding the construction of an air base on the island.¹⁴¹ This site was located two degrees north of the Arctic Circle, under one of the world's most active northern light zones, and the Norwegian Sea north of the rocket range allowed for unobstructed launch or simultaneous launches of many types of rockets in a great variety of rocket trajectories, with a large splash-down area in the Norwegian Sea. It thus met their scientific requirements as well as the practical ones.¹⁴² It was also important that the Gulf Stream provided a mild climate all year round, despite the region's northern latitude.¹⁴³

Space policy subsequently became an official element of Norwegian foreign policy in September 1960, when the Government discussed the FFI's plans for space activities on Norwegian territory.

¹³⁷ FFI, *Ionosfæreforskning*, 15; Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 59.

¹³⁸ David Arnold, *Spying from Space: Constructing America's Satellite Command and Control Systems* (Texas A&M University Press, 2005), 19.

¹³⁹ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 59.

¹⁴⁰ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 65–66.

¹⁴¹ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 59.

¹⁴² Adolfsen, "Forord ved administrerende direktør Kolbjørn Adolfsen."

¹⁴³ FFI, *Ionosfæreforskning*, 15.

The initiative spurred a continental as well as a transatlantic debate within the Government, who were interested in the European space initiatives mainly because of their ambition to join the European Economic Community. The second element entailed the security implications of cultivating a Norwegian-American bilateral sounding rocket programme based on American ballistic missile technology in the High North in the immediate vicinity of the USSR.¹⁴⁴

The transatlantic debate was concerned with how the national space programme would influence the balance between the kingdom's relations with the Americans and its Soviet neighbour. This debate was particularly tense due to the recent U-2 'Grand Slam' mission on 1 May 1960, which compromised Norway as the planned landing site. After being intercepted by a Soviet high-altitude surface-to-air missile near Sverdlovsk, the pilot was taken prisoner and it became known that his planned landing destination was Bodø Air Base in northern Norway. Consequently, Khrushchev threatened retaliatory strikes on several occasions, including strikes on Norwegian bases 'so that nothing is left of them.'¹⁴⁵

The incident was still fresh in the Government's awareness in September when it reviewed the FFI's proposed space programme and, naturally, it was discussed whether the programme's military connotations could further upset the Soviets. However, the FFI ultimately convinced the Government that the space programme was civilian and fitted into the portfolio of the Auroral Observatory in Tromsø, and the Government ultimately approved.¹⁴⁶

In October, the NTNF presented their plans, which Lied asked Robert Major to announce before it became known that the FFI was planning to launch sounding rockets in collaboration with the USAF ARDC, to make the military space programme appear as part of the overall national effort under the umbrella of the NTNF.¹⁴⁷ The NTNF's

¹⁴⁴ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 61.

¹⁴⁵ Rolf Tamnes, *The United States and the Cold War in the High North* (Dartmouth Publishing Company Limited, 1991), 177–81. Internationally, the U-2 incident spurred a debate in which the USSR challenged the concept of free overflight in space that they had themselves established with the Sputniks and led the Americans to escalate their development of reconnaissance satellites. McDougall, ... *The Heavens and the Earth - A Political History of the Space Age*, 259–61.

¹⁴⁶ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 62–65.

¹⁴⁷ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 62–65.

proposal stated that ‘even if space research is a search for fundamental knowledge, without consideration of societal needs, it is inevitable that we will get indirect benefits from this activity, and that experience in the treatment of rockets will benefit our defence forces.’ It proposed a minimum national annual budget of NOK 500,000,¹⁴⁸ plus funding from NASA and other American organisations, and anticipated launching four sounding rockets per year. (In comparison, the prestigious IFA had a budget of NOK 16 million.)¹⁴⁹

With the Government’s approval, the FFI constructed the rocket range on Andøya, with help from the Americans and the Norwegian Armed Forces. They initially constructed a launch pad, a control centre, a rocket assembly building and a rocket monitoring facility, while NASA provided a telemetry station and crew. The Norwegian Air Force Base on the island dispatched military personnel to guard the rocket range and contributed with a military medical service and the transportation of equipment and personnel to the rocket range from southern Norway.¹⁵⁰

Norway launched the first rocket, an American Nike/Cajun, into space from Norwegian territory at 07:09 on the morning of 18 August 1962. With that, Norway was officially a launching state, a concept that would be later defined by international law and include any state party to the 1967 Outer Space Treaty or the 1972 Liability Convention ‘that launches or procures the launching of an object into outer space...’ or any such state ‘from whose territory or facility an object is launched...’¹⁵¹ The Norwegians eventually constructed a permanent telemetry station and grew self-sustained in developing and operating the rocket range.¹⁵² With the Andøya Rocket Range (ARR) operational, the FFI transitioned its ionosphere research from being solely ground-based into mainly space-based experiments from the 1960s onwards.¹⁵³

¹⁴⁸ USD 1 has fluctuated between NOK 5–11 over time.

¹⁴⁹ Collett, “Space in a European Context: The Making of a National Space Research Policy,” 90–92.

¹⁵⁰ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 62–65.

¹⁵¹ Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 62–70.

¹⁵² Wicken, “Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics,” 62–70.

¹⁵³ FFI, *Ionosfærforskning*, 5–6.



Figure 10. Sounding rocket launch from Andøya Space Centre. Photo: Trond Abrahamson, Andøya Space.

Norway, ELDO and ESRO

At the same time as Norway was building its national space infrastructure, the country was debating whether it should take part in the European space research programmes, the future ELDO and ESRO. Certainly, the main obstacle for the Europeans was to develop space launch capability to attain independent access to space. The UK and France originally decided between themselves to develop an Anglo-French space launcher and subsequently tried to involve others to share the significant development costs.¹⁵⁴ ELDO and ESRO merged in the mid-1970s into ESA, eventually developing a fleet of European space launchers.

The Norwegian Government first got involved in European space policy discussions in September 1960, when the UK invited Norway and other European countries to finance the development of a European space launch vehicle based on the British military intermediate-range ballistic missile system Blue Streak. Norway consequently sent an official

¹⁵⁴ Collett, "Space in a European Context: The Making of a National Space Research Policy," 94–95.

delegation headed by Ambassador Jens Boyesen to an intergovernmental meeting in Strasbourg in February 1961 to discuss the initiative, which also included the development of test satellites, overall requiring Norway to contribute with an annual contribution of NOK five million.¹⁵⁵ Finn Lied opposed the proposal and argued repeatedly that Norway's limited number of capable scientists and engineers was the real bottleneck, that Norway would be stretched too thin to get value back on the programme costs and the programme would become 'a burden for our research and our industry'.¹⁵⁶ The NTNF believed that instrumentation of European satellites could be a natural extension of its ambitions to develop instrumentation of sounding rockets as a Norwegian niche; however, the Norwegian Ministry of Industry (MI) concluded that the possible benefits of technological and industrial development of satellites alone 'will not justify the important costs'. Ultimately, the NTNF recommended that the national space programme should be Norway's top priority and ESRO the second. The third and last priority was ELDO, which Norway officially rejected in August 1961.¹⁵⁷

In the discussions regarding ESRO membership, Norway tried to sell in Andøya as Europe's sounding rocket launch site in the northern lights zone. However, the Swedes had already secured support for such a site to be in northern Sweden.¹⁵⁸ Maintaining the national programme as its top priority, the NTNF's recommendation to the Government in February 1962 to join ESRO was highly conditional and stated that it had to be financed on top of the national space programme. The main issue with ESRO was the indistinctness of its real purpose and that investments in 'space' were of some interest to several ministries and sectors, but not of substantial interest to any. It was, at the time, an organisation dedicated to scientific research, which entailed approximately 300 scientists scattered across the European continent. This group represented a variety of disparate scientific disciplines that in various ways could be defined as 'space research', but the technology only served as a tool to advance the already existing research fields. The promise of industrial

¹⁵⁵ Collett, "Space in a European Context: The Making of a National Space Research Policy," 88–95.

¹⁵⁶ Collett, "Space in a European Context: The Making of a National Space Research Policy," 96–104.

¹⁵⁷ Collett, "Space in a European Context: The Making of a National Space Research Policy," 96–104.

¹⁵⁸ Collett, "Space in a European Context: The Making of a National Space Research Policy," 106.

development was somewhat uncertain, since the Norwegian industrial complex was not technologically ready to compete for industrial return, and Norway struggled to justify how the monetary expenses served the country's national interest. The request for additional funding was ultimately rejected by the Norwegian Ministry of Finance, and Norway instead focused on its national space programme. This decision, Lied noted, implied that Norway had to strengthen its cooperation with the Americans, specifically NASA.¹⁵⁹

Foreign policy and satellite telemetry

In the mid-60s, the NTNF took over as the de facto responsible agency for space activities on Andøya and appointed Jens Boyesen as Chairman of the Committee. With that, the Norwegian space programme transitioned from the military to the foreign policy sphere.¹⁶⁰ Boyesen was essentially appointed at the behest of Finn Lied, who had observed to his dismay that Norwegian scientists were not suited as national representatives in what Lied recognised as 'politicised' meetings concerning European space activities. Boyesen, however, had served as state secretary to Halvard Lange during his two periods as Minister of Foreign Affairs and was one of Lange's closest aides. He had also served as Norway's ambassador to NATO and maintained close ties to the policy-making process within the military alliance. The appointment of Boyesen implied that Norway regarded space as a politically imperative field with considerable foreign policy implications. Another striking factor about the reorganisation of the space committee was that the space scientists, including Odd Dahl, were removed from the top level and cut off from budgetary decisions. This was interpreted as a move by Lied to keep the scientists and their research under control, as the Norwegian space programme was broadening its scope and becoming of increased national interest.¹⁶¹

¹⁵⁹ Collett, "Space in a European Context: The Making of a National Space Research Policy," 105–18.

¹⁶⁰ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 65–70.

¹⁶¹ Collett, "The Emergence of a National Space Policy Between Science and Technology," 138–39.

The space programme's transition from the military to the civilian and foreign policy sphere has been attributed to its increasing industrial orientation, as well as the persistent geopolitical tensions in the High North. Norway was meticulously concerned with balancing its East-West relations and despite repeated attempts to reassure the political establishment of the civilian properties of the programme, the FFI's dominant role inevitably coloured the space programme with military undertones.¹⁶²

Soviet concerns over a militarised Norwegian space programme intensified in early 1964, when ESRO sought approval from the Norwegian Government to establish a telemetry station on the Norwegian Svalbard Archipelago as part of a satellite telemetry network for polar orbit satellites. The first satellite was scheduled for launch in 1967, and the proposal spurred new debates concerning Norwegian space activity, international relations and Norway's sovereignty over Svalbard.¹⁶³

Norway had attained sovereignty over the Svalbard Archipelago under the 1920 Svalbard Treaty, where Article 1 established that Norway had full and absolute sovereignty over Bear Island (Bjørnøya) and the Spitsbergen Archipelago, comprising all the islands situated between 10° and 35° longitude east of Greenwich and between 74° and 81° latitude north. At the same time, the treaty imposed several restrictions on Norway and those who wished to settle on Svalbard. For one, Article 9 established that Norway and other parties to the treaty were obligated 'not to create nor to allow the establishment of any naval base' and 'not to construct any fortification' in the said territories. Furthermore, the involved territories 'may never be used for warlike purposes.'¹⁶⁴

Although the French protested against the selection of Svalbard because Norway was not a member of ESRO, ESRO still decided that it was the most ideal location due to its proximity to the North Pole. A station on the archipelago could receive signals from every polar low earth orbit (LEO)

¹⁶² Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 65–70.

¹⁶³ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 65–70.

¹⁶⁴ "Treaty Between Norway, the United States of America, Denmark, France, Italy, Japan, the Netherlands, Great Britain and Ireland and the British Overseas Dominions and Sweden Concerning Spitsbergen Signed in Paris 9th February 1920," (1920).



Figure 11. The Svalbard Archipelago. Map by the Norwegian Polar Institute.

satellite passing and, as with Andøya, the Gulf Stream ensured favourable climatic and operational conditions.¹⁶⁵

The Norwegian Ministry of Foreign Affairs' (MFA) approval in principle in September 1964 induced a strong Soviet diplomatic offensive.¹⁶⁶ The Soviet Ambassador to Norway argued before the Minister of Foreign Affairs that a telemetry station on Svalbard could be used for 'cosmic, radio

¹⁶⁵ Collett, "The Emergence of a National Space Policy Between Science and Technology"; John Krige, *Fifty Years of European Cooperation in Space - Building on its Past, ESA Shapes the Future* (Beauchesne Editeur, 2014), 27, 51.

¹⁶⁶ Olav Riste, *The Norwegian Intelligence Service 1945-1970* (Frank Cass Publishers, 1999), 221–23.

technical and other intelligence activity from Soviet territory'. Anxious about the real purpose of the station and if it could be used for 'warlike purposes', the Soviets issued a formal protest in mid-February, and the Norwegian Government consequentially summoned various experts for a cabinet meeting in mid-March. Karl Holberg from the FFI argued that the proposed telemetry station would have to be significantly reconstructed to be of any substantial military use.¹⁶⁷ Another expert brought in to testify was the head of the military intelligence service, Vilhelm Evang, who originally agreed with Holberg's technical assessment and stated that Kongsfjord Station was 'of a simple sort' which could not easily receive other signals than those it was intended for. But although the construction of the satellite station itself was likely not a sufficient threat to the Soviets, the Soviets could not rule out that NATO was involved if one also considered the planned airfield on Svalbard. Evang thus concluded that the station could result in limited, Soviet actions towards Svalbard.¹⁶⁸

During the summer of 1965 and the autumn of 1966, Evang shifted his assessments more in support of the Soviets and started to assert that the satellite station could indeed be used to collect data on Soviet military capabilities. Moreover, he asserted that ESRO's seven NATO members could without a doubt exploit the station for military purposes. Evang argued that it would 'NOT be technically challenging to install additional equipment that will enable the station to perform surveillance activities'. He also remarked that they would in fact like to have a few positions at the station themselves. Evang at this point believed that the equipment suggested by ESRO would almost certainly be modified to intercept Soviet reconnaissance satellites and space stations, Soviet ICBM tests and Soviet military air and sea communications. This could only be avoided if the station was established and fully controlled by the Norwegian authorities. Furthermore, he warned that the station could trigger the Soviets to establish their own station on Svalbard, which could in turn lead to American countermeasures, triggering an 'electronics race at Svalbard', which was not in Norway's national interest.¹⁶⁹

¹⁶⁷ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 63–70.

¹⁶⁸ Olav Riste and Arnfinn Moland, «*Strengt hemmelig*»: norsk etterretningstjeneste 1945-1970 (Universitetsforlaget, 1997), 269.

¹⁶⁹ Riste and Moland, «*Strengt hemmelig*»: norsk etterretningstjeneste 1945-1970.

The Government nevertheless allowed for ESRO to work with NTNF to establish and operate a telemetry station in Ny-Ålesund on Svalbard. The satellite station was of high strategic value to the Government because it could, for one, stimulate Norwegian space research and industry in a substantial way. But perhaps most importantly, it served the Government's fundamental ambition to expand Norway's physical presence on the archipelago to mark its sovereignty. That was why it insisted on building the station in Ny-Ålesund as opposed to Longyearbyen, which was ESRO's original request. The ultimate deal was that ESRO would finance the project, but that the NTNF would build and operate it to ensure national control. Built over the course of five and a half years, including investments and operating costs of approximately NOK 30 million, it was a considerable project for Norway.¹⁷⁰

To ease the Soviet's apprehensions and avoid a militarisation of the archipelago, the station was kept open for foreign observers, which allowed the Soviets to verify its purpose. The Government anticipated that the Soviets would probably not reciprocally establish their own installation on Svalbard because they had already established their own satellite tracking station on Novaya Zemlya.¹⁷¹ The ESRO station was built near Kongsfjorden and hence given its name, Kongsfjord Station. The NTA established communication channels with the European Space Operations Centre in Darmstadt in Western Germany, and the station remained operative until 1974, when the character of ESRO's satellite missions changed and no longer required telemetry services on Svalbard.¹⁷²

The main limiting feature of Kongsfjord Station was that it did not operate in real-time, meaning that it was not designed to receive live transmissions from satellite measurements. Instead, the satellites recorded the data on tape and transmitted it in playback mode when the satellite passed over the ground station. Satellite recording capacity was limited and unreliable, and ESRO was at the same time discussing the need for real-time transmissions, which allowed for large amounts of data to be transmitted simultaneously. A Norwegian representative, FFI ionosphere researcher Bjørn Landmark, participated in these ESRO discussions, and knowing

¹⁷⁰ Collett, "The Emergence of a National Space Policy Between Science and Technology."

¹⁷¹ Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 63–70.

¹⁷² Per Øvregard, *Televerket: I samfunnets tjeneste* (Norsk Telemuseum, 1996), 330.

that NASA was interested in such a capability as well, Norway singled out satellite telemetry as another niche for Norwegian space activities.¹⁷³

Consequently, the FFI established a real-time telemetry station with support from NASA and the FFI's Canadian counterpart, the Canadian Research Telecommunications Establishment. This station was built inside the Auroral Observatory in Tromsø and operated by the FFI in conjunction with the observatory when it became operational in August 1966.¹⁷⁴ The NTNF established a separate station to coordinate matters with ESRO, and the programme was given national priority.¹⁷⁵ When ESRO placed their first satellite, Iris, into earth orbit on 17 May 1968, it was tracked from Svalbard as well as the Tromsø stations.¹⁷⁶

While Norway anticipated that Tromsø could become a world centre in registering and computing data generated by ground and satellite-based measurements, in the greater scheme of things the station reinvigorated Tromsø and stimulated the creation of a university in the city. As with Kongsfjord Station, the station in Tromsø served Norway's national objectives in the sense that it served to physically populate the northernmost parts of the country. To the FFI, the station served as a training facility in the use of pulse-code modulation technology, which had not yet been applied to large-scale signals transmissions. It thus facilitated a technological breakthrough for Norway as the FFI constructed and delivered its first home-grown digital computer based on integrated circuits technology, which bred a national computer industry.¹⁷⁷

The period up until 1969 is said to be 'the first pioneering era' in Norwegian space activities.¹⁷⁸ With the activities on Svalbard, in Tromsø and on Andøya, the personnel working under the umbrella of the NTNF Space Committee increased from two in 1965 to 62 in 1969. The national space programme flourished with sounding rocket launches, and the space committee expanded its international cooperation to include the UK, Germany and others. By the end of the 1960s, experimental ionosphere research activity on Andøya constituted an estimated ten percent of all experimental ionosphere research world-wide.¹⁷⁹

¹⁷³ Collett, "The Emergence of a National Space Policy Between Science and Technology," 138–48.

¹⁷⁴ Collett, "The Emergence of a National Space Policy Between Science and Technology," 146–48.

¹⁷⁵ Collett, "The Emergence of a National Space Policy Between Science and Technology," 149.

¹⁷⁶ Collett, "The Emergence of a National Space Policy Between Science and Technology," 150–54.

¹⁷⁷ Collett, "The Emergence of a National Space Policy Between Science and Technology."

¹⁷⁸ Collett, "Space in a European Context: The Making of a National Space Research Policy," 82.

¹⁷⁹ Collett, "The Emergence of a National Space Policy Between Science and Technology," 159–62.

The Norwegian merchant fleet and maritime satellite communication

Whilst Norway was building its national rocket programme and the Americans and Soviets were capturing the public eye with spectacular human spaceflight missions throughout the 1960s, telecommunications satellites broke through as the first worthwhile commercialised use of space technology. The Americans launched the first civilian telecommunications satellite, Echo, in August 1960 and in 1963 met another important milestone by placing into orbit the world's first geostationary satellite, Syncom. In geostationary orbit (GEO), approximately 36,000 kilometres above the surface of the Earth, satellites revolve at the same velocity as Earth itself. Thus, appearing stationary over the same area on Earth, GEO satellites provide the same coverage as several satellites in LEO.¹⁸⁰

In Scandinavia, the directors of the Norwegian, Danish and Swedish telecommunications administrations in 1961 formed the Scandinavian Telecommunications Satellite Committee which ensured participation in American civilian satellite experiments through NASA. Norway and the other Scandinavians focused on satellite ground stations, including the design and fabrication of ground station equipment and reception and handling of satellite telemetry. In August 1964, the International Telecommunications Satellite Organizations (Intelsat) consortium was established in Washington, DC., with Norway as one of 19 founding members, and at the end of 1964, the Scandinavian countries established an experimental satellite ground station in Råö, Sweden.¹⁸¹ In March 1965, they bought user rights at the Goonhilly Earth Station in southern England to ensure telephone and television communication across the Atlantic Ocean, and in April, the first Intelsat satellite, Intelsat I, was launched, establishing a new medium for telecommunications.¹⁸²

By the mid-1960s, industrialisation emerged as Norway's main impetus for conducting space activities. Between 1964 and 1965, the NTNPF's space committee was reorganised accordingly to position Norway to build a space industry, with one sub-committee for space research and

¹⁸⁰ McDougall, ... *The Heavens and the Earth - A Political History of the Space Age*, 221.

¹⁸¹ John Peter Collett and Bjørn O. Lossius, "Towards Commercialization of Space: A National Programme for Industrialization of Space Technology," in *Making Sense of Space - The History of Norwegian Space Activities*, ed. John Peter Collett (Scandinavian University Press, 1995), 167–75.

¹⁸² Øvregard, *Televerket: I samfunnets tjeneste*, p. 310.

one for space applications and industrialisation.¹⁸³ The space committee now presented more of an actual, civilian face under the NTNF umbrella with Ambassador Jens Boyesen at the helm and Finn Lied as the only FFI representative. The other two members were the Executive Director of the NTA, Leif Larsen, and the Executive Director of the Norwegian state-owned Kongsberg Weapons Factory (Kongsberg Våpenfabrikk or KV), Bjarne Hurlen. Larsen was appointed because of the increased focus on international telecommunications cooperation, whereas Hurlen, anticipating that space could be added to KV's high-tech profile, represented Norway's defence-industrial establishment.¹⁸⁴ KV was also the FFI's partner in Norway's prestigious anti-submarine missile system, Penguin, which was a strongly interdisciplinary programme that required expertise in several fields, including rocket technology and digital computers. In fact, Norway's developments in space technology have been attributed as derivatives of the Penguin project and inversely, developments of the various space technologies were essential in the development and testing of the Penguin missile system.¹⁸⁵

In 1968, Bjørn Rørholt succeeded Jens Boyesen as Chairman of the Space Committee and served until the mid-1970s. Rørholt had risen to the rank of colonel after his wartime intelligence service and was 'a pioneer in electronic communication technology for the Norwegian Armed Forces' who had headed the Norwegian Defence Communications Administration since 1958.¹⁸⁶ Rørholt's background was in the military intelligence service, where he had been central in the works of the cipher section and the build-up of Norwegian signals intelligence capabilities in the 1950s.¹⁸⁷ The NTA's new director, Per Øvregard, replaced Larsen and Nic Knudtzon, head of the NTA's newly established research institute, became Chairman of the Sub-Committee for Space Applications and Industrialisation. The top positions were thus dominated by telecommunications experts, a composition

¹⁸³ Collett, "The Emergence of a National Space Policy Between Science and Technology," 121.

¹⁸⁴ Collett, "The Emergence of a National Space Policy Between Science and Technology," 138; Collett and Lossius, "Towards Commercialization of Space: A National Programme for Industrialization of Space Technology," 178.

¹⁸⁵ Collett and Lossius, "Towards Commercialization of Space: A National Programme for Industrialization of Space Technology," 177, 89–90.

¹⁸⁶ Collett and Lossius, "Towards Commercialization of Space: A National Programme for Industrialization of Space Technology," 192–93.

¹⁸⁷ Riste and Moland, «*Strengt hemmelig*»: norsk etterretningstjeneste 1945–1970, 138–39.

which again had been ‘carefully stage-managed’ by Lied, who was preparing Norway to engage in satellite telecommunications.¹⁸⁸

Essentially because of the potential of Norway as a shipping nation, it identified maritime satellite communications as a niche for industrialisation. In 1969, Knudtzon presented a systems study on maritime satellite communications based on a future of maritime communications systems that entailed communications via GEO satellites to Norwegian ship owners. A key assumption was that the volume of communication from ship to shore was about to increase rapidly and saturate the common shortwave radio communications capacity. They also presumed that ship owners would increasingly want to execute command and control of everyday operations, which also implied a fundamental change as the captain of a ship at sea would no longer necessarily have the last say in operations at sea. Furthermore, there was an increasing tendency towards ship automation, which also implied increased data transmissions to shore. Another peculiar factor that Knudtzon emphasised in his presentation was an estimated increased need for the crew to communicate with their families on shore, which the ship-owner representatives brushed off as nearly laughable at the time. Nevertheless, they eventually realised the potential, which paved the way for Norway to build up world class satellite communications services and eventually contribute vigorously to the creation of the International Maritime Satellite Organization (Inmarsat).¹⁸⁹

Space policy in the Oil Age: satellite communication and remote sensing

In the 1970s, Norway’s territorial and economic domains in the North Sea and in the Arctic expanded vastly as several large maritime areas became subject to Norwegian jurisdiction. Norwegian foreign policy also faced several new issues as Norway entered the Oil Age and started commercial oil extraction on the Norwegian continental shelf in 1971.¹⁹⁰ At the same time, the relationship between Norway, the US and NATO was revitalised,

¹⁸⁸ Collett and Lossius, “Towards Commercialization of Space: A National Programme for Industrialization of Space Technology,” 192–93.

¹⁸⁹ Collett and Lossius, “Towards Commercialization of Space: A National Programme for Industrialization of Space Technology,” 192–95.

¹⁹⁰ Kjetil Skogrand, *Norsk forsvarshistorie 1940–1970: Alliert i krig og fred* (Eide Forlag, 2004), 18–31.

whilst the continued build-up of Soviet naval bases on the Kola Peninsula cast even longer shadows over Norway.¹⁹¹

Space technology for civilian and military applications advanced considerably in the 1970s, including advanced communications satellites, remote sensing and meteorology, and positioning and navigation services.¹⁹² The new circumstances considerably increased the number of potential users invested in Norwegian space activities, and the debate was increasingly concerned with potential Norwegian membership in ESRO. Due to the national space programme's expansion throughout the 1960s, the country's space policy discourse in the 1970s was much more crowded with participants, including the original ionosphere researchers, the rocket range on Andøya, the telemetry station in Tromsø, the NTA, as well as the coordinating NTN space committee.¹⁹³

In 1974, the Government rejected yet another attempt to join ESRO, mostly because of tight budgets and because ESRO still suffered from being of some interest to many but of sufficient interest to none. In 1975, ELDO and ESRO merged into ESA, where Norway maintained observer status and joined the European Maritime Orbital Test Satellite (MAROTS) programme. This programme eventually merged with the similar, American Marisat programme, which ultimately resulted in the establishment of Inmarsat in 1979.¹⁹⁴

In the mid-1970s, the NTA convinced oil companies operating on the Norwegian continental shelf to invest in satellite communication, which facilitated a breakthrough in Norwegian telecommunications when the NorSat-A satellite became operational in 1976. The increasing need for telecommunications in the North Sea also instigated increased activity on Svalbard, and in 1979, the NTA established a satellite ground station at Isfjord, which connected Svalbard to the NorSat satellite system. This was another notable achievement, as it connected Svalbard to the Norwegian telephone network.¹⁹⁵

¹⁹¹ Tamnes, *Norsk utenrikspolitisk historie 1965-1995: Oljealder*, 17–20.

¹⁹² Industridepartementet, *Norsk romvirksomhet* (Universitetsforlaget A/S, 1986).

¹⁹³ John Peter Collett, "Hesitating Before Europe: Norway's Long Road to ESA Membership," in *Making Sense of Space: The History of Norwegian Space Activities*, ed. Collett, John Peter (Scandinavian University Press, Oslo 1995), p. 216.

¹⁹⁴ Collett, "Hesitating Before Europe: Norway's Long Road to ESA Membership," 216.

¹⁹⁵ Collett, "Hesitating Before Europe: Norway's Long Road to ESA Membership," 216.

In 1977, Finn Lied was becoming convinced that Norway had to invest in another space capability, that is, satellite remote sensing, to ensure maritime surveillance and domain awareness of its new and sizeable territories. Lied started to advocate this position in 1976.¹⁹⁶ At the same time, both the NTA and the Norwegian Defence Chiefs of Staff had expressed their interest in ESRO/ESA.¹⁹⁷ In 1982, the Norwegian Ministry of Environment (MoE) appointed a committee to assess Norway's need for remote sensing satellite capability, how Norway should collect, process, store and distribute the data, as well as the need for research and development, and possible industrial spinoffs for Norway. Satellite remote sensing, the committee noted, entailed mapping, surveillance and warning. The policy explicitly stated that it would not consider the many military applications of space technology, albeit noting that the technology originated in military intelligence and that the world was on the verge of a possible arms race in outer space.¹⁹⁸

Whereas maritime satellite communication was Norway's first sizeable success thanks to the merchant fleet, it was mainly the promise of space surveillance capability to monitor the newfound territorial expansions that was the main impetus for finally joining ESA. In 1986, the Government under the MI appointed another committee to stake out the course of Norwegian space policy for the next 15 years. This policy too stated explicitly that it focused on the civilian aspects of space technology and applications, despite noting that military interest constituted about two thirds of the overall activity. By now, the presumption was that Norway would become a full member of ESA as of 1 January 1987 and that the space committee would separate from the NTNF and establish an independent Norwegian space agency. Furthermore, Tromsø Telemetry Station would be established as an independent foundation and upgraded to serve as a ground station for the European Satellite Remote Sensing (ERS) programme.¹⁹⁹ Consequently, in 1987 Norway finally became a full member and concurrently upgraded the telemetry station in Tromsø for about NOK 40 million to accommodate the requirements of the ERS.²⁰⁰

¹⁹⁶ Collett, "Hesitating Before Europe: Norway's Long Road to ESA Membership," 216.

¹⁹⁷ Collett, "The Emergence of a National Space Policy Between Science and Technology," 156–58.

¹⁹⁸ Finn Lied et al., *Satellitfernmåling*, NOU 1983: 24, 7–9 (Universitetsforlaget, 1983).

¹⁹⁹ Industridepartementet, *Norsk romvirksomhet*.

²⁰⁰ Collett, «Hesitating Before Europe: Norway's Long Road to ESA Membership.»

The covert space programme

A Cold War epicentre

While the FFI and the NTNF throughout the Cold War built up a Norwegian space programme that originated in the country's ionosphere research community, Norway's image as a leading nation in ionospheric research served multiple purposes for Norway during the early days of the Cold War. The first offensive post-war Norwegian intelligence mission, codenamed TORHEL, travelled northwards under the pretence of a Norwegian Geographical Survey (NGS) scientific ionospheric research expedition in July 1946, aiming to intercept Soviet military and police forces and listen for radio signals associated with possible rocket activity. The 'ionospheric research expedition' indeed detected indications of rocket activity on the Soviet side of the border, and the mission was the starting point for a substantial build-up of signals intelligence capability in northern Norway.²⁰¹

Whereas the High North during WWII was relevant mainly for its strategic sea transport routes and the battle for the Atlantic Ocean, the region became a Cold War epicentre with the centralisation of Soviet strategic forces and nuclear weapons testing in the area. As Norway is situated just below the shortest intercontinental flight route between Moscow and Washington DC., the US and the USSR largely set the premises for the kingdom's defence and foreign policy throughout this era.²⁰² In August 1953, the Soviets detonated the world's first fusion device, the *Reaktivnyi Dvigatel Specialnyi*, known as the 'Joe-4', and with the American 'Castle Bravo' detonation on Bikini Atoll in March 1954, both superpowers commanded thermonuclear devices readily adaptable for delivery by aircraft and missiles.²⁰³ The Soviet Navy's Arctic branch, the Northern Fleet, was centralised on the Kola Peninsula, whereas Plesetsk, south of Arkhangelsk, became the Soviet's first, large operative base for land-based ICBMs in 1957. In the mid-1960s, the Soviets built a space launch complex at Plesetsk as well.²⁰⁴

²⁰¹ Riste and Moland, «*Strengt hemmelig*»: norsk etterretningstjeneste 1945-1970, 23.

²⁰² Skogrand, *Norsk forsvarshistorie 1940-1970: Alliert i krig og fred*.

²⁰³ McDougall, ... *The Heavens and the Earth - A Political History of the Space Age*, 106.

²⁰⁴ Riste and Moland, «*Strengt hemmelig*»: norsk etterretningstjeneste 1945-1970; Wicken, "Cold War in Space Research: Ionospheric Research and Military Communication in Norwegian Politics," 49.

From the Russo-American perspective, northern Norway was an ideal geographical site for warning, intelligence and offensive operations towards north-western Russia, and it has been authoritatively claimed that Norway's most important contribution to the Norwegian-American bilateral relationship and the multilateral NATO alliance during the Cold War was, 'undeniably', serving as an electronic listening post towards the USSR.²⁰⁵ Whereas the Americans depended on 'the outpost of Norway' for its location, Norway relied on the US for support to counterbalance the Soviet military threat.²⁰⁶ A sizeable effort to develop signals intelligence capability on Norwegian territory was largely driven forward by the American IC, especially the National Security Agency and the Central Intelligence Agency (CIA), whereas one of Norway's primary motivations was to calm the security-political tensions in the High North. The idea was that if Norway did its own data collection, it could prevent allied aircraft and ships from entering the region.²⁰⁷



Figure 12. Map of the European Arctic, by Åtland & Pedersen, 2008.

²⁰⁵ Tamnes, *Norsk utenrikspolitisk historie 1965-1995: Oljealder*, 69-71; Skogrand, *Norsk forsvarshistorie 1940-1970: Alliert i krig og fred*, 18-30.

²⁰⁶ Tamnes, *The United States and the Cold War in the High North*, 14.

²⁰⁷ Riste, *The Norwegian Intelligence Service 1945-1970*, 155-57.

In 1957, the Sputniks 1 and 2 demonstrated that accurate long-range nuclear-tipped ballistic missiles were no longer a theoretical construct, but a viable weapons capability commanded by the USSR.²⁰⁸ From his dorm room at the FFI in Kjeller, ionospheric researcher Jan Trøim listened to the signals beamed out by Sputnik 1 as its trajectory passed above Norway.²⁰⁹ After a meeting between the American and Norwegian IC's in Oslo in the spring of 1958, the Norwegian Minister of Defence stated before the national Cabinet Defence and Security Committee that Norway should expand its signals intelligence programme, first and foremost 'because it would be of value in verifying a nuclear test ban.' Prime Minister Gerhardsen's response was that 'one should in principle take a positive attitude whenever Norway on account of its geographical situation could be of particular service to the common defence through such clearly defensive measures.'²¹⁰ Thus, during the 1960s, Norway took on a principally new task in monitoring the compliance of arms control agreements efforts.²¹¹

The Americans were primarily concerned with the rapid Soviet build-up of the Northern Fleet with SSBNs and submarine-launched ballistic missiles (SLBMs) on the Kola Peninsula of the 1960s.²¹² However, the rapid developments in space launch and satellite technology introduced a literally overhanging need to assess the potential military threat represented by earth-orbiting satellites, and the new status quo led Norway to incorporate so-called electronic space surveillance capability in their intelligence activities.²¹³

Satellite reconnaissance in the High North

For the Americans, the effort to develop space reconnaissance has been attributed to the Soviet's rapid advancements in weapons technology in the accumulated context of the recent North Korean invasion of South Korea in 1950 and the devastating attack on Pearl Harbour in 1941. The function it served was much like the ground-based intelligence stations, to provide data for early warning and verification of arms control and nuclear-test-ban

²⁰⁸ Dwayne A. Day, John M. Logsdon and Brian Latell, *Eye in the Sky: The Story of the Corona Spy Satellites* (Smithsonian Institution Press, 1998), 22.

²⁰⁹ FFI, *Ionosfæreforskning*.

²¹⁰ Riste, *The Norwegian Intelligence Service 1945-1970*, 101-05.

²¹¹ Tamnes, *Norsk utenrikspolitisk historie 1965-1995: Oljealder*, 69.

²¹² Riste, *The Norwegian Intelligence Service 1945-1970*, 84.

²¹³ Riste and Moland, «Strengt hemmelig»: *norsk etterretningstjeneste 1945-1970*, 259-70, 99-323.

agreements. With an ‘eye in the sky’, the idea was that one could foresee one’s adversary’s next move, as opposed to learning of it afterwards, and the capability was said to ‘revolutionize intelligence’ during the Cold War.²¹⁴

The American reconnaissance satellite programme unexpectedly implicated Norway in its initial stages when the second satellite, Discoverer II, wrongfully ejected its capsule over the Norwegian Svalbard Archipelago in April 1959. It was reported that its blazing descent and its colourful parachute were observed by inhabitants on the archipelago, and the Norwegian Armed Forces subsequently assisted the Americans in the search. However, they only found ‘concentric circular tracks at the suspected impact point and leading to one of the Soviet mining concessions on the island’, which led them to assume that the Soviets had seized the capsule after systematic searches.²¹⁵ This unintended impact on Svalbard was about as much as Norway got to see of the capability, which the Americans did not publicly acknowledge until 1978. The NIS eventually asked their American counterparts to see the imagery, which the Americans refused and instead offered to provide the Norwegians with relevant intelligence products derived from the collected material. Towards the end of the 1960s, Norway received reports containing background information on Soviet forces in Norway’s areas of interest, which were said to be of great value in that they provided an intelligence picture that was ‘as close to reality as possible’. The Americans said at the time that the capability was not adequate to provide continuous strategic and tactical warnings on Soviet troop movements.²¹⁶

Strategic reconnaissance was a primary incentive for the Soviet space programme as well, and the Soviet Zenit reconnaissance satellites were even more complex than their human spaceflight programme, Vostok. Depending on the location of the target, Soviet satellites were launched from Tyuratam or Plesetsk with various inclinations, and some satellites were equipped with electronic intelligence capability in addition to cameras to intercept American and NATO air defence radar frequencies. The first successful launch of a Soviet reconnaissance satellite, a Zenit-2, was deployed into Earth orbit on 26 April 1962 under the pretence of a scientific satellite mission named Kosmos-4.²¹⁷

²¹⁴ Day, Logsdon and Latell, *Eye in the Sky: The Story of the Corona Spy Satellites*, 3–4.

²¹⁵ Day, Logsdon and Latell, *Eye in the Sky: The Story of the Corona Spy Satellites*, 53.

²¹⁶ Riste and Moland, «Strengt hemmelig»: norsk etterretningstjeneste 1945–1970, 260, 67–68, 81, 313.

²¹⁷ Peter A. Gorin, “Zenit: The Soviet Response to Corona,” in *Eye in the Sky: The Story of the Corona Spy Satellites* (Smithsonian Institution Press, 1998).

The Norwegian space surveillance programme

The development of space-based reconnaissance did not render the 'regular', land-based intelligence activity superfluous, but on the contrary, generated a need for increased ground-based capability to monitor space activity. As part of a national programme to strengthen their defences against the possible threat from Soviet spacecraft, the US designed a ground-based electronic space surveillance system. This entailed a global network of signals intelligence stations that would track activity at the Kapustin Yar and Tyuratam missile and space launch base complexes and in outer space. Ground-based capability could furthermore confirm or refute intelligence provided by American reconnaissance satellites, decide which type of data the Soviet reconnaissance satellite was collecting and provide technical information on propulsion, guidance and command, and control functions of adversary capability. The Americans anticipated that five such stations would suffice, of which two were to be in the Middle East, one in the Far East, one in North America and one in Northern Europe, 'preferably in Norway'. Norway was particularly attractive because the Americans anticipated that the Soviets would start launching satellites in polar orbits in 1963. For technical reasons, the Americans anticipated that the Soviet polar-orbit satellites would telemeter their data to Soviet satellite ground stations in the north-western USSR, and a station in northern Norway would thus be well-placed to intercept these transmissions.²¹⁸

At this point, it is necessary to understand the basics of satellite systems operating in polar orbits and the mission system architecture and ground infrastructure they require. Overall, the high orbital speeds and global cover of satellites require a global network of ground stations in order to acquire a detailed intelligence picture of space objects posing a potential threat. Adding to the equation is the threat posed by an ICBM, which at its high points of travel to the target may be mistaken for an Earth-orbiting satellite. Obtaining and upholding a complete picture while at the same time being capable of instantly identifying new threats appearing over the horizon thus requires a sophisticated and wide-spanning network of space surveillance sensors.²¹⁹

As for satellite orbits, the ground track of a satellite constitutes the trace of points formed by a satellite's position vector where it intersects

²¹⁸ Riste and Moland, «*Strengt hemmelig*»: norsk etterretningstjeneste 1945-1970, 260.

²¹⁹ Lyn Dutton et al., *Military Space* (Brassey's, 1990).

the surface of the Earth, with polar orbits per definition being inclined approximately 90 degrees relative to the Earth's equator.²²⁰ Thus, polar-orbit satellites pass directly or almost directly above the North Pole and in LEO take about 90–100 minutes to orbit the Earth. A satellite in low earth polar orbit can therefore accumulatively cover the entire globe as the Earth revolves beneath it, which is why these orbits are preferred for remote sensing missions, including photoreconnaissance and other missions that entail information collection on the surface of the Earth below it.²²¹

When the Americans proposed to establish space surveillance capability on Norwegian territory in October 1962, they offered to cover all costs, including operation of the station. The head of Norwegian military intelligence accommodated the request by proclaiming the importance of such a station in northern Norway, arguing that it could obtain electronic information from 'spacecraft ascending from or returning to the Soviet Union' in polar orbits and that Norway could inform the Americans of Soviet polar orbit satellites about to pass over the US. In November 1962, four Americans travelled to Fauske to see the locations, which resulted in the decision to establish the space surveillance installation 'Fauske II'. There were already other capabilities at Fauske, which meant that several communications, electronics and space surveillance intelligence capabilities could be colocated to complement each other. The equipment, including antennas, receivers, tape recorders, analysis equipment and communications systems, was shipped from the US. The Americans also provided training for 15 Norwegian operators. In November 1964, the installation intercepted Mars probe number 83 in the Soviet Sputnik sequence.²²²

Overall, the purpose of the Norwegian-American space surveillance programme was to track developments in Soviet space activity and technology. It was to identify newly launched satellites, whether these were routine launches or launches of a new or modified type of satellite and to map satellites' functions capacity and pattern of operation.²²³ By 1965, the Soviets were, on average, launching twice as many reconnaissance satellites as the Americans. Overall, the Norwegian signals intelligence programme

²²⁰ Daryl G. Boden, "Introduction to Astrodynamics," in *Space Mission Analysis and Design*, ed. James R. Wertz and Wiley J. Larson (Microcosm Press, 1999).

²²¹ Pål Bjerke and Richard B. Olsen, *En introduksjon til satellitter*, (FFI, 2008).

²²² Riste and Moland, «*Strengt hemmelig*»: *norsk etterretningstjeneste 1945-1970*, 261–62.

²²³ Riste and Moland, «*Strengt hemmelig*»: *norsk etterretningstjeneste 1945-1970*, 261–62, 400.

developed forcefully up until the 1990s, and the Soviet strategic forces in the vicinity of Norway remained the primary focus area.²²⁴

Norway, the space treaties and law

In December 1963, the United Nations General Assembly (UNGA) adopted the Declaration of Legal Principles Governing Activities in the Exploration and Use of Outer Space, all of which formed a foundation for the 1967 Outer Space Treaty (OST). The OST was also inspired by the 1959 Antarctic Treaty, which established Antarctica as a global common under international law. In fact, after the Antarctic Treaty, the OST was the second so-called non-armament treaty, establishing a nuclear-weapons-free zone.²²⁵

The space treaties and the world's first national space law

The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), established in 1959, developed five multilateral space treaties that were conventionally and legally binding upon ratification. The most fundamental is the 1967 OST 'denuclearized outer space and demilitarized the moon'; however, it did not 'demilitarize outer space'.²²⁶ Article IV of the OST states that: 'State Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.'²²⁷

The Outer Space Treaty (1967) and the world's first space law

The OST was successively complemented by the Rescue Agreement (ARRA) (1968),²²⁸ the Liability Convention (LIAB) (1972),²²⁹ the Registration

²²⁴ Tamnes, *Norsk utenrikspolitisk historie 1965-1995: Oljealder*, 69–74.

²²⁵ Utenriksdepartementet, *Om sikkerhet og nedrustning*, St. meld. nr. 101 (1981–82), 61 (1982).

²²⁶ McDougall, ... *The Heavens and the Earth - A Political History of the Space Age*, 417–19.

²²⁷ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (OST) (1967). (Ratified by 109 states as of January 2019).

²²⁸ Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (ARRA) (1968). (Ratified by 98 states as of January 2019).

²²⁹ Convention on International Liability for Damage Caused by Space Objects (LIAB) (1972). (Ratified by 96 states as of January 2019).

Convention (REG) (1975)²³⁰ and the Moon Agreement (MOON) (1979),²³¹ where the latter four supplement and expand on the first.²³² Most of the principles established by the OST, as well as the ARRA, the LIAB and the REG would become considered as customary international law and therefore also binding on nations which are not party to these treaties.²³³

Norway signed the OST in February 1967, and on 29 March 1968, Norway's Minister of Foreign Affairs, John Lyng (Conservative Party) presented it before the Cabinet.^{234, 235} John Lyng had succeeded Halvard Lange in October 1965 and was a moderate supporter of Norway's transatlantic relations concerned with the Norwegian balancing act between the USSR and the US, as opposed to the dominant East-West delineation. Believing that Norway should develop friendly relations between the two power blocs, Lyng has been said to have contributed substantially to securing Norway a reconciliatory role in foreign relations.²³⁶

In the cabinet meeting, Lyng explained that the need to develop international space law had been 'acute' since the launch of Sputnik 1 more than ten years prior and expressed that he was much in favour of Norway ratifying the treaty. He described the organisational structure of the UNCOPUOS and recapped that the United Nations (UN) through the 1963 declaration was aiming to separate discussions on outer space from other disarmament issues. Whereas some parts of the space treaty were negotiated bilaterally between the Americans and the Soviets, who were mainly concerned with each other, other parties to the treaty could potentially gain access to and observe their objects from other states' territories, Lyng stressed. In particular, the space treaty encouraged international scientific cooperation, which Lyng believed to be especially important for smaller states and therefore for Norway. He went on to inform the audience that the Norwegian areas north of the polar

²³⁰ Convention on Registration of Objects Launched into Outer Space (REG) (1975). (Ratified by 69 states as of January 2019).

²³¹ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (MOON) (1979). (Ratified by 18 states as of January 2019).

²³² Norway has ratified the OST, the ARRA, the LIAB and the REG. "Status of International Agreements relating to Activities in Outer Space" (United Nations Office for Outer Space Affairs, 2019). http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2019_CRP03E.pdf.

²³³ Jonty Kasku-Jackson and Elizabeth Waldrop, "Understanding Space Law," in *Space and Defense Policy*, ed. Damon Coletta and Frances T. Pilch (Routledge, 2009), 66.

²³⁴ Norwegian: *Kongen i Statsråd*, referring to the formal Government of Norway.

²³⁵ «St. prp. nr. 88. (1967-68) Om samtykke til ratifikasjon av en traktat av 27. januar 1967 om prinsippene for statenes virksomhet ved utforskning og bruk av det ytre verdensrom, herunder månen og andre himmellegemer.» (March 29 1968).

²³⁶ Tamnes, *Norsk utenrikspolitisk historie 1965-1995: Oljealder*, 17, 27–29.

circle were particularly well-suited to ‘observations of satellites and space rockets’ and that Norway had recently built a rocket launch facility on Andøya, a telemetry station on Svalbard and were currently establishing a telemetry station in conjunction with the Auroral Observatory in Tromsø. Agreements with international organisations and other states’ research institutes played an important role both scientifically and financially in the effort to develop the Norwegian national space infrastructure, and Lyng proclaimed on these grounds that the OST and its emphasis on international cooperation was certainly in Norway’s national interest. Overall, Lyng’s statement in the cabinet meeting demonstrated comprehensive knowledge of Norwegian space activities and the strategic interests they implied, and that Lyng himself appealed to Norway to ratify the treaty.²³⁷

In conjunction with Norway signing the OST, representatives from the Ministry of Justice and Police were particularly concerned with the treaty’s Article VII, which established that once ratified, the launching state assumes international responsibility and potential liability in the case of damage to other state parties to the treaty, including any citizens and juridical persons.²³⁸ To them, the article seemed to place unlimited responsibility on the launching state, whereas the treaty’s Article VI concerning national authorisation for non-governmental associations’ space activities on national territory would require Norway to establish national legislation in this respect. Consequently, the MI drafted a new national law on the launch of objects from Norwegian territory, and Norway thus held back on submitting the Norwegian ratification document until the national legislative circumstances were in order. The MFA also presented the treaty to the MoD, the FFI, the Norwegian Telegraph Board and the NTNF.^{239, 240}

²³⁷ «St. prp. nr. 88. (1967-68) Om samtykke til ratifikasjon av en traktat av 27. januar 1967 om prinsippene for statenes virksomhet ved utforskning og bruk av det ytre verdensrom, herunder månen og andre himmellegemer.»

²³⁸ Norwegian: *Justis- og beredskapsdepartementet*, at the time and until 2012 known as the Ministry of Justice and Police (Norwegian: *Justis- og Politidepartementet*)

²³⁹ That Norway placed responsibility for establishing national space legislation with the MI reflects that Norway officially regarded space activities as an industrial endeavour. Collett and Lossius, “Towards Commercialization of Space: A National Programme for Industrialization of Space Technology,” 165.

²⁴⁰ «St. prp. nr. 88. (1967-68) Om samtykke til ratifikasjon av en traktat av 27. januar 1967 om prinsippene for statenes virksomhet ved utforskning og bruk av det ytre verdensrom, herunder månen og andre himmellegemer.»

Norway ratified the OST on 6 June 1969 and on 13 June 1969, Norway became the first country in history to pass a national space law.²⁴¹ Almost one year after Lyng's appeal, the MI recommended before the Cabinet to approve and sign the draft proposition on the Norwegian national law on space launch. The law had already been presented to the MFA, the Ministry of Justice, the MoD, the Ministry of Transport and the NTNF. At this point, the legislative recommendation was (for reasons unknown) presented by the Minister of Education, Kjell Bondevik. Bondevik reiterated Lyng's statements from the previous year, with a few added concerns by the Ministry of Justice. First, Norway had a national responsibility to authorise non-state space actors and was obliged to make sure that no Norwegian actors would violate the OST. Second, without further deliberation, they drew particular attention to Articles IV and IX, that is, that the OST prohibited any deployment of nuclear weapons or other weapons of mass destruction in orbit around the Earth, and that parties to the treaty were obliged not to pollute outer space and celestial bodies. Third, the account highlighted that no commonly recognised international definition of what constituted 'outer space' existed. The Norwegian Aviation Act of 16 December 1960 did not delineate air space and outer space, and if a future, legally-defined delineation of outer space was set at a higher altitude than what could reasonably be defined as air space, the situation would render an atmospheric layer uncovered by either aviation law or space law. However, Norway presumed at that time that the combination of aviation and space laws, current and future, should be interpreted in such a way that they would not imply such an uncovered atmospheric layer. They reasoned that aviation and space laws would collectively be interpreted to cover the entire continuum of the atmosphere and that, in practice, deciding which law would come into use was therefore unlikely to become a practical issue in the future. Conclusively, the MI stated that a comprehensive national space law was not necessary and that it was sufficient to establish legislation which merely required launching authorisation from the Norwegian authorities. Moreover, they explicitly stated that the Norwegian Government would not voluntarily take on greater responsibility than that which already followed under the OST.²⁴²

²⁴¹ The Norwegian *Act on Launching Objects From Norwegian Territory etc. Into Outer Space* shortly states that without permission from the Norwegian Ministry of Trade and Industry, it is forbidden to launch any object into outer space from Norwegian territory, vessels, aircraft or, in the event the launching is 'undertaken by a Norwegian citizen or person with habitual residence in Norway,' from areas that are not subject to the sovereignty of any state. See <https://lovdata.no/dokument/NL/lov/1969-06-13-38> and https://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/norway/act_38_1969E.html.

²⁴² Industridepartementet, *Ot. prp. nr. 26. (1968-69) Om lov om oppskytning av gjenstander fra norsk territorium m.m. ut i verdensrommet*, (1969).

The Norwegian space law was established specifically to govern rocket launch activity at Andøya Rocket Range, which had by then been an active northern Norwegian launch site for seven years. The MI presumed that the knowledge and experience already acquired jointly by the NTNF and Norwegian Defence Research Establishment (NDRE) personnel through a number of rocket launches from Andøya were sufficient to assess the technical conditions and security measures required in conjunction with space launch from Norwegian territory. On these grounds, the MI concluded that the proposed national law, the Act on Launching Objects From Norwegian Territory etc. Into Outer Space,²⁴³ in short referred to as ‘the Act on Space Launch,’ should go into effect immediately.²⁴⁴

The act was recommended by the Standing Committee on Foreign and Constitutional Affairs to the Odelsting²⁴⁵ on 26 March 1969, approved by the Odelsting on 6 May 1969 and sent to the Lagting,²⁴⁶ before entering into force on 13 June 1969 under the authority and administration of the MI.²⁴⁷ With that, the Norwegian act became the world’s first space law to enter into force.²⁴⁸ The relatively simplistic law states that:²⁴⁹

- 1) *Without permission from the Norwegian Ministry concerned, it is forbidden to launch any object into outer space from:*
 - a. *Norwegian territory, also including Svalbard, Jan Mayen and the Norwegian external territories.*
 - b. *Norwegian vessels, aircrafts etc.*
 - c. *Areas that are not subject to the sovereignty of any state, when the launching is undertaken by a Norwegian citizen or person with habitual residence in Norway.*

Certain terms can be set for such permission as described in paragraph one.

- 2) *The Ministry can issue regulations on control etc. of activities as described in 1.*
- 3) *This act enters into force immediately.*

²⁴³ LOV-1969-06-13-38, *Lov om oppskyting av gjenstander fra norsk territorium m.m. ut i verdensrommet. Nærings- og fiskeridepartementet*. Ikrafttredelse 13.06.1969, rettet 21.06.2021.

²⁴⁴ *Lov om oppskyting av gjenstander fra norsk territorium m.m. ut i verdensrommet*.

²⁴⁵ Odelsting: Until its abolition 2009, the largest of two divisions of the Storting or Norwegian Parliament.

²⁴⁶ Lagting: Until its abolition in 2009, the smallest of two divisions of the Storting or Norwegian Parliament.

²⁴⁷ «Innst. O. nr. 49 Innstilling fra utenriks- og konstitusjonskomiteén om lov om oppskyting av gjenstander fra norsk territorium m.m. ut i verdensrommet.» (March 26 1969); «Forhandlinger i Odelstinget nr. 52.» (May 06 1969); “Besl. O. nr. 34.” (May 06 1969).

²⁴⁸ I. Marboe and F. Hafner, “Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties,” in *National Space Legislation in Europe: Issues of Authorisation of Private Space Activities in the Light of Developments in European Space Cooperation*, ed. Frans G. von der Dunk (Martinus Nijhoff Publishers, 2011), 33.

²⁴⁹ United Nations Office for Outer Space Affairs, *Selected Examples of National Laws Governing Space Activities: Norway*, (1969).

The Norwegian law was later criticised by scholars for its simplicity and relatively narrow definition of the concept of ‘space activity’ and for applying only territorial but not personal jurisdiction. The law only requires authorisation for a specific type of activity, that is, rocket launch, from Norwegian and international territories, the limited scope of which excludes other, non-launch space activities such as satellite operations. It neither specifies the requirements necessary to obtain rocket launch permission by the MTIF, nor addresses registration, liability and insurance issues. It also does not handle space launch by Norwegian actors from foreign territory or the re-entry of Norwegian space objects into the atmosphere.²⁵⁰ The limited scope of the law has so far not posed any practical issues. Receiving a permit for about a two-year period for scientific sounding rockets, the Andoya Space Center (ASC) is the only entity that has been granted permission to launch sounding rockets to outer space under the Norwegian law on space launch. The permit stipulates technical requirements, compliance with international obligations and requires that the ASC and its customers take on the entire liability that the Norwegian state has assumed through the space treaties. The state requires that insurance is in place and that the customers’ responsibilities are stated in writing. The ASC must also conduct a risk assessment in order to minimise the risk of triggering the LIAB. Conclusively, the licence conditions for the authorisation of rocket launches from Norwegian territory are satisfactory. Still, the limited scope of the law could become an issue if Norwegian rockets were launched from foreign territory, if Norway launched satellites from Norwegian territory or if Norway became a portal for space tourism. It has been suggested that Norway therefore should establish mechanisms to regulate a broader spectrum of space activities, in order to enable the Norwegian authorities to ensure that this activity is in line with international obligations and the national interest.²⁵¹

²⁵⁰ Irmgard Marboe, “National Space Law,” in *Handbook of Space Law*, ed. Frans G. von der Dunk and Fabio Tronchetti (Edward Elgar Publishing, 2015), 151–52.

²⁵¹ Norsk Romsenter, *Norge og FNs rammeverk for bruk av verdensrommet*, NRS-Rapport (2017)1, 48–50 (Norsk Romsenter, 2017).

The Rescue Agreement (1968)

On 22 April 1968, Norway signed the second international space treaty, that is, ARRA, which was ratified on 20 March 1970. John Lyng presented the agreement before council on 9 January 1970, recapping the UNCOPUOS' effort to establish the 1967 OST and drawing attention to its Article V, which states that space travellers (at the time, astronauts and cosmonauts) should be considered humanity's emissaries in space. Moreover, they shall be provided with all possible assistance in the event of an accident, emergency or emergency landing on the territory of another party to the treaty or in the ocean. In order to clarify the provisions of Article V of the OST, the UNGA had in November 1967 unanimously passed a resolution requesting the UNCOPUOS to expedite the preparation of an agreement for the assistance and return of space travellers and their spacecraft, and the UNGA unanimously passed a resolution recommending the treaty in December the same year. The ratification was designated as a historic event, Lyng proclaimed. Like the partial-test-ban treaty, the OST and later also the UN Treaty on the Non-Proliferation of Nuclear Weapons,²⁵² the ARRA was opened for signing in London, Moscow and Washington, DC., and Norway's envoys in the respective capitals signed it on 22 April 1968. According to Lyng, Norway rightfully regarded the present agreement first and foremost as a further elaboration and supplement to the OST, which was reason in and of itself for Norway to ratify it. The Norwegian MFA emphasised that Norway should ratify the treaty because of the kingdom's geographical location and size, its long coast and adjacent waters, and its traditions and experience in search and rescue. The agreement had also been presented to the Ministry of Justice (MoJ), the MoD, the FFI and the national communications authority, Teledirektoratet,²⁵³ of which none objected to Norway ratifying the agreement.²⁵⁴

The Liability Convention (1972) and the Registration Convention (1975)

In 1972, the LIAB was established to handle liability issues in the event of damage caused by space objects, including the nature of the damages that

²⁵² United Nations Treaty on the Non-Proliferation of Nuclear Weapons, New York, 12 June 1968.

²⁵³ Norwegian: *Nasjonal Kommunikasjonsmyndighet (NKOM)*, at the time known as the Directorate of Telecommunications (Norwegian: *Teledirektoratet*).

²⁵⁴ Utenriksdepartementet, *St. prp. nr. 51. (1969-1970)*, (1970).

result in compensation and the amount of compensation and settlement of disputes, and it regulates the forms of responsibility that lie with two or more states or international organisations operating in space. The question of Norwegian ratification of the LIAB was submitted to the relevant national ministries as early as 1971, and Norway signed it on 29 March 1972. However, Norway did not ratify it until 1995.²⁵⁵ In conjunction with this, Norway ratified the 1975 REG, which requires states to establish national registries of their space objects and to provide information on these objects to the UN Secretary-General for inclusion in the *UN Register of Objects Launched Into Outer Space*. This register is maintained by the UNCOPUOS' secretariat, called 'the United Nations Office for Outer Space Affairs' (UNOOSA). Parties to the treaty are required to publicly disseminate information on the registered space objects. Originally established to aid the UNCOPUOS in political, legal and technical outer space issues, the space object register has increasingly evolved as a tool to resolve issues regarding international liability and responsibility.²⁵⁶

Whereas the MI agreed with the MFA that Norway should ratify the LIAB, the MoJ wanted to await an international clarification on whether the ratification implied a need to implement national legislation. They noted that the convention's Article XI point two made an important exception to the general rules of international law, which the Norwegian Government therefore thoroughly examined.²⁵⁷ Article XI point two of the LIAB states that:

Nothing in this Convention shall prevent a State, or natural or juridical persons it might represent, from pursuing a claim in the courts or administrative tribunals or agencies of a launching State. A State shall not, however, be entitled to present a claim under this Convention in respect of the same damage for which claim is being pursued in the courts or administrative tribunals or agencies of a launching State or under another international agreement which is binding on the States concerned.

In 1977, the MoJ concluded that ratification did not require legislative amendment, however, the MoF objected, fearing that a state with even just a negligible part of a space project could be held liable for damages

²⁵⁵ Utenrikskomiteen, *Innst. S. nr. 83 - 1994-95* (Stortinget, 1995); Lovdata, "Konvensjon om internasjonalt ansvar for skade voldt av romgjenstander," in *29-03-1972 nr 1 Multilateral* (www.lovdato.no, 1995). <https://lovdata.no/dokument/TRAKTAT/traktat/1972-03-29-1>.

²⁵⁶ United Nations Office for Outer Space Affairs, *United Nations Register of Objects Launched into Outer Space* (2019).

²⁵⁷ Utenrikskomiteen, *Innst. S. nr. 83 - 1994-95*.

that represented significant costs. The MFA therefore put the issue on hold, and because of the LIAB's close association with the REG, which was now also on the table, Norway considered it inappropriate to accede to any of the conventions.²⁵⁸

The LIAB issue was raised again in 1980 and 1990, lastly by the Norwegian space centre considering the development of Andøya and the growing activities there, but the MoF maintained its objection. In 1992, the space centre raised the issue again, and the MoF finally agreed in 1994 not to oppose it, primarily because the law on subsidiary solidary responsibility had not been applied during the 22 years that the convention had been in force. Moreover, the ESA Council had determined in 1977 that ESA should compensate the amount of compensation that a state had to pay. Furthermore, between 1990–1993, sales of Norwegian products and services in the space sector had increased by 83 percent, constituting about NOK 2.2 billion at the time. The MI therefore stated in January 1994 that the country's new business policy considerations implied that Norway should finally accede to the convention. The MI at this point feared that it could become an obstacle to specific projects if Norway did not now accede to the convention and that the activities on Andøya consequently would suffer. For example, it would not be possible to launch small satellites from Andøya if Norway did not endorse the LIAB, because this would be a requirement from clients. The MT at this point stated that Norway's need to formalise relations with the international agreements in the space domain had increased in line with Norwegian participation in ESA, the three satellite consortia Inmarsat, Eutelsat and Intelsat, as well as through the NTA's operation of the Thor satellite.²⁵⁹

In November 1995, the MFA forwarded the Government's proposal for consent to ratify the LIAB as well as the REG to the Storting, specifying that Denmark, Finland, Sweden, ESA and Eutelsat had already ratified the LIAB, whereas Denmark, Sweden and ESA had ratified the REG. The Foreign Committee then recommended the Storting to approve ratification of the LIAB and noted that it would then be natural to also accede to the REG, given the close relationship between the conventions.²⁶⁰ The parliamentary resolution entered into force in Norway on 3 April 1995.²⁶¹

²⁵⁸ Utenrikskomiteen, *Innst. S. nr. 83 - 1994-95*.

²⁵⁹ Utenrikskomiteen, *Innst. S. nr. 83 - 1994-95*.

²⁶⁰ Utenrikskomiteen, *Innst. S. nr. 83 - 1994-95*.

²⁶¹ Lovdata, "Konvensjon om internasjonalt ansvar for skade voldt av romgjenstander."

Norway and the Cold War's arms race in outer space

Perhaps the first time the Norwegian Government thoroughly discussed the possibility of an arms race in outer space concerned Norway's acceptance of the 1963 Partial Test Ban Treaty,²⁶² which Norway first and foremost considered an important contribution to the ongoing disarmament negotiations and to prevent the proliferation of nuclear weapons.²⁶³ Following these discussions, however, some Norwegian parliamentarians expressed particular concern regarding the principled non-extension of the nuclear arms race to outer space. Kjell Bondevik (Christian Democratic Party) emphasised the prevention of nuclear reactive downfall over Norway, as well as the great powers' agreement not to deploy nuclear weapons in outer space, whereas Alv Kjøs (Conservative Party) referred to the treaty as another step further in the principled agreement that already existed.²⁶⁴

The Norwegian MFA had established a national committee for arms control and disarmament in June 1961,²⁶⁵ whereas twenty years later, in 1981, they established the Disarmament Secretariat as a separate office and became active in the Conference on Disarmament (CD) in Geneva. During this time, Norway acquired status as an active observer state and the Foreign Service strengthened its engagement in arms control and disarmament, both at its offices in Oslo and at its missions abroad. This included the strengthening of Norway's permanent delegation to Geneva with an embassy council for disarmament issues, and in the early 1980s, Norway participated in all the CD working groups.²⁶⁶

Norway was mostly concerned with nuclear disarmament and non-proliferation in this respect, but the MFA noted in June 1982 that the UNGA had brought up the issue of an arms race in outer space. The MFA remarked in relation to this that the development of anti-satellite (ASAT) weapons,

²⁶² Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (1963).

²⁶³ *St. prp. nr. 6 (1963-64) Om samtykke til ratifikasjon av en traktat som forbyr mot prøver med kjernefysiske våpen i atmosfæren, det ytre verdensrom og under vannet, datert 5. august 1963 og undertegnet av Norge i London, Moskva og Washington 9. Aug 1963* (Stortinget, 1963).

²⁶⁴ Utenriks- og konstitusjonskomiteén, *Innstilling fra utenriks- og konstitusjonskomiteén om samtykke til ratifikasjon av en traktat om forbud mot prøver med kjernefysiske våpen i atmosfæren, det ytre verdensrom og under vannet, datert 5. august 1963 og undertegnet av Norge i London, Moskva og Washington den 9. august 1963, Innst. S. nr. 12. (1963-64)* (Stortinget, 1963).

²⁶⁵ Utvalget for rustningskontroll og nedrustning.

²⁶⁶ Utenriks- og konstitusjonskomiteén, *Innstilling fra utenriks- og konstitusjonskomiteén om sikkerhet og nedrustning og om norsk deltagelse i FN's 12. ekstraordinære Generalforsamling, Innst. S. nr. 225 (1983-84)* (1984).

which could be used to destroy satellites used for purposes such as navigation, communication, warning and observation, was at an early stage. They also noted that satellites played an important role in surveillance and verification of arms control agreements, and that the significance of satellites would only increase with the attempts to reach more extensive agreements, such as the ongoing efforts to negotiate the Comprehensive Nuclear Test Ban Treaty. Satellites could also provide rapid communication and control of military activity, which they saw as essential to avoid accidental and unintended conflict. Norway was aware that the US and the USSR had been discussing the prohibition of ASAT weapons to prevent an arms race in outer space since 1977 and that they had started official talks in Helsinki in 1978, but that after subsequent talks in Bern, Vienna and Geneva, the bilateral negotiations had come to a halt. The MFA expressed their concern, stating that a prohibition of ASAT weapons and other measures to prevent an arms race in outer space would have a stabilising effect on the great powers, and at the same time secure the possibilities for surveillance of agreements, arms control and disarmament. Their overall attitude was that the exploration of outer space should be kept outside of military conflict relations on Earth.²⁶⁷

Space was not thoroughly discussed during the 12th UNGA on 15 June 1982, although it was noted that the danger of the arms race proliferating into outer space had never been greater. The Belgian Foreign Minister, Leo Tindemans, appealed before the assembly to establish an international satellite verification agency, whereas the Canadian Prime Minister, Pierre Trudeau, suggested an initiative to forbid the development, testing and deployment of all weapons in outer space. Like President Reagan, the MFA noted, Prime Minister Trudeau emphasised the significance of verification in disarmament negotiations and that the methods of verification must necessarily vary from one weapons system to another. Norway's representative, Foreign Minister Sverre Stray, did not express any concerns about an arms race in outer space at this point, but rather expanded on arms control for nuclear and chemical weapons, which seemed to be Norway's primary focus at the time. Space was also not mentioned by Norwegian representatives in statements before the UN or at the CD in Geneva at the end of June, mid-July and mid-August 1982. However, as France had proposed to follow-up on the work of establishing an international satellite

²⁶⁷ Utenriksdepartementet, *Om sikkerhet og nedrustning*, 50.

surveillance organ in the special session on disarmament, the MFA commented afterwards that they would support this effort to avoid an increased militarisation of outer space. In this respect, the Norwegian Government was mostly concerned with reaching an effective and verifiable agreement to prohibit ASAT weapons.²⁶⁸

Norway and the American 'Star Wars' initiative

The debate on the arms race in outer space was broadly invigorated when President Reagan held his 'Star Wars' speech on 23 March 1983, where he challenged the scientists who had once developed nuclear weapons to now use their abilities and develop the necessary means to render nuclear weapons impotent and obsolete. Reagan envisioned essentially an Anti-Ballistic Missile (ABM) defence system that would intercept and destroy strategic missiles before they could reach the US mainland or their allies. The Strategic Defence Initiative (SDI), as it was formally named, aroused great attention world-wide. This was also the case with the Norwegian Prime Minister, who in 1985 appointed an expert committee to thoroughly examine the technical aspects of the programme.²⁶⁹ The status quo had also been commented on by the Norwegian satellite remote sensing committee in their report to the MoE in June 1983, which assessed both that military institutions at the time were growing increasingly more dependent on space capabilities to conduct military missions and that space capabilities would therefore naturally be considered as legitimate targets during armed conflict. Noting that the great powers were already developing weapons with the aim of destroying enemy satellites, they remarked that the world was on the verge of a possible arms race in outer space.²⁷⁰

The Norwegian SDI Committee appointed by the Prime Minister consisted of Erik Klippenberg, who succeeded Finn Lied as FFI director in 1983, Gunnar Stette, a satellite communications expert who was central in developing both the NorSat satellite system for communications with oil platforms in the North Sea, as well as the global Inmarsat system, and Bjørn Grandahl. This trio paid much attention to the development of ballistic

²⁶⁸ Utenriksdepartementet, *St. meld. nr. 39 (1982-83) Norsk deltagelse i FNs 12. ekstraordinære Generalforsamling* (1982), 13, 16, 30, 43–53.

²⁶⁹ Erik Klippenberg, Gunnar Stette and Bjørn Grandal, *Forsvar mot ballistiske raketter - de tekniske og vitenskapelige sider ved USAs strategiske forsvarsinitiativ SDI* (Statsministerens kontor, 1985).

²⁷⁰ Lied et al., *Satellittfernmåling*, 7–9.

missiles and the central factor in the SDI debate that was the bilateral 1972 ABM Treaty, which restricted American and Soviet deployment of anti-ballistic missile systems. Subsequently, the committee described the development of ASAT weapons thus far and assessed how the SDI could play into a European defence system, as well as its possible civilian applications. Lastly, they concluded that it would probably be very challenging for Norway to participate, given Norway's limited population and technological foundation.²⁷¹

Overall, the SDI was debated in several capacities throughout the Willoch Government (1981–1986) and the second Brundtland Government (1986–1989) in the time period 1983–1989. The Willoch Government established that Norway opposed the militarisation of space, but acted very carefully to avoid compromising the country's position within NATO. Although the MFA assessed that the SDI was a burden to the alliance for several reasons, they announced their conditional support for the programme in NATO in March 1985, mainly based on the argument that the USSR was itself developing space weapons. It has later been assessed that the Soviets more likely feared the American technology, as they had repeatedly tried to involve the Americans in an international agreement to prohibit space weapons through initiatives in the UN in 1981 and 1982. Norway's main concerns regarding the SDI concerned the lack of progress in the discussion on space weapons, which it believed could block the Intermediate-Range Nuclear Forces Treaty. It also believed that the SDI could lead the Americans to distance themselves from the defence of Europe, as well as disrupt the nuclear strategic balance and undermine European nuclear weapons. Norway therefore supported it on the condition that the US would abide by the ABM Treaty and not develop, test or deploy space weapons without first negotiating any such activities with the USSR.²⁷²

As mentioned, the USSR and a few other states tried to legally prohibit the weaponisation of space via the UN system, through the 1981 Prevention of an Arms Race in Outer Space initiative, which reaffirmed the fundamental principles of the 1967 OST. However, none of the initiative's resolutions, nor any of

²⁷¹ Klippenberg, Stette and Grandal, *Forsvar mot ballistiske raketter - de tekniske og vitenskapelige sider ved USAs strategiske forsvarsinitiativ SDI*.

²⁷² Aasmund Solem, «Norske reaksjoner på Reagans 'stjernekrigs'-program» (Master's thesis, University of Oslo, 2012), 111–13, <https://www.duo.uio.no/bitstream/handle/10852/34464/AasmundSolemNorgeSDI.pdf?sequence=2>.

the other arms limitation treaties, provide a general definition or description of space weapons that could be subject to prohibition or restriction. Instead, they prohibit generalised capacities, such as the deployment of ‘nuclear weapons; weapons of mass destruction; military manoeuvres; and any type of weapons’ (the 1967 OST), or ‘any type of weapons or measures of a military nature’ (the 1959 Antarctic Treaty). Similarly, the ABM Treaty limited the function of weapons systems to ‘counter ballistic missiles or their elements in flight trajectory.’²⁷³

The Norwegian technical SDI committee expressed that SDI-oriented research would not be stopped by such agreements, in part because it would be impossible to verify compliance but mainly because the overlap between research on SDI technology, technology for civilian and traditional military requirements and research in general was significant. Furthermore, the committee assessed that the ABM Treaty would undeniably come under pressure if the SDI development continued.²⁷⁴

The following Brundtland Government that took office in May 1986 immediately reserved itself more sharply against the SDI, to which the Pentagon in particular took offence. At national level, the affair displayed fundamental differences between the Conservative Party and the Labour Party with respect to international relations. Whereas the Conservative Party had a more conformist attitude towards NATO, the Labour Party to a greater extent aimed to influence it with its postures. Nevertheless, the relatively strong American reactions to Norway’s objections to the SDI led the Brundtland Government to adjust its strong reservations against space militarisation in order to appear more supportive of the Americans and ensure that NATO presented a united front towards the USSR.²⁷⁵

Norway and the second space age (post-Cold War)

In the early 1990s, the collapse of the USSR brought about a new and ambiguous world order. Russia was still a great power militarily, but vulnerable and in economic crisis, with unclear boundaries and governance.²⁷⁶

²⁷³ United Nations Institute for Disarmament Research (UNIDIR), *Disarmament: Problems Related to Outer Space* (1987), 17.

²⁷⁴ Klippenberg, Stette and Grandal, *Forsvar mot ballistiske raketter - de tekniske og vitenskapelige sider ved USAs strategiske forsvarsinitiativ SDI*.

²⁷⁵ Solem, «Norske reaksjoner på Reagans ‘stjernekrigs’-program,» 111–13.

²⁷⁶ Torbjørn L. Knutsen, «Politikk og praksis i historisk lys,» in *Norsk utenrikspolitisk praksis: Aktører og prosesser*, ed. Birgitte Kjos Fonn, Iver B. Neumann and Ole Jacob Sending (Cappelen Akademisk Forlag, 2006).

Post-Cold War optimism invalidated Norway's military Cold War doctrines and dispositions, and Norway gradually built down its national defence structure as NATO adopted a new strategic concept and gradually shifted its focus towards partnership programmes and a broader 'collective security' strategy.²⁷⁷

However, Russia upheld its defence structure and capabilities in the High North and its nuclear forces.²⁷⁸ Norway's Chief of Defence, Admiral Torolf Rein (1989–1994), stated in October 1990 that there would be no *cordon sanitaire* in the High North and urged that Norway going forward must increasingly consider the long-term variations of Russian intent. Russia was still a 'highly qualified adversary'.²⁷⁹ Norway could still be drawn into any conflict affecting major power strategic interests in the High North, where the dominant Russian naval forces operated free of arms control or inspection arrangements.²⁸⁰

During the same period, the Gulf War (1990–91) demonstrated contemporary technological advancements, and the globally televised war demonstrated modern US disruptive capabilities, such as Global Positioning System (GPS) aided precision strikes and satellite communications. Operation Desert Storm was by some experts called 'the first space war' based on its extensive satellite usage.²⁸¹ The Gulf War, along with the discontinuation of the USSR, was said to mark the beginning of '[t]he second space age' – an era characterised by the rise of globalisation and increased transparency enabled by satellite technology.²⁸² Space capability or 'spacepower' was postulated to be its key enabler.²⁸³ Force-enhancing use of satellites would motivate adversaries to counter space-based assets, and commercially available technologies could detect, identify and track LEO satellites, which could no longer operate covertly.²⁸⁴ These circumstances spurred a new, multi-national space race, where China and European nation-states, particularly France, expanded their national space programmes substantially.²⁸⁵ In 1998,

²⁷⁷ Knutsen, «Politikk og praksis i historisk lys.»

²⁷⁸ Dag Jostein Fjærvoll, «Forsvarets utfordringer inn i år 2000,» *Norsk Militært Tidsskrift*, no. 2 (1998).

²⁷⁹ Torolf Rein, «Norges forsvar i 1990-årene,» *Norsk Militært Tidsskrift*, no. 11 (1990).

²⁸⁰ Forsvaret, *Forsvarsstudien 1991* (Forsvarssjefen, 1992), 8.

²⁸¹ Peter Anson and Dennis Cummings, "The First Space War: The Contribution of Satellites to the Gulf War," *The RUSI Journal* 136, no. 4 (1991).

²⁸² Peter L. Hays and Charles D. Lutes, "Towards a Theory of Spacepower," *Space Policy* 23 (2007).

²⁸³ Gray, *Modern Strategy*, 13.

²⁸⁴ Allen Thomson, "Satellite Vulnerability: A Post-Cold War Issue?" *Space Policy*, no. February 1995 (1995).

²⁸⁵ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 21.

France became the first European country to use satellites in a tactical capacity during the Kosovo War.²⁸⁶

As geopolitical interest and attention towards the High North decreased during the 1990s, Norway also focused its military efforts on international operations outside Norway's borders,²⁸⁷ as far away as the Balkans, Lebanon, Iraq and Somalia.²⁸⁸ As for warfighting capabilities for home regions, then-Brigadier General Sverre Diesen, later Chief of Defence, who was in charge of military advice to the important Defence Study of 2000, envisioned the changing character of the military threat. Rather than focusing on mechanised divisions rolling into Norway from the east, he advised that Norway rather faced a threat posed by long-range precision strikes and electronic warfare towards critical infrastructure that aimed to prevent Norway's national leadership from performing wartime functions.²⁸⁹ However, there were competing perspectives on the importance of the new technologies and high-tech warfare. In 1999, Norway's then Chief of Defence General Sigurd Frisvold (1999–2005) expressed his scepticism to the military implications of technological advancement, arguing that modern conflicts such as those in Somalia and Kosovo demonstrated that technological superiority did not necessarily equate to superior military advantage.²⁹⁰

Yet, several states started developing indigenous space capabilities and dedicated military space systems in the name of national security, sovereignty and autonomy.²⁹¹ Even the nascent space power Norway started planning for its first military surveillance satellite.²⁹² For instance, satellite synthetic aperture radar (SAR) imagery showed promising deliveries for the Norwegian Coast Guard and for planning of Orion MPA operations.²⁹³ Thus, despite the 1990s austere defence budgets, in 1998 the FFI initiated a feasibility study to develop a national military surveillance satellite in cooperation with Norwegian industry. The satellite was to carry

²⁸⁶ Jean-Daniel Testé, "Interview with Jean-Daniel Testé, Commander of the French Joint Space Command 25 March 2016, 60 Boulevard Martial Valin, Paris, France," interview by Tale Sundlisæter, 2016.

²⁸⁷ Fjærvoll, «Forsvarets utfordringer inn i år 2000»; Forsvarsdepartementet, *St.meld. nr. 38 (1998-99) Tilpasning av Forsvaret til deltagelse i internasjonale operasjoner* (Regjeringen, 1999).

²⁸⁸ Forvarsmuseet, *INTOPS: Norske soldater, internasjonale operasjoner*, ed. Dag Leraand (Forsvarsmuseet, 2012).

²⁸⁹ Sverre Diesen, "Forsvarsstudie 2000," Expert commentary, *Norsk Militært Tidsskrift*, no. 12 (1999).

²⁹⁰ Sigurd Frisvold, «Hovedutfordringer for Forsvaret ved årtusenskiftet,» Expert commentary, *Norsk Militært Tidsskrift*, no. 11 (1999).

²⁹¹ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 21.

²⁹² Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 21.

²⁹³ Richard B. Olsen, «Norske mikrosatellitter,» *Luftled*, no. 1 (2019).

a passive radar instrument and was estimated to weigh no more than 50 kg. It went through the project planning phases from 1998 until 2003.²⁹⁴ This national military surveillance satellite project was considered during General Frisvold's Defence Study of 2003,²⁹⁵ and is therefore covered in the next chapter. As we shall see, however, General Frisvold's sceptical attitude towards the military value of technology as expressed at the end of the 1990s became a significant impediment for the development of Norwegian military satellite capability.

Norway and the WEU

Important factors in Norwegian space capability development were the country's relations with the Western European Union²⁹⁶ (WEU) and the 1992 establishment of the WEU Satellite Centre in Terreón de Ardoz near Madrid in Spain.²⁹⁷ The WEU's plans for enhanced surveillance satellite cooperation were also noted by the 1991 Defence Commission with respect to Norwegian strategic surveillance.²⁹⁸ Norway expected that military European satellites would come under the auspices of the Western Union and therefore had a strong space involvement in the Western European Armament Group (WEAG).²⁹⁹

In 1989, the FFI had proposed that WEAG, which by the late 1980s had not conducted any work on satellites, should establish a 'Common European Priority Area' (CEPA) on satellite surveillance. This proposal was adopted shortly thereafter, with Norway formally at the helm of the group, called CEPA 9³⁰⁰ or the Satellite Surveillance and Military Space Technology group. Johansen saw an opportunity and took the initiative there. The first meeting was held in Oslo in December 1989 and the first programme, which covered technological developments of significant interest to Norway, was approved by the participants in 1990. Terje Wahl took over the chairmanship of CEPA 9 after Johansen in 1998 and headed the development of data processing and satellite ground station technology.

²⁹⁴ FFI, *Satellittovervåking*, 28–29.

²⁹⁵ Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, 12–13 (Forsvaret, 2003).

²⁹⁶ The WEU officially ceased to exist on 30 June 2011, with the EU taking over its activities.

²⁹⁷ FFI, *Satellittovervåking*, 21.

²⁹⁸ Forsvarskommisjonen, *Forsvarskommisjonen av 1990*, NOU 1992:12, 129–30 (Statens Forvaltningstjeneste, Seksjon Statens Trykning, 1992).

²⁹⁹ Terje Wahl, "Interview with Terje Wahl, Director of Research and Earth Observation, Norwegian Space Agency, 26 June 2022. [In Norwegian]," interview by Tale Sundlisæter, 2022.

³⁰⁰ FFI, *Satellittovervåking*, 21.

Certain projects, some of them funded by the Norwegian MoD, covered developments of critical technology throughout the entire satellite-based surveillance system chain.³⁰¹

In February 1993, Norway's military representative to the WEU, Lt. Gen. Hjalmar Sunde, stated publicly that Norway would not get access to the WEU's space activities until the completion of the WEU satellite centre's experimental phase in 1995.³⁰² At this point, however, Norway already had a certain foothold within the WEU Satellite Centre. To the FFI and the NIS, this participation was essential for their ability to further develop the use of surveillance satellites for Norwegian military purposes.³⁰³

When Norway became an associate member of the WEU following the November 1995 Rome Agreement, which entailed various rights and duties, such as full participation in the WEU Council meetings, working groups and subgroups, where Norway had 'the right to speak'. However, Norway could not block a proposal that required consensus amongst the WEU member states.³⁰⁴ As an associate member, Norway formally joined the European satellite partnership. The MoD appointed the FFI and the NIS to represent Norway and ensure that associate members could station personnel at the satellite centre to get access to satellite data. This was originally resolved, and Norway dispatched intelligence personnel to Torreón, where they participated in the centre's resource group and attained imagery intelligence (IMINT). Norway also joined the overall policy group, the WEU Space Group.³⁰⁵

Not being a full WEU member became a very limiting factor for Norway by the mid-1990s. Until 1995, the WEU satellite centre only collected and analysed data from civilian satellites, at the behest of the WEU Military Committee and its ten member states.³⁰⁶ However, in July 1995, the military optical surveillance satellite Helios 1A, largely developed and owned by France (78.9%), along with Spain (14.1%) and Italy (7%), was launched from French Guiana, providing Europe with its 'first spy satellite'³⁰⁷ The trilateral satellite alliance limited access to WEU member countries under strict conditions, leaving Norway without direct access to the data;³⁰⁸ there

³⁰¹ FFI, *Satellittovervåking*, 21.

³⁰² Hjalmar I. Sunde, «Den Vesteuropæiske Union og NATO - Samarbeidspartnere eller konkurrenter i fremtidens Europa,» *Norsk Militært Tidsskrift*, no. 3 (1993).

³⁰³ FFI, *Satellittovervåking*.

³⁰⁴ Sunde, «Den Vesteuropæiske Union og NATO - Samarbeidspartnere eller konkurrenter i fremtidens Europa.»

³⁰⁵ FFI, *Satellittovervåking*, 30.

³⁰⁶ FFI, *Satellittovervåking*.

³⁰⁷ Kjell Grandhagen, «Helios 1A - Frankrikes første spionsatellitt,» *Norsk Militært Tidsskrift*, no. 1 (1996).

³⁰⁸ FFI, *Satellittovervåking*.

was a separate restricted room at the WEU Satellite Centre for analysis of Helios' images.³⁰⁹ In retrospect, Commander of the French Joint Space Command, Brig. Gen. Testé observed that Helios had much better resolution than civilian satellites and marked 'the start of a new era' in Europe. As opposed to the US, who guarded their satellite capabilities very closely, France, Italy and Spain routinely shared sensitive high resolution imagery data among themselves.³¹⁰

In October 1994, FFI Director Nils Holme stated that a future Norwegian membership of the WEU might give Norway access to the Helios system. A variety of other solutions were conceivable and partly available to Norway, but the costs would be high, and it had not yet been clarified how the Norwegian Armed Forces' needs best could be met in this respect.³¹¹ However, in late November the same year, Norway voted 'No' in the referendum to join the European Union (EU).³¹² The WEU later failed to establish a European military radar satellite system, and the satellite centre was eventually transferred to the EU in 2001, which did not bode well for the non-EU member Norway.³¹³

National space policy, infrastructure and regulations

Throughout the Cold War and up until the 1990s, Norwegian space activities were in general a product of international industrialisation and space technology development, where contributors such as the US Rockefeller Foundation³¹⁴ and the US defence establishment had served as key enablers for Norway to develop national space infrastructure.³¹⁵ While Norway was proud of its national endeavours in space science and technology, it was not Norway's space competency and capacity that served as the main impetus for its relationship with the Americans, but rather its geographical location.³¹⁶

³⁰⁹ Wahl, interview.

³¹⁰ Testé, interview.

³¹¹ Nils Holme, «Problemstillinger i norsk forsvarsforskning,» *Norsk Militært Tidsskrift*, no. 3 (1995).

³¹² University of Oslo, «Norges nei til EU i 1994.» (2015), accessed 3 December 2021. <https://www.norges-historie.no/oljealder-og-overflod/1946-norges-nei-til-eu-i-1994.html>.

³¹³ FFI, *Satellittovervåking*, 31.

³¹⁴ The Rockefeller Foundation is an American private philanthropic foundation that funds medical, security and defence research.

³¹⁵ John Peter Collett, "Epilogue", in *Making Sense of Space: The History of Norwegian Space Activities*, ed. Collett, John Peter (Scandinavian University Press, Oslo 1995), pp. 293–94.

³¹⁶ Bingen, *Det nære verdensroms strategiske dimensjoner*, 7.

In 1983, a Norwegian remote sensing policy addressed military surveillance of large maritime areas and observed that Norway's location 'in the immediate vicinity of an important naval area' implied a particularly important aspect of maritime surveillance. For security reasons, Norway was not likely to get access to downlink data from 'the special military surveillance satellites', but results from the American SEASAT-1 satellite showed that civilian satellites designed to monitor the economic zones also had 'a significant ability to monitor naval activity' in Norway's nearby sea areas. Many of the technical issues were the same on the civilian and the military sides, including the development of sensors and the processing of large amounts of data.³¹⁷ The national security implications of SEASAT were underlined by the fact that a joint committee in the US, composed of members from NASA, the Pentagon, the National Reconnaissance Office (NRO) and the CIA, was assembled to uncover the potential ramifications of international participation and access to the data. Measures were proposed to prevent foreign military exploitation of the SAR data out of fear that SEASAT data could enable or enhance Soviet SLBM targeting capability.³¹⁸

By the end of the 1980s, Norway, through the MI, issued its first national space policy, which was heavily focused on industrial development through European collaboration.³¹⁹ Given Norway's dispersed population, large maritime areas, district policy and foreign trade, the Government anticipated that Norway could become a substantially larger user of satellite data than many other European countries.³²⁰ The policy's primary objective was to address organisational issues related to Norway's membership in ESA.³²¹ When Norway became a full ESA member in January 1987, it was within a context in which Europe, especially France, regarded national and European space development as necessary for political and economic endurance in relation to the US.³²²

In March 1987, Norwegian parliamentary debates leading up to approval of Norway's first national space policy indicated that elected members

³¹⁷ Lied et al., *Satellittfernmåling*, 35–36; James E. David, *Spies and Shuttles: NASA's Secret Relationship with the DoD and CIA* (University Press of Florida, 2015), 260–67.

³¹⁸ David, *Spies and Shuttles: NASA's Secret Relationship with the DoD and CIA*, 260–67.

³¹⁹ Industridepartementet, *Norsk romvirksomhet*; Industridepartementet, *Om norsk romvirksomhet, St. meld. nr. 13 (1986-87)* (Industridepartementet, 1986).

³²⁰ Industridepartementet, *Norsk romvirksomhet*, 39, 41.

³²¹ Drude Berntsen et al., *Norsk Romvirksomhet*, NOU 1986:1 (Universitetsforlaget A/S, 1986).

³²² Collett, "Epilogue," pp. 293–94.

of Norway's national assembly harboured ideas like those identified by Lupton within the US national security community in the 1980s.³²³ Several Norwegian Members of Parliament strived to maintain the notion of space as a peaceful sanctuary, at least in relation to *Norwegian* space activity. Their statements provide insight into how Norway's political establishment viewed and understood space activity during this time, and their aversion to the nexus of space and military affairs notably contrasts with the actual capability development taking place within the FFI and the Armed Forces. This was especially true for left-wing or socialist parties such as Labour and the Socialist Left, whereas the non-socialist or conservative parties, such as the Conservative and Christian Democratic parties, were more pragmatic. A representative of the Labour Party, for example, stated that Norwegian space policy was 'only related to civilian space exploitation' and emphasised that ESA was 'an organisation whose sole purpose is to promote peaceful cooperation between European states in science and applied space research and space technology'.³²⁴ Another representative of the Labour Party, stated, 'I do not think it can be emphasised e strongly enough and often enough that the space cooperation we are now embarking on only has peaceful purposes' and 'What we are now getting involved in are no finagling or covert operations with military or warlike intensions and purposes. This is not a derivative of the SDI.'³²⁵ Clearly, there were differing views within the Labour Party, noting that although the national space policy had a civilian focus, space activities were 'undeniably' marked by security implications and approximately two thirds of the global space capabilities at the time were military. Still, he insisted that civilian space activities were 'independent' from military space activities, and it was surely the civilian part of space that had been dealt with in the policy they were now discussing.³²⁶ The Socialist Left Party expressed scepticism towards the intersection between space technology and 'space weapons research' and asked for 'clear signals' to be given, insisting that Norwegian participation in space activities had to be controlled to prevent these activities. Norway's ESA membership was not to serve as an unwanted 'backdoor into a space weapons programme'.³²⁷

³²³ Lupton, *On Space Warfare: A Space Power Doctrine*, 29–37.

³²⁴ Stortingstidende, 131. ordentlige Stortings forhandlinger 1986–1987, (Stortinget, 1987), 2578.

³²⁵ Stortingstidende, 131. ordentlige Stortings forhandlinger 1986–1987, 2581–82.

³²⁶ Stortingstidende, 131. ordentlige Stortings forhandlinger 1986–1987, 2588.

³²⁷ Stortingstidende, 131. ordentlige Stortings forhandlinger 1986–1987, 2587.

The Conservative Party, representative who signed the agreement committing Norway to full ESA membership in 1985,³²⁸ offered a more accurate view, observing that satellites accessed through ESA would support the Norwegian Navy's Coast Guard in monitoring national EEZ and fisheries protection zones around the Svalbard Archipelago and Jan Mayen Island. The satellites could 'see even small fishing boats no matter the weather and whether it is night or day', which in turn would improve Norwegian military surveillance by enabling the Armed Forces to route Coast Guard platforms, including helicopters, aircraft and vessels, towards ships requiring closer inspection. Norway was currently the fourth largest shareholder in Inmarsat and used satellite communication for North Sea-based oil platforms and the Svalbard Archipelago. Thus, Norway was 'not at all' inexperienced with satellites and space activity, Thomassen assured, although 'our satellite commitments so far have been carried forward by a rather limited, interested circle of professionals.'³²⁹

Towards the discussion's end, Conservative Party representative pinpointed that the question of delineating civil and military space activities was 'more complicated than most other areas' that had ever been treated by the Norwegian Parliament. In the longer term, it was 'clear that the technological effects of this research will make the boundaries between the civilian and military sectors very difficult to draw'. Foss therefore believed that, over time, the user communities in all countries would 'push for these differences to be as small as possible'. In France, West Germany, Italy and the UK, the distinction between military and civilian elements was far smaller than Norway was used to, at least, as far as the majority of Norway's political establishment was concerned. Given Norway's 'pronounced virginity' and tradition of clearly delineating civilian and military affairs, Foss believed that the development and use of space technology in the longer term would force Norway to 'think anew'.³³⁰

The national space policy approved by the Parliament in 1987 established Norway's civilian space agency, NOSA, to implement and follow-up on national space projects and serve as a contact point for ESA.³³¹

³²⁸ Krige, *Fifty Years of European Cooperation in Space - Building on its Past, ESA Shapes the Future*, 436.

³²⁹ Stortingstidende, 131. ordentlige Stortings forhandlinger 1986-1987, 2585-86.

³³⁰ Stortingstidende, 131. ordentlige Stortings forhandlinger 1986-1987, 2594.

³³¹ Industridepartementet, *Om norsk romvirksomhet*, 55.

NOSA was organised under the MI and focused on space as a platform to develop high technology industry through ESA's industrial return policy.³³² The Armed Forces and other 'large user agencies' were advised to ensure their own participation in international space programmes and national investments in space applications.³³³ Whilst it was initially proposed to earmark one seat on NOSA's board for the Norwegian Rescue Service or the Coast Guard,³³⁴ this was overruled by the Energy and Industry Committee, who wanted the board to be composed of five individuals chosen by the MI to ensure a 'dynamic organisation' where 'the many actors and national interests' would not cause a 'paralysis' of the national space organisation.³³⁵

The space policy also established the Tromsø Satellite Station (TSS) as a private foundation.³³⁶ In the late 1980s and 1990s, the TSS was considerably upgraded to accommodate an agreement with the Canadian RADARSAT in 1995.³³⁷ The station was important to the Armed Forces, which could not use facilities on Svalbard due to the non-armament Svalbard Treaty. To develop the TSS to serve the Armed Forces, the FFI contributed extensively to plan and develop the station through various councils and working groups administered by NOSA.³³⁸ The rocket range on Andøya was subject to similar changes,³³⁹ although Norway's most significant space infrastructure investment in the 1990s was the establishment of a satellite station, SvalSat, on Platåberget on the Svalbard Archipelago in 1999. It had the strategic advantage of being able to track all Earth observation satellites in polar orbits, and Norway aimed to make the Svalbard station 'one of the leading satellite stations in the world'.³⁴⁰

³³² Industridepartementet, *Om norsk romvirksomhet*, 50, 56.

³³³ Industridepartementet, *Om norsk romvirksomhet*, 50, 56.

³³⁴ Industridepartementet, *Om norsk romvirksomhet*, 55.

³³⁵ Energi- og industrikomiteen, *Innstilling fra energi- og industrikomiteen om norsk romvirksomhet (St. meld. nr. 13), Innst. S. nr. 102. (1986-87)* (Stortinget, 1987), 5.

³³⁶ Industridepartementet, *Om norsk romvirksomhet*, 50, 56.

³³⁷ Ole Anders Røberg and John Peter Collett, *Norwegian Space Activities 1858-2003*, (ESA Publications Division, 2004), 48.

³³⁸ FFI, *Satellittovervåking*, 8, 20.

³³⁹ Røberg and Collett, *Norwegian Space Activities 1858-2003*, 47; In January 1995, rocket activity on Andøya led to the so-called 'Norwegian Missile Crisis'. See Peter Vincent Pry, "Northern Lights: The Norwegian Missile Crisis January 25, 1995," in *War Scare: Russia and America on the Nuclear Brink*, ed. Peter Vincent Pry (Praeger, 1999).

³⁴⁰ Røberg and Collett, *Norwegian Space Activities 1858-2003*, 48.

This led Norway to evaluate the ramifications of military satellite activity in relation to the Svalbard Treaty.³⁴¹ In 1999, Norway passed a new regulation regarding the establishment, operation and use of satellite ground stations and associated frequencies.³⁴² The FFI beforehand conducted a classified study considering the Svalbard Treaty in light of the construction and operation of Svalbard Satellite Station.³⁴³ Where previous laws merely referred to the treaty, the new law aimed to regulate activity on the Svalbard Archipelago by establishing several explicit prohibitions, including the use of ground stations and satellite data read to ground stations on Svalbard for ‘war purposes’. It prohibited any actors from performing satellite data processing specifically intended for ‘military purposes’, the use of satellite data for ‘military management and weapons control from Svalbard’, and Command and Control (C2) of satellite instruments intended to be used for military purposes from ground stations on Svalbard. In fact, the law dedicated Chapter 3 to: ‘Special rules on the use of the Earth station on Svalbard’ concerning the processing of data received from satellites or other space-based systems to ensure the use of Earth stations at Svalbard were in accordance with the Svalbard Treaty’s Article 9. The regulation also ensured that the station would be open for inspection ‘with reasonable notice time’,³⁴⁴ as had been the case with the Kongsfjord Satellite Station in the late 1960s.³⁴⁵ As we shall later see, the 1999 regulation caused considerable interpretational issues with respect to terms such as ‘military purposes’, and Norway would, after substantial scrutiny, pass a new regulation in 2017.³⁴⁶

³⁴¹ «Forskrift om konsesjon for mobil jordstasjon» (1994), accessed 18 November, 2021, <https://lovdata.no/dokument/SFO/forskrift/1994-10-14-934>; «Forskrift om konsesjonsvilkår for fast jordstasjon for satelittsamband over Eik jordstasjon» (1981), accessed 18 November, 2021, <https://lovdata.no/dokument/SFO/forskrift/1981-02-27-9914>; «Forskrift (midlertidig) om konsesjonsvilkår for å opprette og drive jordstasjon til mottaking av fjernsynssignaler via kommunikasjonssatellitt» (1984), accessed 18 November, 2021, <https://lovdata.no/dokument/SFO/forskrift/1984-11-26-2017>.

³⁴² «Forskrift om etablering, drift og bruk av jordstasjon for satellitt» (1999), accessed 18 November, 2021, <https://lovdata.no/dokument/SFO/forskrift/1999-06-11-664?q=11%20juni%201999%20svalbard%20664>.

³⁴³ Terje Wahl, Some selected publications: Terje Wahl, List of publications. The overview refers to: Andersen V S, Johansen I, Wahl T: Forholdet til Svalbardtraktaten ved bygging og drift av Svalbard Satellittstasjon (SVALSAT). FFI/RAPPORT-95/05387, 1995 (Ikke offentlig).

³⁴⁴ «Forskrift om etablering, drift og bruk av jordstasjon for satellitt.»

³⁴⁵ Olav Riste, *The Norwegian Intelligence Service 1945-1970*, 223.

³⁴⁶ Kommunal- og moderniseringsdepartementet, «Forskrift om etablering, drift og bruk av jordstasjon for satellitt på Svalbard» (2017), <https://lovdata.no/dokument/SF/forskrift/2017-04-21-493?q=Jordstasjon>; Kommunal- og moderniseringsdepartementet, «Forskrift om etablering, drift og bruk av jordstasjon for satellitt i Antarktis» (2017), <https://lovdata.no/dokument/SF/forskrift/2017-04-21-492?q=Jordstasjon>.

Space in Norwegian post-Cold War defence policy

Until the 1990s, the Armed Forces used space primarily for long-range telecommunications. Since the 1960s, Inmarsat had ensured long-distance communications with military vessels in northern waters.³⁴⁷ Norway also had some access to the British military communications satellite system Skynet through NATO and some access to American military systems 'on special occasions' over the decades.³⁴⁸ Norway housed NATO satellite stations at Eggemoen and in Bjerkvik, but for national purposes, the Armed Forces largely rented commercial services via stations in Nittedal and at Eik.³⁴⁹ SATCOM conditions were demanding in the High North, since most communication satellites were geostationary, thus providing poor coverage at northern latitudes.³⁵⁰ While the Navy endorsed Inmarsat early on, the Army was long sceptical of the military value of SATCOM due to terrain shielding in the deep valleys in Troms, where planners anticipated the battle was to take place. These sceptical views on SATCOM changed dramatically when the Army began operating in combined foreign operations.³⁵¹

Whilst SATCOM was predominantly handled through NATO and was a well-established and commercialised capability by the 1990s,³⁵² satellite surveillance capabilities were at this point starting to proliferate.³⁵³ Satellite surveillance became a focus area for military space activity in Norway, especially pertaining to the High North, and principal developments in Norwegian military use of space in the 1990s included radar satellite data processing and IMINT capabilities. A key rationale for Norway's focus on satellite surveillance was the 1977 introduction of the EEZ pursuant to the UN Convention on the Law of the Sea, which left Norway with significant areas under Norwegian jurisdiction, a total of approximately 2 million square kilometres, constituting five times the size of mainland Norway. Intensified competition for marine and sub-seafloor resources

³⁴⁷ Forsvarets Informasjonsinfrastruktur (INI), *Plan for Forsvarets bruk av rommet 2011 - 2015 V 0.1*, (Forsvarets Informasjonsinfrastruktur (INI), 2011); Forsvaret, *Romvirksomhet for sikkerhet og forsvar-situasjonsbeskrivelse og analyse*.

³⁴⁸ Richard B. Olsen, "Interview with Richard B. Olsen, Research Director at Air and Space Systems Division, FFI, 7 July 2022. [In Norwegian]." (2022).

³⁴⁹ Erik Sletengen, «Satellittkommunikasjon,» *Luftled*, no. 1 (2019).

³⁵⁰ Stig Nilsson and John Olav Birkeland, «Høye ambisjoner og en god plan,» Expert commentary, *Luftled*, no. 1 (2019).

³⁵¹ Wahl, interview.

³⁵² Wahl, interview.

³⁵³ FFI, *Satellittovervåking*, 8.

throughout the 1990s made it even more important to command national sovereignty over these areas.³⁵⁴ Norway added a 200 nautical mile economic zone (EEZ) around Jan Mayen Island and the Fishery Protection Zone (FPZ) around the Svalbard Archipelago; the domestic responsibility of commanding authority over these vast areas was assigned to the Coast Guard. This Navy unit expanded with new vessels and assigned use of P-3 Orion surveillance aircraft, in addition to other surveillance systems at the Armed Forces' disposal. Another central task in which satellite surveillance played a role was surveillance of the Kola Peninsula-based post-Soviet Northern Fleet,³⁵⁵ which continues to be a concern for Norway and its allies up to the present day.³⁵⁶

Although strategic space surveillance and especially radar satellites were identified as the most promising emerging military space capabilities and applications for Norway in the 1990s, Norway also evaluated the security implications of developments in SATCOM and PNT services. Norway took note of how the US used GPS comprehensively during 1991's Operation Desert Storm, which revolutionised precision requirements in military operations.³⁵⁷ In the High North, however, GPS coverage deteriorated following the Gulf War. GPS coverage on board a Norwegian submarine in northern waters dropped to 25 percent in the early 1990s as the Americans redirected their GPS satellites to improve coverage in the Gulf. On board this submarine was future Admiral and Norwegian Chief of Defence, Haakon Bruun-Hanssen, who learned first-hand from this experience that 'if you do not own it [the capacity] yourself, you should think carefully about who owns it and where it is used.'³⁵⁸

While they differ in technological function, space-based ISR, SATCOM and PNT systems must be seen in conjunction. The 1990 Defence Commission discussed tactical surveillance only in relation to airborne capabilities, for example, but noticed that 'new communications systems' transmitted images and other data or information across very large distances. These joint functions played an important role in military command

³⁵⁴ Holme, «Problemstillinger i norsk forsvarsforskning.»

³⁵⁵ FFI, *Satellittovervåking*, 4, 18–20.

³⁵⁶ Forsvarsdepartementet, *Prioriterte endringer, status og tiltak i forsvarssektoren*, (Forsvarsdepartementet, 2022); Birkeland, «Maritime airborne intelligence, surveillance and reconnaissance in the High North,» 195–98.

³⁵⁷ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 15.

³⁵⁸ Haakon Bruun-Hanssen, "Interview with Admiral Haakon-Bruun Hanssen (Royal Norwegian Navy), Norwegian Chief of Defence, 15 January 2015, Myntgata 1, Oslo, Norway. [In Norwegian,]» interview by Tale Sundlisæter, 2015.

and control, and enabled information collection on the adversary's status and movements. They also enabled the centralisation of the Armed Forces' combatant command structure, which allowed for timelier decision-making processes that were particularly effective in air operations.³⁵⁹ Another important aspect was the development of weapons technology and conventional long-range precision targeting, enabled by 'technological advances in sensors, communications, computing and satellites'.³⁶⁰ Precision control using 'accurate navigation systems, target seeking, or a combination of these' made it possible to strike static and moving targets or critical parts of a target with very high accuracy. Although the approximate position of the target was required for mobile targets, precision control could be used in long-range missiles, including cruise missiles, which at very low or very high altitudes could penetrate deeply into the adversary's territory. These weapons could destroy important targets with minimal collateral damage, which had previously been difficult to accomplish. Continuously improving precision strike and observation capability even in conditions of darkness and poor visibility meant that military operations could be conducted more independently. It also meant that protective measures had to be taken regardless of such conditions, and operational planning would therefore be more time consuming.³⁶¹

The Tomahawk cruise missiles used on Baghdad during the Gulf War were a specific example, capable of destroying pre-selected targets from distances of up to 1,200 kilometres with high precision. The missiles' pre-programmed trajectory was corrected underway using highly accurate maps, and it was this knowledge about the terrain that was the main limiting factor in the missiles' precision. Battle-damage assessment using aircraft, military satellites or on-site reconnaissance had confirmed precision strikes down to one metre or less.³⁶² Although weapons systems such as the Tomahawk were very expensive and at the time limited to the arsenals of the 'great powers', technological developments would likely enable smaller actors to develop such weapons as well. This was closely linked to the proliferation of civilian, commercially available satellite data advancing to the extent that it could be utilised for fixed trajectories and targeting. The FFI estimated that the development and production of one hundred 'low

³⁵⁹ Forsvarskommissjonen, *Forsvarskommissjonen av 1990*, 129–30.

³⁶⁰ Forsvarskommissjonen, *Forsvarskommissjonen av 1990*, 130.

³⁶¹ Forsvarskommissjonen, *Forsvarskommissjonen av 1990*, 130.

³⁶² Holme, «Problemstillinger i norsk forsvarsforskning.»

cost' cruise missiles with a range of about 500 kilometres could probably be carried out within a budget of NOK 2-3 billion, meaning that even a country with a modest economy would be able to realise such a project over the course of a few years. While the full consequences of precision-guided weapons were still far from clear, it was 'beyond doubt' that the consequences over time would be extensive, also for Norway and the Armed Forces. It would thus be important to keep track of weapons development to gain a comprehensive understanding of the inevitable consequences of the associated threat. Another 'major challenge' would be to develop new calculation methods for balanced fortification, considering the precision and mechanisms of action of the new weapons.³⁶³

Space surveillance as a new investment for the Armed Forces

Norway's Defence Commission of 1990 envisioned developments in military surveillance and targeting of adversary forces and infrastructure, defence materiel for communications and intelligence on a potential enemy's capacity and positions, as well as C2 of Norway's own forces.³⁶⁴ Norway's Chief of Defence needed to ensure capabilities to conduct 'surveillance of Norwegian land, sea and air territories and adjacent areas', and to obtain and evaluate information about adversarial military capacities and activities, and the associated developments in Norway's areas of interest. Military considerations were based on executing various predetermined tasks, such as conducting 'effective surveillance and warning' and assisting with 'the exercise of authority in areas under Norwegian jurisdiction in the form of control and supervision of activities on the continental shelf and in the economic zone'.³⁶⁵

Concerning technological developments impacting strategic surveillance, the 1990 Defence Commission treated satellite capability as the only relevant capacity. They discussed relatively extensively the ongoing development of surveillance satellites, including electro-optical (EO), radar and electronic intelligence satellites, of which the latter could locate and characterise communications, radars and other equipment that emit

³⁶³ Holme, «Problemstillinger i norsk forsvarsforskning.»

³⁶⁴ Forsvarskommissjonen, *Forsvarskommissjonen av 1990*, 129.

³⁶⁵ Forsvaret, *Forsvarsstudien 1991*, 4–5.

electromagnetic radiation. Satellites with different observation capabilities now constituted an important supplement to traditional means and methods for strategic surveillance. Photoreconnaissance satellites had already been in use for a long time but were constantly being improved and, albeit depending on light and weather conditions, could currently detect and classify objects such as tanks, artillery, vessels and aircraft. Both the US and France had commercial photo optical satellites and were selling imagery of the Earth's surface, albeit at a lower resolution than military imagery satellites. The commission also noted that it could take a long time between ordering imagery of an area and receiving it.³⁶⁶

The more recent and rapidly developing radar satellite technologies could operate independently of light and weather conditions and provide images of activities on land and at sea. Radar satellites had less ability to capture detail but were of considerable value to strategic surveillance. ESA, Japan and Canada were developing radar satellites that would be of significant interest for such purposes.³⁶⁷ The development of civilian satellites with optical sensors such as the American Landsat and French Spot systems had by the late 1980s developed to such an extent that the imagery could be used for military purposes, including military mapping of roads, terrain, infrastructure, vegetation and more. For the abovementioned reasons, however, radar imagery held the most promise for Norway.³⁶⁸

'History has showed us', the commission noted, 'that new technologies could impact the power balance among states and the strategic significance of geographical areas.' Satellites would make it increasingly possible to monitor large terrestrial and maritime areas, and to map potentially threatening military dispositions. In a broader sense, satellite surveillance was a useful tool in crisis management, and countries with access to satellite-derived information benefitted from more timely and substantial information. At the same time, increased transparency brought about by satellite-derived information would likely reduce uncertainty in conflict scenarios by providing information about the other party's military dispositions, which in turn could reduce the chances of unintentional confrontation or surprise attacks. In any case, a potential attacker could no longer count on its preparations to be concealed.³⁶⁹

³⁶⁶ Forsvarskommissjonen, *Forsvarskommissjonen av 1990*, 129–30.

³⁶⁷ Forsvarskommissjonen, *Forsvarskommissjonen av 1990*, 129–30.

³⁶⁸ FFI, *Satellittovervåking*, 18–19.

³⁶⁹ Forsvarskommissjonen, *Forsvarskommissjonen av 1990*, 131.

The proliferation of satellite surveillance capability and the associated military potential of satellite-derived intelligence for Norway was vaguely reflected in the Chief of Defence's unclassified 1991 Defence Study, where he proposed a possible military use of satellite surveillance capability as a tool for the Navy. This study initially concluded that with a 'low' resource level going forward, the Navy simply would not be able to acquire satellite surveillance capability. By choosing the recommended 'medium' level, however, the 'increased capacity for satellite surveillance of the coastal and sea areas' would increase the military's capacity for maritime domain awareness. As the defence planning phase was strongly marked by political demands for monetary savings, the Admiral suggested as a budgetary justification that space capability could enable the Norwegian military to re-evaluate, and presumably reduce, parts of Norway's Naval Home Guard (*Sjøheimevernet*).³⁷⁰

Following the Gulf War, the MoD in 1993 deemed that the world was currently witnessing a 'revolutionary development' in electronics, computers and sensor technology, greatly improving military surveillance, reconnaissance and detection systems, weapons and fire control capacities. These developments brought about new military-operational opportunities, changes in military organisational structure, operational and tactical doctrine, and governance, and would eventually transform national military strategies.³⁷¹ The MoD acknowledged that satellites with modern sensor technology were becoming a major supplement to more traditional methods in strategic warning and surveillance, as they made it possible to monitor military activities and force movements. The MoD anticipated that satellites would come to play an important role for the ability both to verify disarmament and armament control agreements and provide strategic warning of military force building.³⁷²

Addressing the Armed Forces' war-time structure, the MoD in 1993 implemented satellite surveillance capability into the long-term plan (LTP) as a 'new investment' for the Navy.³⁷³ This likely entailed the construction of a military satellite station for satellite data downlink and processing. The Armed Forces planned to establish a station with a complete download

³⁷⁰ Forsvaret, *Forsvarsstudien 1991*, 23, 30.

³⁷¹ Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98*, St. meld. nr. 16 (1992-93), (Stortinget, 1993), 71.

³⁷² Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98*, 71.

³⁷³ Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98*, 92.

chain with SAR processing and interpretation for military purposes once the services were fully operational. In the first phase, the Armed Forces expected to build up the interpretation element and use RADARSAT images from TSS for at least two years. However, before establishing a downlink capability for RADARSAT, TSS would provide close to real-time and off-line SAR products to the Armed Forces' interpretation centres upon agreement. In the longer term, the Armed Forces aimed to establish capability to read down data from available military satellites.³⁷⁴

Avdeling/enhet	Status 1992	Struktur 2000	Merknad
ANTI-INVASJON			
Fartøyer			
U-båter	12	12	
MTBer	38	22	Eldre under utfasing, ny MTB fra ca 1997
Mineleggere	2	2	Oppdateres
Landgangsfartøyer	7	5	
Kystartilleri			
75mm/120mm	9	9	Oppdateres
105mm/150mm	14	0	
127mm	7	5	Oppdateres avh av rammer
155mm, ev middelstunge			
missilbatterier	0	1	
Lette missilbatterier	0	12	
Kontrollerbare minifelt	8	6	Utfasing av 2, oppdatering
Torpedobatterier	5	5	Utfasing og oppdatering/nyinvest.
BESKYTTELSE AV			
FORSYNINGSLINJENE			
Eskortefartøyer	7	5	
Kystvaktfartøyer	6	6	
Mineryddere	9	9	Under innfasing
OVERVÅKNINGSSYSTEMER			
Kystradar	13	17	Nybygg/oppdatering
Satelittoverv	0	1	Nyinvestering
Undervannsoverv	0	1	Nyinvestering

Figure 13. Planned war-time force structure for the Navy in 2000.³⁷⁵

Overall, Norway strived to better coordinate the country's surveillance capabilities, which were scattered across different agencies with various responsibilities related to surveillance and control of Norwegian coastal waters.³⁷⁶ The Navy's main surveillance capability was the northern Norway coastal chain, where updates and new acquisitions were considered in conjunction with a 'possible use of satellite surveillance' and other non-military surveillance systems.³⁷⁷

³⁷⁴ FFI and Norsk Romsenter, *Intensjonsavtale mellom FFI og Norsk Romsenter om samarbeide, nedlesing og leveranse av jordobservasjonsdata fra radarsatellitter* (1994).

³⁷⁵ Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98*, 92.

³⁷⁶ Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98*, 92.

³⁷⁷ Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98*, 92.

Considering the Armed Forces' peacetime structure, satellite capability was addressed not under the Navy, but as a possible capability for the NIS, because '[a]n effective intelligence service helps form the basis for correct episode- and crisis management'. Along with modernising the coastal chain and considering the acquisition of a sensor system for subsea surveillance along parts of the Norwegian coast, the MoD considered using satellites 'to monitor coastal and maritime areas' to strengthen the country's intelligence, surveillance, warning and security services.³⁷⁸

The 1990s second defence planning process treated space much less extensively than the first. The 1996 Defence Study under Norway's Chief of Defence General Arne Solli (1994–99) did not mention space or space capability at all.³⁷⁹ Discussing the Defence Study in 1996, General Solli stated that the Armed Forces were amid a transformational process, with 'one foot in the old and one in the new'.³⁸⁰

While General Solli did not consider space capability in his defence study, the MoD's following LTP in 1998 did include space surveillance capabilities, noting that information systems could increasingly be 'integrated on mobile vehicles such as planes, satellites, and unmanned systems ('drones')'. These capabilities improved large land, air and sea area monitoring, but it would still be difficult to detect subsurface activity. Norway's military force structure in the period 1999–2006 would obtain increased sensor systems capacity, which included strengthening maritime surveillance in southern Norway through the continued modernisation and expansion of the coastal chain. Within this context, the Armed Forces would expand their purchase of images from civilian radar satellites to improve their satellite surveillance capability in Norwegian and adjacent maritime domains.³⁸¹ On the same day as the MoD published the 1998 LTP, the Armed Forces allocated NOK 2.6 million for operative use of RADARSAT in the Barents Sea,³⁸² constituting approximately 0.01 percent of the overall defence budget for 1998 of NOK 23.8 billion.³⁸³

³⁷⁸ Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98*, 92.

³⁷⁹ Forsvarssjefen, *Forsvarssjefens grunnsyn for utvikling og bruk av norske militære styrker i fred, krise og krig* (Forsvarets Overkommando, 1995); Forsvarssjefen, *Forsvarsstudien 1996* (Forsvarets Overkommando, 1996).

³⁸⁰ Arne Solli, «Forsvaret 1996: Status og utfordringer,» *Norsk Militært Tidsskrift*, no. 11 (1996).

³⁸¹ Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1999-2002*, *St.meld. nr. 22 (1997-98)* (Stortinget, 1998).

³⁸² Wahl, interview.

³⁸³ Finans- og tolldepartementet, *Den kongelige proposisjon om statsbudsjettet medregnet folketrygden for budsjetterminen 1. januar - 31. desember 1998.*, *St prp nr 1 (1997-98)* <https://www.regjeringen.no> (Regjeringen, 1997), 53, <https://www.regjeringen.no>

Military space activity and capability development

Norway's military space activities during the 1990s appear highly extemporary, with the FFI on a bottom-up basis driving the development of national satellite-based capability through NOSA and the national civilian framework to achieve military objectives.³⁸⁴ The Armed Forces did not have a dedicated structure to manage space activities, but the FFI informed the Armed Forces of potential military space uses and developed military space capability in conjunction with relevant military units. The Armed Forces usually handled it in a function and application-oriented manner through their existing services and bureaucracy, depending on whom it concerned.³⁸⁵ As developments in Norwegian space activity during this time largely entailed satellite surveillance, which became available to Norway and other small states in the late 1980s and early 1990s, national military space activity chiefly concerned the military operating units of the NIS, the FMGT and the Naval Operations Centre (*Sjøops*).³⁸⁶

In March 1991, Director of the FFI Erik Klippenberg (1983–1993) stated that the FFI had been a 'driving force' in the MI's development of TSS. The FFI had developed a computer, CESAR, that the private company Norsk Data were installing at the station. When the ESA ERS-1 (European Remote-Sensing Satellite-1) was launched in May 1991, Norway would be able to download light-and-weather-independent Earth observation data providing coverage in the entire area as shown in Figure 14. Klippenberg anticipated that this capability should become an important factor in a future European collaboration on using surveillance satellites for verification and crisis control.³⁸⁷

³⁸⁴ FFI, *Satellittovervåking*; Henry Kjell Johansen, «Telephone interview with Henry Kjell Johansen, former Research Director at FFI, 22 March 2016. [In Norwegian],» (2016).

³⁸⁵ FFI, *Satellittovervåking*.

³⁸⁶ FFI, *Satellittovervåking*.

³⁸⁷ Erik Klippenberg, «FFI's rolle i årene fremover,» *Norsk Militært Tidsskrift*, no. 7 (1991).

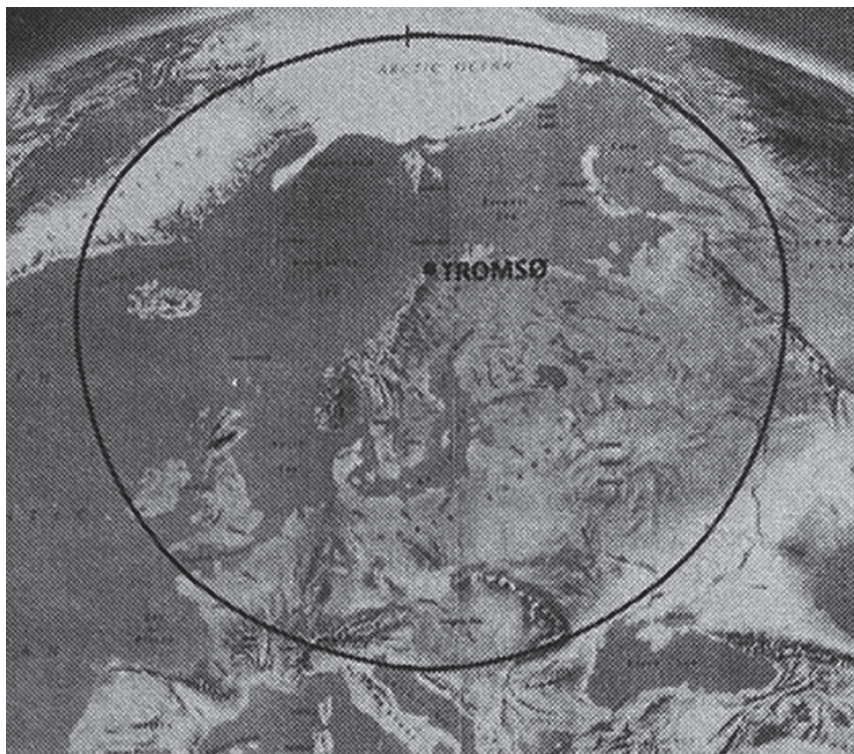


Figure 14. Estimated ERS-1 coverage area for TSS in 1991.³⁸⁸

To process the satellite radar data, Norway developed the multiprocessor computers CESAR and SCALI, which were installed at the TSS for near real-time processing of satellite data. The FFI had since the late 1970s followed the development of SEASAT, equipped with a SAR instrument providing all-weather surveillance capability. Considering the weather and light conditions in the High North, especially in the winter, the FFI's studies concluded that polar radar satellites operating jointly with vessels and aircraft could be a promising concept for Norway.³⁸⁹

Norway's lack of ability to download and process SAR imagery was originally one of the main bottlenecks for military exploitation of satellite imagery that became a niche capability from which Norway would benefit internationally.³⁹⁰ In the early 1980s, activities were already underway

³⁸⁸ The image is a photocopy of the image printed on page 2 in *Norsk Militært Tidsskrift*, no. 7 (1991), which is a reprint of Klippenberg's speech at the Oslo Military Society (OMS) on 4 March 1991. See Klippenberg, «FFI's rolle i årene fremover.»

³⁸⁹ FFI, *Satellittovervåking*, 8, 17.

³⁹⁰ FFI, *Satellittovervåking*, 8, 17, 23.

related to CESAR to make SAR processing faster, and the FFI examined issues related to coverage, interpretation and the physical understanding of what radar satellites could observe.³⁹¹ The Armed Forces financed the development through the FFI, which based on SEASAT data developed signals processing capability to handle ERS-1 satellite data for fisheries supervision and military surveillance. The plan was to transfer SAR images from TSS to a military operations centre, where satellite data could be further analysed in conjunction with data from other surveillance capabilities.³⁹²

The ERS-1 was launched in July 1991. TSS became operational that autumn and started to receive near real-time data. In mid-August 1991, ERS-1 pictures generated by the CESAR computer appeared on-screen at the FFI, so the station primarily transmitted images as opposed to raw data.³⁹³ The data downlinked in Tromsø was transmitted via Intelsat or Earthbound infrastructure to its first users, including the FFI and the Armed Forces. As the service could downlink and process satellite data in near-real time, Norway became the first European country to command a satellite ground station fit for near-real-time maritime surveillance.³⁹⁴

The FFI and the Armed Forces had for decades invested in capability for surveillance of large maritime areas, and satellite capability was in this sense merely an addition to their toolbox. One of the FFI's aims was to develop radar satellite data processing capability to ensure that the Norwegian authorities' information on activity in Norway's areas of interest was at least on a par with that of other states.³⁹⁵ The NIS and the FMGT were particularly interested in developing in-house satellite surveillance capability to monitor the Kola Bay area and develop Norwegian area thematic maps, and Norway had some access at the time to military imaging satellites using Norwegian ground stations through collaborating partners in the US and NATO.³⁹⁶

The FFI's close collaboration with the NIS and the FMGT stimulated the development of high-quality SAR imagery, which helped Norway prove itself valuable to international partners.³⁹⁷ The FFI also

³⁹¹ Wahl, interview.

³⁹² FFI, *Satellittovervåking*, 8, 17, 23.

³⁹³ Wahl, interview.

³⁹⁴ FFI, *Satellittovervåking*, 20.

³⁹⁵ Holme, «Problemstillinger i norsk forsvarsforskning.»

³⁹⁶ FFI, *Satellittovervåking*, 18–21.

³⁹⁷ FFI, *Satellittovervåking*, 18–21.

established close relations with the Naval Operations Centre at the Northern-Norway Defence Command (FKN) near Bodø.³⁹⁸ The FKN was a joint operational regional command led by a lieutenant general or vice admiral responsible for planning and leading joint army, naval and air operations north of 65 degrees latitude.³⁹⁹ The FKN became increasingly involved in military satellite surveillance activities at the FFI through substantial financial contributions and evaluations that enhanced operational use of the maritime satellite surveillance service. The close collaboration with these military services was crucial for the implementation of these projects.⁴⁰⁰

This effort was largely handled by key individuals at the FFI and within the aforementioned military organisations.⁴⁰¹ As for TSS, the FFI's Henry Kjell Johansen worked very closely with NOSA, and military capability development at this station was principally funded through civilian channels,⁴⁰² as opposed to satellite surveillance projects at the FFI, which were largely funded by the MoD.⁴⁰³ Johansen and the FFI established an agreement between the FFI and NOSA to ensure that the Armed Forces would buy a certain minimum of satellite data from TSS each year. NOSA's aim was for the Norwegian military to buy 'a lot of data' from the first ERS-1 satellite, as well as from the Canadian Space Agency's RADARSAT-1, which would provide considerable coverage for the Armed Forces in the High North. According to Johansen, however, the Norwegian Armed Forces ended up buying less data than anticipated following the USSR's dissolution in 1991.⁴⁰⁴

To handle the budding satellite operations, the FFI established a satellite surveillance laboratory in Kjeller, which evolved into an experimental operations centre and a test bed for developing space-based services. SAR images from ERS-1 were downlinked at TSS, where the CESAR computer processed the data via a 2 MB/s satellite link and transferred it to the FFI, resulting in image interpretation within two hours of the satellite's passage over Tromsø.⁴⁰⁵ The data was further handled by an 'intelligence system'

³⁹⁸ FFI, *Satellittovervåking*, 18–21.

³⁹⁹ «Forsvarskommando Nord-Norge,» *Store norske leksikon* (2017), accessed December, 2021, https://snl.no/Forsvarskommando_Nord-Norge.

⁴⁰⁰ FFI, *Satellittovervåking*, 18–21.

⁴⁰¹ FFI, *Satellittovervåking*, 18–21.

⁴⁰² Johansen, «Telephone interview with Henry Kjell Johansen.»

⁴⁰³ Wahl, interview.

⁴⁰⁴ Johansen, «Telephone interview with Henry Kjell Johansen.»

⁴⁰⁵ FFI, *Satellittovervåking*, 23.

developed by the FFI. This system advanced the military development of data processing systems, enriched satellite data with classified data from other sources and transmitted the data to the operational headquarters at Reitan.⁴⁰⁶

The FFI also exchanged data and information with the UK Defence Research Agency and collaborated on collecting data during NATO naval exercises.⁴⁰⁷ The FFI's near-real-time system for ERS and RADARSAT also opened doors to other US-based partners, such as a negotiated collaboration agreement with the US Navy's Naval Research Lab. This, in turn, increased Norway's access to satellite imagery, allowing Norway's capability in imagery processing and IMINT to improve continuously with advancing satellite image resolution.⁴⁰⁸

Norway's focus on satellite surveillance was reaffirmed by Director of the FFI, Nils Holme (1993–2001), in an address to the Oslo Military Society (OMS) in 1994, where Holme stated that radar satellites were indeed of the highest interest to Norway and could in principle provide more information than optical satellites. As opposed to optical satellites, where the vendor had the most insight into the product, the insight into radar-satellite imagery was primarily defined by the user. Radar echoes received by the satellite and retransmitted to the ground were subjected to extensive calculations requiring powerful computers, and it was this processing, conducted by the end-user, that determined the type and accuracy of information that could be obtained.⁴⁰⁹ Satellite surveillance was now one of the FFI's five main defence research areas, along with 'precision-guided and penetrating weapons', electronic warfare, geophysics and human performance. It had been principally thought-provoking to many, Holme stated, when it became clear that Iraq had used French commercial satellite imagery to plan their attack on Kuwait during the Gulf War.⁴¹⁰ Whereas the great powers had commanded high-performance surveillance satellites for quite some time, it was a new phenomenon that overhead surveillance data was now commercially available

⁴⁰⁶ Johansen, "Telephone interview with Henry Kjell Johansen."

⁴⁰⁷ Terje Wahl and Åge Skoelv, "NATO Naval Exercises as Observed From Civilian Radar Satellites" (paper presented at the AGARD Conference Proceedings 580: Space Systems as Contributors to the NATO Defence Mission, Cannes, France, 3–6 June 1996).

⁴⁰⁸ FFI, *Satellittovervåking*, 18–21.

⁴⁰⁹ Holme, «Problemstillinger i norsk forsvarsforskning.»

⁴¹⁰ In 1991, the *Financial Times* disclosed that Iraq bought 'high-definition satellite photographs of Kuwait and Saudi Arabia from a French company specializing in photoreconnaissance three months before the August 2 invasion.' See Lionel Barber, "Iraq bought satellite pictures of Kuwait," *Financial Times* (1991).

in such a capacity. EO imagery could be purchased from organisations in the US, Russia and France, providing resolutions down to one metre. However, EO satellites were still of limited value for routine monitoring of the High North, due to their requirement for clear weather and sunlight.⁴¹¹

By the mid-1990s, Norway was still using ERS-1, and Holme anticipated that more satellites would become accessible and increase the frequency of terrestrial coverage. With two satellites, the High North could be covered once a day. At that time, the Armed Forces were transitioning from the experimental laboratory stage towards establishing operational services to improve their situational awareness and allocation of the Coast Guard's aircraft and vessels. The FFI was now able to use radar satellite data to produce high quality photo-like images to automatically detect ships and determine their course, speed and exact position, as well as roughly classifying and distinguishing between larger civilian and military vessels. It was also possible to use satellite registrations made over the same area at different times for automatic detection of differences in the pictures, providing an overview of port traffic, new roads, houses and other infrastructure. Satellite data also allowed for effective surveillance of possible unauthorised activity in the Svalbard Treaty area. In addition, the FFI developed other applications, including oil spill detection, statistics on sea waves and ice, and terrain characterisation.⁴¹²

A particularly interesting application of satellite data was map production. The method was based on stereoscopic processing of data from satellite passages over an area in approximately parallel but separate orbits, and maps at a scale of 1:25,000 could be produced. There were certain limitations compared to maps based on aerial photography and visual experience; however, Holme assumed the method would be useful to produce military maps of areas otherwise inaccessible to Norway, such as in connection with UN operations. Amassed, the resources and methods available to Norway would likely cover the country's needs for civilian as well as military surveillance in peacetime. During conflict and war, however, this was not likely to be the case. The increased tempo and intensity in ground operations under such circumstances required

⁴¹¹ Holme, «Problemstillinger i norsk forsvarsforskning.»

⁴¹² Holme, «Problemstillinger i norsk forsvarsforskning.»

much more extensive reconnaissance covering much larger areas, and the availability of civilian satellites under such circumstances might be uncertain.⁴¹³

At their laboratory, the FFI analysed more than a thousand ERS-1 SAR images and compared them with information from coastal radars and port offices. This gradually led the FFI to determine that ERS-1 was excellent for detecting oil spills and larger warships, but it was not well-suited to monitoring smaller fishing vessels, typically 40–50 metres long. Larger vessels could be detected and roughly classified in Norwegian coastal waters, and interpreted SAR images were sent from the FFI to the naval operations centre at Reitan via fax machine, demonstrating that radar satellites could provide useful information in a naval invasion scenario.⁴¹⁴

In 1995, the FFI demonstrated how naval vessels could be detected and roughly classified in Norwegian coastal waters during the NATO 'Strong Resolve' exercise. The Armed Forces subsequently established the military Interpretation Centre co-located with the NIS centre in Fauske in northern Norway⁴¹⁵ to interpret and assess radar satellite images and forward products to Reitan.⁴¹⁶ TSS established a fully operative satellite-based maritime surveillance service. Radar images were also used to monitor ice and currents in Arctic waters north of Norway, as these factors had an impact on sonar subsea monitoring.

Also in 1995, ESA launched ERS-2, which was nearly identical to ERS-1 and allowed for interferometry and increased coverage in the High North. The launch of RADARSAT-1 in late 1995 provided even further coverage of the region. RADARSAT carried a so-called 'Scan-SAR' instrument, which 'significantly improved' the coverage of Norwegian areas of interest and could provide full coverage over the course of 24 hours with enhanced detection of smaller vessels.⁴¹⁷

In August 1996, the FFI received its first RADARSAT-1 image, which attracted considerable attention as the imagery showed vessels located

⁴¹³ Holme, «Problemstillinger i norsk forsvarsforskning.»

⁴¹⁴ FFI, *Satellittovervåking*, 23.

⁴¹⁵ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*.

⁴¹⁶ Wahl, interview; Defence Station Fauske was established in the early 1960s as a signals intelligence station to monitor Russian space activities on behalf of the American intelligence community and detected the first satellite launch from Plesetsk. See Riste and Moland, «*Strengt hemmelig*»: *Norsk etterretningstjeneste 1945-1970*, 261–62.

⁴¹⁷ FFI, *Satellittovervåking*, 23, 25.

along the border lines to the Svalbard zone and the EEZ. Figure 15 shows the first image after post-processing at the FFI, exposing foreign fishing vessels fishing in ‘The Loophole’ in the Barents Sea.⁴¹⁸



Figure 15. The first RADARSAT-1 image received at the FFI in August 1996.⁴¹⁹

TSS was gradually upgraded to process data from ERS-1, ERS-2 and RADARSAT, and prepared to handle the ERS follow-on Envisat and RADARSAT-2 as well. By 1997, the FFI with funding from ESA developed algorithms that could produce radar satellite imagery with resolutions down to one metre. Incorporating precise orbital data and interferometric methods, the FFI achieved resolutions down to a few centimetres on the vertical plane.⁴²⁰

Norway became a pioneer in Europe for its use of civilian radar satellites for ship detection, and the Coast Guard routinely used SAR in its duties.⁴²¹ The Norwegian Armed Forces gained a deep understanding of how radar satellites could be used for operational maritime surveillance. After a trial operation in 1996–97, this became an operational capacity by 1998.⁴²² By

⁴¹⁸ FFI, *Satellittovervåking*, 26.

⁴¹⁹ Terje Wahl, «Satellitter, skipsfart og kosmisk stråling» (2013), <https://blogg.forskning.no/terje-wahls-blogg/satellitter-skipsfart-og-kosmisk-straling/1112137>.

⁴²⁰ FFI, *Satellittovervåking*, 23–25.

⁴²¹ FFI, *Satellittovervåking*, 27.

⁴²² FFI, *Satellittovervåking*, 27.

then, these operations also included SAR imagery based on data from the Canadian RADARSAT-1,⁴²³ and the FFI regularly conducted IMINT courses at the Interpretation Centre.⁴²⁴ The establishment of the military capacity in 1998 entailed an agreement with the Norwegian satellite ground station operator TSS,⁴²⁵ later established as the Kongsberg Satellite Services (KSAT). KSAT delivered RADARSAT data for vessel detection to the NIS centre at Fauske for further analysis and dissemination.⁴²⁶ KSAT, largely owned by the Norwegian Government, had been a pioneer in the ground segment business since the late 1960s and developed operational monitoring services in the 1990s.

In the late 1990s, the FFI intensified its work on military oceanography. It also participated in the 'Strong Resolve' fleet exercise in 1998 and contributed satellite-derived information on ocean currents, which supported allied submarine operations, and partnered with the Norwegian Meteorological Institute and the Armed Forces to develop operational services.⁴²⁷ Through the European EUCLID (European Cooperation for the Long Term in Defence) programme, the FFI and the Norwegian private company Informasjonskontroll AS were granted a contract to further develop technology to 'process military data from radar satellites' in 1999.⁴²⁸ The FFI also entered into several contracts with TSS for the purchase of SAR imagery for use in military operations. Under a four-year FFI contract signed in August 1995, the FFI purchased data on behalf of the Armed Forces. Under a subsequent FFI contract signed in January 2000, the FFI only purchased data for its own R&D purposes, while the Armed Forces entered into a separate agreement with TSS on the operational purchase of data. It can be understood that this bifurcation of contractual obligations marks the birth of operationalised Norwegian SAR data.⁴²⁹

⁴²³ FFI, *Satellittovervåking*, 23, 27.

⁴²⁴ Wahl, interview.

⁴²⁵ Tromsø Telemetry Station (Norwegian: *Tromsø telemetristasjon*) was a satellite Earth station located in Tromsø, Norway, later renamed the Tromsø Satellite Station (Norwegian: *Tromsø Satellittstasjon*, TSS). It was taken over by Kongsberg Satellite Services (KSAT), a joint venture between the Kongsberg Group and the Norwegian Space Centre in 2002.

⁴²⁶ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 63.

⁴²⁷ FFI, *Satellittovervåking*, 27.

⁴²⁸ FFI, *Satellittovervåking*, 30.

⁴²⁹ Wahl, interview.

Chapter conclusion

It was principally the 1977 introduction of the EEZ, through which Norway became responsible for vast maritime areas in the High North, that incited Norway to develop national satellite surveillance-based capability for national security purposes. These capabilities could also reinforce Norway's intelligence mission that entailed monitoring Russian military activity, especially the Kola Bay-based strategic forces in the vicinity of Norway.

Norway's development of indigenous military space capability was essentially enabled by civilian, including commercial, space assets, the development of which started to emerge around the same time as the EEZ was introduced. Norway used this newfound access to satellite data to develop satellite-based services for the Armed Forces, which also served as niche capabilities that would add value to international partnerships and reinforce Norway's national security collaboration with allies. Norway first started developing radar satellite data processing capability based on the US civilian Earth observation satellite SEASAT-1 in the late 1970s, and Norway's ability to download and process radar satellite data to generate high-quality SAR imagery became a niche capability.

Since at least 1994, Norway has had some access to US military imaging satellite data and collaborated militarily with the US and the UK to further develop its national military satellite-based capability. Overall, NATO served as a key platform through which Norway accessed SATCOM, as well as space-based ISR, and Norway operated dedicated NATO satellite stations on Norwegian territory. Military space activity thus became another element underpinning Norway's overall defence and security policy, and traditional alliance policy through expanded collaboration with NATO, as well as bilateral partners, especially the US and the UK.

A most noticeable trait is the profound civil-military basis for this activity, which can be understood to have contributed to change the notion of civil-military separation in Norway. Within this context, it is essential to consider that Norway ratified the Additional Protocol I to the 1977 Geneva Conventions in 1981, which signifies that Norway overall acknowledges that civilian capabilities, including satellites, can constitute legitimate military targets.

While Norway's development of indigenous military satellite-based capability commenced with the US' SEASAT-1 satellite through Norway's civilian collaboration with NASA, ESA became a progressively more important instrument serving this purpose. When Norway became a

full member of ESA in 1987, ESA immediately became a central instrument, funding the development of critical space infrastructure for the Armed Forces, such as TSS for national military utilisation of satellite imagery. Another European pillar was the military collaboration through the WEU, where Norway had served as a driving force since 1989 and established satellite surveillance as a priority area within this European military union. Canada, through RADARSAT, became another important partner for Norway's national civil-military space collaboration from 1995 onwards, and Norway also used EUCLID to further enhance its military use of space.

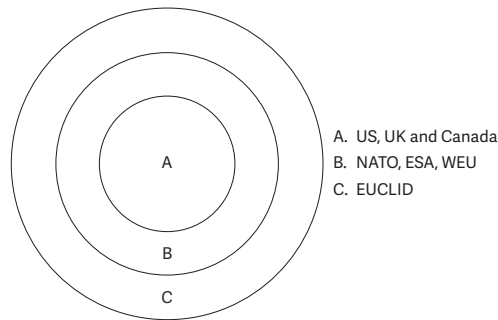


Figure 16. Norwegian collaboration in military space activity in the formative years.

With US President Reagan's 1983 'Star Wars' programme still fresh in mind, several Norwegian parliamentarians in the late 1980s refused to acknowledge the concept of Norwegian military space activity; the term 'military space' had a negative connotation. This political viewpoint did not concede to the fact that Norway's membership in ESA was essential to the development of national military space capability. The MoD in the 1980s and 1990s supported the FFI in developing critical technology throughout the entire satellite surveillance system chain for military use of space, and the MoD expanded the Armed Forces' operative use of radar satellite data in the Barents Sea. Although Norwegian military executives were not noticeably concerned with space capability in the 1990s, their interests were largely maintained by bottom-up activity, of which these executives were perhaps not fully aware.

The Gulf War incited a considerable focus on the operational and tactical use of space assets in Norway. Space surveillance satellites could support all levels of strategy; from strategic surveillance of the Russian

Northern Fleet, verification of arms control agreements and activity in the Svalbard Treaty area, strategic warning through mapping of threatening military dispositions and force movements, naval invasion scenarios and crisis management. Essentially, Norway focused on the use of satellites to improve situational awareness and allocate the Coast Guard's tactical capabilities to execute missions that served to command authority in areas under Norwegian jurisdiction. The FFI defined satellite surveillance as one of its five main defence research areas in the mid-1990s.

Key actors under the MoD umbrella include the FFI, the NIS, the FMGT, the naval operations centre at Reitan and the Coast Guard. They developed and used fundamental space-based capability, predominantly processing, dissemination and IMINT capability, through TSS and by 1998, the Interpretation Centre at Fauske. At this time, the FFI also increasingly focused on space-based military oceanography to support allied submarine operations. Norway continuously drew upon international partnerships, as well as commercial offers, to gain access to space-based services and to develop indigenous space capability for national use, especially in the High North.

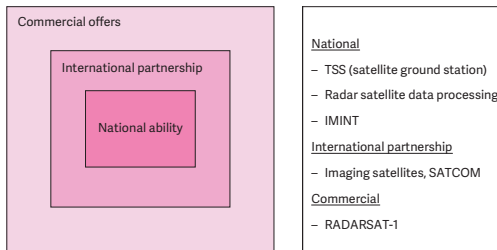


Figure 17. Key capabilities and partnerships for the Armed Forces in the formative years.

Considering Norway's national space capability level as it pertains to Bingen's model, Norway at the onset of these formative years from the late 1970s until the 2000s found itself amongst the 'lost' actors, like most other small and medium-sized states at the time. By the end of the 1990s, Norway was becoming an 'opportunistic' actor, having established key national capabilities including satellite data processing, ground station and IMINT capability.

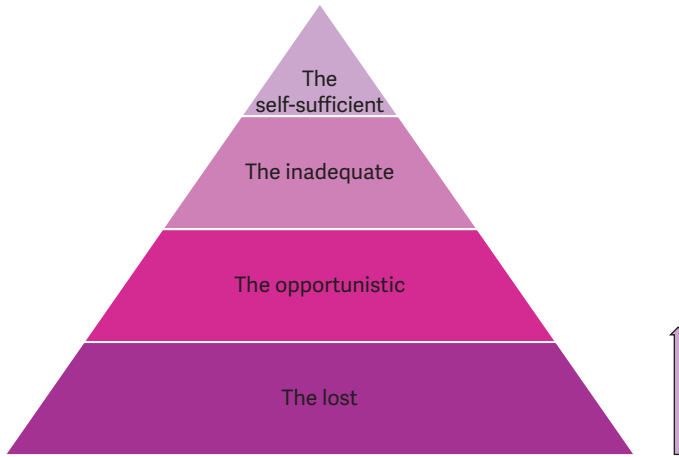


Figure 18. Norway's rise towards the opportunistic from the late 1970s until 2000.⁴³⁰

⁴³⁰ Bingen, *Det nære verdensroms strategiske dimensjoner*, 27–28.

Extemporary military space activities (2000–2014)

The defence posture changed by the late 1990s towards a focus on international operations as engagement, as discussed earlier related to the defence reviews. However, there were communities still arguing for home defence challenges. For instance, the Commander of the Royal Norwegian Navy, Rear Admiral Hans Kristian Svendsholt, stated that Norway's geostrategic posture in the foreseeable future would continue to be shaped by its shared border with Russia, the adjacent northern waters and Norway's NATO membership.⁴³¹ Due to declining defence budgets, however, the Armed Forces would no longer be structured for an invasion scenario, which entailed being attacked by a 'great power with considerable political ambitions', since Norway in such a situation would nonetheless be at the mercy of allied support.⁴³² In the event of conflict or war, Norway would have to rely upon on the immense naval capacity of the US.⁴³³

In addition to being a considerable exporter of fish, Norway at this time commanded ten percent of the world's merchant fleet and transported 80 percent of national imports and 90 percent of exports on keel. Next to Saudi Arabia, Norway had become the world's second largest exporter of oil.⁴³⁴ This included strategic energy resources to central Europe, where Norway supplied Western Europe with about a quarter of its overall gas resources. Oil and gas installations, especially offshore, were 'vulnerable to possible attacks', and protecting and securing this critical infrastructure manifested

⁴³¹ Hans Kristian Svendsholt, «Status og utfordringer i Sjøforsvaret,» *Norsk Militært Tidsskrift*, no. 3 (2000): 5.

⁴³² Forsvaret, *Forsvarsstudie 2000* (Forsvarssjefen, 2000).

⁴³³ Svendsholt, «Status og utfordringer i Sjøforsvaret,» 5.

⁴³⁴ Svendsholt, «Status og utfordringer i Sjøforsvaret,» 5.

itself as a major security and defence policy challenge to Norway in times of peace, crisis and war.⁴³⁵

Norway's struggle with the EU

In the early 2000s, the EU started to challenge ESA's position as Europe's dominant space player, and space became a central talking point in European security and defence policy cooperation. For Norway, a member of ESA but not the EU, this brought about challenges as well as opportunities.⁴³⁶ The EU's rise as a space power also marked the beginning of a 'militarisation' of European space programmes.⁴³⁷ In July 2001, the EU turned the satellite centre in Torrejón into an agency under the supranational EU Council (EC) and incorporated all 'the relevant features' of the WEU constructs. The centre was declared operational in January 2002 and deemed 'essential' for early warning and crisis monitoring considering EU foreign, security and defence policies.⁴³⁸

The Norwegian MoD entered into a bilateral agreement with the EU in December 2001, acceding to the EU's manoeuvre. Norway declared its wish to stay involved in activities at the satellite centre despite its new status as an EC agency, as Norway had 'a lot to contribute' in the future, including 'expertise, military operational personnel, and military geographical services'. The MoD requested the EU to incorporate mechanisms to ensure Norway's continued role corresponding to that of the WEU satellite centre in the past;⁴³⁹ however, the EU did not adhere to these wishes and Norway's influence was significantly reduced. FFI representatives could still participate in user committees but not on the satellite centre's board. Norwegian intelligence staff were still allowed to use the centre but could no longer expect access to 'particularly sensitive information'. FFI leadership started

⁴³⁵ Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005, St.prp. nr. 45 (2000-2001)* (Regjeringen, 2001), 27–28.

⁴³⁶ Bingen, *Det nære verdensroms strategiske dimensjoner*.

⁴³⁷ Sheehan, "Profaning the Path to the Sacred: The Militarisation of the European Space Programme," 170.

⁴³⁸ The Council of the European Union, "COUNCIL JOINT ACTION of 20 July 2001 on the establishment of a European Union Satellite Centre," in *2001/555/CFSP*, ed. the Council of the European Union (Publications Office of the European Union, 2001), http://publications.europa.eu/resource/cellar/bbad6538-22ea-4603-be48-8b45c7b2643f.0006.03/DOC_1.

⁴³⁹ «Avtale mellom Norge og Den europeiske union om Norges tilslutning til Rådets felles handling av 20-07-2001 om opprettelse av et EUs satellittsenter,» ed. Forsvarsdepartementet (Forsvarsdepartementet, 2001), https://lovdata.no/dokument/TRAKTATEN/traktat/2001-12-19-1/ARTIKKEL_6#ARTIKKEL_6.

to doubt whether Norway could continue to play a central role in EU activities in military satellite surveillance.⁴⁴⁰

The FFI therefore focused its efforts through ESA via NOSA instead, and participated in ESA's Earth observation satellite Envisat, launched in March 2002, for its improved modes and services to detect ships, oil spills and oceanographic phenomena. Together with the Norwegian Meteorological Institute, the FFI established an operational service for meteorological and oceanographic information for the Navy to optimise military surface and subsurface naval operations. Through Envisat, the FFI and the Armed Forces also attained funding to enhance TSS that provided national military space-based applications.⁴⁴¹ In a wider sense, Envisat was an important contributor to the EU/ESA Earth observation programme Global Monitoring for Environment and Security (GMES), later renamed Copernicus.⁴⁴² The EC took the lead in developing and administering EU space programmes in 2007, predominantly GMES and the satellite navigation system Galileo, which the EC managed and promoted as civilian programmes. It was, however, widely anticipated that their dual-use characteristics would benefit military and security efforts, and raise security policy concerns.⁴⁴³

The FFI continued to participate in military space projects through the WEAG, where the FFI led CEPA 9 until 2003, but this collaboration too deteriorated following the EU's establishment of the European Defence Agency (EDA) in 2004. The EU Military Committee established a set of European Capability Action Plan (ECAP) groups to remedy shortcomings in EU military forces, and the EDA absorbed the WEAG and ECAP in 2005. Norway could then still participate in projects but was excluded from governing bodies.⁴⁴⁴ The EDA soon demoted running space activities, as the larger European space nations preferred to develop military and security space capabilities indigenously. Germany developed TerraSAR and the military SAR Lupe constellation launched in 2007–2008, Italy launched

⁴⁴⁰ FFI, *Satellitovervåking*, 31–32.

⁴⁴¹ FFI, *Satellitovervåking*, 28, 33.

⁴⁴² European Space Agency, "ESA Declares End of Mission for Envisat," (European Space Agency, 2012), updated 09/05/2012, accessed 4 January, 2021, https://www.esa.int/Applications/Observing_the_Earth/Envisat/ESA_declares_end_of_mission_for_Envisat.

⁴⁴³ John Logsdon, *Security-Related Space Activities in Europe*, Research paper (Elliott School of International Affairs, The George Washington University, 2015).

⁴⁴⁴ FFI, *Satellitovervåking*, 31–32.

their dual-use radar satellite system Cosmo Skymed in 2007–2010 and France launched Pleiades in 2011–2012.⁴⁴⁵

Despite Norway's issues along the EU track on military space collaboration, on the civilian side Norway committed to Galileo through NOSA in 2009. Norway treated Galileo as a purely civilian system and set up a coordinating committee chaired by the MTIF.⁴⁴⁶ Like most national defence ministries in Europe,⁴⁴⁷ the Norwegian MoD opposed Norwegian participation in Galileo, since they already had military agreements with the US on GPS.⁴⁴⁸ There was simply no overarching, strategic thought on space affairs with a holistic, national perspective in Norway in this period.

National space policy and the space coordinating committee

Norway's civilian space policy continued to be industrially driven and Europe-oriented, but from 2005 onwards increasingly emphasised supporting Norwegian technology development in accordance with the Government's High North policy.⁴⁴⁹ In conjunction with committing to Galileo in 2009, Norway also established an inter-ministerial coordinating committee for space activities to follow-up on the considerable financial obligations related to Galileo.⁴⁵⁰ This marked an important step in national space governance and coordination, and in 2011, the committee expanded its portfolio due to the increasing number of space activities, including the launch of Norway's first satellite, the maritime surveillance satellite AISSat-1. Several ministries, including the MoD, acknowledged their vested interests in a range of space activities and partnerships, and the inter-ministerial committee served as a political arena for information exchange. They would meet two or three times a year to coordinate issues related to projects including Galileo and EU space strategy, as well as the Canadian

⁴⁴⁵ Olsen, interview; Wahl, interview.

⁴⁴⁶ Utenriksdepartementet, *Om samtykke til deltagelse i en beslutning i EØS-komiteen om innlemmelse i EØS-avtalen av EUs satellittnavigasjonsprogrammer Galileo og EGNOS (2008-2013)*, St.prp. nr. 54 (2008-2009) (2009), 4.

⁴⁴⁷ Johann-Dietrich Wörner, "Interview with Johann-Dietrich Wörner, Director of the European Space Agency (ESA), 25 March 2016, ESA HQ, Paris, France," interview by Tale Sundlisæter, 2016.

⁴⁴⁸ Tale Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]," (2015), Meeting notes.

⁴⁴⁹ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*, Meld. St. 32 (2012–2013) (Regjeringen, 2013), 47.

⁴⁵⁰ Utenriksdepartementet, *Om samtykke til deltagelse i en beslutning i EØS-komiteen om innlemmelse i EØS-avtalen av EUs satellittnavigasjonsprogrammer Galileo og EGNOS (2008-2013)*, 4.

RADARSAT services, Norwegian microsatellite development, Andøya Space Centre and Barents Watch.⁴⁵¹ In 2012, Norway also committed to Copernicus and contributed through ESA to develop the Sentinel satellites, which added to Norway's and the Armed Forces' maritime and terrestrial surveillance capability.⁴⁵²

In 2013, the MTIF issued its second national space policy, which asserted that only through increased space activity could Norway maintain its leading role in shipping, technological development, environmental security and the High North.⁴⁵³ The number of national and commercial space actors had certainly increased significantly since Norway issued its first space policy in 1987,⁴⁵⁴ and the policy observed that the Armed Forces were currently using space-based Earth observation capabilities, and communications and navigation satellites. The Armed Forces were also planning to acquire military SATCOM capacity due to the anticipated growth in satellite data requirements in the coming years.⁴⁵⁵ Like the 1987 space policy, however,⁴⁵⁶ Norway's second space policy abstained from addressing national security concerns related to space activity.⁴⁵⁷ Until 2014, Norwegian military space activities continued to be conducted impromptu, lacking an overall plan.

Space in Norwegian defence policy and doctrine

Space in Norwegian defence policy continued to predominantly concern satellite-based ISR and SATCOM, although still without any greater ambitions. Neither the Defence Study of 2000 nor the MoD's following LTP in 2001 addressed space in any capacity.⁴⁵⁸ In 2000, Norway's Defence Policy

⁴⁵¹ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*.

⁴⁵² Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*, 23, 53, 56.

⁴⁵³ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*, 23, 53, 56.

⁴⁵⁴ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*, 15–16.

⁴⁵⁵ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*, 65, 72–73.

⁴⁵⁶ Industridepartementet, *Om norsk romvirksomhet* (Industridepartementet, 1986).

⁴⁵⁷ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*.

⁴⁵⁸ Forsvaret, *Forsvarsstudie 2000*; Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*.

Committee submitted a report advocating the importance of technological development for the composition of military forces and the conduct of military operations. It was not yet clear what was ‘politically desirable’ or ‘technically possible’, but NATO demanded interoperability with allied forces at home and abroad. Along with information technology and long-range precision weapons, satellite systems could be used for surveillance, intelligence and communications purposes to aid Norway and NATO solve military tasks in qualitatively new and more efficient ways. Of course, these new technologies also implied the emergence of new threats and vulnerabilities.⁴⁵⁹

In 2000, the High Command published Norway’s first military joint doctrine (*Forsvarets fellesoperative doktrine*, FFOD).⁴⁶⁰ It was to be overarching in the national hierarchy of doctrinal documents and was largely based on NATO doctrine and the doctrines of Norway’s closest allies. The doctrine took a sharp turn away from Norway’s Cold War strategy that was all about exhausting the enemy and instead incorporated the principles of manoeuvre warfare. This concept also served as a basis for current defence analysis at the FFI and emphasised surveillance and intelligence, command and information, weapons, protection and logistics materiel. Whereas using weapons in an exhaustion concept entailed firing towards easily observable adversaries, manoeuvre warfare focused on softer targets at longer distances and necessitated high demands on ISR capability. According to defence analysts at the time, modern manoeuvre warfare operations were built on supreme communication systems and strategic surveillance, ‘in particular satellite information’. It necessitated operational surveillance and intelligence, which could be achieved by ‘linking a large number of different active and passive, physical and human, sensors in a network’ to establish situational awareness among decision-makers. Evidently, this required advanced communications systems.⁴⁶¹

FFOD 2000 treated space as a component of air power, both from a capacity perspective and from the point of view of the geographical ‘third dimension’. Specifically, space was addressed in relation to how it affected air power, rather than the Armed Forces overall. The Norwegian doctrine referred to NATO’s definition of air power. This constituted ‘the military

⁴⁵⁹ Forsvarspolitisk utvalg, *Et nytt forsvar*, NOU 2000: 20 (Statens forvaltningstjeneste, 2000) 77–78.

⁴⁶⁰ *Forsvaret, Forsvarets fellesoperative doktrine* (Forsvarets overkommando, 2000), Del B - Operasjoner, 3, 11.

⁴⁶¹ Bent Erik Bakken, *Teknologi og forsvar - drivkrefter for forandring*. Et seminar under Forsvarsanalysen 2000, FFI/RAPPORT-2000/00070 (FFI, 2000), 51–52.

use of systems that operate in or pass through airspace', which in addition to ground-to-air weapons and manned and unmanned aircraft included 'satellites and space platforms supporting military operations.' It was not the organisational affiliation, but 'the use of the third dimension that is of interest when speaking of air power. Air power is therefore military power exercised by systems using the third dimension.'⁴⁶² For a small air force with limited resources, it was 'easy to think only of air systems, such as aircraft and rockets', but the 'third dimension' extended itself 'from the surface of the Earth and outwards into space,' the doctrine stated. Although the atmosphere and space were physically different, and therefore air- and space systems were different, there was 'absolutely no delineation between the surroundings or the systems'. The 'third dimension' was simply that which covered the surface of the Earth. In principle, air power had 'access to all parts of the surface of the Earth, across borders and natural obstructions', and incorporated 'means of warfare' in air as well as in space. To fully exploit air power, the doctrine proclaimed that both air and space components must be understood well.⁴⁶³

In 2002, the High Command issued air and maritime operations doctrines complementary to the overarching joint doctrine, and although Norway's military focus on space would soon shift to SATCOM, these first doctrines focused on the use of space concerning the ISR function.⁴⁶⁴ Access to information was important to all nations, great or small, and space-based sensors could contribute to strategic warning to increase the security and efficiency of Norway's own forces. The ability to 'observe from high altitudes and cover large areas makes air combat vehicles and satellites particularly well-suited to information gathering.'⁴⁶⁵ Satellites were highlighted as a relevant capacity for the increasingly important tasks of intelligence and surveillance of Norwegian areas of interest and could complement and enhance air power elements.⁴⁶⁶ The air doctrine also presumed that 'space-based forces' might face the same limitations as aircraft, but this could be countered by applying 'a varying number of satellites with varying orbits.'⁴⁶⁷

⁴⁶² Forsvaret, *Forsvarets fellesoperative doktrine*, Del B - Operasjoner, 179.

⁴⁶³ Forsvaret, *Forsvarets fellesoperative doktrine*, Del B - Operasjoner, 180.

⁴⁶⁴ Forsvarets stabsskole, *Forsvarets doktrine for luftoperasjoner* (Forsvarets overkommando, 2002); Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner* (Forsvarets overkommando, 2002).

⁴⁶⁵ Forsvarets stabsskole, *Forsvarets doktrine for luftoperasjoner*, 68.

⁴⁶⁶ Forsvarets stabsskole, *Forsvarets doktrine for luftoperasjoner*, 78.

⁴⁶⁷ Forsvarets stabsskole, *Forsvarets doktrine for luftoperasjoner*, 15–16.

The doctrine for maritime operations in 2002 observed that satellites were becoming ‘smaller and cheaper, the processing capacity larger and the image processing faster’, which meant that satellite-based sensors could be used to monitor the battlefield in real-time or near real-time.⁴⁶⁸ Notably, it referred to a ‘concept for a Norwegian small satellite’ developed by the FFI, and displayed an Ikonos commercial satellite image depicting Capitol Hill in one, three and ten metre resolutions (Figure 19).⁴⁶⁹

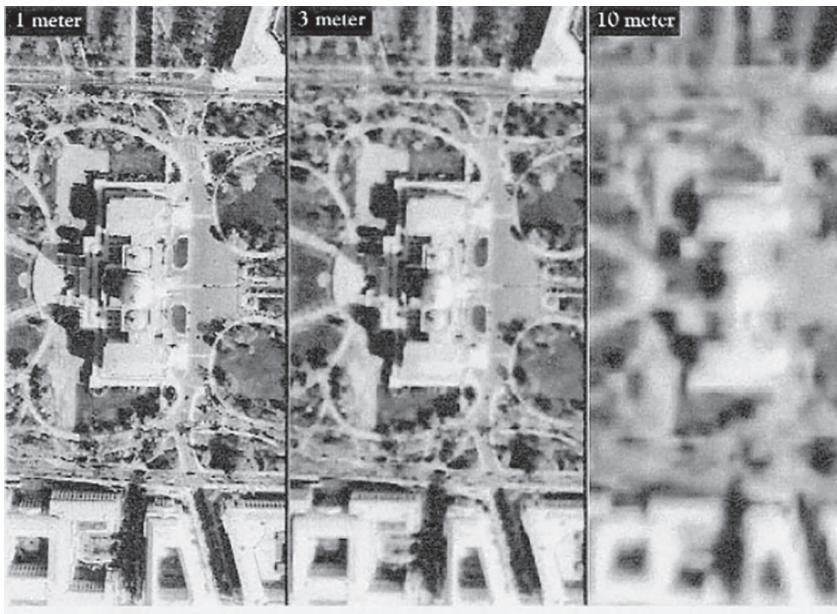


Figure 19. Ikonos satellite image of Capitol Hill.⁴⁷⁰

This doctrine declared that the coordinated use of ‘all sources of information’ formed the basis for situational awareness in Norway’s maritime areas and even implied that Norway’s ‘scarcity of space-based surveillance’ led to unnecessary use of military vessels, aircraft and helicopters for information collection along the Norwegian coast. The Coast Guard was a key instrument that used satellite surveillance capability along with a range of other resources to establish and maintain situational awareness and to control

⁴⁶⁸ Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, 66.

⁴⁶⁹ Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, 66.

⁴⁷⁰ Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, 131.

activities in Norway's operating areas. By fusing all the available information, the Armed Forces could create 'a relatively robust and complete picture', and this formed the technological foundation for a 'network-centric defence'. Each sensor and weapons platform served as a node in an information and communication network. Satellite information could be enriched with information from all sources, and in time, surface vessels along the Norwegian coast could be monitored 'almost continuously'. Ultimately, this could reduce Norway's reaction time in the event of attack.⁴⁷¹

The doctrine for maritime operations also discussed satellites considering '[m]aritime forces in an allied context', now focusing on SATCOM for C2. It stated, 'All frigates and larger units should be equipped with data links and satellite communications.'⁴⁷² The same was true for submarines operating in a 'maritime warfare' context, where 'satellite communications and data links are necessary'. Moreover, it noted that '[a]dvanced satellites' and elevated sensors could retrieve 'much of the information', albeit not on the horizontal plane, which necessitated the use of submarines to collect information for operational and tactical use.⁴⁷³

In 2004, the complementary doctrine for land operations merely stated that '[d]evices will be linked together in joint networks', and modern C2 systems would provide near real-time information pooled from aircraft, UAVs and 'possibly satellites' for intelligence and target location purposes.⁴⁷⁴

FFOD 2000 was replaced by FFOD 2007, which increasingly focused on effect-based operations (EBO), network-centric defence and warfare, and manoeuvre theory.⁴⁷⁵ Net-centricity would link decision-makers, sensors and 'action systems' together in a robust information infrastructure, which would increase information awareness and enable commanders at all levels to make well-informed decisions in a timely manner.⁴⁷⁶ Within this context, FFOD 2007 described space as a domain in which physical platforms operated and communication networks resided, linking other platforms together. The doctrine not only established that space was its own physical domain, but that it was a 'combat arena' on a par with the air, sea and land domains. Indeed, the Norwegian doctrine stated that space was

⁴⁷¹ Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, 66.

⁴⁷² Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, 54.

⁴⁷³ Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, 77–78.

⁴⁷⁴ Forsvarets stabsskole, *Forsvarets doktrine for landoperasjoner* (Forsvarsstaben, 2004), 175.

⁴⁷⁵ Forsvarets stabsskole, *Norwegian Armed Forces joint operational doctrine* (Forsvarsstaben, 2007).

⁴⁷⁶ Forsvarets stabsskole, *Norwegian Armed Forces joint operational doctrine*, 90–93.

an independent operational domain in which ‘the battle is being fought’ and even referred to space as one of the ‘traditional arenas for military operations.’⁴⁷⁷ These latter definitions certainly had no root in reality as far as Norwegian military activity was concerned, but can be understood as an attempt to establish a wider understanding of space as it pertains to greater powers, especially the US.

The next FFOOD was published in 2014 and is therefore discussed in the next chapter. Meanwhile, throughout the 2000s’ first decade, the ‘revolution in information and communication technology’ continued to drive the MoD to further modernise the Armed Forces in the name of network-centric defence. This implied increased communications bandwidth and processing capacity, and cheaper, smaller and lighter user equipment. In 2008, the MoD anticipated that by 2020, satellite-based navigation systems, SATCOM and radio and transponder technology would significantly improve C2, information and identification systems.⁴⁷⁸

It is notable that by 2011, developments in military space activity and technology in general, and an invitation from the USAF concerning a Memorandum of Understanding (MoU) on Responsive Space Capabilities (RSC) in particular, led the Norwegian Armed Forces information infrastructure (INI), the FFI and the NIS to draft a national military space strategy.⁴⁷⁹ In 2010, Norway had launched its first national, dual-use satellite, ‘the microsatellite AISSat-1’, and the MoD was in the process of acquiring a national military SATCOM capability. The Norwegian Parliament had recently adopted the acquisition of such a capability, which according to the strategy draft represented ‘the beginning of a new era of national use of space, both civil and military.’ The strategy’s overall aim was to direct the Armed Forces’ use of space-based resources and capabilities and enhance Norway’s ability to ‘flexibly respond to opportunities and challenges which might arise within the military space domain.’⁴⁸⁰ The draft strategy was never completed as an official military space strategy, however, a national airspace strategy was later published, and the work on RCS as the ability to launch small satellites on demand and on call into low earth orbit and

⁴⁷⁷ Forsvarets stabsskole, *Norwegian Armed Forces joint operational doctrine*, 69–71.

⁴⁷⁸ Forsvarsdepartementet, *Et forsvar til vern om Norges sikkerhet, interesser og verdier, St.prp. nr. 48 (2007-2008)* (Stortinget, 2008), 147.

⁴⁷⁹ Olsen, interview.

⁴⁸⁰ Forsvarets Informasjonsinfrastruktur (INI), *Plan for Forsvarets bruk av rommet 2011-2015 V 0.1*, 7.

to start operating within days may be said to be on a good track by today with the facilities at Andoya Space. We will pick up on this towards the end of the book, as an agreement with Germany in 2019 and with the US in January 2025 show a good development.

Covering the period 2011–15, the aim for the strategy was to provide guidance for the acquisition of military materiel and for the use of space capabilities in military operations. ‘The use of space is spread throughout the Norwegian military organisation’, and it was ‘very important’ to address space holistically to build expertise in a comprehensive way.⁴⁸¹ INI’s Inspector General, Maj. Gen. Sundseth, declared that current Norwegian investments in space-based capacities were of ‘great strategic national importance’ and that an ever-increasing amount of the Armed Forces’ information originated from space-based capacities. Access to and from space provided significant benefits through global presence, which was becoming available to a sharply increasing number of nation-states due to technological advancement, decreasing costs and multinationalism. Military and civilian users could share the costs by developing dual-use assets, and it was certainly an advantage to the small state of Norway that several small and medium-sized states were now mobilising their resources to exploit the space domain. The Armed Forces too should capitalise on emerging forms of international cooperation that until recently had been ‘unthinkable’.⁴⁸²

This military space strategy never entered into force and the initiative did not gain traction, presumably because the Armed Forces were not yet ‘ready’.⁴⁸³ Norwegian military space activities therefore continued to be managed impromptu until 2014, when Chief of Defence, Admiral Bruun-Hanssen (2013–20), decided it was time to launch Norway’s first comprehensive military space strategic review, as we shall see in the next chapter. But first, we will trace the most significant developments in Norwegian defence policy and space activities from 2000 onwards, leading up to the pivotal years of 2014/2015 and the following organisation of space in the Norwegian Armed Forces.

⁴⁸¹ Forsvarets Informasjonsinfrastruktur (INI), *Plan for Forsvarets bruk av rommet 2011–2015 V 0.1*, 7.

⁴⁸² Forsvarets Informasjonsinfrastruktur (INI), *Plan for Forsvarets bruk av rommet 2011–2015 V 0.1*, 3.

⁴⁸³ Olsen, interview.

Network-centric defence and the rationale for military SATCOM

From the early 2000s onwards, Norway's military focus shifted from satellite-based ISR to SATCOM due to the Government's sharply increasing need for bandwidth. Notably, the Stoltenberg Government (2005–13) experienced first-hand on several occasions the severity of failing to establish adequate communication channels in critical situations. This government therefore thoroughly acknowledged the necessity of ensured and secure communications, and clearly instructed the MoD to acquire a national communications satellite capability 'as soon as possible'.⁴⁸⁴

SATCOM became the MoD's and the Armed Forces' focus area, not only at the strategic level but also at the operational and tactical levels. The FFI advised already in January 2000 that tactical military units should communicate on frequency ranges that required line-of-sight via elevated platforms 'such as UAVs or satellites'. This was the most viable way to achieve 'greatly improved communication capacity' for information dissemination between military units, and SATCOM was already being used in this capacity.⁴⁸⁵ A principal SATCOM user was the NJHQ, and whether Norway operated in the Balkans, Afghanistan or Africa, they largely rented SATCOM capability using 'a mixture of solutions.' This entailed setting up a triangle between Norwegian equipment in the field, the Earth-orbiting satellites and FSAT at Eggemoen, which was connected to the NJHQ.⁴⁸⁶ The Armed Forces operated in remote High North areas with poor communications infrastructure, where they employed technology that required progressively increasing amounts of bandwidth. SATCOM was the only capacity that could provide sufficient bandwidth both in Norway's and NATO's military operating areas abroad.⁴⁸⁷ Western communication satellite systems are predominantly geo-stationary along the Equator and give poor services north of 76 degrees north. (Norway launched polar satellites for broadband coverage in 2024). On some occasions, the Armed Forces also

⁴⁸⁴ Nils Helle, «Interview with Commodore Nils Helle, Head of Information and Communication Technology at the Norwegian Defence Logistics Organisation (NDLO), 25 February 2015, Kolsås, Norway. [In Norwegian],» interview by Tale Sundlisæter, 2015.

⁴⁸⁵ Vidar S. Andersen, *Teknologi og forsvar - drivkrefter for forandring*. Et seminar under Forsvarsanalysen 2000, FFI/RAPPORT-2000/00070 (FFI, 2000), 25–26.

⁴⁸⁶ Helle, interview.

⁴⁸⁷ Forsvarsdepartementet, *Om investeringar i Forsvaret, St.prp. nr. 78 (2006–2007)* (Regjeringen, 2007), 8.

faced situations in which they were unable to acquire the desired capacity 'in the right place at the right time.'⁴⁸⁸

As mentioned, the Norwegian defence policy and plans did not address space in any capacity around the millennium.⁴⁸⁹ The Defence Study of 2003 briefly mentioned SATCOM as a necessary capability concerning NATO performance requirements, then specifically related to the Armed Forces' plans to update the SATCOM equipment on their six ULA-class submarines.⁴⁹⁰ Some considerable developments were underway, however. In March 2003, the MoD addressed the need for SATCOM concerning information exchange among mobile platforms and military command structures in military operations at home and abroad. This specifically concerned the Armed Forces' acquisition of Tactical Data Link-16 (TDL-16) for the Fridtjof Nansen-class frigates and the F-16 Mid-Life Update (MLU) fighter aircraft, where SATCOM would serve as a data carrier for TDL-16 on demand. The MoD planned to finance the introduction of SATCOM into the Armed Forces by increasing the overall budget for the frigate project.⁴⁹¹

To accommodate these developments, the Armed Forces established a military satellite station, FSAT, to anchor all national military SATCOM via military and commercial satellites, instead of renting commercial SATCOM services via Eik and Nittedal. FSAT was co-located with the NATO station at Eggemoen and was ready for operation in 2004.⁴⁹² From 2005 onwards, it also incorporated signals intelligence capability for the NIS to collect information from selected foreign satellite systems.⁴⁹³

National SATCOM and the Cyber Defence Force

The Defence Study of 2007 under Chief of Defence, General Sverre Diesen, strongly advocated acquiring dedicated SATCOM capability as a key element in the Armed Forces' endeavour towards a net-centric defence structure.⁴⁹⁴ Modern military forces relied upon information collection sensors,

⁴⁸⁸ Forsvaret, *Forsvarssjefens Forsvarsstudie 2007* (Forsvaret, 2007), 19–20.

⁴⁸⁹ Forsvaret, *Forsvarsstudie 2000*; Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002–2005*.

⁴⁹⁰ Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, 17.

⁴⁹¹ Forsvarsdepartementet, *Anskaffelse av Taktisk Data Link-16 (TDL-16)*, St.prp. nr. 50 (2002–2003) (Regjeringen, 2003), 1, 3.

⁴⁹² Sletengen, «Satellittkommunikasjon.»

⁴⁹³ Kontroll- og konstitusjonskomiteen, *Innstilling til Stortinget fra kontroll- og konstitusjonskomiteen, Innst. 145 S (2016–2017)* (Stortinget, 2016), 14.

⁴⁹⁴ Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*, 10, 19–21.

communication systems such as ‘encrypted satellite communications’ for real-time situational awareness, and powerful weapons systems, all of which would be integrated into the ‘information network’. Norway’s military resources and capacities could be used far more efficiently than in the more ‘hierarchical structures’ of the past.⁴⁹⁵

To streamline and optimise Norway’s military information infrastructure capabilities, the Defence Study of 2007 recommended establishing an independent operating unit, the Armed Forces’ INI.⁴⁹⁶ This entailed establishing an inspector general position to command all information infrastructure capabilities to ensure proper, coordinated development towards network-centric defence.⁴⁹⁷ The MoD formally established INI in 2008 and transferred principal operating functions from the MoD to the Defence Staff, where all military operating unit inspector generals, including INI, were hierarchically placed at the same level. INI headquarters was located at Jørstadmoen Military Base north of Lillehammer, where the inspector general was to bring together all military activities and capabilities related to information and communication technology to improve the Armed Forces’ overall information management and control.⁴⁹⁸ In March 2009, the MoD appointed Maj. Gen. Roar Sundseth as INI’s first Inspector General.⁴⁹⁹

The later Defence Study of 2011 under Chief of Defence, General Harald Sunde (2009–13), continued to focus on developing a network-centric defence structure to capitalise on the rapid developments within data and communication technology. By now, ‘cyber’ had emerged as ‘a new area of warfare’, and the ability to conduct defensive and offensive operations ‘may be crucial in future conflicts and military operations’. To reflect these developments, the study suggested that INI should be renamed the Cyber Defence Force (CYFOR).⁵⁰⁰ FSAT and the planned military communications satellite were amongst CYFOR’s key elements, defined as ‘joint capabilities’ to be managed by CYFOR. FSAT and military SATCOM were proposed as parts of Norway’s operational military structure until 2024, and the military communications satellite was to be ‘introduced’ in the

⁴⁹⁵ Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*, 10.

⁴⁹⁶ Forsvarets Informasjonsinfrastruktur

⁴⁹⁷ Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*, 50.

⁴⁹⁸ Forsvarsdepartementet, *For budsjettåret 2009 under Forsvarsdepartementet Utgiftskapitler: 1700–1795 Inntektskapitler: 4700–4799, St.prp. nr. 1 (2008–2009)* (Regjeringen, 2008), 32, 58, 63, 101.

⁴⁹⁹ Forsvarsdepartementet, «Utnevelser i statsråd 27. mars 2009» (Forsvarsdepartementet, 2009), <https://www.regjeringen.no/no/dokumentarkiv/stoltenberg-ii/fd/Nyheter-og-pressemeddelinger/pressemeddelinger/2009/nytt-fra-statsrad-27-mars-2009/id551626/>. Accessed 14 January, 2022.

⁵⁰⁰ Forsvaret, *Forsvarssjefens Fagmilitære Råd* (Forsvaret, 2011), 45.

period 2013–2016.⁵⁰¹ With that, the Armed Forces could ensure ‘information flow between operators at home and abroad.’⁵⁰²

Secure access to the space segment

The MoD first started planning a project dubbed ‘Secure access to space segment’ in February 2006 to acquire a communications satellite capability to ensure sufficient bandwidth for the Armed Forces by 2012. They designed a conceptual solution, which was ‘necessary for a project of this scope and within such an unknown subject area for the Armed Forces,’ and planned to use NOSA as a key advisor. The MoD started the process of reserving an orbital slot in outer space, initiated talks with potential strategic partners and examined whether Norway could procure the capacity in cooperation with other nations. Several European countries had already expressed their interest in such a joint acquisition.⁵⁰³

The MoD’s plans to acquire military SATCOM were originally related to the Navy’s new Fridtjof Nansen-class frigates, where it was necessary to operate and exchange information with information systems on other platforms to function ‘as well as possible.’ SATCOM was to serve as the frigates’ primary means of communication and the project already included a procurement plan with a budget of NOK 511 million. To ensure that the Navy’s missile torpedo boats (MTBs, also called Missile Corvettes) could also operate in a network-centric defence, the MoD would spend another NOK 149 million to equip the MTBs with SATCOM equipment.⁵⁰⁴

Participation in military operations abroad certainly increased Norway’s dependency on robust and secure SATCOM for geographical coverage and bandwidth capacity, and by experience they had learned that military satellites were ‘far more robust’ than civilian commercial satellite services, not least because they were designed to withstand electromagnetic interference.⁵⁰⁵ SATCOM would also likely reduce Norway’s military dependence on fixed national communication infrastructure, whilst promoting interaction and information exchange with allies and across units within the Armed Forces. It would ensure communication with units deployed abroad and overall facilitate ‘increased operational effect.’ The Navy was

⁵⁰¹ Forsvaret, *Forsvarssjefens Fagmilitære Råd* (Forsvaret, 2011), 49.

⁵⁰² Forsvaret, *Forsvarssjefens Fagmilitære Råd* (Forsvaret, 2011), 66.

⁵⁰³ Forsvarsdepartementet, *Om investeringar i Forsvaret*, 8.

⁵⁰⁴ Forsvarsdepartementet, *Om investeringar i Forsvaret*, 1, 7–8.

⁵⁰⁵ Forsvarsdepartementet, *Om investeringar i Forsvaret*, 1, 7–8.

already equipped with sophisticated SATCOM systems, and the previous Defence Study of 2007 advised that Norway, as a 'major financial initiative' for the defence planning period of 2009–12, should invest in a military communications satellite that would be operational by the end of 2012.⁵⁰⁶

In the 2008 LTP, the MoD formally decided to acquire such a capacity.⁵⁰⁷ The MoD and the Ministry of Finance outsourced the development of a conceptual solution for the military procurement, launch and operation to a private consulting company. The primary coverage area for the Norwegian military communications satellite was Norwegian territorial waters and the EEZ, including the northern area on Svalbard. Additionally, it should cover areas where Norway was participating in international military operations, at that time Eastern Europe and Afghanistan, in addition to Iceland, where Norway was committed to 'surveillance responsibilities'. Norway had already issued a request to the International Telecommunications Union (ITU) for orbital positions that would provide coverage from the Atlantic Ocean and Iceland to the Middle East and Svalbard. The study also assumed that NATO would be interested in renting satellite capacity from the Norwegian satellite on a regular basis and that SATCOM could become one of Norway's contributions to NATO force pooling, alongside capacities such as fighter aircraft and Special Operations Forces (SOF). The satellite project required national control of the satellite through an MoU with another NATO country, which could be secured by dispatching a Norwegian representative to the supplier's satellite control centre.⁵⁰⁸

When the MoD in December 2009 issued its proposition to procure a military communications satellite capability for parliamentary approval, the MoD focused on the increasing military presence in the High North and the Armed Forces' ability to contribute to 'stability and effective surveillance in Norway's areas of interest'. Requirements were however 'further strengthened' by Norway's participation in international military operations. SATCOM had served as the Armed Forces' primary means of communication in operational and strategic capacities at home and abroad for years, but had become more difficult and expensive to rent, and there had been 'several instances' where the Armed Forces were unable to acquire

⁵⁰⁶ Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*, 19–20.

⁵⁰⁷ Forsvarsdepartementet, *Et forsvar til vern om Norges sikkerhet, interesser og verdier*, 85.

⁵⁰⁸ Econ Pöyry and Holte Consulting, *Ekstern kvalitetssikring av Konseptuell løsning for P8007 Sikker tilgang til romsegment* (2008), 19, <https://www.ntnu.no/documents/1261860271/1261975586/129%208007%20Romsegment.pdf>.

the required satellite bandwidth capacity. This was especially true in the High North, where the curvature of the Earth results in poor satellite coverage, and because most commercial communication satellites operated in equatorial geostationary orbit from where they focused their antennas towards highly populated areas. It was therefore important for the MoD that a Norwegian-owned communication satellite should improve this situation in the High North.⁵⁰⁹

The MoD initially examined options involving the UK, Luxembourg, the US and Spain, as well as a national project where the Armed Forces could procure and operate a communications satellite singlehandedly. Another alternative was a national joint acquisition concept, Statsat, between the MoD and the MTIF, where the latter wanted satellite coverage in support of the satellite station in Queen Maud Land, Antarctica. The MoD examined the Statsat option and a bilateral collaboration with the partly-governmental Spanish satellite operator Hisdesat more closely.⁵¹⁰ Norway and Spain currently had a ‘strong and tight relationship’ because Spain was building the entire Norwegian Fridtjof Nansen-class frigate fleet, which entailed ‘enormous investments’. In this respect, it was ‘not so strange’ that Norway chose to collaborate with Spain on the military SATCOM project as well.⁵¹¹

Former Telenor Chief Executive Officer (CEO) Tormod Hermansen and Director of the FFI Paul Narum advocated for the Statsat project and proposed that the MTIF could own and operate the satellite on behalf of the Armed Forces whilst also running it as a commercial enterprise. It would be of strategic interest to Norway as a nation to strengthen its position in space, and Statsat could meet both Norway’s military needs in the High North and provide satellite coverage from the Norwegian base in Antarctica. Statsat would support Norway’s High North policy and demonstrate that Norway had the will and the ability to meet its own needs, which would make Norway an attractive partner in space. It would increase the competitiveness of Norwegian space companies, Norway’s influence in relation to other space actors, develop Norwegian satellite expertise and

⁵⁰⁹ Forsvarsdepartementet, *Framskaffing av ein kommunikasjonssatellitt til Forsvaret, Prop. 56 S (2009–2010)*; Forsvarsdepartementet, *Proposisjon til Stortinget (forslag til stortingsvedtak)* (Regjeringen, 2009).

⁵¹⁰ Forsvarsdepartementet, *Framskaffing av ein kommunikasjonssatellitt til Forsvaret, Prop. 56 S (2009–2010)*; Forsvarsdepartementet, *Proposisjon til Stortinget (forslag til stortingsvedtak)*.

⁵¹¹ Petter Jansen, “Interview with Petter Jansen, Head of the Norwegian Defence Logistics Organisation (NDLO) 19 March 2015, Langkaia, Oslo, Norway [in Norwegian],” interview by Tale Sundlisæter, 2015.

establish a new Norwegian space actor. Norway had ‘significant satellite expertise’, and it was proposed that Statsat could be run in close collaboration with Telenor.⁵¹²

Yet, the MoD in late 2009 discarded the Norwegian Statsat proposal and decided to partner with Hisdesat. This was the most ‘cost-effective’ solution because Hisdesat was ‘a well-established operator’, meaning there would be ‘fewer unresolved issues’ and less uncertainty considering acquisition and future satellite operations. It also included redundant capacity, which Statsat did not. The Hisdesat project was estimated to cost NOK 982 million compared to Statsat’s NOK 1.6 billion. Hence, the national solution was more than 50 percent more expensive in start-up expenses, in addition to having higher annual operating costs.⁵¹³

Like most communications satellites, the satellite, dubbed ‘Hisnorsat’, would be deployed in geostationary orbit.⁵¹⁴ The Armed Forces and Hisdesat would jointly own Hisnorsat, ensuring Norway operational control over the Norwegian part of the communications payload on board the satellite.⁵¹⁵ Norway would own 40 percent and Hisdesat 60 percent of the satellite capacity.⁵¹⁶ In September 2010, Minister of Defence Grete Faremo signed the MoU with her Spanish counterpart, and in June 2011, a ‘development agreement’ was due to be signed by Rear Admiral Elisabeth Natvig on behalf of the Armed Forces. The satellite would be launched in 2014 and offer secure SATCOM over Europe, the Middle East, Asia and Africa until 2030.⁵¹⁷

These plans were noted in the Defence Study of 2011, and the Armed Forces continued to upgrade FSAT to meet their demands ‘across the entire range of national and foreign military operations, adapted to operational needs and requirements.’⁵¹⁸ In December 2011, the manager of the MoD’s military SATCOM programme, Navy Commander Trond Hermannsen (not to be confused with Tormod Hermansen of the Statsat committee),

⁵¹² Trond Gram, «Anbefalte norsk satellitt,» *Teknisk Ukeblad*, 2010, accessed 15 February, 2022, <https://www.tu.no/artikler/industri-anbefalte-norsk-satellitt/236924>.

⁵¹³ Forsvarsdepartementet, *Framskaffing av ein kommunikasjonssatellitt til Forsvaret*.

⁵¹⁴ Peter B. de Selding, “Norway, Spain Expected To Order Milcom Satellite Before New Year,” *SpaceNews*, 2011, <https://spacenews.com/norway-spain-expected-order-milcom-satellite-new-year/>.

⁵¹⁵ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 5, 62, 69.

⁵¹⁶ Forsvarsdepartementet, *Framskaffing av ein kommunikasjonssatellitt til Forsvaret*.

⁵¹⁷ Hisdesat, “Hisdesat and the Norwegian Armed Forces Sign a Development Agreement of the New Communications Satellite, Hisnorsat,” news release, 30 June, 2011, https://www.hisdesat.es/en/nota_prensa/hisdesat-and-the-norwegian-armed-forces-sign-a-development-agreement-of-the-new-communications-satellite-hisnorsat/.

⁵¹⁸ Forsvaret, *Forsvarssjefens Fagmilitære Råd*, 46.

stated that the MoD would invest USD 200 million, equivalent to NOK 1.2 billion, in Hisnorsat. In addition to the space segment, the programme included the procurement of ‘300 satellite communications terminals for Norwegian land, air and maritime platforms, and ground infrastructure’. The satellite would carry ‘almost all of Norway’s military satellite communications traffic’, including current operations in the Balkans, Afghanistan, the Middle East and Africa. Operations in the Arctic, however, were not included, as this region was ‘beyond the reach of a geostationary satellite’. To cover the Armed Forces’ needs in the High North, they would merely ‘continue to lease L-band capacity.’⁵¹⁹ For national operations in the High North, this constituted a great challenge; however, one needs to understand that by 2011, there were few options available for High North coverage and the war in Afghanistan was a priority to the Armed Forces.

Norway’s military SATCOM acquisition project was abruptly terminated, however. The Spanish Government that had negotiated the bilateral SATCOM agreement with Norway was replaced due to the financial crisis, and the new Spanish Government’s support for the project became ‘unclear.’⁵²⁰ The MoD’s LTP in March 2012 still stated that ‘[a] new military communications satellite, which will be acquired in collaboration with Spain, will provide the Armed Forces with secure access to long-range broadband capacity.’⁵²¹ By September 2012, supposedly after reconsidering ‘key assumptions’ and criteria on which the project was based, Norway and Spain suddenly concluded that ‘the business plan was no longer solid enough.’ The income potential was reduced, and it was uncertain whether the Armed Forces needed the capability. Hisnorsat was terminated with immediate effect, and the Armed Forces continued to lease satellite capacity and examine other, long-term SATCOM solutions in parallel.⁵²²

In September 2013, the MoD established a new SATCOM project, but did not yet have any recommendations to the Parliament.⁵²³ FSAT was by now equipped with 20–30 antennas with diameters of up to 18 metres and operated around the clock to ensure that Norway had contact with all their military forces at home and abroad. CYFOR Commander Maj. Gen. Sundseth and FSAT’s station chief were increasingly concerned with

⁵¹⁹ Selding, “Norway, Spain Expected To Order Milcom Satellite Before New Year.”

⁵²⁰ Selding, “Norway, Spain Expected To Order Milcom Satellite Before New Year.”

⁵²¹ Forsvarsdepartementet, *Et forsvar for vår tid* (Regjeringen, 2012), 103.

⁵²² Forsvarsdepartementet, *Proposisjon til Stortinget (forslag til stortingsvedtak)*, Prop. 1 S (2012–2013) (Regjeringen, 2012), 97–98.

⁵²³ Forsvarsdepartementet, *Proposisjon til Stortinget (forslag til stortingsvedtak)*, 110–11.

information security. They were therefore engaged in establishing routines to handle network intrusion, degradation or destruction and stressed that investing in a national military communications satellite would improve the security.⁵²⁴

When the Solberg Government took office in October 2013, they seemed ‘uninterested’ in acquiring a national SATCOM capability, a disinterest that by some has been understood to stem from the new government’s lack of first-hand experience of failing to establish secure communications in critical situations.⁵²⁵ We will, however, see in the next chapter that Russia’s illegal annexation of the Ukrainian Republic of Crimea and Sevastopol in early 2014 incited the MoD and the Armed Forces to become much more serious about space. The national military SATCOM acquisition process would again gain traction, and instead of trying to cover all operating areas around the world, Norway would finally prioritise the High North.

National satellite-based ISR and military scepticism

As we have seen, military space capability became first and foremost associated with SATCOM within the MoD and the Armed Forces from the mid-2000s onwards. Satellite-based ISR was thoroughly addressed in the first military doctrines but received less attention in Norwegian defence planning. In fact, during the 2000s’ first decade, some of Norway’s military executives would publicly demonstrate their scepticism and, at times, condescending attitudes towards the military value of satellite-based ISR capability, especially that which concerned the FFI’s attempts to develop national satellite capability.

In 2000, the process of acquiring satellite imagery was still relatively slow and principally of interest to Norway from a strategic intelligence perspective.⁵²⁶ Its ‘possible future uses’ were plentiful, however. The space age was still in its infancy and the FFI anticipated ‘very significant’ technological and systemic space developments in the coming years. The Armed Forces therefore had to decide on their ambition level for the military use

⁵²⁴ Elin Harstad Iversen, «Cybertrusselen er grenseløs,» *Drammens Tidende*, 4 June 2013, <https://www.dt.no/naringsliv/naringsliv/cybertrusselen-er-grenselos/s/2-2.1748-1.7919624>.

⁵²⁵ Helle, interview.

⁵²⁶ Andersen, *Teknologi og forsvar - drivkrefter for forandring*. Et seminar under Forsvarsanalysen 2000, 20–22.

of space-based sensors. Although satellite-based surveillance systems had proven to be especially useful in international crisis management since the end of the Cold War, the FFI advised that Norway should focus on its national military needs for satellite-based surveillance. In peacetime, this entailed continued fisheries supervision, environmental monitoring, military oceanography and military-oriented surveillance and intelligence. In emergency and low-level crisis situations, they could use satellites to monitor ‘special areas and facilities’ and to track the movement of military units. As satellite coverage was sporadic, however, the information was best suited to detect significant changes compared to the ‘normal situation’ over a longer period, that is, several days. Satellite surveillance data also constituted an ‘excellent basis’ for allocating other dedicated ISR capabilities that could provide more continuous but geographically limited data.⁵²⁷

Sporadic and low-resolution satellite data could also be used in long-range precision weapons as a basis for targeting and fire control, but the use of currently available data as a primary basis for the firing process necessitated strict requirements on satellite availability and geographical coverage, resolution, downlink and processing capacity, as well as positioning accuracy. In wartime, satellites could serve as ‘a very effective supplement to other sensor systems’, but in time, radar satellites had ‘considerable potential’ for targeting using long-range artillery or fighter jets.⁵²⁸ The proliferation of satellite-based ISR capabilities also implied that relevant military stationary facilities could be mapped in peacetime. By using SAR, electro-optical and infra-red (EO/IR), and Moving Target Indicator (MTI) satellite sensors, it might also be possible to locate and track any mobile target.⁵²⁹

Norway’s ability to keep track of militarily relevant activity in its ‘immediate areas’ would be especially important in a crisis. If war was to break out or threaten to break out, area-wide surveillance and intelligence would be essential for strategic and operational assessments, tactical warning, targeting and localisation. The military value of satellite-based intelligence increased with increasing satellite coverage frequency and image resolution and could play a crucial role in planning and conducting national

⁵²⁷ Ragnvald H. Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, FFI/RAPPORT-2000/03429 (FFI, 2000), 63–65.

⁵²⁸ Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, 64.

⁵²⁹ Bjarne Haugstad, *Teknologi og forsvar - drivkrefter for forandring*. Et seminar under Forsvarsanalysen 2000, FFI/RAPPORT-2000/00070 (FFI, 2000), 42.

military operations. However, national military dependency on such a system necessitated very strict requirements for system survival and operability in the event of war.⁵³⁰

Due to cloud cover and weather conditions in the High North, radar satellites were most applicable to the Armed Forces, but the FFI also examined the implications of optical sensor satellite developments. Their dependence on clear weather and daylight meant that one could not rely on optical satellites in a tactical context, but the information could be a 'valuable supplement' under certain conditions. The US had recently launched the Ikonos satellite and the first processed Ikonos image had appeared on the internet in October 1999. Optical satellites with resolutions of less than one metre had also been used during operations in the Kosovo War,⁵³¹ and commercially available optical satellite images were about to provide resolutions down to half a metre.⁵³²

The Armed Forces could take several approaches concerning the 'future Norwegian military use of space-based sensors'. Maritime surveillance based on commercial radar satellites had already manifested itself as a permanent addition to Norway's military ISR toolbox in peacetime, but commercial satellite availability in a crisis or war scenario was highly uncertain and would predominantly depend on ownership. Norwegian co-ownership in a multinational satellite system would reduce uncertainty but came at a high cost. A simple, national small satellite system would further reduce the uncertainty, but would be even more costly. The safest bet in 2000 was to gain further experience in the use of commercial satellite imagery.⁵³³

Although the Armed Forces had routinely used commercial radar satellite imagery for operational maritime surveillance in peacetime since 1998,⁵³⁴ the Defence Study of 2000, as noted above, did not mention space in any capacity.⁵³⁵ Maritime surveillance was predominantly covered by Norway's P-3 Orion Maritime Patrol Aircraft (MPA), which had been recently updated with new surveillance and communication capabilities.⁵³⁶ In October 2000, Chief of Defence General Frisvold voiced his

⁵³⁰ Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, 63–65.

⁵³¹ Andersen, *Teknologi og forsvar - drivkrefter for forandring*. Et seminar under Forsvarsanalysen 2000, 20–22.

⁵³² Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, 63–65.

⁵³³ Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, 65, 67.

⁵³⁴ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*.

⁵³⁵ Ole Nygaard, «Han skal fronte det nye forsvaret.» *Aftenposten*, 11 December 2004, <https://www.aftenposten.no/norge/i/dnXxq/han-skal-fronte-det-nye-forsvaret>.

⁵³⁶ Forsvaret, *Forsvarsstudie 2000*.

concern about the ‘growing technological gap’ between the US and other NATO members in a public address, adding, ‘for the sake of clarity’ that the defence study did not mention or even consider the notion of ‘Star Wars.’⁵³⁷ Like the Defence Study of 2000, the MoD’s following LTP in 2001 made no mention of space capability.⁵³⁸

The Defence Study of 2003, however, acknowledged that the Armed Forces were currently using commercial radar satellites for maritime surveillance on a regular basis.⁵³⁹ General Frisvold personally stated that whilst satellite images helped the Armed Forces identify activity on the sea surface to allocate tactical surveillance capabilities, they had ‘virtually no ability to classify and identify objects’ based on this imagery.⁵⁴⁰ In a crisis scenario with foreign maritime units operating beyond the reach of the Norwegian coastal radar chain, radar satellite data would ensure a considerable military ability to establish and maintain situational awareness and help allocate resources efficiently. Due to the fact that the commercial satellites the Norwegian military was using at this point were not under Norwegian national control, Norway could not expect to access the desired information in all situations, and acquiring sufficient national space capacity would be very expensive.⁵⁴¹

In 2003, the Commander of Northern Norway Regional Command (LDKN), Rear Admiral Jørgen Berggrav, stated that LDKN was continuously purchasing commercial satellite imagery for maritime surveillance in the High North.⁵⁴² FKN was transformed into LDKN in 2002, and Rear Admiral Berggrav was responsible for surveillance, sovereignty and crisis handling in the High North, including the Svalbard Archipelago, the Bjørnøya and Jan Mayen Islands, and adjacent sea areas and airspace. LDKN commanded the Coast Guard and ensured continuous surveillance to maintain domain situational awareness in the region.⁵⁴³ The Coast Guard typically reported its need for support to LDKN, which along with the Interpretation Centre at Fauske prepared a plan for subsequent ordering of

⁵³⁷ Sigurd Frisvold, «Det nye Forsvaret - status og utfordringer,» *Norsk Militært Tidsskrift*, no. 11-00, (2000): 5–6.

⁵³⁸ Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*.

⁵³⁹ Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, 12–13.

⁵⁴⁰ Sigurd Frisvold, «Status og utfordringer i Forsvaret,» *Norsk Militært Tidsskrift*, no. 1 (2004): 8.

⁵⁴¹ Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, 12–13.

⁵⁴² Jørgen Berggrav, «Landsdelskommando Nord-Norge - operativ blindtarm eller indrefilet?» *Norsk Militært Tidsskrift*, 27 October 2003.

⁵⁴³ Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*, 103–04.

commercial satellite imagery.⁵⁴⁴ According to Rear Admiral Berggrav, satellite imagery allowed him to allocate ‘traditional military resources’ such as aircraft or vessels more effectively in Norway’s areas of responsibility.⁵⁴⁵



Figure 20. Norway's areas of responsibility.⁵⁴⁶

⁵⁴⁴ FFI, *Satellittovervåking*, 31.

⁵⁴⁵ Berggrav, «Landsdelskommando Nord-Norge.»

⁵⁴⁶ Food and Agriculture Organization of the United Nations, Norway, <https://www.fao.org> 2013.

Norway's military commanders move to terminate national military surveillance satellite

One of the most remarkable aspects of the Defence Study of 2003 was that it evaluated a nationally developed electronic support measures (ESM) satellite project as an option for Norway's future military structure.⁵⁴⁷ The FFI endeavoured with considerable effort to develop a 'small satellite system for defence and security purposes', estimated in 2000 to cost NOK 600 million.⁵⁴⁸ The primary advantage was that Norway would have full national control of the satellites to ensure 'good area coverage'. The most promising concept for Norway was satellites equipped with passive sensors for radar detection and bearing, and possibly also communications. The FFI conceptualised a system of six small satellites, where downlink and C2 would take place at the Interpretation Centre at Fauske and via a mobile ground station. These satellites would be able to classify targets, although the passive sensors could not detect vessels operating under strict radar or radio silence. The proposed system could operate autonomously for several weeks at a time and transmit encrypted target data directly to a select few military operating units. It could also integrate target data directly into long-range fires systems such as the Norwegian Naval Strike Missile on board Norway's new frigates and a proposed cruise missile capability.⁵⁴⁹

Although the 'giga satellite' era seemed to be over, a radar satellite would still weigh at least one tonne and cost too much, which was why the FFI focused on developing 'smaller satellites' with passive sensors.⁵⁵⁰ The concept evaluated by the Defence Study of 2003 was called *Ny Norsk Satellitt* (NSAT), and would weigh a maximum of 50 kg and carry a passive radar instrument.⁵⁵¹ In March 2001, the FFI publicly announced that 'Norway may build a national military surveillance satellite to control the Norwegian naval areas'. The 'possible military satellite' would cover the vast areas from Svalbard and southwards, where Norway's EEZ and FPZ were larger than all the other economic zones in Europe combined. With 'electronic eyes from space', Norway could then detect navigation and radar

⁵⁴⁷ Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, 12–13.

⁵⁴⁸ Andersen, *Teknologi og forsvar - drivkrefter for forandring*. Et seminar under Forsvarsanalysen 2000, 24–25.

⁵⁴⁹ Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, 67.

⁵⁵⁰ Andersen, *Teknologi og forsvar - drivkrefter for forandring*. Et seminar under Forsvarsanalysen 2000, 24–25.

⁵⁵¹ FFI, *Satellittovervåking*, 28–29.

signals from vessels on the seas below and use this information to allocate resources and deploy forces such as the Fisheries Inspectorate, the Coast Guard, the Navy and MPAs in areas under Norwegian jurisdiction for closer inspection of foreign shipping and fishing activity. It was, however, ‘not relevant’ to monitor Russian ports and stocks of nuclear waste on the Kola Peninsula, as that implied a project ‘of a completely different size and price.’ The FFI could build their proposed ESM satellite for the net sum of NOK 100 million within the next five years, but it was not yet clear whether Norway’s military and political authorities were willing to invest.⁵⁵²

NSAT underwent satellite planning phases from 1998 until 2003, and the FFI developed a full-scale model that was exhibited in several places, which according to the FFI attracted considerable international attention.⁵⁵³ The project was also mentioned in Norway’s military doctrine for maritime operations in 2002, which emphasised its potential in facilitating real-time surveillance of the battlefield.⁵⁵⁴ As it turned out, however, the notion of a Norwegian military satellite in orbit received a ‘somewhat mixed reception’ in various parts of the Norwegian defence sector.⁵⁵⁵

The Defence Study of 2003 did indeed state that the Armed Forces had considered ‘a concept of national passive small satellites’ for continuous maritime surveillance, but because the proposed passive system depended on active transmissions from platforms at sea, it would not suffice for their purposes. Norway could best ensure access to ‘relevant satellite information for military purposes’ through continued international cooperation, which in addition to passive satellite sensors included radar, and optical and IR satellite systems. Norway should also continue its international collaboration that provided access to ‘overview photos at sea’ and ‘prioritised satellite systems within NATO.’ Ultimately, it advised terminating all efforts to develop a Norwegian military satellite.⁵⁵⁶

General Frisvold personally restated his views in December 2003, underlining that ‘relevant satellite information for military purposes’ was best ensured through continued international cooperation within the NATO

⁵⁵² Jan-Petter Helgesen, «Vil bygge overvåkings satellitt: Norge kan komme til å bygge egen militær overvåkings satellitt for kontroll av de norske havområdene,» *Stavanger Aftenblad*, 2001, <https://www.aftenbladet.no/innenriks/i/nmmmn/vil-bygge-overvaakings-satellitt>.

⁵⁵³ FFI, *Satellittovervåking*, 28–29.

⁵⁵⁴ Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, 66.

⁵⁵⁵ Olsen, «Norske mikrosatellitter.»

⁵⁵⁶ Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, 12–13.

framework.⁵⁵⁷ The MoD's 2004 LTP that outlined plans for the Armed Forces through to 2008 adhered to the Defence Study of 2003. The defence policy echoed the defence study considering the need for satellite-based ISR for maritime surveillance and resource allocation, and acknowledged that satellites that were not under Norwegian control might not be available in a crisis. The MoD decided that Norway would continue to purchase commercial satellite information for military use and strengthen international cooperation in the military space domain, predominantly within NATO. Ultimately, the MoD called for the FFI to terminate the development of 'a national military satellite capacity' with immediate effect.⁵⁵⁸

Mixed views on national satellite-based ISR

In November 2005, Inspector General of the Norwegian Navy, Rear Admiral Jan Eirik Finseth, stated that satellites and airborne sensors were among the most effective means of surveillance in the High North and 'only in this way' could the Norwegian military allocate its resources. Real-time situational awareness and understanding the intent of observed activity in the High North was 'crucial'. Rear Admiral Finseth observed that LDKN was increasingly using satellite capacities, 'and I dare say we have never had a better picture in the High North'. It was in fact 'a paradox' that he, the Navy Inspector General, focused more on improving the utilisation and integration of satellite surveillance and airborne sensors than on acquiring more vessels to enhance military operations in these areas.⁵⁵⁹ In a public address in 2006, Minister of Defence Anne-Grete Strøm-Erichsen underlined that the High North was certainly Norway's primary strategic focus area and noted that the LDKN used 'satellites' to monitor Norway's substantial maritime areas.⁵⁶⁰ Others, such as the then Commander of NJHQ in Stavanger, Lt. Gen. Archer (2004–05), and Rear Admiral Berggrav, then head of the MoD's LTP division, argued strongly against prioritising the

⁵⁵⁷ Frisvold, «Status og utfordringer i Forsvaret,» 8.

⁵⁵⁸ Forsvarsdepartementet, *Den videre moderniseringen av Forsvaret i perioden 2005-2008, St.prp. nr. 42 (2003-2004)* (Regjeringen, 2004), 57–58; According to Lt. Gen. David A. Deptula (USAF), scepticism towards the military value of small satellites was also dominant in the US until at least 2007–2009. See David A. Deptula, "Interview with Lt. Gen. (Ret.) David A. Deptula (US Air Force), Head of the Mitchell Institute, 21 October 2015, Arlington, Virginia, USA," interview by Tale Sundlisæter.

⁵⁵⁹ Jan Erik Finseth, "Status og utfordringer," *Norsk Militært Tidsskrift*, no. 12 (2005): 18.

⁵⁶⁰ Anne-Grete Strøm-Erichsen, «Sammen for et moderne forsvar,» *Norsk Militært Tidsskrift*, no. 02 (2006): 8.

FFI's plans to develop a national surveillance satellite.⁵⁶¹ The Defence Study of 2007 in the following year thoroughly focused on SATCOM and did not consider satellite-based ISR.⁵⁶²

The MoD's 2008 LTP for 2009–12 again turned and noted that, within the context of strengthening the Coast Guard's structure and operational capacity, the Armed Forces would continue to use satellite surveillance data to improve surveillance and control of coastal waters.⁵⁶³ In 2010, Norway launched its first satellite, AISSat-1, and the Armed Forces almost instantly became Norway's largest user of AISSat-1 satellite data.⁵⁶⁴ The MoD's LTP of 2012 merely reiterated that the Coast Guard exercised authority in the Norwegian High North, aided by airborne and spaceborne surveillance capabilities.⁵⁶⁵ We see that the question about and priority for satellites' ISR capabilities were controversial and that the top leaders were clearly divided on the issue, to the great frustration of the FFI researchers and others arguing the case for satellite ISR. This we will come back to later towards the end of the book.

Military satellite-based capability development

Space in Norwegian defence policy was dominated by SATCOM due to the attempt to acquire national military SATCOM capability, which would have constituted a considerable investment had it not been terminated due to the financial crisis. As we have seen, there are also indications that key Norwegian military executives personally opposed the development of national satellite-based ISR capability. Aside from Norway's development of SATCOM ground infrastructure, however, Norway's actual national military satellite-based capability was largely related to the ISR function. These developments were conducted in a civil-military track and did not constitute the acquisition of a military satellite, and the development of ground-based technology was partly tied to civilian ground infrastructure.

⁵⁶¹ Olsen, interview.

⁵⁶² Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*.

⁵⁶³ Forsvarsdepartementet, *Et forsvar til vern om Norges sikkerhet, interesser og verdier*, 79.

⁵⁶⁴ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*.

⁵⁶⁵ Forsvarsdepartementet, *Et forsvar for vår tid*, 51.

While senior political leadership in Washington and Moscow had relied upon satellite imagery to make important national security decisions for decades, satellite-based ISR was now becoming available for almost anybody to use.⁵⁶⁶ The FFI thoroughly incorporated this development into Norwegian defence policy analysis. During this time, advancements in space technology and sensor capability led the formerly ‘clear divide’ between military and civilian satellites to become increasingly indistinct. Still, while the space-based platform collecting the data could be one and the same, the data itself would normally be channelled through separate military and civilian ground-based processing elements and infrastructure.⁵⁶⁷

‘Commercial’ satellite imagery and military capability

Military satellite-based ISR capability development largely encompassed a continuation of that in the 1990s. Investment costs were low, and operating costs depended on the purchase of imagery and the number of national operators and analysts. In 2000, the FFI estimated that this activity would cost Norway about NOK 200 million over a 20-year period.

The Interpretation Centre at Fauske continued to produce radar satellite-based IMINT for use in peace and low-level crisis situations at the behest of the joint command in northern Norway.⁵⁶⁸ Radar satellite data was downlinked in Tromsø and transmitted to Fauske, where operators prepared reports that were subsequently disseminated to FKN/LDKN and other military units via messages that could be read directly into operational C2 systems. Reports were enriched with ship-based AIS reporting system information, coastal radar data and information from other sources. This system established a situational picture and pooled information about each detected vessel, and the information was used to decide whether any vessels should be inspected further. Computer systems for operator-supported interpretation and tables for expected detection capability were

⁵⁶⁶ Peter Marquez, “Interview with Peter Marquez, Director of Space Policy at the US National Security Committee (NSC) 2007–2010, 7 December 2015, Washington, DC., US,” interview by Tale Sundlisæter, 2015; James Armor, “Interview with Maj. Gen. (Ret.) James Armor (USAF), Former Director of the Pentagon’s National Security Space Office, 8 December 2015, Capitol Hill Club, Washington, DC., US,” interview by Tale Sundlisæter; Kevin O’Connell, “PhD interview with Kevin O’Connell at Innovative Analytics & Training,” Washington, DC., December 10 2015.

⁵⁶⁷ Bjerke and Olsen, *En introduksjon til satellitter*, 38, 56.

⁵⁶⁸ Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, 64–65; The MoD transformed FKN into LDKN in 2002. Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*, 103–04.

also developed.⁵⁶⁹ The FFI also proposed to augment the Interpretation Centre at Fauske with mobile satellite stations to make the military IMINT service more robust and survivable in crisis and war scenarios.⁵⁷⁰

Radar satellite capability was still Norway's best option for maritime surveillance, and in 2000 there were two notable radar services under development. One focused on bases' and ports' surveillance and another on the prediction of oceanographic conditions affecting subsurface acoustic conditions. Several more civilian radar satellites were being planned or were already under construction. The FFI took particular interest in the Canadian commercial RADARSAT-2, which was to provide resolutions down to three metres.⁵⁷¹ NOSA notified the FFI in 2002 of plans to enter into a bilateral agreement with Canada to ensure 'public Norwegian users' access to SAR data from RADARSAT-2. Along with Envisat, RADARSAT-2 would provide daily coverage of Norwegian areas of interest with a capacity 'satisfactory for most marine tasks'. The operative life expectancy was seven years, and KSAT would downlink, process and distribute the data. User organisations could either enter into agreements with KSAT or make on-demand arrangements.⁵⁷²

RADARSAT-2 was launched in December 2007,⁵⁷³ and in addition to the abovementioned usage, the Armed Forces used RADARSAT-2 and other commercial satellites for tactical purposes during the military exercise Cold Response in northern Norway in 2009. The FFI had previously used commercial satellite imagery during Strong Resolve in 2002 and Battle Griffin in 2005, but during Cold Response they comprehensively tested a service to coordinate military acquisition of images, primarily from commercial satellites.⁵⁷⁴ Like the Interpretation Centre, this concept was a collaboration between the FFI, the NIS and the FMGT. KSAT downlinked the data at TSS, and the FFI served as a link to the Army's tactical intelligence

⁵⁶⁹ FFI, *Satellittovervåking*, 31.

⁵⁷⁰ Andersen, *Teknologi og forsvar - drivkrefter for forandring*. Et seminar under Forsvarsanalysen 2000, 24–25.

⁵⁷¹ Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, 63–65.

⁵⁷² Norsk Romsenter, *Norsk/kanadisk avtale om tilgang på radardata over norske interesser*, 278/PES/HS/6416 (2002).

⁵⁷³ eoPortal, "RADARSAT-2," eoPortal Directory, European Space Agency, 2014, accessed 17 January, 2022, <https://earth.esa.int/web/eoportal/satellite-missions/r/radarsat-2>.

⁵⁷⁴ Pål Bjerke, *Bruk av kommersielle satellittbilder under Cold Response 2009: En prøve på Forsvarets Satellitt og GeoInformasjonssenter (FSGI)*, FFI-rapport 2009/00815 (FFI, 2009), <https://publications.ffi.no>: FFI, 2009).

battalion (*Etterretningsbataljon*), which had its own IMINT section.⁵⁷⁵ In addition to RADARSAT-2, the FFI used images from the Quickbird and Worldview satellites owned by the American commercial satellite operator Digital Globe, where the Worldview satellites provided resolutions down to half a metre. By forming a closer relationship with the satellite operator, the FFI aimed to decrease the response time of satellite imagery acquisition. They made an agreement with Digital Globe, which for the sum of USD 100,000 provided satellite imagery during the ten-day exercise period.⁵⁷⁶

The FFI, the NIS and the FMGT, in collaboration with the NJHQ, continued to develop military operational satellite surveillance applications based on commercially available satellites, improving national capacity to downlink, process and analyse satellite-based sensor data. This included methods and concepts to use satellite data in a military network-based defence structure and supported the Armed Forces with access to space-based support and maritime and terrestrial surveillance during military exercises and operations at home and abroad.⁵⁷⁷

When the MoD merged LDKN with the NJHQ and relocated it to Reitan in 2009 to command all of Norway's military forces,⁵⁷⁸ the NJHQ managed the RADARSAT-2 data purchase agreement between the Norwegian Armed Forces and KSAT. This was part of a larger collaboration coordinated by NOSA. By now, KSAT TSS, which housed the SAR data processing system, could transmit satellite data to Fauske within one hour of reception. Satellite data could also be downlinked on Svalbard, albeit without processing capability due to the Svalbard Treaty. Satellite data was correlated daily with data from other sources to detect, register and alert about deviations in expected traffic patterns along the Norwegian coast and the large maritime areas under Norwegian jurisdiction.⁵⁷⁹ These activities were performed in close collaboration with the NJHQ, including tactical operation rooms such as the National Air

⁵⁷⁵ Pål Bjerke, *Bruk av kommersielle satellittbilder under Cold Response 2009: En prøve på Forsvarets Satellitt og Geoinformasjonscenter (FSGI)*.

⁵⁷⁶ Pål Bjerke, *Bruk av kommersielle satellittbilder under Cold Response 2009: En prøve på Forsvarets Satellitt og Geoinformasjonscenter (FSGI)*.

⁵⁷⁷ FFI, *Satellittovervåking*, 27–33.

⁵⁷⁸ «Reitan (Forsvarets operative hovedkvarter),» Norges forsvar, Store norske leksikon, 2019, accessed 19 January, 2022, https://snl.no/Reitan_-_Forsvarets_operative_hovedkvarter.

⁵⁷⁹ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 65–66.

Operations Centre (NAOC),⁵⁸⁰ the maritime task group NorTG, the Coast Guard and the Garrison of South-Varanger and relevant civilian actors such as the Customs Service (*Tolletaten*) and the Police security service (PST). Operations were closely supported by INI/CYFOR, the Norwegian Defence Logistics Organisation (NDLO) and the FFI. In 2013, the FFI also supplied the Interpretation Centre with a tool for automatic vessel detection to be run in parallel with operative analysis.⁵⁸¹

Such military use of commercial imagery challenged the notion of it being ‘commercial’, however. According to the US Director of National Intelligence (DNI) Lt. Gen. Clapper, the US Government influenced their national commercial satellite providers to the extent that ‘you can’t really say that they are commercial anymore.’⁵⁸² Additionally, former Commander of US Strategic Command Gen. (Ret.) Cartwright observed that Digital Globe and similar companies developed mobile terminals, which made ‘a substantial difference in the usefulness to the [military] ground formations’. It allowed for satellite data acquisition ‘right off the satellite into an antenna that’s with you’, and had ‘a huge, very important impact on the battlefield.’⁵⁸³

An ear in the sky: Norway’s first satellite

Norway’s first satellite was launched in 2010 under civilian governance, however, the FFI was instrumental in its development and the Armed Forces almost overnight became Norway’s largest user of AISSat-1 data once it was launched.⁵⁸⁴

When Norway’s General Staff and the MoD decided to terminate the national ‘military’ satellite project NSAT in 2003–04, the FFI instead partnered with NOSA, the Norwegian Coastal Administration (NCA) and Kongsberg Seatex to develop spaceborne Automatic Identification System

⁵⁸⁰ Norwegian: *Nasjonal luftoperasjonssenter*

⁵⁸¹ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 65–66.

⁵⁸² James R. Clapper, “Interview with Lt. Gen. (US Air Force) James R. Clapper, US Director of National Intelligence, 8 December 2015, Office of the Director of National Intelligence, Tysons Corner, Virginia, US,” interview by Tale Sundlisæter.

⁵⁸³ James E. Cartwright, “Interview with General (Ret.) James E. Cartwright (US Marine Corps), Former Commander of US Strategic Command 2004–2007, 30 October 2018, Akershus Fortress, Oslo, Norway,” interview by Tale Sundlisæter.

⁵⁸⁴ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 70.

(AIS) technology.⁵⁸⁵ AIS is an automatic tracking system that uses transceivers on ships and is used by vessel traffic services. Like radar, AIS could operate independently of weather and light conditions and was well-suited for use in polar areas with seasonally low light and challenging weather conditions.⁵⁸⁶ Norway already operated a land-based coastal AIS network with a range of 30–40 nautical miles,⁵⁸⁷ and in 2004 a feasibility study concluded that AIS could also detect ships and monitor traffic on the high seas from LEO.⁵⁸⁸

From the 2000s' first decade onwards, an increasing number of nation-states were developing and launching national, small, dual-use satellites,⁵⁸⁹ and Norway became one of them in 2010. In June 2010, Norway tested an experimental AIS antenna on board the International Space Station (ISS) and received almost 30 million AIS signals from more than 60,000 vessels world-wide over the next four months.⁵⁹⁰ In July 2010, Norway launched the 20-centimetre cubic AISSat-1, which from polar LEO at some 600 km altitude tracked vessel traffic in Norwegian and international waters, and orbited the Earth above the Barents Sea about 15 times per day.⁵⁹¹ Satellite data was relayed to Norwegian ground stations on Svalbard and in Vardø and quickly became a strategic asset for Norway in international security cooperation. In addition to covering the High North, it would both contribute to the allied effort to fight piracy off the Horn of Africa and monitor maritime traffic in the South Atlantic Ocean.⁵⁹² As we shall see in Part III, in July 2014, Norway launched the successor AISSat-2, and the FFI conceptualised a wide range of small satellite platforms and applications for national security purposes.

⁵⁸⁵ FFI, *Satellitovervåking*.

⁵⁸⁶ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*.

⁵⁸⁷ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*, 63, 72–73.

⁵⁸⁸ Gudrun Høye et al., *Euclid JP 9.16: Space-Based AIS Reception for Ship Identification*, FFI/RAPPORT-2004/01328 (FFI, 2004).

⁵⁸⁹ Brown, "Soft Power and Space Weaponization," 71; James Clay Moltz, *Asia's Space Race: National Motivations, Regional Rivalries, and International Risks* (Columbia University Press, 2011); James Clay Moltz, *Crowded Orbits: Conflict and Cooperation in Space* (California University Press, 2014).

⁵⁹⁰ "NORAIS," *Satellitter og baner*, Store norske leksikon, updated 5 July 2020, 2020, accessed 18 January, 2022, <https://snl.no/NORAIS>.

⁵⁹¹ Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*, 63, 72–73.

⁵⁹² Nærings- og fiskeridepartementet, *Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit*, 63, 72–73.

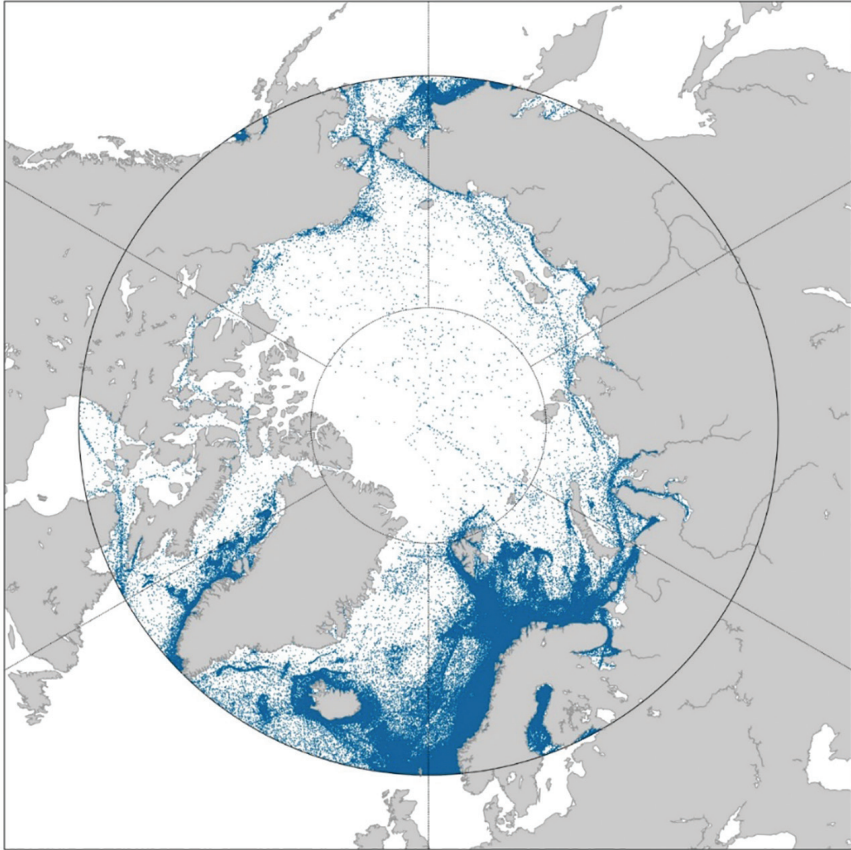


Figure 21. Vessel traffic in the Arctic 2010–2012, as observed by AISSat-1.⁵⁹³

Chapter conclusion

Commercial satellite capability proliferated from the 2000s onwards, and these capabilities were increasingly incorporated into scholarly definitions of space power. Norway is an exemplification of these developments; adding to the traditional bilateral collaboration with the US during this time was Norway's use of commercial satellite imagery from the semi-commercial American satellite provider Digital Globe for tactical military use. Meanwhile, NOSA continued to ensure that the Armed Forces had access to Canadian RADARSAT data, which was another commercial

⁵⁹³ Norwegian Space Agency, "Satkom i Arktis (ASK)," Norwegian Space Agency, 2016, accessed 2 March 2022, <https://www.romsenter.no/Fagomraader/Satellittkommunikasjon2/Satkom-i-Arktis-ASK>.

venture. Norway's military executives, however, continued to emphasise that NATO was the linchpin through which the Armed Forces should ensure access to space-based capability. This was in turn exemplified by the SATCOM project with Hisdesat, where it was a prerequisite for the MoD to collaborate with a fellow NATO country.

Given Norway's centrality in establishing satellite surveillance as a WEU priority area in the late 1980s and the country's leadership in these efforts throughout the 1990s, it was a slap in the face for Norway when the EU in 2001 excluded Norway from the inner circles at the satellite centre in Torrejón because Norway was not a member of the EU. The FFI consequently lost faith in EU satellite surveillance collaboration and instead focused increasingly on projects through ESA to develop national military space capability. The EU's ambitions led the EU to take ownership over European space capabilities developed through ESA, while ESA ensured that its member states were given access to the systems through their ESA membership. Norway eventually joined the EU/ESA projects Galileo and Copernicus. Copernicus eventually became useful to the Armed Forces. However, the MoD and Armed Forces remained sceptical towards Galileo, as they had their own military collaboration with the US on GPS. Additionally, another, US-led multilateral space collaboration emerged, initiated by the USAF, namely Responsive Space Capability.

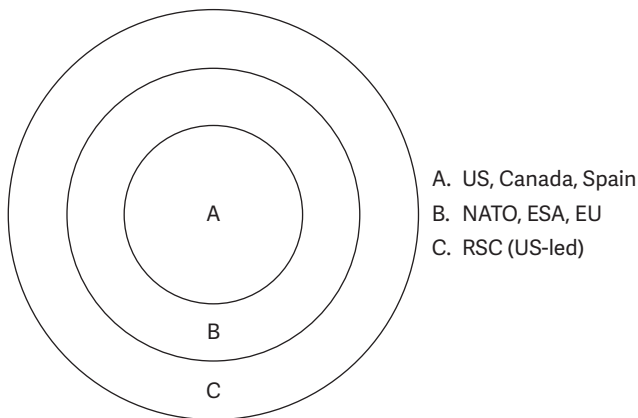


Figure 22. Norwegian collaboration in military space activity from 2000 until 2014.

Whereas the role of satellite surveillance dominated the 1980s and 1990s, the Armed Forces, due to US-imported doctrinal concepts focused

increasingly on SATCOM in the early 2000s. While Norway's military executives to some extent acknowledged the value of satellite surveillance, they did not support the FFI's plans to develop a national military surveillance satellite. The MoD terminated this initiative, which again demonstrates that neither the MoD nor the Armed Forces valued the development of national military space capability at this time. These decisions were principally driven by monetary concerns, which is why de facto Norwegian military space strategy took a clear dual-use path. This is also likely to be why the MoD advocated the centrality of NOSA's role and seemingly presumed that NOSA had some insight into the national security implications of space activity. Yet, despite the increasing focus on these aspects, Norway's national policy crafted by the MTIF and NOSA in 2013 abstained almost completely from addressing military and national security concerns related to space activity.

Developments in Norwegian military space activity continued to be driven forward by the FFI, the NIS, the FMGT, the Navy and the NJHQ, but these activities were certainly supported by NOSA. Technological developments and access to space-based data allowed Norway to increasingly use space-based intelligence throughout the entire strategy chain, from strategic to operational and, to some extent, tactical level. This was also the case for SATCOM, which received substantial focus within the Armed Forces and amongst military executives as a critical military capability. The MoD established INI/CYFOR as a new military operating unit to maintain the development towards a network-centric defence infrastructure, and INI/CYFOR became the military operating unit most widely associated with military space activity in Norway. This is underpinned by the attempt to establish a military space strategy under the auspices of INI in 2011, where INI strongly advocated a dual-use approach focusing on international collaboration, much like the strategy adopted by the MoD following the military space strategic review in 2014–2015, as we shall see.

During these extemporary years leading up to the 2014–15 review, space was addressed in Norwegian military doctrine in 2007 as a physical domain in which satellites constitute nodes in a linked network, which fitted with Norway's focus on military net-centricity. The national joint doctrine, FFOD 2007, was thus by far the closest to addressing space in

a way that did not deviate from national military space activity at the time. The notion of space as a domain where the battle was to take place was somewhat implausible in terms of *Norwegian* military space activity. The doctrine can be understood in terms of how Norway’s more powerful allies related to the space domain, and Norwegian military space activity somewhat aligned with the doctrine due to Norway’s strive towards a network-centric defence that was incited by American doctrine following the Gulf War.

Norway progressively drew upon international partnerships and the increasing amount of commercially available offers during these years, both to develop indigenous space capability and to gain access to space-based services. Through expanded national satellite capability development, international partnerships and commercial offers, the Armed Forces’ access to space-based services grew increasingly robust, resilient and flexible.

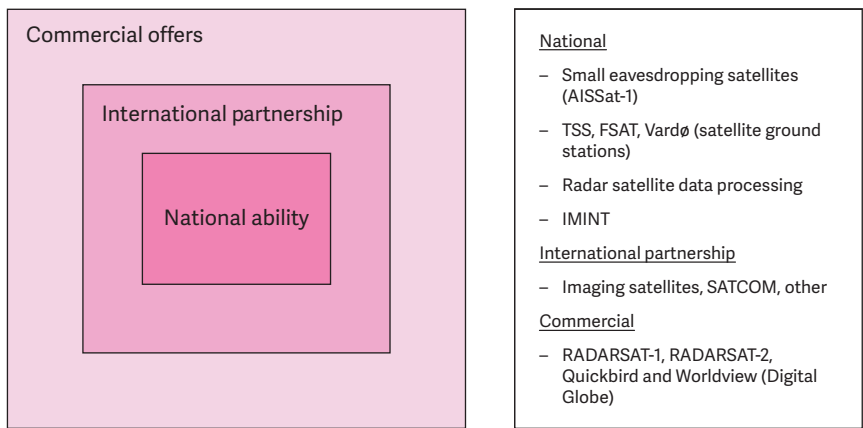


Figure 23. Key capabilities and partnerships ensuring the Armed Forces access to satellite-based capabilities.

Considering Norway’s national space capability level as it pertains to Bingen’s model, Norway became an ‘opportunistic’ space actor in the early 2000s. Having added two small eavesdropping satellites to its national space capability repertoire, Norway was by 2014 on its way to becoming one of the ‘inadequate’, with the Armed Forces as the biggest user of national satellite data.



Figure 24. Visualisation of Norway's rise towards the 'inadequate' in 2000–2014.⁵⁹⁴

Despite these developments, neither the Armed Forces, the MoD, the MTIF nor NOSA had paid particular attention to the national security aspects of space or addressed these aspects in a coherent and structured manner up until 2014. There was nothing to indicate that the Armed Forces or the MoD overall regarded military space activities as notably important. NOSA's perception was that the Armed Forces and the MoD were reluctant to invest in the domain, and there was no clear military structure or military space strategy to stake out the course for the Norwegian Armed Forces.

This was now about to change in a fundamental way. The national space capability development and extemporary military space activities we have seen thus far have set the stage for the Armed Forces and the MoD to start making national space security a priority. As we shall see in the following chapter, 2014–15 marks a pivotal year in the history of Norwegian military space activity. In 2014, Norway's Chief of Defence decided it was time for the Norwegian Armed Forces to address the space domain in a comprehensive, overarching way.

⁵⁹⁴ Based on Bingen's hierarchical classification of nation-state space actors: Bingen, *Det nære verdensroms strategiske dimensjoner*, 27–28.

Organising space power in the Norwegian Armed Forces (2014 to present day)

The military space strategic review (2014–2015)

Even though the relationship between Russia and the West had gradually deteriorated since 2007–08, there was no real change to the security policies of NATO countries until 2014. By 2014, when Russia invaded Ukraine and annexed the Ukrainian Republic of Crimea and Sevastopol, this changed.⁵⁹⁵ Russia had clearly become more assertive, and US DNI Lt. Gen. Clapper was convinced the Russians were indeed ‘trying to recapture the glory days of the Soviet Union.’⁵⁹⁶ The situation extended to some extent to the Arctic, deemed an area of geopolitical and military-strategic significance to Russia, and in September 2014, NATO adopted a plan to strengthen military capability and presence in vulnerable areas, including the High North.⁵⁹⁷

According to the US DNI, it was understood by everyone during this time that the High North was ‘growing in importance...’ Russia and China certainly recognised the region’s strategic value, and the Americans were following these regional developments closely. To the DNI, Norway was one of the US’ ‘most capable, loyal allies,’⁵⁹⁸ with Norway transitioning into the next concentric circle after Five Eyes in terms of US intelligence collaboration, according to Clapper and Brown.⁵⁹⁹ Other US officials observed that the Arctic region did play an important role in US foreign policy, but ‘to a degree it has been neglected...’ Its currently increasing attention was

⁵⁹⁵ Thomas D. Grant, “Annexation of Crimea,” *American Journal of International Law*, 109, no. 1 (January 2015).

⁵⁹⁶ Clapper, interview.

⁵⁹⁷ Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*, 15

⁵⁹⁸ Clapper, interview.

⁵⁹⁹ Clapper and Brown, *Facts and Fears: Hard Truths From a Life in Intelligence*, 256.

due to increasing naval traffic in Arctic waters, and because ‘countries like Russia are expanding their capabilities in the region.’⁶⁰⁰

On 1 October 2014, Norway’s Minister of Defence Ine Eriksen Søreide instructed Chief of Defence Admiral Bruun-Hanssen to undertake a comprehensive defence study that was to emphasise Russia’s recent actions towards one of its neighbouring countries.⁶⁰¹ Norway was facing ‘a more assertive and military capable Russia’, and relations between Russia and Western states were deteriorating. Through forceful demonstrations of military power in Eastern Ukraine as well as in Syria, it appeared that Russia had significantly enhanced its military forces, and the MoD proclaimed that Russia’s disrespect for international law had destabilised Eastern Europe in a way that resembled the Cold War. Although the MoD did not anticipate that Russia would use military force against Norway, it could not be ruled out, and this was a most fundamental aspect to consider in the upcoming defence planning process. Norway’s post-Cold War transition into a task-force-oriented military structure had reduced Norway’s ability to handle crisis and war scenarios in its own geographical vicinity, and the Armed Forces struggled to adapt its structure and operational concepts to current technological advancements.⁶⁰²

Also on 1 October 2014, the Armed Forces issued a new joint doctrine to replace that of 2007. The new doctrine, FFOD 2014, declared that a great power assault on the small state of Norway, even a limited one, constituted an ‘existential threat.’⁶⁰³ The Armed Forces now focused more on ‘joint operations’ than before, while becoming ever more dependent on civilian and non-military actors. Whereas military tasks had only slightly changed since 2007, the various types of military operations in which they participated had changed ‘a lot’. Roles and definitions associated with ‘military power’ were defined in a wider sense to accommodate the increasing variety of military contributions and types of conflicts and roles, ranging from ‘complex peace operations’ to ‘stabilising operations’. What was now referred to as the ‘evolution in information technology’ continued to alter the conduct of military operations, from the pure land, sea and

⁶⁰⁰ Deptula, interview.

⁶⁰¹ Forsvaret, *Forsvarets fellesoperative doktrine* (07 Media AS, 2014), 18

⁶⁰² Forsvarsdepartementet, *Ny langtidsplan for forsvarssektoren - anmodning om Forsvarssjefens tilråding om den videre utviklingen av Forsvaret* (Regjeringen, 2014).

⁶⁰³ Forsvaret, *Forsvarets fellesoperative doktrine*, 18

air operations of the past to joint operations that included ‘all military resources’. At the same time, the Armed Forces were focusing more on national tasks.⁶⁰⁴

Space in Norwegian defence policy and military doctrine

Space in Norwegian defence policy and military doctrine, as well as the discourse amongst Norwegian military and defence policy executives, continued to cement the focus on SATCOM and space-based ISR.⁶⁰⁵

As visualised in Figure 25, FFOD 2014 conceptualised ‘outer space’ as an element in the ‘dimensions of the operational environment’. Like former Norwegian joint doctrines, space was a ‘conventional’ physical military environment, while the partly overlapping ‘air dimension’ still extended ‘from the surface of the Earth and further out into the atmosphere’, unhindered by natural boundaries or obstacles. The new doctrine, however, delineated ‘controlled airspace’, that is, airspace up to 14,000 kilometres, and ‘uncontrolled airspace’, which was everything above that.⁶⁰⁶

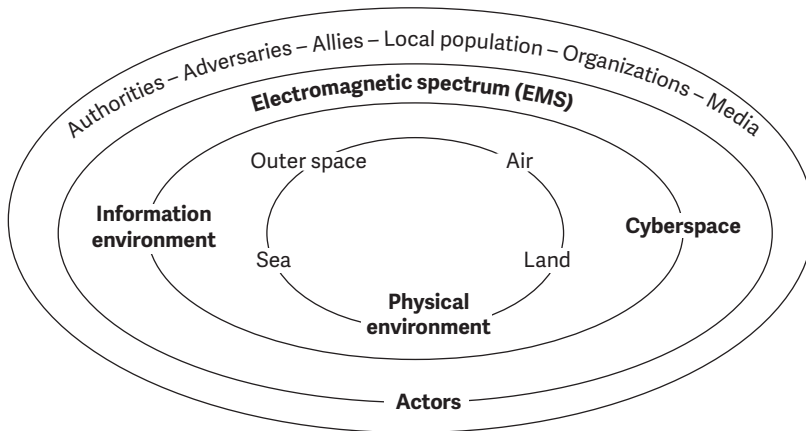


Figure 25. The dimensions of the operational environment.⁶⁰⁷

⁶⁰⁴ Forsvaret, *Forsvarets fellesoperative doktrine*, 3–4, 7.

⁶⁰⁵ Jansen, interview; Forsvaret, *Forsvarets fellesoperative doktrine*; Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*; Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*.

⁶⁰⁶ Forsvaret, *Forsvarets fellesoperative doktrine*, 19, 21

⁶⁰⁷ The figure is the author’s translated version of Figure 2.1. in FFOD 2014: Forsvaret, *Forsvarets fellesoperative doktrine*, 19.

The doctrine noted that several contemporary space-based systems were dual-use, and a large share of military satellite communications was relayed through civilian systems. Civilian and commercial considerations could therefore affect the ‘information flow’ in military operations and, by extension, military operations per se. It was also understood that space-based systems interfaced the other military dimensions, including the physical, electromagnetic, information and cyberspace, and if space-based systems were disrupted or eliminated, it could ‘considerably reduce the operational leeway’. The ‘great powers’ commanded strategic capacities for ‘Space Operations’ and ‘Counter Space Operations’ towards adversarial space-based systems. Long-range ballistic missiles operated in space, and space operations were a ‘key element’ in NATO ballistic missile defence.⁶⁰⁸

Likely reflecting the increasing focus on space internationally and within NATO,⁶⁰⁹ Norwegian joint doctrine in 2014 addressed ‘the air and space dimension’ in the headline, as opposed to merely ‘air’ as before. Like Norway’s former joint doctrines, the topic was treated in more detail subordinate to air forces, implicating a link to the Air Force. It observed how the *res communis* principle established that space, like the high seas, was a global common that ‘can be used by everyone on equal terms’. As per the principle of free overflight in space, satellites operated above other nation-states without violating sovereign rights and provided ‘enhanced ability to operate globally.’⁶¹⁰ The Norwegian doctrine also referred to the 1967 Outer Space Treaty (OST), stating that the OST prohibits ‘deployments of weapons’ in outer space.⁶¹¹ The Norwegian doctrine however failed to specify that the OST only explicitly prohibits deployment of weapons of mass destruction in outer space, whereas a ban on the use of conventional

⁶⁰⁸ Forsvaret, *Forsvarets fellesoperative doktrine*, 21–22.

⁶⁰⁹ JAPCC, *Nato’s Future Joint Air & Space Power (NFJASP)*, The Joint Air Power Competence Centre (JAPCC) (<https://www.japcc.org>, April 2008); JAPCC, *Filling the Vacuum: A Framework for a NATO Space Policy*, Joint Air Power Competence Centre (JAPCC) (<https://www.japcc.org>, June 2012); Mark Barrett et al., “Assured Access to the Global Commons,” *Norfolk, VA: Allied Command Transformation, North Atlantic Treaty Organization* (2011); Thomas Single, “NATO Space Operations Assessment,” *Joint Air Power Competence Centre (JAPCC)* (2009); D Naskrent, “NATO Air and Space Power in Counter-IED Operations: A Primer,” *Joint Air Power Competence Center* (2010); Barrett et al., “Assured Access to the Global Commons”; ACT’s global commons study was followed up through NATO Multinational Experiment 7 (MNE-7) in January 2011–December 2012, resulting in documents such as the UK Ministry of Defence’s handbook on space dependencies, vulnerabilities and threats. See UK Ministry of Defence, *Space: Dependencies, Vulnerabilities and Threats* (The Development, Concepts and Doctrine Centre, 2012).

⁶¹⁰ Forsvaret, *Forsvarets fellesoperative doktrine*, 111–12.

⁶¹¹ Forsvaret, *Forsvarets fellesoperative doktrine*, 113.

weapons in space has for decades been subject to discussion without reaching consensus.⁶¹²

According to the Norwegian joint doctrine, the Armed Forces were now to understand space as part of the operational environment in capacity of platforms and systems used for ‘communication, navigation, surveillance, observation and intelligence’, restricted by conditions such as cloud cover, camouflage and shielding. The domain was particularly important because it supported all the other military service branches, all of which relied on space-based support. The doctrine also noted that most communications satellites operated in geostationary orbit, from where Earth coverage decreased with increasing latitude. In conjunction with low altitudes above the horizon and alpine terrain, these circumstances implicated substantial blind spots.⁶¹³

In 2015, the Defence Staff issued a doctrine for maritime operations to replace that of 2002, compared to which the new doctrine treated space much less extensively. Space was mentioned concerning sensor technology that was being ‘continuously developed’ to facilitate increased range and higher resolution and robustness. Advanced sensors were increasingly being integrated into a wide range of light sensors platforms, such as ‘microsatellites’ and other unmanned systems. Space also contributed to building situational awareness, and for naval powers it would be important to maintain situational awareness underwater, in the airspace ‘and even in outer space.’⁶¹⁴

‘The Norwegian Armed Forces need a space strategy’

As we shall see, 2014–2015 would become a pivotal time in the history of Norwegian military space activity. Following the unsuccessful strategy

⁶¹² UNOOSA, “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,” in *United Nations Office for Outer Space Affairs*, ed. United Nations Office for Outer Space Affairs (<https://www.unoosa.org>: UNOOSA, December 19 1966), International law; Since the 1980s, there have been several attempts to ban the use and deployment of weapons in outer space, however to no avail. See, for example, Freeland, “The Laws of War in Outer Space”; One of the most significant initiatives to ban conventional weapons in space was the UN Resolution on the Prevention of an Arms Race in Outer Space, which was initiated through a UN resolution in December 1981. See UN General Assembly, “Prevention of an Arms Race in Outer Space,” in *A/RES/36/97 C*, ed. United Nations (<https://undocs.org>: United Nations, 1981), UN Resolution. <https://undocs.org/en/A/RES/36/97>.

⁶¹³ Forsvaret, *Forsvarets fellesoperative doktrine*, 111–112.

⁶¹⁴ Forsvaret, *Forsvarets doktrine for maritime operasjoner* (Forsvarsstaben, 2015), 77, 79.

initiative in 2011 under the auspices of INI, Director of the FFI John-Mikal Størdal stated in a media interview in May 2013 with Norway's leading engineering journal *Teknisk Ukeblad* that the Armed Forces should prepare a holistic military space strategy. The FFI was examining how the Armed Forces could take a more active role, and anticipated that space technology could become a key supplement to existing systems 'in a completely different way than before'. Such an undertaking was up to the MoD, but the FFI would certainly have liked to contribute to such a strategy.⁶¹⁵

In late February 2014, Størdal expanded on these views in Norway's most widely distributed national newspaper, *Aftenposten*, which published an opinion article by Størdal that was insistently titled: 'The Norwegian Armed Forces needs a space strategy'. Despite using satellite technology 'every single day' for information collection, communication and navigation, the Armed Forces had no dedicated department or staff to manage space activities. The Armed Forces benefitted from AISSat-1, launched four years prior, and Størdal was certain that in the future, microsattellites could also carry camera systems, radars and communication equipment. Space capabilities enabled Norway to more efficiently allocate its military assets, such as vessels and patrol aircraft, and the potential for additional, cost-effective space-based solutions was increasing. To capitalise on space capability, however, the Armed Forces needed to develop a space strategy addressing plans, technological development and competence building, as well as essential questions such as how to utilise space technology and how important this technology is in the short and long term. They should also assess the extent to which space technology could pose a threat in the hands of 'less friendly countries'.⁶¹⁶

In addition to Størdal's public appeal to the MoD in 2013 and 2014, Størdal and Deputy Director of the NIS Tom Rykken, during the spring of 2014, initiated a meeting with the head of the MoD's LTP Division, Rear Admiral Elisabeth Natvig, to convince her that the MoD should carry out a military space strategic review as part of the upcoming defence study.⁶¹⁷ By the autumn of 2014, the MoD formally recognised the Armed Forces' lack of such a strategy and instructed the Chief of Defence and the Armed Forces to identify their needs and clarify their structure, coordination and

⁶¹⁵ John-Mikal Størdal, «Drømmen var å bli jagerflyver eller dykker. Nå er målet til John-Mikal Størdal å gjøre FFI til verdensledende innen forskning,» interview by Tale Sundlisæter, no. 19/20 2013, 2013.

⁶¹⁶ John-Mikal Størdal, «Forsvaret trenger en romstrategi,» Opinion, *Aftenposten*, 27 February 2014.

⁶¹⁷ Olsen, interview.

ambition level for space activities. Ultimately, the MoD instructed Admiral Bruun-Hanssen to undertake an in-depth military space strategic review as part of Defence Study 2015.⁶¹⁸

Given the recent course of events in Ukraine, the MoD instructed that Defence Study 2015 was to propose nothing less than ‘a fundamentally new organisational structure’ for the Armed Forces. Explicitly, a mere continuation of the current military structure and capabilities would not suffice. Given Norway’s demographic and geographical prerequisites, there were likely to be ‘untapped opportunities’ considering ISR, which was to be a central aspect of the study. While the MoD would continue to prioritise its relations with the US, they also wanted to collaborate more effectively with geographically close allies such as the UK, Germany and the Netherlands, as well as ‘selected partners’, such as Sweden and Finland.⁶¹⁹

Admiral Bruun-Hanssen’s rationale for the military space strategic review

In January 2015, the Chief of Defence expressed that he was currently working with a core group of individuals to uncover threats towards Norway and to decide upon core competencies needed for the Armed Forces to protect the country. Which platforms or structures would they end up with? How would they ensure Norwegian command and control? Which military bases would they operate from? How could they ensure sufficient ISR? Within this overall ‘defence picture’, which goals and objectives would they set for Norwegian military space activities? Which strategy should they implement to achieve these goals, and what would the associated organisational structure look like? To stake out this course, the Admiral said he relied almost fully on the FFI. It was too soon yet to speak of how it should all be organised within the military structure, as he first had to attain a better understanding of the dominant areas and how it should all be assembled. For him, the defence study was ‘a first instance to kick-start some of these thoughts’⁶²⁰

Admiral Bruun-Hanssen said that the military space strategic review had been initiated by the FFI, the NJQH and the NIS, which had issued him a

⁶¹⁸ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*.

⁶¹⁹ Forsvarsdepartementet, *Ny langtidsplan for forsvarssektoren - anmodning om Forsvarssjefens tilrådning om den videre utviklingen av Forsvaret*.

⁶²⁰ Bruun-Hanssen, interview.

note stating it was ‘about time to sit down’ and decide what the Armed Forces wanted to accomplish with space technology. Even small states such as Norway could now use cost-effective technology such as small satellites, which in and of itself increased the awareness of the subject. To become more autonomous and capable, however, the Armed Forces had to actively address it.⁶²¹

Admiral Bruun-Hanssen personally understood ‘space power’ as a notion that entailed the use of space in a military context, such as sensors and weapons operating in space or from space and down towards the Earth. His own first encounter with ‘something that had to do with space power’ was related to the establishment of the US Space Command, which to this day still influenced his thinking about space power.⁶²² The US Space Command was established in 1982.⁶²³ It was about ‘exploiting space.’ Military operations traditionally encompassed three domains, including air and air power, sea and sea power and land and land power, all of which inhabited military forces, their weapons, sensors and personnel. Addressing space power, ‘the same things’ and ‘the ability to do the same in space’ came to mind, including the ability to observe, communicate and deploy, and operate functional weapons in or from the space domain. The Admiral associated space with communication and observation satellites, ballistic missiles and ‘Star Wars’, including the ability to neutralise other weapons and satellites in space.⁶²⁴ Norway might contribute to NATO’s ongoing effort to examine ‘rocket shields’ and missile defence systems, with which NATO aimed to neutralise weapons traversing space. Given Norway’s geographical vicinity to such a possible launch, Norway could either ‘shoot something down on its way up’ or, in case Norway was close to the target, ‘contribute in the terminal phase.’ Norway would not singlehandedly acquire ‘weapons that traverse space’, use weapons from space or launch anything into space to ‘neutralise them up there’, the Admiral believed.⁶²⁵

As ‘a small state with limited resources and means’, Norway’s interests were not global but focused on Norwegian territory and nearby areas.

⁶²¹ Bruun-Hanssen, interview.

⁶²² Bruun-Hanssen, interview.

⁶²³ In the US, the US Space Command is associated with Space Control doctrine. See Lupton, *On Space Warfare: A Space Power Doctrine*, 29, 67; and Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 6.

⁶²⁴ Bruun-Hanssen, interview; These aspects are predominantly associated with American High Ground doctrine. See Lupton, *On Space Warfare: A Space Power Doctrine*, 52; and: Hays, Rumbaugh and Gleason, *Developing a Foundational Spacepower Doctrine: Fostering an Independent Space-Minded Culture and Identity*, 3.

⁶²⁵ Bruun-Hanssen, interview.

Within the scope of the defence study, Norway's future in space was limited and 'small'. For a 'small state amongst more than two hundred states,' Norwegian military space capability was primarily a question of 'surveillance and communication from a bird's eye view,' and the Admiral's primary objective was to ensure continuous maritime surveillance in the High North. The NJHQ defined how often the Armed Forces had to be present in these areas for the surveillance to be deemed 'continuous,' and this mission was conducted using radar and airborne capabilities. If the Armed Forces could place their airborne radar on a satellite, however, they could achieve 'exactly the same'. If the Armed Forces could attain an equivalent or better image from space *at a lower cost*, that would be their real impetus to change from one domain to the other.⁶²⁶

The Armed Forces had conducted military operations using space-based capability for at least ten years and usage was increasing. The military space strategic review was therefore not merely opportune – space capabilities were already a prerequisite for Norwegian military operations. How it had been addressed thus far did not indicate that space had been considered important, however. The Armed Forces' current use of space activities resembled its use of 'cellular phones and the Internet,' that is, technologies they were merely using. Apart from the Norwegian AIS satellites, Norwegian military space activities encompassed '*ad hoc*' use of commercial SATCOM and satellite imagery. This demonstrated what space could bring to the table, such as collecting information and managing military operations 'in entirely different ways than before.' It often left the Armed Forces wanting more than they could get.⁶²⁷

Admiral Bruun-Hanssen's primary rationale for launching the military space study seemed not to originate first and foremost from a personal conviction that space systems were militarily important, but from the potential to reduce materiel and operational costs for the Armed Forces. He was to execute Norway's military tasks at the lowest possible cost. Was it less expensive to continue operating aircraft, with the personnel and infrastructure that required, or would a satellite be more cost-effective? That was his starting point. Traditionally, the Armed Forces had perceived satellites as too expensive to 'do something on our own,' but the FFI had convinced the Admiral that the decreasing costs associated with space systems implied

⁶²⁶ Bruun-Hanssen, interview.

⁶²⁷ Bruun-Hanssen, interview.

that the Armed Forces might become more autonomous in space. He did not see it as an alternative to supply the existing military structure with space capability, however, as the fiscal circumstances by which he was bound implied that the only option was to fully replace existing military capabilities with space systems. It would be ‘either this or that’.⁶²⁸

In January 2015, Norway’s Chief of Defence described the Armed Forces as ‘novices’ in space. Whilst space systems and their national security implications were understood in small professional environments and amongst a small set of individuals, this understanding was ‘motley’ and had never been institutionalised in the military organisation. The FFI had ‘significant competence’. The NIS had ‘some’ competence limited to specific intelligence-oriented matters entrenched in the space domain. The NJHQ and the Navy had ‘some’ competence as well, whereas CYFOR understood SATCOM. What they lacked was a holistic approach. By merging these professional environments, the Armed Forces could likely establish a decent competence base. The Chief of Defence did not currently consider himself prepared to assess whether this approach would be ‘good enough’ but relied on the FFI to evaluate these issues. If the Armed Forces were to invest in space and integrate space as a ‘natural part of the planning processes’, they would have to systematise their competencies. They had to be capable of defining and assessing what space capabilities could bring to the table, know what to order and how to implement it. They would also have to find out whether a given space capability was a sufficient replacement for existing capabilities.⁶²⁹

As with other military capabilities, a dedicated ‘segment’ should be established to ensure proper competence, follow developments, incorporate it into plans, integrate it into larger systems, and craft and follow up strategies to reach their identified goals and objectives. The Inspector General of the Air Force, for example, was to ensure operative units and sufficient air capability, but space was not part of his portfolio. How was the Chief of Defence to ensure space-based capability and where should this competence be established? Perhaps it should remain in CYFOR, because Norway’s military use of space originally entailed SATCOM, and CYFOR was responsible for and competent in matters of communications capability. If the Armed Forces were to acquire other space capabilities, such as radar

⁶²⁸ Bruun-Hanssen, interview.

⁶²⁹ Bruun-Hanssen, interview.

and optical satellites, the Chief of Defence was, however, not sure whether CYFOR should be responsible for ‘everything’. This train of thought led the Admiral to ask a few, basic questions:⁶³⁰

- What was ‘special’ about space?
- Was it the space domain?
- Or was it the satellites?
- Or was it the capabilities they carry?
- Depending on the answer, how should the Armed Forces organise this effort?

This was not clear, but the space domain certainly entailed more than communication. The Chief of Defence was not sure whether this necessitated a dedicated, military ‘space unit’, but if they were to move forward and away from their extemporary approach, the effort had to take place within ‘a unit’ or a ‘staff element within a larger unit’. It was also unclear whether the military space strategic review would result in a purely military approach or whether it would be part of an overall national endeavour, but the Admiral anticipated that the Armed Forces would surely organise and handle space differently than today. ‘It may well happen’ that the effort became integrated as a part of the NJHQ, because the contact point for Norway’s military space activities had to be a person who executed missions on behalf of the Armed Forces.⁶³¹

Coincidentally, Admiral Bruun-Hanssen’s last position happened to be Chief of the NJHQ, and overall, he had spent up to eight years there, when the Armed Forces ‘really started to use satellite communications’ and the AIS satellite. Thus, he could testify to the effect of these capabilities. He believed that neither CYFOR nor the NIS could provide ‘all the answers’, whereas the FFI was a defence research institute and not a military operating unit. But the NJHQ conducted all of Norway’s military operations and ‘may be the right place to do so’. They could use ‘virtual organisations’, so it was not necessary to be physically present.⁶³²

Over the coming defence planning period, the Admiral anticipated that the Armed Forces would take great strides towards structuring and

⁶³⁰ Bruun-Hanssen, interview.

⁶³¹ Bruun-Hanssen, interview.

⁶³² Bruun-Hanssen, interview.

systematising their space competence and activities. This would depend on their assessments and conclusions in Defence Study 2015, on which they were currently working. More so, it depended on political priorities. The Armed Forces could present space-based opportunities, but it was ultimately a matter of political will. If the Admiral's recommendations were well-received politically, the Armed Forces could advance considerably in space activity. If not, it was a dead end. Whilst he could not speak at this point on how this would develop, Admiral Bruun-Hanssen was certain the time had come to start the process.⁶³³

The working group

In the wake of Defence Study 2015, three representatives, including Chief Scientist Richard Olsen at the FFI, Deputy Commander of the NJHQ NAOC Maj. (Air Force) Eirik Ludvigsen and a NIS representative, formed a working group on 'space activities for security and defence'.⁶³⁴ This group drove the military space strategic review from the bottom up. During the autumn of 2014, Defence Staff Lt. Col. Arne Edvardsen (Air Force), CYFOR Commander Senior Grade Trond Hermansen (Navy), and NDLO Chief Engineer Trygve Jordan (Army) joined the working group.⁶³⁵ Olsen and the NIS representative were the same individuals that had three years prior drafted INI's *Plan for the Norwegian Armed Forces' Use of Space 2011–2015*.⁶³⁶ While they had not been ready at that time, the MoD and the Armed Forces were now prepared to engage in a broader debate on the nebulous space domain.⁶³⁷

The attempt to establish a national military space strategy in 2011 was originally triggered by a USAF invitation to sign an MoU on RSC, which made the MoD unsure of how to handle the invitation.⁶³⁸ The MoD signed this MoU in mid-2014, encompassing research and development of 'rapid operationalisation' of space capabilities with the US and Australia, Canada, Germany, the UK, Italy, the Netherlands, Norway, Spain and Sweden. Norway also considered participating in military satellite projects such as the German SAR-Lupe, the French Helios and the European Multinational

⁶³³ Bruun-Hanssen, interview.

⁶³⁴ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 1

⁶³⁵ Norwegian: *Forsvarets Logistikkorganisasjon (FLO)*

⁶³⁶ Forsvarets Informasjonsinfrastruktur (INI), *Plan for Forsvarets bruk av rommet 2011-2015 V 0.1.*

⁶³⁷ Olsen, interview.

⁶³⁸ Olsen, interview.

Space-Based Imaging System. There was a pending inquiry to participate in Canada's RADARSAT Constellation Mission, and the MTIF were considering an invitation from the US Strategic Command to share space situational awareness (SSA) data. This accumulating volume of enquiries continued to bring the organisational issue to the fore; the Norwegian defence sector was not set up to handle international inquiries on space collaboration, and subject matter authority for space had never been delegated within the military organisation. None of the military operating units were overall responsible for 'space force production', management or the development of military space capability. The question of military organisation, management and control of space activities thus became a central aspect of the 2014–2015 military space strategic review.⁶³⁹

The working group progressively reported their findings to the MoD's division for long-term planning, represented by Senior Staff Officer Lt. Col. (Army) Ole Øyvind Stensli.⁶⁴⁰ The working group's starting point was to investigate how (as opposed to if) space capabilities could strengthen Norway's national decision-making basis through ISR activities in Norway's areas of interest. Norwegian military 'space-related activities' currently included Space Situational Awareness (SSA),⁶⁴¹ ISR, PNT, including navigation warfare, and SATCOM. Consistent with NATO terminology for space operations, military space activity entailed 'space force enhancement' and 'space control' operations.⁶⁴² The group based their initial studies on a few, key documents, predominantly NATO and US doctrines, and developed a preliminary situational analysis report that was to serve as a 'strategic foundation.' The Armed Forces could use this foundation to define operational requirements adhering to national security guidelines.⁶⁴³

The working group advocated an ambition of national self-sufficiency and argued that Norway should own space capabilities under national control to support and ensure sovereign national decision-making. Moreover, it was a key supposition that the Armed Forces could benefit greatly from the use of space-based assets at all levels of leadership, command and operations, including the political, strategic, operational and tactical levels. The

⁶³⁹ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 5, 55–60

⁶⁴⁰ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁴¹ SSA is about knowledge, characterisation and the practice of tracking space objects.

⁶⁴² Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 75

⁶⁴³ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

working group presented four ‘main points’ where satellites could contribute substantially. Three of these points primarily valued space for its function in intelligence and supporting the intelligence cycle,⁶⁴⁴ thus representing what we may call a ‘Strategic Intelligence doctrine’.

- 1) Satellites can help Norwegian authorities discover events and understand the significance of these events.
- 2) Satellites can support the Norwegian Government and society with timely information.
- 3) The intelligence collection activity in itself and the importance of national autonomy in that respect is significant.

The working group’s fourth point can be understood as underpinning both lines of doctrinal thinking.

- 4) Space can support the execution of military power, spanning from maintaining sovereignty during peacetime to crisis management and warfare operations.⁶⁴⁵

The long-standing process of defence budget reductions, combined with political requirements to do more with less, had increased the Armed Forces’ dependency on ISR, communication and PNT services. The working group examined how space could be a viable part of the solution by looking to other NATO member states and the current state of the space domain, before turning introspective to assess how this landscape affected the Norwegian Armed Forces. Upon this foundation, the Armed Forces could organise themselves and define roles, responsibilities and overall military space authority. How to coordinate, organise and structure this effort emerged as a key challenge. The ‘ownership’ of space within the Armed Forces was unclear, as were Norway’s military space ambitions and intentions. Over the years, only CYFOR and the NIS had consistently supported the Armed Forces with space capability, that is, SATCOM and space-based ISR, in an extemporary and event-driven manner.⁶⁴⁶

⁶⁴⁴ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁴⁵ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁴⁶ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 75

The reference group

From February until April 2015, a space reference group participated in at least three joint meetings with the working group. The reference group was composed of at least 16 individuals, including five Navy officers, three Army officers, one Air Force officer and seven civilians. The objective was to provide for a holistic representation of the Norwegian military sector and develop relationships with relevant civilian actors, such as the National Security Authority (NSM) and NOSA. This effort to address and comprehend the space domain within the Armed Forces was so far unprecedented in Norway.⁶⁴⁷

Most of the participants held the rank of lieutenant colonel or its equivalent, and the group included participants working at all levels of the defence structure, that is, representing political, strategic, operational and tactical military units, respectively. Three of the military officers, two Navy and one Army, were currently serving as MoD staff officers (not counted as MoD personnel in Figure 26).⁶⁴⁸

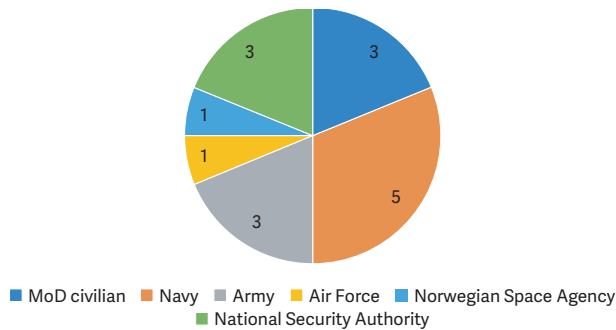


Figure 26. Composition of the space reference group categorised by affiliation.

Of the Navy officers, one had recently led a requirements-and-needs analysis on maritime ISR and currently held a staff officer position within the MoD. Another served in the MoD's security policy division focusing on Arctic and High North aspects. A third served as a senior staff officer in the Navy and was concerned with maritime surveillance and naval strategic concepts. A fourth held a Navy staff officer position working on

⁶⁴⁷ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁴⁸ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

structural implementation and a fifth held a position within NDLO ensuring SATCOM for Norwegian forces.

One Army officer had an information systems background and currently held a position within the MoD and participated primarily to support Lt. Col. Stensli. A second represented the Army's combat lab at the Army weapon's school and a third worked on materiel development within the Special Forces Staff. The only Air Force officer attending represented the Air Force Staff and currently held a position as station chief at an Air Force station.⁶⁴⁹

Three of the civilian participants represented the MoD, including two specialist directors and one person with a legal background, who worked with material acquisition related to Defence Study 2015. There were three representatives from the NSM working on risk management on object security, and one representative from NOSA's strategy division. Towards the end of the last joint meeting, the MoD Specialist Director present conveyed that he was 'more and more convinced' that space should be a 'prioritised subject' within Defence Study 2015. He also expressed that this military space 'forum' should be continued in the next LTP process.⁶⁵⁰ The visualisation of the group's composition in Figure 27 shows that some participants represented more than one function:

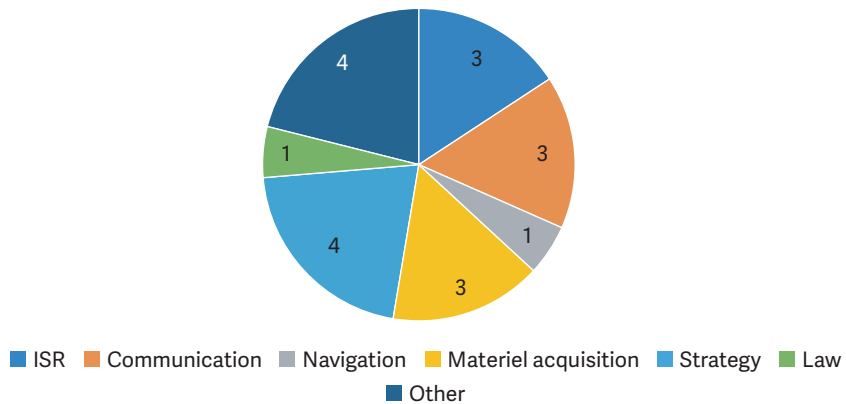


Figure 27. Composition of the space reference group categorised by background.

⁶⁴⁹ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁵⁰ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

Throughout the meetings, the working group briefed the reference group on the status and progress of their work and requested feedback and discussions on selected topics. They asserted before the reference group that this military space strategic review was based on the axiom that space is extremely important as support for all types of operations. On this basis, the reference group was to form a set of requirements for Norwegian military investment in space. The assembly, led by the working group's NIS representative, identified several key discussion points. The process also spurred a broader debate and triggered a range of questions that were used in the iterative process to develop the 'strategic foundation' for further review. The discussions indicated the level of collective knowledge and awareness of the space domain and its military implications, whilst increasing the understanding of pressing issues and viewpoints within the represented military units. Overall, the process turned into a considerable and comprehensive learning experience for those involved.⁶⁵¹

Key discussion points for the Norwegian Armed Forces

During the three meetings, the reference group posed a myriad of questions and comments that in sum demonstrated a relatively austere level of understanding of the subject matter across the Armed Forces. One of the first questions was why they were becoming engaged with military space now, and why was it important? Was it even worth addressing? What could they use space for? Could space activities meet any of their needs? Which tasks should they solve with space-based services, and which not? What were the operative and functional needs of the NJHQ? Consequently, which space capabilities should the Armed Forces focus on? Should they consider any other national strategies? Specifically, what would society's need for maritime ISR be 20–25 years from now?⁶⁵² One participant observed that there was 'very little' strategic guidance on space within the Armed Forces. There was a lack of awareness considering how the space domain was managed,

⁶⁵¹ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁵² Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

and a consensus emerged amongst the representatives that it was surely 'high time' to undertake this military space strategic review.⁶⁵³

An essential task was to identify military requirements. It was decided early on that the military space strategic review would prioritise national concerns and 'what we do here at home', while the international aspects were secondary. They decided to keep a clear focus on the High North.⁶⁵⁴ But were they supposed to conduct this study with Norway, the nation, in mind or the defence sector? Following this question, Lt. Col. Stensli would repeatedly state that they had certainly been summoned to consider 'the big picture', to assess the 'defence specific part in light of a greater whole'. The effort concerned the 'total defence dimension' and it was not the Armed Forces that should ultimately be happy with the outcome, but Norwegian society as a whole.⁶⁵⁵

At least one participant openly disagreed with this approach and stated that they should rather focus on 'the basic function of military activity' wherein 'the state is obligated to protect its citizens'. In line with the MoD's instructions, the 'national' approach quickly took precedence, however. There were certainly overlapping national needs for the Armed Forces and civil society, but civil-military collaboration on space in Norway had over the years been 'bad', and there had been 'no will' within the Armed Forces to invest in space. One exclaimed that 'the Armed Forces are more important to NOSA and civil society than you might think'. Another observed that the delineation between military and civilian aspects of space was 'unclear', whereby the NIS representative leading the meeting stated that 'that is how it is'. When another pointed out how closely intertwined the military and civilian aspects were, the NIS representative stated that they were 'not intending to delineate between military, civilian, governmental and commercial space systems' in this military space strategic review.⁶⁵⁶

Going forward, the Armed Forces either had to reinforce their resources or make better use of what they already had. For example, there was cross-sectorial interest in a 'space security analysis' that entailed all the four

⁶⁵³ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁵⁴ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁵⁵ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁵⁶ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

segments involved, including space, link, ground and human competence. NOSA were currently developing a ‘national space security strategy’ that was to be ready some time in 2015 and the NSM had similar plans. The MoD representative with a legal background inquired whether this space security strategy development should be managed by the MoD?⁶⁵⁷

The question of organisation and responsibility within the Norwegian military structure had originally triggered the military space strategic review in the first place, and one participant now commented that space suffered from a ‘lack of organisation and systematic approach’. Another remarked that there was indeed a ‘need for organisation’ and suggested it should ‘preferably be centralised’. Yet another noted that they had to identify their needs to build their organisation accordingly. It was also remarked that the Armed Forces should establish a dedicated military space programme, and it would be ‘highly preferable’ to achieve a functional interplay between the civil and the military sectors.⁶⁵⁸

While France and India had established their respective national space commands, the working group identified that most other nation-states were treating space as an extension of the air domain. In Norway, however, CYFOR was currently responsible for the RSC MoU. The Defence Staff were overall responsible for ISR, although ‘bits and pieces’ of this responsibility were delegated within the military structure. In parallel with the military space strategic review, the Armed Forces were conducting a study specifically addressing military use of commercial satellite imagery. It was unclear which professional responsibilities were already distributed and which remained. Certain ‘elements’ and ‘characteristics’ of the space domain made it difficult to delegate professional responsibility for the entire domain.⁶⁵⁹

On a general basis, it was ‘always a challenge if one unit in the Armed Forces was responsible for delivering services to others’, because they would likely ‘prioritise themselves’. The reference group participants asked themselves what their own military unit should be doing versus what others should be doing, and at least one participant observed that this could get ‘sensitive’. Roles, responsibilities and space authority were ‘parallel’ and

⁶⁵⁷ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁵⁸ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁵⁹ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

‘intertwined’ questions that could lead to ‘conflicts of interest’ within the Armed Forces. This was exemplified by the NIS representative’s exclamation before the group that although the Air Force had taken it upon themselves to address space in Norwegian military doctrine, this did not imply that the Air Force had a leading or authoritative role in any way.⁶⁶⁰

Prior to the meetings, the participants were given the situational analysis stating that the Armed Forces were Norway’s largest national user of satellite-based services and space technology, and that both military and civil sectors were ‘completely dependent on a functioning space infrastructure.’⁶⁶¹ One reference group participant observed that over the years, the Armed Forces had been scaled down because they ‘must be modern’, which only reinforced the military’s dependence on ISR, SATCOM and PNT services. What little they had left of the military structure was now ‘so thinly spread’ that these space-based services had become ‘essential’. The special forces representative noted that SATCOM was a critical capacity and in some cases the only option, and that the need for information collection was increasing more and more. As they were ‘becoming completely dependent on space-based platforms’, it was essential to secure space-based services, necessitating complementary systems and redundancy. Another believed that the best way to counter vulnerability was with ‘more satellites’. The MoD had opposed Norwegian participation in Galileo that added to the overall robustness in available GNSS systems, however.⁶⁶²

Within this context, it was asked whether it was necessary for the Armed Forces to own the space capacity, ‘or can we rent it?’ One concern with commercial solutions was that ‘[s]uddenly everyone will know where the special forces are’. Despite having a commercial framework agreement in place, one participant had still not been able to ensure SATCOM capability, making the Armed Forces unable to operate as planned. Commercial solutions compromised operational security, and Norway should certainly acquire national military SATCOM capability. At the same time, while the Armed Forces required secure SATCOM during wartime, this capability could then easily be disabled by the adversary.⁶⁶³

⁶⁶⁰ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁶¹ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 74

⁶⁶² Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁶³ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

One claimed that there was a correlation between how ‘good’ a country’s defence was and how well they were doing ‘in the space sector’, suggesting a correlation between national autonomy in space and military power.⁶⁶⁴ It would also be ‘useful’ for the Armed Forces to establish an ‘ambition level’, which they had not yet done. Another proposed defining the current ambition level as ‘low’, adding that NATO’s current ambition level was ‘also not very high’. Norway had to ensure funding, but also ‘national space systems competence’. What were the ambitions with respect to education? Indeed, capability entailed both organisational, personnel and human resources.⁶⁶⁵

The Armed Forces had recently identified they would suffer a maritime ISR capability gap between 2025–2030 due to the technical end of life of their MPA, and the coastal radar chain was nearing end of life in 2018–2020. These central data collection capabilities for the Armed Forces supported the execution of sea power in peace, crisis and armed conflict. The state of the Norwegian MPA fleet and the planned phasing out of the coastal radar chain was a recurring topic and the group discussed whether they should consider fully replacing these capabilities. What were the societal needs for maritime ISR in a 20–25-year perspective, considering future defence materiel acquisition?⁶⁶⁶

The Armed Forces also needed to focus more on interoperability. The Netherlands was highlighted as a country that, like Norway, had extensive maritime requirements. Norway was overall collaborating very closely with the Dutch, and this was now extending into space. Some Canadian initiatives ‘definitely’ represented opportunities for Norway.⁶⁶⁷ Moreover, data and information exchange could be ‘more important than money, as Norway could use exclusively collected data to obtain ‘very good barter deals’ amongst allies.⁶⁶⁸ At least one participant noted that the military opera-

⁶⁶⁴ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]”; This supposition was also implied by Aliberti, Cappella and Hrozensky, *Measuring Space Power*.

⁶⁶⁵ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁶⁶ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁶⁷ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian].”

⁶⁶⁸ Sundlisæter, “Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]”; Øystein Bø, “Interview with Øystein Bø, State Secretary (Vice Minister) to the Norwegian Minister of Defence, 26 February 2016, Myntgata 1, Oslo, Norway. [In Norwegian],” interview by Tale Sundlisæter, 2016.

tional gain provided by space capabilities must justify the costs,⁶⁶⁹ although the working and reference group members were overall significantly less focused on budgetary requirements compared to the Chief of Defence and the MoD.⁶⁷⁰

This first stage of the process was relatively open, and the working group's situational analysis was unclassified. The successive effort grew more focused and detailed and, with that, classified. It is thus not the purpose of this research to answer or address all these questions and concerns, but to describe how the Armed Forces approached the subject. A selected few key discussion points are treated in more detail in subsequent chapters.

Space in Defence Study 2015

The Chief of Defence presented Defence Study 2015 to the Minister of Defence on 1 October 2015. The Armed Forces quoted the Admiral on Twitter, stating, 'My recommendation will strengthen our ability to give timely notification, our ability to react, preparedness and perseverance.' There was a prominent focus on intelligence through 'increased use of surveillance satellites, intelligence and surveillance aircraft, and unmanned vehicles.'⁶⁷¹

Defence Study 2015 stated that the Armed Forces depended on space-based capabilities and that future operative tasks would rely increasingly on space-based intelligence, communication and navigation services. Satellites were 'central' to ISR and communication, and 'crucial' to situational awareness, substantiated timely decisions and response. Military space investment was necessary to modernise the Armed Forces in relation to enhanced ISR, C2 and combat power, and existing capabilities should be phased out and replaced by 'new and more cost-effective technology.' Along with unmanned systems and long-range precision-guided weapons, space systems were essential for the Armed Forces to meet 'tomorrow's challenges.'⁶⁷²

The study emphasised the strategic intelligence value of space-based capability, especially considering Norway's upper threshold defence level proceeding first line defence, reinforcement and NATO operations. The

⁶⁶⁹ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁷⁰ Bruun-Hanssen, interview; Bø, interview.

⁶⁷¹ Forsvaret, Twitter, 1 October, 2015.

⁶⁷² Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*, 4, 25, 36

study herein illustrated satellite capability, along with vessels, aircraft and sensors on land.

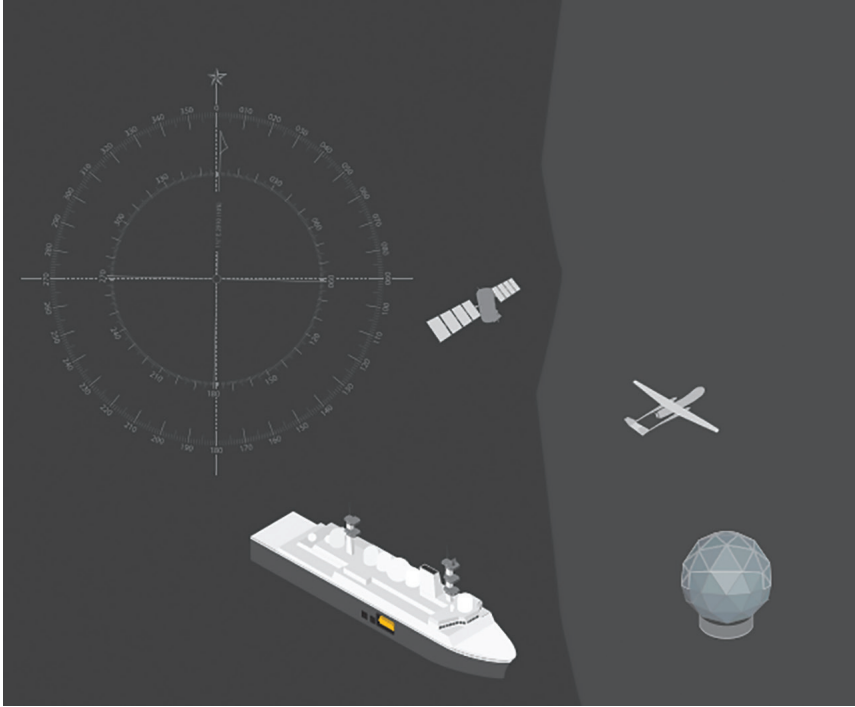


Figure 28. The role of satellites in Norway's first threshold defence level.⁶⁷³

The NIS would overall be modernised to adapt to the increasing needs for ISR and ensure timely warning of threats against Norway. This was 'absolutely necessary' to ensure a decision-making basis for Norway's military and political leadership. To enhance situational awareness and early warning capability at the strategic, operational and tactical levels, the Armed Forces should attain 'more, better, and more flexible sensors' such as satellite-based surveillance systems, unmanned aerial systems and new intelligence and surveillance aircraft. Satellite capability constituted an element in the development of 'a comprehensive, unified intelligence system from strategic to tactical level' aimed at improving the ability to share information across military units and chains of command.⁶⁷⁴

⁶⁷³ Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*, 37.

⁶⁷⁴ Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*, 37, 75–76.

Considering maritime surveillance and situational awareness, the study recommended replacing Norway's P-3 Orion MPA and DA-20 Jet Falcon intelligence aircraft with an alternative maritime reconnaissance capacity, which meant that Norway would lose its only airborne anti-submarine warfare capability, the P-3. The idea was to establish a military structure consisting of space-based sensors and smaller manned and unmanned maritime reconnaissance aircraft operating in conjunction, to be located with the F-35 combat aircraft squadron at Evenes Air Base, south-east of Andøya, and Andøya Air Base would be closed.⁶⁷⁵

It was also necessary to invest in C2 information infrastructure including SATCOM for effective planning, management and conduct of joint operations with national and allied forces, and F-35 operations required target data based wholly or partly on 'resources in space'. To maximise the national investment in F-35 and ensure its function as a central weapons platform in several types of operations, Norway had to strengthen its military real-time communications and target data transfer capability.⁶⁷⁶ Such platforms could also be 'an important contribution' to the NATO alliance, meaning that Norway could use the capability as a bargaining tool amongst allies.⁶⁷⁷

Defence Study 2015's intention to make space a national military priority was new to Norwegian strategic thinking. Yet, this aspect went almost unnoticed in public debates, which focused on the 'more traditional issues' related to the land, air and naval domains.⁶⁷⁸

Chapter conclusion

In this period, Norway engaged in space technology development and cooperation at an all-new level. While the US continued to dominate Norway's inner circle in alliance collaboration, the Netherlands emerged as a central bilateral partner in military space collaboration. Norway also signed the multilateral, US-led RSC MoU, and considered additional projects with other NATO member states, while there was some scepticism within the MoD considering the EU/ESA PNT system Galileo.

⁶⁷⁵ Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*, 52–53, 75.

⁶⁷⁶ Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*, 4, 25, 36

⁶⁷⁷ Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*, 86

⁶⁷⁸ Stig Eivind Nilsson, «Fremtiden er her: Space er det femte domene i et femte generasjons forsvar,» *Opinion, Forsvarets Forum* (2017), <https://forsvaretsforum.no/fremtiden-er-her/114217>.

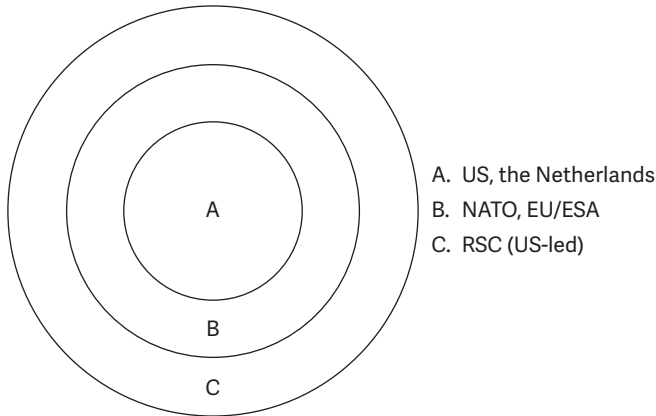


Figure 29. Norwegian collaboration in military space activity in 2014/2015.

The highest political priority in Norwegian defence planning was cost-effectiveness, and the potential for cost-savings was the main impetus for launching the military space strategic review. The Chief of Defence depended on political will, and the MoD instructed the Armed Forces to conduct the space review considering the nation's overall interests, as opposed to taking a purely military approach. Although not all mid-level military officers agreed with this approach, the review was conducted as per the MoD's request.

It was confirmed during the joint meetings between the working group and the reference group that national intergovernmental, cross-sectorial and civil-military collaboration had been flawed in Norway in the past. The Armed Forces were accused of having no desire to invest in space, and it was identified as essential to improve these internal, domestic relations to ensure constructive and efficient collaboration between the national civil and military sectors. At ministerial level, this principally entailed the MoD and the MTIF, and at agency level, this pertained to the Armed Forces and NOSA. The notion of civil-military separation too had evolved significantly since the 1980s, and in 2015, the Armed Forces explicitly aimed *not* to delineate between military, civilian, governmental and commercial space capabilities, but to rather utilise all available space capabilities.

The national agencies and military operating units that had driven the development of Norwegian military space activity since the onset were the same that were now driving the bottom-up military space strategic review. They included the FFI, the NIS and the NJHQ, as well as the Defence Staff, NDLO and CYFOR. Notably, the NIS representative before the group

demoted the role of the Air Force, which was the only military operating unit that over the years had addressed space in Norwegian joint military doctrine. According to the NIS, this role that the Air Force had taken upon itself did not imply that the Air Force should be considered authoritative in any way.

Even though Defence Study 2015 elevated the importance of space capabilities for surveillance and communication, the many and intertwined functions of space capabilities complexified the holistic coordination of the space domain. Norwegian military officers were for this reason wary that potential conflicts of interest could lead to inter-service rivalry, noting that if one of the military operating units was appointed the role of Norway's military space authority, this operating unit might prioritise its own mission. It was also not clear who was responsible for what in relation to ISR in the Armed Forces, where the Defence Staff and not the NIS were overall responsible for ISR. Moreover, the Defence Staff had delegated 'bits and pieces' of this responsibility, although no one seemed to have an overview. The joint meetings showed that space was currently valued predominantly for its function in strategic intelligence, that is, the original intelligence mission for space. Moreover, the working group advocated an ambition of national self-sufficiency, which entailed that Norway should increasingly focus on national ownership and control of space capabilities to ensure sovereign decision-making.

As for Norwegian military doctrine, FFOD 2014 seemed to serve a general educational purpose and was clearly influenced by NATO and US doctrine, as opposed to serving as guidance or direction of space activity as it pertained to the Norwegian Armed Forces. Compared to previous Norwegian doctrines it was, however, considerably more informative and it did consider the Norwegian concern over poor SATCOM coverage at high altitudes. It can be understood that the academic environment who authored the doctrine had noticed the sharply increasing military focus on space; however, this still did not seem to reflect or align with Norwegian military space activity.

The promising era of Program Space (2015–2020)

The world's economic centre of gravity continued to shift towards Asia during this time, with China, India and other emerging economies by far exceeding the Western growth rate. The US became more and more occupied with great power politics and rivalry. Simultaneously, Europe experienced a migration flow from the many conflicts, predominantly the rise of the Islamic State in the Middle East and beyond. The US, Europe and Norway became greatly involved in the Middle East in this period.

However, Norway continued to view the High North as its most important area of responsibility and, in addition to environmental changes and increasing international activity, Norway remained chiefly concerned with Russia's bolstering of its military forces in the region.⁶⁷⁹ To meet these challenges, the MoD decided to further invest in the NIS and 'future-oriented, strategic capacities' to reinforce Norway's national ability to maintain situational awareness and control in its vicinity.⁶⁸⁰

Norway also took note of Russia's use of network-based intelligence operations in Ukraine and identified several vulnerabilities tied to Norwegian society's comprehensive use of information and communication systems. Given Norway's geographical extent, topography and resources, SATCOM was identified as a key element in Norway's national electronic communications structure, and critical infrastructure and societal functions depended

⁶⁷⁹ Else-May Botten et al., *Representantforslag fra stortingsrepresentantene Else-May Botten, Odd Omland, Torstein Tvedt Solberg og Eirik Sivertsen om å sikre bredbåndstelekomunikasjon i nordområdene, Representantforslag 76 S (2015–2016)* (Stortinget, 2016).

⁶⁸⁰ Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*, 3, 5.

on satellite services to operate. Overall, the Government concluded that the strategic significance of space-based systems would only increase over the next few years.⁶⁸¹

ESA's increasing focus on security and defence

In Europe, ESA was growing noticeably involved in matters of security. In the spring of 2016, Director of ESA, Johann Dietrich Wörner, stated that the agency was thoroughly examining how to get more involved in matters of 'security and defence', as per the request of several of ESA's member states. Wörner, a German national and former head of the German Aerospace Centre, expressed that '[w]e live in a world where security becomes more and more important...' and ESA could certainly contribute in this respect.⁶⁸²

Considering Norway, which like Canada and Switzerland was a member of ESA but not of the EU, ESA was responsible for ensuring their national interests in space activity, and these three states could take part in EU space programmes through ESA membership. Reflecting upon the EU's rise as a space power, ESA's Director observed that it was not an option for ESA to become absorbed by the EU, principally due to ESA's geo-return policy and the control mechanism that ensured each member state an equal vote. In order for the EU to absorb ESA, the states would have to give up their national identities, 'which will never happen...'⁶⁸³

The 'old story' was that space could provide information. Although ESA's Earth observation systems could not provide continuous surveillance 'on an hourly basis', they could, for example, be used to monitor migration and national borders. They could observe 'large movements' and estimate the number of individuals in refugee camps. ESA maintained close relations with the EDA, as well as national defence and security entities, and several of ESA's member states had asked for 'more activities in security'. Although ESA was bound by its convention which specified that all its activities had to be conducted for 'peaceful purposes', this term was fluid and subject to interpretation. To the ESA Director himself, this notion implied 'the opposite of aggressive.' Whereas 'the terms military and peaceful might

⁶⁸¹ Olav Lysne et al., *Digital sårbarhet - sikkert samfunn: Beskytte enkeltmennesker og samfunn i en digitalisert verden*, NOU 2015:13 (07 Aurskog AS, 2015), 100, 118.

⁶⁸² Wörner, interview.

⁶⁸³ Wörner, interview.

be contradicting each other’, notions such as ‘security’ and ‘defence’ were acceptable.⁶⁸⁴

As opposed to the US, which principally approached space with a military incentive, Europe’s overall approach to space was civilian, principally because ‘Europe’ is composed of sovereign nation-states. Although some military space activities were conducted within a supranational European context and within NATO, the ESA Director observed that ‘...the real stuff is always done nationally, also in Europe.’ Military affairs were a matter for the nation-state. For this reason, several of ESA’s member states had hesitated to support Galileo, because they already had access to GPS through military relations. Overall, Wörner’s recent proposal to ‘intensify our focus on security and defence...’ triggered ‘different reactions’ amongst the ESA member states, with ‘smaller’ states being ‘more interested than the larger ones’ in getting ESA involved in activities that could be used for national military purposes. The most powerful European states preferred to develop military or ‘defence’ space capabilities themselves, ‘in the name of autonomy...’ They wanted, for example, to keep high-resolution space capabilities under national control. Because ESA’s capabilities were open access, these systems were subject to data resolution limitations. Ideas to develop ‘a European communications satellite’ had also been proposed, but the larger states wanted ‘to have independence in that area’ as well.⁶⁸⁵

Norwegian national (security) space policy and doctrine

In 2016, Norway established the interdepartmental Space Security Committee as part of the overall national organisation to coordinate and administer national space activities, as an increasing number of space issues necessitated broad, cross-sectorial political support. The Space Security Committee was designated to handle the ‘ever-increasing number of cases’ that concerned classified information, and included representatives from numerous ministries, as well as the NSM, PST, the NIS, the Directorate for Civil Protection (DSB), the Norwegian Communications Authority (NKOM) and NOSA.⁶⁸⁶

⁶⁸⁴ Wörner, interview.

⁶⁸⁵ Wörner, interview.

⁶⁸⁶ Nærings- og fiskeridepartementet, *Høyflyvende satellitter – jordnære formål — En strategi for norsk romvirksomhet*, Meld. St. 10 (2019–2020) (Nærings- og fiskeridepartementet, 2019), 33.

National space policy

It was mentioned during the military space strategic review in 2015 that several national actors were contemplating establishing a national security space strategy.⁶⁸⁷ This effort never materialised as a dedicated strategy, but was incorporated into Norway's third national space policy issued by the MTIF in 2019. The policy presented four main national space activity objectives, of which one was 'space security', which in addition to military use of space encompassed securing critical space infrastructure against threats, export control issues and non-proliferation. It accounted for the Armed Forces' organisation considering their newfound ambition to invest in space. Moreover, it acknowledged that the 2013 space policy had barely addressed the needs of the defence sector.⁶⁸⁸

The 2019 space policy underpinned the MoD's civil-military approach to space, which now constituted a strategic investment for the Armed Forces. The 2016 LTP clarified dependencies and needs and strengthened the national focus on space activities to establish space activities as a separate operational domain 'as land power, naval power, air power and cyberspace are today.' One of the MoD's top priorities was certainly to specify and clarify roles and responsibilities in this respect, as well as to draw on civil-military cooperation. In fact, the national space strategy noted that civil-military cooperation in space activity could 'to a large extent be based on experiences from civil-military cooperation on the use of airspace', which was 'well established and works well.'⁶⁸⁹ The policy declared that the defence sector had recently established 'clear and clarified responsibilities' and that Norway's military space activities were currently being managed and coordinated by the Chief of Defence's 'professional space authority'.⁶⁹⁰ In late 2018 and 2019, the Armed Forces published new doctrines for air and joint operations, respectively.⁶⁹¹

The 2018 air doctrine was authored by two academics at the Royal Norwegian Air Force Academy, who based their work on other air force

⁶⁸⁷ Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

⁶⁸⁸ Nærings- og fiskeridepartementet, *Høytflyvende satellitter – jordnære formål – En strategi for norsk romvirksomhet*, 31–33.

⁶⁸⁹ Nærings- og fiskeridepartementet, *Høytflyvende satellitter – jordnære formål – En strategi for norsk romvirksomhet*, 31.

⁶⁹⁰ Nærings- og fiskeridepartementet, *Høytflyvende satellitter – jordnære formål – En strategi for norsk romvirksomhet*, 52.

⁶⁹¹ Lars Peder Haga and Ole Jørgen Maaø, *Forsvarets doktrine for luftoperasjoner* (2nd ed.), (Forsvaret, 2018); Forsvarets stabsskole, *Forsvarets fellesoperative doktrine* (Forsvarsstaben, 2019).

doctrines, publications and other military professionals. They had ‘quickly realised’ that the Chief of the Royal Norwegian Air Force had no space domain responsibility, and writing the doctrine was ‘a significant challenge’ because ‘a Norwegian military space doctrine does not exist’. Overall, it was very unclear who was ‘responsible’ for the space domain in Norway. This led them to write a ‘hybrid’ doctrine in which they mentioned space, defined space, accounted for ‘different types of operations’ and emphasised the importance of space in Norwegian air operations. The air doctrine was, however, ‘NOT a Norwegian space doctrine’. It discussed space as it related to air operations, but it did not discuss space ‘per se’ or considering other types of military operations.⁶⁹² Thus, they concluded that ‘it must be clearly defined which unit in the Armed Forces shall be responsible for operating and further developing Norwegian capacities in space’, and the Armed Forces certainly needed a separate military doctrine for space operations.⁶⁹³

The air doctrine itself did not significantly differ from how space was addressed in FFOD 2014. It clarified that PNT and communication systems were not only used for navigation or ‘good old-fashioned communication’, but also supported weapons systems, data exchange ‘and not least for intelligence.’⁶⁹⁴ It treated space as an operating environment and ‘a global commons...which could provide a major military advantage given one has the right capabilities in space.’⁶⁹⁵ It also noted that SATCOM and PNT capability provided ‘operational support.’⁶⁹⁶

The Armed Forces also issued a new joint doctrine in late 2019. FFOD 2019 resembled its predecessor. It emphasised that space operations contributed to ‘joint operations’ and noted that space-based systems could be used to identify adversarial ‘dispositions and intentions’ and to allocate ‘more flexible resources towards specific points of interest.’ It also defined defensive space control measures such as physically securing ground components and hardening link and user components to resist electronic attacks and ensure redundancy. Offensive space control measures could be exercised by attacking the adversary’s space segments and the associated ground, user and link segments ‘kinetically, electronically or in the form

⁶⁹² Ole Jørgen Maaø, «Verdensrommet i den nye luftdoktrinen,» *Luftled*, no. 1 (2019): 11.

⁶⁹³ Maaø, «Verdensrommet i den nye luftdoktrinen,»

⁶⁹⁴ Maaø, «Verdensrommet i den nye luftdoktrinen,» 10.

⁶⁹⁵ Maaø, «Verdensrommet i den nye luftdoktrinen,» 11; Haga and Maaø, *Forsvarets doktrine for luftoperasjoner*, Chapter 2.2.

⁶⁹⁶ Maaø, «Verdensrommet i den nye luftdoktrinen,», 11; Haga and Maaø, *Forsvarets doktrine for luftoperasjoner*, Chapter 5.

of cyber-attacks'. The doctrine here noted that ground infrastructure and the link components were often easier to attack than the space segment, that is, the satellite. Only the great space powers were currently capable of kinetically incapacitating satellites by kinetic impact.⁶⁹⁷

The MoD State Secretary's views on military space activity

In February 2016, the MoD State Secretary Øystein Bø of the Conservative Party, a self-proclaimed supporter of NATO and the Armed Forces, as well as of privatisation, conveyed that the MoD had examined whether Norway should acquire dedicated military satellites. They had, however, concluded that 'the cost might be greater than the value'. The MoD's longstanding, *de facto* space policy remained largely unchanged, but what was 'new' was that the MoD now understood that it did indeed depend on satellite capability. To meet its requirements, the Armed Forces could 'just turn around and look' at what already existed and who they could collaborate with. The Armed Forces were not to become 'a driving force' and the Norwegian defence sector should certainly not 'develop everything on our own'. While the Armed Forces required space capabilities for purposes such as intelligence, situational awareness and communication, space would not become a military 'core activity'. Instead, they would rely on existing space capability and 'piggy-back on civilian things', securing their data with national encryption. 'We must be aware of what we spend money on', and instead of spending money on space, they could 'sit back and let people develop what works, and then we buy what we need.'⁶⁹⁸

To the State Secretary, politics was about making decisions and then trusting that they were right. To ensure a sound decision-making basis in the military space segment, the MoD had commissioned Col. Nilsson from the Air Force to examine how to 'solve our satellite needs cheapest and best'. From a political perspective, it was principally a question of what they could afford, and while the Armed Forces were neither to drive Norway's development of space technology, nor develop its own, they would holistically map their space requirements considering 'communication, situational awareness, and intelligence'. 'I do not think we will sit down and look

⁶⁹⁷ Forsvarets stabsskole, *Forsvarets fellesoperative doktrine*, 114, 22–23.

⁶⁹⁸ Bø, interview.

at whether we should spend more money on this (...) than we have done before.’ The MoD had ‘so much else to spend money on’. If they could use off-the-shelf merchandise and piggy-back on others, it was not necessary to be ‘further ahead in development than we are today’. The exception would be if the FFI identified unmet needs which the Armed Forces could not attain elsewhere, but, in general, the Armed Forces should ‘buy and use what we need, but nothing more.’ NOSA also knew what the Armed Forces wanted, the State Secretary explained, and to make NOSA ‘endeavour to meet our needs’, the MoD could look for alternative partnerships abroad, instead of merely leaning on NOSA. The MoD could use national players such as Space Norway, as well as foreign commercial satellite resources.⁶⁹⁹

Norway’s national space policies, issued by the MTIF in 1986 and 2013, had refrained from addressing military space considerations and State Secretary Bø believed this to be partly due to the US SDI programme of the 1980s and the associations it had ingrained into the minds of the Norwegian people. He believed that many Norwegians to this day associated the notion of ‘military use of space’ with SDI, and that the subject of military space activity for that reason was still ‘somewhat challenging to write about.’ It was still ‘tricky’ and ‘touchy’ to address. Ultimately, the notion of ‘military use of space’ was associated with something ‘offensive’.⁷⁰⁰

Another reason why Norway’s national space policies had not addressed space holistically considering national security concerns could be due to the Norwegian sector principle and the associated funding mechanisms. Space activities were funded and managed in distinct, civilian and military tracks, respectively, and the civilian sector had ‘not bothered’ to engage with the FFI’s military research. Similarly, the MoD allocated its research and development funds, currently around NOK two billion, exclusively to the FFI. This civil-military separation was ‘artificial’ and ought to change, however, to attain increased synergy effects overall between the sectors.⁷⁰¹

⁶⁹⁹ Bø, interview; As opposed to State Secretary Bø, the Deputy Director of FFI’s Air and Space Systems Division believed, as late as 2016–2017, that NOSA’s as well as the Armed Forces’ own understanding of Norway’s military space requirements were hardly understood: Olsen, interview.

⁷⁰⁰ Bø, interview; SDI stirred a fiery political debate in Norway, especially as it pertained to Norway’s relations with Russia. See Solem, «Norske reaksjoner på Reagans’ ‘stjernekrigs’-program»; In 1985, Norway’s Prime Minister commissioned an in-depth report examining the technical aspects of SDI: Klippenberg, Stette and Grandal, *Forsvar mot ballistiske raketter - de tekniske og vitenskapelige sider ved USA’s strategiske forsvarsinitiativ SDI*.

⁷⁰¹ Bø, interview; The State Secretary’s observations were not entirely correct. Norway’s civilian space activities and associated funding originated from the MTIF and was channeled through NOSA, not the Norwegian Research Council: Olsen, interview.

While several of Norway's military executives emphasised during this time that Norway's cross-sectorial space collaboration was, at best, sub-optimal,⁷⁰² State Secretary Bø had 'not heard any voices' indicating that this was an issue. 'It can always be better coordinated', but space was given sufficient attention as far as the needs of the Norwegian defence sector were concerned. The Armed Forces would likely not take on more responsibility or influence the development of national space activity to a greater extent. While the MoD would examine the subject more closely, 'I do not envisage the Armed Forces going in and taking a bigger role.' The Armed Forces would likely become a bigger user of space-based services, but if the Armed Forces took on a more active role, it could lead to intergovernmental coordination issues 'and that kind of thing.'⁷⁰³

Norway's political executives were careful not to interfere with how the Armed Forces chose to organise themselves, 'as long as it is done efficiently, cost-effectively and delivers what is needed.' The appointment of Norway's military space authority would be a 'bottom up' process, as these things usually were, and the State Secretary had not given any thought as to how Norway's military space activity should be organised, although 'one could imagine that it could be in some form of joint service.' Since space was important for intelligence collection and situational awareness in the future, the NIS was an 'obvious candidate' that could potentially benefit greatly from space and therefore had a sense of 'ownership' to the domain. But there was also the F-35, a platform that would 'interact with everyone'. It was not merely a new combat aircraft, but 'actually a completely new platform, with network-based defence that will talk to the Army, talk to the Navy'. On that note, State Secretary Bø reasoned that space concerned the Air Force because satellites 'are things that fly, even if it is high up'. Moreover, 'all the weapons branches will benefit from the satellite-based and space-based activities, especially on the communication side'. Either way, 'there will always be someone who will be dissatisfied with where it ends up.' 'There is always a power struggle in the Armed Forces.'⁷⁰⁴

⁷⁰² Tom Rykken, "Interview with Tom Rykken, Deputy Director of the Norwegian Intelligence Service, 25 November 2015, NIS headquarters at Lutvann, Oslo, Norway. [In Norwegian]," interview by Tale Sundlisæter, 2015; Kjell Grandhagen, "Interview with Lt. Gen. (Ret.) Kjell Grandhagen (Norwegian Army), former head of the Norwegian Intelligence Service, 4 March 2016, DnB's premises at Dronning Eufemias gate 30, Oslo, Norway. [In Norwegian]," interview by Tale Sundlisæter, 2016; Jansen, interview.

⁷⁰³ Bø, interview.

⁷⁰⁴ Bø, interview.

Going forward, the MoD and the MTIF planned to establish SATCOM capability in the High North. The Norwegian AIS satellite had successfully demonstrated the potential for increased civil-military collaboration, of which there had not been much before, and the State Secretary was optimistic about the development of smaller satellites and ‘exciting’ dual-use opportunities.⁷⁰⁵

Program Space – a sober, but necessary investment

Defence Study 2015 identified that the Armed Forces lacked resources to clarify how space could enhance the Armed Forces’ land, air and sea operations, and recommended a ‘sober, but necessary investment’ in military space activity and competence building. This required allocating a few positions to hash out a military structure and coordinate operational requirements.⁷⁰⁶ The MoD therefore established an interim space programme during the autumn of 2015 to implement the study’s military recommendations in light of political considerations. This effort would be led by Col. Nilsson, a former fighter pilot and C2 specialist seconded by the Air Force in 2014 to assist the MoD in coordinating Defence Study 2015 and the following LTP. According to Col. Nilsson, ‘[i]t was always in the cards that one should establish Program Space.’ The military space strategic review identified that several Norwegian military units used space capabilities, but they did not cooperate on these matters, and space activities had over the years been ‘too expedient’, despite the domain’s growing impact on military activity. The Navy, the NJHQ, CYFOR and the NIS each had their own specialist environments and subject matter expertise located in different places, and their use of resources was fragmented and appeared disorganised. The Armed Forces was spending NOK 100 million annually on space without following an overall plan. One of the main objectives of establishing Program Space was therefore to coordinate these actors and their investments, capabilities and resources.⁷⁰⁷

⁷⁰⁵ Bø, interview.

⁷⁰⁶ Forsvarsdepartementet, *Forsvarssektorens utnyttelse av verdensrommet, 2016/50010-1/FD IV 2/SENIB* (Forsvarsdepartementet, 2016).

⁷⁰⁷ Stig Eivind Nilsson, “Interview with Col. Stig Eivind Nilsson (Royal Norwegian Air Force), Former Head of the MoD Program Space and the Defence Staff Space Operations Section, 28 April 2022, telephone interview, Rygge Air Base, Norway. [In Norwegian],» interview by Tale Sundlisæter, 2022.

In January 2016, the head of the MoD's LTP Division, Rear Admiral Elisabeth Natvig, and Director of Defence Planning, Brig. Gen. Inge Kampenes, requested that NDLO, the NJHQ, the Defence Staff, the NIS, NSM, the FFI and the Defence Materiel Agency (NDMA) dispatch personnel to solve four core tasks:⁷⁰⁸

- Clarify with the Chief of Defence how the Armed Forces should organise this new focus area by the end of 2016.
- Clarify, coordinate, and prioritise current space activities within the Norwegian defence sector.
- Formulate a principal objective for the Armed Forces' space utilisation, considering Norway's national space strategy and using NATO as a facilitator.
- Strengthen research and development efforts, principally through the FFI, but not excluding research communities at home or abroad.⁷⁰⁹

It was a key assumption that establishing a joint forum for the different expert areas that space encompasses would help the Armed Forces identify requirements and opportunities more efficiently. First and foremost, Program Space would centrally and virtually coordinate the existing military space activities and expertise environments dispersed across the country – physical location was deemed less relevant. Second, it would establish a dedicated military point of contact for space to serve as a military liaison towards relevant civil and military actors at home and abroad. Third, it was to establish space as a new subject matter area in the Armed Forces, preferably at executive military level, to increase awareness of the 'new' domain across the entire military organisation.⁷¹⁰

At the onset, Col. Nilsson presented two alternative approaches to the Chief of Defence, of which one was a 'purely military track' and entailed building up all required fields of competency within the military structure. Alternatively, they could draw upon civilian and international environments, 'especially the civilian-international' nexus. Since the former alternative was too expensive, they decided to start 'within reasonable limits' with a civil-military approach. Norway had a considerable civilian space

⁷⁰⁸ Forsvarsdepartementet, *Forsvarssektorens utnyttelse av verdensrommet*.

⁷⁰⁹ Forsvarsdepartementet, *Forsvarssektorens utnyttelse av verdensrommet*.

⁷¹⁰ Nilsson, interview.

environment, including actors such as NOSA, KDA, Space Norway and Andøya Space, through which the Armed Forces could acquire dual-use capabilities under circumstances that did not require dedicated military capability. Formally, the Chief of Defence recommended this approach, which the MoD endorsed.⁷¹¹

In June 2016, the MoD issued their LTP for 2017–2020, which echoed former defence policies concerning the Coast Guard's use of satellites to exercise authority in Norway's EEZ and the fishery zones around Jan Mayen Island and the Svalbard Archipelago. However, it accounted for vulnerabilities and opportunities related to space capabilities much more extensively than former national defence policies. For one, the satellites upon which the Armed Forces continued to grow increasingly reliant to conduct military operations and assert national sovereignty and authority in the High North constituted attractive adversarial targets.⁷¹² The new plan also embodied the increasing number of space actors, including Norway, that were driven by technological developments and decreasing costs related to space technology. Dual-use satellites, such as the Norwegian AIS satellites, were proliferating.⁷¹³ It could now be 'cost-effective' to employ a combination of national and international space systems, dual-use technology, small satellites and multilateral partnerships to enhance Norwegian military capability. The policy stated the investment would be national, civil-military and cross-sectorial, and that it would serve civil society as well as the Armed Forces. They would also reinforce these views in a new national space strategy that was currently being developed in collaboration with NOSA, the space industry and international partners. Because Norwegian military space activities were currently 'scattered and without clear lines of responsibility', the MoD would 'soberly increase' their space investments, optimise the current use of resources, and clarify roles and responsibilities. To achieve this, the MoD would establish a programme to implement ambitions and plans for structural development and military space investments.⁷¹⁴

This embodied the formal establishment of Norway's military space programme, dubbed Program Space, that had been established during the autumn of 2015 as a temporary structure within the MoD to provide a

⁷¹¹ Nilsson, interview.

⁷¹² Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*, 25, 35–36.

⁷¹³ Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*, 35–36

⁷¹⁴ Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*, 102–103

top-down approach to space in the Armed Forces. Positions and resources were established within the Armed Forces and allocated to the MoD for the three years that Program Space was to be managed by the Ministry, from January 2017 until the end of 2019.⁷¹⁵ It constituted an element subordinate to the LTP division and was tasked with coordinating and managing investments, implementing approved ambitions, recommending future organisation, roles and responsibilities, and ensuring a holistic coordination of national and international collaboration.⁷¹⁶

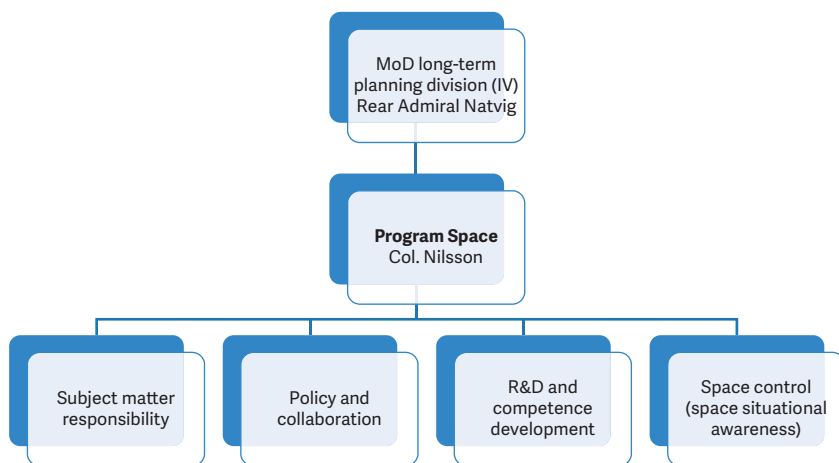


Figure 30. Organisation of Program Space within the MoD.

As civilian as possible – as military as necessary

In February 2017, Program Space declared that the MoD invested in space because it was ‘strategically important’, ‘operationally necessary’ and ‘financially beneficial’. Their approach was ‘sober and step by step’, and the programme was to be ‘as civilian as possible – as military as necessary’. In addition to ‘adequate’ SSA, this entailed ‘adequate and secure’ access to SATCOM, ISR, targeting sensor information and PNT services ‘at all levels’, including the strategic, joint and tactical levels. Research and development efforts would focus on applicable solutions considering the Armed Forces’ operative needs.

⁷¹⁵ Nilsson, interview.

⁷¹⁶ Nilsson, *Forsvarssektorens satsing på space: «Nøkernt og trinnvis»*.

In ‘a small state perspective’, the Armed Forces should strive for national control over space capabilities covering their most critical needs, whilst increasing ‘robustness’ through international partnerships and increasing ‘flexibility’ with commercial capabilities. A reproduction of this model for military access to space, which was an adapted version of a model originating from the French Joint Space Command, is presented in Figure 31 below.⁷¹⁷



Figure 31. Reproduction of Program Space’s model for military access to space.⁷¹⁸

Norway’s most critical needs encompassed maritime SATCOM and micro-satellites for maritime surveillance in the High North, where 80 percent of all maritime traffic in the Arctic travelled through Norwegian waters. As a ‘small state’, Norway could use microsatellites to develop national space capability that could provide ‘interesting and valuable contributions’ for national and allied use, including a small satellite SATCOM concept currently being explored by the FFI. Program Space, however, focused on a project that entailed a national ‘large satellite’ to be deployed in highly elliptical orbit (HEO) for operational SATCOM capability in the High North.⁷¹⁹

⁷¹⁷ Nilsson, *Forsvarssektorens satsing på space: «Nøkternt og trimnvis»*.

⁷¹⁸ Nilsson, *Forsvarssektorens satsing på space: «Nøkternt og trimnvis»*, 11; As previously noted, the model used by Program Space originated from the French Joint Space Command: Testé, “SSA: First Priority of French Military Space Policy 2025”.

⁷¹⁹ Nilsson, *Forsvarssektorens satsing på space: «Nøkternt og trimnvis»*.

The Program Space investment plan in 2017 included key capabilities such as: GPS, Wideband Global SATCOM and SSA data sharing with the US; a bilateral research and development project (SMART MilSpace) between Norway and the Netherlands; Canadian RADARSAT and RCM; EU/ESA systems Copernicus and Galileo and the EU satellite centre; and a multinational collaboration between Norway, Canada, France and Denmark.⁷²⁰ The latter concerned a possible collaboration on SATCOM in the High North, which did not materialise, and Norway would instead collaborate closely with the US.⁷²¹ SMART MilSpace was based on converging interests in the naval domain and was jointly funded by the Norwegian and Dutch MoDs to explore possible niches, and the FFI was exploring additional ESM concepts.⁷²² Additionally, NOSA during this time prolonged the agreement with RADARSAT⁷²³ and ensured that the Armed Forces acquired up to 30,000 radar images annually from the Copernicus programme.⁷²⁴

Norway also signed a bilateral agreement with US Strategic Command (USSTRATCOM) in April 2017 that formally authorised SSA data and services sharing. The agreement was signed jointly by the Head of the MoD's LTP division, Maj. Gen. Odd-Harald Hagen, and the MTIF's Director of Innovation and Research, Arne Benjaminsen. According to Maj. Gen. Hagen, the agreement was 'an important milestone for Norway's development as an active and responsible space nation in the High North and Arctic'. The agreement also served as 'practical and symbolic evidence of the strong relationship and continuing development between our two nations.' USSTRATCOM, on the other hand, intended to establish similar agreements with 'all space-faring nations,' so the agreement was far from unique in that respect.⁷²⁵

⁷²⁰ Nilsson, *Forsvarssektorens satsing på space: «Nøkernt og trinnvis»*.

⁷²¹ Nilsson, interview; Næringskomiteen, *Innstilling til Stortinget fra næringskomiteen, Innst. 330 S (2017-2018)* (Stortinget, 2018).

⁷²² FFI, *Historien om SMART MilSpace* (2022).

⁷²³ Nilsson, interview.

⁷²⁴ Wahl, interview; In 2017, the FFI concluded that the Sentinel-1 satellites were 'a great step forward' considering space-based operational vessel detection. See Tonje Nanette Arnesen Hannevik et al., *Arctic Maritime Surveillance With Sentinel-1 Data Using a Norwegian Collaborative Ground Segment* (FFI, 2017).

⁷²⁵ United States Strategic Command Public Affairs, "U.S. Strategic Command, Norway sign agreement to share spaceservices, data," newsrelease, 5 April, 2017, <https://www.stratcom.mil/Media/News/News-Article-View/Article/1142970/us-strategic-command-norway-sign-agreement-to-share-space-services-data/>.

The Air Force should have a role

Program Space hesitated to take a clear decision on military organisation. Based on Norwegian and allied military joint doctrines, ‘it was not easy to see how it should be done.’⁷²⁶ Most nations followed the ‘traditional approach’ where the air force administered national military space activities. But in Norway, ‘[s]pace is not part of the Air Force...’ In Norway, military space activity was largely associated with SATCOM, which was managed by CYFOR, whereas the Air Force had always had a more passive role. Col. Nilsson observed that this did not at all align with Norwegian joint doctrine.⁷²⁷

In FFOD 2014, for example, space was addressed as an extension of the air domain, although the Air Force had never truly been involved in space activities. The Norwegian joint doctrine was largely detached from actual military organisation and activity in Norway at the time, which led Col. Nilsson to question the overall purpose of Norwegian military doctrine. Program Space provided some input to the 2018 doctrine for air operations, but ‘nothing substantial.’ Since Program Space had not yet decided on anything, their contribution to develop national military doctrine was ‘vague and insufficiently clear.’⁷²⁸

Following a year spent investigating roles, responsibilities and assessments, Program Space tentatively concluded based on allied doctrine and practice that the Air Force should manage the role as Norway’s military space authority. Program Space proposed this solution to the Chief of Defence in December 2018. Representatives from vested units such as the Defence Staff, the NIS and the NJHQ were present at this meeting and had already endorsed the proposal according to Col. Nilsson. It had also been somewhat coordinated with the recently published national military doctrine for air operations.⁷²⁹

‘It was for once somewhat synchronised with the doctrines.’ Although no final decision had been made, Col. Nilsson believed ‘it was always in the cards, partly due to parity with other nations and to get the players involved, that the Air Force should have a role.’ NATO was hosting ‘air and space’ congregations, and it was ‘natural’ that the Air Force should have

⁷²⁶ Nilsson, interview.

⁷²⁷ Nilsson, interview.

⁷²⁸ Nilsson, interview.

⁷²⁹ Haga and Maaø, *Forsvarets doktrine for luftoperasjoner*; Forsvarets stabsskole, *Forsvarets fellesoperative doktrine*.

a leading role in Norway as well.⁷³⁰ Before ‘possibly’ ending up in the Air Force, however, Program Space planned to transfer to the Defence Staff in January 2020 and remain there for three years to maintain a strategic perspective on space in the Armed Forces. In 2023, they would agree on the military space authority and organisation.⁷³¹

Chapter conclusion

The US continued to dominate the inner circle of Norway’s alliance policy in military space collaboration. Norway’s civilian bilateral space collaboration with Canada continued as well, while the relationship with the Netherlands as a key bilateral partner in Norwegian military space collaboration was reinforced. Norway’s military space policy entailed that NATO should serve as a main facilitator in Norway’s development of the Armed Forces’ international space collaboration. Additionally, the Armed Forces became a substantial user of satellite data originating from the EU/ESA Copernicus programme during this time, and ESA was progressively focusing on delivering space-based services for national defence and security purposes.

The notion of national military space capability as a security policy tool was a central part of the strategy fully embraced by the MoD. Norway identified potential niche capability based on microsatellite platforms, including ISR and SATCOM solutions that were to cover Norway’s national security requirements whilst offering something of value to its allies. Norway’s plans to develop national SATCOM capability covering the High North emerged as essential in this respect, underlining that the High North was indeed Norway’s most important geostrategic area of interest.

The MoD was concerned with the financial aspects, which was why the MoD continued to uphold the role of the MTIF and the importance of following a civil-military path in Norwegian military space development. The MoD also wanted to avoid complexifying intergovernmental relations with the MTIF, which administered NOSA. The 2019 space policy was the first of its kind to thoroughly address national security aspects, which both indicated that national civil-military relations were improving and that Norway as a nation had taken a big step forward in its understanding

⁷³⁰ Nilsson, interview.

⁷³¹ Nilsson, interview.

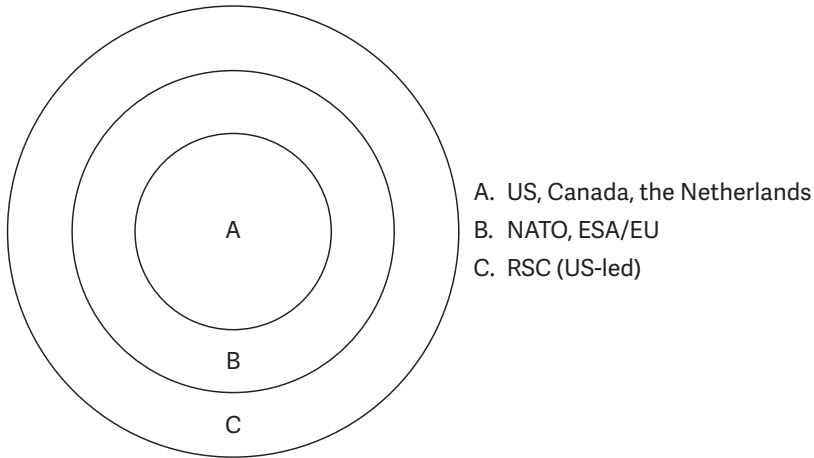


Figure 32. Key pillars of Norwegian collaboration in military space activity during the era of Program Space.

of national security aspects related to space. It can also be understood that Norway's political establishment had finally overcome the notion of military space activity as too tricky, touchy or politically sensitive to openly consider, as it might have been seen in the past.

To manage Norway's newfound space investment, the MoD set up Program Space as a temporary, top-down structure within the Ministry to ensure a holistic and strategic coordination of Norwegian military space activity. Within the Armed Forces, the NIS, the NJHQ, CYFOR and the Navy managed their activities separately, and Program Space thus aimed to coordinate them. Overall, this was a relatively austere undertaking focused on maritime ISR and SATCOM for intelligence and military-operational purposes, and the MoD's State Secretary proposed the NIS, the Air Force and CYFOR as potential candidates for military space authority. These structural issues were essential and demonstrated the necessity of establishing a command structure under which to operate before putting concrete plans into action.

The previously informal dual-use, civil-military approach to Norwegian military space activity and capability development was now formalised through the national space policy. As Foss predicted in 1987, this had indeed been driven forward by technological development combined with the strict political requirement of cost-effectiveness. The civil-military approach was the only economically viable solution.

Establishing the military space organisation (2014–2022)

In October 2020, the MoD's new LTP explicitly focused Norway's 'step-by-step and sober effort' to meet national military requirements through capacity development and cooperation with other actors in relation to two main objectives. This was really a consolidation of Norwegian space activities through the decades and entailed strengthening the Armed Forces' access to the following key capabilities:⁷³²

- Space-based maritime surveillance under national control
- SATCOM for communications and C2 in the High North

Since NATO did not plan to develop common space capabilities but relied on force pooling based on the members' national space assets, the MoD also aimed for Norway to contribute to the alliance with space domain awareness and 'space-based support services'.⁷³³

This defence policy also declared under joint capacities that a key element was established within the Armed Forces to ensure strategic planning, management, leadership and coordination of military space activities, and to integrate space as an operational domain in the Armed Forces. This key element, which the 2019 space policy had referred to as the Armed Forces' professional space authority, was the unit formerly known as Program Space within the MoD.⁷³⁴ In January 2020, this unit warped into the Space

⁷³² Forsvarsdepartementet, *Evne til forsvar - vilje til beredskap. Langtidsplan for forsvarssektoren*, 108–09.

⁷³³ Forsvarsdepartementet, *Evne til forsvar - vilje til beredskap. Langtidsplan for forsvarssektoren*, 108–09.

⁷³⁴ Nærings- og fiskeridepartementet, *Høytflyvende satellitter – jordnære formål — En strategi for norsk romvirksomhet*, 52.

Operations Section within the Defence Staff, before it later became known as the Space Division within the NIS, as of January 2022, in the wake of an internal power struggle between the NIS and the Air Force.⁷³⁵

Following the Russian invasion of Ukraine in February 2022, the MoD further bolstered the NIS and maritime surveillance activities in the High North, and escalated Norway's frigate, submarine, corvette and Coast Guard activity.⁷³⁶ In March, the MoD issued an urgent white paper accounting for immediate measures to strengthen the Armed Forces' operational capability, stating that satellite capabilities, P-8 and F-35 would contribute more in the maritime domain.⁷³⁷ The MoD also reinforced their intention to continue their 'important investments in space activities', including space-based maritime surveillance and SATCOM. These capabilities, the MoD anticipated, would contribute significantly to increase Norway's situational awareness and support military operations in the High North.⁷³⁸

The Space Operations Section and the Air Force as military space authority

Program Space formally operated for three years under MoD governance and subsequently transferred in nearly the same shape and form to the Defence Staff as of January 2020. With that ended the era of Program Space and the era of the Space Operations Section began.⁷³⁹ Program Space transferred to the Defence Staff along with almost all its resources and personnel, and the Chief of Defence organised it as a section under the Operations Division headed by Maj. Gen. Yngve Odlo. Col. Nilsson continued to serve as head of what was now known as the Space Operations Section.⁷⁴⁰

The plan was to keep the section as an element within the Defence Staff throughout the upcoming transitional phase, as Admiral Bruun-Hanssen was about to retire and give way to Maj. Gen. Eirik Kristoffersen as Chief

⁷³⁵ Stig Nilsson, *Space i Forsvaret: Det femte operasjonsdomene i et femte generasjons forsvar* (2021), 7.

⁷³⁶ Forsvarsdepartementet, «Regjeringen med strakstiltak for å styrke Forsvaret,» news release, 18 March, 2022, <https://www.regjeringen.no/no/aktuelt/regjeringen-med-strakstiltak-for-a-styrke-forsvaret/id2904668/>.

⁷³⁷ Forsvarsdepartementet, *Prioriterte endringer, status og tiltak i forsvarssektoren*, 42–43.

⁷³⁸ Forsvarsdepartementet, *Prioriterte endringer, status og tiltak i forsvarssektoren*, 38.

⁷³⁹ Nilsson, interview.

⁷⁴⁰ Maj. Gen. Odlo was promoted to Lt. Gen. in 2021, when he succeeded Lt. Gen. Rune Jakobsen as Commander of the Norwegian Joint Headquarters (NJHQ). According to Col. Nilsson, the circumstances made Maj. Gen. Odlo 'very interested in space' and he brought these perspectives with him into his new role as Commander of the NJHQ.

of Defence in August 2020. The idea was to ensure a continuation of the strategic perspective on space under the new Chief of Defence.⁷⁴¹

The plan to remain within the Defence Staff for three years was quickly altered. During the spring of 2020, Chief of Defence Staff Vice Admiral Elisabeth Natvig recommended transferring the Space Operations Section to the Chief of the Air Force, and Admiral Bruun-Hanssen appointed the Chief of the Air Force as military space authority as of January 2021. It would then be up to the Chief of the Air Force to manage all space activities within the Armed Forces, which partly entailed delegating professional authority for other military operating units to manage space-based ISR, SATCOM and PNT.⁷⁴²

However, as the decision was made, this spurred a debate concerning ISR, where the NIS argued that ISR was not tied to the professional authority for space, but to the professional authority for intelligence. Col. Nilsson saw the debate as ‘nonsensical’ because this was not mutually exclusive – ISR concerned space as well as intelligence. The distinction was in its use, and most other countries appointed the Air Force to manage the use of ISR in conventional military operations as a force-enhancing element, as opposed to its use for intelligence purposes.⁷⁴³ The use of space-based ISR was still largely confined to strategic use in the Armed Forces, but it was becoming increasingly clear that it could provide timely information at all levels of warfare and military command. Thus, the Armed Forces needed to focus more on the value of space-based ISR in operational planning and tactical implementation.⁷⁴⁴

In May 2020, the Space Operations Section, still formally a section under the Defence Staff, moved into new offices in Skøyen, Oslo, where some of the most central Norwegian space actors were localised in a ‘space hub’, including NOSA, Space Norway and KSAT. According to the plan approved by Admiral Bruun-Hanssen in December 2018, such a colocation was to ensure close collaboration with the national space community. In this ‘space hub, the Space Operations Section established monthly meetings with NOSA and ‘troika meetings’ between the heads of the Space

⁷⁴¹ Nilsson, interview.

⁷⁴² Nilsson, interview.

⁷⁴³ Nilsson, interview.

⁷⁴⁴ Runar Jørgensen and Eirik Ludvigsen, «Etterretning, overvåking og rekognosering i «New Space»,» *Lufitled*, no. 1 (2019).

Operations Section, NOSA and the national space infrastructure owner Space Norway. They would discuss overarching issues and identify areas for further collaboration, and the Armed Forces entered into formal agreements with NOSA, Space Norway, Andøya Space and KSAT.⁷⁴⁵

In the 'space hub', the Space Operations Section was shielded from the administrative tasks of the Defence Staff and unfolded their mission to integrate space as a new domain and ensure a holistic management of space within the Armed Forces. According to Col. Nilsson, they built an identity as 'a somewhat untraditional' and independent unit working 'on behalf of the Armed Forces together with the civilians...'. This had both 'a symbolic and a practical effect.'⁷⁴⁶ Civil-military cooperation was essential. Actors such as Statsat and the Norwegian Coastal Administration were also important, as was the FFI, one of Norway's 'most important drivers' in military and civilian space research and development for decades.⁷⁴⁷

The Space Operations Section started to plan, in accordance with Admiral Bruun-Hanssen's appointment of the Chief of the Air Force as military space authority as of January 2021.⁷⁴⁸ In June 2020, one of the military space strategic review working group members, Lt. Col. Ludvigsen, wrote a column in a national defence magazine stating that in Norway, 'the Chief of Defence delegates professional authority for military space activities to the Chief of the Air Force.' Correspondingly, the Air Force was now establishing a space organisation, which was 'the start of something completely new in Norway.' Sub-responsibilities for satellite surveillance, navigation and SATCOM were, however, still assigned to other units in the Armed Forces, as before.⁷⁴⁹

To prioritise the use of maritime satellite surveillance, SATCOM and space-based PNT capability in joint operations and exercises, the Chief of the NJHQ was appointed 'Space Coordinating Authority'. In addition to joint elements for land, air, sea and cyberspace, the NJHQ now added a joint space element to the mix. The Air Force envisioned managing space operations like the Army managed land operations and the Navy managed

⁷⁴⁵ Nilsson, interview.

⁷⁴⁶ Nilsson, interview.

⁷⁴⁷ Nilsson, interview.

⁷⁴⁸ Nilsson, interview.

⁷⁴⁹ Eirik Ludvigsen, «Militer romvirksomhet: Ser vi konturene av et nasjonalt romoperasjonssenter i Luftforsvaret?» Column, *Forsvarets Forum* (<https://forsvaretsforum.mpublish.no>), June 2020, 3, Forsvarets Operative Hovedkvarter, <https://forsvaretsforum.mpublish.no/03-2020/mobile/index.html#p=93>.

naval operations, and the planned space operations centre would establish ‘an understanding of space as a domain’ in the Armed Forces. They would follow up on space-based projects, control ‘future satellites’ and carry out other space operations-related tasks.⁷⁵⁰

The build up to attack and the subsequent war in Ukraine in 2022 soon demonstrated the value of satellite imagery and its extensive use by the media to publicly document and verify Russian military movements and actions. This exemplified the observations made by the former head of the NIS in March 2016 that news agencies were using satellite images ‘almost as an intelligence service would have done ten to twenty years ago.’⁷⁵¹ For example, the Norwegian media and the NIS both used the same commercial satellite image (Figure 33) obtained from Maxar Technologies to verify the build-up of Russian forces in Voronezh, 190 kilometres from the Ukrainian border.⁷⁵²



Figure 33. Russian military materiel in Voronezh in the autumn of 2021.⁷⁵³

⁷⁵⁰ Ludvigsen, «Militer romvirksomhet: Ser vi konturene av et nasjonalt romoperasjonssenter i Luftforsvaret?»

⁷⁵¹ Grandhagen, interview.

⁷⁵² Etterretningstjenesten, *Fokus 2022*, 10 (Forsvaret, 2022), <https://www.forsvaret.no>; Maria Lavik, «Norske diplomat-veteranar trur ikkje på storkrig,» *Vårt Land*, 20 January 2022, <https://www.vl.no>.

⁷⁵³ Photo taken by Maxar Technologies in 2021. The image was retrieved from Lavik, "Norske diplomat-veteranar trur ikkje på storkrig."

Space and intelligence: the Intelligence Service as military space authority

Despite its outwardly steady course, the Space Operations Section never made it to the Air Force. When Gen. Kristoffersen started as Chief of Defence in mid-August 2020, he reversed Admiral (Ret.) Bruun-Hanssen's plans within less than three weeks.⁷⁵⁴ Admiral Bruun-Hanssen recalled in retrospect that when he retired as Chief of Defence in August 2020 there was still disagreement within the Armed Forces as to whether the space programme should be continued in the Defence Staff, the Air Force Staff or the NIS. At times, there was also 'too much focus on "the space programme" rather than the actual capacities and services that the Armed Forces wanted to acquire.'⁷⁵⁵

Chief of Defence Gen. Kristoffersen recalled that once he was appointed in August 2020, the outbound Chief of the NIS had warned him of how 'Program Space' incited 'parallel environments without joint commitment to space in the Armed Forces.' Since the original intent was to achieve holistic coordination of military space activities, the outbound Chief of the NIS maintained that 'Program Space' was directly working against its purpose. This was happening mainly because it did not have insight into the extensive space activities carried out by the NIS, which constituted a significant proportion of military space activity in Norway.⁷⁵⁶

Having worked with satellite-based information for decades, the NIS had established a competence base and an international network of partners, and 'Program Space' thus appeared to be working in parallel and without insight. Upon this basis, the outbound Chief of the NIS recommended to the new Chief of Defence that as a starting point, the NIS should be responsible for all military space activities in Norway. Gen. Kristoffersen reasoned that the development of two parallel space environments in the Armed Forces was counterproductive for the small state of Norway and consequently asked the Chief of the NIS to take on the role of Norway's military space authority.⁷⁵⁷

⁷⁵⁴ Nilsson, interview.

⁷⁵⁵ Haakon Bruun-Hanssen, "E-mail Correspondence with Former Chief of Defence Admiral (Ret.)"; Haakon Bruun-Hanssen: "Space", 18 July 2022, interview by Tale Sundlisæter, 2022.

⁷⁵⁶ Eirik Kristoffersen, "E-mail Correspondence with Chief of Defence General Eirik Kristoffersen: 'Program Space'", 10 June 2022, interview by Tale Sundlisæter, E-mail, 2022.

⁷⁵⁷ Kristoffersen, "E-mail Correspondence with Chief of Defence General Eirik Kristoffersen: 'Program Space'".

With that, it was swiftly decided that the Space Operations Section would no longer be added to the Air Force, but rather to the NIS.⁷⁵⁸ Within the NIS, the unit once known as Program Space within the MoD and the Space Operations Section within the Defence Staff became known as the ‘Space Division.’⁷⁵⁹ The NIS absorbed the associated personnel resources and significantly increased its operations budget, ‘because there were significant resources tied to the professional authority’s responsibility for space.’⁷⁶⁰ In addition to being Norway’s commanding authority for intelligence, the Chief of the NIS now also acted as Norway’s commanding authority for military space activities.⁷⁶¹ Col. Nilsson’s main question to this approach was how the Chief of the NIS would handle this dual role?⁷⁶²

Vice Admiral Stensønes became Chief of the NIS in November 2020, after the former Chief of the NIS had convinced Gen. Kristoffersen to appoint the NIS as military space authority. In an interview, he would, therefore, explicitly not comment on the considerations related to the Air Force or the NIS in this role. He observed, however, that most countries organised their military space activities within their air force and characterised this approach as traditional, ‘but a bit old-fashioned’. Space was an independent operating domain that differed from the air domain, both in terms of the properties of the space domain itself and the physical laws by which objects in space are bound. ‘It is almost like comparing surface vessels and aircraft’, the Vice Admiral observed, and because the NIS had such a long-standing experience with space activities, they had ‘a much better starting point’ to serve as the Armed Forces’ space authority. He compared the Norwegian approach to that of the US, where ISR was managed by the IC. In Norway, the NIS supported all levels, including the political, military-strategic, operational ‘and down to tactical level’, with a decision-making basis derived from satellites and other collection platforms.⁷⁶³

⁷⁵⁸ Nilsson, interview.

⁷⁵⁹ Nilsson, *Space i Forsvaret: Det femte operasjonsdomene i et femte generasjons forsvar*, 7.

⁷⁶⁰ Nilsson, interview.

⁷⁶¹ Stig Nilsson, *OMS: Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet*, podcast audio, Oslo Militære Samfund, 2021, 20:18, <https://oslomil-samfund.no/2021/09/07/foredrag-spacedomenet-det-femte-domenet-i-femte-generasjons-forsvar-oberst-stig-nilsson-sjef-forsvarets-romvirksomhet/>.

⁷⁶² Nilsson, interview.

⁷⁶³ Nils Andreas Stensønes, ‘Interview with Vice Admiral Nils Andreas Stensønes (Royal Norwegian Navy), Chief of the Norwegian Intelligence Service, 20 May 2022, NIS headquarters at Lutvann, Oslo, Norway. [In Norwegian],» interview by Tale Sundlisæter, 2022.

Vice Admiral Stensønes believed that the primary advantage of organising the space programme within the NIS was that ‘you could merge everything here.’ Additionally, due to their extensive network of international partners, the NIS knew more than the other Norwegian military operating units about what Norway could obtain from others. Consequently, the NIS was also the most qualified military operating unit to identify in which niches and space capabilities Norway could develop. He did not elaborate on space-based PNT or SATCOM, however. ‘We are talking about intelligence, surveillance, and reconnaissance,’ and one and the same satellite could be used to collect data supporting all three aspects. Whether it was one or the other depended on timeliness, time-criticality and observation frequency. The intelligence aspect was tied to products, where data from the same satellite was processed and assessed within a larger context along with information from other sources. ‘ISR merges, in a way, and is used for different purposes.’⁷⁶⁴

The Intelligence Service and the Space Division

Once subordinated to the NIS, whose overall budgets had tripled over the past 15 years,⁷⁶⁵ the Space Division adjusted its agreement with NOSA. The Armed Forces would no longer collaborate directly with the individual Norwegian civilian space actors but would use NOSA as a single point of contact, whereby NOSA would enter into agreements, act as a secretariat, and lead studies on behalf of the Armed Forces. The Space Division was still located in the ‘space hub’ on the western side of Oslo, ‘...where we could work closely together...’ Their collaboration with NOSA during this time encompassed regular meetings at executive and working group levels.⁷⁶⁶

According to Col. Nilsson, there were certain ‘fixed’ key premises tied to the Space Operation Section’s transfer to the NIS in the autumn of 2020. This entailed that their tasks, responsibilities and location remained the same and that they would continue to manage the space authority role as delegated by Gen. Kristofferson to the Chief of the NIS. This role entailed

⁷⁶⁴ Stensønes, interview.

⁷⁶⁵ Erik Andreassen, «E-tjenesten styrkes med milliarder - får mer penger enn noen-sinne», *NRK Troms og Finnmark*, 9 October 2020, <https://www.nrk.no/tromsogfinnmark/etterretningstjenesten-styrkes-igjen--budsjetter-mer-enn-tredoblet-de-siste-15-arene-1.15192192>.

⁷⁶⁶ Nilsson, interview.

A function-oriented management structure for military space activity

In 2021, the Space Division advised the Chief of the NIS to establish an executive management group as part of a three-level structure to maintain the various professional responsibilities, including SDA, ISR, SATCOM and PNT.⁷⁷² The structure was based on a management concept where subject matter authorities related to ‘space’, namely SDA, ISR, SATCOM and PNT, were delegated and subordinated to the commanders of the different military operating units⁷⁷³ and which constituted traditional competence areas that had long since been established within the Armed Forces.⁷⁷⁴ It follows that the chosen organisational structure essentially constituted the answer to Admiral Bruun-Hanssen’s question in January 2015 considering what was really ‘special’ about space?⁷⁷⁵ The answer seemed to be that it was principally the function of the space capability, whether it was SDA, ISR, SATCOM or PNT.⁷⁷⁶

The proposal to establish an executive management group was a continuation of an initiative that commenced with Program Space in 2016 and its establishment of a space coordination forum, which between 2016 and 2020 met three times a year to discuss progress. It included commanders from military operating units such as the Navy, the NJHQ, the NIS, the FFI, the Special Forces, the Air Force and the Home Guard (*Heimevernet*), as well as NOSA. The space coordination forum constituted the second level of the three-level structure, where the third level encompassed working groups in relevant military operating units and the first level was the proposed executive management group.⁷⁷⁷

Completing the three-level management structure for military space activity, the management group was established upon its first meeting held in May 2021. The Space Division presented the recommended structure and the Chief of the NIS endorsed it and added the Director of the FFI

⁷⁷² Nilsson, interview.

⁷⁷³ Nilsson, OMS: *Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet*, 19:00–22:00.

⁷⁷⁴ Nilsson, OMS: *Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet*, 20:00–24:00.

⁷⁷⁵ Bruun-Hanssen, interview.

⁷⁷⁶ According to Lt. Gen. (Ret.) David A. Deptula, one should move beyond domain-based commands towards functionally based commands – commands based on functions, where the domains are simply where those functions are conducted, i.e., an ISR cyber command: Deptula, interview.

⁷⁷⁷ Nilsson, interview.

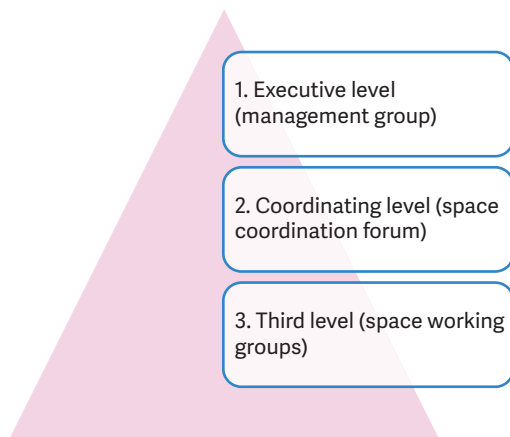


Figure 35. Three-level management structure for military space activity.

to the group.⁷⁷⁸ The executive group members agreed on the structure in mid-2021 and planned to meet regularly to reinforce the Armed Forces' space activities.⁷⁷⁹

The structure was later presented by the Head of the Space Division in September 2021.⁷⁸⁰ The management group was led by the Chief of the NIS, Norway's military space authority, who, in capacity of being Chief of the NIS, retained responsibility for SDA and space-based ISR. The Chief of the NJHQ, currently in the process of establishing a dedicated Space Operations Centre, was 'Space Coordinating Authority', responsible for allocating and prioritising space capabilities in military operations. The Chief of CYFOR was responsible for SATCOM and the Chief of the Navy was responsible for PNT.⁷⁸¹

In May 2022, Chief of the NIS Vice Admiral Stensønes conveyed that establishing 'the management group' had been his first undertaking as Norway's military space authority, which constituted 'a central leadership forum' for space activities in the Armed Forces. The organisation of Norway's military space activity was certainly based entirely on the functions that space capabilities support, encompassing SDA, ISR, SATCOM and PNT. This was further underpinned by the working groups that were established across the various vested military operating units, as these

⁷⁷⁸ Nilsson, interview.

⁷⁷⁹ Nilsson, *OMS: Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet*, 19:00–22:00

⁷⁸⁰ Nilsson, *Space i Forsvaret: Det femte operasjonsdomene i et femte generasjons forsvar*, 6.

⁷⁸¹ Nilsson, *Space i Forsvaret: Det femte operasjonsdomene i et femte generasjons forsvar*, 6.

groups were also organised by function and focused on the core subject areas of SDA, ISR, SATCOM and PNT.⁷⁸²

According to the Vice Admiral, the management group's principal task was to ensure that all of Norway's military interests were maintained across the military operating units within the Armed Forces, as well as for Norway's political executive leadership. The executive-level management group would meet twice a year 'or as needed', and the Vice Admiral expected to use this group 'to make the difficult choices.' By May 2022, the group had met three times. During the first meeting, they cemented the roles and responsibilities corresponding to the abovementioned considerations, where 'the original and traditional responsibilities for space activities in the Armed Forces' would be continued as before. As outlined above, this meant that the Chief of CYFOR would still be responsible for SATCOM and the Chief of the Navy would still be responsible for PNT. The Chief of the NIS, as before, would be responsible for space-based ISR. During their second meeting, the space management group assessed progress. At their third meeting, they developed a long-term concept for satellite operations, and this draft was consulted by vested parties in mid-May 2022.⁷⁸³

Terminating the Space Division – implications and aspects to consider

Soon after the appointment of the NIS as military space authority, the Space Division's location became an issue, and it was decided to relocate the unit to the NIS' headquarters on the eastern outskirts of Oslo.⁷⁸⁴ The process of terminating the Space Division was managed by the NIS' new Deputy Director, who subsequently took the helm of the management structure's second level, that is, the space coordination forum. The deputy transferred the Space Division's resources and personnel from the 'space hub to the NIS' headquarters, where the resources were distributed among the 'classic intelligence divisions' within the NIS.⁷⁸⁵ Soon a new structure with a development unit, an operational unit and a "Space Commander", was set

⁷⁸² Stensønes, interview; According to Lt. (Ret.) Gen. David A. Deptula, militaries organised in the past by domains because the technologies of the day had not advanced to the degree that functions could be accomplished in multiple domains, but this is now changing: Deptula, interview.

⁷⁸³ Stensønes, interview; Deptula, interview.

⁷⁸⁴ Nilsson, interview.

⁷⁸⁵ Nilsson, interview.

up, responsible for executing space operations to support operational and tactical military levels.

The ‘dual-mission’ of operational support and strategic intelligence was not a problem, according to Chief of the NIS Vice Admiral Stensønes. On the contrary, his perception was that ‘the two parallel [military space] environments’ had now been merged, since ‘everything’ was now assembled within the NIS. With that, the NIS was free to develop a unified competence base to ‘task satellites, develop new capacities and operate established systems.’ The Vice Admiral had decided to discontinue the Space Division ‘to avoid duplication’ of work. Further underpinning the significance of the three-level management structure for military space activity, the NIS distributed the Space Division’s resources by function, ‘because it does not matter if the data comes from satellites, land stations or other collection capabilities.’⁷⁸⁶

Serving as an interface, the NIS also had a dedicated person heading its own ‘Program Space Capacities’, whose requirements were set by the NIS Collection Division in the same manner as the other collection platforms. The head of this internal programme was tasked to meet the collection requirements and to ‘develop the right [space] capabilities.’⁷⁸⁷

The dilemma, as Col. Nilsson saw it, was that one of the Space Division’s key functions had been to maintain the separation between the two distinct missions of space support to military operations and intelligence. He emphasised that the Chief of the NIS was now responsible for meeting the space requirements of the entire Armed Forces, not just that which entailed intelligence.⁷⁸⁸

In May 2022, the Chief of the NIS said his organisation had agreements with ‘all the relevant players’, and as Chief of the NIS *and* as the Armed Forces’ ‘Space Commander’, Vice Admiral Stensønes signed ‘all these agreements’ himself. For example, the NIS was currently working with NOSA to develop ‘the best unclassified image Norway could get.’ The idea was to use this ‘image’ as a baseline upon which they could add layers with information of different classification levels ‘for use in different contexts, share with different partners, and so on.’ The NIS also collaborated with ‘all the relevant international actors’ and the Vice Admiral had, since

⁷⁸⁶ Stensønes, interview.

⁷⁸⁷ Stensønes, interview.

⁷⁸⁸ Nilsson, interview.

he took the helm as Norway's military Space Commander, attended 'the Space Commander's Conference in Colorado' on two occasions.⁷⁸⁹

The obvious challenge was for the NIS to maintain the 'conventional' space collaboration on behalf of the entire Armed Forces, and support both the national joint operational level and the tactical forces with space support for operations, ranging from ISR to targeting support. The NIS had a strong established network of intelligence services on a bilateral level, but little in relation to 'conventional' military services. The NIS normally only interacted with other nations' intelligence communities but had now taken it upon itself to cooperate with other environments, such as other nations' air forces, which is where space affairs were normally located in NATO partner countries.

Chapter conclusion

The battle for space authority in the Armed Forces appears as a turbulent affair for those who were involved. The question of which military operating unit was best suited to manage the role of Norway's military space authority and Space Commander, as predicted during the military space strategic review, certainly incited inter-service rivalry within the Armed Forces. Despite the Air Force's lack of experience with operational use of the space domain, Program Space proposed that the Air Force should have a leading role. This proposal caused slight rancour amongst the other services, especially the NIS. Appointing the Air Force was partly based on how space was treated in Norwegian military joint doctrine, however, considering that these doctrines have not corresponded well to Norway's actual military space activity over the years, the proposal seemed somewhat peculiar. While the Chief of Defence did appoint the Air Force, he later recalled that there was, in fact, no consensus as to whether the Defence Staff, the Air Force Staff or the NIS should have a leading role in the nation's military space activity when he retired in August 2020. While the Air Force was chosen to achieve parity with other nation-states as the strongest argument, the NIS had a stronger basis, considering their experience with activities entrenched in the space domain, as the NIS has been a central military operating unit in this respect from the onset. There was, however, a question of the nature of the military space activity of which the Air Force was

⁷⁸⁹ Stensones, interview.

designated to be responsible, as it did not pertain to the intelligence domain, but to military force enhancement.

It was certainly ironic that Program Space and its derivatives were accused of further dissevering Norwegian military space activities, since the very purpose of establishing the unit was to ensure holistic coordination of space on behalf of the entire Armed Forces. To which extent this argument was true or driven by personal or institutional aspirations for the NIS to absorb the military space investment and its resources is unclear, although the same can be said of appointing the Air Force as space authority. At times, it seems as if both solutions can be partly attributed to the aphorism ‘Miles’s Law’, namely, that where you stand depends on where you sit. Given the history of Norwegian military space activity, including that which entails the development of indigenous military space capability, the appointment of the NIS as military space authority was not surprising. The MoD’s State Secretary had even proposed in 2016 that the NIS was a clear military space authority candidate, and it can be understood in a wider sense that the appointment of the NIS corresponds to Norway’s overall bolstering of the NIS over the past decades. While the NIS is becoming an increasingly powerful institution in Norway, the question of how and to what extent they will be able to manage the dual role that space and intelligence *and* space and the military constitutes, is essential.

Securing the High North: space as a pillar in Norway's defence and security policy (2014 to present day)

Military SATCOM for communications, command and control

In January 2015, Chief of Defence Admiral Bruun-Hanssen conveyed that the Armed Forces would likely acquire their own communications satellite. While the Armed Forces were currently using SATCOM as an addition to the land-based network on the Norwegian mainland, they relied extensively on SATCOM for communications outside Norway.⁷⁹⁰

The Chief of Defence principally focused on the bottom line. Norway's first attempt to acquire military SATCOM was due to the high expenses that leasing commercial SATCOM entailed, where the more they used, the more it made sense to invest in indigenous capacity. While Norway had suffered 'a temporary setback' with Hisdesat, the MoD were currently assessing other solutions, including partnering with other nation-states, commercial actors or going it alone.⁷⁹¹ Inspector General of CYFOR Maj. Gen. Odd Egil Pedersen too observed that Norway's military space activity was a matter of resources, as space systems were 'extremely expensive'. This was now changing, both in terms of SATCOM and 'small satellites'.⁷⁹²

Chief of the NJHQ Lt. Gen. Rune Jakobsen believed the Armed Forces were currently using satellite data to the extent that they were dependent, and SATCOM was an absolute necessity for secure communication also at home, in northern Norway. Internal communication within the brigade,

⁷⁹⁰ Bruun-Hanssen, interview.

⁷⁹¹ Bruun-Hanssen, interview.

⁷⁹² Odd Egil Pedersen, "Interview with Maj. Gen. Odd Egil Pedersen, Commander of the Norwegian Cyber Defence Force, 18 November 2015, Norwegian Defence Command and Staff College, Akershus Festning, Oslo, Norway. [In Norwegian]," interview by Tale Sundlisæter, 2015.

as well as from the Northern Brigade to the NJHQ, was currently 'a big challenge' due to the insufficient coverage provided by geostationary satellites in the High North. This region required elliptical-orbiting satellites. The original driver for SATCOM was Norway's participation in international military operations such as in Afghanistan, where the Armed Forces entirely depended on satellites to relay daily and weekly reports and encrypted communications. The primary task was then to convey situational understanding to Norway.⁷⁹³

Lt. Gen. Jakobsen also noted that the Armed Forces were currently running several missions without classified means of communication, such as in South Sudan or in Mali, where they used unclassified Skype services 'because we have nothing else'. It was a matter of cost and benefit, and establishing satellite downlink in South Sudan was expensive, so the contribution had to be of a certain size 'to justify the cost'. The Armed Forces sometimes had to choose alternative solutions, which in an extreme case would be 'an African pre-paid SIM card', with the limited functionality and increased risk that entailed. In joint operations with the US, the Armed Forces accessed US SATCOM capability, such as in Afghanistan, for local operational use and for operations carried out by the Norwegian task unit or Quick Reaction Force. However, this did not include all communication to Norway, and using civilian satellites in Afghanistan for administrative communication 'costs a lot of money'.⁷⁹⁴

According to the Chief of NDLO Petter Jansen, in March 2015 there were no clear, unambiguous plans to procure space capability for the Armed Forces, but 'suggestions on the table' entailed a geostationary as well as an affordable new generation of HEO SATCOM as a solution. The latter would ensure SATCOM coverage in the High North. Defence Study 2015 would likely provide an answer because the SATCOM market was 'very variable', and current alternatives were often limited due to military requirements for 'top secret' communication.⁷⁹⁵

The other key driver behind military SATCOM was the F-35. Once the Armed Forces started using the F-35, the Chief of Defence believed there was 'no other choice' than to acquire SATCOM. The F-35 made SATCOM

⁷⁹³ Jakobsen, interview.

⁷⁹⁴ Jakobsen, interview.

⁷⁹⁵ Jansen, interview.

more relevant than anything else because the aircraft was to generate and share considerable amounts of data with other platforms, which required continuous inbound and outbound communications with the aircraft. The Armed Forces would be too dependent on others if they could not control their own SATCOM capability, and F-35 operations in the High North would likely be a primary driver in Norway's SATCOM acquisition plans.⁷⁹⁶

Inspector General of the Air Force, Maj. Gen. Per-Egil Rygg, could 'almost guarantee' that Defence Study 2015 would address F-35 and SATCOM in the High North. The F-35 was a central capability, and SATCOM was an independent requirement tied to the aircraft. Norway currently depended on other militaries and civilian actors for SATCOM capacity, and while the lack of nationally controlled SATCOM would not ground the F-35, it would significantly reduce its flexibility and Norway's autonomy in relation to other states. Norway could not afford such a limitation, and Maj. Gen. Rygg was therefore certain the issue would be resolved.⁷⁹⁷

A major inhibiting factor in Norway's military SATCOM acquisition process was the government's procurement system. Acquiring 'a new gadget' required following a strict protocol that must be approved by the MoD, encompassing quality assurance and risk assessment. The time from capacity selection to procurement could take up to ten years. This was counterproductive in the sense that the Armed Forces were outpaced by the technological development in the meantime. NATO was 'full of large mastodon systems that are outdated before they are implemented.' The Armed Forces must shorten its decision cycle and run more projects over operational budgets as opposed to investment funds. As the NJHQ commander saw it, it was in fact advantageous to purchase commercial capacity which you could 'throw away after three years.'⁷⁹⁸ Chief of the Norwegian Navy Rear Admiral Saunes too believed that the Armed Forces should reinforce redundancy by expanding commercial partnerships.⁷⁹⁹

The CYFOR commander strongly believed that all military domains, including land, sea, air and cybersecurity, 'really belong together', and many

⁷⁹⁶ Bruun-Hanssen, interview.

⁷⁹⁷ Per-Egil Rygg, "Interview with Maj. Gen. Per-Egil Rygg, Commander of the Royal Norwegian Air Force, 27 January 2015, Rygge Air Base, Norway [in Norwegian]," interview by Tale Sundlisæter, 2015.

⁷⁹⁸ Jakobsen, interview.

⁷⁹⁹ Lars Saunes, "Interview with Rear Admiral Lars Saunes, Inspector General of the Royal Norwegian Navy, 22 January 2016, Norwegian Defence Command and Staff College, Akershus Fortress, Oslo, Norway. [In Norwegian]," interview by Tale Sundlisæter, 2016.

of Norway's military capabilities interacted and transmitted large volumes of data through the space domain. Norway deployed forces to remote locations, such as Afghanistan, Iraq and Mali, and had vessels sailing 'all over the world', and SATCOM was the only way to ensure continuous data transmissions during operation. SATCOM was often a prerequisite for communications and C2 of Norwegian military vessels, aircraft and terrestrial forces, and for the Armed Forces' ability to 'see the same picture' – be it a pilot in a cockpit, a soldier on the ground or a person standing on the bridge in a vessel. Moreover, during the Bold Quest military exercise series of this period, they had carried out experiments in the cyber domain that entailed remotely steering a vessel in northern Norway from Texas in the US. This included firing with live ammunition from the remotely steered vessel using target data acquired from the exercise location in Texas. The ability to link continents, capabilities and military services to develop holistic situational awareness was 'enormous' and would only continue to improve with the increasing number of sensors and capacities deployed in the various domains.⁸⁰⁰

The Chief of the NJHQ too situated Defence Study 2015 and space activities within the context of the Armed Forces' strive towards network-centric defence, 'where sensors are connected in seamless networks'. The Armed Forces were now prioritising 'cyber capabilities' to ensure holistic situational awareness and C2 from the strategic down to the tactical level. Overall, space capacities played 'a consistent role at all levels' of strategy. Some units were 'completely dependent' on communicating with aircraft, for example, and SATCOM was then preferable. Satellite was 'almost a prerequisite' for the NJHQ to communicate with tactical units in the Navy, the Northern Brigade or other elements. Although Lt. Gen. Jakobsen could communicate with the military-strategic level in Oslo without satellite, 'fibre channels are vulnerable' and SATCOM constitutes redundancy in strategic communication.⁸⁰¹

The Army was, for example, acquiring fully digital CV-90 steel armoured vehicles. The situational picture in each individual carriage was identical and used local networks to manage target data in real time. However, for the

⁸⁰⁰ Pedersen, interview.

⁸⁰¹ Jakobsen, interview.

NJHQ to access the data, they had to be relayed via satellite. Interoperability requirements were becoming even more prominent with the F-35, and ‘everything’ was based on attaining situational awareness and ‘seamless’ communication of situational awareness and target data. Operational systems must communicate with fighter aircraft through NATO links 11 and 16, which the Armed Forces used extensively at home and in NATO operations. CYFOR reflected this accelerating development, where geography and distance determined capacity selection. Ultimately, ‘all indications are that the space segment is becoming more important.’ According to Lt. Gen Jakobsen, there was at this point no need for Norway to develop indigenous image satellites, because the country lacked the communications capability to support it.⁸⁰²

Indeed, the interconnectedness of sensors and capacities often required satellite capacity. One of the CYFOR commander’s principal tasks was therefore to ensure ‘freedom of action’ in space, so the satellites were ‘safe to use for Norwegian forces.’ This presented a few, basic questions. Which satellite should you choose? Should you own that satellite yourself, or should you share it with someone? Or should you team up with a commercial venture?⁸⁰³

From a security policy perspective, the CYFOR commander believed that national ownership of the satellite, which Norway lacked, was essential. Unless their communications were unclassified, the Armed Forces had to encrypt the data, and cryptography was therefore inextricably linked and just as essential. With cryptography, the Armed Forces could somewhat control the data despite not owning and controlling the satellite. If the adversary could not ‘crack the crypto’ within an acceptable time frame, it might be acceptable that the encrypted data ended up in the wrong hands. Although Norway was a relatively small state, Norway had a surprisingly substantial cryptography competence and capacity.⁸⁰⁴ The Chief of Defence too noted that whichever solution they chose to acquire, the Armed Forces could employ national cryptography to ‘everything we do’ with the satellite.⁸⁰⁵

⁸⁰² Jakobsen, interview.

⁸⁰³ Pedersen, interview.

⁸⁰⁴ Pedersen, interview.

⁸⁰⁵ Bruun-Hanssen, interview.

Perhaps the most considerable issue for Norway was that most SATCOM capacities designed to cover Europe, North Africa and Afghanistan did not necessarily cover Norway's areas of interest, most notably the High North, which required HEO satellites. Maj. Gen. Pedersen proposed that Norway's Prime Minister should ensure a holistic High North SATCOM strategy, encompassing the command of SATCOM for national self-sufficiency. The Armed Forces had operated in the High North for several years, but other national actors from sectors such as justice, petroleum, fisheries and the environment were starting to get 'more involved' in the region. The Armed Forces were therefore 'not alone in the north anymore' and a national satellite could cover the needs of several sectors and agencies.⁸⁰⁶ Certainly, this implicated a reinforced impetus to establish national space capability.⁸⁰⁷

Whilst it 'sounds very nice to have a national satellite', the CYFOR commander also reflected upon how such a satellite could pose a security policy risk if all the vested sectors decided to 'lay their eggs in this satellite'. The small state of Norway would not be able to withstand 'all the noise' that would arise in the space domain in a crisis or war scenario. Military use of a national, dual-use satellite implied that the satellite constituted a legitimate military target, which posed some challenges that 'the nation and the state must think about'. Considering a non-friendly scenario with another 'player in the north', or if someone wanted to 'influence' Norway militarily, that actor could certainly employ offensive space control measures towards the Norwegian satellite. Depending on the satellite's functions, capacities and other properties, the adversary could jam the satellite or get it 'out of sync'. Thus, it would impact all the users negatively that this satellite was being used by the Armed Forces, and 'the fisherman who is going fishing even if there is a crisis' might not be able to use that satellite.⁸⁰⁸

Commercial SATCOM raised the issue that you do 'not really always know exactly who owns them'. It was not always evident whether the capacity was owned by a nation-state or a commercial player listed on the stock exchange. Whilst commercial players could likely cover Norway's military requirements in the High North in peacetime, access to commercial capability would be much less certain in a war or crisis scenario. Commercial

⁸⁰⁶ Pedersen, interview.

⁸⁰⁷ Shabbir, Sarosh and Nasir, "Policy Considerations for Nascent Space Powers."

⁸⁰⁸ Pedersen, interview.

actors were likely to be influenced by the warring parties and would likely prioritise their own government's needs for expanded SATCOM capacity. A holistic, national SATCOM strategy for the High North should thus be established to ensure Norway redundant capacity through multilateral collaboration. The Americans, the Canadians, the British, the Dutch, the Germans and the French came to mind, that is, partners who were already 'politically accepted and approved.' Surely, an American-owned satellite would make it 'much more difficult' for Russia because an attack on that satellite could evoke a 'major political crisis' involving the Americans. A Russian attack on a national, Norwegian satellite, however, merely equated to a small state facing a large nation. According to the CYFOR commander, this was the central security policy dilemma.⁸⁰⁹

This was a question of deterrence and reassurance,⁸¹⁰ and could be understood as an element in Norway's strive for collective security.⁸¹¹ Maj. Gen. Pedersen advocated that deterrence would be the wisest approach, because partnering with the US in space would reduce the likelihood of Russian aggression towards Norway in space. The question was whether an attack on a Norwegian satellite, or a satellite in general, would trigger NATO's Article V. Would NATO come to Norway's rescue in a scenario where Russia incapacitated a national, Norwegian satellite? Like the cyber domain, if it could not be proved that lives or great values were at stake, these questions were at best challenging to answer.⁸¹²

Consolidating Norway's position in the Arctic

In 2015, advocacy for SATCOM was gaining traction, not only amongst military executives and officers but also at the highest levels of government, where the MoD was working actively to establish national SATCOM capability in the High North. When the US took the helm of the Arctic Council in 2015, they established a task force to map the needs for Arctic

⁸⁰⁹ Pedersen, interview.

⁸¹⁰ Holst, «Norsk sikkerhetspolitikk i strategisk perspektiv.» 465.

⁸¹¹ Tamnes, *Integration and Screening: The Two Faces of Norwegian Alliance Policy, 1945–1986*, 60–61.

⁸¹² Pedersen, interview.

telecommunications capacity, and NOSA proposed a concept consisting of two HEO satellites.⁸¹³

In February 2016, State Secretary Bø observed that there were ‘changes underway’. The MoD and the MTIF were examining financing mechanisms that entailed involving the civil aviation and shipping sectors. Bø’s aim was to limit the MoD’s expenses and integrate ‘defence and military elements’ onto the satellites, ‘as part of the whole package.’⁸¹⁴ According to Col. Nilsson, the MoD also planned to supply Norway’s allies and NATO operations in the High North with military SATCOM capability in return for favours, adhering to a one-on-one equal value exchange policy. This could entail anything from training, courses, NATO contributions or other forms of remissions.⁸¹⁵

In late March 2016, four parliamentarians from the Labour Party requested a solution to ensure broadband communications in ‘the Norwegian part of the High North’ and advocated that Norway, with that, should apply national technology and infrastructure to ‘take a leading role that will consolidate Norway’s position in the Arctic.’⁸¹⁶ By May, the Transport and Communications Committee backed the request.⁸¹⁷

During the autumn of 2016, the Government started an external project investigation, which in April 2017 recommended proceeding with the ‘pan-Arctic coverage’ SATCOM concept. The Norwegian ‘sector-political’ space infrastructure owner Space Norway, wholly owned and managed by the MTIF, had since 2015 worked on the concept, where two HEO satellites would provide coverage 24 hours a day north of 65° latitude. A ground station and an operation centre located in Norway would ensure national satellite control, and the proposition declared that the satellite system ‘will be used by the Armed Forces, Norway’s allies, and international commercial actors.’⁸¹⁸

⁸¹³ Botten et al., *Representantforslag fra stortingsrepresentantene Else-May Botten, Odd Omland, Torstein Tvedt Solberg og Eirik Sivertsen om å sikre bredbåndstelekomunikasjon i nordområdene*.

⁸¹⁴ Bø, interview.

⁸¹⁵ Nilsson, interview.

⁸¹⁶ Botten et al., *Representantforslag fra stortingsrepresentantene Else-May Botten, Odd Omland, Torstein Tvedt Solberg og Eirik Sivertsen om å sikre bredbåndstelekomunikasjon i nordområdene*.

⁸¹⁷ Transport- og kommunikasjonskomiteen, *Innstilling fra transport- og kommunikasjonskomiteen om Representantforslag fra stortingsrepresentantene Else-May Botten, Odd Omland, Torstein Tvedt Solberg og Eirik Sivertsen om å sikre bredbåndstelekomunikasjon i nordområdene*, Innst. 304 S (2015-2016) (Stortinget, 2016).

⁸¹⁸ Nærings- og fiskeridepartementet, *Space Norway AS og prosjekt for satellittkommunikasjon i nordområdene*, Prop. 55 S (2017-2018) (Nærings- og fiskeridepartementet, 2018), 2.

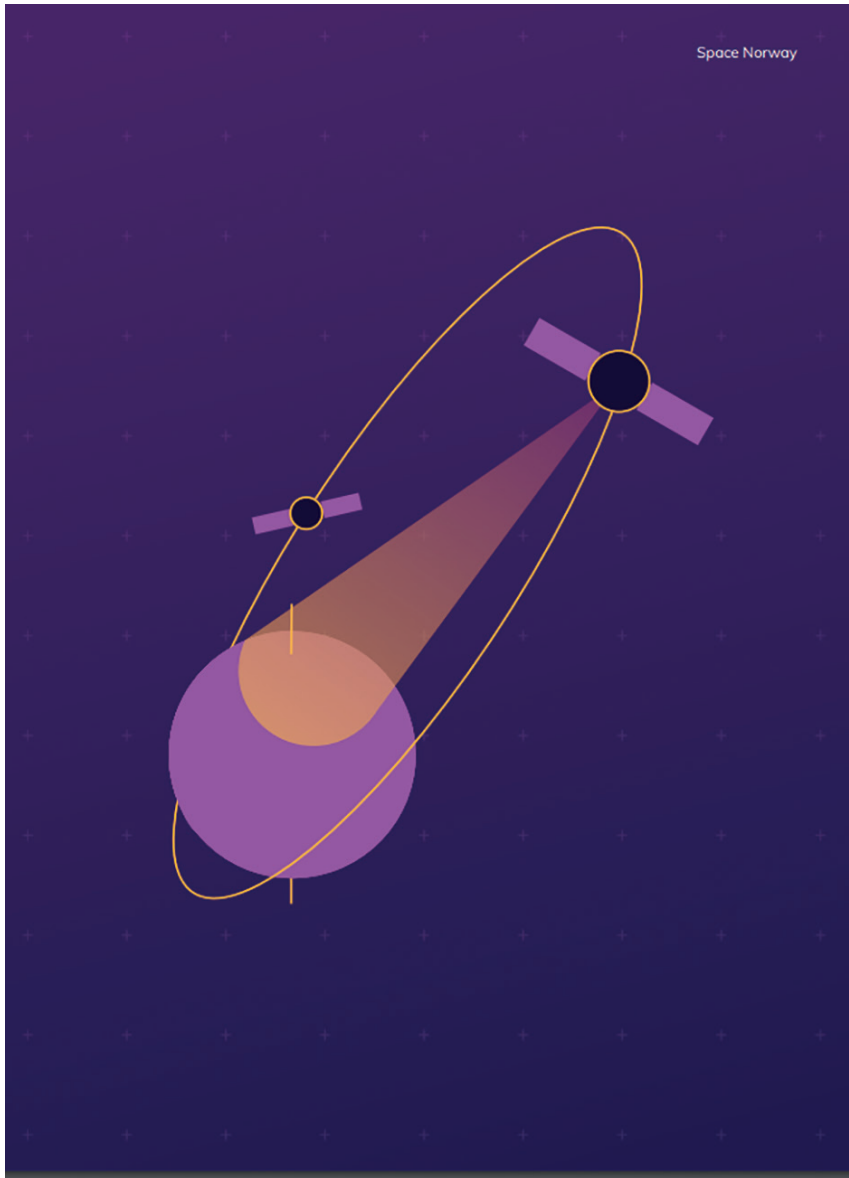


Figure 36. Illustration of Space Norway's HEO satellite constellation.⁸¹⁹

In mid-2017, Space Norway inquired about capital to carry out the HEO project from the MTIF. The project went through an external quality

⁸¹⁹ Space Norway, *Space Norway Annual Report* (Space Norway, 2020), 13, https://spacenorway.no/wp-content/uploads/Space-Norway_Annual_Report_2020_ENG.pdf.

assurance, where this examination concluded that commercial SATCOM providers within a few years would cover Norway's societal needs in the High North and therefore did *not* support the Government's proposal to establish national SATCOM capability. Following a revised inquiry by Space Norway in January 2018, an interdepartmental evaluation underlined that the Government firmly disagreed with the external review. According to the Government, the external review had underestimated existing and future needs and overestimated alternative solutions. After all, the High North was Norway's most important strategic area of responsibility and the SATCOM project supported this policy. Specifically, it was 'especially important to establish a capability that can cover the needs of the Armed Forces', and the solution proposed by the external review did not suffice in this respect. The Space Norway project was thus 'the most cost-effective way' to meet Norwegian civilian as well as military user needs in the High North.⁸²⁰

In the spring of 2018, the MTIF announced that Parliament 'may grant a conditional commitment' to fund Space Norway's HEO SATCOM project with USD 139 million, then corresponding to approximately NOK 1.1 billion. This constituted 25 percent of the project's total costs of USD 556 million, and the remaining 75 percent was to be obtained through external loans and customer prepayments. Space Norway would negotiate agreements with customers within the first quarter of 2019 and launch the satellites in 2022. The satellites had a life expectancy of 15 years and would ensure Norway's strategic national considerations, that is, the Armed Forces' requirements for military broadband under national control.⁸²¹

The MTIF now publicly declared that the 'Government wants Arctic internet'. According to Minister of Foreign Affairs Ine Eriksen Søreide, it was 'quite natural' that Norway took the lead in improving the communications capability in its 'most important strategic area of responsibility'. The Norwegian authorities required SATCOM for search and rescue, oil spill protection and crisis management, and the Armed Forces required consistent and secure communications to operate in Norwegian waters.

⁸²⁰ Nærings- og fiskeridepartementet, *Space Norway AS og prosjekt for satellittkommunikasjon i nordområdene*, 3.

⁸²¹ Nærings- og fiskeridepartementet, *Space Norway AS og prosjekt for satellittkommunikasjon i nordområdene*, 4.

According to Minister of Defence Frank Bakke-Jensen, the satellite solution could serve the Armed Forces as well as Norway's allies.⁸²²

In late May 2018, the Industry Committee endorsed the HEO SATCOM proposition, emphasising its foreign and security policy significance. The committee emphasised that the Armed Forces, Norway's allies and commercial actors would use the capability, and stated that with this project, Norway took a regional lead in the High North, strengthening its position in the Arctic. The committee remarked that European PNT and remote-sensing satellites would contribute to Norway's ability to exercise authority in the region as well.⁸²³

Parliament treated the Industry Committee's proposal in early June 2018. The Labour Party's Eirik Sivertsen, one of the four parliamentarians who originally promoted the project, stated that the SATCOM project was important because Norway had been no less than 'an Arctic great power' for the past decade. This was not due to having 'the greatest military forces', the largest population or economy, but because Norway was active in the region and had established a permanent presence. This SATCOM project was not merely about the revenue, but was about establishing the infrastructure required to maintain its national security interests in the future. This included the ability to exercise military authority, but also to facilitate Norwegian settlement and economic activities. The system would also expand Norway's leeway to develop cooperation with others, 'especially Arctic states.'⁸²⁴

Finally, Parliament unanimously approved the recommendation to fund the project with the proposed USD 139 million.⁸²⁵

Balancing deterrence and reassurance

While discussions and policies leading up to Parliament's unanimous approval thoroughly underlined that the Armed Forces and Norway's allies would use the satellite system,⁸²⁶ the possible implications were soon

⁸²² Nærings- og fiskeridepartementet, «Government wants Arctic internet,» news release, 23 March, 2018, <https://www.regjeringen.no/en/aktuelt/vil-ha-internett-i-arktisk/id2594837/>.

⁸²³ Næringskomiteen, *Innstilling til Stortinget fra næringskomiteen*.

⁸²⁴ Stortinget, «Referat fra møter i Stortinget,» *Stortingstidende*, nr. 87 - 4. juni - Sesjonen 2017-2018, 4663-64.

⁸²⁵ Stortinget, «Referat fra møter i Stortinget,» *Stortingstidende*, nr. 87 - 4. juni - Sesjonen 2017-2018, 4684.

⁸²⁶ Nærings- og fiskeridepartementet, *Space Norway AS og prosjekt for satellittkommunikasjon i nordområdene*; Næringskomiteen, *Innstilling til Stortinget fra næringskomiteen*.

scrutinised by Norwegian state media. Two days following the unanimous approval, public broadcaster NRK claimed that Parliament had ‘unknowingly’ approved a satellite collaboration with the Pentagon, which entailed that the Norwegian satellites would be used by US nuclear submarines operating in Arctic waters. This stirred a public debate, especially engaging left-wing parliamentarians representing the Socialist Left Party, the Red Party and the Centre Party, which had approved the project two days prior.⁸²⁷

The following discourse cast light on fundamental, inter-political disagreements and central aspects of Norwegian security policy, such as the Socialist Left Party’s fundamental scepticism towards the US and Norway’s membership in NATO.⁸²⁸ In this sense, the debates to some extent resembled those stirred by US President Reagan’s ‘Star Wars’ programme in the 1980s.⁸²⁹

A principal argument considering the HEO SATCOM system was that the Armed Forces were ‘hiding’ behind civilian capabilities.⁸³⁰ It became a central aspect to consider that Norway had ratified the Additional Protocol I to the 1977 Geneva Conventions in 1981,⁸³¹ whereby Norway acknowledged that civilian capabilities used in a military context could constitute legitimate military targets.⁸³²

Statements from various American officials became central in the Norwegian public debate. The Secretary of the Air Force had stated that by hosting US payloads on foreign national satellites, the satellite’s host nation would become involved in potential conflicts with US adversaries.⁸³³ Another USAF official announced in January 2018 that the Americans intended to host ‘an enhanced polar system payload on a Norwegian

⁸²⁷ NRK, «Militært samarbeid om satellitter,» 2018-2019, <https://www.nrk.no/emne/militaert-samarbeid-om-satellitter-1.14173213>.

⁸²⁸ Stortinget, «Referat fra møter i Stortinget,» *Stortingstidende*, nr. 94 - 14. juni - Sesjonen 2017-2018, 5275-76.

⁸²⁹ Solem, «Norske reaksjoner på Reagans ‘stjernekrigs’-program.»

⁸³⁰ NRK, «Militært samarbeid om satellitter.»

⁸³¹ Stortinget, «Tilleggsprotokoll til Geneve-konvensjonene av 12-08-1949 hva angår beskyttelse av ofre for internasjonale væpnede konflikter (Protokoll I),» ed. Stortinget (Lovdata, 1982). <https://lovdata.no/dokument/TRAKTAT/traktat/1977-06-08-1>.

⁸³² United Nations, “Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), of 8 June 1977,” ed. United Nations (1977). https://www.un.org/en/genocideprevention/documents/atrocities-crimes/Doc.34_AP-I-EN.pdf.

⁸³³ Marcus Weisgerber, “US Air Force to Put Sensors on Allies’ Satellites,” *Defense One*, 21 April 2018, <https://www.defenseone.com/threats/2018/04/us-air-force-put-sensors-allies-satellites/147622/>.

satellite.⁸³⁴ Commander of USAF Space Command (AFSPC) Gen. John W. Raymond confirmed these plans in March 2018, stating these plans were part of US space strategy, that is, to ‘strengthen alliances and attract new partners’. Specifically, AFSPC planned to host Enhanced Polar System protected satellite communications payloads on the two Norwegian satellites scheduled for launch in 2022.⁸³⁵

NRK asserted that through such a partnership with the Pentagon, Norway could get entangled in a ‘star war’, and interviewed international experts stating that the US likely did employ hosted payloads to prevent attacks on their own space capabilities. Without a doubt, partnering with the Pentagon would make Norwegian satellites ‘ordinary targets during armed conflict’, and Norway could get involved in a ‘major power conflict’ in which the Norwegian HEO satellites and associated ground infrastructure could become targets. In a wider sense, it could pave the way for other US-European and inter-European partnerships, causing ‘increased military use of space.’ The ‘symbolic’ demonstration of a closer military bilateral partnership between Norway and the US could increase Norway’s overall exposure and the likelihood of attacks against its satellite system, including cyber-attacks.⁸³⁶

In Norway, the Centre Party’s defence spokesperson, Liv Signe Navarsete, declared that Norway’s collaboration with the Pentagon would ‘hardly be welcome in Russia’, while the leader of the Red Party Bjørnar Moxnes claimed that the Government had ‘categorically deceived Parliament’. His main issue was the alleged link to the US in regard to nuclear weapons which would compromise Norway’s security interests by making the satellites legitimate military targets for US adversaries and worsen Norway’s relations with Russia. Norway had already formalised several agreements with the Americans that entailed both SATCOM, space-based ISR and SDA, however.⁸³⁷

⁸³⁴ Vivienne Machi, “Air Force, Industry Considering Future of Protected Satcom,” *National Defense Magazine*, 19 January 2018, <https://www.nationaldefensemagazine.org/articles/2018/1/19/air-force-industry-considering-future-of-protected-satcom>.

⁸³⁵ Department of the Air Force, *Presentation to the Subcommittee on Strategic Forces* (The White House, 2018), 7, 16.

⁸³⁶ Bård Wormdal, «Norge kan bli dratt inn i en stjernekrig.» NRK, 29 September 2018, https://www.nrk.no/finnmark/_-norge-kan-bli-dratt-inn-i-en-stjernekrig-1.14217421.

⁸³⁷ NRK, «Stortinget godkjente satellittsamarbeid med USA - uten å vite om det.» (6 June 2018). <https://www.nrk.no/finnmark/stortinget-godkjente-satellittsamarbeid-med-usa--uten-a-vite-om-det-1.14068473>.

Subsequently, Moxnes and the leader of the Socialist Left Party Audun Lysbakken asked the Government to account for the Pentagon's alleged plans to integrate American military sensors on the Norwegian satellites. The American payloads were affiliated with military communications networks used by US (SSBNs and drones, which, according to US officials, were 'particularly susceptible to attacks by countries claiming to be threatened by US military presence.' The USAF's main impetus for integrating military equipment on the Norwegian satellites was to reduce their own risk and the likelihood of US satellites being attacked, and Lysbakken and Moxnes demanded impeding ongoing negotiations with the Pentagon. Additionally, Norway should enforce a strict requirement to prevent the integration of equipment that could be used by 'other countries' nuclear weapons systems.' If American SSBNs were to use the Norwegian satellites, Moxnes warned, Russia might 'look at Norway with new and perhaps less friendly eyes.'⁸³⁸

According to the Minister of Trade, Industry and Fisheries Torbjørn Røe Isaksen there was no formalised agreement with the US, and ongoing negotiations did not entail a dedicated nuclear weapons support system, but 'a communication system for transmitting limited voice and data volumes'. Parliament should not endanger 'this important project' based on public media, and the Government had in fact rejected the external review because it did not meet the needs of the Armed Forces. 'Clearly, the satellite system will be used by the Armed Forces, and of course it will be used by our allies.'⁸³⁹

Minister of Defence Frank Bakke-Jensen added that the MoD had openly communicated with allies at conferences and used media to promote their commitment to invest in space activities.⁸⁴⁰ It was known all along that the SATCOM project was 'a civil-military public private partnership', meaning it could hardly be surprising if this entailed partnering with the Pentagon. The Norwegian SATCOM project also merely fitted into Norway's long-standing defence and security policy, and its transatlantic orientation.⁸⁴¹ Both the former and the current governments had worked to enhance the prominent issue of improving communications in the Arctic.

⁸³⁸ Stortinget, *Referat fra møter i Stortinget*, 5280.

⁸³⁹ Stortinget, *Referat fra møter i Stortinget*, 5272–73.

⁸⁴⁰ Stortinget, *Referat fra møter i Stortinget*, 5275.

⁸⁴¹ Stortinget, *Referat fra møter i Stortinget*, 5276.

The high costs associated with space infrastructure necessitated a dual-use solution that covered ‘all types of activity’, civil as well as military. SATCOM was ‘crucial’ for Norway to establish and maintain situational awareness for correct and timely decision-making, and for the Armed Forces to operate effectively in peacetime, crisis and war, Bakke-Jensen stressed.⁸⁴²

According to Bakke-Jensen, NRK’s allegations that Norway’s possible collaboration with the US would increase the geopolitical tension in the High North were unsubstantiated and had ‘no root in reality’. It was in Norway’s interest to ensure allied attention to Arctic and northern waters, which was a reason in itself to collaborate with allies on this project. For this very reason, the MoD had maintained a dialogue with the Pentagon since the autumn of 2016. Norway’s military approach was indeed to be ‘as civilian as possible and as military as necessary’ and, in space, ‘all nations are small’. According to Margunn Ebbesen of the Conservative Party, it was ‘a paradox’ that the Socialist Left and Red parties claimed to be concerned with security and preparedness in the north, as they were now opposing a project that would ‘actually help to provide security and safety for us who live and work in the emergency areas.’⁸⁴³ Sivertsen argued that the project did not contradict Norway’s security policy, including its nuclear weapons policy, which Norway had exercised since 1957 to avoid becoming entangled in nuclear operations.⁸⁴⁴ Finally, the Centre Party’s Geir Pollestad remarked that although it was obvious that the Pentagon could be a potential Space Norway customer, ‘we would at least be able to avoid this unnecessary noise that is now being created around the project’ if Parliament had been more thoroughly informed.⁸⁴⁵ In any case, by a majority of 92 to 10 votes, Parliament rejected Lysbakken’s and Moxnes’ proposal to reconsider the satellite project.⁸⁴⁶

Preparing for national mission control

By July 2019, Space Norway had secured agreements with Inmarsat and ‘the Norwegian and US militaries’ and anticipated providing mobile broadband for ‘civilian and military users in the Arctic’ by 2023. Northrop Grumman

⁸⁴² Stortinget, *Referat fra møter i Stortinget*, 5274.

⁸⁴³ Stortinget, *Referat fra møter i Stortinget*, 5279.

⁸⁴⁴ Stortinget, *Referat fra møter i Stortinget*, 5278–80.

⁸⁴⁵ Stortinget, *Referat fra møter i Stortinget*, 5277.

⁸⁴⁶ Stortinget, *Referat fra møter i Stortinget*, 5327.

started building the satellites in the US and Space Norway's subsidiary Heosat and KSAT in Tromsø prepared to operate the satellites from Tromsø to 'ensure Norwegian control of this critically important capability.'⁸⁴⁷ Overall, Space Norway ensured five key investors including the Armed Forces, the Pentagon, a Norwegian bank, Inmarsat and the MTIF, which invested in the project as a for-profit commercial business investment.⁸⁴⁸

The MoD and the Armed Forces were now customers of Space Norway. Operational roles and responsibilities within the Armed Forces were clarified and followed up by CYFOR, which started preparing FSAT for mission control at Eggemoen. Space Norway was to launch the satellites and handle telemetry, tracking and command, and maintain the satellites' highly elliptical orbits around the Earth, whereas the Armed Forces and the Pentagon would control their respective satellite payloads individually via their own, national, military satellite ground stations.⁸⁴⁹

Chapter conclusion

Norway's second attempt to acquire national military SATCOM capability is exceedingly more promising than the first and underlines Norway's national interest at several levels in relation to its High North policy. It also demonstrates the dominance of the US within the inner circle of Norway's bilateral relations.

The HEO SATCOM project spurred a fundamental security policy debate concerning Norway's military integration with the West and the balance of Norway's relations with Russia. It can be understood that by partnering with the Pentagon, Norway adopted a deterrence strategy in space. Yet, the solution was principally chosen considering the bottom line for all the vested parties, including the Americans. The discourse highlighted fundamental disagreements between Norway's political Socialist Left, the minority known to oppose Norway's membership in NATO, and the majority, which recognises that Norway depends on the US and NATO for collective military support.

⁸⁴⁷ Space Norway, "Space Norway to Provide Satellite Based Arctic Broadband," news release, 3 July, 2019, <https://spacenorway.no/home/>.

⁸⁴⁸ Nilsson, interview.

⁸⁴⁹ Nilsson, interview.

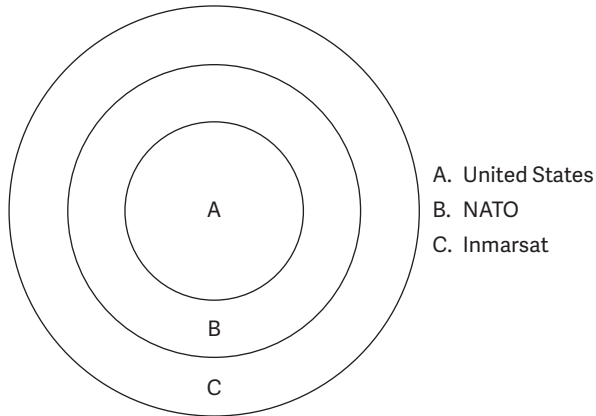


Figure 37. Key pillars of Norwegian collaboration in military use of SATCOM.

The national SATCOM capability was cross-sectorial, but the principal argument for establishing the capability was Norway's military requirements, where the capability is believed to serve Norway and the Armed Forces at all levels of strategy. The requirements of the Armed Forces were the Government's essential alibi to overrule the external review that decided to terminate the SATCOM project, which also demonstrates that where there is a political will, there is a way.

The SATCOM project could only be materialised through such a dual-use approach. The MoD was open about their plans and ambitions, and publicly advocated that Norway's military space programme entailed exploiting civilian actors and capabilities to the greatest possible extent. Although Norwegian state media impelled the MoD to admit that the military connotation and partnership with the Pentagon entailed that the satellites could constitute legitimate military targets, this was not ground-breaking. Norway acceded to Additional Protocol (I) to the Geneva Conventions in 1981, and FFOD 2014 highlighted that the Armed Forces were generally becoming increasingly dependent on civilian and commercial capabilities and actors. The media spectacle did, however, serve the purpose of promoting increased awareness on security policy issues related to the military use of space and overall matured the discourse and thinking about space power in Norway.

Civil-military relations in Norway grew stronger as the MoD worked closely with the MTIF to establish the national SATCOM capability. They ensured broad political support to the extent that it became a priority at

the highest level of politics and a central element in Norway's High North policy. The capability was used to substantiate political rhetoric portraying Norway as no less than an Arctic great power and a regional leader, implying Norway commanded regional hegemony in the High North. However, it was a strict requirement that 75 percent of the project costs would be covered by external investors and customers, underlining that the bottom line was the be-all and end-all.

The discourse amongst Norwegian military and political executives during this time emphasised the role of SATCOM in establishing situational awareness and timely decision-making. In fact, Norway's lack of SATCOM was a key factor inhibiting Norway from conducting intelligence operations ranging from strategic intelligence via all the strategic levels down to the tactical, as Norway did not have the SATCOM capability to support this activity. In 2022, however, CYFOR was preparing to manage Norway's upcoming SATCOM capability in peacetime, crisis and war, at all levels of strategy, which enforces the overlap between the Strategic Intelligence and Force Enhancement doctrines.

Space-based maritime ISR under national control

Debating the proliferation of space-based services and technologies

Chief of Defence Admiral Bruun-Hanssen stated during the military space strategic review in 2015 that space was partly a prerequisite to the Armed Forces' operations to claim sovereignty in the High North; however, they were not dependent. Space capabilities allowed for continuous observation of larger areas 'in a completely different way' than with aircraft, but they could do without. Space-based ISR did, however, allow the Armed Forces to conduct military operations in a more cost-effective way. Essentially, Norway's current military use of space-based ISR capability encompassed using AIS in conjunction with Canadian radar satellite imagery to operate the Coast Guard.⁸⁵⁰

Going forward, the Chief of Defence suggested that Norway could acquire national ISR satellites, partnering with other states, state actors or private entities, or a combination of these options. Polar orbit satellites covered Norway and the High North, which implied that countries like Canada, Denmark (through Greenland), Sweden and Finland had similar interests and thus constituted potential partners. The Armed Forces could also partner with other agencies within Norway. It was however unlikely, the Admiral dryly noted, that the Armed Forces would collaborate with the Russians.⁸⁵¹

⁸⁵⁰ Bruun-Hanssen, interview.

⁸⁵¹ Bruun-Hanssen, interview.

Chief of NDLO Petter Jansen observed that the Armed Forces' space-based ISR requirements usually coincided with international events where Norway was not the only state requiring satellite surveillance, which led the costs to go 'straight up'. As a consequence, the Armed Forces were paying 'a great deal' for these capacities, and he was therefore 'absolutely sure' it would be cheaper, in the long run, to establish satellite capacity 'alone or with others'. Norway should partner with 'our military allies', as opposed to civilian actors. By aligning with the 'purely military market', the Armed Forces could standardise their potential satellites within 'the NATO family'.⁸⁵²

Chief of the NJHQ Lt. Gen. Rune Jakobsen predominantly associated space with SATCOM, although 'the ISR function' was also important to the NJHQ. He believed that 'Norway as a nation is probably too small' to own indigenous image satellites, but that was principally because Norway lacked the communications capacity to support it. Furthermore, Norway was 'probably not a great power in the space segment' and if Norway was to be an interesting partner considering space, that was likely due to Norway's geographical location near Russia. 'That makes us more interesting as a partner than our excessive ability.'⁸⁵³

The NJHQ were purchasing high-resolution commercial satellite images as part of their surveillance missions in the High North, 'especially related to fisheries monitoring'. Satellite imagery was also of 'great value' for the brigade commander or commander of the Norwegian task group at sea. At the same time, the NJHQ had no guarantee that these satellite images would be available when they needed them, and '[y]ou can never make yourself dependent on a civilian capacity that may not work in war.' The civilian satellite might be incapacitated, or they might stop supplying you with data to protect their own commercial interests 'and so on.'⁸⁵⁴

Lt. Gen. Jakobsen had 'great faith' in cooperation within NATO and between individual nations. Although other nations' satellite imagery was often subject to strict regimes due to costs, unwillingness to disclose capacity and a reluctance towards sharing national intelligence that was 'coded into every nation', intelligence-sharing between states had started to improve even before the war in Bosnia in the mid-1990s. He pointed out

⁸⁵² Jansen, interview.

⁸⁵³ Jakobsen, interview.

⁸⁵⁴ Jakobsen, interview.

that because the NIS in 1993 were incapable of supporting tactical commanders in the field with actionable intelligence, the Army had established the Intelligence Battalion to ensure tactical-level intelligence. It was first and foremost throughout the Afghanistan operation that the NIS became more 'end-user oriented' and increasingly focused on tactical intelligence to support the commander 'then and there.' Mainly due to Afghanistan, the overall intelligence cooperation between nation-states had taken 'a quantum leap'.⁸⁵⁵

The Chief of CYFOR, who had previously served as an intelligence officer for twelve years, described the overall application of space technologies as 'absolutely enormous.' Satellite modules could be composed of various types of sensors, including sensors that could detect and track large, military formations composed of several thousand troops, which allowed you to observe the movements of that entire military formation in the terrain. Although he, as CYFOR commander, was 'only' responsible for ensuring operative communications capability for the Armed Forces, he emphasised that intelligence was 'not possible to convey to the recipient without communications.' Intelligence was certainly part of the 'C4ISR (Command, Control, Communications, Computers, ISR) concept' with which he was overall concerned. While Norway currently had access to commercial space-based ISR covering the High North, Maj. Gen. Pedersen proposed that if Norway acquired a national ISR satellite, the nation would be much more capable of protecting 'the information we are looking for in the north'.⁸⁵⁶

Chief of the Norwegian Navy Rear Admiral Lars Saunes first and foremost thought of space in terms of maritime ISR, although they also relied on SATCOM 'wherever they were.' His previous experiences encompassed operational responsibilities in maritime intelligence-driven operations, of which all were tied to bilateral intelligence agreements. The Rear Admiral stood out in the sense that he had worked at the FFI in 2001 and been 'involved with mini-satellites' and collaborated closely with NOSA. In his view, the Armed Forces were 'an important player' and the Navy was 'a key player'. Considering ISR, the NIS was also very much engaged, whereas the NJHQ had a central role in collaborating with NOSA on operational requirements. He pointed out that the Air Force was not very involved,

⁸⁵⁵ Jakobsen, interview.

⁸⁵⁶ Pedersen, interview.

whereas the Navy was the Armed Forces' largest user of space-based intelligence considering the Navy's role in maintaining and developing situational awareness. The Coast Guard served as an executive tool for five different ministries and 14 different agencies across the Norwegian government and thus had access to a substantial amount of cross-sectorial information, which the Coast Guard used to create 'the best possible image'. Within the context of Defence Study 2015, the Navy had developed a joint ISR study through the intelligence service, which partly encompassed space capability.⁸⁵⁷

According to Rear Admiral Saunes, the Armed Forces were dependent on space in various capacities, and the Navy was 'very dependent on space to carry out operations in an efficient manner'. They could still conduct operations without space capacities 'with lower efficiency', however. The Navy would convey their requirements and priority areas, and receive radar satellite imagery 'delivered on time', which could be enriched with AIS satellite data to build a 'maritime image' and identify discrepancies. For example, if the Navy detected a vessel not transmitting AIS signals that could be visually identified with radar satellite imagery, 'then we know that we have a deviation.' The Navy could then use their traditional resources, such as MPA or vessels for further inspection. Thus, applying satellite information on their surveillance missions provided 'a very good picture of the activity that takes place on the surface in our maritime areas of responsibility.'⁸⁵⁸

From Saunes' perspective, national space-based assets such as the AIS satellite would be very useful, but in allied operations, the Armed Forces would access US partner networks through which they could attain tactical satellite information from the US and other nation-states. The Americans had an excellent ability to attain as well as share real-time information and tactical information. Military operations were overall becoming increasingly intelligence-driven, which was 'absolutely necessary.' With satellite imagery, the Armed Forces and their allies could support 'those who are out there' in understanding 'what is happening around them.' Satellites were, of course, 'just another source of information in addition to other sources' the Armed Forces could use for verification or to detect discrepancies. As a 'small nation', Norway needed to ensure broad international cooperation with European countries as well as with the US. Norway had recognised

⁸⁵⁷ Saunes, interview.

⁸⁵⁸ Saunes, interview.

that to access joint ISR capacity, it ‘must do so in partnership with other nations’, because ‘we are too small to do this ourselves.’ Defending Norway was an allied operation, which was why Norway conducted maritime operations with a few strategic partners, including the US, the UK, the Netherlands and Germany. In Saunes’ view, to think that Norway could use its own satellite capacities to protect the country was ‘a bit naive.’ Small states would never have sufficient capacity to protect themselves and must, therefore, cooperate with larger states. NATO could hardly play a role, because NATO’s capability merely encompassed what the member states could individually bring to the table.⁸⁵⁹

Whilst the Rear Admiral was convinced that Norway must team up with its more powerful allies also in space, he knew from the FFI that Norway was ‘quite far ahead with the development of small satellites’ and anticipated that Norway might develop national radar satellites in addition to AIS. Norway should in this respect focus on the Arctic, and the Navy had recently established a coastguard forum with five Arctic nations to collaborate on joint utilisation of resources in this region. The Navy had previously established a maritime security awareness forum with the Coast Guard. This had resulted in Barents Watch, where the Norwegian MFA eventually took the lead because they did not want it to be seen as a military initiative, as they aimed at the time to collaborate more extensively with Russia in the High North. Barents Watch collected information from multiple sources to create the best possible situational understanding of the maritime domain, considering oil pollution, fisheries authority and search and rescue, all of which were under the national responsibility of the Coast Guard. Data from Norway’s national military sensors were integrated to improve that situational understanding, and by removing the source affiliations, the Coast Guard could declassify and share the information across agencies within the government.⁸⁶⁰

The Navy Inspector General also believed there might be opportunities for small states considering the decreasing costs of small and commercial satellites that could be used efficiently; however, it would become a problem in the event of a state-to-state security policy situation. Information-sharing infrastructures could become military targets for anti-satellite weapons intended to deny the US or NATO information dominance. Another aspect

⁸⁵⁹ Saunes, interview.

⁸⁶⁰ Saunes, interview.

was that Google and Facebook would eventually know more about ‘what is happening in the world’ than the Armed Forces, which only made it even more important for the Armed Forces to extract intelligence from these sources. This was ‘nothing new’ but it could perhaps pose a threat that ‘anyone’ could now access ‘so much information’, especially considering non-state actors. Government actors would have that information anyway, but this ‘accelerating technological development’ would likely pose ‘major challenges in the future’ for the Armed Forces.⁸⁶¹

According to NIS Deputy Director Tom Rykken, the NIS were currently following the development of new space technologies and applications, considering their own collection capability and assessing the threat picture in space and from space based on earthbound radar systems. The latter encompassed tracking selected foreign intelligence satellites and developments in countries of interest, where the NIS partly attained information from others who were willing to share. Rykken believed that Norway had conducted its first military space strategic review mainly because the Armed Forces ‘increasingly acknowledged the significance of good intelligence’. This realisation was a consequence of Norway’s participation in international operations, where situational understanding was ‘absolutely necessary’. Once the Armed Forces ventured outside of Norway’s national borders and the areas they already knew well, the importance and understanding of intelligence had ‘dawned on many’ and broadly manifested itself.⁸⁶²

Rykken principally valued the space domain for the opportunities it provided for military and intelligence purposes, based upon the original motivation for access to space that was to obtain a view of locations you would otherwise be denied. Space activity was closely tied to the development of long-range ballistic missiles and for a long time only concerned ‘the major nations’. They developed space-based capacities including signals intelligence, electro-optical sensors, radio and other instruments that allowed them to study geography, human and military activity and strategic dispositions, and obtain information for decision-makers. To the NIS, space was at the time particularly interesting from a High North perspective because it allowed for linking large land and maritime areas. While Norway had never commanded its own national satellites, it had over the

⁸⁶¹ Saunes, interview.

⁸⁶² Rykken, interview.

years and decades relied on other nations who were willing to share information from theirs, and this information was especially useful in relation to situational awareness in real-time, as well as for ‘basic intelligence’, that is, the understanding of ‘what is going on’ over time. These capabilities were also essential tools in planning and conducting military operations.⁸⁶³

As the technology previously monopolised by intelligence services was now ‘moving into the commercial world’, the main challenge was how to use the available information. This shift from expensive government programmes to commercialisation was also ‘particularly interesting’ as it induced a ‘proliferation of opportunities’ and allowed for the use of space-based information in a wide range of areas. This did not only entail intelligence but also other disciplines, ranging from environmental research, warnings, disasters and climate change to migration and road construction. It was, however, a challenge to the NIS that the ‘ever-increasing amount of data’ made it increasingly demanding to process it and identify ‘what is interesting’. This made it more important to utilise machines, systems and programs to assist in locating the relevant information, reserving human resources for the more advanced and comprehensive analysis and assessments to identify a sound decision-making basis. The development towards greater transparency also implied that Norway’s own military activities could be exposed, and it was a common military assessment to consider whether it was riskier to be discovered and tracked than to move. However, the development was overall positive for the NIS. The commercialisation of space capabilities gave them a better overview and allowed them to employ their other capacities more effectively and focus their clandestine activities elsewhere.⁸⁶⁴

This proliferation of space-based services and technologies was rife with opportunities for small states like Norway. Advanced systems could be compressed into small units, which was ‘of great importance to everyone’ and posed a ‘geostrategic significance’ that might require Norway to think anew and increasingly pursue international relationships. Space-based solutions were becoming so cost-effective that Norway could consider developing national space capacities to supplement commercial ones. Rykken envisioned that Norway could develop ESM sensors or other sensors, especially bearing sensors that emitted electronic energy and could

⁸⁶³ Rykken, interview.

⁸⁶⁴ Rykken, interview.

provide significant information on ‘who is down there and what is going on.’ The whole point was to get a picture, a situational understanding, ‘at all levels.’ Information collected at the tactical level could have ‘very great value’ for a defence minister at strategic level and vice versa; strategic intelligence could be very useful at the tactical level, as well as at all the levels in between, ‘from “grand strategy” down to the tactical level.’ In fact, stratification did not make sense when you were dealing with intelligence, because one and the same piece of information could be of ‘great value for the entire chain.’ Norway had an advantage in that sense, as a small country with a short distance between the strategic leadership and the forces.⁸⁶⁵ These considerations suggested that Norway perhaps did not favour strategic intelligence over the operational or tactical as was the case in the US.⁸⁶⁶

Going forward, Rykken believed that Norway should focus on attaining access to space-based information and noted that they could partner with ‘many commercial players.’ Albeit the increased commercialisation induced an ‘increased robustness in the entire system,’ commercial capabilities alone might not be ‘robust enough’ for Norway, and it had perhaps come to the point where Norway could supply commercial space capabilities with national ones.⁸⁶⁷

In March 2016, the recently retired Chief of the NIS Lt. Gen. (Ret.) Kjell Grandhagen was ‘pretty sure’ that space-based sensors were becoming progressively relevant for Norway and that Norway would develop national space capability as well as partner with nations ‘who share our interests,’ which would then also share the costs. In other words, space-based systems would become increasingly important in the years to come, because they were becoming cheaper and more cost-effective. If you were to ask which information Norway wanted to obtain or to convey, whether it was for communication or surveillance, electro-optical or signals intelligence, space-based systems ‘automatically’ appeared as a possibility. Considering Russia’s recent display of aggression towards one of its neighbouring countries, space-based ISR constituted part of the solution to the MoD’s instruction to enhance Norway’s situational awareness and early warning capability in the High North.⁸⁶⁸ Lt. Gen. (Ret.) Grandhagen addressed many of the

⁸⁶⁵ Rykken, interview.

⁸⁶⁶ Rumbaugh, *What Place for Space: Competing Schools of Operational Thought in Space*, 13.

⁸⁶⁷ Rykken, interview; This differed from the Americans, for example, who supplied their national technical means (NTM) with commercial space assets: Clapper, interview.

⁸⁶⁸ Grandhagen, interview.

same aspects as Rykken. He focused similarly on the role of space-based assets as elevated information collection platforms, but also considered the role of SATCOM and the balance between land, sea, air and space-based systems, system vulnerability and redundancy. Certainly, Norway ought to strengthen its cross-sectorial space coordination to ensure synergies between military and civilian space activities where possible. It was 'quite obvious' that space was of 'great significance for Norway' and dual-use applications were conceivable both in terms of communication, navigation and surveillance, such as the AIS satellite. The Armed Forces should focus on their 'near areas of interest' and exploit the contemporary trends of commercialisation, miniaturisation and multinationalisation to a greater extent. Whereas military systems used to be superior to commercial ones, this capability gap would soon cease to exist.⁸⁶⁹ Now, military structures could rather use their resources to refine the output of civilian systems for military purposes, and Norway could employ a variety of small sensors and platforms in conjunction, each solving a few, limited tasks at a low cost. Norway could also join forces with Arctic nations with similar interests or collaborate with the likes of Australia, where interests could be overlapping even if they were 'quite far apart', as a satellite could solve tasks for Norway and Australia at the same time.⁸⁷⁰

A key trend which Lt. Gen. (Ret.) Grandhagen had focused on as Chief of the NIS was the merging of the political and military strategic levels, which the NIS had been observing over the past 15 to 20 years. This was partly related to their experiences from international military operations, where the top political level sometimes had to 'actually get involved in what goes on right down to the level of detail'. Similarly, a commander at 'a very low level' might depend on 'strategic' information to understand his or her assignment at hand. It might well be that a special forces soldier in Afghanistan would use a satellite image originally collected for a strategic purpose, and these considerations implied that the notion of strategic levels 'may not really be that important'. This was especially true for 'a small country like Norway', where one had to see these levels in context: Norway had to identify systems that could serve as many purposes as possible simultaneously and the differences between the strategic levels might therefore be less than for a 'superpower'. The US, for example, could afford to employ

⁸⁶⁹ Grandhagen, interview.

⁸⁷⁰ Grandhagen, interview.

a wider range of sensors, operated by different parts of their structure, although the Americans also strived to merge their systems of collection platforms to fuse data into a ‘common image’, which could subsequently be filtered for the different levels as needed.⁸⁷¹

From an American point of view, US DNI Lt. Gen. Clapper observed during this time that as for the US, commercial satellite imagery could not directly replace its national technical means (NTM), as commercial satellites were not designed for its purposes. It could, however, serve as a critical supplement, and the optimal solution was a mix, as commercial capability could free up capacity for what they could only do with their NTM. At the same time, the DNI questioned the extent to which commercial space capabilities were, in fact, commercial, since the US Government had influenced commercial satellite providers to serve its needs. The DNI therefore argued that ‘you can’t really say that they are commercial anymore.’⁸⁷²

Both the acting US DNI, former Commander of Air Force Space Command Gen. (Ret.) Lance Lord, and former Commander of US Strategic Command Gen. (Ret.) James E. Cartwright identified that the principal advantage of commercial satellite imagery was that it was unclassified, which made it much easier to share amongst allies.⁸⁷³ According to the DNI, the US Government therefore used these capabilities extensively for purposes such as disaster recovery and in allied operations. In many cases for which the US NTM were not designed, commercial satellite imagery could be the US Government’s only option.⁸⁷⁴ As the Norwegian 1990 Defence Commission had noted in 1992,⁸⁷⁵ the DNI also commented on the drawback of space-based ISR proliferation in the sense that ‘anyone can see what’s going on, and that is an issue.’ Whilst this depended on your point of view, military commanders were not comfortable with the development, but had no other choice but to operate in ‘a more transparent world’, which made the conduct of intelligence more difficult. These challenges were not new, but were becoming more prominent with a more assertive Russia.⁸⁷⁶

⁸⁷¹ Grandhagen, interview.

⁸⁷² Clapper, interview.

⁸⁷³ Clapper, interview; Lance Lord, “Interview with Gen. (Ret.) (US Air Force) Lance Lord, former Commander of US Space Command, 7 December 2015, Tysons Corner, McLean, Virginia, USA,” interview by Tale Sundlisæter, 2015; Cartwright, interview.

⁸⁷⁴ Clapper, interview.

⁸⁷⁵ Forsvarskommissionen, *Forsvarskommissionen av 1990*, 131.

⁸⁷⁶ Clapper, interview.

According to Kevin O'Connell, who performed the intelligence briefings for President George H. W. Bush at the White House, the increasing global transparency meant that intelligence, which used to be 'about secrets', was now 'much more about looking across the secret-open divide.'⁸⁷⁷

In Norway, Lt. Gen. (Ret.) Grandhagen observed that the ever-increasing transparency brought about by a wealth of easily obtainable information translated to 'a completely different opportunity to trace the evidence' and ability to verify information, constituting an advantage to small intelligence services. However, whilst the space domain offered 'a lot of captivating solutions', space systems were vulnerable and thus required redundancy. Counter-space capabilities certainly existed, and space was therefore not a 'silver bullet.' It was risky for Norway and its allies to be too dependent on 'information from one sensor in space.' It made more sense to diversify and add redundancy in terms of ground-based, air-based and space-based systems, including civilian and commercial services. Ensuring an agreement with three different commercial players in addition to operating your own satellites provided 'a much greater redundancy in what you do'. Considering intelligence in general, the key was to merge information from many different types of sources to get 'a verified picture.' Satellite images alone could prove a specific activity or 'something going on,' but most often it was 'one of many different sources of information that need to be put together' with information from additional sources such as other electronic sources or human sources. Still, satellite images and space-based information were growing in importance and were becoming increasingly accessible. News agencies were using satellite images 'almost as an intelligence service would have done ten to twenty years ago', showing that 'this has happened, because this image proves it'. Thus, it was clearly 'a pretty important documentation tool.'⁸⁷⁸

A parallel debate on satellites vs Maritime Patrol Aircraft

Admiral Bruun-Hanssen's proposal to replace MPA with a constellation of satellites, small aircraft and UAVs received some attention in the public

⁸⁷⁷ O'Connell, interview.

⁸⁷⁸ Grandhagen, interview.

debate following Defence Study 2015.⁸⁷⁹ The Admiral did not believe the fiscal circumstances by which he was bound would allow for supplementary capabilities to the existing military force structure and considered satellite systems as an alternative to MPA. MPA was, however, equipped with radar and optical sensors on one and the same platform, and it was not clear whether this was possible with a satellite. Radar imagery alone would not suffice, as it had to be combined with optical sensors for further identification. How often would cloud coverage obstruct optical satellite systems from performing their tasks? A satellite system, as opposed to aircraft, could also not serve as a weapons platform. This was solvable because the Armed Forces could use other types of aircraft, or, depending on range and speed, might not need an elevated platform at all. If you had sensor capability relaying target data in real-time, you could launch weapons from land.⁸⁸⁰

Another difference was that satellites could not be used to assert sovereignty or safeguard sovereign rights on Norwegian territory or in Norway's EEZ. Norway had substantial interests and resources over which it had gained dominance through international agreements, including fisheries and oil and gas extraction, and safeguarding these sovereign rights necessitated the assertion of 'power in some shape or form'. That power was asserted by vessels, planes and personnel who were physically present 'where the event is taking place' and not in space. To assert this power with traditional military means, however, the Armed Forces were 'completely dependent' on surveillance capability, and space was in this respect 'substantial'.⁸⁸¹

As opposed to Admiral Bruun-Hanssen, Air Force Inspector General Maj. Gen. Rygg argued that space-based capabilities could *not* replace MPA. This was 'a very interesting issue' which Maj. Gen. Rygg was currently discussing with several individuals, and the answer was two-sided. Space technology constituted 'a good supplement' and could well become a major contribution sometime in the future. If satellite technology was

⁸⁷⁹ Alf Bjarne Johnsen and Rune Thomas Ege, «Slik blir det nye Forsvaret - hvis forsvarssjefen får bestemme,» *Verdens Gang*, 1 October 2015, <https://www.vg.no/nyheter/innenriks/i/OM2A3/slik-blir-det-nye-forsvaret-hvis-forsvarssjefen-faar-bestemme>; Per Gram, «Forsvarssjefens innstilling er et klart varsel om at Russland er trusselen,» *Blogspot*, 1 October, 2015, <https://gramsluftfartsblogg.blogspot.com/2015/10/forsvarssjefens-innstilling-er-et-klart.html>; Kjetil Stormark, «Må droppe antiubåtkapasitet,» *Aldrimer.no*, 21 August 2015, <https://www.aldrimer.no/ma-droppe-antiubatkapasitet/>.

⁸⁸⁰ Bruun-Hanssen, interview.

⁸⁸¹ Bruun-Hanssen, interview.

deemed cheap enough, they would invest in it, but that would be in addition to, not instead of, existing capabilities. Satellites could never provide the physical presence and visibility that was necessary to claim Norwegian sovereignty and jurisdiction. This aspect was just as important as that of information collection and situational awareness because the moment you left a physical void behind, Maj. Gen. Rygg ‘guaranteed’ that void would be filled by someone else. If that was to happen, the Armed Forces ‘can just sit there and observe all we want with the satellite’. As was currently the way of the world, the P-3 Orion could not be replaced by anything other than the P-8. The P-3 could neither be replaced by UAVs nor by a combination of UAVs and satellites, given the current technological maturity level of these systems. There were different opinions on this issue, but from an air power perspective, it was ‘almost crystal clear’. The Americans, the Australians and ‘other prominent air power nations’ were on the same page. If it was an option at all, air capacities could only be replaced by a combination of satellites and other aircraft. If satellites could perform several tasks currently performed by aircraft, the Armed Forces could use cheaper, smaller, lighter and less advanced aircraft with lower acquisition and operational costs to maintain national, military presence in the air domain.⁸⁸²

Former Inspector General of the Norwegian Navy Rear Admiral (Ret.) Jan Eirik Finseth did not agree that such a presence was only ensured by aircraft or capacities visible to the human eye from Earth. ‘The opponent will know that you are there.’ In the High North, ‘the Russians would know about the satellites.’ They would understand if Norway used new or different technology, ‘although they [the Russians] may wonder what we are doing, whether we will gain more knowledge about what they are doing, and what they are trying to hide.’ It was, therefore, not necessary to have a visible aircraft flying in the airspace. Not least, he anticipated that ‘the day it becomes known that Norway has a satellite, it will be a big deal...’⁸⁸³

The Chief of NDLO expressed similar views. The presence of military capability played a role in asserting sovereignty, as well as in the understanding of sovereignty itself, and Jansen envisioned that aircraft ‘in their current form’ would cease to serve as sensor platforms and that manned aerial capability would be replaced by combinations of UAVs

⁸⁸² Rygg, interview.

⁸⁸³ Jan Eirik Finseth, “Interview with Rear Admiral (Ret.) Jan Eirik Finseth, former Inspector General of the Royal Norwegian Navy, 19 December 2016, Akershus Fortress, Oslo, Norway. [In Norwegian],” interview by Tale Sundlisæter.

and satellites. Moreover, traditional aerial capacities would be replaced by space-based missiles and weapon systems or missiles traversing the space domain, which in turn required warning systems. Such a development would increase the significance of 'land power' as you would then have to claim sovereignty on land as much as in the air. Although it would likely take 'a long time' before one would stop using manned aircraft to assert sovereignty in the air domain, this would 'certainly happen' and it would effectively reduce the significance of MPA and fighter jets as sovereignty-enhancing tools.⁸⁸⁴

Less than two months after the public release of the defence study, NIS Deputy Director Rykken stated that despite the opportunities presented by space technology, he personally believed that Norway would operate maritime air capacities 'for many years to come.'⁸⁸⁵ The following day, the Chief of the NJHQ observed that Admiral Bruun-Hanssen had indeed proposed to replace the P-3 Orion with a combination of satellites, small aircraft and UAVs, but this solution fully depended on secure communications capacity, which Norway currently did not have. According to the Chief of the NJHQ, MPA was 'the most important tool I have when it comes to understanding the situation in the High North.' He was 'pretty sure' that satellites, UAVs and smaller aircraft could cover the intelligence part of the MPA mission, although '[m]aybe not today, but tomorrow.' After all, the P-3 was a 'cheap platform' with 'other capacities' which satellites could not currently cover.⁸⁸⁶

In early December 2015, US DNI Lt. Gen. Clapper said he 'had understood that a very satisfactory arrangement had been found between the Norwegian Government and the US Navy' to replace Norway's P-3 fleet with P-8s.⁸⁸⁷ In June 2016, the MoD announced they would 'invest in Norway's ability to establish national and allied situational awareness in the north' by acquiring new maritime patrol aircraft to replace the P-3C Orion. MPA Squadron 333 would operate these aircraft from Evenes Air Base, and Andøya Air Base would be closed.⁸⁸⁸ In March 2017, the MoD announced that the Defence Materiel Agency on behalf of the Armed

⁸⁸⁴ Jansen, interview.

⁸⁸⁵ Rykken, interview.

⁸⁸⁶ Jakobsen, interview.

⁸⁸⁷ Clapper, interview.

⁸⁸⁸ Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*, 65

Forces had signed a contract with the US authorities to procure five P-8A Poseidon MPA and that the first aircraft would land on Norwegian territory in 2022.⁸⁸⁹

Space operations and the Svalbard Treaty

In 2015, satellite industry and electronic communications development drove the Ministry of Transport and Communication (MTC) to modernise Norway's regulations regarding satellite ground station activity on the Svalbard Archipelago and in Antarctica.⁸⁹⁰ In February 2016, the MoD's Deputy Minister observed that the non-armament Svalbard Treaty was likely a factor that had inhibited the space power discourse in Norway over the years. KSAT had a facility on the archipelago, and it 'could have become a problem in relation to the treaty' if the Armed Forces got affiliated with that specific facility.⁸⁹¹ Chief of CYFOR Maj. Gen. Pedersen noted in November 2015 that the Armed Forces were present on Jan Mayen Island, where they operated satellite modules in collaboration with Kongsberg Group actors and Norwegian industry. As Chief of CYFOR, his main concern was to ensure operational SATCOM 'in the military domain', and the Svalbard Treaty certainly constituted 'a demanding security policy framework' in that respect. Violating the Svalbard Treaty might cause security policy disputes or concerns over the administrative regime for the Svalbard Archipelago, and if the Armed Forces downlinked military information there, Norway would certainly lose international credibility. The Armed Forces therefore steered clear of such activity in the treaty area.⁸⁹²

On the Norwegian mainland, ground station activity was regulated by the Electronic Communications Act of 2003. Frequency licenses and regulations on Svalbard and in Antarctica were based on this act in conjunction with legal interpretations of international law, predominantly the Svalbard and Antarctic Treaties.⁸⁹³ In the original regulation proposal,

⁸⁸⁹ Forsvarsdepartementet, «Norge har inngått kontrakt om kjøp av fem nye P-8A Poseidon maritime patruljefly,» news release, 29 March, 2017, <https://www.regjeringen.no/no/tema/forsvar/p-8a-poseidon/p-8a-poseidon/norge-har-inngatt-kontrakt-om-kjop-av-fem-nye-p-8a-poseidon-maritime-patruljefly/id2545872/>.

⁸⁹⁰ Samferdselsdepartementet, *Nytt regelverk for nedlesning av data fra satellitt på Svalbard og i Antarktis*, (Samferdselsdepartementet, 2015); Samferdselsdepartementet, *Utkast til forskrifter om etablering, drift og bruk av jordstasjon for satellitt på Svalbard og i Antarktis - Høringsnotat*, (Samferdselsdepartementet, 2015).

⁸⁹¹ Bø, interview.

⁸⁹² Pedersen, interview.

⁸⁹³ Samferdselsdepartementet, "Høring - To forskrifter om etablering, drift og bruk av jordstasjon for satellitt, henholdsvis på Svalbard og i Antarktis," (Samferdselsdepartementet, 2015).

the MTC proposed to strictly prohibit all communication with military satellites from ground stations in these treaty areas. Communication with dual-use satellites, that is, ‘satellites that have both civilian and military capability’ would be allowed if the satellite data were made ‘freely or commercially available.’ The Norwegian Communications Authority (NKOM) would decide when to release data and permit exceptions if ‘there are research or commercial considerations that must be considered.’ NKOM would also supervise satellite ground stations and satellite activity.⁸⁹⁴

The MTC issued the proposal to 43 consultative bodies, not including the Armed Forces.⁸⁹⁵ KSAT, which owns and operates Norway’s satellite ground stations on the Norwegian mainland, on Svalbard and in Antarctica, requested that the MTC define ‘commercially available,’ as KSAT could not verify whether a satellite was being used ‘for civilian purposes only.’ Deciding when to make satellite data ‘commercially available’ was a third-party matter over which KSAT had no control. Satellites could be wholly civilian, but private actors could still decide not to make the data ‘freely or commercially available.’ Satellite owners could also refuse to disclose this information for commercial and competitive reasons.⁸⁹⁶ Norwegian space infrastructure owner Space Norway, which owned 50 percent of KSAT, voiced similar concerns.⁸⁹⁷ Both the NSM and NOSA used the Norwegian AIS satellites to exemplify that civilian satellites whose data were not commercially available still did not conflict with the Svalbard Treaty.⁸⁹⁸ The NSM noted that Galileo had a government use service, that is, Public Regulated Services (PRS), where encrypted data were downlinked by Galileo stations on Svalbard and in Antarctica. To ensure adequate protection of the PRS data, they had to be exempted from the proposed

⁸⁹⁴ Samferdselsdepartementet, *Nytt regelverk for nedlesning av data fra satellitt på Svalbard og i Antarktis*.

⁸⁹⁵ Samferdselsdepartementet, «Høring - To forskrifter om etablering, drift og bruk av jordstasjon for satellitt, henholdsvis på Svalbard og i Antarktis,» (Samferdselsdepartementet, 2016), accessed 3 May, 2022, <https://www.regjeringen.no/no/dokumenter/horing---to-forskrifter-om-etablering-drift-og-bruk-av-jordstasjon-for-satellitt-henholdsvis-pa-svalbard-og-i-antarktis/id2469012/?expand=horings svar&lastvisited=undefined>.

⁸⁹⁶ Kongsberg Satellite Services AS, *Høringssvar - Kongsberg Satellite Services 2*, Cor-16-81 (Samferdselsdepartementet, 2016).

⁸⁹⁷ Space Norway, *Høringsuttalelse - Forskrifter om etablering, drift og bruk av jordstasjon for satellitt* (Samferdselsdepartementet, 2016).

⁸⁹⁸ Nasjonal Sikkerhetsmyndighet, *Forskrifter om etablering, drift og bruk av jordstasjon for satellitt, på Svalbard og i Antarktis*, (Samferdselsdepartementet, 2016); Norsk Romsenter, *Høringsuttalelse - To forskrifter om etablering, drift og bruk av jordstasjon for satellitt, henholdsvis på Svalbard og i Antarktis* (Samferdselsdepartementet, 2016).

data availability requirement.⁸⁹⁹ The DSB was concerned with the national supervisory function, and urged the MTC to clarify roles and responsibilities for space activities to avoid ‘an unfortunate fragmentation of this governmental responsibility.’⁹⁰⁰

Prior to the 1999 regulations, the FFI had conducted a classified study considering the Svalbard Treaty and the construction and operation of Svalbard Satellite Station,⁹⁰¹ and now criticised the new proposal for not accounting for the emerging diversity in satellite applications. Principally, the FFI advised the MTC to not self-impose stricter regulations than necessary to adhere to international law. This could harm Norway’s ability to exercise authority and possibly impact on other parties to the treaty negatively.⁹⁰² NOSA voiced the same concerns, warning that some of the proposed changes ‘could create problems for some military use’. The MTC’s original proposal also meant that some of the current ground station operations on Svalbard might have to be terminated. NOSA had not identified that the current national regulations had violated international law, so there was no reason to self-impose a stricter regime. The principal purpose was to ensure that the Svalbard Archipelago would not be used for ‘warlike purposes’. NOSA proposed instead to merely prohibit communication with ‘satellites used exclusively for military purposes’. They also proposed to add the Norwegian Security Act to the regulation’s legal basis. This would allow the Government to make urgent decisions in the interest of national security, emergency preparedness and public interest.⁹⁰³

The final regulation entered into force on 1 May 2017 and prohibits ground stations in the treaty areas from communicating with satellites whose data are made available ‘for military purposes only’ or if ‘the main intent’ was to use the data militarily. It is also prohibited to assist satellites

⁸⁹⁹ Nasjonal Sikkerhetsmyndighet, *Forskrifter om etablering, drift og bruk av jordstasjon for satellitt, på Svalbard og i Antarktis*.

⁹⁰⁰ Direktoratet for samfunnssikkerhet og beredskap (DSB), *Anmodning om uttalelse - Forskrifter om etablering, drift og bruk av jordstasjon for satellitt, henholdsvis på Svalbard og i Antarktis* (Samferdselsdepartementet, 2016).

⁹⁰¹ Wahl, Some selected publications: Terje Wahl. The overview refers to: Andersen V S, Johansen I, Wahl T: Forholdet til Svalbardtraktaten ved bygging og drift av Svalbard Satellittstasjon (SVALSAT). FFI/RAPPORT-95/05387, 1995 (Ikke offentlig).

⁹⁰² FFI, *Høringsvar - Forsvarets Forskningsinstitutt 2* (Samferdselsdepartementet, 2016).

⁹⁰³ Norsk Romsenter, *Høringsuttalelse - To forskrifter om etablering, drift og bruk av jordstasjon for satellitt, henholdsvis på Svalbard og i Antarktis*.

that are to perform functions specifically for military purposes, except for emergency situations, whereby the operator is allowed to assist ‘all satellites.’⁹⁰⁴

Chapter conclusion

As part of the defence review around 2015, space developments were weighed up against the replacement of the maritime patrol aircraft. While space-based intelligence, surveillance and reconnaissance (ISR) clearly could provide valuable continuous observation over large areas, the Armed Forces were not entirely dependent on it. The Chief of Defence suggested that Norway could further develop its ISR capabilities by acquiring national satellites or partnering with other states, private entities or a mix of both. The NIS was also closely monitoring the evolution of space technologies and potential threats, assessing foreign intelligence satellites and space developments. This shift in focus on space was partly driven by Norway’s participation in international military operations, where intelligence and situational awareness became critical. Admiral Bruun-Hanssen proposed replacing the current P-3 Orion aircraft with a combination of satellites, small aircraft and UAVs to enhance cost-effectiveness. While this idea sparked debate, some questioned the feasibility of replacing MPA’s radar and optical sensor capabilities with satellites. Part of the argument was that satellites could not physically assert sovereignty or safeguard Norwegian interests, such as fisheries and oil rights, which required presence through vessels, planes and personnel. Air Force Inspector General Maj. Gen. Rygg, argued against this, that space-based capabilities could not replace MPA’s. While satellites could supplement current capabilities, they could not provide the physical presence needed to assert sovereignty, a view supported by other air power nations. Also, NIS Deputy Director Rykken stated that despite the opportunities presented by space technology, he personally believed that Norway would operate maritime air capacities ‘for many years to come’.

Despite the potential benefits of space technology, it was agreed that Norway would likely continue to rely on maritime air capacities for the foreseeable future. As we know, the debates ended with a satisfactory

⁹⁰⁴ Kommunal- og moderniseringsdepartementet, «Forskrift om etablering, drift og bruk av jordstasjon for satellitt på Svalbard»; Kommunal- og moderniseringsdepartementet, «Forskrift om etablering, drift og bruk av jordstasjon for satellitt i Antarktis.»

arrangement between the Norwegian Government and the US Navy to replace Norway's P-3 fleet with P-8s. In June 2016, the MoD announced that they would 'invest in Norway's ability to establish national and allied situational awareness in the north' by acquiring new maritime patrol aircraft to replace the P-3C Orion. In March 2017, the MoD announced that the Defence Materiel Agency on behalf of the Armed Forces had signed a contract with the US authorities to procure five P-8A Poseidon MPAs and that the first aircraft would land on Norwegian territory in 2022.

Another important development in 2015 was the Norwegian Government's updated regulations governing satellite ground station activities on Svalbard and in Antarctica, influenced by developments in the satellite industry. The Svalbard Treaty, which prohibits military use of the archipelago, was seen as a potential barrier to expanding Norway's space operations, especially in the military domain. Concerns arose over the military's involvement with facilities like KSAT on Svalbard, as violations of the treaty could damage Norway's international credibility. The initial review proposed strict controls, including prohibiting communication with military satellites in these areas, but this faced pushback from stakeholders like KSAT, Space Norway and other Norwegian agencies, which argued that the regulations could harm commercial and military interests. Ultimately, the final regulation, enacted in May 2017, prohibited communication with satellites primarily used for military purposes, while allowing exceptions for emergencies. The aim was to maintain compliance with the Svalbard Treaty and balance national security and commercial interests.

Status and future

The international scene changing

Amid global economic and geopolitical change

Technology development is driven by several factors. Technological opportunities are important, of course, but not by any means the only factors. There is seldom truth to arguments of ‘technological determinism’; however, some technologies do cause social change. This is normally a result of parallel, soft, casual elements such as economic optimism and risk willingness, trends and fashion, political decisions and similar.⁹⁰⁵ Not all potential technologies are developed or succeed and prevail. A central, and perhaps the most important, factor is ‘motivation’, meaning the strategic interests and security policies of a nation, business or industry.

Thus, the development of new ground-breaking technologies and related conceptual thinking normally comes about from the interaction between the state and industry, people with operational or business ideas and people with technological expertise. Space developments are of such a nature, where states need to and will be involved. To understand what may come our way in the coming years, we therefore need to understand the global political, economic and security landscape, and the technological bases – all of which are rapidly changing at present – to be able to make the right choices.

Today, we live in times of uncertainty: in a dynamic and fast-changing political and security landscape, and with technological innovations

⁹⁰⁵ Merritt Roe Smith and Leo Marx, eds., *Does Technology Drive History? The Dilemma of Technological Determinism* (The MIT Press, 1994), 67–69, 77–78.

constantly providing new opportunities. For one thing, great power politics and rivalries are back. They have been back for some time, but it is inherently difficult to see dramatic changes evolving. Today, we may best describe our outlook on world affairs as living, or staying, in the eye of the storm. Everything is rotating; no-one knows how the global political, economic and security landscape will look emerging from these times of change.

Following the rise of China, we have today two major economies dominating world affairs. The US' and China's economies alone constitute almost half of the global economy. Russia has lost position and influence, and has consequently turned into a 'resurgent Russia', trying to cling onto its past influence on world affairs. Even though Russia constitutes a marginal economic power, it is one of the most resourceful states in many respects. Not least, it is still the second greatest nuclear power, ensuring its military might for deterrence and safeguarding of its own state interests. China has developed into a peer-competitor to the US and its allies in the Far East, especially around the South China Sea and inside its 'second island chain' region. China has also openly stated that it is aiming to become a 'world class' fighting force by 2050. They are well on the trajectory to achieving this. Consequently, US strategic outlook has turned to that region, and the modernisation efforts of the US military have come to focus primarily on these so-called 'peer-, or near-peer competitors' – for the most, on China. This development will increasingly have repercussions for NATO as an alliance. Living in the midst of this transition into a new global order, of two major economies and a 'multi-polar world system' of competitors, we see increased tension between the global great powers as well as between regional powers. There are also very important dynamics between the great powers and the middle-size powers, where the latter hinge on the great powers in a changing system at a regional level.

The great power rivalry also transcends into the sphere of economy. These relations are even harder to understand and predict the outcomes of as economic relations are both inherently global and interrelated, and at the same time, we witness trends of nationalisation of industries and control with data and digital networks. We see that globalism receives criticism and state-driven competition and even nationalism is on the rise. Still, the dependencies are so great that it is hard to foresee an extensive disconnect between the two major economies and between the other major economies, including the EU from a European perspective.

State programmes and business

The two great powers of the Cold War, the US and the USSR, engaged in a race for rocket technology and with that, also space exploration and space power. The launch of Sputnik in 1957 marked the start of the space race, soon followed by Soviet cosmonaut Yuri Gagarin as the first man in space, and later the Apollo Moon landings, with Apollo 11 landing men on the Moon on July 20 1969 and returning safely to Earth. The Apollo missions, with several landings and exploration, marked US and NASA domination over space power.⁹⁰⁶ The US' and NASA's dominance continued with the Space Shuttle programme ensuring access to space for exploration. The Hubble Space Telescope, launched by the Space Shuttle *Discovery* in 1990, transformed our understanding of the universe. Even today, NASA remains at the forefront of space exploration. Russia is still a major provider of commercial launch services, with its great knowledge and expertise in rocket technology. The USSR landed its first satellite on Mars in 1971, but communication was lost. Simultaneously, China tried to catch up, also in these fields. China launched its first satellite in 1970 and its first crewed spaceflight in 2003, becoming the third country to independently send humans into space.⁹⁰⁷ India, the EU, with ESA, and Japan are trying to keep pace in the great power space race.⁹⁰⁸ The political and military strategic considerations were, from early on, an important indirect driver for space development through many groundbreaking technologies, and not least a parallel of strategic rocket forces for nuclear deterrence. Over time, space has become crucially important for military forces, ranging from communication and interconnectivity, and navigation services (Global Navigation Satellite Systems (GNSS)) to strategic intelligence gathering, missile warning systems, tactical reconnaissance and targeting support. Space-based ISR has for years been the backbone of Western powers in relation to situational awareness capabilities. The Western, or American, dominance in regard to military space systems has led to an increased focus on ASAT in Russia. China, on the other hand, has increasingly tried to catch up with the West to develop similar and advanced space capabilities over the last two decades. The 'militarisation of space' was a critical and

⁹⁰⁶ Paul Corky, *The Battle for Space Power* (Amazon, 2024), 11–15.

⁹⁰⁷ Corky, *The Battle for Space Power*, 152–155.

⁹⁰⁸ Mitsuru Obe, "Space race to heat up in 2024 as Japan, China, India reach for the stars", *Nikkei, Aerospace & Defence Industries*, 3 January 2024, <https://asia.nikkei.com/Business/Aerospace-Defense-Industries/Space-race-to-heat-up-in-2024-as-Japan-China-India-reach-for-the-stars>

important part of the final stages of the Cold War and has re-emerged in the new era of great power competition and increasingly military rivalry.⁹⁰⁹ With ever-more sophisticated space vehicles, of smaller size, ‘Space Warfare’ has evolved from kinetic ASAT efforts to a broader capacity to disrupt the capabilities of the greater GNSS and communication systems, as well the advanced ISR satellite systems. On the other hand, Western dominance and China and India’s growth push Russia to explore the old ideas of putting nuclear weapons into space. Russia, an economically weakened great power, uses its leverage in rocket and nuclear expertise to remain an influential player in world affairs and military might.⁹¹⁰ Currently, Russia seems to be placed in the position of disruptor, rather than player, in the race for new capabilities and outer space exploration. Still, someone to be counted, as expressed by Weaver and Røseth: ‘Our country relies on satellites – we’re in big trouble if Russia takes them out.’⁹¹¹

In parallel with the classic, large-scale, state programmes, a new business market has emerged over the last few decades. In the beginning, the large state programmes provided launch services for the merging market of smaller satellites (SmallSat) and orbital systems of various businesses. Today, we partially see a separation of the two markets. The greater powers’ state programmes have become more focused on ‘outer space’ exploration: establishing staging positions in orbit or on the Moon, getting to Mars, maybe even establishing sustainable human presence on new planets. To most people, this still seems like science fiction, however, Tim Marshall reminds us of some of the great changes in human explorations we have seen that at the time seemed just as incredible. He says, ‘What was distant is now near, what was slow is fast, and the impossible is now the norm,’ and

⁹⁰⁹ As societies and military forces have become crucially dependent upon space capabilities, ‘space warfare’ becomes a reality. Be it efforts to safeguard its capabilities – or to disrupt or spy on the others’ systems – this naturally comes as an extension of evolving capabilities and our reliance on them. As mentioned, Russia has increased its focus on ASAT capabilities in regard to China. As the US established its US Space Force, President Trump proclaimed that space had become a ‘war-fighting domain’ and that the US would need to dominate this ultimate high ground. Several other countries have established ‘space commanders’ and organisations, and NATO has defined space as an operational domain. From the early days of space exploration, the fight for space dominance was on the table. US President Reagan’s ‘Star Wars’ was a notable example. Actually, the ideas of space warfare and ASAT came about soon after the advent of the intercontinental missiles of the late 1950s, which exit the atmosphere and travel into space. The Anti-Ballistic Missile (ABM) Treaty of 1972 was put in place to stop these developments. Other aspects of space warfare were also on the drawing board at the height of the second Cold War period. Many of the systems would, however, require high-power supplies, be it for electronic or laser weapon systems. The question of nuclear power in space has re-emerged.

⁹¹⁰ Aaron Bateman, “Why Russia might put a nuclear weapon in space”, *Foreign Affairs*, March 2024.

⁹¹¹ John M. Weaver and Tom Røseth, “Our country relies on satellites – we’re in big trouble if Russia takes them out”, *The Hill*, 3 June 2024, accessed 2 August 2024.

reflects on Leonardo da Vinci's very early ideas of making humans fly. He goes on to state, 'With this in mind, our thoughts on space and the future should not be limited – not even, except on a practical basis, by science.'⁹¹² However, the state programmes are also challenged by the increasingly influential and powerful private enterprises, creating their economic foundation by first building business empires and then moving into low orbit satellite systems for technological knowledge and business while keeping visionary ideas of the future of space exploration. For instance, Elon Musk believes that there is a 70 percent chance that he will see self-sustaining cities on Mars in his lifetime,⁹¹³ while Jeff Bezos believes the next step is mile-wide, wheel-shaped rotating cities stationed near Earth.⁹¹⁴ In the case of China, it is very difficult, if impossible, to separate between state and privately-run companies.

The 'New Space', business-driven, accessible low-orbit systems are both a consequence of technology trends and developments, as well as a desired transition by the greater powers. For instance, in the US – the leading space power – we saw a major policy shift at NASA beginning in 2010 and accelerating in 2017. The policy shift in the US led to labels such as 'Commercial Space', 'New Space' and 'Space 2.0,' as private sector organisations became partners and got parts of the value chain, rather than being contractors. NASA began on a far larger scale to purchase services and outcomes, rather than just hardware to integrate into the state systems.⁹¹⁵ Over the last decade, investments and business involvement have just exploded. There was a rapid increase in numbers of start-ups from around 2010 on, and venture capital gradually increased, significantly so from 2018–19 onward.⁹¹⁶

Three distinct periods of satellite remote sensing technologies

The early systems of 'earth observation' for civilian use, or 'surveillance' or 'reconnaissance' (often labelled ISR) by the military, was and still is mainly dominated by the larger nations and the EU. The first US Landsat

⁹¹² Tim Marshall, *The Future of Geography* (Elliot and Thompson Limited, 2023), 257.

⁹¹³ Marshall, *The Future of Geography*, 265.

⁹¹⁴ Marshall, *The Future of Geography*, 267.

⁹¹⁵ David S. Rose, "Foreword", in Robert C. Jacobson, *Space is Open for Business* (Robert C. Jacobsen, 2020).

⁹¹⁶ Robert C. Jacobson, *Space is Open for Business*, 129–135.

was launched in 1972. Traditional EO⁹¹⁷ satellites are large satellites, originally approximately 2,000 kg, such as the ESA Envisat of 2002 with a launch weight of 8,211 kg. These are still in use, and the capabilities of their electro-optical and radar sensors have steadily improved. These developments were and still are mainly driven by national security and intelligence needs. What may be labelled ‘Space Remote Sensing 1.5’ emerged in the mid-1990s, as the US commercialised licensing of high spatial resolution satellites imagery. Around the turn of the millennium, the EarlyBird, Ikonos, Quickbird and OrbView-3 satellites established new standards, with resolutions down to 25 cm. These systems were still large and operated in very much the same way as state-owned systems. The systems were and are still largely run by government-commercial cooperation, with commercial industry only controlling approximately 25 percent of the market.⁹¹⁸

As mentioned, the great change came around 2010 and may be defined as a paradigm, ‘Remote Sensing 2.0.’⁹¹⁹ Madry et al. define what emerged as a ‘radical revolution in the EO world’. Planet Labs, later renamed Planet, which grew out of the NASA/Ames PhoneSat project, was established in 2009/10. It brought with it a whole new mindset on how to develop such systems, as well as the mindset of launching ever-new satellites with improved performance and testing commercial and new sensors. Its initial grid soon amounted to 130 satellites. It broke the rules, creating and launching satellites that were cheap, disposable, not (traditionally) space-rated and manufactured in expensive cleanrooms.⁹²⁰

The future we now see opening for commercial interests and nations smaller than the handful of great powers opting for far-outer-space projects is with SmallSat grids, ever-new sensor and communication capabilities and, most likely, many services we do not even know we miss or need as yet. The SmallSat development is truly a revolution. The industry is growing at

⁹¹⁷ “IO” is often used for “Electro-optical” as a sensor; and used for “Earth Observation” in civil research and for space capabilities.

⁹¹⁸ Scott Madry et al., *Innovative Design, Manufacturing and Testing of Small Satellites* (Springer, 2018), 31–34. However, all breakthroughs on the commercial side have a history. In the case of modern small satellites, we should give credit to a groundbreaking company from the UK, Surrey Satellite Technology Ltd., funded by Surrey University back in 1985, which may be said to have set the stage. This company was later taken over by Airbus Defence and Space. It was the first to develop modular EO microsatellites. Through NASA, it launched the satellite system MicroSat 70 for disaster relief. Several countries participated in this effort.

⁹¹⁹ Madry et al., *Innovative Design, Manufacturing and Testing of Small Satellites*, 34.

⁹²⁰ Madry et al., *Innovative Design, Manufacturing and Testing of Small Satellites*, 36–37.

a fast pace, by many called a ‘gold rush’ of space commercialisation.⁹²¹ As mentioned earlier, this development took off around 2010, but has increased since 2017. The numbers of satellites in orbit and operational increased four-fold in the period. It is expected that there will be an annual launch of 2,500 SmallSats in the years ahead.⁹²² Even though the number of launches was kept steady at approximately 90 per year, the increase was due to great numbers of SmallSat satellites piggybacking on medium and heavy launchers.

The next development we see the contours of is small-size, purpose-built launchers for launching various types of SmallSat into low orbit. Several companies and states are currently exploring this technology, both through traditional rockets and re-usable launchers.⁹²³ Re-usable launchers are pursued as cost-effective options (when developed), but also as ‘green technology’, which has become an ambition for many states. However, many of these technologies are very similar to the technologies and major components of ballistic missiles. Thus, this development is also of great concern for the risk of proliferation of military weapons.⁹²⁴

The crucial reliance on space capabilities for society and the military today leads to increased vulnerability. It is a fear that existing systems may be targeted by others if greater states get interlocked in direct conflict or war, and subsequently services are denied to those ‘not on the right side’ in a conflict by international companies, directly or indirectly controlled by states or because the owners take a personal stand. Recent examples of this are how space services have been provided – or denied – in the war in Ukraine and in the early stages of the Israel-Hamas War in Gaza.⁹²⁵ States must and do have the ability to limit companies’ services. This is something that is necessary and reasonable but, at the same time, something

⁹²¹ Danton Boas et al., “Innovative and Low-Cost Systems”, in Francesco Branz et al., *Next Generation Cubesats and Smallsats* (Elsevier, 2023), 403–405.

⁹²² Gareth Willmer, “In Booming Satellite Market, Micro-Rockets are the Next Big Thing”, *Horizon, the EU Research & Innovation Magazine*, 10 April 2023.

⁹²³ Willmer, “In Booming Satellite Market, Micro-Rockets are the Next Big Thing.”

⁹²⁴ Kolja Brockmann and Markus Schiller, “Small and Micro Launchers in the NewSpace Era: New Missile Proliferation Risks or More of the Same?” *SIPRI*, 2024, accessed 30 July 2024, <https://www.sipri.org/commentary/topical-background/2023/small-and-micro-launchers-newspace-era-new-missile-proliferation-risks-or-more-same>.

⁹²⁵ See, for instance, Julian Borger, “Elon Musk Ordered Starlink to be Turned Off During Ukraine Offensive”, *The Guardian*, 8 September 2023, <https://www.theguardian.com/technology/2023/sep/07/elon-musk-ordered-starlink-turned-off-ukraine-offensive-biography>; Chloe Cornish, “Israel tells Elon Musk Starlink can Only Operate in Gaza With its Approval”, *The Financial Times*, 27 November 2023, accessed 10 June 2024, <https://www.ft.com/content/67a874e3-42fb-4c69-8d74-212f2fed5d0e>; Tim Fernholz, “The US Restricts Sales of Satellite Images Over Just One State—Israel”, *Quartz*, 7 November 2023, accessed 10 June 2024, <https://qz.com/israel-hamas-satellites-national-security-1850999797>.

economically driven interests often overlook. It is, on the other hand, important that states are aware of potential conflicts of interest and dilemmas that may arise, and are ready to act adequately, timely and lawfully in order to protect vital national and international interests. In this regard, states must ensure that a reasonable and adequate legal framework is in force.

Further, one must expect that ground segments, links and satellites will be targeted and services disrupted in cases of conflict or war. This is but one rationale for building and ensuring the full value chain of space competencies and capacity. This includes building small satellites and being able to launch nationally. The services and capacities of the greater nations, including companies with origins in those states, will be prioritised for national needs in times of crisis and war.⁹²⁶ The larger satellites of the greater states are, in many respects, much more vulnerable to enemy interests in times of crisis and before wars. The new, emerging SmallSat systems of commercial industries and smaller nations are, in many respects, less so, due to their share numbers and being of less importance in the great game of war. Still, they will most likely be targeted and disrupted. Being able to replace and build on the existing systems as needed will probably prove to be an invaluable capability in the future.

To be able to create and ensure the full value-chain for SmallSat development in smaller states, research communities and industry are reliant on state sponsorship for research and for long-term commitments to industry. This applies to the greater states when getting established, not the smaller nations. In the case of China, it is hardly possible to separate state from commercial industry, and in case of the US, even SpaceX and Rocket Lab have ensured their business foundation by providing for US state needs for launching of the Space Force or building satellites for the NRO.⁹²⁷

Small satellites – trends and developments

Currently, we are witnessing two mega-trends unfolding with SmallSat communication grids and dramatically increased performance for SmallSat earth observation capabilities.

⁹²⁶ Bleddyn E. Bowen, *Original Sin, Power, Technology and War in Outer Space* (Hurst & Company, 2022), 236–238.

⁹²⁷ Michael Sheetz, “Investing in Space: Why Military Contracts are Crucial for Space Companies”, *CNBC*, 3 July 2024; Global Market Insights (GMI), *Report on “Small Satellite Market”*, July 2024, accessed 30 July 2024, <https://www.gminsights.com/industry-analysis/small-satellite-market>.

We are seeing great efforts in the development of communication and internet grids, with leading companies such as Starlink by Space X, the planned competitor 'Project Kuiper' by Amazon, and others. Starlink is opting for a constellation of more than 12,000 SmallSat to provide for global broadband coverage. The success of the Starlink system has demonstrated the feasibility of mega-constellations and has led to follow-on companies and states developing competing services. Multiple Chinese companies and the Chinese state are clearly trying to catch up with the American and European major companies providing SmallSat grids of communication and internet services.⁹²⁸

We are also seeing great efforts in the field of ever higher performance and availability of Earth observation sensors, even new types of sensors, as the militarisation of systems and data computing power increases. The most used sensors for area surveillance today are AIS and radar satellites. Electro-optical sensors are important for final classification and detailed information. Over the last few years, multi and hyper-spectral sensors have gradually improved the resolution, even for small sensors, and are increasingly becoming available. Passive radar, collecting and measuring active signals used by others (e.g. navigation radars onboard ships) are also coming into use for SmallSat systems. The prospective use of bi and multi-static radar systems is also being explored for SmallSat systems. These can be designed with active transmitters, purpose-built or they can utilise already active signals from the sky, for example, reflections from the great numbers of navigation satellite signals (GNSS).⁹²⁹ As sensors become more and more sensitive, computing power increases and Artificial Intelligence (AI) data handling⁹³⁰ becomes more accessible; new sensors will be

⁹²⁸ Shunsuke Tabeta, "China to launch 26,000 satellites, vying with U.S. for space power", *Nikkei, Aerospace & Defence Industries*, 10 January 2024, accessed 10 June 2024, <https://asia.nikkei.com/Business/Aerospace-Defense-Industries/China-to-launch-26-000-satellites-vying-with-U.S.-for-space-power>.

⁹²⁹ Giovanni Soldi, Domenico Gaglione, Nicola Forti et al., "Space-Based Global Maritime Surveillance. Part I: Satellite Technologies", *IEEE A&E Systems Magazine*, September 2021, accessed 10 July 2024, <https://ieeexplore.ieee.org/document/9532493>.

⁹³⁰ The Norwegian Ministry of Defence published an AI strategy in 2024 (https://www.regjeringen.no/no/aktuelt/kunstig-intelligens-i-forsvarssektoren/id2999913/?utm_source=regjeringen.no&utm_medium=email&utm_campaign=nyhetsvarsel20231013), that still needs to be operationalised by the Armed Forces, the Norwegian Defence Institute and Forsvarets materielladministrasjon. The research communities are increasingly bringing AI research into several traditional disciplines, e.g., Cybernetics (Interview, Eirik Selnaes Sivertsen, NTNU, 10 July 2024). The industry is also following this trend, where, for instance, KSAT bought the new startup VAKE, aiming to become a world leader in the use of AI and machine learning on satellite data for maritime domain awareness (KSAT, "KSAT has Acquired Majority Stake in Norwegian Startup VAKE", press release, 20 March 2024, accessed <https://www.ksat.no/news/news-archive/2024/ksat-has-acquired-majority-stake-in-norwegian-startup-vake/>).

developed. The grids or constellations of SmallSat provide the prospect of constant coverage when compared to larger satellites. Constant coverage has come more to the forefront in maritime surveillance efforts since the sabotage of underwater infrastructure in the Baltic Sea, North Stream and the communications cables between Estonia and Finland.⁹³¹ The next step for industries will be to interconnect all the types of sensors in space and between space and other sensors systems. It is especially in this field we may see all-new usages of the ever-increasing availability of sensors and data. Surveillance as a continuous process and reconnaissance as spot observation on specific focuses are about collecting information. The information needs to be assessed and analysed to provide decision-makers with processed data for use.

Technical surveillance and reconnaissance of maritime areas are for smaller, defined areas conducted by subsurface and surface vessels and sensors, as well as elevated sensors from manned aircraft or unmanned drones. As subsurface and surface sensors have limited range, larger area surveillance and reconnaissance are mainly conducted by manned aircraft, medium-size unmanned drones and space platforms. Such assets have largely been operated by state actors due to the size, complexity and cost of such systems. However, with the trends of miniaturisation of sensors and components, lower costs and less demand on power supply, such capabilities are becoming available for many users. Over recent years, space-based systems for surveillance and reconnaissance have been provided by an ever-increasing number of civil, commercial actors. Especially SmallSat systems, developed and run by commercial actors, are becoming an important asset for both civil companies and government services.

As for Norway, SmallSat constellations have the potential for even greater effect than for most countries. All satellites orbiting will only provide surveillance of a swath in their passage of a region. The width of the swath depends on the type of sensor, be it for communication or Earth observation. Consequently, single satellites only give so much effect, and grids of satellites are needed for a full coverage, with low revisit times. SmallSat in polar orbits will provide very good coverage in polar regions, for example, the geo-strategic areas of interest for Norway. Norway is thus

⁹³¹ Jon Henley, "NATO Vows to Respond if Finland-Estonia Gas Pipeline Damage is Deliberate", *The Guardian*, 11 October 2023, accessed 20 July 2024, <https://www.theguardian.com/world/2023/oct/11/nato-vows-to-respond-if-finland-estonia-gas-pipeline-damage-is-deliberate>.

in a favourable position to create and rely on cost-effective constellations of relatively small numbers of satellites, compared to states closer to the equator (that will require far greater numbers of satellites for the same effective revisit times over targets of interest. Paired with its long-standing position as a large ground segment provider for downlink and communication with satellites, this makes a good case for national reliance on SmallSat systems as a baseline Earth observation capability for Norway.

It seems clear that SmallSat are fast becoming a key factor for surveillance and reconnaissance systems. The great potential of many types of sensors, the fusion of data and soon-to-be vast access to smaller satellites lead to a challenge in analysis and use of the data. Legacy surveillance systems are largely operated by humans for processing and analysis. Even today, human operated systems are not able to exploit the vast amount of data available. AI, with autonomous processing of single data and fusion, is the only way forward and must be embraced. The fast-developing sensor and computing technology is greater than the development of higher capacity communication systems (at least until laser communications systems become a reality). As a consequence, we see the need for not only autonomous processing, but also a need for 'in-situ', on-site or on-platform analysis. Only processed data can be effectively communicated with today's communication systems.

Legacy SAR system databases are built on general pictures of different angles and simulated targets. However, SAR pictures are always slightly different when produced by different sensors and in every case affected by sea state, wind and weather. It is therefore very difficult to create good databases on such general or generated data. An alternative is to create databases from numerous pictures or iterations. For all practical purposes, both area coverage is challenging due to limited numbers of satellites, and the identification certainty of space-based SAR is limited due to coverage and how databases are built and sustained.

Passive radar systems with databases are very challenging to build and, not least, to keep updated. Still, good and continuously updated databases are crucially important. Legacy passive radar systems database processing and continuous programming are extremely labour consuming for organisations. The passive radar signals are, with the right resolution, true fingerprints of the targets. A passive radar capable of separation of individual vessels, with the same systems, needs to have a high resolution and should also be able to record and analyse the pulse repetition interval. This is due to the important trend of globalisation of research and production. Technical

research has increasingly become more standardised, and trade and production of both complete systems and parts have become truly global. A navigation radar for a medium-size fishing vessel or a large cargo ship, or even military systems, have become largely similar, be it a French, American, Russian, Korean or Japanese system. Thus, a modern passive radar sensor must have a good resolution and needs to cover both S-band (2,000–4,000 MHz, most systems around 3,050–3,060 MHz) and X-band (8,000–10,000 MHz, most systems around 9,400 MHz). Most vessels have both and use one or the other band, as S-band radars are needed for longer range and poor weather conditions. This is important for the design of new systems; a good quality of sensors is nothing without a good database or ‘library’. In order to be able to use passive radars for practical applications, they are fully dependent on databases with a positive, confirmed identification. Additionally, the positive, confirmed identification needs to be updated regularly, as only smaller maintenance to systems leads to small, but critical, changes to the signature. Consequently, databases for the use of passive radars for identification need to be regularly – or, in fact, continuously – updated. To do this by means of manned aircraft and programming by humans is extremely labour consuming and costly, and almost impossible to do in a timely manner. Building and maintaining updated databases using AI technology, utilising repeated identifications and fusion of data is the future.

Fusion of data and the ‘observation pyramid’

Further, data need to be fused and automatically analysed, and various types of sensors need to be automatically interconnected to continue tracking and identification. For more than a decade, the Norwegian University of Science and Technology (NTNU) in Trondheim pursued such interconnection of various sensors for maritime surveillance through its Centre for Autonomous Marine Operations and Systems (AMOS). This Centre of Excellence⁹³² operated from 2013 till 2023, with funding of more than NOK 1.3 billion. One of the key ambitions of the centre, now transferred to the NTNU Small Satellite Lab,⁹³³ was the creation of data and sensor fusion,

⁹³² Visit NTNU AMOS at: <https://www.ntnu.edu/amos>

⁹³³ Visit the NTNU Small Satellite LAB at: <https://www.ntnu.edu/smallsat>

which was named the ‘Observation Pyramid’ (*Observasjons-pyramiden*).⁹³⁴ This was designed to create a system-of-systems, integrating autonomous and conventional infrastructure across domains such as space, air, sea and underwater. The agents share data to make more effective operations possible, at a reduced cost and with less carbon emissions. As noted by Tor Arne Johansen and Eirik Selnæs Sivertsen from NTNU, building system-of-systems requires a high level of competence and diverse skills that can only be found through a union of disciplines and activities. In order to stay ahead, NTNU has actively tried to learn and transfer knowledge, and share best practices across its many labs and field experiments in different departments. According to the researchers, the Observation Pyramid is a concept which has significantly more potential than we have utilised so far. It is still necessary to carry out further research in autonomy, new prototypes of robots, use of AI, machine learning, modelling, fusion of observations and models, new sensors, communications, etc. to utilise the full potential of the concept. Also, research fields such as cooperation between “robots” all from sensor-carrying platforms to active agents manipulating the environment/infrastructure, effective data processing pipelines for data products, and the development of new scientific methods to utilise opportunities are constantly being worked on.⁹³⁵

Chapter conclusion

Clearly, we live in times of great power rivalries, where the functioning of the long-established ‘international systems’ is being challenged. Living in the midst of this transition into a new global order, of two major economies and a ‘multi-polar world system’ of competitors, we see increased tension between the global great powers, as well as between regional powers. This dynamic and fast-changing political and security landscape, as well as ever new technological innovations, creates a dynamic environment for political and business-driven changes to world affairs. Such times of change come with both challenges and dangers, but also great opportunities. As for space technology, concepts and the fast-growing commercial market, we can see several

⁹³⁴ Eirik Selnæs Sivertsen, Project Manager NTNU, interview 1 August 2024. “The Observation Pyramid” was designed by Kanna Rajan and Tor Arne Johansen, and is still used as ambition and model for how to build smart, inter-related surveillance systems.

⁹³⁵ Professor Tor Arne Johansen, Department of Engineering Cybernetics, NTNU, interview 23 July 2024; Project Manager Eirik Selnæs Sivertsen, NTNU, interview 1 August 2024.

trends developing in parallel. On the one hand, they are inherently global from the perspective of research and development, and for business. On the other hand, we see nationalism and protectionism, as well as espionage, on the rise and security efforts more in focus for everything from research to capability development. Even though state and commercial interests overlap and interact, we also see a partial separation into two markets. The greater powers state programmes have become more focused on ‘outer space’ exploration, as well as being more concerned with ‘militarisation’. With ever more sophisticated space vehicles ‘space warfare’ has evolved from kinetic ASAT efforts to include a broader capacity to disrupt the capabilities of GNSS and communication, as well as ISR systems. As we see an increased Western dominance, with China and India’s increasing its capabilities, Russia is falling behind the developments – and as a declining global actor she seems to fall back on exploring old ideas of putting nuclear weapons in space.

For sure, the ‘New Space’, business-driven, accessible low-orbit systems are the ‘new oil’. The policy shift of the US more than a decade ago has led to dramatic changes. The private sector and commercial actors are becoming true partners. Commercial actors have got parts of the value chain, rather being contractors. With this, smaller states like Norway, with its strong economy and highly relevant, technical communities, have taken the opportunity to establish themselves in this industry to ensure national control of basic services based on SmallSat systems.

It should be obvious that the SmallSat industry has seen and most likely will continue to see enormous growth over the next few years. The range of capabilities and use is great; however, the new possibilities and usage of space are just in their infancy. It is hard to foresee the future. The overall trends of today are focused on the cost benefit and coverage versus accuracy and high resolution, the demand for scaling to meet time-to-market challenges, be it civil or military use, and efforts to minimise all latencies.⁹³⁶ As we will see in the following chapter, Norway has increased its efforts already, with several projects in space and more on the way.

⁹³⁶ SIMERA, “Trends to Impact the Design of Optical Payloads for Smaller Satellites”, *SIMERA*, accessed 4 August 2024, <https://www.simera-sense.com/3-trends-to-impact-the-design-of-optical-payloads-for-smaller-satellites/>.

Norwegian satellite-based ISR capability development

When Norway launched AISSat-2 in 2014,⁹³⁷ the country had two satellites in orbit, acquired and operationalised for the net sum of NOK 50 million, and the system was operational nearly around the clock. Along with the receiver on board the International Space Station, the three platforms had global coverage and collected data from more than 40,000 vessels per day. According to the Military Space Strategic Review Working Group, the system served as a ‘very important tool’ for the Norwegian authorities, including the Coast Guard and the NJHQ.⁹³⁸

During its existence, Program Space had earmarked about ten percent of its resources to the FFI’s research and development projects, such as NorSat and SMART Milspace.⁹³⁹ The NorSat payloads were developed in cooperation with the FFI and Norwegian industry, and the satellite platforms were built by the Canadian University of Toronto Institute for Aerospace Studies Space Flight Laboratory (UTIAS SFL), like the AIS satellites. Similarly, the main financial contributors were NOSA and the NCA.⁹⁴⁰

In July 2017, Norway launched NorSat-1 and NorSat-2 into similar orbits as the AIS satellites, that is, polar sun-synchronous orbits at approximately 600 kilometres altitude. They were launched from Baikonur Cosmodrome in Kazakhstan, along with some 70 other small satellites. Each of the Norwegian small satellites weighed about 16 kilograms and cost about NOK

⁹³⁷ ”AISSat,” *Satellitter og baner*, *Store norske leksikon*, updated 13 January 2022, 2022, accessed 13 January, 2022, <https://snl.no/AISSat>.

⁹³⁸ Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, 66, 70.

⁹³⁹ Nilsson, interview.

⁹⁴⁰ Norwegian Space Agency, “NorSat-1 and NorSat-2 launched!” news release, 2017, <https://www.romsenter.no/no/News/News/NorSat-1-and-NorSat-2-launched>.

25 million each. They were equipped with AIS receivers and were operated from satellite ground stations in Vardø and on Svalbard, Norway.⁹⁴¹ In addition to AIS, NorSat-1 carried space weather and solar studies instruments, and NorSat-2 carried a ship-to-ship communications system, that is, VHF Data Exchange System (VDES), to test a new SATCOM-based standard for maritime communication.⁹⁴²

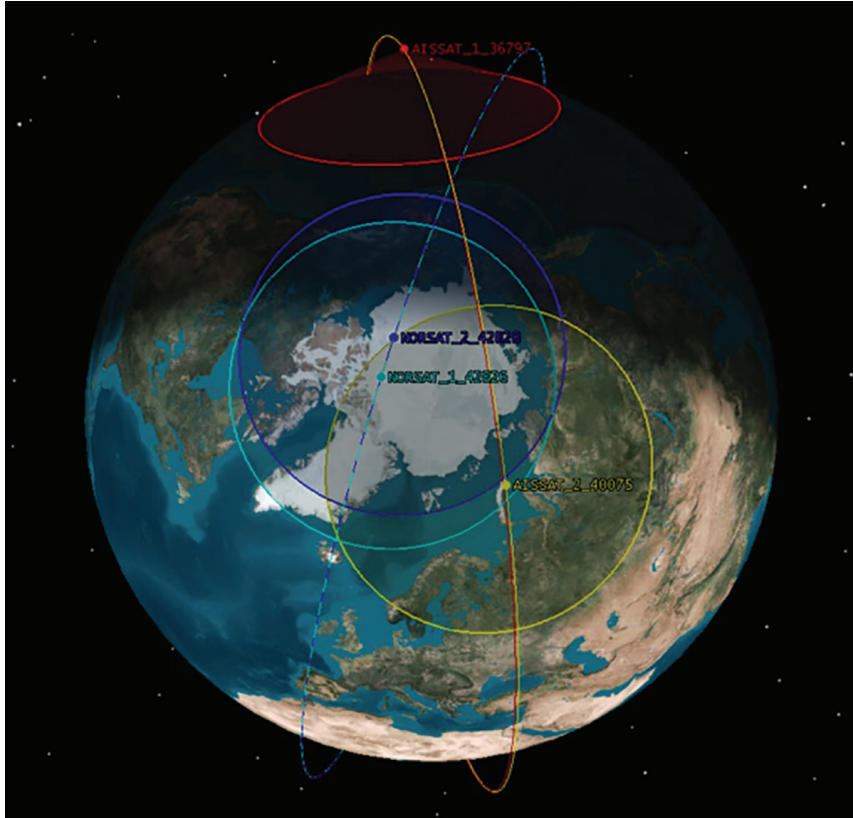


Figure 38. Orbit simulation of AISSat-1 and 2 and NorSat-1 and 2.⁹⁴³

In April 2018, the FFI announced that the NorSat satellite technology demonstrators would pave the way for new Norwegian space technology that would ‘make it easier to control what happens in Norwegian waters’

⁹⁴¹ Roger Birkeland (with Erik Tandberg), «NorSat-serien», *Satellitter og baner*, Store norske leksikon, 2022, accessed 5 May, 2022, <https://snl.no/NorSat-serien>. (Last updated 29 May 2024).

⁹⁴² Norwegian Space Agency, “NorSat-1 and NorSat-2 launched!”

⁹⁴³ Torkild Eriksen et al., “In-Orbit AIS Performance of the Norwegian Microsatellites NorSat-1 and NorSat-2,” *CEAS Space Journal*, 12, no. 4 (2020): 505, Fig. 3.

in the years to come. The FFI's ambition was 'to write the next chapter of Norwegian microsatellites' with NorSat-3 and NorSat-4, both equipped with modernised AIS receivers. NorSat-3 would also carry a navigation radar detector and NorSat-4 an electro-optical camera to 'further enhance the overview of the maritime traffic picture.'⁹⁴⁴

NorSat-4 would weigh about 20 kilograms and detect vessels that were approximately 30 metres long or larger, with each satellite picture covering approximately 10,000 square kilometres. The camera should be able to operate during polar nights and poor lighting conditions. Like the other Norwegian small satellites, it would be fully Norwegian-owned and controlled, meaning the camera could be pointed at certain areas at given times at the behest of the Norwegian authorities. The MoD had verbally committed to finance the payload and were currently negotiating with NOSA and the FFI, which planned to launch NorSat-4 in 2021.⁹⁴⁵ The development and construction of NorSat-4 was, however, delayed due to financial issues as well as the pandemic, and as of mid-2022, the plan was to launch NorSat-4 in October 2023, later delayed to 2024. In the longer term, the FFI aimed to develop a SAR microsatellite to provide nationally controlled, detailed images of sea surface and ship traffic, regardless of light and weather conditions.⁹⁴⁶

In late April 2021, Norway launched NorSat-3 into a similar orbit as the other satellites from ESA's Space Centre in French Guiana.⁹⁴⁷ The navigation radar detector on board NorSat-3 would pick up signals from navigation radars that are necessary to navigate safely and therefore less likely to be switched off compared to AIS.⁹⁴⁸ Whereas switching off AIS would not pose major complications, turning off the navigation radar carries a high risk of colliding with other vessels and obstacles in the water, including icebergs.⁹⁴⁹ NorSat-3 would help Norway identify vessels that for various reasons tried to evade the AIS system.⁹⁵⁰ At first, NorSat-3 satellite data were only transferred to the FFI, and in 2021–2022, the NIS collaborated

⁹⁴⁴ FFI, «Slik skal norske mikrosatellitter overvåke skipstrafikk,» 2018, updated 9 December 2020, <https://www.ffi.no/aktuelt/nyheter/slik-skal-norske-mikrosatellitter-overvake-skipstrafikk>.

⁹⁴⁵ FFI, «Slik skal norske mikrosatellitter overvåke skipstrafikk.»

⁹⁴⁶ Olsen, interview.

⁹⁴⁷ Birkeland, «NorSat-serien.»

⁹⁴⁸ Birkeland, «NorSat-serien.»

⁹⁴⁹ Hallvard Sandberg, «Norsk selskap skal få egne overvåkingsatellitter,» *NRK*, 1 May 2022, <https://www.nrk.no/urix/norsk-selskap-skal-fa-egne-overvakingssatellitter-1.15948631>.

⁹⁵⁰ Birkeland, «NorSat-serien.»

with the FFI to ensure that the data would also be available to the NJHQ in northern Norway.⁹⁵¹

Building a Norwegian satellite surveillance fleet

In May 2022, the Kongsberg Group and its subsidiary KDA announced plans to build three maritime surveillance satellites nearly identical to NorSat-3 ‘...to see which vessels are present in the northern maritime areas.’ Kongsberg aimed to sell satellite surveillance data to the Norwegian authorities, but other countries ‘may also be interested.’⁹⁵² Research Director Richard Olsen at the FFI, who developed the navigation radar detector antenna on NorSat-3, stated that ‘Norway is NATO’s eyes and ears’ in the High North and the geopolitical situation made it all the more important to know what is happening’ in Russia’s neighbourhood.⁹⁵³

This represented a change in which the investment costs and the remaining associated financial technical risks shifted from the Government to Norwegian industry, a model which the MoD had long since strived to establish.⁹⁵⁴ In a wider sense, it followed an international trend identified by Director of ESA Johann Dietrich Wörner in 2016. Private investments were increasingly entering the stream, posing the question of ‘how autonomous this information should be.’ In Germany, for example, a private company had produced three-dimensional Earth imaging data, with the German state as a principal customer. Whereas governments typically required at least one independent source of information, they would supplement this with additional sources such as privatised or commercial capability.⁹⁵⁵

As opposed to large and costly American and Russian surveillance satellites, ‘the Kongsberg satellites’ would be small, cheap and quick to build, and KDA aimed to build a ‘fleet’ of satellites with ‘different types of technology that can capture different types of data.’ By keeping the satellites so small that they could fit ‘...in the trunk of a car...’, KDA could rapidly adapt new technology to the platforms. The plan announced in May 2022 entailed launching the first three satellites into ‘relatively high Earth orbits,’

⁹⁵¹ Stensønes, interview.

⁹⁵² Sandberg, «Norsk selskap skal få egne overvåkings satellitter.»

⁹⁵³ Sandberg, «Norsk selskap skal få egne overvåkings satellitter.»

⁹⁵⁴ Nilsson, interview.

⁹⁵⁵ Wörner, interview.

from where the satellites would cover large maritime areas during each passage, including southern maritime areas. According to the Head of KDA, Eirik Lie, the company had identified a commercial opportunity and, at the same time, wanted to contribute to making Norway ‘a real space nation and taking that role in the world.’⁹⁵⁶ In July 2022, Kongsberg announced that it was acquiring 77 percent of Nano Avionics, a Lithuanian ‘smallsat mission integrator and bus manufacturer.’ According to Kongsberg, this was a ‘game changer’ for its own ‘space ambitions.’ The Arctic Surveillance Program (ASP), established by the Norwegian Coastal Administration, the Armed Forces, the Norwegian Defence Research Establishment and the Norwegian Space Agency in 2023, was a national attempt to bring together the efforts for space observation satellites, or ISR, in a comprehensive way. It represented a significant and comprehensive investment in maritime surveillance, the development of the national space industry and the support of national actors and research and development R&D initiatives. The ASP has since been constructed with both a user and manager level structure, which meets regularly to coordinate national user needs and plans. Additionally, a national industry forum has been established to better coordinate national efforts.

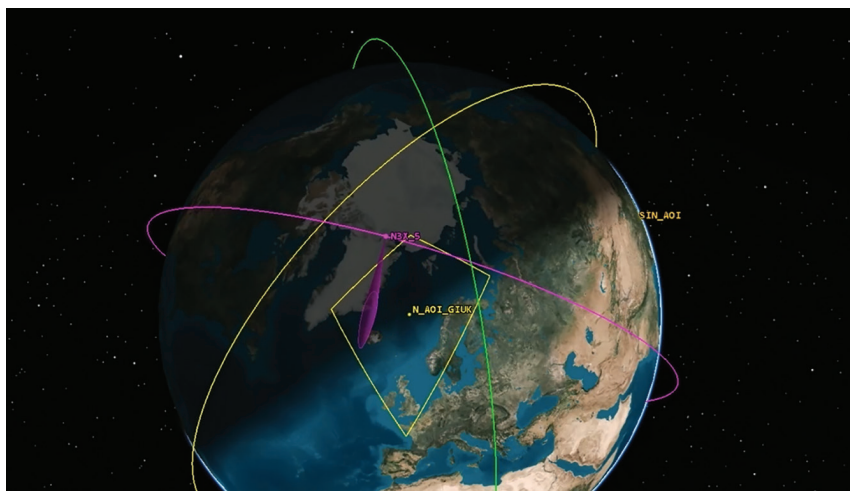


Figure 39. Simulation of the ‘Kongsberg satellites.’⁹⁵⁷

⁹⁵⁶ Sandberg, «Norsk selskap skal få egne overvåkingsatellitter.»

⁹⁵⁷ Sandberg, «Norsk selskap skal få egne overvåkingsatellitter.»

Norway and the 'exclusive international league'

Norway has come a long way since being categorised as an 'opportunistic' space actor in 2004. By the early 2020s, Norway had developed a wide range of capabilities, strengthening its overall position as a space nation and climbing up to the second highest level of 'the inadequate'.⁹⁵⁸ In relation to Paikowsky's 'Space Club', Norway with the KDA satellites and Nano Avionics acquisition nearly reached the second lowest level, which entailed indigenous capability to develop, maintain and control satellites.⁹⁵⁹ With an operational space launch facility, it can also be understood that Norway would soon be standing with one foot on the second highest level of the pyramid, 'only' lacking indigenous space launch capability to qualify. While Norway was now about to establish launch facilities under national control, the country would still rely on others, such as Isar Aerospace, for access to space.

For Norway as a space nation, it was even more significant than the satellite 'fleet' itself that KDA planned to launch their satellites into Earth orbit from Andøya Spaceport in northern Norway.⁹⁶⁰ NOSA was certainly convinced that establishing a space launch base on Andøya would constitute a significant strategic move for the nation.⁹⁶¹ In 2018, former Commander of USSTRATCOM Gen. (Ret.) Cartwright even envisioned 'several spaceports' in Norway, given its 'significant geographical advantage' in being situated close to the North Pole.⁹⁶²

In June 2020, the Government granted the state-owned space launch complex Andøya Spaceport a conditional commitment of approximately NOK 280 million in equity and around NOK 80 million in grants to establish a satellite launch facility.⁹⁶³ Andøya had been used as a rocket launch base since the 1960s, but this activity only entailed relatively small, sub-orbital rockets.⁹⁶⁴ Having teamed up with the German commercial rocket company Isar Aerospace, KDA aimed to write its name in the history

⁹⁵⁸ Bingen, *Det nære verdensroms strategiske dimensjoner*.

⁹⁵⁹ Paikowsky, *Clubs of Power: Why Do Nation-States Join the "Space Club"?* 19.

⁹⁶⁰ Sandberg, «Norsk selskap skal få egne overvåkings satellitter.»

⁹⁶¹ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, Vedlegg 1 til HMS/EHM/2018/54 (Norsk Romsenter, 2020).

⁹⁶² Cartwright, interview.

⁹⁶³ Regjeringen, *Statsbudsjettet 2021: Nordland*, (Regjeringen, 2020).

⁹⁶⁴ John Peter Collett et al., *Making Sense of Space - The History of Norwegian Space Activities* (Scandinavian University Press, 1995); Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*.

books by having its satellites launched and deployed into Earth orbit from Norwegian territory.⁹⁶⁵ Norway had also signed an agreement on military space activity collaboration with Germany in the autumn of 2019.⁹⁶⁶

Security and foreign policy aspects in national space legislation

Norway's plans to develop a satellite launch facility encouraged the Government to update Norway's 1969 law on space launch from Norwegian territory, which had been the world's first national space law to enter into force.⁹⁶⁷ Norway's budding military space activities were now explicitly taken into consideration. In February 2020, the MTIF issued a national space law proposal to more than 50 consultative bodies. These recipients included the FFI and one Norwegian military operating unit within the Norwegian Armed Forces, namely the Air Force.⁹⁶⁸ At this point, the dominating perception seemed to be that the Air Force was about to become Norway's military space authority.⁹⁶⁹

In 2019, the MTIF appointed a national 'Space Act Committee' to develop the new law. The 1969 legislation was no longer sufficient to fulfil Norway's obligations under international law, and the Government expected that space activity under Norwegian jurisdiction, both in terms of the number of actors as well as the scope, would soon increase. As it was issued by the MTIF, the main rationale was that the law should contribute to Norwegian value creation and manage the risks associated with space activity.⁹⁷⁰ The MTIF focused on space as an imperative capability for Norway as a maritime nation, considering key industries such as offshore activities, maritime transport and fishing.⁹⁷¹

The Space Act Committee took it upon themselves to additionally identify security and foreign policy aspects that should be incorporated into the law. Based on Finnish and Danish national space legislation, the Space Act

⁹⁶⁵ Sandberg, «Norsk selskap skal få egne overvåkings satellitter.»

⁹⁶⁶ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 25.

⁹⁶⁷ Marboe and Hafner, "Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties," 33.

⁹⁶⁸ Nærings- og fiskeridepartementet, *Høring om Romlovutvalgets utredning «Rett i bane»*, (Nærings- og fiskeridepartementet, 2020).

⁹⁶⁹ Nilsson, interview.

⁹⁷⁰ Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet* (Nærings- og fiskeridepartementet, 2020), 13.

⁹⁷¹ Nærings- og fiskeridepartementet, *Ny lov om romvirksomhet* (Nærings- og fiskeridepartementet, 2019).

Committee incorporated in Paragraph Five Article D that space activity on Norwegian territory could ‘...not conflict with Norway’s foreign or security interests.’⁹⁷² Satellite-based infrastructure was increasingly being used to solve several ‘socially critical tasks’ and created new opportunities for civilian and military activity. Norway was becoming increasingly vulnerable to attacks on space-based infrastructure, and this could be exploited by actors who wanted to damage Norwegian interests. Therefore, the Norwegian authorities had to consider Norway’s foreign and security policy interests when assessing whether to grant permits. That Norway was upfront about these issues would also allow applicants to explicitly address any concerns.⁹⁷³

The committee established that space infrastructure was of increasing strategic importance and ‘the Norwegian Armed Forces have a clear interest in having satellites and other infrastructure in space.’ The Norwegian military’s space activities made the Space Act Committee address whether the national space law should apply to Norwegian military space activity. While the military was bound by international law, ‘as part of the state’ it was not necessarily a given that the Armed Forces must comply with national space law. For example, Finland’s Armed Forces were exempt from Finland’s national space law concerning aspects such as legal permits, insurance reporting and inspection rights. The Danish law on space activities did not explicitly exempt the Danish Armed Forces, but the Danish Government could grant exceptions on a case-to-case basis. The Space Act Committee concluded that Norwegian military space activity should fall within the scope of the law, especially because much of Norway’s military activity had civilian purposes. Instead of a general exception, the Space Act Committee proposed that the Norwegian authorities could make exceptions on a case-to-case basis, much like the Danes. Additionally, ‘foreign vessels outside Norwegian territory’ could be subject to the Norwegian law if it was in line with international law.⁹⁷⁴

On Svalbard, permits for space activity could not be granted if the activity opened for ‘warlike purposes,’ *buts de guerre*. The Svalbard Treaty ‘clearly entails a ban on the deployment and launching of weapons and other

⁹⁷² Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet*, 9.

⁹⁷³ Nærings- og fiskeridepartementet, *Høring om Romlovutvalgets utredning «Rett i bane»*, 69.

⁹⁷⁴ Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet*, 58–60.

forms of warfare'; however, 'the delineation between such activity and other forms of military activity is not clear.'⁹⁷⁵ The dominant opinion amongst the Norwegian authorities was that the Svalbard Treaty only applied to 'acts of war' and the Space Act Committee based their views on this interpretation.⁹⁷⁶ Furthermore, space operators on Norwegian territory would be subject to national export control law, since space launch and satellite technologies and services were largely dual-use.⁹⁷⁷ Since space activity could involve socially critical infrastructure and 'advanced, partly military, technology', several space activities would be subject to the National Security Act.⁹⁷⁸

Ascending towards the apex of the 'Space Club'

A national space launch facility would make Norway less dependent on other states' launch capabilities and priorities, and Norway could certainly use the facilities as a foreign and security policy instrument.⁹⁷⁹

Satellite information was already being used to provide a knowledge base in international negotiations concerning international climate and environment agreements. A space launch facility would make Norway more attractive in relation to bilateral and multilateral space cooperation and would overall assert its status as an active foreign policy player. NOSA also proposed that Norway's Prime Minister could use the capability to further strengthen the country's role and status in international positions and important candidacies, including the candidacy for a seat on the UN Security Council in 2021–2022 and Norway's chairmanship of the Hague Code of Conduct against Ballistic Missile Proliferation.⁹⁸⁰

⁹⁷⁵ The wording in the Antarctic Treaty was stricter and would allow for the use of space for 'peaceful purposes only'. See Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet*, 62.

⁹⁷⁶ Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet*, 61–62.

⁹⁷⁷ Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet*, 68.

⁹⁷⁸ Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet*, 118; The addressees were asked to provide their responses by mid-May 2020. Nærings- og fiskeridepartementet, *Høring om Romlovutvalgets utredning «Rett i bane»*; Two years later, the law was still pending. The hearings generated several lengthy answers and the submission of a new draft was therefore delayed. Wahl, interview.

⁹⁷⁹ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 41–42.

⁹⁸⁰ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*.

NOSA proposed that to further reinforce Norwegian space activities, the Armed Forces, the FFI and the Norwegian defence industry could build on their long-standing collaboration in developing rocket engines, missiles, command and control systems for submarines and air defence systems. In 2020, NOSA deemed that the Armed Forces were ‘in an early stage in the development of their own space capabilities’ and anticipated a rapid increase in national military space activities.⁹⁸¹

The Norwegian defence sector had by now strengthened its focus on military use of space, and national development of small satellites was solidified as ‘a central part’ of the nation’s space strategy. NOSA expected that the MoD would focus even more on space activities in its next LTP for the Norwegian defence sector. Several of Norway’s most important defence companies were central to the Norwegian space industry. Several technological competence areas, including command, control and information systems, missile technology, control and navigation systems, rocket engine technology and cryptology, were relevant for space activities and space launch base operations. Hence, the Norwegian Defence and Security Industry Association advocated the chosen military strategy that entailed a mutually reinforcing civil-military cooperation. NOSA was convinced that establishing a space launch base on Andøya would constitute ‘a significant strategic move’ for Norway.⁹⁸²

Considering defence and security policy, the MoD wanted ‘secure access to a launch base for small satellites’ and assumed that such a space launch complex would be of military interest to several of Norway’s allies as well. Considering that there were at this point no operational satellite launch complexes on the European continent, a Norwegian launch site could serve as a contribution from an alliance perspective.⁹⁸³ NATO, for example, had come to consider the space domain as ‘crucial’ to achieve political and military objectives, and anticipated that space activities would only increase. Thus, ‘allied access to launch facilities’ was essential. A Norwegian spaceport could also be used to consolidate or develop bilateral agreements with Norway’s closest allies. The MoD had entered into an agreement in 2014 with the US and a handful of other nations to develop RSC. RSC aimed to ensure space-based services ‘in a timeframe that meets operational

⁹⁸¹ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 27.

⁹⁸² Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 27, 36.

⁹⁸³ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 36.

requirements' by quickly developing and launching space capability on demand.⁹⁸⁴

According to USAF Lt. Gen. (Ret.) Deptula, with a multiple small satellite solution, combatant or local commanders could directly control and task the satellites, as opposed to the US architecture that entailed 'large, very specialized, very few, and very expensive satellites that because of their value required a centralized collection board.'⁹⁸⁵ The FFI informed RSC of Norway's plans to build a commercial launch site for small satellites and invited actors from a few RSC nations, including the US, Germany, the UK and Canada, to convene at Andøya. Conclusively, 'there is also interest from our allies for a launch base for small satellites on Norwegian territory.'⁹⁸⁶

NOSA envisioned that the Norwegian defence sector would 'take a more active role' to help materialise the space launch facility on Andøya. However, there had to be a 'right balance' concerning civil-military relations, as well as 'selected allies.' The MoD expressed that a national space launch base could have 'significant potential' but reiterated the necessity of a civilian-military approach. A Norwegian space launch base should not only serve the defence sector and the Norwegian military but should also be socio-economically sustainable and provide services which the Norwegian Armed Forces could use.⁹⁸⁷ To the MoD, a nationally controlled space launch base on Andøya supported Norway's High North policy and the notion that the High North was 'Norway's most important strategic area of responsibility.' At the same time, it supported the heavily alliance-based Norwegian defence policy, as '[f]ew nations have the resources to acquire and operate all space capabilities alone.'⁹⁸⁸ Andøya Spaceport also fitted directly into the MoD's strategic ambition level based on a layered approach, including national and international cooperation and commercial capabilities.⁹⁸⁹ It would facilitate commercial as well as international cooperation whilst increasing Norway's national security, flexibility, predictability and responsiveness in relation to its ability to prioritise national needs.⁹⁹⁰ For educational purposes, Andøya Space Education (formerly known as

⁹⁸⁴ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 38.

⁹⁸⁵ Deptula, interview.

⁹⁸⁶ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 38.

⁹⁸⁷ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 37.

⁹⁸⁸ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 37.

⁹⁸⁹ Nilsson, *Forsvarssektorens satsing på space: «Nøkternt og trinnvis»*, 11.

⁹⁹⁰ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 37.

Narom) discussed with the MoD the possibility of offering courses and workshops on space and satellite education to the Norwegian Armed Forces.⁹⁹¹

By February 2020, Norway had launched five small national satellites by piggybacking on large space launch vehicles commissioned to deploy other, much larger satellites into space, with Norway consequently ending up as ‘a low-priority customer.’ The FFI had remarked that space launch constituted the largest factor of uncertainty in national satellite project schedules and had caused a significant number of costly delays over which Norway had no control. Additionally, it limited Norway’s ability to select orbital altitude and time of launch. These limitations could significantly affect the performance of the satellites, and NOSA therefore urged the Norwegian defence sector to include access to space launch services in their considerations.⁹⁹²

On 8 October 2021, Norway’s Prime Minister Erna Solberg announced that the Government had given ‘the go-ahead to establish a launch base for small satellites’ on Andøya, which would create 150 new jobs on the small island. With Norway set to become ‘one of very few countries that will be able to launch satellites from its own territory’, it was a ‘historic day’ for Norway as a space nation, the Prime Minister proclaimed.⁹⁹³ Norway would have to compete with Sweden, Scotland and Portugal, however, as these countries too were striving to become the preferred space launch base on the European continent.⁹⁹⁴ Prime Minister Solberg proclaimed that Norway through Andøya Space ‘will play in an exclusive international league’ and it would establish ‘a new and exciting chapter’ for the Norwegian space industry. Certainly, the Prime Minister’s rhetoric in October 2021⁹⁹⁵ was not unlike that identified by Paikowsky, considering why nations join the ‘Space Club’, an ‘elite group’, where membership provides benefits such as political and diplomatic power, status, exclusivity and international prestige.⁹⁹⁶ The Prime Minister was certainly

⁹⁹¹ Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 52.

⁹⁹² Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, 37.

⁹⁹³ Eirik Billingsø Elvevold and Eivind Bø, «Grønt lys for Andøya Space-finansiering: – En historisk dag,» *E24*, 8 October 2021, <https://e24.no/naeringsliv/i/RrOkW2/groent-lys-for-andoeya-space-finansiering-en-historisk-dag>.

⁹⁹⁴ Andreas Nilsen Trygstad, «Andøya Space får 365 millioner: – Dette er startskuddet for romvirksomhet 2.0,» 8 October 2021, *NRK Nordland*, <https://www.nrk.no/nordland/andoya-space-center-og-andoya-spaceport-far-millioner-i-finansiering-til-satellittbase-1.15682330>.

⁹⁹⁵ Trygstad, «Andøya Space får 365 millioner: – Dette er startskuddet for romvirksomhet 2.0».

⁹⁹⁶ Paikowsky, *Clubs of Power: Why Do Nation-States Join the “Space Club”?*

using this capability in a quest for national and international prestige. The Norwegian defence magazine *Forsvarets Forum* covered the story and cited Kongsberg Group CEO Geir Håøy saying that Norway would now acquire ‘new space-based capacities in line with the ambitions that Norway will be a leading space nation.’⁹⁹⁷ On 14 October 2021, Jonas Gahr Støre took over as Norway’s new Prime Minister and appointed the Director of Andøya Space as Norway’s new Minister of Defence.⁹⁹⁸ On the same day, Chairman of the Board at Andøya Space, Rasmus Sunde, announced that Andøya Space’s former Chief Operating Officer, retired Vice Admiral Ketil Olsen, would take the helm as Director of Andøya Space. Herein, Sunde emphasised that Olsen had held various top positions within the Norwegian MoD, the Norwegian Defence Staff and NATO, and had ‘led military units from tactical via operational to strategic level.’ Furthermore, Olsen had partly been chosen for his ‘large network after almost ten years in NATO.’⁹⁹⁹

Chapter conclusion

By mid-2022, Norway was undoubtedly taking great strides towards space autonomy and self-sufficiency, and national space investments supported Norway’s High North policy and self-proclaimed national identity as ‘NATO in the High North’. Budding national space activities and ambitions prompted Norway to modernise its legal and regulatory framework, further underlining the strategic significance of this activity. These developments also demonstrated the complexities related to civil-military separation in space activity and capability, especially related to the Svalbard Treaty. It was proposed that space activity on Norwegian soil was not to conflict with Norway’s foreign or security interests, and the proposal was thoroughly designed to increase the leeway of the Armed Forces and the Government’s ability to use space power as an instrument in the event of conflict or war. As of late 2022, the proposal is still pending.

⁹⁹⁷ Andrea Vasholmen Mostue, «Klarsignal for å etablere en oppskytningsbase på Andøya,» *Forsvarets Forum*, 9 October 2021, <https://forsvaretsforum.no/andoya-space-innenriks-kongsberg-gruppen/klarsignal-for-a-etablere-en-oppskytningsbase-pa-andoya/221223>.

⁹⁹⁸ Ole Kåre Eide and Øyvind Førland Olsen, «Odd Roger Enoksen blir ny forsvarsminister,» *Forsvarets Forum*, 14 October 2021, <https://forsvaretsforum.no/politikk/odd-roger-enoksen-blir-ny-forsvarsminister/221894>.

⁹⁹⁹ Eirik Amb Nysveen, «Ketil Olsen er ny sjef for Andøya Space,» *E24*, 14 October 2021, <https://e24.no/teknologi/i/oW97OW/ketil-olsen-er-ny-sjef-for-andoeya-space>.

Using a wide array of space capabilities as security policy tools to increase the nation's status as a space power and reinforce its relations with its closest allies has developed into Norway's *de facto* space policy. Norwegian politicians, including the Prime Minister, have become increasingly vocal about it. The satellite launch facility in northern Norway was most prominent and was advocated as a truly exceptional capability. Justifiably so; while a few other nations had similar aspirations, establishing a satellite launch facility on Norwegian territory will be a significant step up for Norway, and it is still unprecedented on the European continent. This is also fundamentally changing the notion that satellite launch capability is reserved for the major powers, as it has been in the past. Norway does not yet command a national satellite launch vehicle, however. The choice of Isar Aerospace as a partner in this respect can be understood as a result of Norway's long-standing collaboration with Germany on sounding rocket projects, and Norway would probably not have partaken in such a collaboration with a non-ally. Germany was also one of the countries the MoD explicitly wanted to collaborate closer with, and in 2019, Norway signed an agreement to collaborate with Germany on military space activities.

Aspects related to increased Norwegian self-sufficiency and how Norway reinforced its alliances in space have only become more pertinent to consider following Russia's invasion of Ukraine in February 2022. In the past, Norway has launched its national small surveillance satellites from Russian space launch complexes on board Russian space launch vehicles, which might have been suboptimal before, but has now become an aspect worthy of considerable concern. Norway would not want to rely on Russia to launch national space capabilities that are taking an increasingly central role in Norway's military strategy and defence and security policy.

For Norway to justify its national space investments, it was essential that NATO had defined space as a critical domain. This concerned KDA's small-satellite fleet but especially the space launch facility, which Norway promoted as a potential NATO capability under Norwegian national control. With this capability, Norway also aspired to take a central role in the US-led RSC, where satellites could be launched rapidly on demand during crisis, conflict or war. That the space launch facility was intended to serve a key role in Norwegian security policy was further underlined by the appointment of Vice Admiral Olsen as Director of Andøya Space. Whilst the MoD stressed that the space launch complex was to serve several of

Norway’s national sectors, an argument that first and foremost served the purpose of reducing the MoD’s own expenses related to the capability, the military and security policy considerations and implications tied to this facility are substantial.

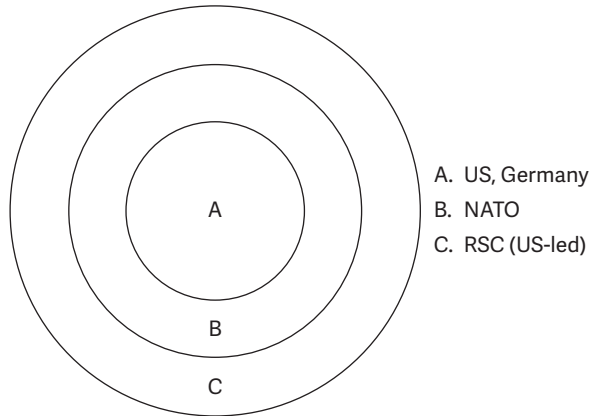


Figure 40. Key pillars of Norwegian collaboration in military use of ISR and Andøya Spaceport.

The disproportionate developments in national space capability strengthened the core of the Armed Forces’ access to military space-based services. They also mark a change in the sense that Norway has traditionally not promoted its space activity, explicitly opposing embarking on projects associated with power and prestige. It should still not be downplayed that the Government imposed strict requirements for the space launch complex to be run as a commercial enterprise. Like the SATCOM project, once the funding came through, Norwegian politicians took the opportunity to bask in the limelight of Norway’s first step towards autonomous space capability; despite having considerable national security implications, it is the commercial viability of all these projects that is fundamental.

Norwegian military commanders during this time advocated national self-sufficiency in space in regard to both space-based ISR and SATCOM, relating to the Stractic Intelligence and Force Enhancement doctrines. The Deputy Director of the NIS also claimed that the importance of intelligence was a key driver in undertaking the review in the first place. Some military executives believed that the Armed Forces were now dependent on space.

Others did not share these views, as there were optional capabilities available. The maturity level of existing space-based ISR was also questioned, just as it was by General Frisvold in the early 2000s, and Norway ultimately opted for the traditional route by retaining its MPA capability. Still, national capability development supporting both doctrines was now burgeoning in Norway. Considering the strides towards net-centricity, combined with the role of the NIS as a military operating unit responsible for intelligence *and* Norwegian military space activity, the unofficial Norwegian space doctrines – doctrinal thinking, *Stractic Intelligence* and *Force Enhancement*, can be understood to be converging.

A space power in the High North

National ambitions

The Norwegian Defence Pledge of 2024, the “*Long-term Defence Plan for the Norwegian Armed Forces for 2025–2036*”, endorsed by the Parliament, set out an ambitious plan for strengthening the security of Norway, including efforts to increase the focus on space developments.¹⁰⁰⁰ The defence plan focuses, amongst other things, on the dramatic technological changes we see around us, all from interconnectivity, robotics and artificial intelligence to space. The Government acknowledges the value of competence and value chains as an important fundament for national defence.¹⁰⁰¹ As for space developments, the defence pledge re-states the national cross-departmental plan of building a full value-chain for small-satellites.¹⁰⁰² The cooperation between the defence and transport ministries in particular is stressed as important for space developments.¹⁰⁰³ R&D are an important part of this. The ambition is to keep up with the technological developments, preferably keeping the technological edge in certain fields. For the Armed Forces, multidomain operations and situational awareness are crucially important, especially with state-of-the-art technologies for surveillance of our northern maritime region and the Arctic. This includes collection of data, fusion and analysis across the military and civil sectors.¹⁰⁰⁴

¹⁰⁰⁰ Forsvaresdepartementet, *Prop. 87 S, Forsvarsloftet – for Norges trygghet. Langtidsplan for Forsvarssektoren 2025-2036*, 5 April 2024, (Ministry of Defence, 2024).

¹⁰⁰¹ Forsvaresdepartementet, *Prop. 87 S*, , 24.

¹⁰⁰² Forsvaresdepartementet, *Prop. 87 S*, 62.

¹⁰⁰³ Forsvaresdepartementet, *Prop. 87 S*, 86–87.

¹⁰⁰⁴ Forsvaresdepartementet, *Prop. 87 S*, 124–126.

However, the pledge is a political plan, not yet funded per activity. Even though the overall budget target has been set, this will require annual budget allocations. Also, when it comes to space ambitions, the ambitions and plans are more general than explicit. Consequently, we asked the political leadership of the Ministry of Defence to provide some more details on their ambitious, but still overarching and general plan. The State Secretary of the MoD, Marie Lamo Vikenes, expected that more funding would be allocated for R&D in the field of space developments in the years ahead. However, she admitted that the Government had not yet defined concrete projects for development. This is an ongoing debate between different actors from different sectors. She stressed that the two main priorities for R&D are also stated in the Defence Pledge, arguing that Norway must take part in the development of ‘multi-domain’ operation concepts and shall be the leading actor when it comes to best possible situational understanding of the situation and developments in the High North; and Norway shall develop future operational capabilities through technological innovation and change.¹⁰⁰⁵

Vikenes explained that the ambitions set forth in the Defence Pledge will require increased control and direction for research efforts at a strategic level, and that greater efforts should be directed at cross-departmental coordination of research. The Ministry of Defence also foresees greater use of competition with more ‘certified actors’ to engage in research and development at a classified level.¹⁰⁰⁶ This may include, in addition to the FFI, other national research communities, the university and college sectors, and industry.¹⁰⁰⁷

The current Government is working on a white paper on research, which is expected to be published next year and will include concrete plans for defence-related research, coordinated between the MoD, the Ministry of Education and Research, and the Ministry of Justice. This will also include new mechanisms for funding for strategic research and innovation. As a basis for this, a commissioned report by the FFI, the NSM and the Research Council of Norway contains recommendations on how to include greater parts of the research and innovation communities in restricted and classified strategic efforts at a state level.¹⁰⁰⁸

¹⁰⁰⁵ Marie Lamo Vikenes, interview 6 August 2024.

¹⁰⁰⁶ Vikenes, interview.

¹⁰⁰⁷ Vikenes, interview.

¹⁰⁰⁸ Vikenes, interview.

On questions about the national ambition of a full value-chain for small-satellite systems, Lamo explained that this was on its way, among other with the Arctic Surveillance Programme for the development of national capacities for satellite-based surveillance. This also includes cooperation with KSAT for the management of the satellites systems and deliveries of satellite-based surveillance data for the Norwegian areas of interest, as well as building-up Andøya Spaceport, with its dual use for military purposes.¹⁰⁰⁹

These ambitions and plans also include international research cooperation. Among others, the FFI has established cooperation with two Dutch research agencies, the Royal Netherlands Aerospace Centre (NLR) and the Netherlands Organisation for Applied Scientific Research (TNO), with concrete deliveries of two LEO satellites in polar orbit. The participation in the multi-lateral '*Responsive Space Capabilities*' programme with allies and partners, active partnership in programmes under the European Defence Fund and EDA, and some of ESA's industrial programmes are considered important parts of creating this full 'value-chain'.¹⁰¹⁰

There are also others who are more sceptical to the ideas or ambitions of working towards a 'full value-chain' at the national level.

Hans Morten Synstnes, a lead strategist at the Norwegian Space Agency at least argues that what this implies need to be defined, as there will always be, or should be and discussion on what we should develop nationally and what should be in cooperation with others, especially common efforts within the frameworks of the ESA, EUs space program, EUMETSat, and other bilateral cooperations. He argues that the national ambitions may come at cross with what we have experienced as positive fallouts of international cooperations.¹⁰¹¹

Perspectives from industry and researchers

Balanced optimism

Interviewing key actors from industry and research communities, they look forward to these new plans but are also cautious about concrete funding for research programmes and long-term commitment.

¹⁰⁰⁹ Vikenes, interview.

¹⁰¹⁰ Vikenes, interview.

¹⁰¹¹ Hans Morten Synstnes, Norwegian Space Agency, interview 11 September 2024.

Principal researcher Richard Olsen from the FFI has for a long time been a leading figure within military use of space and at the forefront for advocating national capabilities. Olsen has been quoted in numerous articles over the last decade, arguing for more state-funded projects. As he put it, we are in a fairly good position today as a result of personal efforts by individual researchers, more at odds with leadership in the military and government. The FFI engaged in studies for developing small satellites in the late 1990s, which in due time ended with the project ‘NSAT-1’. An initial “possibility study” was first presented to the Chief of Defence’s official military study of 2003, but it was not supported at the top levels. The estimated NOK 300 million price tag was considered too high. However, the Government approved the project the year after.¹⁰¹² Still today, Olsen argues that the national ambitions need greater funding and commitment from military and political leaders.¹⁰¹³ Even though we have seen increased willingness to fund space-related research and development, he argues that too much has probably been routed through the larger-scale European initiatives, bringing too little back to Norwegian research communities. Both Olsen and the FFI have argued for a decade already that the civil space programme should have focused greater attention on the national programmes. Until recently, and certainly in regard to the first Norwegian satellites, they have come about because of personal initiatives and joint, voluntary work – with ‘pocket money’ – rather than being state-sponsored. At best, these efforts have supported a few subcontractors of larger European companies such as Thales and Airbus. From his perspective, this has done little for the greater research communities and industry, and the systems developed are of limited use for security-related needs, as Norway is largely kept outside encrypted services and outside the secure communication and surveillance programmes of the EU. Olsen supports the recent national ASP as a civil-military effort, but it is in need of greater funding and long-term state commitment to become truly operationalised. The same applies to the national ambition for Andøya Spaceport: it is an important step that will require significant funding from the state over a period of years to be able to deliver as per intention.¹⁰¹⁴

¹⁰¹² Espen Hofoss, “Det var som å skru på lyset”, *FFI*, 2021, accessed 19 August 2024.

¹⁰¹³ Richard Olsen, Principal Researcher FFI, interview 17 July 2024.

¹⁰¹⁴ Richard Olsen, interview 17 July 2024.

These perspectives are also supported by Professor Tor Arne Johansen from the NTNU Department of Engineering Cybernetics, one of the leaders of the NTNU SpaceLab.¹⁰¹⁵ Johansen argues that Norway has some key national advantages, such as proximity to the pole, the North Pole in this case, for infrastructure and launch of satellites, strong research communities for the maritime domain and national focus on and ambitions for climate and environmental research that offers great dual-use potential. From his perspective, Norway has all the fundamentals in place to become a space power, if we see true state willingness to support development. The ‘New Space’ developments favour a state like Norway, due to our geographical location, our technical research base and the possibility of state financing of low-cost, high-tech systems. However, to take the leap, Norway needs to target the efforts more towards aerospace engineering in the years ahead.¹⁰¹⁶ Small satellites in polar orbits will also provide for very cost-efficient coverage for surveillance efforts by space assets compared to other systems due to the high revisit-time in our region.

The Kongsberg Group have been involved in the space domain for a long period. In fact, Norway has for decades been one of the leading nations in developing effective ground infrastructures. Harald Aarø, Executive Vice President of Kongsberg Defence & Aerospace AS (KDA) and closely engaged in their space programmes, is very positive to the increased efforts by Norway over the last few years. From his perspective, Norway is already a renowned ‘Space power’, especially due to the capacities developed by KSAT. As he pointed out, many allies are dependent on the services of KSAT today. Furthermore, KDA, especially Kongsberg NanoAvionics, is emerging as a leading industry actor in the development of small satellites, and ‘New Space’ systems are moving on from tests and demonstrations to becoming true capacities. As he stated, we are now moving on from small-scale ‘happy-go-lucky’ efforts to more robust systems. With access to space through Andøya Spaceport, this position will be strengthened even more.¹⁰¹⁷

Andøya Space has received great attention over the last few years. Ketil Olsen, Chief Executive Officer (CEO) at Andøya Space, is positive to some of the developments we have seen but is still partially disappointed. Serving as an admiral in NATO a few years back, when NATO defined space as a

¹⁰¹⁵ Tor Arne Johansen, interview.

¹⁰¹⁶ Tor Arne Johansen, interview.

¹⁰¹⁷ Harald Aarø, Executive Vice President of Kongsberg Defence & Aerospace AS, interview 25 July 2024.

new domain and promoted great ambitions, he believed that space capabilities were further along and that we would see more investment than he has seen over the last few years. As he said, by all means, there are positive developments: ‘we have received state financing of NOK 150 million in both 2024 and for 2025 for the establishment of Andøya Spaceport and signed an agreement with the MoD in 2023 for long-term development’. However, he stated that this is far from what was expected, or what he hoped for. As he argued, the potential for the SmallSat industry to become ‘the new oil’, with reference to the famous quote by Morgan Stanley in 2020, is far from reality yet. Olsen is still an optimist, believing that space industries may become a catalyst for new growth in the Norwegian economy, but it is becoming time critical to keep up with other nations. Ketil Olsen asked for the state to take more risk and support long-term development, rather than placing too much risk on the shoulders of the industry in these early days of rapid technological change and uncertain international dynamics. In the same way as Richard Olsen from the FFI, Ketil Olsen is critical of the extensive EU focus of the Norwegian Space Agency, as EU regulations still largely exclude Norwegian research communities and industries from security-related research and production in Europe.¹⁰¹⁸

Challenges and the way forward

As to whether Norway is on a path to becoming a true space power, the experts largely agree that we are on a great track, but that it will require state engagement and long-term commitment to become a reality. We are not there yet. Richard Olsen, at least, sees the contours of Norway becoming a ‘Space nation’, if not a ‘Space power’. As he argued, the ASP, ASBM and ASX initiatives put us ahead of other Northern European and NATO countries. He also thinks we are on a good track for the development of operational concepts. However, we do have some way to go in regard to secure systems. The capabilities we are currently developing are still vulnerable to disruption and espionage.¹⁰¹⁹ Tor Arne Johansen from NTNU sees the potential, but argues that a more dedicated strategic effort is still needed to release the potential for a broader spectrum of society, including the fields of security, climate and environment, and resource and transport management. He

¹⁰¹⁸ Ketil Olsen, Chief Executive Officer (CEO) at Andøya Space, interview 21 July 2024.

¹⁰¹⁹ Richard Olsen, interview 17 July 2024.

argued that we need a broader effort across domains and sectors.¹⁰²⁰ As for the industry, some niches are more developed than others. In the case of the ground segment, Norway, with actors such as the Kongsberg Group and Telenor, has been in a good position internationally for a long time. Other industries are more in their infancy.

Ketil Olsen argue that the established industries of today, such as the mainly state-owned Kongsberg Group, with KDA and KSAT; as well as Space Norway and Andøya Space; and the established fully private companies such as Eidel and VAKE are crucially important for the development. With these and some other niche companies, we have national players in most parts of the value chain, except for rocket technology. The greatest challenge, from his perspective, is that we do not have the leading prime mover or guiding actor to lead the way. He also argued that the important infrastructure represented by the company he leads, Andøya Spaceport, needs to move on from being a limited business case for delivering commercial return on investment to the Ministry of Trade, Industry and Fisheries. The infrastructure is of high indirect importance to many other industries and national interests, which is not opted for in today's model.¹⁰²¹

Harald Aarø from KDA sees two main challenges to the way forward. First, there is need for a 'Team Norway' and cooperation between Norwegian private and research communities to complement each other nationally. He argued that this is crucially needed for us to be able to compete in the international market, and that an international market is necessary for us to be able to fund national programmes. Aarø argued that the state must take the lead in defining roles and responsibilities. This is a critical next step.¹⁰²² Second, Aarø argued that Norwegian government agencies to a greater extent should rely on and buy services from Norwegian companies that have the potential of becoming international actors in their areas of expertise. Even though some services may be cheaper to buy from international actors, this will most likely not be the case in the long term. Norwegian companies need national, state customers to get established, both as a national industry and for Norway to become a preferred partner in international cooperation and alliances. The trend in most countries is for the state to support national research communities and industries, so

¹⁰²⁰ Tor Arne Johansen, interview 17 July 2024.

¹⁰²¹ Ketil Olsen, interview.

¹⁰²² Aarø, interview.

buying from international actors what you may get from your own industry is a bad strategic choice in emerging markets like ‘New Space’.

However, as noted by Truls Orderløkken Andersen, CEO at Eidel AS, there are in fact two competing business models and major companies in Norway today: the Kongsberg Group, with a more or less complete value-chain in-house and Space Norway, which to a greater extent opens up for smaller companies to compete and contribute to their programmes as they do not manage their own major deliveries.¹⁰²³ In general, Andersen is positive to the development in Norway, especially with the Arctic Ocean Surveillance (AOS) programme, providing it gets long-term state financing. This will then contribute to establishing a full value-chain in this effort, in parallel to the ongoing European In-Orbit Demonstration programmes. However, the main question will be whether the Norwegian Government will support and steer the programmes in regard to open standards (e.g., Advanced Data Handling Architecture) that are being developed by the European actors versus company standards that will be far more proprietary. Both Aarø from KDA and Andersen from Eidel AS stress the need for being able to compete in the international arena to be able to build a sustainable industry.

Ketil Olsen argued that the Government needs to take far more risk and to make ‘Responsive space’ a central part of national strategies. He pointed out that our national dependencies on space will show themselves within a few days if targeted by other actors or hampered by natural means. He thinks quick replacement of capacities will be an important, if not fundamental, need in the future. At the core of such a capacity, we need a robust launch facility: a national, robust spaceport.¹⁰²⁴

International integration still important

In parallel to the national ambitions of a full Space affair value-chain set forth by the last two governments in Norway, international cooperation is still crucially important. By all standards, Norway is a small state with limited resources. However, being a space actor also brings one to the table to get involved in multinational or bilateral cooperation. The

¹⁰²³ Truls Orderløkken Andersen, CEO at Eidel AS, interview 6 August 2024.

¹⁰²⁴ Ketil Olsen, interview. See, for instance, <https://businessnorway.com/articles/norway-zooms-towards-first-on-demand-responsive-space-launch/>, accessed 18 August 2024.

space infrastructure under the umbrella of Proliferated Warfighter Space Architecture,¹⁰²⁵ which plans to establish itself on Andøya, is such an example. This will be an important architecture for situational understanding, command and control, and target following. This will also integrate with long-range air defence.¹⁰²⁶ In addition, the Norwegian Government plans to facilitate for the US Space Force to set up a radio-frequency antenna in Norway for its LEO constellation, for example, the Tranche 1 satellites in polar orbit, which are important from such a perspective. This programme will, among others, include Link-16, a tactical data link widely used by NATO and Norwegian forces.¹⁰²⁷ One of the best examples of how national plans, competence and industry open doors to international cooperation is perhaps the recent invitation to the prestigious community of Combined Space Operations.¹⁰²⁸ This connection is mainly a military cooperation forum, indicating an increased interest and focus on military affairs for space efforts. As discussed earlier in Chapter 10, entering the ‘club’ is crucially important – almost an objective in its own right – as it provides for so many operational cooperations and business opportunities.

The ideas of competencies in the whole value-chain also go hand-in-hand with international cooperation in research, production and usage of data. Examples include the Norway-Netherlands cooperation on nanosatellites with passive radar sensors and KDA’s three new microsatellites based on NanoAvionics’ MP42 microsatellite bus. These will supplement the existing satellites to create a constellation with greater capacity.¹⁰²⁹

Chapter conclusion

Norway, with growing research communities and a broader industry is in a good position today for it to become a true “space power”. Even with the

¹⁰²⁵ The Proliferated Warfighter Space Architecture constitutes the Space Development Agency’s resilient layered network of military satellites and supporting elements.

¹⁰²⁶ Norwegian Government, “USA og Norge bygger satellittstasjon på Andøya”, public announcement, Regjeringen, 10 April 2024, accessed 10 October 2024, <https://www.regjeringen.no/no/aktuelt/usa-og-norge-bygger-satellittstasjon-pa-andoya/id3033397/>.

¹⁰²⁷ Michael Marrow, “Norway to Host US Space Development Agency RF Antenna, New Link 16 Test: SDA Director”, *Global Space*, April 11 2024, accessed 1 August 2024, <https://breakingdefense.com/2024/04/norway-to-host-us-space-development-agency-rf-antenna-new-link-16-test-sda-director/>.

¹⁰²⁸ Norwegian Government, “Norge inn i multilateralt militært romsamarbeid”, public announcement, Regjeringen, 16 February 2024, accessed 10 June 2024, <https://www.regjeringen.no/no/aktuelt/norge-inn-i-multilateralt-militart-romsamarbeid/id3025749/>.

¹⁰²⁹ Kongsberg Defence & Aerospace press release, “Kongsberg Defence & Aerospace Orders Three Surveillance Satellites From NanoAvionics”, *KDA*, 18 May 2022, accessed 20 July 2024, <https://nanoavionics.com/news/kongsberg-defence-aerospace-orders-three-surveillance-satellites-from-nanoavionics/>.

currently limited number of satellites, research communities and industry have proven their abilities. SAR, AIS and optical instruments have come into use in Norway. The Norwegian Government's SAR, AIS microsattellites and passive radar detection sensors are maturing the technologies. The Norwegian Government is currently implementing a space strategy that is very much focused on the maritime domain and security. This motivates the national Micro-SAR programme that is optimised for ship detection, as well as the Arctic Surveillance Program (ASP), in which a number of new satellite constellations with AIS, navigation radar detectors and other instruments in affordable microsattellites are being developed for maritime surveillance and situational awareness.¹⁰³⁰

At a national level, we have the ground infrastructure, we are developing sensors and communications suites for satellites, and we are launching satellites (even though this is still through international rocket providers). But the overall effort still needs commercial prime movers and long-term state sponsorship. As for all the sensors and capabilities emerging, they all need to be interconnected to be effectively utilised. There are great prospects in what NTNU has dubbed 'the observation pyramid'. Arguably, the use of small satellites is more effective than the use of aircraft and drones for large-area surveillance – especially in our geographical area – but the needed growth requires national competencies and industry.

The often quoted national ambition '... to facilitate a complete Norwegian industrial value-chain for space-based infrastructure and services using small satellites'¹⁰³¹ remains important as a guiding star. As noted by researchers at NTNU and the FFI, it will require continuous and long-term state funding to build a good research base for space technologies. Too much has been based on 'pocket money' and spinoffs from other fields of research. The same applies to industry, as noted by the Kongsberg Group actors, Eidel AS and Andøya Space: a close cooperation between national actors, long-term contracts and state financing are required to build an industry base at home that will be able to compete in the international market. This is all necessary for upholding a cost-effective business model. Even though the research and industry base is on a good track, a broader base is needed for Norway to be able to call itself a 'space power', at least

¹⁰³⁰ Tor Arne Johansen, interview. Sivertsen, interview.

¹⁰³¹ See, for instance, Innovasjon Norge, "Muligheter for næringslivet i norsk romvirksomhet", conference at Andøya Space 4 October 2023. Accessed 19 August 2024. <https://www.innovasjon Norge.no/artikkel/muligheter-for-naeringslivet-i-norsk-romvirksomhet>

from the perspective of Hans Morten Synstnes of the Norwegian Space Agency. He argued that both the research and development communities of the FFI and universities need to be strengthened and that the industrial base for developing, building, running and exploiting the space-based systems needs a broader competence base.¹⁰³²

Finally, in addition to the arguments for an effective sector of space-related industries, the inherently unstable security dynamics on the international scene should make the case for a state-sponsored, small satellite, full value-chain in Norway. This is both to be a preferred partner in the security domain, as well as for self-reliance at a time when more and more infrastructure is becoming industry-based, thus making states vulnerable to private, international companies for critical services to the state. The well-established cooperation in Norway known as the 'triangle model' (*trekant-modellen*) of defence cooperation is also useful as a model for dual-use industries like space. The Government, including the Armed Forces, sets the requirements or applies new technologies growing from other sectors – the industry, with the prime movers Space Norway, Kongsberg Group actors, Andøya Space and hopefully, in due course, also Nammo, leads the way – but all are reliant on the research base for new technologies at the FFI and universities and, not least, the highly competent personnel from research and education at universities and colleges.

¹⁰³² Synstnes, interview.

Wrap-up

Norway on the path to becoming a space power

Norwegian space research and activities can be traced back to the late 19th century. The study of the ionosphere, particularly its role in wave propagation – crucial for navigation and radio communication – became a field of expertise for Norwegian scientists. Pioneers such as Kristoffer Birkeland in the early 1900s and Leiv Marius Harang, the first managing director of the Auroral Observatory in Tromsø (established in 1928), were important individuals who laid the foundations for this work. During the early Cold War period, the Norwegian Defence Research Establishment (FFI) continued research in these fields, notably through its Division for Telecommunications, collaborating with the Norwegian Telecommunications Administration (Televerket). By the late 1950s, ionospheric research had evolved from the domain of geophysics into space research. However, engaging in space technology, such as rockets and satellites, proved more challenging and costly than the relatively inexpensive ground-based research of the past. To advance in this field, Norway therefore looked to the US. The country pursued both civilian collaboration with NASA in the US and the European Economic Community, as well as military cooperation through the FFI and, later, the Norwegian Intelligence Service (NIS).

On 22 January 1960, Norway established its national 'Interim Committee for Space Research', organised under the auspices of the Royal Norwegian Council for Scientific and Industrial Research. This marked the formal beginning of Norway's space journey, as it was the first step towards establishing the country as a 'launching state'. The committee was tasked with

shaping Norwegian space policy, overseeing the creation of a national space organisation and facilitating cooperation with US agencies. By the 1960s, Norway had constructed the Andøya Rocket Range with support from the US. The Norwegian Armed Forces were an integral part of this. The range included a launch pad, a control centre, a rocket-assembly building and a monitoring facility. NASA contributed a telemetry station and personnel. On 18 August 1962, Norway successfully launched its first rocket from Andøya, officially marking the country as a 'launching state'. Following this achievement, the FFI transitioned its ionospheric research from being ground-based to primarily space-based experiments throughout the 1960s. In the mid-1960s, Jens Boyesen from the Ministry of Foreign Affairs (MFA) became Chairman of the Royal Norwegian Council for Scientific and Industrial Research's (NTNF) Space Committee. This shift signalled a move from military to civilian and foreign policy oversight of the space efforts, attributed to increasing industrialisation and the growing politicisation of European space activities, as well as persistent geopolitical tensions in the High North. Space activities on Svalbard, for example, became a balancing act, leveraging the region's geographical advantages while avoiding a militarisation of the islands.

Though space research and governmental involvement in space began as early as the late 19th century, the late 1950s and 1960s are considered the 'first pioneering era' of Norwegian space activities. This period saw significant cooperation with both the US and emerging European space institutions, with research conducted at sites on Svalbard, in Tromsø and on Andøya. By the end of the 1960s, experimental ionospheric research on Andøya represented approximately 10 percent of all global research in this field.

Norway's prominence in ionospheric research served multiple strategic purposes, particularly during the Cold War. The northern Norwegian regions became central to the geopolitical dynamics of the US-USSR nuclear standoff, first as overflight routes for nuclear-armed bombers and later for missile systems. By the late 1960s, the Barents Sea became a key launch area for second-strike nuclear weapons with the Soviet SSBNs (nuclear-powered ballistic missile submarines), turning northern Norway into a vital location for intelligence gathering. Norway's geographical position made the country a key player in the US intelligence community, leading to a significant American investment in signals intelligence capabilities on Norwegian soil. While supporting Norwegian security, this collaboration was managed

carefully to avoid tensions with the USSR, a diplomatic balancing act that remains a hallmark of Norway's defence strategy.

In response to the potential threat posed by Soviet spacecraft, the US developed a ground-based electronic space surveillance system, including stations in Northern Europe. By 1962, Fauske II, a space surveillance installation in Norway, was established to monitor Soviet space activities and enhance US situational awareness of Soviet launches. In parallel, the US Space Surveillance Network was established to detect and track space objects orbiting Earth, including fragmentation debris. The GLOBUS surveillance system, operational at Vardø in Finnmark since the 1950s, was built as part of this and has since been upgraded in subsequent decades. GLOBUS III became operational in 2016. As explained by Hans Morten Synstnes from the Norwegian Space Agency, the GLOBUS-system is an important contributor to space traffic control in the High North, as part of the US Space Surveillance Network. He further argued that even though the Armed Forces may have a good capability within space surveillance and tracking, we have not come far on the civilian side. The Norwegian Space Agency has been delegated this role for civil use and is crucially dependent on a better cooperation with the Armed Forces.¹⁰³³

In the 1990s, Tromsø Satellite Station (TSS), a private foundation, was significantly upgraded to support an agreement with Canadian RADARSAT. The station became critical to the Norwegian Armed Forces, as they could not use facilities on Svalbard due to the non-armament provisions of the Svalbard Treaty. The most significant space infrastructure investment during this period was the establishment of the SvalSat station on Svalbard, which offered a strategic advantage in tracking Earth observation satellites in polar orbits. Norway aimed to position SvalSat as one of the world's leading satellite stations. The Norwegian Government passed new legislation regulating satellite activities on Svalbard to ensure compliance with the Svalbard Treaty, including prohibitions on using satellite data for military purposes.

Despite major developments in global space capabilities, Norway's military space activities in the 1990s remained limited. The FFI advocated for a national satellite capability through the Norwegian Space Agency (NOSA), but progress was slow. The Armed Forces lacked a dedicated structure for managing space activities, though the FFI continued to inform the military

¹⁰³³ Synstnes, interview.

about potential applications of space technology, often collaborating with allied forces to utilise foreign satellite systems.

From the 2000s onward, commercial satellite capabilities expanded and these systems became increasingly important in defining space power. Norway demonstrated this shift by incorporating commercial satellite imagery, such as from the US company Digital Globe, into tactical military operations. At the same time, NOSA continued to ensure that the Armed Forces had access to Canadian RADARSAT data. Despite these advancements, Norwegian military leadership emphasised that NATO remained the essential framework for securing space-based capabilities. This was exemplified by Norway's participation in the SATCOM project with Hisdesat.

Norway's leadership in satellite surveillance through the Western European Union (WEU) in the 1980s and its continued role in the European Space Agency (ESA) projects in the 1990s gave the country a good position in European space efforts. However, Norway's exclusion from the EU's satellite centre in Torrejón in 2001, due to not being an EU member, was a setback. This exclusion led the FFI to shift its focus towards collaboration with ESA, eventually leading to Norwegian participation in key ESA programmes such as Galileo and Copernicus. While Copernicus proved valuable to the Armed Forces, scepticism towards Galileo remained, as Norway maintained separate military GPS collaborations with the US. Additionally, US-led multilateral space initiatives, such as the Responsive Space Capability project, further shaped Norway's military space efforts.

Whereas satellite surveillance dominated Norwegian military space activities in the 1980s and 1990s, the early 2000s saw a shift in focus due to doctrinal concepts imported from the US. Although Norway's military leadership acknowledged the value of satellite surveillance, they did not support the FFI's plans to develop a national military surveillance satellite. Consequently, the Ministry of Defence (MoD) terminated this initiative, underscoring the fact that neither the MoD nor the Armed Forces prioritised the development of a national military space capability at that time. Financial concerns were a key factor in these decisions, leading to a mainly civil-led dual-use path for Norwegian military space developments. This dual-use approach was also reflected in the MoD's advocacy for NOSA's central role, as it was assumed that NOSA understood the national security implications of space activity. However, despite growing attention to these

aspects, Norway's national space policy, developed in 2013, largely avoided addressing military and national security concerns related to space.

Military space activities continued to be driven forward by the FFI, the Norwegian Intelligence Service (NIS), the Navy and the Norwegian Joint Headquarters (NJHQ), with support from NOSA. Technological advancements and access to space-based data enabled Norway to increasingly incorporate space-based intelligence. SATCOM also became a significant focus within the Armed Forces, recognised as a critical military capability. In this context, the MoD established INI/CYFOR, a new military operating unit tasked with developing a network-centric defence infrastructure. This unit became the focal point for Norway's military space activities, particularly in the years leading up to the 2014–15 strategic review.

In 2007, space was formally addressed as a physical domain in Norwegian military doctrine, with satellites positioned as nodes in a network, consistent with Norway's emphasis on military net-centricity. The national joint doctrine (FFOD) of 2007 came closest to articulating a view of space that aligned with Norwegian military activities at the time. While the idea of space as an operational domain may have seemed impractical in the context of Norwegian military space activities, the doctrine reflected how Norway's more powerful allies, particularly the US, conceptualised space. Norway's approach to military space largely followed the network-centric defence model that was influenced by US doctrine after the Gulf War.

During these years, Norway increasingly relied on international partnerships and commercial offers to enhance its space capabilities. By developing national satellite capabilities, fostering international partnerships and utilising commercial space services, the Armed Forces strengthened their access to space-based intelligence, making them more robust, resilient and flexible. Norway may best be classified as an 'opportunistic' space actor in the early 2000s. However, with the addition of two small eavesdropping satellites to its capabilities, Norway was, by 2014, on the path to becoming a junior, or 'inadequate' space power, with the Armed Forces emerging as the primary user of national satellite data. Despite these developments, however, military space concerns were not addressed in a coherent or structured way by the Armed Forces, the MoD or NOSA until 2014. There was little indication that military space activities were seen as a significant priority by the MoD or the Armed Forces. NOSA noted that the MoD and the Armed Forces were hesitant to invest in military space and lacked a clear military structure or strategy to guide space-related activities.

This situation was about to change. The developments in national space capability and ad hoc military space activities set the stage for the Armed Forces and the MoD to begin prioritising the national security aspects of space. A pivotal turning point in the history of Norwegian military space activities was reached in 2014–15. In 2014, the Chief of Defence decided that the time had come for the Norwegian Armed Forces to develop a comprehensive and overarching space strategy.

The national military space capability became part of security policy. Norway identified niche capabilities, such as microsatellite platforms and solutions for ISR (Intelligence, Surveillance and Reconnaissance), but foremost in regard to SATCOM for Arctic regions, which would meet both national security needs and offer great value to its allies. The development of SATCOM capabilities for the High North became essential, underscoring the region's importance as Norway's key geostrategic area. To manage its expanding space investments, the MoD established 'Program Space', a temporary structure designed to coordinate military space activities strategically. Within the Armed Forces, the NIS, the NJHQ, CYFOR and the Navy continued to manage their respective activities independently, with Program Space aiming to centralise and streamline efforts. While this was a relatively modest undertaking focused on maritime ISR and SATCOM for intelligence and operational use, it laid the groundwork for future developments. The MoD's State Secretary proposed that the NIS, the Air Force and CYFOR should be considered as potential candidates for overseeing the military space authority, signalling the importance of establishing a command structure before implementing concrete plans. The dual-use, civil-military approach that had characterised Norwegian military space activities was now formalised through the national space policy. As the Conservative Party representative had predicted in 1987, technological development combined with the political imperative of cost-effectiveness had driven this approach. The civil-military model emerged as the only economically viable solution.

Throughout this period, the US remained a dominant force in Norway's military space collaborations, both through NATO and through bilateral partnerships. Norway's civilian collaboration with Canada continued and its relationship with the Netherlands as a key partner in military space was strengthened. Norway's military space policy emphasised NATO's role as the primary facilitator for international space collaboration. Additionally, the Armed Forces became significant users of satellite data from the EU/ESA

Copernicus programme, which focused increasingly on providing space-based services for national defence and security. The 2019 space policy was the first to comprehensively address the national security aspects of space, signalling a major shift in how the country understood and managed its space activities. This policy marked a significant step forward, as it suggested that Norway's political establishment had moved beyond viewing military space as a politically sensitive or difficult issue to address.

The battle for authority over military space in the Armed Forces was marked by rivalry, particularly regarding which military unit should assume responsibility for the nation's military space activities. Program Space proposed that the Air Force should take the lead, but this decision sparked dissatisfaction among other branches, especially from the NIS. Although the Air Force's lack of experience with operational space activities made this proposal somewhat contentious, it was partly based on how space was treated in Norwegian military joint doctrine and among neighbouring countries. However, given that these doctrines had not always aligned with Norway's actual space activities, this decision appeared peculiar.

Ultimately, the Chief of Defence appointed the Air Force as the leading authority, by which time Program Space as a temporary organisation was supposed to be transferred to a permanent part of the Armed Forces. Still, by the time of Admiral Bruun-Hansen's retirement in August 2020, it was clear there was no consensus within the Armed Forces about which branch should oversee military space activities. While the Air Force's appointment was intended to maintain parity with other nations, the NIS had a stronger historical foundation, competence and network in space-related activities. The question of which service should be responsible for military space continued to be a point of contention. Ultimately, the decision to appoint the NIS as the primary military space authority made sense, given the agency's long-standing involvement in the space domain. General Kristoffersen changed the decision and planned transfer to the Air Force and gave the NIS the leading responsibility. The NIS became responsible for military space activities on behalf of the Norwegian Armed Forces and the Chief of Defence. Still, both the Air Force and other service branches of the Armed Forces are included and should be closely coordinated. Most nations have a division of responsibility, doctrinal focus and work-processes both in the tracks of the intelligence services and the Air Force. The most important reason why the NIS was given the overall lead role and responsibility was its long-standing and still important cooperation with US intelligence services.

The focus ahead should be, and is, to integrate space capabilities into all branches and processes of the Armed Forces.

Over the last decade, Norway's efforts have led to considerable developments, ranging from AISSat-1 and 2, the NorSat series 1, 2, 3, TD and 4, ARCSAT smallband and the latest ASBM broadband communication to the satellite constellation N3X. In this way, Norway has made significant progress towards space autonomy and self-sufficiency. The national space investments have supported Norway's High North policy and its self-proclaimed identity as 'NATO in the High North'. The growing space activities and ambitions have also led to work on modernising the legal and regulatory framework, further solidifying the strategic importance of these efforts. These developments also highlighted the complexities surrounding the separation of civil and military space activities, particularly in relation to the Svalbard Treaty.

Norway's strategy to leverage all its space capabilities as tools for security policy, to enhance its status as a space power and to strengthen its relations with allies has become more explicit. Politicians, including the Prime Minister, have been vocal about this strategy. The satellite launch facility in northern Norway has become a central point in this initiative, touted as a unique and exceptional capability. Indeed, while few other nations have similar aspirations, establishing a satellite launch facility on Norwegian soil represents a significant leap for the country and remains unprecedented on the European continent. The January 2025 Technology Safeguards Agreement between Norway and the US marked a new milestone for the national aspiration of creating a full value-chain of space capabilities in Norway. Although Norway does not yet possess a national satellite launch vehicle, the new agreement with the US, as well as a partnership with German Isar Aerospace from 2019, are setting the course for the future.

To justify its national space investments, Norway needed NATO to define space as a critical domain. This was particularly relevant for the KDA's small-satellite fleet and the space launch facility, which Norway promoted as a potential NATO capability under national control. With this capability, Norway also hoped to assume a central role in the US-led Rapid Space Capability, where satellites could be launched quickly on demand during times of crisis, conflict or war. The strategic importance of the space launch facility was underscored by the appointment of Vice Admiral Ketil Olsen as CEO of Andøya Space. While the MoD emphasised

that the launch facility would serve multiple sectors, including commercial interests, the military and security policy implications tied to this facility were substantial.

The expanding national space capability has obviously strengthened the Armed Forces' access to military space-based services. It also marks a departure from Norway's traditional reluctance to promote space activities, avoiding projects perceived as associated with power and prestige. Nevertheless, it is important to note that the Government imposed strict requirements for the space launch complex to operate as a commercial enterprise. Similar to the SATCOM project, once funding was secured, Norwegian politicians were quick to highlight the significance of Norway's first step towards autonomous space capabilities. While these developments have considerable national security implications, the commercial viability of these projects remains essential.

Today, Norwegian research communities and the space industry are laying a good and crucial foundation for Norway to become a true space power. The national political investments in agreements and framework for commercial interest set the course. Despite the limited number of satellites currently in operation, both the research communities and industry have proven their capability. SAR, AIS and optical instruments have found applications in Norwegian projects. The SAR and AIS microsatellites, along with new passive radar detection sensors, are advancing the technologies needed for the future. Norway is also implementing a space strategy that focuses heavily on the maritime domain and national security. This has led to the development of the Micro-SAR programme for ship detection and the Arctic Surveillance Program (ASP), which involves the creation of satellite constellations equipped with AIS, navigation radar detectors, and other instruments to enhance maritime surveillance and situational awareness.

At national level, Norway has developed ground infrastructure, sensors and communications suites for satellites, and has launched satellites, albeit through international rocket providers. However, to ensure long-term success, this effort will require a combination of commercial leadership and risk-willingness, but also sustained state funding. As emerging technologies and sensors continue to evolve, they must be interconnected to maximise their utility. The prospects for growth in this sector are significant. While small satellites are more effective than aircraft and drones for large-area

surveillance, especially in Norway's geographical context, this growth requires national competence and expertise, and industry development.

The national ambition to 'facilitate a complete Norwegian industrial value-chain for space-based infrastructure and services using small satellites' remains a guiding principle. Researchers at universities and the FFI have emphasised that continuous, long-term state funding is crucial for building a solid research base for space technologies. Up until today, researchers have argued that too much of the funding has been ad hoc or derived from spinoffs in other fields. Similarly, the space industry in Norway – led by companies like Kongsberg Group actors, Eidel AS and Andøya Space – requires close cooperation between national actors and long-term state contracts to build an industry capable of competing in the international market. This collaboration is essential for maintaining a cost-effective business model.

Finally, considering the volatile international security environment, Norway's commitment to developing a state-sponsored small satellite value-chain is more important than ever. This initiative not only positions Norway as a preferred partner in the security domain but also ensures national self-reliance in an era where more and more critical infrastructure is industry-based. The established 'triangle model' of defence cooperation in Norway could serve as a useful framework for dual-use industries like space: the Government, as well as the Armed Forces, defines the requirements and applies new technologies; the space industry leaders, such as Space Norway, the Kongsberg Group actors and Andøya Space, take the lead; and research institutions and universities provide the necessary technologies and highly skilled personnel.

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Appendix A: Interviews

Norwegian nationals

Name	Interviewed in capacity of role
Aarø, Harald	Executive Vice President of Kongsberg Defence & Aerospace AS
Andersen, Truls Orderløkken	CEO at Eidel AS
Bruun-Hanssen, Haakon (Adm.)	Chief of Defence, Norwegian Armed Forces
Bø, Øystein	State Secretary to the Norwegian Minister of Defence
Finseth, Jan Eirik (Rear Adm.)	Inspector General of the Royal Norwegian Navy
Grandhagen, Kjell (Lt. Gen.)	Chief of the Norwegian Intelligence Service
Helle, Nils (Commodore)	Head of Information and Communication Technology at the Norwegian Defence Logistics Organisation
Jakobsen, Rune (Lt. Gen.)	Chief of the Norwegian Joint Headquarters
Jansen, Petter	Chief of the Norwegian Defence Logistics Organisation
Johansen, Henry Kjell	Research Director at the Norwegian Defence Research Establishment
Johansen, Tor Arne	Professor at the Department of Engineering Cybernetics, Norwegian University of Science and Technology
Nilsson, Stig Eivind (Col.)	Head of the Ministry of Defence's Program Space, the Defence

Olsen, Ketil	Staff's Space Operations Section, and the Norwegian Intelligence Service Space Division Chief Executive Officer at Andøya Space
Olsen, Richard B.	Deputy Director of the Air and Space Systems Division at the Norwegian Defence Research Establishment
Pedersen, Odd Egil (Maj. Gen.)	Chief of the Norwegian Cyber Defence Force
Rygg, Per-Egil (Maj. Gen.)	Inspector General of the Royal Norwegian Air Force
Rykken, Tom	Deputy Director of the Norwegian Intelligence Service
Saunes, Lars (Rear Adm.)	Inspector General of the Royal Norwegian Navy
Sivertsen, Eirik Selnæs	Project Manager Space at the Norwegian University of Science and Technology
Synstnes, Hans Morten	Lead, Strategy, Norwegian Space Agency
Stensønes, Nils Andreas (Vice Adm)	Chief of the Norwegian Intelligence Service
Vikenes, Marie Lamo	State Secretary Norwegian, Ministry of Defence
Wahl, Terje	Director of Research and Earth Observation at the Norwegian Space Agency

US nationals

Name	Interviewed in capacity of role
Armor, James (Maj. Gen.)	Director of the Pentagon's National Security Space Office
Cartwright, James E. (Gen.)	Commander of US Strategic Command
Clapper, James R. (Lt. Gen.)	Director of National Intelligence

Deptula, David A. (Lt. Gen.)	Dean of the Mitchell Institute for Aerospace Studies
Lord, Lance (Gen.)	Commander of US Air Force Space Command
Marquez, Peter	Director of Space Policy on the US National Security Committee at the White House
O'Connell, Kevin	Chief Executive Officer of Innovative Analytics & Training

French nationals

Name	Interviewed in capacity of role
Testé, Jean-Daniel (Brig. Gen.)	Commander of the French Joint Space Command

German nationals

Name	Interviewed in capacity of role
Johann-Dietrich Wörner	Director of the European Space Agency

Other contributors

Norwegian nationals

Name	Consulted in capacity of role
Berglund, Jan (Commodore)	Head of the Norwegian Defence Command and Staff College. Held Norway's highest Special Operations Forces position (Chief of Staff) to ISAF SOF 2009–2010
Billington, Rolf Arne	Historian at the Norwegian Ministry of Defence
Christoffersen, Øyvind	Senior Adviser at the Norwegian National Security Authority
Diesen, Sverre (Gen.)	Chief of Defence, Norwegian Armed Forces

Edvardsen, Arne (Lt. Col.)	Senior Staff Officer, Norwegian Defence Staff
Hannestad, Finn Kristian (Maj. Gen.)	Defence Attaché at the Norwegian Embassy in Washington, D.C., and former Inspector General of the Royal Norwegian Air Force
Kristoffersen, Eirik (Gen.)	Chief of Defence, Norwegian Armed Forces
Melien, Tor Jørgen (Com. Sr. Gr.)	Researcher and former editor of <i>Norsk Militært Tidsskrift</i>
Mæland, Arne Jørgen	Chief Technologist Space Systems, Telenor Satellite
Slensvik, Thomas (Commander)	Head teacher in strategy and doctrine at Norwegian Defence Command and Staff College
Stensli, Ole Øyvind (Lt. Col.)	Senior Staff Officer, Communication and Information Systems, Norwegian Ministry of Defence
Stette, Gunnar	Professor Emeritus at Norwegian University of Science and Technology
Synstnes, Hans Morten	Strategy Chief Adviser at Norwegian Space Agency
Tandberg, Erik	Consultant at Norwegian Space Agency
Winnæss, Geir (Com. Sr. Gr.)	Senior Adviser at the Norwegian Ministry of Defence
Ydstebø, Palle (Lt. Col.)	Norwegian expert on war studies and military doctrine

US nationals

Name	Consulted in capacity of role
Arnold, David C. (Col.)	Associate Professor at the National War College

Baker, John	Associate at Innovative Analytics & Training
Bueneke, Richard	Senior Adviser, Space Policy at US Department of State
Gallagher, Nancy	Director of the Center for International and Security Studies at the University of Maryland
Gleason, Michael P.	Senior Adviser, Space Policy at US Department of State
Hays, Peter L.	Intelligence Policy Analyst at Leidos
Hitchens, Theresa	Former Director of United Nations Institute for Disarmament
Johnson, Dana	Deputy Director of Space Policy at US Department of State
Logsdon, John (Prof.)	Founder and former Director of George Washington University Space Policy Institute
Loverro, Doug (Col.)	Deputy Assistant Secretary for Space Policy at the Pentagon
Pace, Scott (Prof.)	Director of George Washington University Space Policy Institute
Rafferty, Rick	Associate at Innovative Analytics & Training
Rose, Frank	Deputy Assistant Secretary of State for Space and Defense policy at US Department of State
Sheldon, John	Executive Director at the George C. Marshall Institute
Vedda, James	Senior Space Policy Analyst, the Aerospace Corporation
Weeden, Brian	Technical Advisor, Secure World Foundation
Weeden, Charity	Canadian Embassy Assistant Attaché for Air and Space Operations

French nationals

Name

Brachet, Gerard

Heisbourg, François

Consulted in capacity of role

Led the development of **Satellite
pour l'Observation de la Terre**

Special Adviser for Foundation
pour la Recherche Stratégique

Italian nationals

Name

Ferrazzani, Marco

Giannopapa, Christina

Consulted in capacity of role

Chief Legal Counsel at the
European Space Agency

Head of Political Affairs Office at
the European Space Agency

Appendix B:

Abbreviations

ABM	Anti-Ballistic Missile
AFSPC	Commander of USAF Space Command
AI	Artificial Intelligence
AIS	Automatic Identification System
AOS	Arctic Ocean Surveillance (program)
ARDC	Air Research and Development Command
ARRA	Rescue Agreement
ASC	Andoya Space Center
ASP	Arctic Surveillance Program
C2	Command and Control
CD	Conference on Disarmament
CEO	Chief Executive Officer
CERN	European Organisation for Nuclear Research
CIA	Central Intelligence Agency
CYFOR	Cyber Defence Force
DLR	German Aerospace Centre
DNI	Director of National Intelligence
DSB	Directorate for Civil Protection (<i>Direktorat for sikkerhet og beredskap</i>)
EBO	Effects-Based Operations
EC	EU Council
ECAP	European Capability Action Plan
EDA	European Defence Agency
EEZ	Exclusive Economic Zone
ELDO	European Launcher Development Organisation
Envisat	Environmental Satellite
EO	Often used for E”Electro-optical” as a sensor; and used for “Earth Observation” in civil research and for space capabilities.
ERS	European Remote Sensing Satellite
ESA	European Space Agency

ESM	Electronic Support Measures
ESRO	European Space Research Organisation
EU	European Union
EUCLID	European Cooperation for the Long Term In Defence
FFI	Norwegian Defence Research Establishment (<i>Forsvarets Forskningsinstitutt</i>)
FFOD	Norwegian joint doctrine (<i>Forsvarets fellesoperative doktrine</i>)
FKN	Northern-Norway Defence Command (<i>Forsvarskommando Nord-Norge</i>)
FMGT	Norwegian Military Geographic Service
FPZ	Fishery Protection Zone
FSAT	Norwegian Armed Forces Satellite Station (<i>Forsvarets Satellittstasjon</i>)
GEO	Geostationary Earth Orbit
GMES	Global Monitoring for Environment and Security (later renamed Copernicus)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HEO	Highly Elliptical Orbit
IC	Intelligence Community
ICBM	Intercontinental Ballistic Missile
IFA	Institute for Nuclear Energy
IMINT	Imagery intelligence
INI	Information Infrastructure (<i>Informasjon-sinfrastruktur</i>)
Inmarsat	International Maritime Satellite Organization
Intelsat	International Telecommunications Satellite Organizations
IR	Infrared
ISR	Intelligence, Surveillance and Reconnaissance
ISS	International Space Station
ITU	International Telecommunications Union
JAPCC	Joint Air Power Competence Centre
KDA	Kongsberg Defence and Aerospace
KSAT	Kongsberg Satellite Services
KV	Kongsberg Våpenfabrikk

LDKN	Northern Norway Regional Command (<i>Landsdelskommando Nord-Norge</i>)
LEO	Low Earth Orbit
LIAB	Liability Convention
LTP	Long-term plan (<i>Langtidsplan</i>)
MAROTS	European Maritime Orbital Test Satellite
MI	Norwegian Ministry of Industry
Milspace	Military space
MLU	Mid-Life Update
MNE	Multinational Experiment
MOON	Moon Agreement
MoU	Memorandum of Understanding
MPA	Military Patrol Aircraft
MTB	Missile Torpedo Boat
MTI	Moving Target Indicator
NAOC	National Air Operations Centre
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCA	Norwegian Coastal Administration (<i>Kystverket</i>)
NCW	Network-Centric Warfare
NDLO	Norwegian Defence Logistics Organisation
NDMA	Norwegian Defence Materiel Agency (<i>Forsvarsmateriell</i>)
NDRE	Norwegian Defence Research Establishment
NIS	Norwegian Intelligence Service (also used to denote previous organisational variants, i.e., Intelligence Staff, etc.)
NJHQ	Norwegian Joint Headquarters (<i>Forsvarets Operative Hovedkvarter</i>)
NKOM	Norwegian Communications Authority (<i>Nasjonal kommunikasjonsmyndighet</i>)
NLR	Royal Netherlands Aerospace Centre
NOK	Norwegian krone
NORDEFECO	Nordic Defence Cooperation
NorTG	Norwegian Task Group

NOSA	Norwegian Space Agency (<i>Norsk Romsenter</i>) (also used to denote the Norwegian Space Centre)
NRO	National Reconnaissance Office
NSAT	New Norwegian Satellite (<i>Ny Norsk Satellitt</i>)
NSC	National Security Committee
NSM	National Security Authority (<i>Nasjonal sikkerhetsmyndighet</i>)
NTA	Norwegian Telecommunications Administration's
NTM	National technical means
NTNF	Norwegian Council for Scientific and Industrial Research
NTNU	Norwegian University of Science and Technology
OMS	Oslo Military Society (<i>Oslo Militære Samfund</i>)
OST	Outer Space Treaty
PNT	Positioning, Navigation and Timing
PRS	Public Regulated Services
PST	Police security service (<i>Politiets Sikkerhetstjeneste</i>)
R&D	Research and development
REG	Registration Convention
RSC	Responsive Space Capabilities
SAR	Synthetic Aperture Radar
SATCOM	Satellite Communications
SDA	Space Domain Awareness (interchangeably denoted SSA)
SDI	Strategic Defence Initiative
SFL	Space Flight Laboratory
SLBM	Submarine-Launched Ballistic Missile
SMART	Strategic and Mutual Assistance in Research and Technology
SOF	Special Operations Forces
SSA	Space Situational Awareness (interchangeably denoted SDA)
SSBN	US Navy designation for nuclear ballistic missile submarines

TDL	Tactical Data Link
TNO	Netherlands Organisation for Applied Scientific Research
TSS	Tromsø Satellite Station (<i>Tromsø satellitt-stasjon</i>)
UAV	Unmanned Aircraft Vehicle
UK	United Kingdom
UN	United Nations
UNCOPUOS	The United Nations Committee on the Peaceful Uses of Outer Space
UNGA	United Nations General Assembly
UNOOSA	United Nations Office for Outer Space Affairs
US	United States
USAF	United States Air Force
USD	US dollars
USSR	Union of Soviet Socialist Republics
USSTRATCOM	United States Strategic Command
UTIAS	University of Toronto Institute for Aerospace Studies
VDES	VHF Data Exchange System
VHF	Very High Frequency
WEAG	Western European Armament Group
WEU	Western European Union

Where nationality is not specified, Norwegian origin is assumed, that is:

High Command	Norwegian High Command
Intelligence Service	Norwegian Intelligence Service
MFA	Norwegian Ministry of Foreign Affairs
MoD	Norwegian Ministry of Defence
MoE	Norwegian Ministry of Environment
MoJ	Norwegian Ministry of Justice
MTC	Norwegian Ministry of Transport and Communication
MTIF	Norwegian Ministry of Trade, Industry and Fisheries
The Armed Forces	Norwegian Armed Forces
The Government	The Government of Norway

