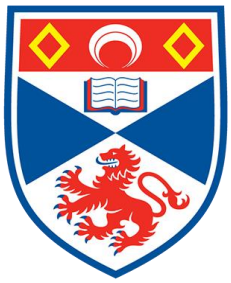
Space Power in the High North

Perspectives from the Kingdom of Norway

Tale Sundlisaeter



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Abstract

Norway's main impetus for developing national military satellite-based capability was the 1977 introduction of the EEZ, through which Norway became responsible for vast maritime areas in the High North. These capabilities also underpinned Norway's intelligence mission that entailed monitoring Russian military activity, especially the Kola Bay-based Russian strategic forces in the vicinity of Norway. Norway developed niche technologies for military use predominantly based on civilian satellites, and ESA became an essential instrument as it enabled Norway to develop indigenous satellite-based services for the Norwegian Armed Forces. Norway in turn used this capability to reinforce its military relations with the United States and key allies within the NATO framework. Following the 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.

This thesis examines how Norwegian military space activity fits into the nation's overall defence and security policy and argues this activity and the associated national capability development has emerged as a strategic asset in Norwegian alliance policy. This activity reflects upon relations between national policymakers and practitioners, and has contributed to obscure the notion of civil-military separation in Norway. The activity also demonstrates the existence of two unofficial space doctrines in Norway. One focuses on intelligence and the other on force enhancement. The 2020 appointment of the Norwegian Intelligence Service as Norway's military space authority demonstrates the value of space for intelligence activities supersedes other uses of the domain. Lastly, the study has identified a notable discrepancy between Norwegian military space activity and how space is addressed in national military doctrine.

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Research Data/Digital Outputs access statement

The research data underpinning this thesis cannot be made publicly available due to ethical considerations.

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Abbreviations

ACT	Allied Command Transformation
AIS	Automatic Identification System
CCRS	Canadian Centre for Remote Sensing
CEO	Chief Executive Officer
CIA	Central Intelligence Agency
CYFOR	Cyber Defence Force
DNI	Director of National Intelligence
EBO	Effects-Based Operations
EC	European Commission
ECAP	European Capability Action Plan
EDA	European Defence Agency
EEZ	Exclusive Economic Zone
Envisat	Environmental Satellite
E/O	Electro-optical
ERS	European Remote-Sensing Satellite
ESA	European Space Agency
ESM	Electronic Support Measures
EU	European Union
EUCLID	European Cooperation for the Long term In Defence
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
FFI	Norwegian Defence Research Establishment (*Forsvarets Forskningsinstiutt*)
FFOD	Norwegian joint doctrine (*Forsvarets fellesoperative doktrine*)
FKN	Northern-Norway Defence Command's (*Forsvarskommando Nord-Norge*)
FMGT	Norwegian Military Geographic Service

FSAT	Norwegian Armed Forces Satellite Station (*Forsvarets Satellittstasjon*)
FVEY	Five Eyes
DLR	German Aerospace Centre
DSB	Directorate for civil protection (*Direktorat for sikkerhet og beredskap*)
GSV	The Garrison of South-Varanger (*Garnisonen i Sør-Varanger*)
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HEO	Highly Elliptical Orbit
IC	Intelligence Community
IMINT	Imagery intelligence
INI	Information Infrastructure (*Informasjonsinfrastruktur*)
IR	Infrared
ISR	Intelligence, Surveillance and Reconnaissance
ITU	International Telecommunications Union
JAPCC	Joint Air Power Competence Centre
KDA	Kongsberg Defence and Aerospace
KSAT	Kongsberg Satellite Services
LDKN	Northern Norway Regional Command (*Landsdelskommando Nord-Norge*)
LTP	Long-term plan (*Langtidsplan*)
Milspace	Military space
MLU	Mid-Life Update
MNE	Multi-National Experiment
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 (*Kystverket*)
NCW	Network-Centric Warfare
NDLO	Norwegian Defence Logistics Organization
NDMA	Norwegian Defence Materiel Agency (*Forsvarsmateriell*)
NIS	Norwegian Intelligence Service (also used to denote previous organizational variants, i.e., Intelligence Staff, etc.)
NJHQ	Norwegian Joint Headquarters (*Forsvarets Operative Hovedkvarter*)
NKOM	National communications authorities (*Nasjonal kommunikasjonsmyndighet*)
NOK	Norwegian Krone
NORDEFCO	Nordic Defence Cooperation
NorTG	Norwegian Task Group
NOSA	Norwegian Space Agency (*Norsk Romsenter*) (also used to denote the Norwegian Space Centre)
NRO	National Reconnaissance Office
NSAT	New Norwegian Satellite (*Ny Norsk Satellitt*)
NSC	National Security Committee
NSM	National Security Authority (*Nasjonal sikkerhetsmyndighet*)
OMS	Oslo Military Society (*Oslo Militære Samfund*)
OST	Outer Space Treaty
PLA	People’s Liberation Army
PNT	Positioning, Navigation and Timing
PST	Police security service (*Politiets Sikkerhetstjeneste*)
QRF	Quick Reaction Force
R&T	Research and Technology

RSC	Responsive Space Capabilities
SAR	Synthetic Aperture Radar
SATCOM	Satellite Communications
SCA	Space Coordinating Authority
SDA	Space Domain Awareness (interchangeably denoted SSA)
SDI	Strategic Defense Initiative
SFL	Space Flight Laboratory
SLBM	Submarine-Launched Ballistic Missile
SMART	Strategic and Mutual Assistance in R&T
SOF	Special Operations Forces
SSA	Space Situational Awareness (interchangeably denoted SDA)
USSTRATCOM	United States Strategic Command
TDL	Tactical Data Link
TSS	Tromsø Satellite Station (*Tromsø satellittstasjon*)
TT&C	Telemetry, Tracking&Command
UK	United Kingdom
UN	United Nations
US	United States
USAF	United States Air Force
USD	US Dollars
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
WMD	Weapons of Mass Destruction

Where nationality is not specified, Norwegian origin is assumed, i.e.:

Intelligence Service	Norwegian Intelligence Service
High Command	Norwegian High Command
The Armed Forces	Norwegian Armed Forces
The Government	The Government of Norway
MFA	Norwegian Ministry of Foreign Affairs
MoD	Norwegian Ministry of Defence
MTC	Norwegian Ministry of Transport and Communication
MTIF	Norwegian Ministry of Trade and Industry

Introduction

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 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 Norway tremendously and Norway became responsible for monitoring maritime areas five times the size of the Norwegian mainland.

Figure 1: Norway's main areas of interest.[1]

Norway's surveillance mission includes monitoring fisheries and petroleum activity, 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 Norway throughout the second space age made satellite surveillance a key defence research area to ensure that national decision makers were well informed of activity in Norway's areas of interest. Although Russian behaviour has consistently demonstrated it is in Russia's interest to

[1] Rolf Tamnes et al., Expert commission on Norwegian security and defence policy, (https://www.regjeringen.no: Forsvarsdepartementet, 2015). Figure 2, p. 15

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 United States (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 deepened Norway's surveillance requirements and prompted the Norwegian government to further bolster its military space investments.

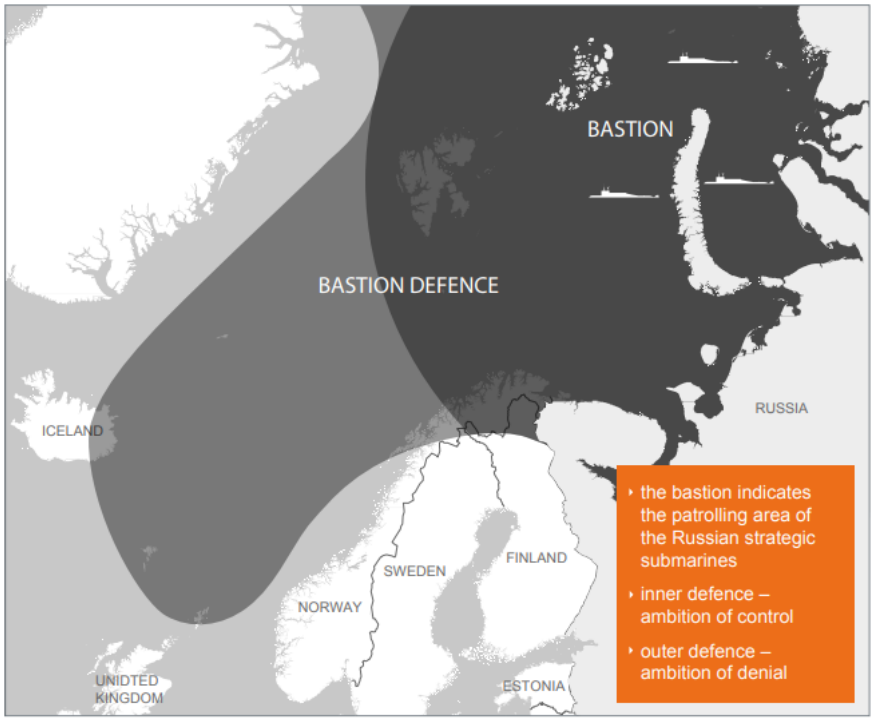

Figure 2: The Russian bastion and the patrolling area of Russian SSBNs.[2]

Outline

Presented in three main parts, this study comprises a chronological and thematical examination of Norwegian military space activity and its role in Norwegian defence and security policy. It is the story of Norway's rise as a space power from the 1970s until present day, when the small state of Norway starts developing a remarkably wide range of national space capabilities.

Part I Chapter 1 covers from the late 1970s until circa 2000, the formative years of Norway's development of indigenous military satellite-based capability, principally centred around the need for ISR. It takes us through the second space age that commenced in the 1990s following the Gulf War. Norway's military space activities during this time are carried out in a seemingly ad hoc and improvised manner. Part I Chapter 2 covers circa 2000 until 2014, where Norway continues to conduct military space activity with no clear organisational approach or overarching strategy for the Armed Forces. Progressively throughout the 2000s, the Armed

[2] Ibid. Figure 4, p. 21

Forces focuses increasingly on satellite communications (SATCOM). The chapter covers key points such as Norway's decision *not* to develop a national military surveillance satellite in 2004, *not* to develop 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, Chapter 2 sets the stage for things to come in 2014 and beyond. How the Norwegian Armed Forces addressed space up until this point does not imply that space had been considered important thus far; however, this was now about to change in a significant way.

Part II depicts the major changes taking place from 2014 until present day and constitutes this study's centre of gravity. Chapter 3 covers 2014 to 2015, 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) undertakes its first comprehensive military space strategic review and wilfully decides that space is essential for the Norwegian Armed Forces. The chapter provides a detailed presentation of the review and an in-depth bureaucratic analysis on how Norway thinks about organizing its national military space affairs. Part II Chapter 4 portrays the subsequent establishment of the MoD's Program Space and its derivatives headed by Col. Stig Eivind Nilsson (Air Force) from circa 2015 until 2020. Lastly, Part II Chapter 5 considers how the Norwegian Armed Forces chooses to organize its newfound space investment under the auspices of its new Chief of Defence General Eirik Kristoffersen (Norwegian Special Operations Forces, SOF) and the Chief of the Norwegian Intelligence Service (NIS) from 2020 until 2022. This part presents bureaucratic processes and emerging and differing views on how to organize space as a new domain within the Norwegian military structure.

Part III covers the same time frame as Part II, circa 2014 until present day, and describes key activities and capability developments that take place in parallel with the bureaucratic processes within the MoD and the Norwegian Armed Forces during this time. It depicts how Norway rises as a space power, both in terms of capability development and how the country significantly develops its thinking on national security space affairs. Norway climbs the steps towards the apex of the "Space Club" from the opportunistic to the inadequate, and finally incorporates national military and security concerns into its overarching, national space policy.

1. Analytical approach

This section introduces a conceptual framework to examine and situate the study of Norwegian military space activity within a broader context. It combines the concept of "space power" with two analytical levels to analyse Norwegian military space activity as an element of Norwegian defence and security policy, considering international affairs, domestic policy, and military bureaucracy and organization.

1.1. Research question and hypotheses

This study follows a qualitative research design and constitutes a case study of Norwegian military space activity from the late 1970s until present day, with a regional and geopolitical focus on the High North.[3] As we get closer in time to the present, the study focuses on the pivotal military space strategic review in 2014/2015. The study predominantly focuses on Norway's military use of *satellites*, particularly the intelligence, surveillance, and reconnaissance (ISR) and communications functions, as opposed to positioning, navigation, and timing (PNT) and ground-based space surveillance activity and space domain awareness (SDA). This noted activity is examined within a framework of existing views on space power whilst considering Norway's security policy at two analytical levels that include foreign and domestic affairs. Norway's military space activity over the course of nearly 50 years is traced through different historical eras. Until 2014, this activity was not formally considered or institutionalized in the Norwegian defence structure. The activity had thus far been managed and conducted on an ad hoc basis, which is why this study is oriented around the military space *activity*, including capability development and organization. This activity has been affiliated with different parts of the Norwegian national security structure, and therefore involves several organisational units, of which the most important under the MoD umbrella include FFI, NIS, CYFOR, NJHQ, and Navy.

The primary research question is:

- What is the role of Norwegian military space activity in Norway's defence and security policy?

To answer this question, the study contemplates the following hypotheses:

[3] 'The High North' is a notion that was taken into use by 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 (www.fni.no, 2010), pp. 5-7. For background, motivation, and definition of the Arctic, see: Tale Sundlisæter et al., "GNSS and SBAS System of Systems: Considerations for Applications in the Arctic," (https://gps.stanford.edu: Stanford University, 2012).

1) Norwegian military space activity has emerged as a strategic asset in Norwegian alliance policy.
2) Norwegian military space activity reflects upon relations between Norwegian policymakers and practitioners.
3) Norwegian military space activity has transformed the notion of civil-military separation in Norway.
4) Norwegian military space activity demonstrates the existence of two competing, unofficial space doctrines in Norway.
5) There is a detachment between space in Norwegian military joint doctrine and Norwegian military space activity.

1.2. Existing views on space power

During the Cold War, military space power (*militær rommakt)* was largely reserved for a few nation-states.[4] 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.[5] For the purposes of this thesis, this is how the concept should be understood, and the term space power can thus be interchangeably denoted as military space power.

The space power concept, as it is currently understood, originates from the US and the Cold War era and several authors have claimed that there is a lack of thought on the subject.[6] In 1971, Futrell described how American military leaders 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.[7] In 1988, Lupton attributed the lack of thought on space power 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.[8] In 1996, Gray 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'.[9] Gray also incorporated the interplay between space and information and communications technology into the space power concept and spoke of 'space age information warfare', where space systems provided the most vital data for military effectiveness.[10]

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[4] Forsvaret, Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse, (Oslo 2015).
[5] 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 (New York: Springer Science+Business Media, 2015).
[6] James E. Oberg, *Space Power Theory* (Fairchild Drive: 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) (Ann Arbor, 1994); Robert Frank Futrell, *Ideas, Concepts, Doctrine. Basic Thinking in the United States Air Force 1907-1960*, vol. 1 (Maxwell Air Force Base: Air University Press, 1971), pp. 549-50; David E. Lupton, *On space warfare: A space power doctrine*, Air University Press (Maxwell Air Force Base, 1988); Peter L. Hays, "Spacepower Theory," in *Handbook of Space Security*, ed. K.-U. Schrogl et al. (New York: Springer Science+Business Media, 2015).
[7] Futrell, *Ideas, Concepts, Doctrine. Basic Thinking in the United States Air Force 1907-1960,* 1, pp. 549-50.
[8] Lupton, *On space warfare: A space power doctrine*.
[9] Colin S. Gray, "The influence of space power upon history," *Comparative Strategy* 15, no. 4 (1996): 307.
[10] Ibid., pp. 293, 99.

In 1998, Jusell observed 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. Thus, how to organize military space forces and how to define space power was a pressing issue that required addressing actors, capabilities, functions, and purposes.[11] In 1999, Alberts, Garstka and Stein coined the concept known as 'network-centric warfare' (NCW),[12] while Gray observed that space power should indeed 'explore the interconnectedness, indeed interdependence, of the different geographical environments'. If a revolution in military affairs was under way, 'most probably it is in spacepower'.[13]

In 2000, McLean observed that that the role of space over the past 30 years had been viewed 'with a degree of scepticism by most within the military community' and that 'military commanders and defence departments, of whatever country' at best had acknowledged 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'. However, in 2000, these sceptical views were increasingly 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'.[14]

Commercial space capabilities were now 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, which obscured the delineation of civilian satellite remote sensing and military satellite reconnaissance.[15] 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'.[16] In 2001, Smith proclaimed that 'Commercial Space Assets Make All Actors Space Powers',[17] and the concept of space power was overall receiving increased attention.[18] In 2006, according to Fredriksson, the integration of traditional military functions on non-military (space) platforms was now altering the notion of what space power is, who has it or who can obtain it.[19]

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[11] Judson J. Jusell, *Space Power Theory: A Rising Star*, Air University (Air Command and Staff College, Maxwell Air Force Base, Alabama: Air Command and Staff College, April 1998), p. 27, https://spp.fas.org/eprint/98-144.pdf.

[12] David S. Alberts, John J. Garstka, and Frederick P. Stein, *Network-Centric Warfare: Developing and Leveraging Information Superiority* (Washington, DC.: 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 of Science in Defense Analysis Naval Postgraduate School, 2004), p. xvii.

[13] Colin S. Gray, *Modern Strategy* (New York: Oxford University Press, 1999), p. 13.

[14] Alasdair McLean, "A new era? Military space policy enters the mainstream," *Space Policy* 16 (2000): p. 244.

[15] Jusell, *Space Power Theory: A Rising Star*, pp. 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 (Santa Monica: RAND and ASPRS, 2001).

[16] Ann M. Florini and Yahya A. Dehqanzada, "Commercial Satellite Imagery Comes of Age," in *Intelligence and the National Security Strategist: Endiring Issues and Challenges*, ed. Roger Z. George and Robert D. Kline (United States: Rowman & Littlefield Publishers, Inc., 1999).

[17] M. V. Smith, "Ten Propositions Regarding Spacepower" (Master Air University, 2001), https://apps.dtic.mil/sti/pdfs/ADA407810.pdf.

[18] John M Logsdon, "Just say wait to space power," *Issues in Science and Technology* 17, no. 3 (2001): p. 33.

[19] Brian E. Fredriksson, *Globalness: Toward a Space Power Theory*, Air University Press (Air University, Maxwell Air Force Base, Alabama, 2006).

In 2008, Brown 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.'[20] Burzykowska in 2009 denounced the great powers' space power discourse and argued that proliferating commercial space technologies brought about a variety of options to the extent that if one country refused to cooperate, you could just turn to another.[21] Hays claimed the same year that commercial space capabilities interfered with 'traditional space missions', complexifying and obfuscating military space affairs,[22] while Sheehan observed that the civilian and 'non-military' European space programs were subject to 'militarisation' by member states.[23]

In 2015, Hays again argued that commercial space capabilities raised issues such as how to protect 'quasi-military systems', and that security implications for dual-use space capabilities and products were unclear.[24] According to the Commander of the French Joint Space Command in 2015, Brig. Gen. Testé, the proliferation of high-resolution satellite surveillance data directly undermined the diplomatic value of France's national satellites.[25] Golston and Baseley-Walker 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, but came at the price of not having control or authority over this component of national security.[26]

In 2019, Moltz argued that the increasing space commercialisation spurred 'net-centric space power' marked by resiliency through multiple small platforms and rapid innovation.[27] Despite the increase in commercially available space systems, however, Ojala observed in 2021 that even 'small nations' strive to establish indigenous and sovereign space capabilities.[28] And despite the multitude of definitions of space power, Shabbir, Sarosh and Nasir pinpointed in 2021 that most definitions of space power are capability oriented; while non-state actors can play a significant role in space, the space power concept principally relates to nation-states.[29]

[20] Trevor Brown, "Soft power and space weaponization," *Air & Space Power Journal* 23, no. 1 (2009): p. 71.
[21] Anna Burzykowska, "Smaller states and the new balance of power in space," *Space Policy* 25, no. 3 (2009): p. 189-90.
[22] Peter L. Hays, "Space and the military," in *Space and Defence Policy*, ed. Damon Coletta and Frances T. Pilch, Space power and politics (London and New York: Routledge Taylor & Francis Group, 2009), p. 150.
[23] 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 (London and New York: Routledge Critical Security Studies, 2009), p. 171.
[24] Hays, "Spacepower Theory," pp. 69, 73.
[25] Peter B. de Selding, "Imagery Proliferation has Diplomatic Cost for France," *spacenews* (www.spacenews.com) 2015, https://spacenews.com/imagery-proliferation-has-diplomatic-cost-for-france/.
[26] Daniel Golston and Ben Baseley-Walker, *The Realities of Middle Power Space Reliance*, UNIDIR (Geneva, 2015).
[27] James Clay Moltz, "The Changing Dynamics of Twenty-First-Century Space Power," *Journal of Strategic Security* 12, no. 1 (2019): pp. 78-79, https://www.jstor.org/stable/pdf/26623076.pdf.
[28] 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 (1 December 2021).
[29] Zaeem Shabbir, Ali Sarosh, and Sheikh Imran Nasir, "Policy Considerations for Nascent Space Powers," *Space Policy* 56 no. 101414 (May 2021).

1.2.1. Space as an element of national power

Another common denominator in the varied space power landscape is that space power is tied to several elements within a nation.[30] It includes national, military, civilian, and commercial capabilities, which are in turn subdivided into space-based, ground-based and launch systems.[31] There is presumably also a relation between the nation's overall space capability and its ability to use space for military affairs.[32] In 2004, Bingen in a report commissioned by the Norwegian Space Agency (NOSA) addressed the role of space in 'global power hierarchies' and observed that activities in space can be understood as a reflection of power relations on Earth.[33] In 2009, Paikowsky offered a similar view, considering why nation-states join the 'Space Club'.[34] Bingen and Paikowsky categorized space actors in a hierarchical structure based on national space capability.[35] We can use these models to assess the development of Norwegian space power until present day, presuming that Norway's overall space capability serves as a foundation for its military space capability.

Bingen categorized '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; with time, 'maybe India'. Russia was also in this category, albeit with one foot in the lower level due to financial instability.[36]

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

[31] Jusell, *Space Power Theory: A Rising Star*, pp. 23-30.

[32] Shabbir, Sarosh, and Nasir, "Policy Considerations for Nascent Space Powers."

[33] Jon Bingen, *Det nære verdensroms strategiske dimensjoner*, Europa-programmet (Oslo: Europa-programmet, June 2004), pp. 27-28.

[34] Paikowsky, *Clubs of Power: Why Do Nation-States Join the "Space Club"?*, p. XI.

[35] Bingen, *Det nære verdensroms strategiske dimensjoner*.

[36] Ibid.

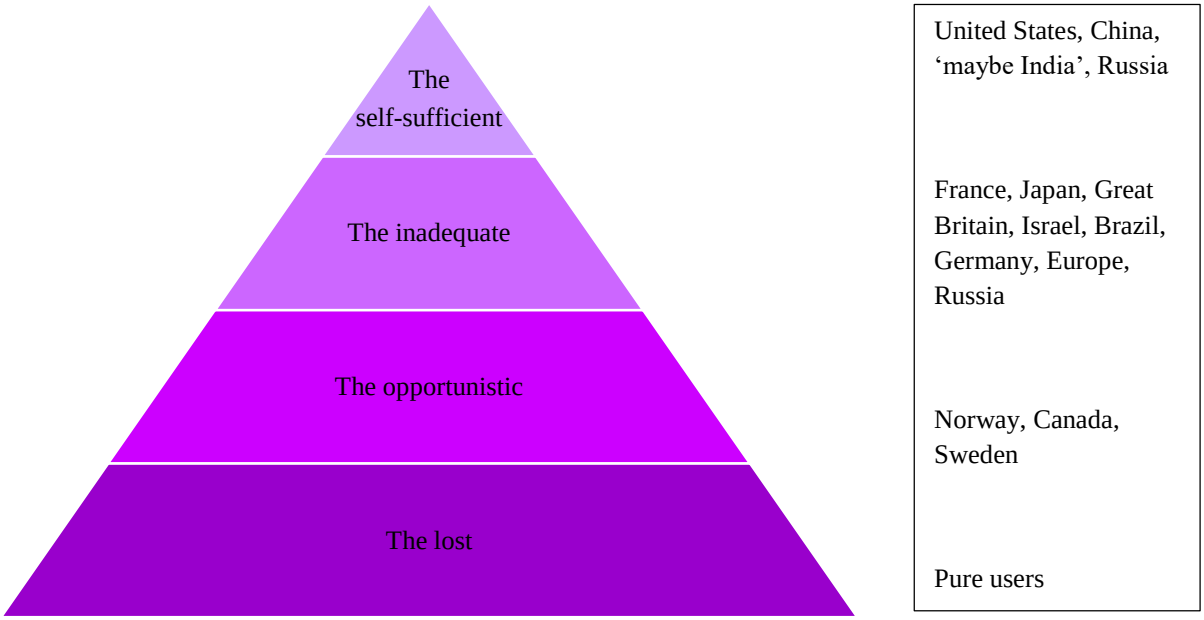

Figure 3: Visualization of hierarchical classification of space actors.[37]

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.[38] As we shall see, this study of Norwegian military space activity depicts how Norway starts out as a 'lost' space actor, transcends the level of the opportunistic, and is reaching the level of the 'inadequate' towards present day.

Paikowsky's model is similar, where Norway throughout the study rises from the lowest level of the "Space Club" and up to the third, and even sets one foot in the second highest level of the pyramid:

[37] Ibid., pp. 27-28.
[38] Ibid.

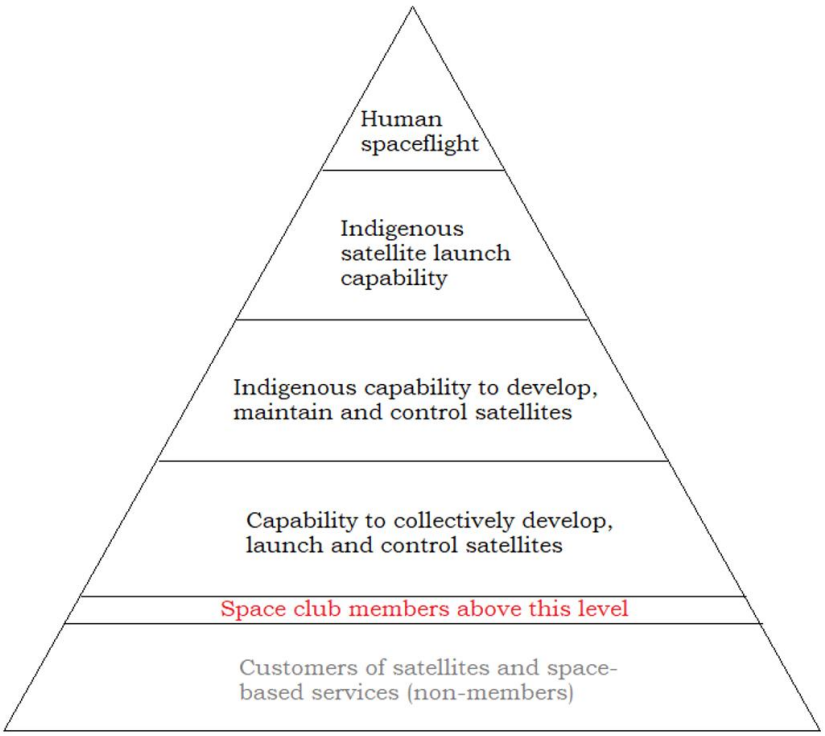

Figure 4: Levels of membership in the "Space Club".[39]

1.2.2. 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).[40] 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.

[39] Reproduction of Paikowsky's visualization of the "Space Club", retrieved from: Paikowsky, *Clubs of Power: Why Do Nation-States Join the "Space Club"?*, p. 19.
[40] 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), p. 7.

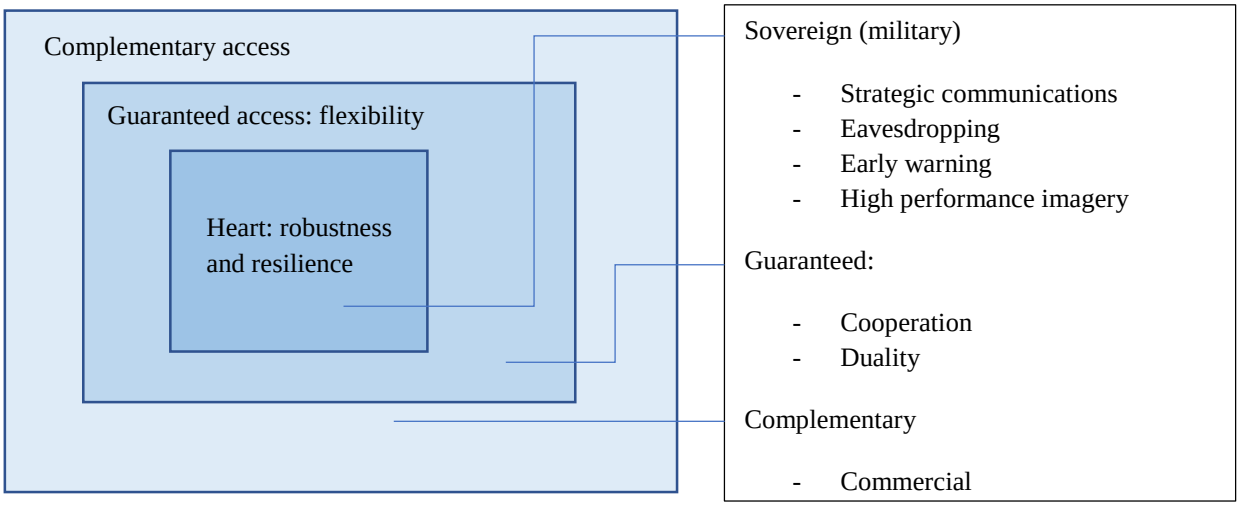

Figure 5: The French three-level model for access to space-based services.

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 French[41] is not transferrable to Norway, but the Norwegian MoD's Program Space by 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 prioritized 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.

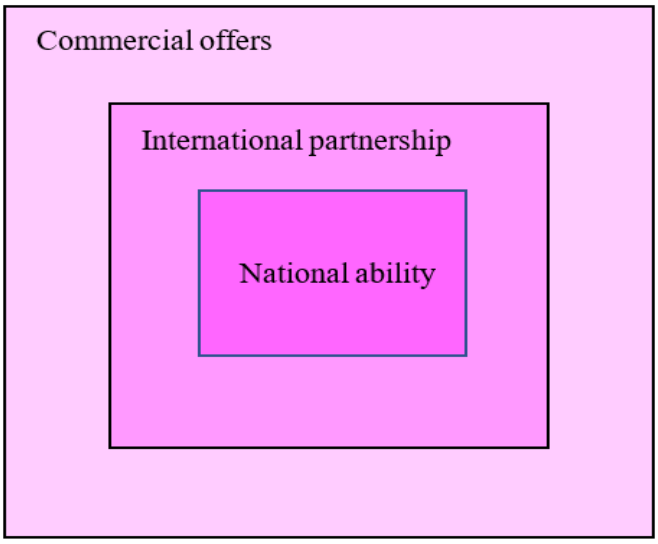

Figure 6: Norwegian military access to space-based services.[42]

[41] Ibid.
[42] Stig Nilsson, Forsvarssektorens satsing på Space: "Nøkternt og Trinnvis", (Forsvarsdepartementet, 2017).

1.3. Two levels of analysis

This study takes a two-level approach that builds on Col. Håvard Klevberg's (Norwegian Air Force) examination in 2011 of Norwegian maritime air power in the High North. Klevberg's case study of Squadron 333 and its role in Norwegian security policy constitutes a geographical overlap and a partial supplement to Norwegian military space activities considering the ISR function. Like Squadron 333, 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 Soviet Union/Russia[43] and, increasingly, China.[44] Whilst Squadron 333 has played a role in allied maritime control operations towards hostile submarines and vessels, it has primarily operated in peacetime to collect information on activity below, on, and above the surface of northern seas. It has served as a strategic asset to Norwegian authorities in intelligence and maritime air power.[45] In 2015, Norway's Chief of Defence recommended to replace Norway's MPA capability with a combination of satellites and lightweight aircraft and unmanned aerial vehicles,[46] which implies that satellites can partly replace MPA capability in the High North.[47] Norway developed space capability supporting maritime surveillance missions in this region to optimise the use of the more flexible capabilities, including Squadron 333 and the Coast Guard.

There are several similarities, and some key differences, between the case studies. We have established that space power entails military and civilian space capabilities, which brings dual-use considerations into play. According to Freeland, 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. It is principally the narrowing financial environments that drive even the major space powers into developing governmental space assets serving civilian and military purposes in conjunction.[48] Whereas MPA constitutes military materiel, Norway's military space activity largely incorporates civilian, or dual-use assets.

The focus that entails the geographical and geopolitical operating area in the High North and the function of satellites as data collection platforms largely overlap,[49] and 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, but Norwegian military space activity has not been conducted continuously by one military unit. Quite oppositely, it has been carried out in an ad hoc manner and has never been institutionalized in the Norwegian military organisation. In addition to information collection, space-based capabilities support functions such as communications and PNT. In 2020, Dr. Col.

[43] Håvard Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk" (Dissertation for the Degree of PhD Monograph, University of Oslo, 2011).
[44] Tamnes et al., *Expert commission on Norwegian security and defence policy*, p. 23.
[45] Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk."
[46] Forsvaret, Et forsvar i endring: Forsvarssjefens fagmilitære råd, (www.forsvaret.no: Forsvaret, 2015).
[47] Forsvarsdepartementet, Kampkraft og bærekraft: Langtidsplan for forsvarssektoren, Prop. 151 S (2015-2016) Proposisjon til Stortinget (forslag til stortingsvedtak) (www.regjeringen.no: Forsvarsdepartementet, 2016).
[48] Steven Freeland, "The Laws of War in Outer Space," in *Handbook of Space Security* (new York: Springer Science+Business Media, 2015).
[49] Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk," pp. 9-10.

John Olav Birkeland (Norwegian Air Force) observed that the 'new services' of satellite- and UAV-based ISR are currently inadequate in the search for submerged submarines,[50] and that MPA is still the most essential instrument to monitor and counter Russian submarine and naval activity.[51] He advised, however, that '[s]atellites should be an integrated element of maritime surveillance'.[52] Unlike satellites, MPA provides ASW capability, and the aircraft provides physical presence in the airspace. It is a more flexible platform considering manoeuvrability, whereas satellites typically move in highly predictable orbits. Space capabilities have the advantage of free overflight and global coverage, and the Norwegian Armed Forces have employed space capability 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.[53]

Considering these ties between the study of Norwegian maritime air surveillance and military space activity, it is viable to apply Klevberg's framework to examine the role of Norwegian military space activity in a national security perspective.[54] This study omits the analysis at the individual level due to ethical considerations, as several characters are known to the author and still active in the work force, whereas others cannot be identified. The actors presumably act on behalf of the system and the roles they represent.

Principal differences between the case studies require adjustment or justification of the framework and will be discussed and incorporated where applicable. The space power concept combined with the two analytical levels facilitates classification and analysis of empirical data, assumptions, justifications, assessments, and presentation.

1.3.1. Military space activity and international affairs

The security policy framework coincides with the study of Squadron 333 as Norway is an allied nation that relies on the US as its primary guardian. Since the late 1970s, the High North has become a region of increasing economic interest in addition to its security policy considerations, where the old Soviet giant Russia continues to be Norway's primary threat into present day.[55] Norway's alliance policy can be modelled based on varying degrees of trust, confidentiality, and technological adaption between allies and partners. The original model is composed of three concentric circles corresponding to the circles A, B and C in Figure 7,[56] and is used here to evaluate Norwegian alliance policy as it pertains to military space activity.

[50] John Olav Birkeland, "Maritime airborne intelligence, surveillance and reconnaissance in the High North - The role of anti-submarine warfare - 1945 to the present" (Doctor of Philosophy in War Studies PhD, University of Glasgow, 2020), p. 154, https://theses.gla.ac.uk/81995/.
[51] Ibid., p. 2.
[52] Ibid., p. 234.
[53] See Maritim Luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk (2011) p. 3.
[54] Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk."
[55] Forsvarsdepartementet, Prioriterte endringer, status og tiltak i forsvarssektoren, Meld. St. 10 (2021-2022) (www.regjeringen.no: Forsvarsdepartementet, 2022).
[56] Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk," pp. 8-9.

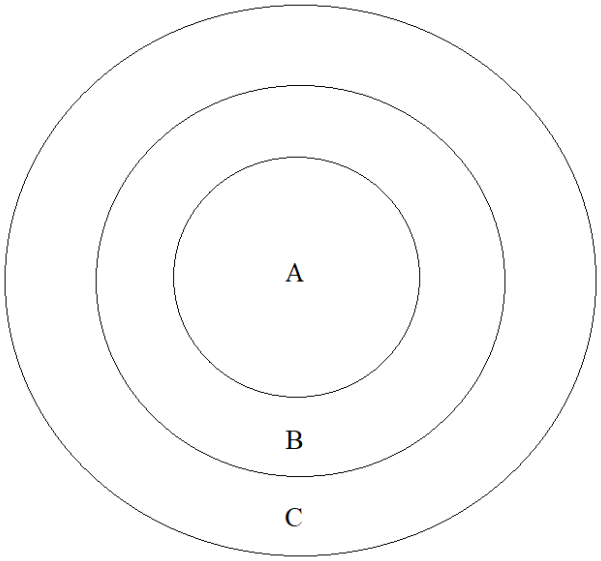

Figure 7: Three circles for Norwegian collaboration in military space activity.[57]

Dual-use considerations entail that the model above incorporates an added layer of complexity when considering military space activity. It poses the question 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.

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 NATO, the other cornerstone in Norwegian security policy.[58] 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.[59] 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.[60] No Nordic defence cooperation (NORDEFCO) in space has been identified.[61] NORDEFCO has been referred to as a possible 'mini-NATO', but the Nordic states have historically not been prepared or willing for such an

[57] Ibid., p. 9.
[58] Torgeir Larsen, *Sikkerhetspolitiske rammebetingelser i bevegelse*, Norwegian Institute of International Affairs (NUPI) (www.nupi.brage.unit.no: Norwegian Institute of International Affairs (NUPI), 2018); Considering intelligence collaboration, the United States 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* (New York: Penguin Random House LLC, 2018), Autobiography, p. 256.
[59] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, pp. 62-63.
[60] FFI, *Satellittovervåking*, FFI (Kjeller, 2006).
[61] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, p. 61.

undertaking.[62] This is likely subject to change since Russia's invasion of Ukraine on 24 February 2022 prompted Finland and Sweden to apply for NATO membership.[63]

1.3.1.1. Space as a security policy tool

In 2006, Klein observed that being small allows one to benefit to a greater extent from relations with more powerful allies and their space capabilities.[64] Klevberg later used the notion proposed by Norwegian sociologist Gudmund Hernes in 1975, which entails that power relations between actors are shaped by one's ability to provide something of use for the other, and differences in size or interests can lead small powers to take advantage of the large.[65] The US, the Soviet Union/Russia and other nations have benefitted from free overflight in space for decades,[66] whereas Norway has relied on others for information collected by their satellites. However, when Norway first started developing indigenous military space capability, part of the strategy was to develop niche capability to provide something of use for its allies.[67] Whilst satellites have never been confined by national boundaries, airspaces, or waters, the study considers whether Norwegian military space activity and capability development serves as an instrument in Norway's alliance policy.

1.3.1.2. Deterrence and reassurance

In 1986, Tamnes introduced the Cold War terms *integration* and *screening* to explain Norwegian alliance policy and relations to the West bloc,[68] and these terms have been found to be applicable outside the Cold War era.[69] A corresponding concept pair, *deterrence* and *reassurance*, was introduced by Holst in 1966 to describe the balance of Norway's relations with the Communist bloc. By demonstrating military power and alliance affiliations, Norway aimed to deter the Soviets 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, so allied activity would not provoke Soviet military aggression.[70] Integration corresponds to deterrence and entails that Norway has sought

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[62] Håkon Lunde Saxi, *Nordic defence cooperation after the Cold War*, ed. Anna Therese Klingstedt, Oslo Files on Defence and Security, (Oslo: Institutt for Forsvarsstudier (IFS), March, 2011); "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/.

[63] "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/.

[64] Klein, *Space Warfare: Strategy, Principles and Policy*, pp. 60-68, 116-26.

[65] Gudmund Hernes, *Makt og avmakt. En begrepsanalyse* (Oslo: Universitetsforlaget, 1975), pp. 40-52.

[66] Walter A McDougall, *... The Heavens and the Earth - A Political History of the Space Age* (New York: Basic Books, Inc., 1985).

[67] FFI, *Satellittovervåking*.

[68] Rolf Tamnes, *Integration and screening: the two faces of Norwegian Alliance policy, 1945-1986* (National Defence College Norway, Research Centre for Defense History, 1986), pp. 60-61. Cited in; Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk," p. 6.

[69] Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk," p. 491.

[70] Johan Jørgen Holst, "Norsk sikkerhetspolitikk i strategisk perspektiv," *Internasjonal Politikk*, no. 5 (1966): p. 465; Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk."

collective security as part of a wider integration process between the US and Western Europe. Screening corresponds to reassurance and entails that Norway has sought to limit allied activity on Norwegian territory, without reducing the effect of integration.[71] Norway has increasingly emphasised alliance policy and integration,[72] and these concepts are used here to evaluate the role of Norway's military space activity considering the country's contemporary alliance policy as well as its relations with Russia.

1.3.2. Military space activity and domestic affairs

The second level concerns how Norway organises itself internally, including the MoD's relations with the Ministry of Trade, Industry, and Fisheries (MTIF), which governs NOSA; FFI's role and influence on the MoD; the interplay between the MoD, FFI, and the Armed Forces; and military inter-service relations. The key Norwegian military operating units mostly involved in space activity include the Norwegian Intelligence Service (NIS) and the Norwegian Military Geographic Service (FMGT), which since 2009 has been subordinated to NIS; the Norwegian Cyber Defence Force (CYFOR); the Norwegian Joint Headquarters (NJHQ); and the Norwegian Navy. The study of Norwegian military space activity also reflects upon relations between political and military authorities and their understanding of this activity. Norwegian military space activity has largely been a bottom-up approach, and it is therefore interesting to examine how the activity is understood at the political level. As we shall see, the study indicates that the political establishment have at times been detached from comprehending political implications of national military capability development, and national security aspects of space have generally been poorly understood.

1.3.2.1. Space power doctrines

Examining the Armed Forces' principal ideas, affiliations, ownership, and views on space power constitutes another link to the study of Squadron 333, where Klevberg identified that inter-service rivalry 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?[73] Space power has been derived both from air and sea power analogies,[74] 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 how it should be organized.[75] National security space aspects can also be understood in terms of 'space and the military'[76] and 'space and intelligence',[77] implying that there is a delineation between the two.

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[71] Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk," pp. 5-8.
[72] Ibid., pp. 6, 491-93.
[73] Ibid., pp. 266-306.
[74] Hays, "Space and the military," pp. 151-52; Klein, *Space Warfare: Strategy, Principles and Policy*.
[75] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, p. 55; Russell Rumbaugh, *What place for space: Competing schools of operational thought in space*, The Aerospace Corporation Center for Space Policy and Strategy (Chantilly, Virginia, 2019).
[76] Hays, "Space and the military."
[77] David Christopher Arnold, "Space and intelligence," in *Space and Defense Policy*, ed. Damon Coletta and Frances T. Pilch, Space power and politics (London and New York: Routledge Taylor & Francis Group, 2009).

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.' Lupton identified that principal doctrines governing space forces were neither published nor taught'.[78] According to Hays, Rumbaugh and Gleason in 2020, contemplating Holley's abovementioned definition, the 'inherent links between doctrine and organizations' are 'almost always inextricably woven together'.[79] The space doctrines represent different perspectives on how to organise 'space forces' and what technologies they should focus on.[80]

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.[81]

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 defendable 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.[82]

This study proceeds focusing on Rumbaugh's modern derivatives of Lupton's Sanctuary and Survivability doctrines, including "Frictionless Intelligence" and "Keep the Plumbing Running", circumscribed by an orange square in Figure 88.[83] These doctrines are selected based

[78] Lupton, *On space warfare: A space power doctrine*, p. ix.
[79] 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 (Chantilly, Virginia, 2020), p. 2.
[80] Lupton, *On space warfare: A space power doctrine*; Colin S. Gray, *American Military Space Policy: Information Systems, Weapon Systems, and Arms Control* (Cambridge, Massachusetts: Abt Books, 1982); Hays, Rumbaugh, and Gleason, *Developing a foundational spacepower doctrine: fostering an independent space-minded culture and identity*.
[81] Hays, Rumbaugh, and Gleason, *Developing a foundational spacepower doctrine: fostering an independent space-minded culture and identity*.
[82] Rumbaugh, *What place for space: Competing schools of operational thought in space*, p. 9.
[83] Ibid., pp. 10-14; Hays, Rumbaugh, and Gleason, *Developing a foundational spacepower doctrine: fostering an independent space-minded culture and identity*, pp. 1,3,4; Lupton's Sanctuary and Survivability doctrines are described in: Lupton, *On space warfare: A space power doctrine*, pp. 29-51.

on their applicability to Norway, considering Norway's military activity and capability, which compared to the full-spectrum military capability of the US is very limited. Norway's military ambitions are also much less extensive, and predominantly concerns Norwegian territory and its vicinity. By extension, the study evaluates the relevance of these US doctrines for the nascent space power of Norway. For the purposes of this thesis, these two doctrines are modified and renamed, with "Frictionless Intelligence" corresponding to "Stractic Intelligence" and "Keep the Plumbing Running" corresponding to "Force Enhancement" (see Figure 9). In the history of Norwegian military space activity, ISR is the original and overarching impetus for national space capability development, with Stractic Intelligence as the overarching, unofficial doctrine, and Force Enhancement as the secondary.

Doctrine	Vision of future war	Role of space	Technological preferences	Organizational Affiliation
Force Enhancement	Traditional military units fighting like units	Supporting other parts of the Norwegian Armed Forces	Incremental improvement and availability	Military operating units, predominantly NIS, CYFOR, Navy, NJHQ
Stractic 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	NIS (Army Intelligence Battalion)

Figure 9: Rumbaugh's space doctrines adapted to Norwegian military space activity.

Stractic Intelligence can be understood as fitting into the "space and intelligence" discourse.[84] The corresponding US doctrine has largely focused on supporting senior policymakers with strategic intelligence and is associated with the US Intelligence Community (IC).[85] Another strand emerged following a US Presidential Decision Directive in 1995 that instructed the US IC to support military troops and operations.[86] This corresponds to post-Cold War developments in Norway. Whereas the main function of NIS during the Cold War was strategic warning, the organisation evolved from the 1990s onwards to add intelligence support for the

[84] Arnold, "Space and intelligence."
[85] Rumbaugh, *What place for space: Competing schools of operational thought in space*, p. 13.
[86] Ibid.

Armed Forces in military operations abroad.[87] In the US, the IC accepted the given direction, but continued to prioritise strategic intelligence.[88] As for Norway, NIS were central in developing Norway's first indigenous space capabilities supporting strategic intelligence and space support in the High North.[89] 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.[90] Additionally, the Norwegian Army commands a tactical intelligence battalion.[91] 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.

Force Enhancement corresponds to the legacy term with the same name[92] which constituted a mission area known to 'increase joint force effectiveness…'[93] It encompasses military SATCOM, ISR, PNT, missile warning, and environmental monitoring.[94] 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.[95] Force Enhancement doctrine is understood as part of the "space and the military" discourse[96] 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 at 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.[97] 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.[98]

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[87] Director of the Norwegian Intelligence Service Major General Jan Blom, "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).
[88] Rumbaugh, *What place for space: Competing schools of operational thought in space*, p. 13.
[89] FFI, *Satellittovervåking*.
[90] Forsvarsdepartementet, Evne til forsvar - vilje til beredskap. Langtidsplan for forsvarssektoren, Prop 14 S, p. 107 (www.regjeringen.no: Forsvarsdepartementet, 2020); Friis and Hansen proposed in 2021 that to enhance NIS' function as a strategic intelligence service, one solution could be to organize NIS as an independent agency directly subordinated to the MoD. See: Karsten Friis and Vegard Valther Hansen, "Kronikk: Etterretningstjenestene må reformeres," Feature story, *Dagens Næringsliv* (www.dn.no) 2021.
[91] 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.
[92] Rumbaugh, *What place for space: Competing schools of operational thought in space*, p. 11.
[93] US Joint Chiefs of Staff, Space Operations, Joint Publication 3-14, p. xi (Washington, DC.: US Joint Chiefs of Staff, 2013).
[94] Hays, "Space and the military," pp. 160-69.
[95] Ibid., p. 160.
[96] Ibid.
[97] Rumbaugh, *What place for space: Competing schools of operational thought in space*, p. 10.
[98] Ibid., p. 11.

1.3.2.2. Space and Norwegian military doctrine

In a critical review of Norwegian joint doctrine 2007, Sir Hew Strachan identified a discrepancy between the context in which Norwegian doctrine is developed and the purpose it is meant to serve, i.e. 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 from the US, 'the most committed of the NATO powers to the centrality of war-fighting'.[99] Bjerga and Haaland later observed that 'concepts developed for the use of force of a great power, 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'.[100] With these aspects in mind, this study observes whether there is a detachment between how space is addressed in Norwegian military doctrine and the nation's military space activity.

[99] Hew Strachan, "Norwegian Armed Forces Joint Operational Doctrine," *Norsk Militært Tidsskrift*, no. 4 (2009).
[100] 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).

2. Sources and Methodology

This part of the introductory chapter accounts for the study's methodological approach, including sources and data collection strategy, structure and presentation, limitations, and further research. The study is empirically oriented, primarily based on text-based documents and interviews, which is used to examine the study object based within the given analytical framework.

2.1. Literature

There are three main categories of secondary sources. One is that which has already covered the nexus of Norwegian security policy and military space activity. This bulk of literature is very sparse and principally limited to two primary manuscripts that cover technological and political aspects during the Cold War. It shows that Norwegian military space activity has occurred in two parallel tracks, although there are indications of links between the two through FFI and NIS. Collett's *Making Sense of Space – The History of Norwegian Space Activities*, published in 1995, covers the public aspects of military space activity during this time.[101] The other track entails Norwegian military space activity via NIS and is depicted in Riste and Moland's *Strengt hemmelig. Norsk etterretningstjeneste 1945 – 1970* as part of a historical account of NIS published in 1997. Chapter 11 on *Telemetri: Overvaking av romfart, rakett- og satellittaktivitet* depicts Norwegian collection of intelligence on Soviet space activity.[102] Solem's account in 2012 of Norwegian political reactions in 1983 – 1989 on President' Reagan's Strategic Defense Initiative (SDI) constitutes a backdrop that considers how Norwegian politicians perceived military use of the space domain during this time.[103]

In 2016, von Porat Erichsen and Ødegaard addressed military exploitation of space in a textbook used to educate military officers at the Norwegian Command and Staff College. However, they discussed the subject in general, largely considering NATO doctrine, British white papers, and American literature, but neither situated the subject within a Norwegian context nor considered nation-specific military space activity or how it relates to Norway.[104] This is where this study on Norwegian military space activity provides a unique contribution.

Furthermore, the analytical framework, as we have seen, builds on Dr. Col. Klevberg's *Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk*, which accounts for maritime air surveillance with MPA in the High North.[105] Towards this study's end, attention was brought to Dr. (Col.) Birkeland's account of maritime airborne ISR in the High North, which considers the role of ASW. This can to some extent be seen as an extension of Klevberg's study with a

[101] John Peter Collett et al., *Making Sense of Space. The History of Norwegian Space Activities* (Oslo: Scandinavian University Press, 1995).
[102] Olav Riste and Arnfinn Moland, *"Strengt hemmelig" Norsk etterretningstjeneste 1945 - 1970* (Oslo: Universitetsforlaget, 1997), pp. 259-70; In 1999, Olav Riste published an English translation of the book: Olav Riste, *The Norwegian Intelligence Service 1945-1970* (London: Frank Cass Publishers, 1999).
[103] Aasmund Solem, "Norske reaksjoner på Reagans "stjernekrigs"-program" (Master Universitetet i Oslo, 2012), https://www.duo.uio.no/bitstream/handle/10852/34464/AasmundSolemNorgeSDI.pdf?sequence=2.
[104] Olaf von Porat Erichsen and Geir Ødegaard, "Militær utnyttelse av romdimensjonen," in *Militære fellesoperasjoner - en innføring* (Oslo: Abstrakt forlag AS, 2016), p. 211.
[105] Klevberg, "Maritim luftovervåking i nord: 333 skvadron i norsk sikkerhetspolitikk."

focus on the ISR and ASW functions. Birkeland evaluates the role of satellites as supplements to MPA. It thus overlaps more with this study than Klevberg's, and helps to grasp the concept of ISR.

To situate the topic within a broader context and to understand the notion of space power as it relates to Norway, this study considers existing views on space power based on international literature limited to English writings. This bulk of literature is dominated by American authors who have largely considered the concept from an American point of view. As an increasing number of nation-states have engaged in space activity, non-US authors have gradually added to the discourse. To limit the vast amount of existing literature, it has been a selection criterion to evaluate literature that explicitly discusses space power, or spacepower.[106]

Since this case study is nation-specific, it considers Norway's overall defence and security policy to understand how military space activity fits into this narrative. The relevant period of Norway's defence history until 2000 is covered in *Norsk forsvarshistorie*, book 5 (1970 – 2000).[107] A similar series covers security aspects of Norwegian foreign policy until 1995, where Tamnes' *Oljealder* covers 1965 – 1995.[108] To understand Norway's central bilateral relationship with the US, in addition to that covered by Riste and Moland, Rolf Tamnes' *The United States and the Cold War in the High North* constitutes an important backdrop.[109] *Norsk utenrikspolitisk praksis: Aktører og prosesser* addresses how Norwegian foreign policy is shaped, and the involved actors.[110] *Utenrikspolitikk og norsk krisehåndtering* also provides a framework for contemporary Norwegian foreign and security policy.[111] *Militærstrategi på norsk* provides an understanding of Norwegian military strategy,[112] and *Nytt landskap – nytt forsvar: norsk militærmakt 1990 – 2010* considers the Norwegian Armed Forces and Norwegian military activity and organisation from 1990 until 2010.[113]

2.2. Primary sources

2.2.1. Government documents

Empirical data has been extracted from digitalised Norwegian government documents at www.regjeringen.no, www.stortinget.no, www.forsvaret.no, www.ffi.no, and, to some extent, www.romsenter.no. National space policies issued in 1987, 2013, and 2019 by MTIF and its preceding ministries are consulted to understand Norway's national approach to the space

[106] British English tend to favour space power as two words while American English often writes it as spacepower.
[107] Kjetil Skogrand, *Norsk forsvarshistorie 1940 - 1970: Alliert i krig og fred* (Bergen: Eide forlag, 2004); Jacob Børresen, Gullow Gjeseth, and Rolf Tamnes, *Norsk forsvarshistorie 1970 - 2000: Allianseforsvar i endring* (Bergen: Eide forlag, 2004).
[108] Rolf Tamnes, *Norsk utenrikspolitisk historie 1965-1995: Oljealder* (Oslo: Universitetsforlaget, 1997).
[109] Rolf Tamnes, *The United States and the Cold War in the High North* (Aldershot: Dartmouth Publishing Company Limited, 1991).
[110] Ole Jacob Sending et al., *Norsk utenrikspolitisk praksis: Aktører og prosesser*, ed. Birgitte Kjos Fonn, Iver B. Neumann, and Ole Jacob Sending (Oslo: Cappelen adakemisk forlag, 2006).
[111] Gunnar Fermann et al., *Utenrikspolitikk og norsk krisehåndtering*, vol. 3 (Oslo: Cappelen Damm AS, 2018).
[112] Håkan Edström et al., *Militærstrategi på norsk - en innføring* ed. Håkan Edström and Palle Ydstebø (Oslo: Abstrakt forlag AS, 2011).
[113] Tormod Heier et al., *Nytt landskap - nytt forsvar: Norsk militærmakt 1990-2010* (Oslo: Abstrakt forlag AS, 2011).

domain and how national security space aspects have been addressed. However, the main bulk of primary source documents originates from the MoD, the Norwegian Armed Forces and FFI, and are consulted to trace how space has been addressed from a defence-political and military point of view. Since the late 1980s, Norway's quarterly long-term planning process for the Norwegian defence sector has generated several key documents, including military defence studies, FFI analyses and defence policy white papers, denoted long-term plans (LTP) for the Armed Forces. LTP processes have also generated external material, such as commissioned reports by expert groups.

The publication *Stortingstidende* provides documentation of debates in the Norwegian Parliament and provides valuable insight into how Norway's political establishment has regarded the subject over time.

2.2.2. Archival material

The NIS archive in Oslo granted access to the archival material upon which Riste and Moland based Chapter 11 on space surveillance, missiles, and satellite activity. In the archives at the Norwegian Defence Museum in Oslo, I consulted non-digitalised versions of Norway's primary military journal, *Norsk Militært Tidsskrift* (NMT). This journal has over the years and decades reprinted original speeches presented by military and political executives at Oslo Military Society (*Oslo Militære Samfund*, OMS). OMS is a Norwegian association where Norwegian officers, civil servants and officials meet to discuss security and military affairs, and the organisation publishes NMT, which also contain articles written by military officers. Additionally, Terje Wahl has provided some documentation from his personal archive, predominantly considering FFI's activity when Norway first started to develop indigenous space capability. Coinciding with trips to Washington, D.C., I consulted the Library of Congress, but this did not result in notably relevant discoveries.

2.2.3. Semi-structured interviews

Between 2014 and 2022, I conducted several in-depth interviews and background conversations with authoritative national security space professionals and military-political executives to capture individual thoughts on military space activity, with particular attention to Norway and the High North region. There are 25 in-depth interviews which constitute an essential part of the primary research data underpinning this thesis. The relevance of these individual contributions is tied to the capacity in which they served at the time and the expertise and experience they have accumulated over their years in distinguished service. Of these in-depth interview participants, 16 were Norwegian and held relevant executive positions at the time of the interview. Additionally, the study is based on in-depth interviews with nine foreign nationals who currently or formerly acted as military-political executives or space professionals. These include seven US nationals, one French national, and one German national, where the latter spoke on behalf of ESA. Additionally, many other individuals have contributed with useful background information. An exhaustive list of participants is given in Appendix A.

Participants were selected using judgement sampling, presuming that military-political executives and national security space experts could provide valuable and authoritative contributions to the research. Snowball sampling occurred where participants recommended other, relevant interview objects and provided contact information. I prepared each interview with a set of questions adjusted to the participant's role and nationality. Some of the answers facilitated follow-up questions that were not part of the original set of questions, and most interviews, apart from four, were conducted using audio recordings subsequently transcribed in detail. Most interviews lasted approximately one hour, and on some occasions, participants made themselves available for follow-up questions via e-mail. In addition to in-person interviews, I conducted a few interviews via e-mail and telephone. In addition to the in-depth interviews, several American space professionals were consulted for background conversations at the study's onset.

2.2.4. Observing the space reference group

From February to March 2015, I took part in the military defence study process as a student observer during three reference group roundtable meetings on 3 February, 23 February and 24 March at the MoD's premises in Myntgata 1 in Oslo. The meetings concerned Admiral Bruun-Hanssen's military space strategy review and the MoD's initiative to analyse the Norwegian Armed Forces' use of space to provide a direction for further development. The participants had been summoned by the MoD and the space working group to discuss different points of view on Norwegian military use of space capability and were provided with an agenda and discussion topics by the MoD in advance of each meeting.

Methodologically, these meetings resembled focus group interviews, where the leader of the meeting served as a moderator and was responsible for encouraging participants to speak freely and provide their opinions whilst keeping to the subject. The meetings were effective as they brought together several individuals across the country, predominantly military officers, in the same room. It was organized by the MoD, whereas I merely showed up to observe. The form of the meetings generated discussions on various subjects, which allowed for collecting large amounts of information within a relatively short timeframe. Discussions likely generated new perspectives that otherwise might not have come to the fore. A possible drawback was that participants with dominating personalities were likely more apt to voice their opinions in group meetings, which possibly skewed the discussion.[114] A technical drawback was that the meetings were not recorded, it was not possible to write down all the information by hand, and parts of the sessions were classified. Notes taken therefore provide a non-exhaustive representation.

2.3. Limitations and further research

This is an unclassified study of Norwegian military space activity, and its principal limitation is that a sizeable share of this activity takes place within closed environments subjected to the Norwegian National Security Act (*Sikkerhetsloven*). A holistic presentation of Norwegian military space activity can only be produced and published within such a closed environment.

[114] Bruce L. Berg, *Qualitative Research Methods for the Social Sciences* (Boston: Allyn & Bacon, 2009), pp. 158-66.

According to the National Security Act, classified data is generally declassified after 30 years unless otherwise decided, which means that the earliest post-Cold War empirical data might now become available, posing an interesting basis for further research. This includes empirical data related to aspects defined out of scope for this study, including MFA activity and international space security.

Thematically, this study addresses Norwegian military space activity, where space power is understood as a concept that relates to national security objectives and the military dimension. Norwegian military space activity predominantly entails ISR, SATCOM, PNT, and SDA. This study focuses on space-based ISR and SATCOM, predominantly covering the maritime domain and the High North. Norway's military SDA capability differs as it observes space from the ground up, as opposed to satellites, which observes Earth from space. SDA capability is central to the notion of space control, and the related national activity could for example be examined using Rumbaugh's Space Control First doctrine.

Space-based PNT has been discussed to a much lesser extent than ISR and SATCOM in public defence policy planning, likely because it not an option for Norway to singlehandedly develop a space-based global navigation satellite system (GNSS). Navigation warfare concepts developed under the auspices of the Navy are largely classified, and these aspects play into Force Enhancement doctrine. Another aspect is the use of missile technology, which Norway develops, produces, and exports. Although this study touches upon aspects of how space-based capabilities are used in weapons technology, the role of missiles and space is generally not considered. As an alternative, one could examine how other US space doctrines, such as Rumbaugh's "Enable Global Missile War", could be adopted to provide a more holistic picture of Norwegian military space activity.

The study has identified that there is a detachment between the political level and military bureaucracy, which should be further explored. There are indications that there are also differences within the MoD, where different departments have different interests and orientations or perspectives on Norwegian defence and space policy. For example, Division II is largely concerned with the transatlantic perspective, whereas the long-term planning division IV is more explorative, and the industrial development division (VI) focuses more on the European pillar.

Individuals involved in defence planning processes prior to 2014 have, with a few exceptions, not been interviewed. Interviewing a larger selection of former military executives would have provided more insight into the reasoning behind decision making processes during the time when Norway first started developing indigenous space-based capability. It would, for example, have been of great interest to examine more deeply the decision-making process leading up to General Frisvold's decision to terminate FFI's military satellite project, NSAT, in 2003.

This study does not evaluate Norwegian military space activity considering space *security*, which like the associated SDA capability focuses on the space domain itself and aspects related to international security as opposed to military use of space. This pertains to the threat landscape, including counter-space capabilities and issues such as space debris. Thus, further research could focus on the MFA and its role in international space security affairs; i.e. through

the Conference of Disarmament, other United Nations (UN) forums, and export control regimes.

Since this study is limited to the evaluation of writings in English and Norwegian, it is limited in the sense that it only reflects a Western-oriented view on space power. Studies that focus on the threat landscape should obviously examine sources written in other languages, such as Russian, Chinese, Persian, and Korean.

Towards the end of 2022, the small state of Norway is at the verge of becoming a considerable space power in terms of capability. An obvious topic for further research is to follow the continuation of Norwegian military space activity, especially how Norway's newfound military space authority, NIS, manages its dual-hatted space mission. Further attention should be given to space collaboration within NORDEFCO, and how Norway is able to capitalise militarily and geopolitically on key national space assets, including Highly Elliptical Orbit (HEO) SATCOM, maritime ISR, and Andøya spaceport.

Will Norway continue to rise towards the pyramidion of the "Space Club"?

Part I: Norway and the Second Space Age

Late 1970s – 2014

The formative years of contemporary Norwegian military space activity

Late 1970 – 2000

1.1. Introduction

In the early 1990s, the collapse of the Soviet Union brought about ambiguity and a new world order. Russia was still a great power, but vulnerable and in economic crisis, with unclear boundaries and governance.[115] 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 became an 'organization for collective security'.[116] By the end of the century, Norway became a strategic energy supplier of oil and gas to Europe, and Norway's Minister of Defence Dag Jostein Fjærvoll anticipated that Norway had to strengthen its relations with allies to secure and protect petroleum installations.[117] Chief of the High Command's LTP division Brig. Gen. Sverre Diesen (Army) envisioned the changing character of the military threat, which had once been represented by mechanised divisions rolling into Norway from the east. Now, 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.[118]

To compensate for its deteriorating economic situation and diminishing conventional defence structure, Russia throughout the 1990s strengthened its Kola Bay-based strategic naval forces in the vicinity of Norway.[119] Norway's Chief of Defence 1989 – 1994 Admiral Torolf Rein 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'.[120] 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 from arms control or inspection arrangements.[121]

During the same time, the 1990 – 1991 Gulf War demonstrated contemporary technological advancements, and the globally televised war demonstrated US effect-based operations (EBO) and disruptive capabilities such as Global Positioning System (GPS)-aided precision strikes.[122] Operation Desert Storm was even deemed to be the first 'space war' based on its extensive

[115] 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 (Oslo: Cappelen akadamisk forlag, 2006).
[116] Ibid.
[117] Dag Jostein Fjærvoll, "Forsvarets utfordringer inn i år 2000," Expert commentary, *Norsk Militært Tidsskrift*, no. 2 (1998).
[118] Sverre Diesen, "Forsvarsstudie 2000," Expert commentary, *Norsk Militært Tidsskrift*, no. 12 (1999).
[119] Fjærvoll, "Forsvarets utfordringer inn i år 2000."
[120] Torolf Rein, "Norges forsvar i 1990-årene," *Norsk Militært Tidsskrift*, no. 11 (1990).
[121] Forsvaret, Forsvarsstudien 1991, p. 8 (Oslo: Forsvarssjefen, 1992).
[122] Kevin Pollpeter and Jonathan Ray, "The Conceptual Evolution of China's Military Space Operations and Strategy," in *China's Evolving Military Strategy*, ed. Joe McReynolds (Washington, DC.: The Jamestown Foundation, 2016).

satellite usage.[123] The Gulf War, along with the discontinuation of the Soviet Union was said to mark the beginning of '[t]he second space age' – an era characterized by the rise of globalisation and increased transparency enabled by satellite technology.[124] New concepts such as the Revolution of Military Affairs (RMA) emerged, and space capability or 'spacepower' was postulated to be its key enabler.[125] Force enhancing use of satellites would motivate adversaries to counter space-based assets, and commercially available technologies could detect, identify, and track low-Earth orbit satellites, which could no longer operate covertly.[126] These circumstances spurred a new, multinational space race, where China and European nation-states, particularly France, expanded their national space programs substantially.[127] In 1998, France became the first European country to use satellites in a tactical capacity during the Kosovo war.[128]

As geopolitical interest and attention towards the High North decreased during the 1990s, Norway focused its military efforts on international operations outside Norway's borders,[129] as far away as the Balkans, Lebanon, Iraq, and Somalia.[130] In 1999, Norway's Chief of Defence 1999 – 2005 General Sigurd Frisvold expressed his scepticism to RMA and the military implications of technological advancement, arguing that modern conflicts such as in Somalia and Kosovo demonstrated that technological superiority did not necessarily equate to superior military advantage.[131]

Yet, several nation-states developed indigenous space capabilities and dedicated military space systems in the name of national security, sovereignty, and autonomy,[132] and even the nascent space power of Norway started planning for its first military surveillance satellite.[133] Throughout the 1990s, satellite Synthetic Aperture Radar (SAR) imagery proved to be valuable for the Norwegian Coast Guard and for planning of maritime patrol aircraft (MPA) Orion expeditions.[134] Thus, despite the 1990s austere defence budgets, FFI in 1998 initiated a feasibility study to develop a national military surveillance satellite in cooperation with Norwegian industry. The satellite was to carry a passive radar instrument and was estimated to weigh no more than 50 kg and went through the project planning phases from 1998 until 2003.[135] This national military surveillance satellite project was considered during General

[123] Peter Anson and Dennis Cummings, "The first space war: the contribution of satellites to the Gulf War," *the RUSI Journal* 136, no. 4 (1991).
[124] Peter L. Hays and Charles D. Lutes, "Towards a theory of spacepower," *Space Policy* 23 (2007).
[125] Gray, *Modern Strategy*, p. 13.
[126] Allen Thomson, "Satellite vulnerability: a post-Cold War issue?," Research article, *Space Policy*, no. February 1995 (February 1995).
[127] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, p. 21.
[128] 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.
[129] Fjærvoll, "Forsvarets utfordringer inn i år 2000."; Forsvarsdepartementet, St.meld. nr. 38 (1998-99) Tilpasning av Forsvaret til deltagelse i internasjonale operasjoner, (Regjeringen, 1999).
[130] Forvarsmuseet, *INTOPS: Norske soldater, internasjonale operasjoner*, ed. Dag Leraand (Oslo: Forsvarsmuseet, 2012).
[131] Sigurd Frisvold, "Hovedutfordringer for Forsvaret ved årtusenskiftet," Expert commentary, *Norsk Militært Tidsskrift*, no. 11 (1999).
[132] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, p. 21.
[133] Ibid.
[134] Richard B. Olsen, "Norske mikrosatellitter," *Luftled*, no. 1 (April 2019).
[135] FFI, *Satellittovervåking*, pp. 28-29.

Frisvold's Defence Study 2003,[136] 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.

1.2. Norway and the WEU

Important factors in Norwegian space capability development was the country's relations with the Western European Union (WEU) and the 1992 establishment of the WEU Satellite Centre in Terreón de Ardoz near Madrid in Spain.[137] The WEU's plans for enhanced surveillance satellite cooperation was also noted by the 1991 Defence Commission with respect to Norwegian strategic surveillance.[138] 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).[139]

FFI's Johansen had in 1989 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 9"[140] 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 program, which covered technological developments of significant interest to Norway, was approved by the participants in 1990. Wahl inherited the chairmanship of CEPA 9 after Johansen in 1998 and headed the development of data processing and satellite ground station technology. Certain projects, some of them funded by the Norwegian MoD, covered developments of critical technology throughout the entire satellite-based surveillance system chain.[141]

In February 1993, Norway's military representative to the WEU, Lt. Gen. Hjalmar Sunde, stated before OMS 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.[142] Sunde might not have been fully informed, since Norway though FFI at this point had a certain foothold within the WEU satellite centre. Overall, FFI and NIS came to consider this participation essential for their ability to further develop the use of surveillance satellites for Norwegian military purposes.[143]

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[136] Forsvaret, Forsvarssjefens Militærfaglige Utredning 2003, pp. 12-13 (Oslo: Forsvaret, 2003).
[137] FFI, *Satellittovervåking*, p. 21.
[138] Forsvarskommisjonen, (Forsvarskommisjonen av 1990), NOU 1992:12, pp. 129-30 (Oslo: Statens Forvaltningstjeneste (Seksjon Statens Trykning), 1992).
[139] 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.
[140] FFI, *Satellittovervåking*, p. 21.
[141] Ibid.
[142] Hjalmar I. Sunde, "Den Vesteuropeiske Union og NATO - Samarbeidspartnere eller konkurrenter i fremtidens Europa," *Norsk Militært Tidsskrift*, no. 3 (1993).
[143] FFI, *Satellittovervåking*.

When Norway became a WEU associated member following the November 1995 Rome Agreement, this entailed various rights and duties, such as full participation in the WEU Council meetings, working groups and sub-groups, where Norway had 'the right to speak'. However, Norway could not block a proposal that required consensus amongst WEU member states.[144] As an associate member, Norway formally joined the European satellite partnership. The MoD appointed FFI and NIS to represent Norway and ensure that associated 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 IMINT. Norway also joined the overall policy group, the 'WEU Space Group'.[145]

Not being a full WEU member soon 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.[146] 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'[147] The trilateral satellite alliance limited access to WEU member countries under strict conditions, leaving Norway without direct access to the data;[148] there was a separate restricted room at WEUSC for analysis of Helios images.[149] In retrospect, Commander of the French Joint Space Command, Brig. Gen. Testé observed that Helios had much better resolution than the 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.[150]

In October 1994, FFI director Nils Holme stated that a future Norwegian membership in 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.[151] However, in late November the same year, Norway voted "No" in the Referendum to join the European Union (EU).[152] WEU later failed to establish a European military radar satellite system, and the satellite centre was eventually transferred to the EU in 2001, which would not bode well for the non-EU member of Norway.[153]

[144] Sunde, "Den Vesteuropeiske Union og NATO - Samarbeidspartnere eller konkurrenter i fremtidens Europa."
[145] FFI, *Satellittovervåking*, p. 30.
[146] Ibid.
[147] Kjell Grandhagen, "Helios 1A - Frankrikes første spionsatellitt," *Norsk Militært Tidsskrift*, no. 1 (1996).
[148] FFI, *Satellittovervåking*.
[149] Wahl, interview.
[150] Testé, interview.
[151] Nils Holme, "Problemstillinger i norsk forsvarsforskning," *Norsk Militært Tidsskrift* 1995, no. 3 (1995).
[152] "Norges nei til EU i 1994," UiO, 2015, accessed 03 December, 2021, https://www.norgeshistorie.no/oljealder-og-overflod/1946-norges-nei-til-eu-i-1994.html.
[153] FFI, *Satellittovervåking*, p. 31.

1.3. National space policy, infrastructure, and regulations

Throughout the Cold War and 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 Foundation and the US defence establishment had served as key enablers for Norway to develop national space infrastructure.[154] 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 a main impetus for its relationship with the Americans, but Norway's geographical location.[155]

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 would likely not 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 military side, including the development of sensors and the processing of large amounts of data.[156] National security implications of SEASAT were underlined by the fact that a joint committee in the US, composed by members from the National Aeronautics and Space Administration (NASA), the Pentagon, the National Reconnaissance Office (NRO), and the Central Intelligence Agency (CIA), was assembled to uncover 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 submarine-launched ballistic missile (SLBM) targeting capability.[157]

By the end of the 1980s, Norway through the Ministry of Industry issued its first national space policy, which was heavily focused on industrial development through European collaboration.[158] 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 European countries.[159] The policy's primary objective was to address organisational issues related to Norway's membership in ESA.[160] When Norway became a full ESA member from January 1987, it was within a context which Europe, especially France, regarded national and European space development as necessary for political and economic endurance in relation to the US.[161]

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[154] John Peter Collett, "Epilogue," in *Making Sense of Space: The History of Norwegian Space Activities*, ed. John Peter Collett (Oslo: Scandinavian University Press, 1995), pp. 293-94.
[155] Bingen, *Det nære verdensroms strategiske dimensjoner*, p. 7.
[156] Finn Lied et al., Satellittfjernmåling, NOU 1983: 24, pp. 35-36 (Oslo: Universitetsforlaget, 1983); James E. David, *Spies and Shuttles: NASA's Secret Relationship with the DoD and CIA* (Florida: University Press of Florida, 2015), pp. 260-67.
[157] David, *Spies and Shuttles: NASA's Secret Relationship with the DoD and CIA*, pp. 260-67.
[158] Industridepartementet, Norsk romvirksomhet, (Oslo: Universitetsforlaget A/S, 1986); Industridepartementet, Om norsk romvirksomhet, St. meld. nr. 13 (1986-87) (Oslo: Industridepartementet, 1986).
[159] Industridepartementet, *Norsk romvirksomhet*, pp. 39, 41.
[160] Drude Berntsen et al., Norsk Romvirksomhet, NOU 1986:1 (Oslo: Universitetsforlaget A/S, 1986).
[161] Collett, "Epilogue," pp. 293-94.

In March 1987, Norwegian parliamentarian debates leading up to approval of Norway's first national space policy indicates that elected members of Norway's national assembly harboured ideas like those identified by Lupton within the US national security community in the 1980s.[162] Several Norwegian elects strived to maintain the notion of space as a peaceful sanctuary, at least considering *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 the actual capability development taking place within FFI and the Armed Forces. This was especially true for left-wing or socialist parties such as the Labour and Socialist Left parties, whereas the non-socialist or conservative parties such as the Conservative and Christian Democratic parties were more pragmatic. Labour Party representative Brørby Larsen, for example, stated that Norwegian space policy was 'only related to civilian space exploitation' and emphasized that ESA was 'an organization whose sole purpose is to promote peaceful cooperation between European states in science and applied space research and space technology'.[163] Bohlin, also representing the Labour Party, expressed that: 'I do not think it can be emphasized strongly enough and often enough that the space cooperation we are now embarking on only has peaceful purposes' and that: '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.'[164] Kristiansen's views indicated 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.[165] Socialist Left Party representative Haug expressed her 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 program'.[166]

Conservative Party representative Thomassen, who in 1985 signed the agreement committing Norway to full ESA membership,[167] 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 at the

[162] Lupton, *On space warfare: A space power doctrine*, pp. 29-37.
[163] Stortingstidende, 131. ordentlige Stortings forhandlinger 1986 - 1987, p. 2578 (Stortinget, 1987).
[164] Ibid., pp. 2581-82.
[165] Ibid., p. 2588.
[166] Ibid., p. 2587.
[167] John Krige, *Fifty years of European cooperation in space - building on its past, ESA shapes the future* (Paris: Beauchesne Editeur, 2014), p. 436.

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'.[168]

Towards the discussion's end, Conservative Party representative Foss 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 Great Britain, the distinction between military and civilian elements were far less 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 for 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'.[169]

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 contact point towards ESA.[170] NOSA was organized under the Ministry of Industry and focused on space as a platform to develop high technology industry through ESA's industrial return policy.[171] The Armed Forces and other 'large user agencies' were advised to ensure their own participation in international space programs and national investments in space applications.[172] And whilst it was initially proposed to earmark one seat at NOSA's board for the Norwegian rescue service or the Coast Guard,[173] this was overruled by the Energy and Industry Committee, who wanted the board to be composed of five individuals chosen by the Ministry of Industry to ensure a 'dynamic organization' where 'the many actors and national interests' would not cause a 'paralysis' of the national space organisation.[174]

The space policy also established Tromsø Satellite Station (TSS) as a private foundation.[175] In the late 1980s and 1990s, Tromsø satellite station was considerably upgraded to accommodate an agreement with the Canadian RADARSAT in 1995.[176] The station was important to the Armed Forces, which could not use facilities at Svalbard due to the non-armament Svalbard Treaty. To develop Tromsø satellite station to serve the Armed Forces, FFI contributed extensively to plan and develop the satellite station through various councils and working groups administered by NOSA.[177] The rocket range at Andøya was subject to similar

[168] Stortingstidende, *131. ordentlige Stortings forhandlinger 1986 - 1987*, pp. 2585-86.
[169] Ibid., p. 2594.
[170] Industridepartementet, *Om norsk romvirksomhet*, p. 55.
[171] Ibid., pp. 50, 56.
[172] Ibid.
[173] Ibid., p. 55.
[174] Energi- og industrikomiteen, Innstilling fra energi- og industrikomiteen om norsk romvirksomhet (St. meld. nr. 13), Innst. S. nr. 102. (1986-87), p. 5 (Oslo: Stortinget, 1987).
[175] Industridepartementet, *Om norsk romvirksomhet*, pp. 50, 56.
[176] Ole Anders Røberg and John Peter Collett, *Norwegian Space Activities 1858 - 2003*, ESA Publications Division (Noordwijk, 2004), p. 48.
[177] FFI, *Satellittovervåking*, pp. 8, 20.

changes,[178] although Norway's most significant space infrastructure investment in the 1990s was the establishment of a satellite station, Svalsat, at 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'.[179]

This led Norway to evaluate ramifications of military satellite activity in relation to the Svalbard Treaty.[180] In 1999, Norway passed a new law regarding the regulation of establishment, operation, and the use of satellite ground stations and associated frequencies.[181] FFI beforehand conducted a classified study considering the Svalbard Treaty in light of the construction and operation of Svalbard satellite station.[182] 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 use of ground stations and satellite data read to ground stations at Svalbard for 'war purposes'. It prohibited any actors from performing satellite data processing specifically intended for 'military purposes', 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 at Svalbard. In fact, the law dedicated its Chapter 3 to: 'Special rules on the use of 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 law also ensured that the station would be open for inspection 'with reasonable notice time',[183] as had been the case with the Kongsfjord satellite station in the late 1960s.[184] As we shall later see, the 1999 law caused considerable interpretational issues with respect to terms such as 'military purposes', and Norway would, after substantial scrutiny, pass a new law in 2017.[185]

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[178] Røberg and Collett, *Norwegian Space Activities 1858 - 2003*, p. 47; In January 1995, rocket activity at 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 (London: Praeger, 1999).

[179] Røberg and Collett, *Norwegian Space Activities 1858 - 2003*, p. 48.

[180] "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.

[181] "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.

[182] 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).

[183] Lovdata, "Forskrift om etablering, drift og bruk av jordstasjon for satellitt."

[184] Olav Riste, *The Norwegian Intelligence Service 1945-1970*, ed. Christopher Andrew et al., Studies in intelligence, (London: Frank Cass Publishers, 1999), p. 223.

[185] Kommunal- og moderniseringsdepartementet, "Forskrift om etablering, drift og bruk av jordstasjon for satellitt på Svalbard," (www.lovdata.no: Lovdata, 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," (www.lovdata.no: Lovdata, 2017). https://lovdata.no/dokument/SF/forskrift/2017-04-21-492?q=Jordstasjon.

1.4. 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.[186] 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.[187] 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.[188] SATCOM conditions were demanding in the High North, since most communication satellites were geostationary, thus provided poor coverage at northern latitudes.[189] And 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.[190]

Whilst SATCOM was predominantly handled through NATO and was a well-established and commercialized capability by the 1990s,[191] satellite surveillance capabilities were at this point starting to proliferate.[192] 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 throughout the 1990s made it even more important to command national sovereignty over these areas.[193] Norway added a 200 nautical mile fishing zone around Jan Mayen Island and a fish protection zone around the Svalbard archipelago; the domestic responsibility of commanding authority over these vast areas were 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 Bay-based post-Soviet Northern Fleet,[194] which continues to be a concern for Norway and its allies into present day.[195]

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

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

[188] Erik Sletengen, "Satellittkommunikasjon," *Luftled*, no. 1 (2019).

[189] Stig Nilsson, Birkeland, John Olav and John Olav Birkeland, "Høye ambisjoner og en god plan," Expert commentary, *Luftled*, no. 1 (April 2019).

[190] Wahl, interview.

[191] Ibid.

[192] FFI, *Satellittovervåking*, p. 8.

[193] Holme, "Problemstillinger i norsk forsvarsforskning."

[194] FFI, *Satellittovervåking*, pp. 4, 18-20.

[195] Forsvarsdepartementet, *Prioriterte endringer, status og tiltak i forsvarssektoren*; Birkeland, "Maritime airborne intelligence, surveillance and reconnaissance in the High North," pp. 195-98.

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 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.[196] 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% in the early 1990s as the Americans redirected their GPS satellites to improve coverage in the Gulf. On board this submarine was a future Admiral and Norwegian Chief of Defence, 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.'[197]

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 considering 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 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.[198] 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'.[199] 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 dark and poor visibility weather conditions 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.[200]

The autonomous Tomahawk cruise-missiles used towards Baghdad during the Gulf War was a specific example, capable of destroying pre-selected targets from distances up to 1200 kilometres with high precision. The missile's 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 missile's precision. Battle damage assessment using aircraft, military

[196] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, p. 15.
[197] 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.
[198] Forsvarskommisjonen, *(Forsvarskommisjonen av 1990)*, pp. 129-30.
[199] Ibid., p. 130.
[200] Ibid.

satellites or on-site reconnaissance had confirmed precision strikes down to one metre or less.[201] 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. FFI estimated that development and production of one hundred 'low cost' cruise missiles with a range of about 500 kilometres could probably be carried out within a budget of 2-3 billion NOK, 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 to Norway and the Armed Forces. It would thus be important to keep track of the 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.[202]

1.4.1. 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 command and control of Norway's own forces.[203] 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'.[204]

Considering 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 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 with lower resolution than military imagery satellites. The

[201] Holme, "Problemstillinger i norsk forsvarsforskning."
[202] Ibid.
[203] Forsvarskommisjonen, *(Forsvarskommisjonen av 1990)*, p. 129.
[204] Forsvaret, *Forsvarsstudien 1991*, pp. 4-5.

commission also noted that it could take a long time from Norway ordering imagery of an area to the time when that imagery became available.[205]

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.[206] The development of civilian satellites with optical sensors, such as the American Landsat and French Spot systems had by the late 1980s developed to the 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.[207]

'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.[208]

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 the political demand 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*).[209]

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,

[205] Forsvarskommisjonen, *(Forsvarskommisjonen av 1990)*, pp. 129-30.
[206] Ibid.
[207] FFI, *Satellittovervåking*, pp. 18-19.
[208] Forsvarskommisjonen, *(Forsvarskommisjonen av 1990)*, p. 131.
[209] Forsvaret, *Forsvarsstudien 1991*, pp. 23, 30.

and would eventually transform national military strategies.[210] 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 both for the ability to verify disarmament and armament control agreements and for the ability to provide strategic warning of military force building.[211]

Addressing the Armed Forces' war-time structure, the MoD in 1993 implemented satellite surveillance capability into the LTP as a 'new investment' for the Navy.[212] This likely entailed the construction of a military satellite station for satellite data downlink and processing. The Armed Forces planned to establish a station, FEOS, with a complete download chain with SAR processing and interpretation for military purposes once the services were fully operational. In a first phase, the Armed Forces expected to build up the interpretation element and use RADARSAT images from Tromsø satellites station for at least two years. However, before FEOS would establish 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.[213]

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 minefelt	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 10: Planned war-time force structure for the Navy in 2000.[214]

[210] Forsvarsdepartementet, Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98, St. meld. nr. 16 (1992-93) p. 71 (Oslo: Stortinget, 1993).
[211] Ibid.
[212] Ibid., p. 92.
[213] FFI and Norsk Romsenter, Intensjonsavtale mellom FFI og Norsk Romsenter om samarbeide, nedlesing og leveranse av jordobservasjonsdata fra radarsatellitter, (1994).
[214] Forsvarsdepartementet, *Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1994-98*, p. 92.

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.[215] 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.[216]

Considering the Armed Forces' peace-time structure, satellite capability was addressed not under the Navy, but as a possible capability for 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.[217]

The 1990s second defence planning process treated space much less extensively than the first. The 1996 Defence Study under Norway's Chief of Defence 1994 – 1999 General Arne Solli (Army) did not mention space or space capability at all.[218] 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'.[219]

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 other 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 get 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 of Norwegian and adjacent maritime domains.[220] On the same day as the MoD published the 1998 LTP, the Armed Forces allocated 2.6 million NOK for operative use of RADARSAT in the Barents Sea,[221] constituting approximately 0.01 percent of the overall defence budget for 1998 of 23.8 billion NOK.[222]

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[215] Ibid.
[216] Ibid., p. 92.
[217] Ibid.
[218] Forsvarssjefen, *Forsvarssjefens grunnsyn for utvikling og bruk av norske militære styrker i fred, krise og krig*, Forsvarets Overkommando (Oslo, 1995); Forsvarssjefen, Forsvarsstudien 1996, (Oslo: Forsvarets Overkommando, 1996).
[219] Arne Solli, "Forsvaret 1996: Status og utfordringer," *Norsk Militært Tidsskrift*, no. 11 (1996).
[220] Forsvarsdepartementet, Hovedretningslinjer for Forsvarets virksomhet og utvikling i tiden 1999-2002, St.meld. nr. 22 (1997-98) (Oslo: Stortinget, 1998).
[221] Wahl, interview.
[222] Finans- og tolldepartementet, Den kongelige proposisjon om statsbudsjettet medregnet folketrygden for budsjetterminen 1. januar - 31. desember 1998. , St prp nr 1 (1997-98), p. 53 (https://www.regjeringen.no: Regjeringen, 1997).

1.4.2. Military space activity and capability development

Norway's military space activities during the 1990s appear highly extemporary, with 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.[223] The Armed Forces did not have a dedicated structure to manage space activities, but 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 its existing services and bureaucracy, depending on whom it concerned.[224] 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 NIS, FMGT and the Naval Operations Centre (*Sjøops*).[225]

In March 1991, Director of FFI 1983 – 1993 Erik Klippenberg stated that FFI had been a 'driving force' in the Ministry of Industry's development of Tromsø satellite station. FFI had developed a computer, CESAR, that Norsk Data were installing at the station. When the ESA ERS-1 (European Remote-Sensing Satellite-1) would be launched in May 1991, Norway would be able to download light-and weather- independent Earth observation data providing coverage in the entire area as showed in Figure 11. Klippenberg anticipated that this capability should become an important factor in a future European collaboration on using surveillance satellites for verification and crisis control.[226]

[223] FFI, *Satellittovervåking*; Henry Kjell Johansen, "Telephone interview with Henry Kjell Johansen, former Research Director at FFI, 22 March 2016. [In Norwegian]," (2016).
[224] FFI, *Satellittovervåking*.
[225] Ibid.
[226] Erik Klippenberg, "FFI's rolle i årene fremover," *Norsk Militært Tidsskrift*, no. 7 (1991).

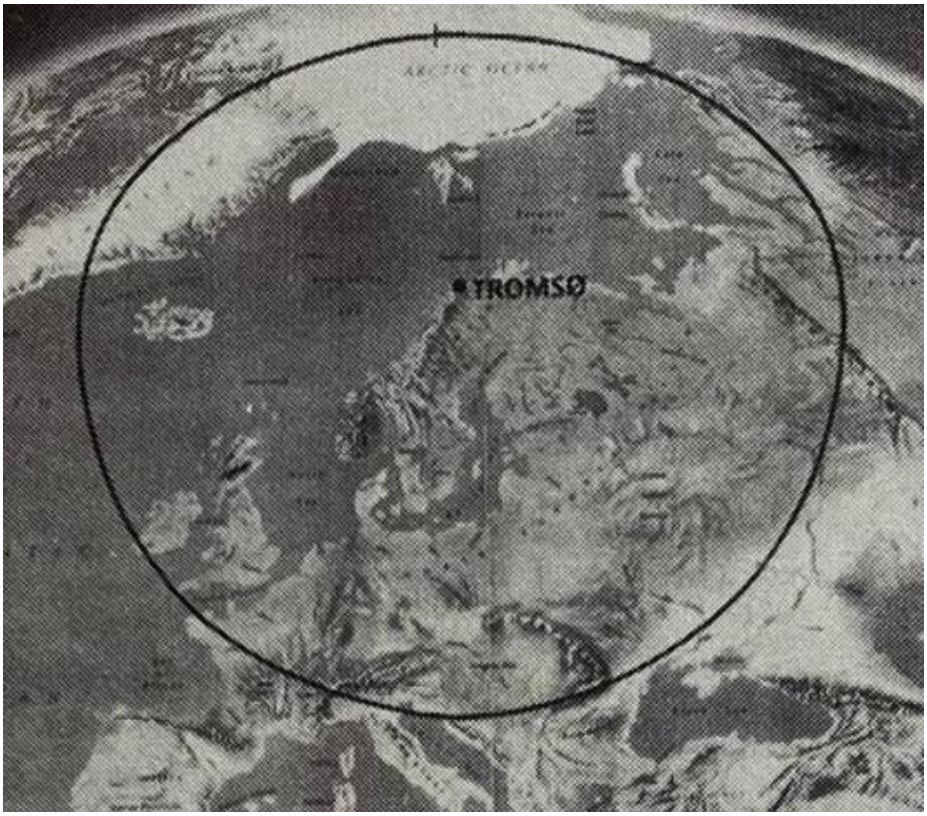


Figure 11: Estimated ERS-1 coverage area for Tromsø satellite station in 1991.[227]

To process the satellite radar data, Norway developed multiprocessor computers CESAR and SCALI that were installed at Tromsø satellite station for near-real-time processing of satellite data. 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, FFI's studies concluded that polar radar satellites operating jointly with vessels and aircraft could be a promising concept for Norway.[228]

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.[229] In the early 1980s, activities were already underway related to CESAR to make SAR processing faster, and FFI examined issues related to coverage, interpretation and the physical understanding of what radar satellites could observe.[230] The Armed Forces financed development costs through 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

[227] The image is a photocopy of the image printed on page 2 in Norsk Militært Tidsskrift no. 7 in 1991, which is a reprint of Klippenberg's speech in OMS on 4 March 1991. See: ibid.
[228] FFI, *Satellittovervåking*, pp. 8, 17.
[229] Ibid., pp. 8, 17, 23.
[230] Wahl, interview.

Tromsø satellite station to a military operations centre, where satellite data could be further analysed in conjunction with data from other surveillance capabilities.[231]

ERS-1 launched in July 1991 and Tromsø satellite station became operational that autumn and started to receive near real-time data from the station. In mid-August 1991, ERS-1 pictures generated by the CESAR computer appeared on-screen at FFI, so the station primarily transmitted images, as opposed to raw data.[232] The data downlinked at Tromsø was transmitted via Intelsat or Earthbound infrastructure to its first users, including 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.[233]

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 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 were at least on par with that of other states.[234] NIS and 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 currently had some access to military imaging satellites using Norwegian ground stations through collaborating partners in the US and NATO.[235]

FFI's close collaboration with NIS and FMGT stimulated the development of high-quality SAR imagery, which helped Norway prove itself valuable to international partners.[236] FFI also established close relations with the Naval Operations Centre (*Sjøops*) at the Northern-Norway Defence Command's (FKN) near Bodø.[237] 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.[238] SJØOPS became increasingly involved in military satellite surveillance activities at 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.[239]

This effort was largely handled by key individuals at FFI and within the aforementioned military organisations.[240] As for Tromsø satellite station, FFI's Henry Kjell Johansen worked very closely with NOSA, and military capability development at this station was principally

[231] FFI, *Satellittovervåking*, pp. 8, 17, 23.
[232] Wahl, interview.
[233] FFI, *Satellittovervåking*, p. 20.
[234] Holme, "Problemstillinger i norsk forsvarsforskning."
[235] FFI, *Satellittovervåking*, pp. 18-21.
[236] Ibid.
[237] Ibid.
[238] "Forsvarskommando Nord-Norge," Store norske leksikon, 2017, accessed December, 2021, https://snl.no/Forsvarskommando_Nord-Norge.
[239] FFI, *Satellittovervåking*, pp. 18-21.
[240] Ibid.

funded through civilian channels,[241] as opposed to satellite surveillance projects at FFI, which were largely funded by the MoD.[242] Johansen and FFI established an agreement between 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 Soviet Union's dissolution in 1991.[243]

To handle the budding satellite operations, FFI established a satellite surveillance laboratory at 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 FFI, resulting in image interpretation within two hours after satellite passage over Tromsø.[244] The data was further handled by an 'intelligence system' developed by 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.[245]

FFI also exchanged data and information with the United Kingdom (UK) Defence Research Agency and collaborated on collecting data during NATO naval exercises.[246] FFI's near-real-time system for ERS and RADARSAT also opened doors with other US-based partners, such as a negotiated collaboration agreement with the US Navy's Naval Research Lab (NRL). 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.[247]

Norway's focus on satellite surveillance was reaffirmed by Director of FFI 1993 – 2001 Nils Holme in an address to 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.[248] Satellite surveillance

[241] Johansen, "Telephone interview with Henry Kjell Johansen, former Research Director at FFI, 22 March 2016. [In Norwegian]."
[242] Wahl, interview.
[243] Johansen, "Telephone interview with Henry Kjell Johansen, former Research Director at FFI, 22 March 2016. [In Norwegian]."
[244] FFI, *Satellittovervåking*, p. 23.
[245] Johansen, "Telephone interview with Henry Kjell Johansen, former Research Director at FFI, 22 March 2016. [In Norwegian]."
[246] Terje Wahl and Åge Skøelv, "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).
[247] FFI, *Satellittovervåking*, pp. 18-21.
[248] Holme, "Problemstillinger i norsk forsvarsforskning."

was now one of 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.[249] 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 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 requirements of clear weather and sun light.[250]

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. Currently, 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 aircrafts and vessels. 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 would also be 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. FFI also developed other applications, including oil spill detection, statistics on sea waves and ice, and terrain characterisation.[251]

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 1:25000 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 much more extensive reconnaissance covering much larger areas, and the availability of civilian satellites under such circumstances might be uncertain.[252]

At their laboratory, FFI analysed more than a thousand ERS-1 SAR images and compared it with information from coastal radars and port offices. This gradually led FFI to determine that ERS-1 was excellent for detecting oil spills and larger warships, but it was not well suited for

[249] In 1991, the Financial Times exposed that Iraq bought 'high-definition satellite photographs of Kuwait and Saudi Arabia from a French company specializing in photoreconnaissance three montsh three months before the August 2 invasion.' See: Lionel Barber, "Iraq bought satellite piectures of Kuwait," *Financial Times* 1991.
[250] Holme, "Problemstillinger i norsk forsvarsforskning."
[251] Ibid.
[252] Ibid.

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 FFI to the naval operations centre at Reitan via fax machine, demonstrating that radar satellites could provide useful information in a naval invasion scenario.[253]

In 1995, 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 a military Interpretation Centre co-located with Defence Station Fauske (*Forsvarets stasjon Fauske*)[254] to interpret and assess radar satellite images and forward products to Reitan.[255] Tromsø satellite station 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.[256]

In August 1996, FFI received its first RADARSAT-1 image, which attracted considerable attention as the imagery showed vessels located along the border lines to the Svalbard zone and the EEZ. Figure 12 shows the first image after post-processing at FFI, exposing foreign fishing vessels fishing in "The Loophole" (*Smutthullet*) in the Barents Sea.[257]

[253] FFI, *Satellittovervåking*, p. 23.
[254] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*.
[255] 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*, pp. 261-62.
[256] FFI, *Satellittovervåking*, pp. 23, 25.
[257] Ibid., p. 26.

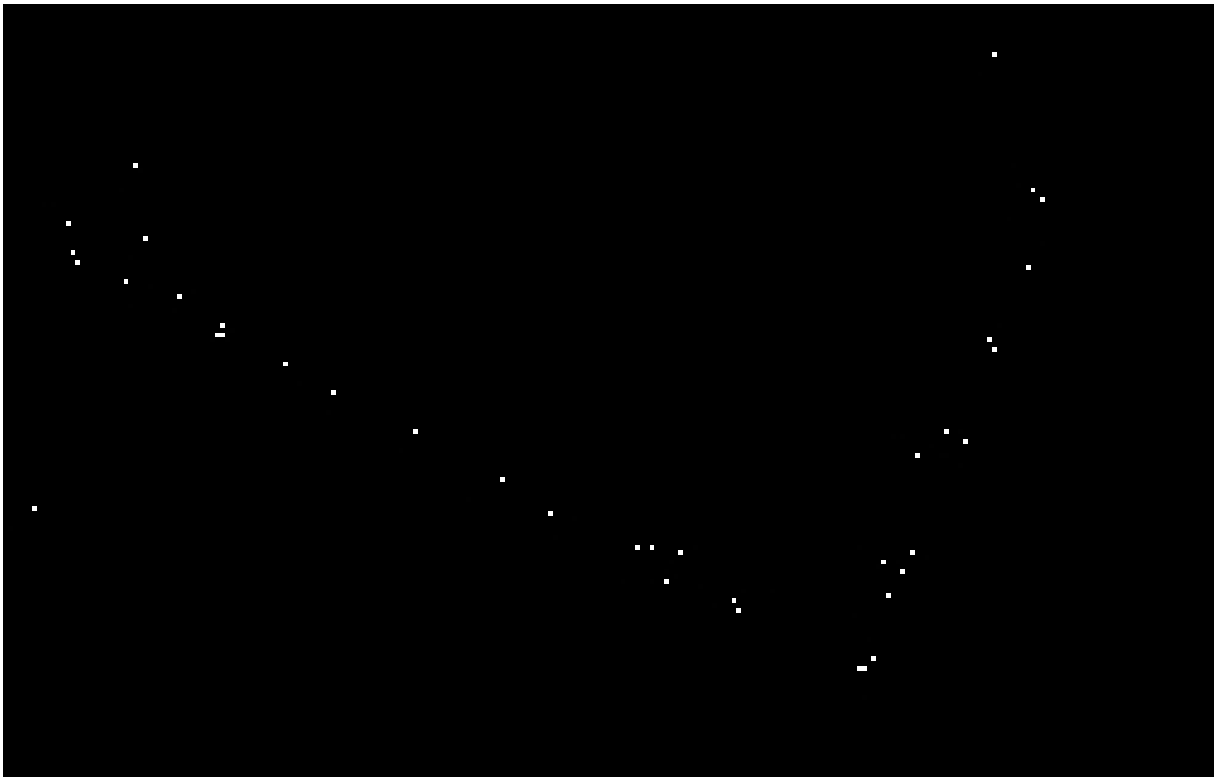


Figure 12: The first RADARSAT-1 image received at FFI in August 1996.[258]

Tromsø satellite station 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, 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, FFI achieved resolutions down to a few centimetres in the vertical plane.[259]

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.[260] The military Interpretation Centre gained a deep understanding of how radar satellites could be used for operational maritime surveillance, and after a trial operation in 1996-97, the centre became operational in 1998.[261] By then, these operations also included SAR imagery based on data from RADARSAT-1,[262] and FFI regularly conducted IMINT courses at the Interpretation Centre.[263] The establishment of the military interpretation centre in 1998 entailed an agreement with the Norwegian satellite ground station operator Kongsberg Satellite Services (KSAT) in Tromsø on delivery of

[258] Terje Wahl, "Satellitter, skipsfart og kosmisk stråling," (2013). https://blogg.forskning.no/terje-wahls-blogg/satellitter-skipsfart-og-kosmisk-straling/1112137.
[259] FFI, *Satellittovervåking*, pp. 23-25.
[260] Ibid., p. 27.
[261] Ibid.
[262] Ibid., pp. 23, 27.
[263] Wahl, interview.

RADARSAT data for vessel detection, where KSAT would transmit the satellite imagery to Fauske for further analysis and dissemination.[264]

In the late 1990s, FFI intensified its work on military oceanography. They also participated in the "Strong Resolve" fleet exercise in 1998 and contributed with 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.[265] Through the European Euclid ("European cooperation for the long term in defence") program, FFI and Informasjonskontroll AS were in 1999 granted a contract to further develop technology to 'process military data from radar satellites'.[266] FFI also made several contracts with Tromsø satellite station for the purchase of SAR imagery for use in military operations. Under a four-year FFI contract signed in August 1995, FFI purchased data on behalf of the Armed Forces. Under a subsequent FFI contract signed in January 2000, FFI only purchased data for its own R&D purpose, 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.[267]

1.5. 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 partners 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.

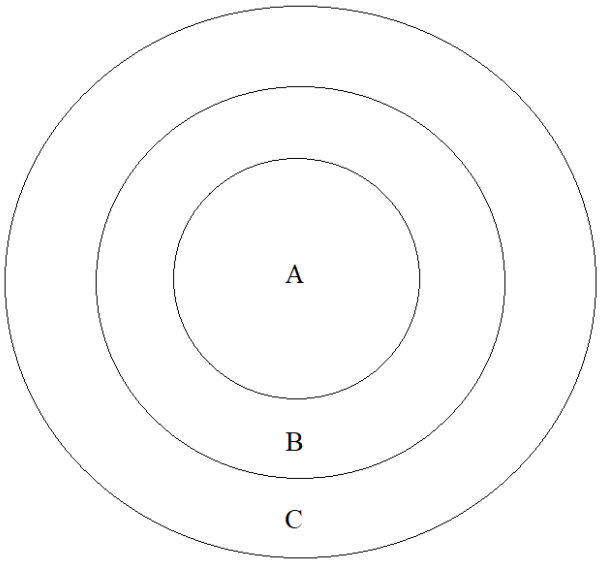
Since at least 1994, Norway had some access to US military imaging satellite data and collaborated militarily with the US and the UK to further develop its national military satellite-based capability. Overall, NATO served as a key platform through which Norway accessed SATCOM as well as space-based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

[264] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, p. 63.
[265] FFI, *Satellittovervåking*, p. 27.
[266] Ibid., p. 30.
[267] Wahl, interview.

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 in 1981 ratified the Additional Protocol I to the 1977 Geneva Conventions, 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 Tromsø satellite station for national military utilisation of satellite imagery. Another European pillar was the military collaboration through WEU, where Norway since 1989 served as a driving force 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.



A. US, UK, and Canada
B. NATO, ESA, WEU
C. EUCLID

Figure 13: Norwegian collaboration in military space activity in the formative years

With US President Reagan's 1983 "Star Wars" program 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. These political viewpoints 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 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. FFI defined satellite surveillance as one of its five main defence research areas in the mid-1990s.

Key actors under the MoD umbrella include FFI, NIS, 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 Tromsø satellite station and by 1998, the Interpretation Centre at Fauske. At this time, 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.

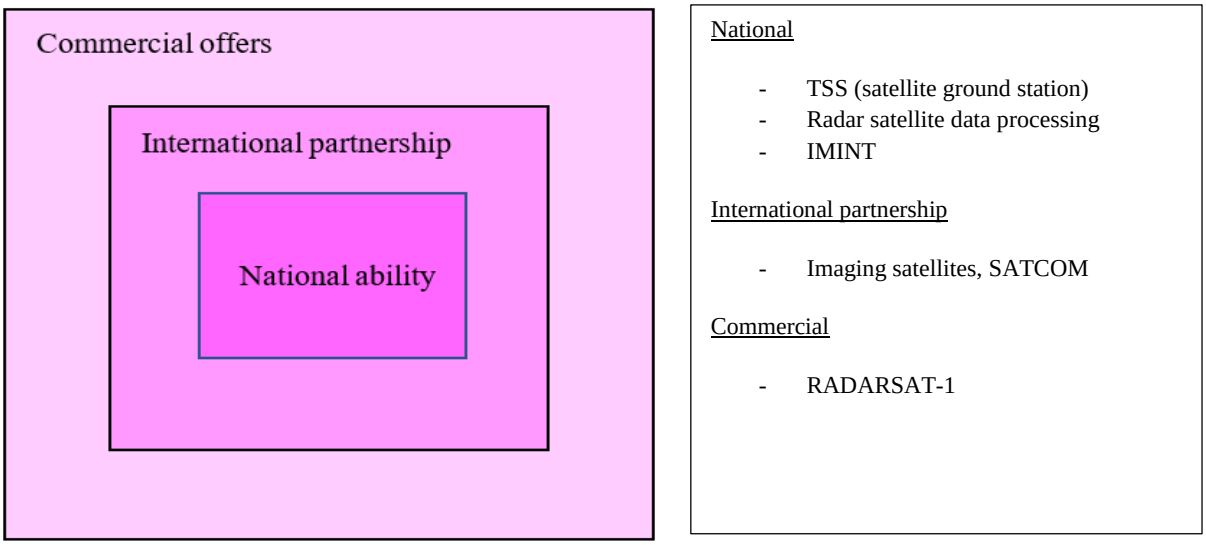


Figure 14: Key capabilities and partnerships for the Armed Forces in the formative years.

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.

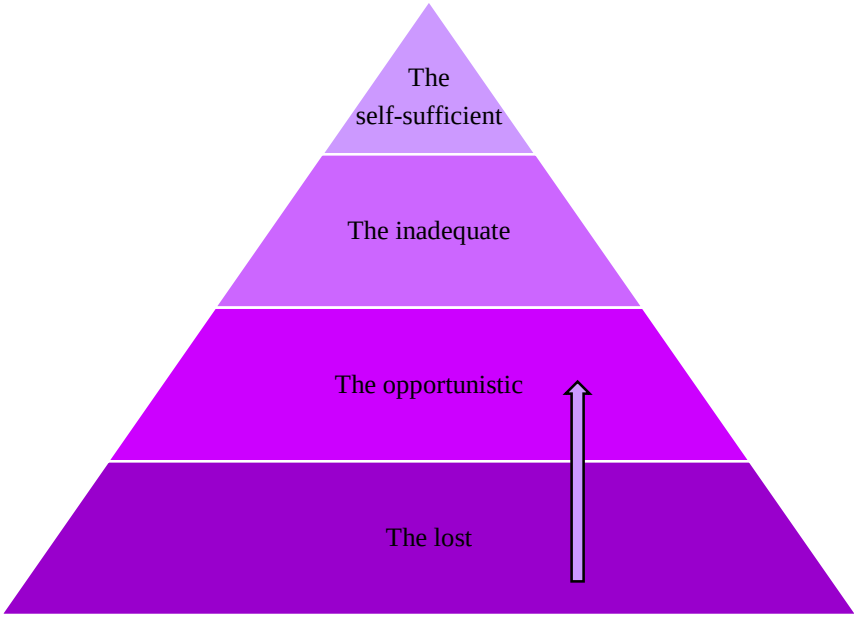


Figure 15: Norway’s rise towards the opportunistic from the late 1970s until 2000.[268]

[268] Bingen, *Det nære verdensroms strategiske dimensjoner*, pp. 27-28.

2. Extemporary military space activities 2000 – 2014

Ca 2000 – 2014

2.1. Introduction

In 2000, 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.[269] Due to declining defence budgets, however, the Armed Forces would no longer structure itself for an invasion scenario, which entailed being attacked by a 'great power with considerable political ambitions', since Norway in such a scenario would nonetheless be at the mercy of allied support.[270] In the event of conflict or war, Norway would have to rely upon on the immense naval capacity of the US.[271]

In addition to being a considerable exporter of fish, Norway currently 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.[272] 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 itself as a major security and defence policy challenge to Norway in peace, crisis, and war.[273]

In 2009, Norway's Minister of Foreign Affairs Jonas Gahr Støre stated that the dissolution of the Soviet Union had not eliminated Norway's former challenges, including its asymmetrical relationship with its 'large and not always fully predictable' neighbour.[274] Norway was also growing concerned with the rise of China as the world's second largest economy and the associated alteration of 'global power relations and regional instability'. US-China relations had a pivotal impact on international security, their relationship was marked by rivalry, and the US focused less on Europe as its attention to the Asia-Pacific region increased. China modernised its military forces and aimed to reduce US significance in important military strategic areas, 'for example in outer space' and at sea.[275] In 2013, China also attained observer

[269] Hans Kristian Svensholt, "Status og utfordringer i Sjøforsvaret," (Oslo Militære Samfund: Norsk Militært Tidsskrift 3-00, 31 January 2000), p. 5.
[270] Forsvaret, Forsvarsstudie 2000, FS 2000 (Oslo: Forsvarssjefen, 2000).
[271] Svensholt, "Status og Utfordringer i Sjøforsvaret," p. 5.
[272] Ibid.
[273] Forsvarsdepartementet, Omleggingen av Forsvaret i perioden 2002-2005, St.prp. nr. 45 (2000-2001), pp. 27-28 (Regjeringen, 2001).
[274] Jonas Gahr Støre, "Nato 60 år. En allianse for vår tid," (Oslo Militære Samfund: Norsk Militært Tidsskrift, 03, 23, 09 2009), Speech. https://oslomilsamfund.no/2009/03/23/foredag-nato-60-ar-en-allianse-for-var-tid/.
[275] Forsvarsdepartementet, Et forsvar for vår tid, Prop. 73 S (2011-2012), p. 22 (www.regjeringen.no: Regjeringen, 2012).

status on the Arctic Council, solidifying its growing ambitions in Norway's main area of interest, the High North.[276]

2.2. 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, an ESA but not an EU member, this brought about challenges as well as opportunities.[277] The EU's rise as a space power also marked the beginning of a 'militarisation' of European space programs.[278] 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.[279]

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 inquired the EU to incorporate mechanisms to ensure Norway's continued role corresponding to that of the WEU satellite centre in the past;[280] 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 to doubt whether Norway could continue to play a central role in EU activities in military satellite surveillance.[281]

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, FFI established an operational service for meteorological and oceanographic information for the Navy to optimise military surface and subsurface naval operations. Through Envisat, FFI and the Armed Forces also attained funding to enhance Tromsø satellite station that provided national military space-based applications.[282] In a wider

[276] Jeremy Greenwood and Shuxian Luo, "Could the Arctic be a wedge between Russia and China?," *War on the Rocks*, 3 June, 2022, https://warontherocks.com/2022/04/could-the-arctic-be-a-wedge-between-russia-and-china/.
[277] Bingen, *Det nære verdensroms strategiske dimensjoner*.
[278] Sheehan, "Profaning the path to the sacred: The militarisation of the European space programme," p. 170.
[279] 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.europa.eu: Publications Office of the European Union, 2001). http://publications.europa.eu/resource/cellar/bbad6538-22ea-4603-be48-8b45c7b2643f.0006.03/DOC_1.
[280] Lovdata, "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 (Lovdata.no, 2001), EF. https://lovdata.no/dokument/TRAKTATEN/traktat/2001-12-19-1/ARTIKKEL_6#ARTIKKEL_6.
[281] FFI, *Satellittovervåking*, pp. 31-32.
[282] Ibid., pp. 28, 33.

sense, Envisat was an important contributor to the EU/ESA Earth observation program GMES (Global Monitoring for Environment and Security), later renamed Copernicus.[283] The EC took the lead on developing and administering EU space programs in 2007, predominantly GMES and the satellite navigation systems Galileo, which the EC managed and promoted as civilian programs. It was however widely anticipated that their dual-use characteristics would benefit military and security efforts and raise security policy concerns.[284]

FFI continued to participate in military space projects through WEAG, where 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 EDA absorbed WEAG and ECAP in 2005. Norway could then still participate in projects but was excluded from governing bodies.[285] 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 their dual-use radar satellite system Cosmo Skymed in 2007 – 2010, and France launched Pleiades in 2011 and 2012.[286]

Despite Norway's issues along the EU track on military space collaboration, Norway on the civilian side through NOSA committed to Galileo in 2009. Norway treated Galileo as a purely civilian system and set up a coordinating committee chaired by the Ministry of Trade and Industry.[287] Like most national defence ministries in Europe,[288] the Norwegian MoD opposed Norwegian participation in Galileo, since they already had military agreements with the US on GPS.[289]

2.3. 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 considering the Government's High North policy.[290] In conjunction with committing to Galileo in 2009, Norway also established an inter-ministerial coordinating committee for space

[283] "ESA declares end of mission for Envisat," Observing the Earth, European Space Agency, updated 09/05/2012, 2012, accessed 4 January, 2021, https://www.esa.int/Applications/Observing_the_Earth/Envisat/ESA_declares_end_of_mission_for_Envisat.
[284] John Logsdon, SECURITY-RELATED SPACE ACTIVITIES IN EUROPE, October 2015, Research paper, Elliott School of International Affairs, The George Washington University.
[285] FFI, *Satellittovervåking*, pp. 31-32.
[286] Olsen, interview; Wahl, interview.
[287] 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), p. 4 (Oslo 2009).
[288] 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.
[289] 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.
[290] Nærings- og fiskeridepartementet, Between heaven and earth: Norwegian space policy for business and public benefit, Meld. St. 32 (2012–2013), p. 47 (www.regjeringen.no: Regjeringen, 2013).

activities to follow-up on the considerable financial obligations related to Galileo.[291] This marked an important step in national space governance and coordination, and the committee in 2011 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 RADARSAT services, Norwegian microsatellite development, Andøya Space Centre, and Barents Watch.[292] 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.[293]

In 2013, 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 in the High North.[294] The number of national and commercial space actors had certainly increased significantly since Norway issued its first space policy in 1987,[295] and the policy observed that the Armed Forces were currently using space-based Earth observation capabilities, 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.[296] Like the 1987 space policy, however,[297] Norway's second space policy abstained from addressing national security concerns related to space activity.[298] Until 2014, Norwegian military space activities continued to be conducted impromptu, lacking of an overall plan.

2.4. Space in Norwegian defence policy and doctrine

Space in Norwegian defence policy continued to predominantly concern satellite-based ISR and SATCOM, although the MoD's and the Armed Forces' focus shifted around the turn of the century from the former to the latter. Doctrinal trends affecting Norway at the time encompassed the drive for 'jointness', which according to the Chief of Defence's spokesperson Brig. Gen. Kjell Grandhagen was continuously enforced upon the military by 'impatient politicians' who wanted to improve the coordination between land, sea and 'the airspace above the two'. The early 2000s were also marked by 'increased multinationalism'

[291] Utenriksdepartementet, *Om samtykke til deltagelse i en beslutning i EØS-komiteen om innlemmelse i EØS-avtalen av EUs satellittnavigasjonsprogrammer Galileo og EGNOS (2008-2013)*, p. 4.
[292] Nærings- og fiskeridepartementet, *Between heaven and earth: Norwegian space policy for business and public benefit*.
[293] Ibid., pp. 23, 53, 56.
[294] Ibid.
[295] Ibid., pp. 15-16.
[296] Ibid., pp. 65, 72-73.
[297] Industridepartementet, *Om norsk romvirksomhet*.
[298] Nærings- og fiskeridepartementet, *Between heaven and earth: Norwegian space policy for business and public benefit*.

and tighter military integration between national military forces, even at lower levels of operations.[299]

Neither Defence Study 2000 nor the MoD's following LTP in 2001 addressed space in any capacity.[300] In 2000, Norway's Defence Policy 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.[301]

In 2000 the High Command published Norway's first military joint doctrine (FFOD). 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.[302] This concept also served as a basis for current defence analysis at 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. Manoeuvre operations depended on strategic surveillance, 'in particular satellite information', with sufficient coverage frequency and resolution. It also 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.[303]

FFOD 2000 treated space as a component of air power, both in a capacity perspective and from the point of view of the geographical 'third dimension'. Specifically, space was addressed considering how it affected air power, as opposed to the Armed Forces overall. The air power concept had emerged as aircraft, 'and later rockets and space systems', were used in warfare, and the Norwegian doctrine precedingly referred to NATO's current definition of air power. This constituted 'the military 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

[299] Kjell Grandhagen, "Aerospace in Future Joint Campaigns," in *A Second Aerospace Century: Choices for the Smaller Nations*, ed. John Andreas Olsen, Norsk Militært Tidsskrift (Trondheim: The Royal Norwegian Air Force Academy, 2001).
[300] Forsvaret, *Forsvarsstudie 2000*; Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*.
[301] Forsvarspolitisk utvalg, Et nytt forsvar, NOU 2000: 20, pp. 77-78 (Oslo: Statens forvaltningstjeneste, 2000).
[302] Forsvaret, Forsvarets fellesoperative doktrine del B - operasjoner, pp. 3, 11 (Oslo: Forsvarets overkommando, 2000).
[303] Bent Erik Bakken, Teknologi og forsvar - drivkrefter for forandring. Et seminar under Forsvarsanalysen 2000, FFI/RAPPORT-2000/00070, pp. 51-52 (Kjeller: FFI, 2000).

therefore military power exercised by systems using the third dimension.'[304] For a small air force with limited resources, it was 'easy to think only of air systems, i.e., 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.[305]

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 considering the ISR function.[306] Access to information was important for 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 for information gathering.'[307] 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.[308] The air doctrine also presumed that 'space-based forces' might face the same limitations as aircrafts, but this could be countered by applying 'a varying number of satellites with varying orbits.'[309]

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.[310] Notably, it referred to a 'concept for a Norwegian small satellite' developed by FFI, and displayed an Ikonos commercial satellite image depicting Capitol Hill in one, three, and ten metre resolutions (Figure 16).[311]

[304] Forsvaret, *Forsvarets fellesoperative doktrine del B - operasjoner*, p. 179.
[305] Ibid., p. 180.
[306] Forsvarets stabsskole, Forsvarets doktrine for luftoperasjoner, (Oslo: Forsvarets overkommando, 2002); Forsvarets stabsskole, Forsvarets doktrine for maritime operasjoner, (Oslo: Forsvarets overkommando, 2002).
[307] Forsvarets stabsskole, *Forsvarets doktrine for luftoperasjoner*, p. 68.
[308] Ibid., p. 78.
[309] Ibid., pp. 15-16.
[310] Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, p. 66.
[311] Ibid.

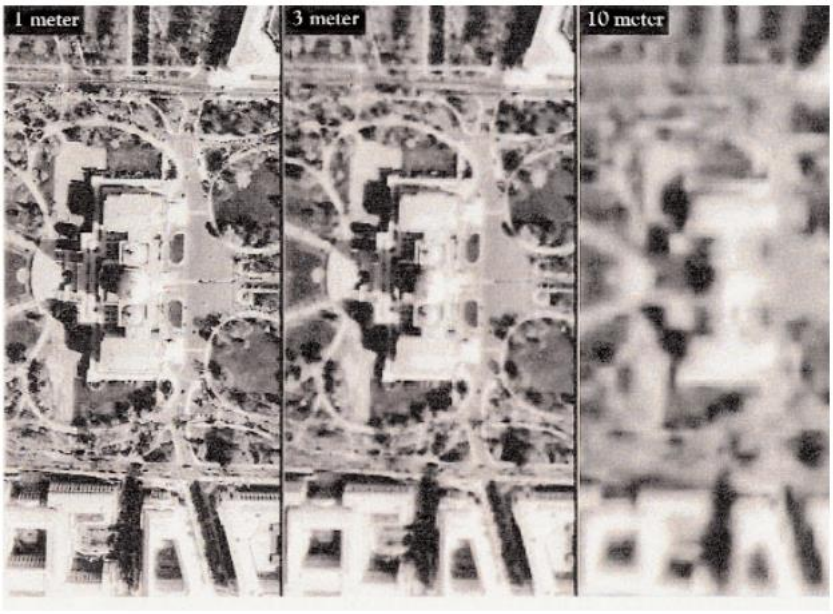


Figure 16: Ikonos satellite image of Capitol Hill.[312]

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 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 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 with 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.[313]

The doctrine for maritime operations also discussed satellites considering '[m]aritime forces in an allied context', now focusing on SATCOM for C2. 'All frigates and larger units should be equipped with data links and satellite communications.'[314] 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 in the horizontal plane, which necessitated the use of submarines to collect information for operational and tactical use.[315]

[312] Ibid., p. 131.
[313] Ibid., p. 66.
[314] Ibid., p. 54.
[315] Ibid., pp. 77-78.

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.[316]

In 2007, FFOD 2000 was replaced by FFOD 2007, which focused on effect-based operations, network-centric defence, and manoeuvre theory.[317] 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.[318] 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 par with the air, sea, and land domains. Indeed, the Norwegian doctrine stated that space was 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'.[319] 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 FFOD was published in 2014 and is therefore discussed in the next chapter. Meanwhile and 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.[320]

It is notable that by 2011, developments in military space activity and technology in general, and an invitation from the United States Air Force (USAF) concerning an MoU on Responsive Space Capabilities (RSC) in particular, led INI, FFI and NIS to draft a national military space strategy.[321] Norway had in 2010 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

[316] Forsvarets stabsskole, Forsvarets doktrine for landoperasjoner, p. 175 (Oslo: Forsvarsstaben, 2004).
[317] Forsvarets stabsskole, Norwegian Armed Forces joint operational doctrine, (Oslo: Forsvarsstaben, 2007).
[318] Ibid., pp. 90-93.
[319] Ibid., pp. 69-71.
[320] Forsvarsdepartementet, Et forsvar til vern om Norges sikkerhet, interesser og verdier, St.prp. nr. 48 (2007-2008), p. 147 (Oslo: Stortinget, 2008).
[321] Olsen, interview.

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'.[322]

Covering the period 2011 – 2015, the aim was for the strategy 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 organization', and it was 'very important' to address space holistically to build expertise in a comprehensive way.[323] 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'.[324]

This military space strategy never entered into force, and the initiative did not gain traction, presumably because the Armed Forces were not yet 'ready'.[325] Norwegian military space activities therefore continued to be managed impromptu until 2014, when Chief of Defence 2013 – 2020 Admiral Bruun-Hanssen 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 year of 2014/2015 and the following organisation of space in the Norwegian Armed Forces.

2.4.1. 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 2005 – 2013 Stoltenberg Government on several occasions experienced first-hand 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'.[326]

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. FFI advised already in January 2000 that tactical

[322] Forsvarets Informasjonsinfrastruktur (INI), *Plan for Forsvarets bruk av rommet 2011 - 2015 V 0.1*, p. 7.
[323] Ibid.
[324] Ibid., p. 3.
[325] Olsen, interview.
[326] Nils Helle, "Interview with Commodore Nils Helle, Head of Information and Communication Technology at the Norwegian Defence Logistics Organization (NDLO), 25 February 2015, Kolsås, Norway. [In Norwegian]," interview by Tale Sundlisæter, 2015.

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.[327] A principal SATCOM user was the NJHQ, and whether Norway operated in the Balkans, in Afghanistan, or in 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 NJHQ.[328] The Armed Forces progressively operated in remote 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.[329] On some occasions, the Armed Forces also faced situations in which they were unable to acquire the desired capacity 'in the right place at the right time'.[330]

Norwegian defence policy in 2000 – 2001 did not address space in any capacity.[331] Defence Study 2003 briefly mentioned SATCOM as a necessary capability considering NATO performance requirements, specifically related to the Armed Forces' plans to update the SATCOM equipment on their six ULA-class submarines.[332] Some considerable developments were underway, however. In March 2003, the MoD addressed the need for SATCOM considering 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 in the Armed Forces by increasing the overall budget for the frigate project.[333]

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 rented commercial SATCOM services via Eik and Nittedal. FSAT was co-located with the NATO station at Eggemoen and was ready for operations in 2004.[334] From 2005 onwards, it also incorporated signals intelligence capability for NIS to collect information from selected foreign satellite systems.[335]

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[327] Vidar S Andersen, Teknologi og forsvar - drivkrefter for forandring. Et seminar under Forsvarsanalysen 2000, FFI/RAPPORT-2000/00070, pp. 25-26 (Kjeller: FFI, 2000).
[328] Helle, interview.
[329] Forsvarsdepartementet, Om investeringar i Forsvaret, St.prp. nr. 78 (2006–2007), p. 8 (www.regjeringen.no: Regjeringen, 2007).
[330] Forsvaret, Forsvarssjefens Forsvarsstudie 2007, pp. 19-20 (Oslo: Forsvaret, 2007).
[331] Forsvaret, *Forsvarsstudie 2000*; Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*.
[332] Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, p. 17.
[333] Forsvarsdepartementet, Anskaffelse av Taktisk Data Link-16 (TDL-16), St.prp. nr. 50 (2002–2003), pp. 1, 3 (www.regjeringen.no: Regjeringen, 2003).
[334] Sletengen, "Satellittkommunikasjon."
[335] Kontroll- og konstitusjonskomiteen, Innstilling til Stortinget fra kontroll- og konstitusjonskomiteen, Innst. 145 S (2016–2017), p. 14 (Oslo: Stortinget, 2016).

2.4.1.1. National SATCOM and the Cyber Defence Force

Defence Study 2007 under Chief of Defence 2005 – 2009 General Sverre Diesen (Army) strongly advocated acquiring dedicated SATCOM capability as a key element in the Armed Forces' endeavour towards a net-centric defence structure.[336] Modern military forces relied upon information collection sensors, 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.[337]

To streamline and optimise Norway's military information infrastructure capabilities, Defence Study 2007 recommended to establish an independent operating unit, i.e., the Armed Forces' Information Infrastructure (INI).[338] This entailed establishing an Inspector General position to command all information infrastructure capabilities to ensure a proper, coordinated development towards network-centric defence.[339] 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.[340] In March 2009, the MoD appointed Maj. Gen. Roar Sundseth as INI's first Inspector General.[341]

Defence Study 2011 under Chief of Defence 2009 – 2013 General Harald Sunde (Army) 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).[342] 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

[336] Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*, pp. 10, 19-21.
[337] Ibid., p. 10.
[338] Forsvarets Informasjonsinfrastruktur
[339] Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*, p. 50.
[340] Forsvarsdepartementet, For budsjettåret 2009 under Forsvarsdepartementet
Utgiftskapitler: 1700–1795 Inntektskapitler: 4700–4799, St.prp. nr. 1 (2008–2009), pp. 32, 58, 63, 101 (www.regjeringen.no: Regjeringen, 2008).
[341] "Utnevnelser i statsråd 27. mars 2009," Forsvarsdepartementet, 2009, accessed 14 January, 2022, https://www.regjeringen.no/no/dokumentarkiv/stoltenberg-ii/fd/Nyheter-og-pressemeldinger/pressemeldinger/2009/nytt-fra-statsrad-27-mars-2009/id551626/.
[342] Forsvaret, Forsvarssjefens Fagmilitære Råd, p. 45 (www.forsvaret.no: Forsvaret, 2011).

satellite was to be 'introduced' in the period 2013-2016.[343] With that, the Armed Forces could ensure 'information flow between operators at home and abroad'.[344]

2.4.1.2. Secure access to 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.[345]

The MoD's plans to acquire military SATCOM was 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 511 million NOK. To ensure that the Navy's missile torpedo boats (MTBs) could also operate in a network-centric defence, the MoD would spend another 149 million NOK to equip the MTBs with SATCOM equipment.[346]

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.[347] 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 already equipped with sophisticated SATCOM systems, and Defence Study 2007 advised that Norway, as a 'major financial initiative' for the defence planning period of 2009 – 2012, should invest in a military communications satellite that would be operational by the end of 2012.[348]

In the 2008 LTP, the MoD formally decided to acquire such a capacity.[349] 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 EEZ, including the northern area at Svalbard. Additionally, it should cover areas where Norway was

[343] Ibid., p. 49.
[344] Ibid., p. 66.
[345] Forsvarsdepartementet, *Om investeringar i Forsvaret*, p. 8.
[346] Ibid., pp. 1, 7-8.
[347] Ibid.
[348] Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*, pp. 19-20.
[349] Forsvarsdepartementet, *Et forsvar til vern om Norges sikkerhet, interesser og verdier*, p. 85.

participating in international military operations, currently 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 SOF. The satellite project required national control of the satellite through a Memorandum of Understanding (MoU) with another NATO country, which could be secured by dispatching a Norwegian representative at the supplier's satellite control centre.[350]

When the MoD in December 2009 issued its proposition for Parliament's approval to procure a military communications satellite capability, 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 for years served as the Armed Forces' primary means of communication in operational and strategic capacities at home and abroad, but had become more difficult and expensive to rent, and there had been 'several instances' where the Armed Forces were unable to acquire 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.[351]

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 MTIF, where MTIF 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.[352] 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.[353]

Former Telenor Chief Executive Officer (CEO) Tormod Hermansen and Director of FFI Paul Narum advocated the Statsat project and proposed that MTIF could own and operate the satellite

[350] Econ Pöyry og Holte Consulting, *Ekstern kvalitetssikring av Konseptuell løsning for P8007 Sikker tilgang til romsegment* (Oslo, 2008), p. 19, https://www.ntnu.no/documents/1261860271/1261975586/129%208007%20Romsegment.pdf.
[351] Forsvarsdepartementet, Framskaffing av ein kommunikasjonssatellitt til Forsvaret, Prop. 56 S (2009–2010) Proposisjon til Stortinget (forslag til stortingsvedtak) (www.regjeringen.no: Regjeringen, 2009).
[352] Ibid.
[353] Petter Jansen, "Interview with Petter Jansen, Head of the Norwegian Defence Logistics Organization (NDLO) 19 March 2015, Langkaia, Oslo, Norway [in Norwegian]," interview by Tale Sundlisæter, 2015.

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 both meet 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 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 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.[354]

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 982 million NOK compared to Statsat's 1.6 billion NOK. Hence, the national solution was more than 50 percent more expensive in start-up expenses, in addition to higher annual operating costs.[355]

Like most communications satellites, the satellite, dubbed 'Hisnorsat', would be deployed in geostationary orbit.[356] 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.[357] Norway would own 40 percent and Hisdesat 60 percent of the satellite capacity.[358] In September 2010, Minister of Defence Grete Faremo signed the MoU with her Spanish counterpart and in June 2011, a 'development agreement' was about to be signed by Rear Admiral 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.[359]

These plans were noted in Defence Study 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.'[360] In December 2011, the manager of the MoD's military SATCOM program, Navy Commander Trond Hermannsen (not to be confused with Tormod Hermansen of the Statsat committee) stated that the MoD's would invest 200 million USD, approximately 1.2 billion NOK, in Hisnorsat. In addition to the space segment, the program included the procurement of '300 satellite communications terminals for Norwegian land, air and maritime platforms, and ground infrastructure'. The satellite would

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354 "Anbefalte norsk satellitt," Teknisk Ukeblad, 2010, accessed 15 February, 2022, https://www.tu.no/artikler/industri-anbefalte-norsk-satellitt/236924.
355 Forsvarsdepartementet, *Framskaffing av ein kommunikasjonssatellitt til Forsvaret*.
356 Peter B. de Selding, "Norway, Spain Expected To Order Milcom Satellite Before New Year," *Spacenews* (www.spacenews.com) 2011, https://spacenews.com/norway-spain-expected-order-milcom-satellite-new-year/.
357 Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, pp. 5, 62, 69.
358 Forsvarsdepartementet, *Framskaffing av ein kommunikasjonssatellitt til Forsvaret*.
359 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/.
360 Forsvaret, *Forsvarssjefens Fagmilitære Råd*, p. 46.

carry ‘almost all of Norway’s military satellite communications traffic’, including current operations in the Balkans, in 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’.[361]

Norway’s military SATCOM acquisition project was abruptly terminated, however. The Spanish government that 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’.[362] 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’.[363] 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.[364]

In September 2013, the MoD established a new SATCOM project, but did not yet have any recommendations to the Parliament.[365] FSAT was by now equipped with 20 – 30 antennas with diameters 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 information security, as they had heard of ‘cases where hackers have taken control of satellites’. They were therefore establishing routines to handle network intrusion, degradation, or destruction, and urged that investing in a national military communications satellite would improve the security.[366]

When the Solberg Government took office in October 2013, they seemed ‘uninterested’ in acquiring national SATCOM capability, a disinterest that by some has been understood to stem from the new government’s lack of first-hand experience in failing to establish secure communications in critical situations.[367] 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.

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[361] Selding, "Norway, Spain Expected To Order Milcom Satellite Before New Year."
[362] Ibid.
[363] Forsvarsdepartementet, *Et forsvar for vår tid*, p. 103.
[364] Forsvarsdepartementet, Proposisjon til Stortinget (forslag til stortingsvedtak), Prop. 1 S (2012–2013), pp. 97-98 (www.regjeringen.no: Regjeringen, 2012).
[365] Forsvarsdepartementet, Proposisjon til Stortinget (forslag til stortingsvedtak), pp. 110-11 (www.regjeringen.no: Regjeringen, 2013).
[366] Elin Harstad Iversen, "Cybertrusselen er grenseløs," *Drammens Tidende* (www.dt.no), 4 June 2013, https://www.dt.no/naringsliv/naringsliv/cybertrusselen-er-grenselos/s/2-2.1748-1.7919624.
[367] Helle, interview.

2.4.2. 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 sceptical and at times condescending attitudes towards the military value of satellite-based ISR capability, especially that which concerned 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 in a strategic intelligence perspective.[368] Its 'possible future uses' were plentiful, however. The space age was still in its infancy and FFI anticipated 'very significant' technological and systemic space developments in the coming years. The Armed Forces therefore had to decide their ambition level for the military use 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, 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, i.e. 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.[369]

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 with time, radar satellites had 'considerable potential' for targeting using long-range artillery or fighter jets.[370] The proliferation of satellite-based ISR capabilities also implied that relevant military stationary facilities could be mapped in peacetime. By using SAR, EO/IR, and Moving Target Indicator (MTI) satellite sensors, it might also be possible to locate and track any mobile target.[371]

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,

[368] Andersen, *Teknologi og forsvar - drivkrefter for forandring. Et seminar under Forsvarsanalysen 2000*, pp. 20-22.
[369] Ragnvald H Solstrand, Teknologi, forsvar og forsvarsstrukturer, FFI/RAPPORT-2000/03429, pp. 63-65 (Kjeller: FFI, 2000).
[370] Ibid., p. 64.
[371] Bjarne Haugstad, Teknologi og forsvar - drivkrefter for forandring. Et seminar under Forsvarsanalysen 2000, FFI/RAPPORT-2000/00070, p. 42 (Kjeller: FFI, 2000).

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 military operations. However, national military dependency on such a system necessitated very strict requirements for system survival and operability in the event of war.[372]

Due to cloud cover and weather conditions in the High North, radar satellites were most applicable to the Armed Forces, but FFI also examined 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,[373] and commercially available optical satellite images were about to provide resolutions down to half a metre.[374]

The Armed Forces could take several approaches considering 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 be even more costly. The safest bet in 2000 was to gain further experience with the use of commercial satellite imagery.[375]

Although the Armed Forces had routinely used commercial radar satellite imagery for operational maritime surveillance in peacetime since 1998,[376] Defence Study 2000 as noted above did not mention space in any capacity.[377] Maritime surveillance was predominantly covered by Norway's 'very important' MPA capacity that included four P-3 Orions.[378] In October 2000, Chief of Defence General Frisvold in a public address voiced his concern about the 'growing technological gap' between the US and other NATO members, and added 'for the sake of clarity' that Defence Study 2000 did not mention or even consider the notion of 'Star Wars'.[379] Like Defence Study 2000, the MoD's following LTP in 2001 made no mentions of space capability.[380]

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[372] Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, pp. 63-65.
[373] Andersen, *Teknologi og forsvar - drivkrefter for forandring. Et seminar under Forsvarsanalysen 2000*, pp. 20-22.
[374] Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, pp. 63-65.
[375] Ibid., pp. 65, 67.
[376] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*.
[377] Ole Nygaard, "Han skal fronte det nye forsvaret," *Aftenposten* (www.aftenposten.no), 11 December 2004, https://www.aftenposten.no/norge/i/dnXxq/han-skal-fronte-det-nye-forsvaret.
[378] Forsvaret, *Forsvarsstudie 2000*.
[379] Sigurd Frisvold, Det nye Forsvaret - status og utfordringer, pp. 5-6 (Norsk Militært Tidsskrift 11-00, 2000).
[380] Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*.

Defence Study 2003 however acknowledged that the Armed Forces were currently using commercial radar satellites for maritime surveillance on a regular basis.[381] 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.[382] 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.[383]

In 2003, 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.[384] FKN was transformed into LDKN in 2002, and the Rear Admiral 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.[385] 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 commercial satellite imagery.[386] According to the Rear Admiral, satellite imagery allowed him to allocate 'traditional military resources' such as aircraft or vessels more effectively in Norway's areas of responsibility.[387]

[381] Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, pp. 12-13.
[382] Sigurd Frisvold, "Status og utfordringer i Forsvaret," *Norsk Militært Tidsskrift*, no. 1 (2004): p. 8.
[383] Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, pp. 12-13.
[384] Jørgen Berggrav, "Landsdelskommando Nord-Norge - operativ blindtarm eller indrefilet?," (Oslo Militære Samfund: Norsk Militært Tidsskrift, 27 October 2003).
[385] Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*, pp. 103-04.
[386] FFI, *Satellittovervåking*, p. 31.
[387] Berggrav, "Landsdelskommando Nord-Norge."

Figure 17: Norway's areas of responsibility.[388]

2.4.2.1. Norway's military commanders move to terminate national military surveillance satellite

Of the most remarkable aspects of Defence Study 2003 was that it evaluated a nationally developed electronic support measures (ESM) satellite project as an option for Norway's future military structure.[389] FFI endeavoured with considerable effort to develop a 'small satellite system for defence and security purposes', estimated in 2000 to cost 600 million NOK.[390] 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. 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

[388] Food and Agriculture Organization of the United Nations, Norway, (https://www.fao.org 2013).
[389] Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, pp. 12-13.
[390] Andersen, *Teknologi og forsvar - drivkrefter for forandring. Et seminar under Forsvarsanalysen 2000*, pp. 24-25.

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.[391]

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 FFI focused on developing 'smaller satellites' with passive sensors.[392] The concept evaluated by Defence Study 2003 was called *Ny Norsk Satellitt* (NSAT), i.e. "New Norwegian Satellite", and would weigh maximum 50 kg and carry a passive radar instrument.[393] In March 2001, 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 was larger than all other economic zones in Europe combined. With 'electronic eyes from space', Norway could then detect navigation and radar 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'. FFI could build their proposed ESM satellite for the net sum of 100 million NOK within the next five years, but it was not yet clear whether Norway's military and political authorities were willing to invest.[394]

NSAT underwent satellite planning phases from 1998 until 2003, and FFI developed a full-scale model that was exhibited in several places, which according to FFI attracted considerable international attention.[395] 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.[396] 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.[397]

Defence Study 2003 stated indeed 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, optical -and IR satellite systems. Norway should also continue its international collaboration that provided access to 'overview photos at sea' and 'prioritized

[391] Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, p. 67.
[392] Andersen, *Teknologi og forsvar - drivkrefter for forandring. Et seminar under Forsvarsanalysen 2000*, pp. 24-25.
[393] FFI, *Satellittovervåking*, pp. 28-29.
[394] Jan-Petter Helgesen, "Vil bygge overvåkingssatellitt: Norge kan komme til å bygge egen militær overvåkingssatellitt for kontroll av de norske havområdene.," *Stavanger Aftenblad* (aftenbladet.no) 2001, https://www.aftenbladet.no/innenriks/i/nmmmn/vil-bygge-overvaakingssatellitt.
[395] FFI, *Satellittovervåking*, pp. 28-29.
[396] Forsvarets stabsskole, *Forsvarets doktrine for maritime operasjoner*, p. 66.
[397] Olsen, "Norske mikrosatellitter."

satellite systems within NATO.' Ultimately, it advised to terminate all efforts to develop a Norwegian military satellite.[398]

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 framework.[399] The MoD's 2004 LTP that outlined plans for the Armed Forces through 2008 adhered to Defence Study 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 FFI to terminate the development of 'a national military satellite capacity' with immediate effect.[400]

2.4.2.2. 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'. The Rear Admiral 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.[401] In 2006, Minister of Defence Anne-Grete Strøm-Erichsen in a public address 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.[402]

Yet, when FFI's Richard Olsen the same year presented a new satellite surveillance concept, it received less favourable attention. Commander of NJHQ 2004 – 2005 Lt. Gen. (Ret.) Archer, for example, stood up and exclaimed that Olsen was 'dead, but he won't lie down', referring to the MoD's termination of FFI's national military surveillance satellite in 2003.[403] Rear Admiral

[398] Forsvaret, *Forsvarssjefens Militærfaglige Utredning 2003*, pp. 12-13.
[399] Frisvold, "Status og utfordringer i Forsvaret," p. 8.
[400] Forsvarsdepartementet, Den videre moderniseringen av Forsvaret i perioden 2005 - 2008, St.prp. nr. 42 (2003 - 2004), pp. 57-58 (www.regjeringen.no: Regjeringen, 2004); According to Lt. Gen. David A. Deptula (USAF), scepticism towards the military value of small satellites wasalso dominant in the United States 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.
[401] Jan Erik Finseth, "Status og utfordringer," *Norsk Militært Tidsskrift*, no. 12 (7 November 2005): p. 18.
[402] Anne-Grete Strøm-Erichsen, "Sammen for et moderne forsvar," *Norsk Militært Tidsskrift*, no. 02 (9 January 2006): p. 8.
[403] Olsen, interview.

Jørgen Berggrav, now head of the MoD's LTP division,[404] followed suit and publicly expressed his personal disbelief in FFI's plans to develop a national surveillance satellite.[405]

Defence Study 2007 the following year thoroughly focused on SATCOM and did not consider satellite-based ISR.[406] The MoD's 2008 LTP for 2009 – 2012 still noted within the context of strengthening the Coast Guard's structure and operational capacity that the Armed Forces would continue to use satellite surveillance data to improve surveillance and control of coastal waters.[407] 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.[408] Much like Defence Study 2007, however, Defence Study 2011 did not address the Armed Forces' use of satellite-based ISR,[409] but mentioned that airborne capabilities could be applied more efficiently by using 'information from a wide range of other sensors and sources'.[410] The MoD's following LTP in 2012 merely reiterated that the Coast Guard exercised authority in the Norwegian High North aided by airborne and spaceborne surveillance capabilities.[411]

2.5. 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.

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.[412] 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

[404] Forsvarsdepartementet, "Kontreadmiral Jørgen Berggrav blir sjef for Avdeling for forsvarspolitikk og langtidsplanlegging i Forsvarsdepartementet," news release, 3 June, 2005.
[405] Olsen, interview.
[406] Forsvaret, *Forsvarssjefens Forsvarsstudie 2007*.
[407] Forsvarsdepartementet, *Et forsvar til vern om Norges sikkerhet, interesser og verdier*, p. 79.
[408] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*.
[409] Forsvaret, *Forsvarssjefens Fagmilitære Råd*.
[410] Ibid., p. 17.
[411] Forsvarsdepartementet, *Et forsvar for vår tid*, p. 51.
[412] Peter Marquez, "Interview with Peter Marquez, Director of Space Policy at the US National Security Committee (NSC) 2007 - 2010, 7 December 2015, Washington, DC., United States.," 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., United States.," interview by Tale Sundlisæter; Kevin O'Connell, "PhD interview with Kevin O'Connell at Innovative Analytics & Training," (Washington, DC., December 10 2015).

civilian satellites to become increasingly indistinct. Still, while the space-based platform collecting the data could be one and the same, the data would normally be channelled through separate military and civilian ground-based processing elements and infrastructure.[413]

2.5.1. "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, FFI estimated that this activity would cost Norway about 200 million NOK 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.[414] 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 also developed.[415] 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.[416]

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 prediction of oceanographic conditions affecting sub-surface acoustic conditions. Several more civilian radar satellites were being planned or were already under construction. FFI took particular interest in the Canadian commercial RADARSAT-2, which was to provide resolutions down to three metres.[417] NOSA notified 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.[418]

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[413] Pål Bjerke and Richard B. Olsen, En introduksjon til satellitter, pp. 38, 56 (Kjeller: FFI, 2008).
[414] Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, pp. 64-65; The MoD transformed FKN into LDKN in 2002. Forsvarsdepartementet, *Omleggingen av Forsvaret i perioden 2002-2005*, pp. 103-04.
[415] FFI, *Satellittovervåking*, p. 31.
[416] Andersen, *Teknologi og forsvar - drivkrefter for forandring. Et seminar under Forsvarsanalysen 2000*, pp. 24-25.
[417] Solstrand, *Teknologi, forsvar og forsvarsstrukturer*, pp. 63-65.
[418] Norsk Romsenter, Norsk/kanadisk avtale om tilgang på radardata over norske interesser, 278/PES/HS/6416 (Oslo 2002).

RADARSAT-2 was launched in December 2007,[419] 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. 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.[420] Like the Interpretation Centre, this concept was a collaboration between FFI, NIS, and FMGT. KSAT downlinked the data at Tromsø satellite station, and FFI served as a link to the Army's tactical intelligence battalion (*Etterretningsbataljon*), which had its own IMINT section.[421] In addition to RADARSAT-2, FFI used images from 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, FFI aimed to decrease the response time of satellite imagery acquisition. They made an agreement with Digital Globe, which for the net sum of 100 000 USD provided satellite imagery during the ten-day exercise period.[422]

FFI, NIS, and FMGT in collaboration with 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.[423]

When the MoD merged LDKN with the NJHQ and relocated the NJHQ to Reitan in 2009 to command all of Norway's military combat units and departments,[424] 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 at 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 on deviations in expected traffic patterns along the Norwegian coast and the large maritime areas under Norwegian jurisdiction.[425] These activities were performed in close collaboration with the NJHQ, including tactical operation rooms such as the National Air Operations Centre (NAOC),[426] the maritime task group (NorTG), the Coast Guard and the Garrison of South-Varanger (GSV), and relevant civilian actors such as the

[419] "RADARSAT-2," eoPortal Directory, European Space Agency, 2014, accessed 17 January, 2022, https://earth.esa.int/web/eoportal/satellite-missions/r/radarsat-2.
[420] Pål Bjerke, Bruk av kommersielle satellittbilder under Cold Response 2009
En prøve på Forsvarets Satellitt og GeoInformasjonssenter (FSGI), FFI-rapport 2009/00815 (https://publications.ffi.no: FFI, 2009).
[421] Ibid.
[422] Ibid.
[423] FFI, *Satellittovervåking*, pp.. 27-33.
[424] "Reitan (Forsvarets operative hovedkvarter)," Norges forsvar, Store norske leksikon, 2019, accessed 19 January, 2022, https://snl.no/Reitan_-_Forsvarets_operative_hovedkvarter.
[425] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, pp. 65-66.
[426] Nor: Nasjonal luftoperasjonssenter

Customs Service (*Tolletaten*) and the Police security service (PST). Operations were closely supported by INI/CYFOR, the Norwegian Defence Logistics organization (NDLO) and FFI. In 2013 FFI also supplied the Interpretation Centre with a tool for automatic vessel detection to be run in parallel with operative analysis.[427]

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 'you can't really say that they are commercial anymore.'[428] 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.'[429]

2.6. An ear in the sky: Norway's first satellite

Norway's first satellite was launched in 2010 under civilian governance, however 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.[430]

When Norway's General Staff and the MoD decided to terminate the national 'military' satellite project NSAT in 2003 – 2004, FFI instead partnered with NOSA, the Norwegian Coastal Administration (NCA), and Kongsberg Seatex to develop spaceborne AIS technology.[431] 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.[432] Norway already operated a land-based coastal AIS network with a range of 30 – 40 nautical miles[433] and in 2004 a feasibility study concluded that AIS could also detect ships and monitor traffic on the high seas from low Earth orbit.[434]

An increasing number of nation-states were in the 2000s' first decade onwards developing and launching national small, dual-use satellites,[435] and Norway in 2010 became one of them. In

[427] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, pp. 65-66.
[428] 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, United States," interview by Tale Sundlisæter.
[429] 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.
[430] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, p. 70.
[431] FFI, *Satellittovervåking*.
[432] Nærings- og fiskeridepartementet, *Between heaven and earth: Norwegian space policy for business and public benefit*.
[433] Ibid., pp. 63, 72-73.
[434] Gudrun Høye et al., Euclid JP 9.16: Space-based AIS reception for ship identification FFI/RAPPORT-2004/01328 (Kjeller: FFI, 2004).
[435] Brown, "Soft power and space weaponization," p. 71; James Clay Moltz, *Asia's Space Race: National Motivations, Regional Rivalries, and International Risks* (New York: Columbia University Press, 2011); James Clay Moltz, *Crowded Orbits: Conflict and Cooperation in Space* (New York: California University Press, 2014).

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.[436] In July 2010, Norway launched the 20-centimetre cubic AISSat-1, which from polar low-Earth orbit 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.[437] Satellite data was relayed to Norwegian ground stations at Svalbard and 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 to monitor maritime traffic in the South Atlantic Ocean.[438] As we shall see in Part III, in July 2014, Norway launched the successor AISSat-2, and FFI conceptualised a wide range of small satellite platforms and applications for national security purposes.

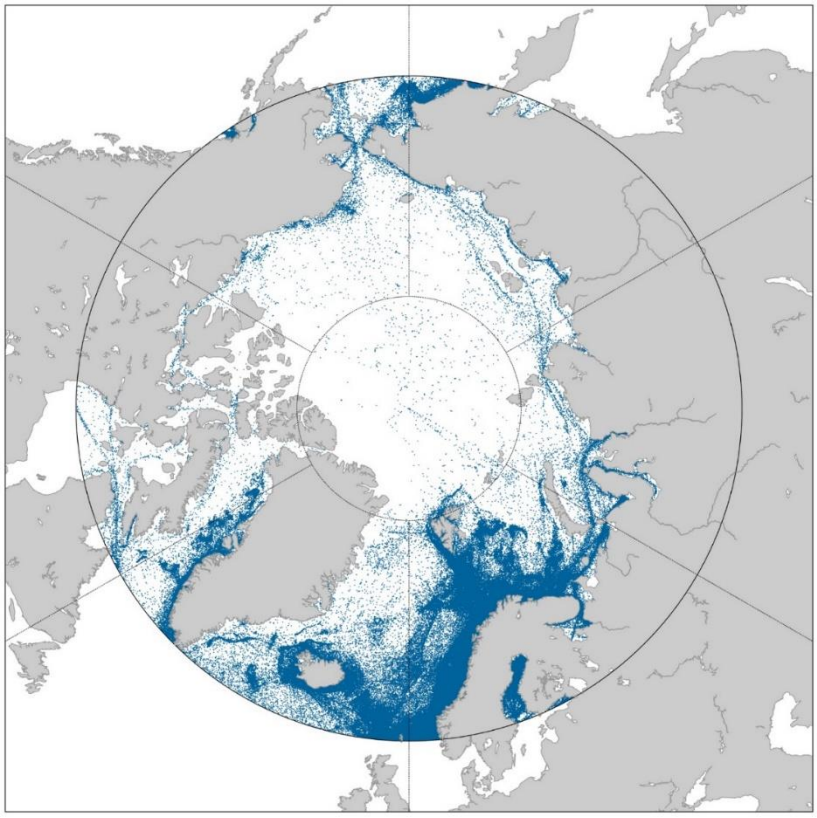

Figure 18: Vessel traffic in the Arctic 2010 – 2012 as observed by AISSat-1.[439]

[436] "NORAIS," Satellitter og baner, Store norske leksikon, updated 5 July 2020, 2020, accessed 18 January, 2022, https://snl.no/NORAIS.
[437] Nærings- og fiskeridepartementet, *Between heaven and earth: Norwegian space policy for business and public benefit*, pp. 63, 72-73.
[438] Ibid.
[439] "Satkom i Arktis (ASK)," Norwegian Space Agency, 2016, accessed 2 March 2022, https://www.romsenter.no/Fagomraader/Satellittkommunikasjon2/Satkom-i-Arktis-ASK.

2.7. 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 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 Torréon because Norway was not a member of the EU. FFI consequentially 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, where Copernicus eventually became useful to the Armed Forces. The MoD 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 USAF, namely Responsive Space Capability.

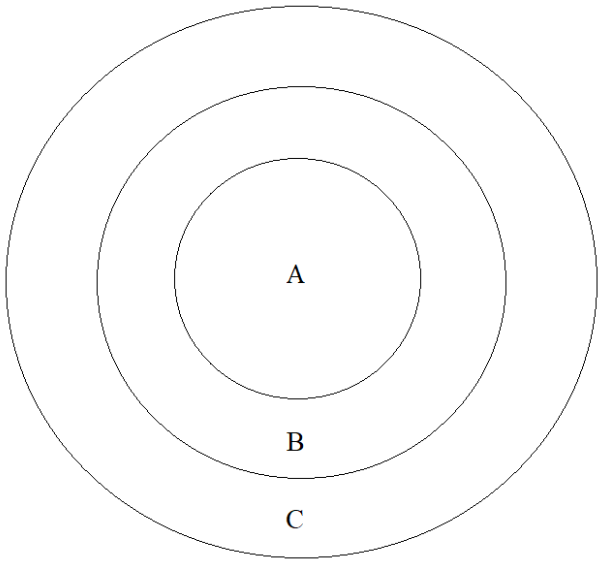

Figure 19: Norwegian collaboration in military space activity from 2000 until 2014

Whereas the role of satellite surveillance dominated the 1980s and 1990s, the Armed Forces, due to US-imported doctrinal concepts such as manoeuvre and net-centric warfare, focused increasingly on SATCOM in the early 2000s. And while Norway's military executives to some extent acknowledged the value of satellite surveillance, they objected to 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. 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 likely also why the MoD advocated the centrality of NOSA's role, and seemingly presumed that NOSA had some insight into national security implications of space activity. Yet, despite the increasing focus on these aspects, Norway's national policy crafted by 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 FFI, NIS, FMGT, Navy, and 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 2014/2015 review, space was in 2007 addressed in Norwegian military doctrine as a physical domain in which satellites constitute nodes in a linked network, which fitted to Norway's focus on military net-centricity. The 2007 Norwegian joint doctrine was thus far the closest to addressing space in a way that did not deviate from national military space activity at the time, although 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.

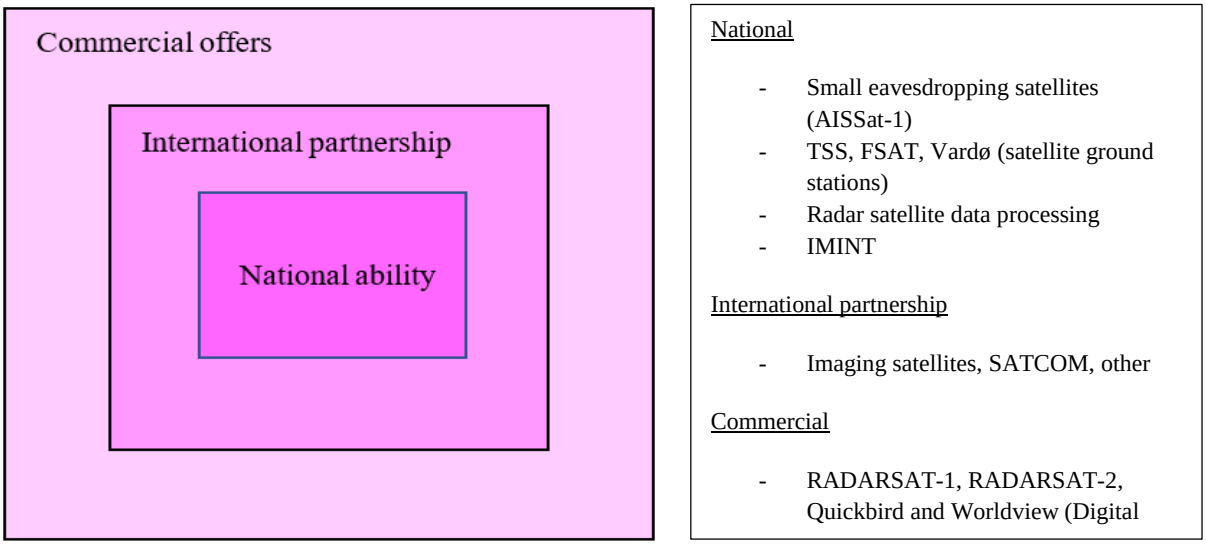

Figure 20: Key capabilities and partnerships ensuring the Armed Forces access to satellite-based capabilities.

Considering Norway's national space capability level as it pertains to Bingen's model, Norway in the early 2000s became an 'opportunistic' space actor. Having added two small eavesdropping satellites to its national space capability repertoire, Norway was by 2014 on its way to become one of the 'inadequate', with the Armed Forces as the biggest user of national satellite data.

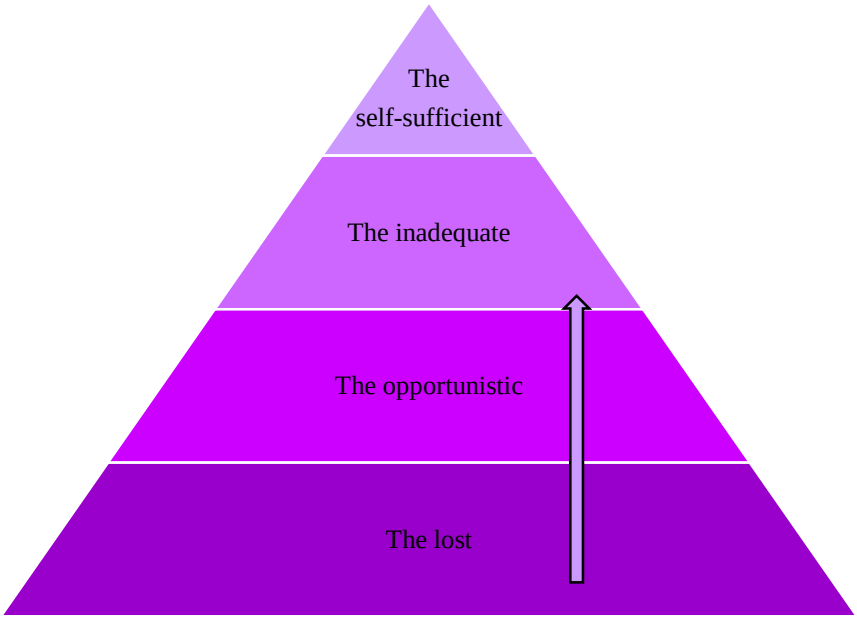

Figure 21: Visualization of Norway's rise towards the 'inadequate' in 2000 – 2014.[440]

[440] Based on Bingen's hierarchical classification of nation-state space actors: Bingen, *Det nære verdensroms strategiske dimensjoner*, pp. 27-28.

Despite these developments, neither the Armed Forces, the MoD, MTIF nor NOSA had paid particular attention to 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 security space a priority. As we shall see in the following chapter, 2014/2015 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.

Part II: The pivotal year of 2014 – 2015 and the organisation of space in the Norwegian Armed Forces

Ca. 2014 – 2022

1. The military space strategic review

2014 – 2015

1.1. Introduction

In the spring of 2014, Russia again brought about ambiguity and a new geopolitical order with their invasion and annexation of the Ukrainian Republic of Crimea and Sevastopol.[441] They 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.'[442] The situation extended to some extent to the Arctic, deemed an area of geopolitical and military-strategic significance to Russia, and NATO in September 2014 adopted a plan to strengthen military capability and presence in vulnerable areas, including the High North.[443]

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',[444] with Norway transitioning into the next concentric circle after Five Eyes (FVEY) in terms of US intelligence collaboration.[445] 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 due to increasing naval traffic in Arctic waters, and because 'countries like Russia are expanding their capabilities in the region.'[446]

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 neighbour countries.[447] Norway was facing 'a more assertive and military capable Russia', and relations between Russia and western states were deteriorating. Through forceful demonstration 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.[448]

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[441] Thomas D. Grant, "Annexation of Crimea," *American Journal of International Law* 109, no. 1 (January 2015).
[442] Clapper, interview.
[443] Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*., p. 15
[444] Clapper, interview.
[445] Clapper and Brown, *Facts and fears: hard truths from a life in intelligence*, p. 256.
[446] Deptula, interview.
[447] Forsvaret, Forsvarets fellesoperative doktrine, (Oslo: 07 Media as, 2014)., p. 18
[448] Forsvarsdepartementet, Ny langtidsplan for forsvarssektoren - anmodning om Forsvarssjefens tilrådning om den videre utviklingen av Forsvaret, (Oslo: Regjeringen, 2014).

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'.[449] 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 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 'stabilizing 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 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.[450]

1.2. 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.[451]

As visualised in Figure 22, 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', i.e., airspace up to 14 000 kilometres, and 'uncontrolled airspace', which was everything above.[452]

[449] Forsvaret, *Forsvarets fellesoperative doktrine*., p. 18
[450] Ibid., pp. 3-4, 7
[451] Jansen, interview; Forsvaret, *Forsvarets fellesoperative doktrine*; Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*; Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*.
[452] Forsvaret, *Forsvarets fellesoperative doktrine*., pp. 19, 21

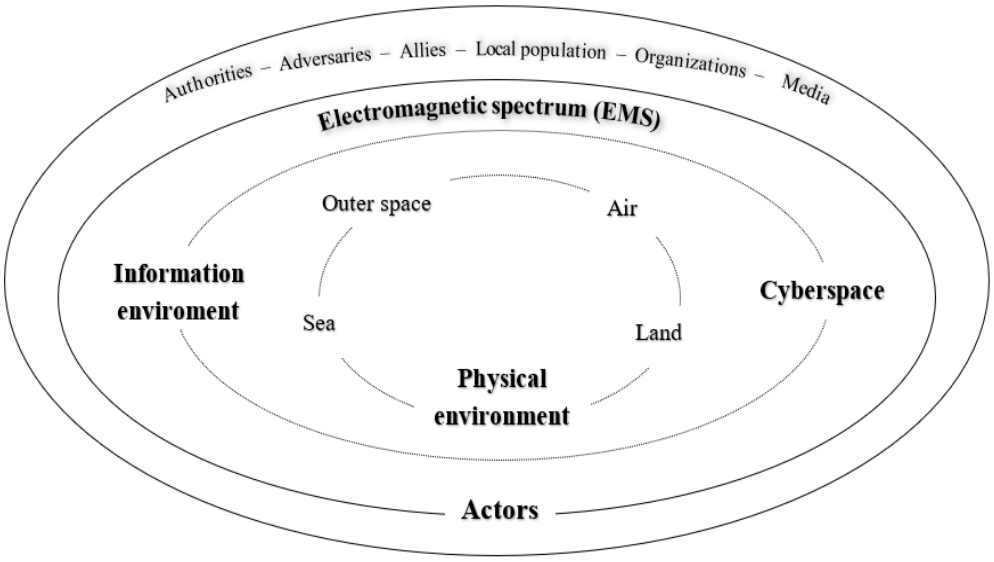

Figure 22: The dimensions of the operational environment.[453]

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.[454]

Likely reflecting the increasing focus on space internationally and within NATO,[455] 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,

[453] The figure is the author's translated version of Figur 2.1. in FFOD 2014: ibid., p. 19.
[454] Ibid., pp. 21-22
[455] 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 Multi-National Experiment 7 (MNE-7) in January 2011 - December 2012, resulting in documents such as the UK MoD's handbook on space dependencies, vulnerabilities and threats. See: UK MoD, Space: Dependencies, Vulnerabilities and Threats, (Shrivenham: The Development, Concepts and Doctrine Centre, 2012).

satellites operated above other nation-states without violating sovereign rights and provided 'enhanced ability to operate globally'.[456] The Norwegian doctrine also referred to the 1967 Outer Space Treaty (OST), stating that the OST prohibits 'deployments of weapons' in outer space.[457] The Norwegian doctrine however failed to specify that the OST only explicitly prohibits deployment of Weapons of Mass Destruction (WMD) in outer space, whereas a ban on the use of conventional weapons in space has for decades been subject to discussion without reaching consensus.[458]

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 operate 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.[459]

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 considering 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'.[460]

1.3. 'The Norwegian Armed Forces needs a space strategy'

As we shall see, 2014 – 2015 would become a pivotal year in the history of Norwegian military space activity. Following the unsuccessful strategy initiative in 2011 under the auspices of INI, Director of FFI John-Mikal Størdal in May 2013 stated in a media interview with Norway's leading engineering journal *Teknisk Ukeblad* that the Armed Forces should prepare a holistic military space strategy. 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

[456] Forsvaret, *Forsvarets fellesoperative doktrine*, pp. 111-12.
[457] Ibid., p. 113.
[458] 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 now avail. See, for example: Freeland, "The Laws of War in Outer Space."; 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 (PAROS), 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.
[459] Forsvaret, *Forsvarets fellesoperative doktrine*., pp. 111-112
[460] Forsvaret, Forsvarets doktrine for maritime operasjoner, (Bergen: Forsvarsstaben, 2015)., pp. 77, 79

'in a completely different way than before'. Such an undertaking was up to the MoD, but FFI would certainly like to contribute to such a strategy.[461]

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 benefited from AISSat-1 launched four years prior, and Størdal was certain that in the future, microsatellites 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 must 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 terms. They should also assess the extent to which space technology could pose a threat in the hands of 'less friendly countries'.[462]

In addition to Størdal's public appeal to the MoD in 2013 and 2014, Størdal and Deputy Director of 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.[463] By the fall 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 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.[464]

Given the recent course of events in Ukraine, the MoD instructed that Defence Study 2015 was to propose nothing less than 'a fundamentally new organizational 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 'untapped opportunities' considering ISR, which was to be a central aspect of the study. And 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 Great Britain, Germany, and the Netherlands, as well as 'selected partners', such as Sweden and Finland.[465]

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[461] 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.
[462] John-Mikal Størdal, "Forsvaret trenger en romstrategi," Opinion, *Aftenposten* (Aftenposten), 27 February 2014, Debatt.
[463] Olsen, interview.
[464] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*.
[465] Forsvarsdepartementet, *Ny langtidsplan for forsvarssektoren - anmodning om Forsvarssjefens tilrådning om den videre utviklingen av Forsvaret*.

1.4. 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? 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 FFI. It was yet too soon 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. To him, the defence study was 'a first instance to kick start some of these thoughts'.[466]

The Admiral said that the military space strategic review had been initiated by FFI, NJQH and NIS, who had issued him a 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.[467]

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,[468] in 1982,[469] which to this day still influenced his thinking about space power. It was about 'exploiting space.' Military operations traditionally encompassed three domains, including air and airpower, 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.[470] 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

[466] Bruun-Hanssen, interview.
[467] Ibid.
[468] Ibid.
[469] In the United States, the US Space Command is associated with Space Control doctrine. See: Lupton, *On space warfare: A space power doctrine*, pp. 29, 67; and: Rumbaugh, *What place for space: Competing schools of operational thought in space*, p. 6.
[470] Bruun-Hanssen, interview; These aspects are predominantly associated with American High Ground doctrine. See: Lupton, *On space warfare: A space power doctrine*, p. 52; and: Hays, Rumbaugh, and Gleason, *Developing a foundational spacepower doctrine: fostering an independent space-minded culture and identity*, p. 3.

singlehandedly acquire ‘weapons that traverse space’, use weapons from space or launch anything into space to ‘neutralize them up there’, the Admiral believed.[471]

As ‘a small state with limited resources and means’, Norway’s interests were not global but focused on Norwegian territory and nearby areas. 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 in a bird’s eye view’, and the Admiral’s primary objective was to ensure continuous maritime surveillance in the High North. 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.[472]

The Armed Forces had conducted military operations using space-based capability for at least ten years, and the 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 their use of ‘cellular phones and the Internet’, i.e. 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’. And it often left the Armed Forces wanting more than they could get.[473]

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 of reducing 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 FFI had convinced the Admiral that the decreasing costs associated with space systems implied 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’.[474]

Norway’s Chief of Defence in January 2015 described the Armed Forces as ‘novices’ in space. Whilst space systems and their national security implications were understood in small

[471] Bruun-Hanssen, interview.
[472] Ibid.
[473] Ibid.
[474] Ibid.

professional environments and amongst a small set of individuals, this understanding was 'motley' and had never been institutionalised in the military organisation. FFI had 'significant competence'. NIS had 'some' competence limited to specific intelligence-oriented matters entrenched in the space domain. The NJHQ 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 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 competences. 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.[475]

As with other military capability, 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. Were the Armed Forces to acquire other space capabilities, such as radar 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:[476]

- 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 more 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

[475] Ibid.
[476] Ibid.

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.[477]

Coincidentally, Admiral Bruun-Hanssen's last position happened to be as Chief of 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 thus testify to the effect of these capabilities. He believed that neither CYFOR nor NIS could provide 'all the answers', whereas 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 organizations', so it was not necessary to be physically present.[478]

Over the coming defence planning period, the Admiral anticipated that the Armed Forces would take great strides towards structuring and 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 to how this would develop, Admiral Bruun-Hanssen was certain the time had come to start the process.[479]

1.5. The working group

In the wake of Defence Study 2015, three representatives including Chief Scientist Richard Olsen at FFI, Deputy Commander of the NJHQ Air Operations Centre (NAOC) Maj. (Air Force) Eirik Ludvigsen, and a NIS representative, formed a working group on 'space activities for security and defence'.[480] This group drove the military space strategic review from the bottom up. During the fall 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.[481] Olsen and the NIS representative were the same individuals that three years prior drafted INI's 'Plan for the Norwegian Armed Forces' use of space 2011 – 2015'.[482] 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.[483]

The attempt in 2011 to establish a national military space strategy was originally triggered by an USAF invitation to sign an MoU on RSC, which made the MoD unsure of how to handle the invitation.[484] The MoD signed this MoU in mid-2014, encompassing research and development of 'rapid operationalization' of space capabilities with the US and Australia, Canada, Germany,

[477] Ibid.
[478] Ibid.
[479] Ibid.
[480] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*., p. 1
[481] Nor: Forsvarets Logistikkorganisasjon (FLO)
[482] Forsvarets Informasjonsinfrastruktur (INI), *Plan for Forsvarets bruk av rommet 2011 - 2015 V 0.1*.
[483] Olsen, interview.
[484] Ibid.

Great Britain, Italy, the Netherlands, Norway, Spain, and Sweden. Norway also considered to participate in military satellite projects such as the German SAR-Lupe, the French Helios, and the European Multinational Space-Based Imaging System (MUSIS). There was a pending inquiry to participate in Canada's RADARSAT Constellation Mission (RCM), and 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 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.[485]

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.[486] 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 SSA, 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.[487] 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.[488]

Indisputably, 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 on all levels of leadership, command, and operations, including the political, strategic, operational, and tactical levels. The 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,[489] thus representing Stractic Intelligence doctrine.

1) Satellites can help Norwegian authorities discover events and understand the significance of these events
2) Satellites can support Norwegian society with timely information

[485] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*., pp. 5, 55-60
[486] Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."
[487] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*., p. 75
[488] Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."
[489] Ibid.

3) The intelligence collection activity in itself and the importance of national autonomy in that respect is significant.

A fourth point supported Stractic Intelligence as well as Force Enhancement doctrine:

4) Space can support the execution of military power, spanning from maintaining sovereignty during peacetime to crisis management and warfare operations.[490]

Despite having progressively scaled down the Armed Forces since the end of the Cold War, Norway's political elite expected to continuously increase military efficiency by streamlining the military organisation and modernising its capacities. 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 NIS had consistently supported the Armed Forces with space capability, i.e., SATCOM and space-based ISR, in an extemporary and event-driven manner.[491]

1.6. 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 posture a holistic representation of the Norwegian military sector and develop relationships with relevant civilian actors, such as the National Security Authority (*Nasjonal Sikkerhetsmyndighet*, NSM) and NOSA. This effort to address and comprehend the space domain within the Armed Forces was by far unprecedented in Norway.[492]

Most of the participants held the rank of lieutenant colonel or the equivalent, and the group included participants working at all levels of the defence structure, i.e., representing political, strategic, operational, and tactical military units, respectively. Three of the military officers,

[490] Ibid.
[491] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*., p. 75
[492] Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."

two Navy and one Army, were currently serving as MoD staff officers (not counted as MoD personnel Figure 23).[493]

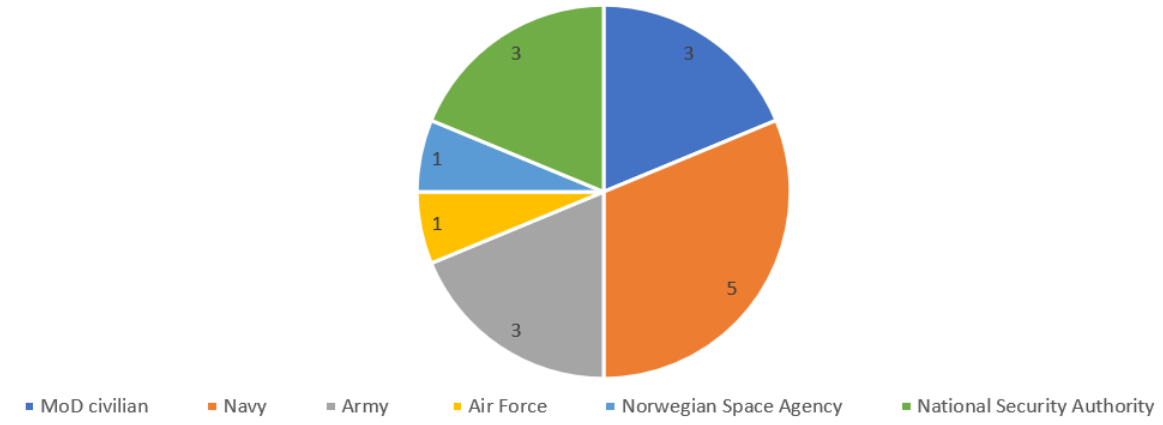

Figure 23: Composition of the space reference group categorised by affiliation.

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 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.[494]

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 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 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 into the next LTP process.[495] The visualisation of the group's composition in Figure 24 incorporates that some participants represented more than one function:

[493] Ibid.
[494] Ibid.
[495] Ibid.

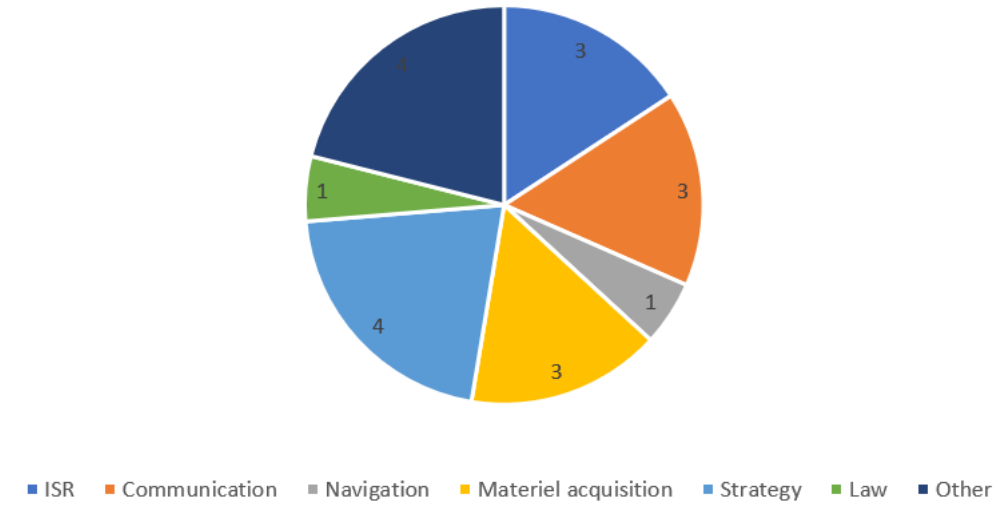

Figure 24: Composition of the space reference group categorised by background.

Throughout the meetings, the working group briefed the reference group on the status and progress of their work and inquired feedback and discussions on selected topics. They asserted before the reference group that this military space strategic review was based on the following axiom:

- 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.[496]

1.7. 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 getting 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

[496] Ibid.

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 the society's need for maritime ISR be 20 – 25 years from now?[497] 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, and a consensus emerged amongst the representatives that it was surely 'high time' to undertake this military space strategic review.[498]

An essential task was to identify military requirements. It was early decided that the military space strategic review would prioritise national concerns and 'what we do here at home', while international aspects were secondary. They decided to keep a clear focus on the High North.[499] 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 overall.[500]

At least one participant openly disagreed with this approach and stated they should rather focus on 'the basic function of military activity' wherein 'the state is obligated to protect its citizens'. On par 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 is 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.[501]

Going forward, the Armed Forces either had to reinforce their resources or make better use of what they already had. For example, there was a cross-sectorial interest for a 'space security analysis' that entailed all the four 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 NSM had similar plans. The MoD representative with a legal background inquired whether this space security strategy development should be managed by the MoD?[502]

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

[497] Ibid.
[498] Ibid.
[499] Ibid.
[500] Ibid.
[501] Ibid.
[502] Ibid.

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 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 program, and it would be 'highly preferable' to achieve a functional interplay between the civil and the military sectors.[503]

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 was overall responsible for ISR, although 'bits and pieces' of this responsibility was 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.[504]

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 '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.[505]

Prior to the meetings, the participants were given the situational analysis stating that the Armed Forces was 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'.[506] 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 the best way to counter vulnerability was with 'more satellites'. The MoD

[503] Ibid.
[504] Ibid.
[505] Ibid.
[506] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*., p. 74

had opposed Norwegian participation Galileo that added to the overall robustness in available GNSS systems, however.[507]

Within this context, must the Armed Forces 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'. And 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.[508]

One claimed there to be 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 [509] It would also be 'useful' for the Armed Forces to establish an 'ambition level', which they had not yet done. Another proposed to define the current ambition level as 'low', adding that NATO's current ambition level was 'also not very high'. Norway had to ensure monetary funding, but also 'national space systems competence'. What were the ambitions with respect to education? Indeed, capability entailed both organisational, personnel and human resources.[510]

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 maritime patrol aircraft, 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?[511]

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.[512] 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.[513] At least one participant noted

[507] Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."
[508] Ibid.
[509] Ibid.; This supposition was also implied by Aliberti, Cappella, and Hrozensky, *Measuring Space Power*.
[510] Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."
[511] Ibid.
[512] Ibid.
[513] Ibid.; 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.

that the military operational gain provided by space capabilities must justify the costs,[514] although the working and reference group members were overall significantly less focused on budgetary requirements compared to the Chief of Defence and the MoD.[515]

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 thesis 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 more in detail in subsequent chapters.

1.8. 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 that: '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.'[516]

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 and substantiated timely decisions and response. Military space investment was necessary to modernise the Armed Forces considering 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'.[517]

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 study herein illustrated satellite capability along with vessel, aircraft -and early warning radar.[518]

[514] Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."
[515] Bruun-Hanssen, interview; Bø, interview.
[516] Forsvaret, Twitter, 1 October, 2015.
[517] Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*., pp. 4, 25, 36
[518] defe

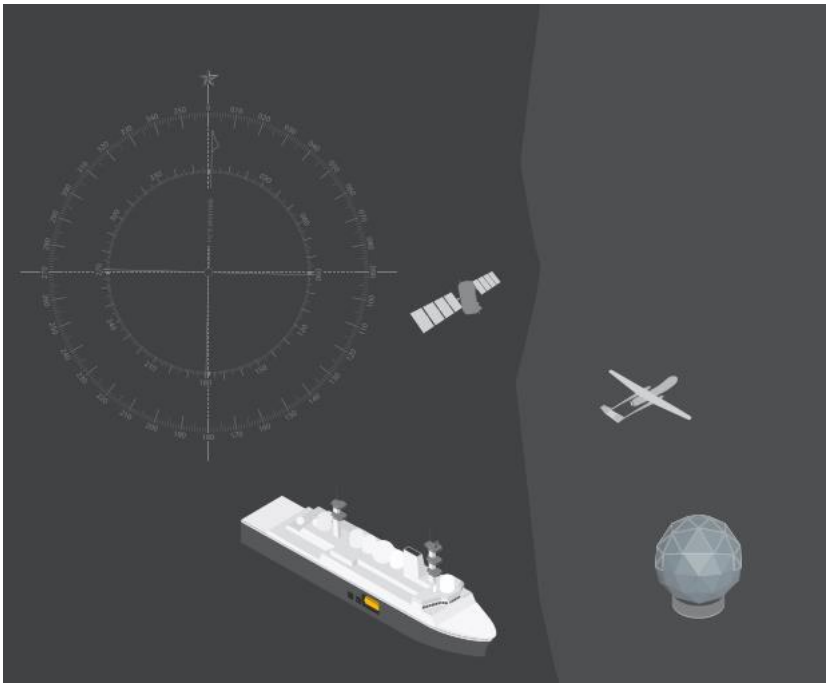

Figure 25: The role of satellites in Norway's first threshold defence level.[519]

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 on 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.[520]

Considering maritime surveillance and situational awareness, the study recommended to replace 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 ASW 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 airbase south-east of Andøya, and Andøya airbase would be closed.[521]

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

[519] Forsvaret, *Et forsvar i endring: Forsvarssjefens fagmilitære råd*, p. 37.
[520] Ibid., pp. 37, 75-76
[521] Ibid., pp. 52-53, 75

in several types of operations, Norway had to strengthen its military real-time communications and target data transfer capability.[522] 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.[523]

Defence Study 2015's intent to make space a national military high priority focus area was absolutely unprecedented in Norway. Following the publication of the study, this aspect however went almost unnoticed in public debates, which focused on the 'more traditional issues' related to the land, air, and naval domains.[524]

1.9. Chapter conclusion

A central aspect of Norway's thus far unwritten military space strategy entailed using space as a strategic bargaining tool in an allied context. And 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.

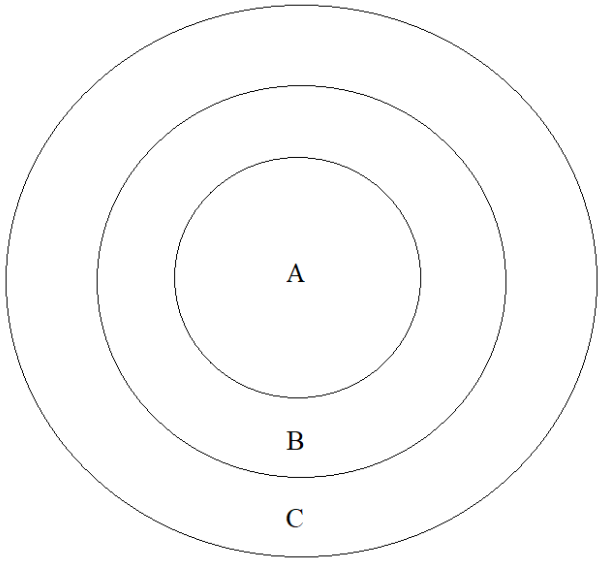

Figure 26: Norwegian collaboration in military space activity in 2014/2015

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

[522] Ibid., pp. 4, 25, 36
[523] Ibid., 86., p. 86
[524] Stig Eivind Nilsson, "Fremtiden er her: Space er det femte domene i et femte generasjons forsvar," Opinion, *Forsvarets Forum* (www.forsvaretsforum.no) 2017, https://forsvaretsforum.no/fremtiden-er-her/114217.

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 throughout the years and decades. 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 national civil and military sectors. At ministerial level this principally entailed the MoD and 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 who were now driving the bottom-up military space strategic review. They included FFI, 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 were the only military operating unit that over the years had addressed space in Norwegian joint military doctrine. According to 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.

Defence Study 2015 was principally a question of overhead surveillance and communication. However, 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 were appointed the role as Norway's military space authority, this operating unit might prioritise its own mission. It was also not clear who was responsible for what considering ISR in the Armed Forces, where the Defence Staff and not NIS was overall responsible for ISR. Moreover, the Defence Staff had delegated 'bits and pieces' of this responsibility, although no one seemed to have the overview.

The joint meetings showed that space was currently valued predominantly for its function in strategic intelligence, i.e. 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. The following Defence Study 2015 was unprecedented as it proposed that satellites and other emerging technologies could be used to replace traditional and existing military space capability.

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 of poor SATCOM coverage at high altitudes. It can be understood that the academic environment authoring 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.

2. The promising era of Program Space

Ca. 2015 – 2020

2.1. Introduction

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. China continued to fortify the PLA, whose Navy in 2018 constituted more than 300 vessels and surpassed the naval forces of the US. Disputes emerged between the US and the larger European countries, some of which were also increasingly rivalling each other.[525] These circumstances, in addition to the declining influence of the UN as the larger nation-states progressively managed their relations outside of consensus-oriented arenas, made it more challenging for small and medium powers to maintain their national interest.[526]

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.[527] To meet these challenges, the MoD decided to further invest in NIS and 'future-oriented, strategic capacities' to reinforce Norway's national ability to maintain situational awareness and control in its vicinity.[528]

Norway also took note of Russia's use of network-based intelligence operations in Ukraine and identified several vulnerabilities tied to the Norwegian society's comprehensive use of information and communication systems. Given Norway's geographical extent, topography, and resources, SATCOM was identified a key element in Norway's national electronic communications structure, and critical infrastructure and societal functions depended 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.[529]

2.2. ESA's escalating 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

[525] Utenriksdepartementet, Norges roller og interesser i multilateralt samarbeid, Meld. St. 27 (2018-2019), pp. 21-22 (Oslo: Utenriksdepartementet, 2019).
[526] Ibid., pp. 6, 24.
[527] Else-May Botten et al., Representantforslag fra stortingsrepresentantene Else-May Botten, Odd Omland, Torstein Tvedt Solberg og Eirik Sivertsen om å sikre bredbåndstelekommunikasjon i nordområdene, Representantforslag 76 S (2015-2016) (Oslo: Stortinget, 2016).
[528] Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*, pp. 3,5.
[529] Olav Lysne et al., Digital sårbarhet - sikkert samfunn: Beskytte enkeltmennesker og samfunn i en digitalisert verden, NOU 2015:13 (www.regjeringen.no: 07 Aurskog AS, 2015)., pp. 100, 118

(DLR), expressed that '[w]e live in a world where security becomes more and more important…' and ESA could certainly contribute to this aspect.[530]

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 programs through ESA membership. Reflecting upon the EU's rise as a space power, the ESA 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 ensures each member state an equal vote. For the EU to absorb ESA, the states had to give up their national identities, 'which will never happen…'.[531]

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 both 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 be contradicting each other', notions such as 'security' and 'defence' were acceptable.[532]

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 by 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 of 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. And 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.[533]

[530] Wörner, interview.
[531] Ibid.
[532] Ibid.
[533] Ibid.

2.3. Norwegian national (security) space policy and doctrine

In 2016, Norway established an interdepartmental 'Space Security Committee' as part of the overall national organisation to coordinate and adminster 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 the Ministries of Defence, Justice and Emergency Preparedness, Trade, Industry, and Fisheries, Local Government and Modernization, Transport, and Foreign Affairs, as well as NSM, PST, NIS, the Directorate for civil protection (*Direktorat for sikkerhet og beredskap*, DSB), the National communications authorities (*Nasjonal kommunikasjonsmyndighet*, NKOM) and NOSA.[534]

2.3.1. Norway's third space policy

It had been mentioned during the military space strategic review in 2015 that several national actors were contemplating to establish a national security space strategy.[535] This effort never materialised as a dedicated strategy but was incorporated into Norway's third national space policy issued by 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.[536]

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 cyber 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.'[537]

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'.[538]

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[534] Nærings- og fiskeridepartementet, Høytflyvende satellitter – jordnære formål — En strategi for norsk romvirksomhet, Meld. St. 10 (2019–2020), p. 33 (www.regjeringen.no: Nærings- og fiskeridepartementet, 2019).
[535] Sundlisæter, "Defence Study Space Reference Group Meetings: 3 February, 23 February and 15 April 2015, Myntgata 1, Oslo, Norway [in Norwegian]."
[536] Nærings- og fiskeridepartementet, *Høytflyvende satellitter – jordnære formål — En strategi for norsk romvirksomhet*, pp. 31-33.
[537] Ibid., , p. 31.
[538] Ibid., p. 52.

2.3.2. Space in Norwegian military doctrine

In late 2018 and 2019, the Armed Forces published new doctrines for air and joint operations, respectively.[539]

The 2018 air doctrine was authored by two academics at the Royal Norwegian Air War College, who based their work on other air force 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.[540] 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.[541]

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'.[542] 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.' [543] It also noted that SATCOM and PNT capability provided 'operational support' and that 'Norwegian military commitment to space is sober'.[544]

The Armed Forces also issued a new joint doctrine in late 2019. FFOD 2019 resembled its predecessor. It underpinned 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 of cyber-attacks'. The doctrine here noted that ground, user -and link components

[539] Lars Peder Haga and Ole Jørgen Maaø, Forsvarets doktrine for luftoperasjoner (2. opplag), (Oslo: Forsvaret, 2018); Forsvarets stabsskole, Forsvarets fellesoperative doktrine, (https://fhs.brage.unit.no: Forsvarsstaben, 2019).
[540] Ole Jørgen Maaø, "Verdensrommet i den nye luftdoktrinen," *Luftled*, no. 1 (April 2019): , p. 11.
[541] Ibid.
[542] Ibid., , p. 10.
[543] Ibid., , p. 11; Haga and Maaø, *Forsvarets doktrine for luftoperasjoner (2. opplag)*.(Chapter 2.2.)
[544] Maaø, "Verdensrommet i den nye luftdoktrinen,", p. 11; Haga and Maaø, *Forsvarets doktrine for luftoperasjoner (2. opplag)*.(Chapter 5)

were often easier to attack than space segment, i.e. the satellite. Only the great space powers were currently capable of kinetic incapacitating satellites by kinetic impact.[545]

2.4. MoD State Secretary's views on military space activity

In February 2016, 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 'it might be a little too expensive in relation to what it tastes like'. The MoD's longstanding, *de facto* space policy remained largely unchanged, but it was 'new' that the MoD now understood that they did indeed depend on satellite capability. To meet their 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' and secure 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'.[546]

To the State Secretary, politics was about making decisions and then trusting 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 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 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 'stretch a little to try and satisfy us', 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.[547]

Norway's national space policies [issued by MTIF in 1986 and 2013] had refrained from addressing military space considerations, and State Secretary Bø believed this to partly due to

[545] Forsvarets stabsskole, *Forsvarets fellesoperative doktrine*, pp. 114, 22-23.
[546] Bø, interview.
[547] Ibid.; As opposed to State Secreatry Bø, the Deputy Director of FFI's Air and Space Systems Division believed that as late as 2016 - 2017, NOSA's as well as the Armed Forces' own understanding of Norway's military space requirements were hardly understood: Olsen, interview.

the US 'Star Wars' [SDI] program of the 1980s and the associations it had ingrained in the minds of the Norwegian people. He believed 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'.[548]

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 FFI's military research. Similarly, the MoD allocated its research and development funds, currently some two billion NOK, exclusively to FFI. This civil-military separation was 'artificial' and ought to change, however, to attain increased synergy effects overall between the sectors.[549]

While several of Norway's military executives emphasised during this time that Norway's cross-sectorial space collaboration was, at best, suboptimal,[550] State Secretary Bø had 'not heard any voices' indicating 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'.[551]

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, 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

[548] 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: Erik Klippenberg, Gunnar Stette, and Bjørn Grandal, Forsvar mot ballistiske raketter - de tekniske og vitenskapelige sider ved USAs strategiske forsvarsinitiativ SDI, (Oslo, USA: Statsministerens kontor, 1985).
[549] Bø, interview; The State Secretary's observations were not entirely correct. Norway's civilian space activities and associated funding originated from MTIF and was channeled through NOSA, not the Norwegian Research Council: Olsen, interview.
[550] 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.
[551] Bø, interview.

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'.[552]

Going forward, the MoD and 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.[553]

2.5. 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.[554] The MoD therefore stood up an interim space program 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, NJHQ, CYFOR, and NIS each had their own environments and subject matter expertise located in different places, and their use of resources was fragmented and appeared disorganised. The Armed Forces were spending 100 million NOK annually on space without following an overall plan. One of the main objectives with establishing Program Space was therefore to coordinate these actors and their investments, capabilities, and resources.[555]

In January 2016, Head of the MoD's LTP Division Rear Admiral Elisabeth Natvig and Director of Defence Planning Brig. Gen. Inge Kampenes inquired NDLO, NJHQ, the Defence Staff, NIS, NSM, FFI, and the Defence Materiel Agency (NDMA) to dispatch personnel to solve four core tasks:[556]

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[552] Ibid.
[553] Ibid.
[554] Forsvarsdepartementet, Forsvarssektorens utnyttelse av verdensrommet, 2016/50010-1/FD IV 2/SENIB (www.regjeringen.no: Forsvarsdepartementet, 2016).
[555] Stig Eivind Nilsson, "Interview with Col. Stig Eivind Nilsson (Royal Norwegian Air Force), former head of 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.
[556] Forsvarsdepartementet, *Forsvarssektorens utnyttelse av verdensrommet*.

- 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 FFI, but not excluding research communities at home or abroad.[557]

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.[558]

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 competencies 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 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.[559]

In June 2016, the MoD issued their LTP for 2017 – 2020, which echoed former defence policies considering 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.[560] The new plan also

[557] Ibid.
[558] Nilsson, interview.
[559] Ibid.
[560] Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*, pp. 25, 35-36.

embodied the increasing number of space actors, including Norway, that was driven by technological developments and decreasing costs related to space technology. Dual-use satellites, such as the Norwegian AIS satellites, were proliferating.[561] 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, 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 current use of resources, and clarify roles and responsibilities. To achieve this, the MoD would establish a program to implement ambitions and plans for structural development and military space investments.[562]

This embodied the formal establishment of Norway's military space program, dubbed Program Space, that had been stood up during the autumn of 2015 as a temporary structure within the MoD to provide a 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 Program Space was to be managed by the ministry, from January 2017 until the end of 2019.[563] It constituted an element subordinate to the LTP division and was tasked to coordinate and manage investments, implement approved ambitions, recommend future organisation, roles and responsibilities, and ensure a holistic coordination of national and international collaboration.[564]

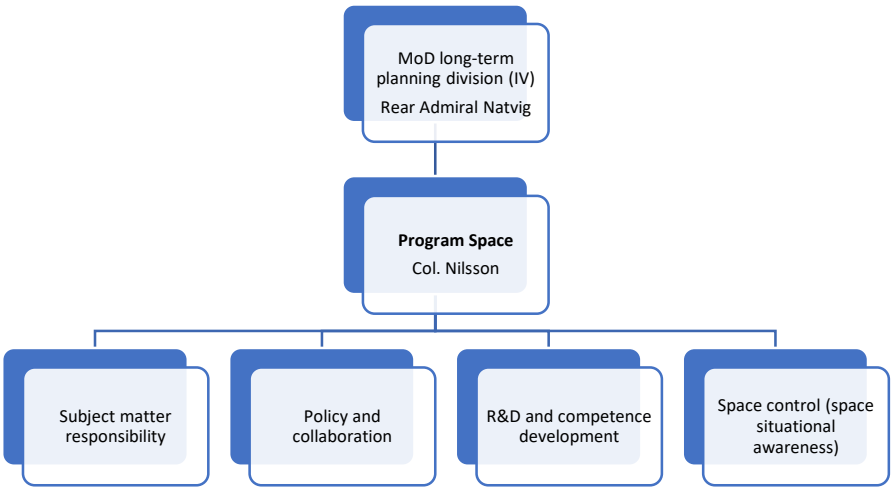


Figure 27: Organisation of Program Space within the MoD.

[561] Ibid., pp. 35-36
[562] Ibid., pp. 102-103
[563] Nilsson, interview.
[564] Nilsson, *Forsvarssektorens satsing på Space: "Nøktern og Trinnvis"*.

2.6. 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 program 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. 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 28 below.[565]

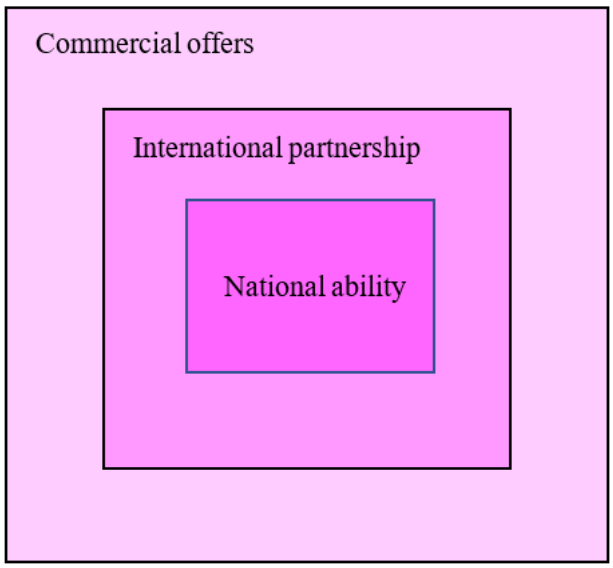


Figure 28: Reproduction of Program Space's model for military access to space.[566]

Norway's most critical needs encompassed maritime SATCOM and microsatellites 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 FFI. Program Space however focused on a project that entailed a national 'large satellite' to be deployed in HEO for operational SATCOM capability in the High North.[567]

[565] Ibid.
[566] Ibid., p. 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."
[567] Nilsson, *Forsvarssektorens satsing på Space: "Nøktern og Trinnvis"*.

The Program Space investment plan in 2017 included key capabilities such as GPS, Wideband Global SATCOM (WGS), 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.[568] 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.[569] 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 FFI were exploring additional ESM concepts.[570] Additionally, NOSA during this time prolonged the agreement with RADARSAT,[571] and ensured that the Armed Forces acquired up to 30, 000 radar images annually from the Copernicus program.[572]

Norway also signed a bilateral agreement with United States 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 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.' USSATRATCOM, on the other hand, intended to establish similar agreements with 'all space-faring nations', so the agreement was far from unique in that respect.[573]

2.7. 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.'[574] 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 very passive role'. Col. Nilsson

[568] Ibid.
[569] Nilsson, interview; Næringskomiteen, Innstilling til Stortinget fra næringskomiteen, Innst. 330 S (2017-2018) (Oslo: Stortinget, 2018).
[570] FFI, Historien om SMART MilSpace, (2022).
[571] Nilsson, interview.
[572] Wahl, interview; In 2017, FFI concluded that the Sentinel-1 satellites were 'a great step forward' considering space-based operational vessel detection. See: Tonje Nanette Arnedsen Hannevik et al., Arctic maritime surveillance with Sentinel-1 data using a Norwegian collaborative ground segment, (www.ffi.no: FFI, 2017).
[573] United States Strategic Command Public Affairs, "U.S. Strategic Command, Norway sign agreement to share space services, data," news release, 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/.
[574] Nilsson, interview.

observed that this did not at all align with Norwegian joint doctrine, 'which has no roots in reality'.[575]

In FFOD 2014, for example, space was addressed as an extension of the air domain, although the Air Force had never been involved in space activities. Norwegian joint doctrine appeared to have been written by academics, detached from actual military organisation and activity, which led Col. Nilsson to question the overall purpose of Norwegian military doctrine. Were they premise-based documents or best practice descriptions? 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 'sufficiently vague and sufficiently clear.'[576]

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, NIS and NJHQ were present at this meeting and had according to Col. Nilsson already endorsed the proposal. It had also been somewhat coordinated with the recently published national military doctrine for air operations.[577]

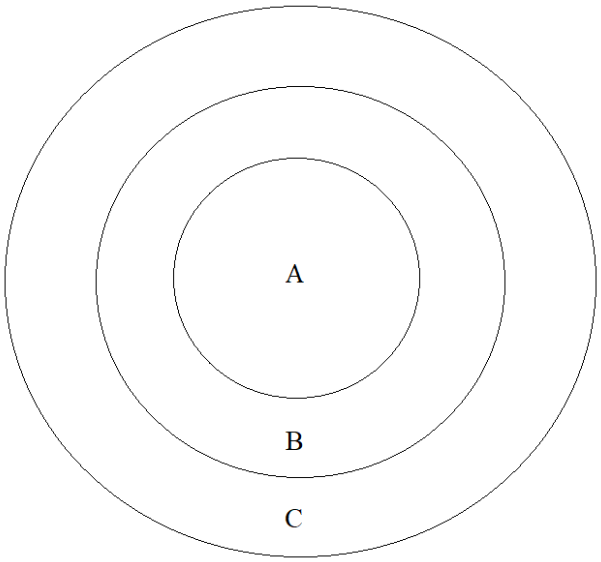
'It was for once somewhat synchronised with the doctrines.' Although no final decision had been made, Col. Nilsson believed 'it was always in the cards, partly due to parity with other nations and to get the players involved, that the Air Force should have a role.' NATO was hosting "air and space" congregations, and it was 'natural' that the Air Force should have a leading role in Norway as well.[578] 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 make consolidate the appointment of Norway's military space authority.[579]

2.8. 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 program during this time, and ESA was progressively focusing on delivering space-based services for national defence and security purposes.

[575] Ibid.
[576] Ibid.
[577] Haga and Maaø, *Forsvarets doktrine for luftoperasjoner (2. opplag)*; Forsvarets stabsskole, *Forsvarets fellesoperative doktrine*.
[578] Nilsson, interview.
[579] Ibid.

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, underpinning that the High North was indeed Norway's most important geostrategic area of interest.



A. United States, Canada, The Netherlands
B. NATO, ESA/EU
C. RSC (US-led)

Figure 29: Key pillars of Norwegian collaboration in military space activity during the era of Program Space

The MoD was as usual principally concerned with financial aspects, which was why the MoD continued to uphold the role of 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 MTIF, who 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 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 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, NIS, NJHQ, CYFOR and 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 NIS, 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. Like 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.

3. The battle for space authority in the Norwegian Armed Forces

Ca. 2020 – 2022

3.1. Introduction

This era's geopolitical situation is dominated by Russia's invasion of Ukraine on 24 February 2022. Although US, British, and some European small-state intelligence services warned of Russia's plans and intentions well before the invasion, the threat was largely underestimated, and the invasion stunned the international community.[580]

The war 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 by the former head of NIS in March 2016 that news agencies are using satellite images 'almost as an intelligence service would have done ten to twenty years ago'.[581] For example, Norwegian media and NIS both used the same commercial satellite image (Figure 30) obtained from Maxar Technologies to verify the build-up of Russian forces in Voronezh, 190 kilometres from the Ukrainian border.[582]

Figure 30: Russian military materiel in Voronezh in the fall of 2021.[583]

[580] Neveen Shaaban Abdalla et al., "Intelligence and the war in Ukraine: Part 1," *Russo-Ukrainan war, War on the Rocks*, 30 June, 2022, https://warontherocks.com/2022/05/intelligence-and-the-war-in-ukraine-part-1/.
[581] Grandhagen, interview.
[582] Etterretningstjenesten, Fokus 2022, p. 10 (https://www.forsvaret.no: Forsvaret, 2022); Maria Lavik, "Norske diplomat-veteranar trur ikkje på storkrig," *Vårt land* (https://www.vl.no), 20 January 2022.
[583] Photo taken by Maxar Technologies in 2021. The image was retrieved from: Lavik, "Norske diplomat-veteranar trur ikkje på storkrig."

3.2. Space in Norwegian defence policy

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 considering 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:[584]

- 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'.[585]

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, to integrate space as an operational domain in the Armed Forces. This 'key element',[586] which the 2019 space policy had referred to as the Armed Forces' 'professional space authority',[587] was the unit formerly known as Program Space within the MoD. In January 2020, this unit warped into the Space Operations Section within the Defence Staff, before it would become known as the Space Division within NIS as of January 2022 in the wake of an internal power struggle between NIS and the Air Force.[588]

Following the Russian invasion of Ukraine in February 2022, the MoD further bolstered NIS and maritime surveillance activities in the High North, and escalated Norway's frigate, submarine, corvette, and Coast Guard activity.[589] In March, the MoD issued an urgent white paper accounting for immediate measures to strengthen the Armed Forces' operational capability, stating that national drone -and satellite capabilities, P-8, and F-35 would contribute more 'in the maritime domain.'[590] The MoD also reinforced their intent 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.[591]

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[584] Forsvarsdepartementet, *Evne til forsvar - vilje til beredskap. Langtidsplan for forsvarssektoren*, pp. 108-09.
[585] Ibid.
[586] Ibid., p. 108.
[587] Nærings- og fiskeridepartementet, *Høytflyvende satellitter – jordnære formål — En strategi for norsk romvirksomhet*, p. 52.
[588] Stig Nilsson, Space i Forsvaret: Det femte operasjonsdomene i et femte generasjons forsvar, p. 7 (2021).
[589] 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/.
[590] Forsvarsdepartementet, *Prioriterte endringer, status og tiltak i forsvarssektoren*, pp. 42-43.
[591] Ibid., p. 38.

3.3. The short-lived era of the Space Operations Section

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 ends the era of Program Space, and the era of the Space Operations Section begins.[592] Program Space transferred to the Defence Staff along with almost all its resources and personnel, and the Chief of Defence organized it as a section under the Operations Division headed by Maj. Gen. Yngve Odlo (Army). Col. Nilsson continued to serve as head of what was now known as the Space Operations Section (*Romoperasjonsseksjonen*).[593]

Col. Nilsson's original plan was to remain 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 of Defence in August 2020. The idea was to ensure a continuation of the strategic perspective on space under the new Chief of Defence.[594]

3.3.1. Space and the military: the Air Force as military space authority

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 to transfer 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.[595]

The appointment spurred a debate concerning ISR, where 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 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.[596] 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.[597]

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[592] Nilsson, interview.
[593] Maj. Gen. Odlo was promoted to Lieutenant General (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 brought these perspectives with him into his new role as Commander of the NJHQ.
[594] Nilsson, interview.
[595] Ibid.
[596] Ibid.
[597] Runar Jørgensen and Eirik Ludvigsen, "Etterretning, overvåking og rekognosering i "New Space"," *Luftled*, no. 1 (April 2019).

In May 2020, the Space Operations Section, still formally a section under the Defence Staff, moved into new offices at Skøyen in 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 co-location 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 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.[598]

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.'[599] Civil-military cooperation was essential. Actors such as Statsat and the Norwegian Coastal Administration were also important, as was FFI, one of Norway's 'most important drivers' in military and civilian space research and development for decades.[600]

The Space Operations Section started to plan according to Admiral Bruun-Hanssen's appointment of the Chief of the Air Force as military space authority as of January 2021.[601] 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 appoints 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'.[602]

To prioritise the use of maritime satellite surveillance, SATCOM and space-based PNT capability in joint operations and exercises, the Chief of NJHQ was appointed 'Space Coordinating Authority'. In addition to joint elements for land, air, sea and cyber, 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 naval operations, and the planned space operations centre would establish 'an understanding of space as a

[598] Nilsson, interview.
[599] Ibid.
[600] Ibid.
[601] Ibid.
[602] Eirik Ludvigsen, "Militær 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.

domain' in the Armed Forces. They would follow up on space-based projects, control 'future satellites', and carry out other space operations-related tasks.[603]

3.3.2. Space and intelligence: the Intelligence Service as military space authority

Despite their outwardly steady course, the Space Operations Section never made it to the Air Force. When Gen. Kristoffersen took the helm as Chief of Defence in mid-August 2020, he reversed Admiral (Ret.) Bruun-Hanssen's plans within less than three weeks, on what to some seemed like a whim.[604] Admiral Bruun-Hanssen however 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 program should be continued in the Defence Staff, the Air Force Staff, or NIS. At times, there was also 'too much focus on "the space program" rather than the actual capacities and services that the Armed Forces wanted to acquire.'[605]

Chief of Defence Gen. Kristoffersen recalled that once he took the helm of the Armed Forces in August 2020, the outbound Chief of 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 NIS maintained that 'Program Space' was directly working against its purpose. This was happening mainly because 'Program Space' did not have insight into the extensive space activities carried out by NIS, which constituted a significant proportion of military space activity in Norway.[606]

Having worked with satellite-based information for decades, 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 NIS recommended to the new Chief of Defence that as a starting point, 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 consequentially asked the Chief of NIS to take on the role as Norway's military space authority.[607]

With that, it was swiftly decided that the Space Operations Section would no longer be added to the Air Force, but to NIS.[608] Within 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".[609] NIS absorbed the associated personnel resources and significantly increased its operations budget, 'because there were significant resources tied to the professional authority's

[603] Ibid.
[604] Nilsson, interview.
[605] Haakon Bruun-Hanssen, "E-mail correspondance with former Chief of Defence Admiral (Ret.) Haakon Bruun Hanssen: "space", 18 July 2022," interview by Tale Sundlisæter, 2022.
[606] Eirik Kristoffersen, "E-mail correspondance with Chief of Defence General Eirik Kristoffersen: "Program Space", 10 June 2022," interview by Tale Sundlisæter, E-mail, 2022.
[607] Ibid.
[608] Nilsson, interview.
[609] Nilsson, *Space i Forsvaret: Det femte operasjonsdomene i et femte generasjons forsvar*, p. 7.

responsibility for space.'[610] In addition to being Norway's commanding authority for intelligence, the Chief of NIS now also acted as Norway's commanding authority for military space activities.[611] Col. Nilsson's main question to this approach was how the Chief of NIS would handle this 'double-hat'?[612]

In May 2022, Chief of NIS Vice Admiral Stensønes, who took the helm of NIS in November 2020 after the former Chief of NIS had convinced Gen. Kristoffersen to appoint NIS as military space authority, could not explicitly comment on considerations related to the Air Force. He observed however that most countries organised their military space activities within their air forces, 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 NIS did have 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. And in Norway, NIS supported all the strategic levels, including the political, strategic, operational 'and down to tactical level' with a decision-making basis derived from satellites and other collection platforms.[613]

Vice Admiral Stensønes believed that the primary advantage of organising the space program within NIS was that 'you could merge everything here.' Additionally, due to their extensive network of international partners, NIS knew more than the other Norwegian military operating units about what Norway could attain from others [other nation-states]. Consequently, NIS was also the most qualified military operating unit to identify which niches and space capabilities Norway could develop itself. 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.'[614]

[610] Nilsson, interview.
[611] Stig Nilsson, *OMS: Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet*, podcast audio, Oslo Militære Samfund 2021 https://oslomilsamfund.no/2021/09/07/foredrag-spacedomenet-det-femte-domenet-i-femte-generasjons-forsvar-oberst-stig-nilsson-sjef-forsvarets-romvirksomhet/. 20:18
[612] Nilsson, interview.
[613] 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.
[614] Ibid.

3.4. The Intelligence Service and the Space Division

Once subordinated to NIS, whose overall budgets had tripled over the past 15 years,[615] the Space Division adjusted its agreement with NOSA. The Armed Forces would no longer collaborate directly with the individual Norwegian civilian space actors but 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.[616]

According to Col. Nilsson, there were certain 'fixed' key premises tied to the Space Operation Section's transfer to NIS in the fall of 2020. This entailed that their tasks, responsibilities, and location remained the same, and that they would continue to manage the space authority role appointed by Gen. Kristofferson to the Chief of NIS. This role entailed the coordination of civil-military and international relations and 'conventional space cooperation', while they were explicitly *not* to interfere with any of the intelligence-specific space cooperation that NIS were already managing. In other words, there was a separation of "military" and "intelligence" in terms of space activity.[617]

In September 2021, Col. Nilsson as head of the Space Division publicly presented their work on '[s]pace in the Armed Forces'.[618] A 'responsible space nation in the Arctic', Norway's military approach to space continued to be '[a]s civilian as possible – as military as necessary'.[619] The Space Division was presented as a '[s]trategic staff' within NIS, where they supported the Chief of NIS, Vice Admiral Stensønes, in executing the mandate as Norway's military space authority. Their tasks entailed:[620]

- Space Operations at a tactical level.
- Coordinating and managing the development of the Armed Forces' space activities.
- Developing the Armed Forces' space strategy, doctrine, and plans.
- Developing SDA/SSA.
- Leading the national and international collaboration on space - *except* that which entailed the traditional 'intelligence collaboration'.

[615] Erik Andreassen, "E-tjenesten styrkes med milliarder - får mer penger enn noensinne," *NRK Troms og Finnmark* (www.nrk.no), 9 October 2020, https://www.nrk.no/tromsogfinnmark/etterretningstjenesten-styrkes-igjen-_-budsjetter-mer-enn-tredoblet-de-siste-15-arene-1.15192192.
[616] Nilsson, interview.
[617] Ibid.
[618] Nilsson, *Space i Forsvaret: Det femte operasjonsdomene i et femte generasjons forsvar*, p. 7.
[619] Ibid., p. 1.
[620] Ibid., p. 7.

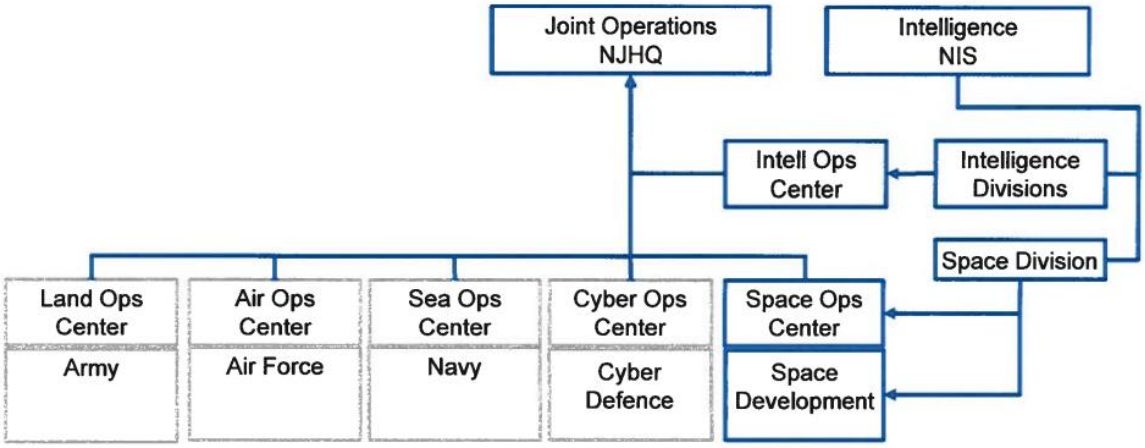

Figure 31: The Armed Forces Space Division, 6 September 2021.[621]

3.4.1. A function-oriented management structure for military space activity

In 2021, the Space Division advised the Chief of 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.[622] 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 units,[623] and which constituted traditional competence areas that had since long been established within the Armed Force.[624] 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?[625] The answer seemed to be that it was principally the function of the space capability, whether it was SDA, ISR, SATCOM, or PNT.[626]

The proposal to establish an executive management group was a continuation of an initiative that commenced with Program Space in 2016 and their 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, NJHQ, NIS, 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 level one was the proposed executive management group.[627]

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[621] Ibid.
[622] Nilsson, interview.
[623] Nilsson, *OMS: Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet.* 19:00 - 22:00
[624] Ibid. 20:00 - 24:00
[625] Bruun-Hanssen, interview.
[626] According to Lt. Gen. (Ret) David A. Deptula, one should move beyond domain-based commands towards functionally based commands - commands based on fuctions, where the domains are simply where those functions are conducted. I.e., an ISR cyber command: Deptula, interview.
[627] Nilsson, interview.

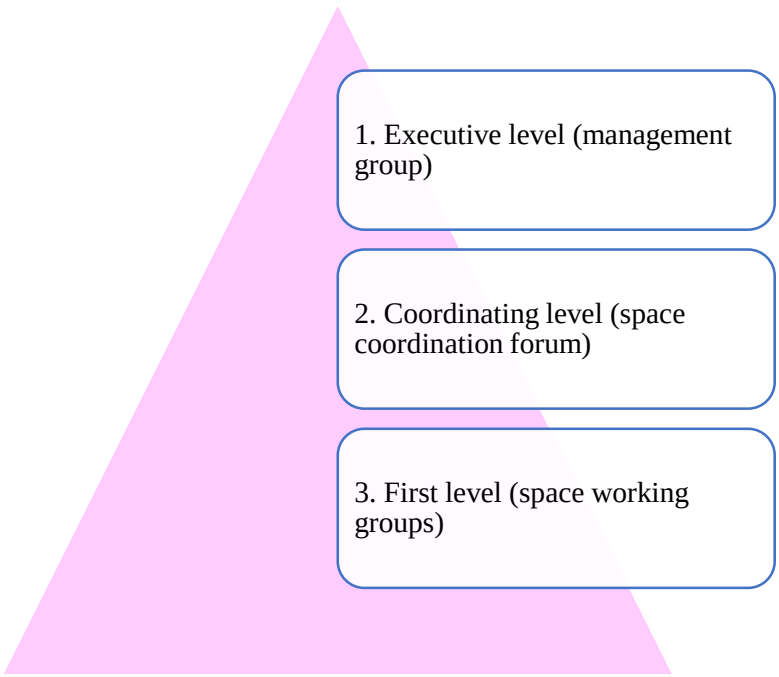

Figure 32: Three-level management structure for military space activity.

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 NIS endorsed it and added the Director of FFI to the group.[628] The executive group members agreed on the structure in mid-2021 and planned to meet regularly to reinforce the Armed Forces' space activities.[629]

The structure was later presented by the head of the Space Division in September 2021.[630] The management group was led by the Chief of NIS, Norway's military space authority, who in capacity of being Chief of NIS retained responsibility for SDA and space-based ISR; The Chief of 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.[631]

In May 2022 Chief of NIS Vice Admiral Stensønes conveyed it had been his first undertaking as Norway's military space authority to establish 'the management group' (*ledergruppen*), 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

[628] Ibid.
[629] Nilsson, *OMS: Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet*. 19:00 - 22:00
[630] Nilsson, *Space i Forsvaret: Det femte operasjonsdomene i et femte generasjons forsvar*, p. 6.
[631] Ibid.

operating units, as these groups were also organised by function and focused on the core subject areas of SDA, ISR, SATCOM, and PNT.[632]

Figure 33: The Armed Forces' space management group in 2021.[633]

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 NIS, as before, would be responsible for space-based ISR. During their second meeting, the space management group assessed progress and progression. In their third, they had developed a long-term concept for satellite operations, and this draft was in mid-May 2022 being consulted by vested parties.[634]

[632] Stensønes, interview; According to Lt. (Ret.) Gen. David A. Deptula, militaries organized 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.
[633] Stensønes, interview.
[634] Ibid.

3.5. Terminating the Space Division – implications and aspects to consider

Soon after the appointment of NIS as military space authority, the Space Division's location became an issue, as the Chief and Deputy Director of NIS were not comfortable having a physically detached unit located on the opposite side of the city. Hence, they called for the unit to relocate their resources and personnel, at the time 13 individuals, to NIS HQ in the eastern outskirts of Oslo.[635]

To those involved, it was astonishing that the Chief of NIS following Col. Nilsson's presentation in September 2021 decided to reorganise the structure to the extent that the Space Division was 'closed down' by the end of 2021. Col. Nilsson was informed in early October 2021 and presented the outcome at the executive space management group's second meeting in October 2021. The process of terminating the Space Division was managed by NIS' new deputy director, who subsequently took the helm of the management structure's second level, i.e. the space coordination coordinating forum. The deputy transferred the Space Division's resources and personnel from the "space hub" to NIS HQ, where the resources were distributed among the 'classic intelligence divisions' within NIS.[636]

With that, the 'key element', which the MoD had established to ensure strategic planning, management, leadership, and coordination of the Armed Forces' space activities[637] ceased to exist.[638] Why did this happen, and what does it entail? Admiral Bruun-Hanssen's observation that there was at times 'too much focus on "the space program" comes to mind,[639] as well as the claims that 'Program Space' generated 'parallel' space universes within the Armed Forces.[640] The implications might be slightly more intricate, and the former head of Program Space, the Space Operations Section, and the Space Division, Col. Nilsson, was concerned they might not have been fully understood.

3.5.1. The dual-hat dilemma

At the presentation of the Space Division's organisational structure and placement within NIS in September 2021, the head of the Space Division emphasised that the Chief of NIS was now 'dual-hatted', because "space authority" and "intelligence authority" were two separate and independent missions.[641] Curiously, it can be understood as an inverse exemplification of this duality that the US Space Force in January 2021 became the 18th 'intelligence element' of the US IC. This was a course of action taken to 'elevate space intelligence missions' and

[635] Nilsson, interview.
[636] Ibid.
[637] Forsvarsdepartementet, *Evne til forsvar - vilje til beredskap. Langtidsplan for forsvarssektoren*, pp. 8-9.
[638] Nilsson, interview.
[639] Bruun-Hanssen, interview.
[640] Kristoffersen, interview.
[641] Nilsson, *OMS: Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet*. 25:00 - 26:00

collaboration, underscoring the combining and interchanging role of space as military *and* intelligence operational domains.[642]

During its existence, the Space Division established that the Chief of NIS was Norway's military 'Space Commander' to underline that he was now responsible for executing space operations at a tactical military level. According to Col. Nilsson, it was unusual in Norway to appoint one and the same person to manage two or more roles and responsibilities.[643]

In September 2021, Col. Nilsson underlined that he was not an intelligence officer himself, but his manager was the Chief of NIS, because the Chief of NIS was Norway's military space authority.[644] Whilst NIS depended on space capabilities, 'you must separate the two missions' of space and intelligence.[645] There was, however, a principal advantage of being subordinated to the Chief of NIS, as being 'on the inside' of this closed entity allowed for easier coordination between the 'conventional' and the intelligence aspects of the Armed Forces' overall space activities.[646]

When the Space Division was terminated, Col. Nilsson's principal question was whether NIS and its 'classic intelligence divisions' would now be able to manage their traditional intelligence requirements *and* the Armed Forces' overall 'conventional requirements' for space, at the same time? Col. Nilsson described the initiative that had once commenced with Program Space following Admiral Bruun-Hanssen's Defence Study 2015 six years prior as 'fragmented'.[647]

Chief of NIS Vice Admiral Stensønes did not see it that way. On the contrary, his perception was that 'the two parallel [military space] environments' had now been merged, since 'everything' was now assembled within NIS. With that, NIS were 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, NIS distributed the Space Division's resources by function, 'because it does not matter if the data comes from satellite, land stations or other collection capabilities.'[648]

Serving as an interface, NIS also had a dedicated person heading their own "Program Space Capacities", whose requirements were set by the NIS Collection Division in the same manner as with other collection platforms. The head of this internal program was tasked to meet the collection requirements and to 'develop the right [space] capabilities.[649]

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[642] Office of the Director of National Intelligence, "DNI Ratcliffe Welcomes U.S. Space Force as 18th Intelligence Community Member," news release, 8 January, 2021, https://www.dni.gov/index.php/newsroom/press-releases/press-releases-2021/item/2179-dni-ratcliffe-welcomes-u-s-space-force-as-18th-intelligence-community-member.
[643] Nilsson, *OMS: Spacedomenet: det femte domenet i femte generasjons Forsvar - oberst Stig Nilsson, sjef Forsvarets Romvirksomhet*. 25:00 - 26:00
[644] Ibid. 25:00 - 26:00
[645] Ibid. 20:00 - 24:00
[646] Ibid. 25:00 - 26:00
[647] Nilsson, interview.
[648] Stensønes, interview.
[649] Ibid.

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 and intelligence. He emphasised that the Chief of NIS was certainly responsible for meeting the space requirements for the entire Armed Forces, and not just that which entailed intelligence. Would NIS be able to manage this combination of intelligence requirements and other, conventional requirements? The relocation of the dismantled Space Division's personnel resources from the "space hub" at Skøyen to the Intelligence Service's secluded facilities at Lutvann would perhaps complexify military space collaboration with national civilian partners. At best, this civil-military collaboration was 'no longer what it used to be.'[650]

In May 2022, the Chief of NIS said his organisation had agreements with 'all the relevant players', and as Chief of NIS *and* the Armed Forces' 'Space Commander', Vice Admiral Stensønes signed 'all these agreements' himself. For example, 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.' NIS also collaborated with 'all the relevant international actors' and the Vice Admiral had since he took the helm as Norway's military Space Commander attended 'the Space Commander's Conference in Colorado' on two occasions.[651]

As for international collaboration, Col. Nilsson questioned how NIS could maintain the 'conventional' space collaboration on behalf of entire Armed Forces. How would they maintain the aspects not covered by their traditional intelligence collaboration with their partners in the confined intelligence realm? NIS might prefer to collaborate with their already established network of partners, rather than with 'conventional' military services, partners, and civilian actors. NIS normally only interacted with other nations' intelligence communities but had now taken it upon themselves to cooperate with other environments, such as other nations' air forces. Were they able and motivated to manage such an undertaking? Moreover, would NIS be able to maintain a trusting relationship with their traditional intelligence partners, while at the same time expanding national collaboration with other environments 'outside' of the intelligence realm? 'This is a demanding exercise', Col. Nilsson stated, which was why he exclaimed that this path that was staked out by Gen. Kristoffersen during the fall of 2020 was 'either very clever, or very unwise.'[652]

Another issue with terminating the Space Division was that it could be seen as debasing the political guidelines given by the MoD' 2020 LTP and the MTIF's 2019 national space strategy.[653] Norwegian policy had by now identified and reinforced that Norway's military space strategy entailed civil-military collaboration and strategic investments, and that a key, or central element had been established within the Armed Forces to maintain these aspects. The solution was not yet set in stone, however. The Space Division's original plan had been to carry

[650] Nilsson, interview.
[651] Stensønes, interview.
[652] Nilsson, interview.
[653] Forsvarsdepartementet, *Evne til forsvar - vilje til beredskap. Langtidsplan for forsvarssektoren*, p. 108; Nærings- og fiskeridepartementet, *Høytflyvende satellitter – jordnære formål — En strategi for norsk romvirksomhet*, p. 52.

out a re-evaluation of tasks and roles in 2023. Thus, in theory, NIS might then propose a final recommendation for further structuring of Norway's military space activities in 2023. In the end of April 2022, Col. Nilsson was not sure that such an evaluation would take place, however, or whether the 'reorganisation' of the Space Division was now being consolidated within NIS. If the latter was the case, NIS could now manage the MoD's space investment 'from an intelligence perspective if they so wish, instead of prioritising the needs of others.' Col. Nilsson also questioned what the Air Force were to do. Were they 'in limbo'? At best, it was now 'uncertain' how NIS would manage Norway's civil-military -and international cooperation, since the Armed Forces no longer had 'an independent unit' that could manage the conventional, civil-military collaboration at home and abroad. Would NIS follow this up 'as intended'? This would now be as difficult to prove as to disprove, since they would now never know whether the Space Division would have succeeded. And in a confined environment such as NIS, 'it becomes even more difficult to assess.'[654]

3.6. 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 as 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 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 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, NIS did have a stronger basis considering their experience with activities entrenched in the space domain, as 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 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 NIS to absorb the military space investment and its resources is unclear, although the same can probably be said for appointing the Air Force as space authority. At times, it seems as if both solutions can be partly attributed to the aphorism Miles' Law, namely, that where you stand depends on where

[654] Nilsson, interview.

you sit. Given the history of Norwegian military space activity, including that which entails the development of indigenous military space capability, the appointment of NIS as military space authority was not surprising. The MoD's State Secretary had even proposed in 2016 that NIS was a clear military space authority candidate, and it can be understood in a wider sense that the appointment of NIS corresponds to Norway's overall bolstering of NIS over the past decades. While NIS is becoming an increasingly powerful institution in Norway, the question of how and to which extent they will be able to manage the dual-hat that space and intelligence *and* space and the military constitutes, is just as reasonable as it is essential.

Considering the isolated story of Program Space and its derivatives, the decision to dissolve this key element was unexpected. This organisational unit had served as the very symbol of Norway's decision to invest in military space activity since 2015, and its discontinuance appears at first sight as a discontinuance of the national military investment itself. However, military space activities were now being managed at the strategic level by the executive management group, and the space coordination was continued as well. It can perhaps be understood that the first-level space management group or the second-level space coordination forum from now on constitutes the "key element" referred to in Norwegian defence and space policies.

At last, Admiral Bruun-Hanssen's question in January 2015 concerning upon which basis space should be organised within the Armed Forces was answered: the function provided by space capabilities, which for Norway included SATCOM, ISR, SDA, and PNT, was the fundament for the three-layer organisational management structure. This was in fact nothing new, but a mere continuation of a longstanding practice in the Armed Forces. The difference was that these environments would now be coordinated from executive level via a coordinating forum down to working group level. Space had finally been established, acknowledged, and institutionalised as a military domain in Norway.

Part III: Norway – an Arctic great power? Space as an instrument in Norwegian defence and security policy

Ca. 2014 – 2022

1. Military SATCOM for communications, command, and control in the High North

1.1. Commanders' views on military SATCOM

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.[655]

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. And 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.[656] 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'.[657]

Chief of 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, as well as from the Northern Brigade (*Brigade Nord*) [Norway's major combat formation and only military 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 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.[658]

Lt. Gen. Jakobsen also noted that the Armed Forces were currently running several missions without classified means of communications, 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 the 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 (QRF).

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[655] Bruun-Hanssen, interview.
[656] Ibid.
[657] 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.
[658] Jakobsen, interview.

However, this did not include all communication to Norway, and using civilian satellites in Afghanistan for administrative communication 'costs a lot of money.'[659]

According to 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 geostationary as well as a 'very affordable' new generation of HEO SATCOM solutions. The latter would ensure SATCOM coverage in the High North or 'north of North Germany'. 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.[660]

The other key driver behind military SATCOM was F-35. Once the Armed Forces started using F-35, the Chief of Defence believed there was 'no other choice' than to acquire SATCOM. F-35 made SATCOM 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.[661]

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. 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 'weakness', and Maj. Gen. Rygg was therefore certain the issue would be resolved.[662]

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 ministry, 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

[659] Ibid.
[660] Jansen, interview.
[661] Bruun-Hanssen, interview.
[662] Per-Egil Rygg, "Interview with Maj. Gen. Per-Egil Rygg (Royal Norwegian Air Force), Commander of the Royal Norwegian Air Force, 27 January 2015, Rygge Air Base, Norway [in Norwegian]," interview by Tale Sundlisæter, 2015.

away after three years.' [663] Rear Admiral Saunes too believed that the Armed Forces should reinforce redundancy by expanding commercial partnerships.[664]

The CYFOR commander strongly believed that all military domains, including land, sea, air and cyber, 'really belong together' and many 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, aircrafts, and terrestrial forces, and for the Armed Forces' ability to 'see the same picture' – was it a pilot in the cockpit, a soldier on the ground or a person standing on the bridge in a vessel. Moreover, during the Bold Quest military exercise, they had carried out 'an experiment 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.[665]

The Chief of 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.[666]

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 NJHQ to access the data, they had to be relayed via satellite. Interoperability requirements were becoming even more prominent with 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

[663] Jakobsen, interview.
[664] 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.
[665] Pedersen, interview.
[666] Jakobsen, interview.

for Norway to develop indigenous image satellites, because the country lacked the communications capability to support it.[667]

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?[668]

In a security policy perspective, the CYFOR commander believed that national ownership of the satellite, which Norway lacked, was essential. And 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. And although Norway was a relatively small state, Norway had a surprisingly substantial cryptography competence and capacity.[669] 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.[670]

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 Minster 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 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.[671] Certainly, this implicated a reinforced impetus to establish national space capability.[672]

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,

[667] Ibid.
[668] Pedersen, interview.
[669] Ibid.
[670] Bruun-Hanssen, interview.
[671] Pedersen, interview.
[672] Shabbir, Sarosh, and Nasir, "Policy Considerations for Nascent Space Powers."

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.[673]

Commercial SATCOM posed 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 war or crisis scenario. Commercial 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, i.e. 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.[674]

This was a question of deterrence and reassurance[675] and could be understood as an element in Norway's strive for collective security.[676] 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 with 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.[677]

1.2. Consolidating Norway's position in the Arctic

In 2015, advocacy for SATCOM was gaining traction not only amongst military executives and officers, but at the highest levels of government, where the MoD worked 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 telecommunications capacity, and NOSA proposed a concept consisting of two HEO satellites.[678]

[673] Pedersen, interview.
[674] Ibid.
[675] Holst, "Norsk sikkerhetspolitikk i strategisk perspektiv," p. 465.
[676] Tamnes, *Integration and screening: the two faces of Norwegian Alliance policy, 1945-1986*, pp. 60-61.
[677] Pedersen, interview.
[678] Botten et al., *Representantforslag fra stortingsrepresentantene Else-May Botten, Odd Omland, Torstein Tvedt Solberg og Eirik Sivertsen om å sikre bredbåndstelekommunikasjon i nordområdene*.

State Secretary Bø observed in February 2016 there were 'changes underway'. The MoD and MTIF were examining financing mechanisms that entailed involving the civil aviation and shipping sector 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.'[679] 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 of 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.[680]

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.'[681] By May, the Transport- and Communications Committee backed the request.[682]

During the autumn of 2016, the government started an external project investigation, which in April 2017 recommended to proceed with the 'pan-Arctic coverage' SATCOM concept. The Norwegian 'sector-political' space infrastructure owner Space Norway, wholly owned and managed by 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 players.'[683]

[679] Bø, interview.
[680] Nilsson, interview.
[681] Botten et al., *Representantforslag fra stortingsrepresentantene Else-May Botten, Odd Omland, Torstein Tvedt Solberg og Eirik Sivertsen om å sikre bredbåndstelekommunikasjon i nordområdene*.
[682] 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 bredbåndstelekommunikasjon i nordområdene, Innst. 304 S (2015-2016) (Oslo: Stortinget, 2016).
[683] Nærings- og fiskeridepartementet, Space Norway AS og prosjekt for satellittkommunikasjon i nordområdene, Prop. 55 S (2017-2018), p. 2 (Oslo: Nærings- og Fiskeridepartementet, 2018).

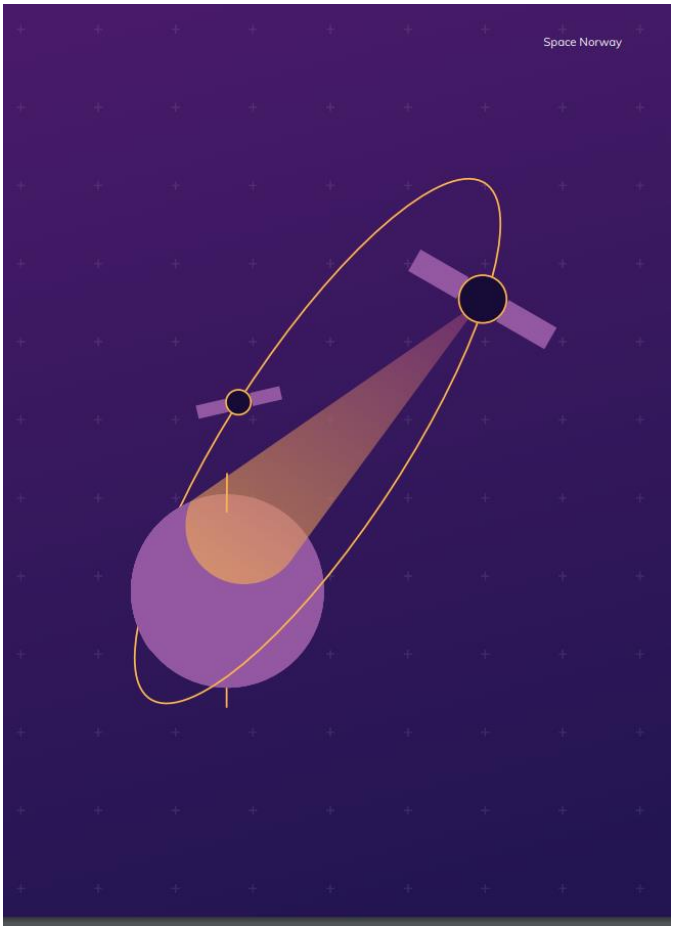

Figure 34: Illustration of Space Norway's HEO satellite constellation.[684]

In mid-2017, Space Norway inquired MTIF about capital to carry out the project, which was of such a size that it had to go through an external quality assurance. 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 underpinned 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.[685]

[684] Space Norway, *Space Norway Annual Report* (www.spacenorway.no: Space Norway, 2020), p. 13, https://spacenorway.no/wp-content/uploads/Space-Norway_Annual_Report_2020_ENG.pdf.
[685] Nærings- og fiskeridepartementet, *Space Norway AS og prosjekt for satellittkommunikasjon i nordområdene*, p. 3.

In the spring of 2018, MTIF announced that the Parliament 'may grant a conditional commitment' to fund Space Norway's HEO SATCOM project with 139 million USD, then corresponding to some 1.1 billion NOK. This constituted 25 percent of the project's total costs of 556 million USD, 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 was the Armed Forces' requirements for military broadband under national control.[686]

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.' 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. According to Minister of Defence Frank Bakke-Jensen, the satellites solution could serve both the Armed Forces as well as Norway's allies.[687]

By late May 2018, the Industry Committee endorsed the HEO SATCOM proposition, emphasising its foreign and security policy significance. The committee reinforced that the Armed Forces, Norway's allies, and commercial actors would use the capability, and stated that Norway with this project 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.[688]

The 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 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 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'.[689]

Finally, the Parliament unanimously approved the recommendation to fund project with the proposed 139 million USD.[690]

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[686] Ibid., p. 4.
[687] Nærings- og fiskeridepartementet, "Government wants Arctic internet," news release, 23 March, 2018, https://www.regjeringen.no/en/aktuelt/vil-ha-internett-i-arktis/id2594837/.
[688] Næringskomiteen, *Innstilling til Stortinget fra næringskomiteen*.
[689] Stortinget, Referat fra møter i Stortinget pp. 4663-64 (Stortingstidende (nr. 87 - 4. juni - Sesjonen 2017-2018, pp. 4595-4684) 2018).
[690] Ibid., p. 4684.

1.3. Deterrence and Reassurance

While discussions and policies leading up to the Parliament's unanimous approval thoroughly underpinned that the Armed Forces and Norway's allies would use the satellite system,[691] possible implications were soon scrutinised by Norwegian state media. Two days following the unanimous approval, public broadcaster NRK claimed that the 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, who two days prior had approved the project.[692]

The following discourse casted light on fundamental, inter-political disagreements and central aspects of Norwegian security policy, such as the socialist left parties' principal scepticism towards the US and Norway's membership in NATO.[693] In this sense, the debates to some extent resembled those stirred by US President Reagan's 'Star Wars' program in the 1980s.[694]

A principal argument considering the HEO SATCOM system was that the Armed Forces were "hiding" behind civilian capabilities.[695] It became a central aspect to consider that Norway in 1981 ratified the Additional Protocol I to the 1977 Geneva Conventions,[696] whereby Norway acknowledges that civilian capabilities used in a military context could constitute legitimate military targets.[697]

Statements from various American officials became central in the Norwegian public debate. A USAF Secretary 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.[698] Another USAF official announced in January 2018 that the Americans intended to host 'an enhanced polar system payload on a Norwegian satellite.'[699] 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, i.e. to 'strengthen alliances and attract new partners'. Specifically, AFSPC planned to host Enhanced Polar System (EPS) protected satellite

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[691] Nærings- og fiskeridepartementet, *Space Norway AS og prosjekt for satellittkommunikasjon i nordområdene*; Næringskomiteen, *Innstilling til Stortinget fra næringskomiteen*.

[692] NRK, "Militært samarbeid om satellitter," (www.nrk.no) 2018-2019, https://www.nrk.no/emne/militaert-samarbeid-om-satellitter-1.14173213.

[693] Stortinget, Referat fra møter i Stortinget, pp. 5275-76 (Stortingstidende (nr. 94 - 14. juni - Sesjonen 2017-2018, pp. 5217-5330) 2018).

[694] Solem, "Norske reaksjoner på Reagans "stjernekrigs"-program."

[695] NRK, "Militært samarbeid om satellitter."

[696] Stortinget, "Tilleggsprotokoll til Geneve-konvensjonene av 12-08-1949 hva angår beskyttelse av ofre for internasjonale væpnede konflikter (Protokoll I)," ed. Stortinget (www.lovdata.no: Lovdata, 1982). https://lovdata.no/dokument/TRAKTAT/traktat/1977-06-08-1.

[697] 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/atrocity-crimes/Doc.34_AP-I-EN.pdf.

[698] Marcus Weisgerber, "US Air Force to Put Sensors on Allies' Satellites," *Defense One* (www.defenseone.com), 21 April 2018, https://www.defenseone.com/threats/2018/04/us-air-force-put-sensors-allies-satellites/147622/.

[699] Vivienne Machi, "Air Force, Industry Considering Future of Protected Satcom," *National Defense Magazine* (www.nationaldefensemagazine.org), 19 January 2018, https://www.nationaldefensemagazine.org/articles/2018/1/19/air-force-industry-considering-future-of-protected-satcom.

communications payloads on the two Norwegian Norway satellites scheduled for launch in 2022.[700]

NRK asserted that through such a partnership with the Pentagon, Norway could get entangled in a 'star war', and inquired 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.[701]

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 the Parliament'. His main issue was the alleged link to the US nuclear weapons program, 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.[702]

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 SSBN's and drones, which according to US officials were 'particularly susceptible to attacks by countries claiming to be threatened by US military presence.' USAF's main impetus for integrating military equipment on the Norwegian satellites was to reduce their own risk and likelihood of US satellites being attacked, and Lysbakken and Moxnes demanded to impede 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.'[703]

According to Minister of MTIF Røe Isaksen, there was no formalised agreement with the US, and ongoing negotiations did not entail a dedicated nuclear weapons support system, but 'a

[700] Department of the Air Force, Presentation to the subcommittee on strategic forces, pp. 7, 16 (Washington, DC.: The White House, 2018).
[701] Bård Wormdal, "Norge kan bli dratt inn i en stjernekrig," *NRK* (www.nrk.no), 29 September 2018, https://www.nrk.no/finnmark/_-norge-kan-bli-dratt-inn-i-en-stjernekrig-1.14217421.
[702] "Stortinget godkjente satellittsamarbeid med USA - uten å vite om det," (June 6 2018). https://www.nrk.no/finnmark/stortinget-godkjente-satellittsamarbeid-med-usa-_-uten-a-vite-om-det-1.14068473.
[703] Stortinget, *Referat fra møter i Stortinget*, p. 5280.

communication system for transmitting limited voice and data volumes'. The 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.'[704]

Minister of Defence 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.[705] 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 in Norway's long-standing defence and security policy and its transatlantic orientation.[706] Both the former and the current governments had worked to improve the prominent issue of improving communications in the Arctic. The high costs associated with the 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 underpinned.[707]

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 fall of 2016. Norway's military approach was indeed to be 'as civilian as possible and as military as necessary', and in space, 'all the nations are small'. Monetary considerations drove military space activities to become increasingly characterised by international cooperation, of which the Pentagon's intent to integrate their payloads on the Norwegian satellites was an exemplification. The US would become a customer of Space Norway via the Norwegian MoD and download US encrypted communication to a station in Alaska. Because the US payloads were incapable of communicating with submerged submarines, the extent to which the Norwegian satellites could be used in American nuclear submarine operations was very limited.[708]

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.'[709] 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.[710]

[704] Ibid., pp. 5272-73.
[705] Ibid., p. 5275.
[706] Ibid., p. 5276.
[707] Ibid., p. 5274.
[708] Ibid., pp. 5275-76.
[709] Ibid., p. 5279.
[710] Ibid., pp. 5278-80.

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 the Parliament had been more thoroughly informed.[711]

In any case, with 92 against ten votes, the Parliament rejected Lysbakken's and Moxnes' proposal to reconsider the satellite project.[712]

1.4. Preparing for national mission control

By July 2019 Space Norway secured agreements with Inmarsat and 'the Norwegian and US militaries' and anticipated to provide mobile broadband for 'civilian and military users in the Arctic' by 2023. Northrop Grumman 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.'[713] Overall, Space Norway ensured five key investors including the Armed Forces, the Pentagon, a Norwegian bank, Inmarsat, and MTIF, who invested in the project as a for-profit commercial business investment.[714]

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, who started preparing FSAT for mission control at Eggemoen. Space Norway were to launch the satellites and handle telemetry, tracking and command (TT&C) 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.[715]

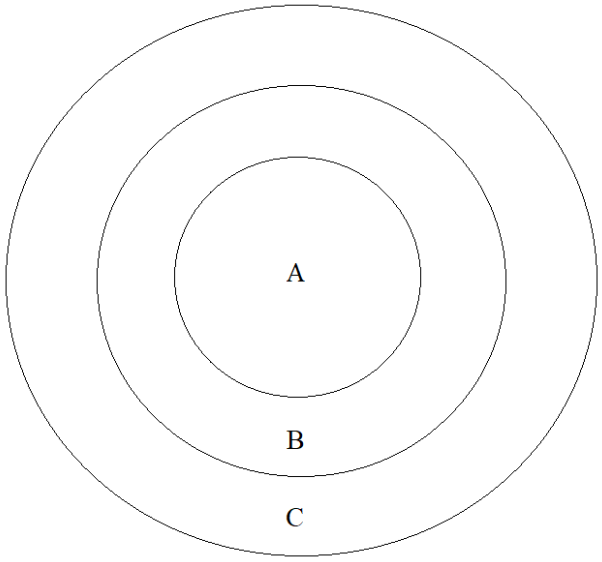
1.5. Chapter conclusion

Norway's second attempt to acquire national military SATCOM capability is exceedingly more promising than the first and underpins Norway's national interest at several levels considering 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 has adopted a deterrence strategy in

[711] Ibid., p. 5277.
[712] Ibid., p. 5327.
[713] Space Norway, "Space Norway to provide satellite based Arctic broadband," news release, 3 July, 2019, https://spacenorway.no/home/.
[714] Nilsson, interview.
[715] Ibid.

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.



A. United States
B. NATO
C. Inmarsat

Figure 35: 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 was the Government's essential alibi to overrule the external review that ruled to terminate the SATCOM project, which also demonstrates that where there is a political will, there is a way.

The SATCOM project could only materialise through such a dual-use approach. The MoD was very open about their plans and ambitions, and publicly advocated that Norway's military space program 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 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 inciting increased awareness on security policy issues related to 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 MTIF to establish the national SATCOM capability. They ensured broad political support to the extent that it become 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. Still, it was a strict requirement that 75% of the project costs must be covered by external investors and customers, underpinning that the bottom line was alpha and omega.

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 is preparing to manage Norway's upcoming SATCOM capability in peacetime, crisis, and war, at all levels of strategy, which enforces the overlap between the Stractic Intelligence and Force Enhancement doctrines.

2. Space-based maritime ISR under national control and a spaceport in the High North

2.1. Commanders' views on space-based ISR

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.[716]

Going forward, the Chief of Defence suggested that Norway could acquire national ISR satellites, partner 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.[717]

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 'extremely much' 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'. [718]

Chief of 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 were 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.'[719]

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

[716] Bruun-Hanssen, interview.
[717] Ibid.
[718] Jansen, interview.
[719] Jakobsen, interview.

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 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.'[720]

Lt. Gen Jakobsen had 'great faith' in cooperation within NATO and between individual nations. Although other nations' satellite imagery were 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 that because 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 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'.[721]

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. In fact, without space-based capacities, Norway would 'probably not have had such a good intelligence capacity'. Satellites enabled the Armed Forces to collect information used to identify developments over time, and to extract near-real-time situational awareness. 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.'[722]

Inspector General of the Royal 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 FFI in 2001 and been 'involved with mini-satellites' and collaborated closely with NOSA. In his view, the Armed Forces was 'an important player' and the Navy was 'a key player'. Considering ISR, NIS was also very much

[720] Ibid.
[721] Ibid.
[722] Pedersen, interview.

engaged, whereas NJHQ had a central role in collaborating with NOSA on operational requirements. He pointed out that the Air Force was not very involved, 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.[723]

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 a 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 'mobile devices', such as MPA or vessels for further inspection. Thus, applying satellite information in their surveillance missions provided 'a very good picture of the activity that takes place on the surface in our maritime areas of responsibility.'[724]

National space-based assets such as the AIS satellite could be used globally, 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 of '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. And as a 'small nation' Norway must ensure broad international cooperation with European countries as well as with the US. Norway had recognised that to access joint ISR capacity, they '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 United Kingdom, the Netherlands, and Germany. 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.[725]

Whilst the Rear Admiral was convinced that Norway must team up with its more powerful allies also in space, he knew from FFI that Norway was 'quite far ahead with the development of small satellites' and anticipated that Norway might develop national radar satellites in

[723] Saunes, interview.
[724] Ibid.
[725] Ibid.

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, because 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 was 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.[726]

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 infrastructure could become military targets of anti-satellite weapons intended to deny US or NATO information dominance. It was another aspect 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.[727]

According to NIS Deputy Director Tom Rykken, 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 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.[728]

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 have a perspective to locations you would otherwise be denied. Space activity was closely tied to the development of long-range ballistic missiles, and for long only concerned 'the major nations'.

[726] Ibid.
[727] Ibid.
[728] Rykken, interview.

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, strategic dispositions, and obtain information for decision makers. To NIS, space was today particularly interesting in a High North perspective because it allowed for linking large land and maritime areas. While Norway had never commanded national satellites, they had over the years and decades relied on other nations who were willing to share information from theirs, and this information was especially useful considering situational awareness in real-time, as well as for 'basic intelligence', i.e. the understanding of 'what is going on' over time. These capabilities were also essential tools in planning and conducting military operations.[729]

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 programs 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 other disciplines ranging from environmental research, warning, disasters and climate change to migration and road construction. It was however a challenge to NIS that the 'ever-increasing amount of data' made it increasingly demanding to process the data and identify 'what is interesting'. This made it more important to utilise machines, systems, and programs to assist in locating the relevant information, and human resources should rather be reserved 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 to 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.[730]

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 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 the strategic 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

[729] Ibid.
[730] Ibid.

advantage in that sense, as a 'small country' with 'such a short distance' between the strategic levels.[731] These considerations suggested that Norway perhaps did not favour strategic intelligence over the operational or tactical as was the case in the US.[732]

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.[733]

In March 2016, the recently retired Chief of 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', who 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. And 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 neighbour 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.[734]

Lt. Gen. (Ret.) Grandhagen addressed many of the 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 its 'near areas of interests' and exploit the contemporary trends of commercialisation, miniaturisation and multi-nationalisation to a greater extent. Whereas military systems used to be superior to commercial ones, this capability gap would soon cease to exist.[735] 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

[731] Ibid.
[732] Rumbaugh, *What place for space: Competing schools of operational thought in space*, p. 13.
[733] Rykken, interview; This differed from the Americans, for example, who supplied their NTMs with commercial space assets: Clapper, interview.
[734] Grandhagen, interview.
[735] Ibid.

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.[736]

A key trend which Grandhagen had focused on as Chief of NIS was the merging of strategic levels, which 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 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.[737]

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 their national technical means (NTM), as commercial satellites were not designed for their 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 the US government's needs. The DNI therefore argued that 'you can't really say that they are commercial anymore.'[738]

Both the acting US DNI, former Commander of Air Force Space Command General (Ret.) Lance Lord, and former Commander of US Strategic Command Gen. (Ret.) James E. Cartwright identified that the principal advantage with commercial satellite imagery was that it was unclassified, which made it much easier to share amongst allies.[739] 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.[740] As the Norwegian 1990 Defence Commission had noted in 1992,[741] 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

[736] Ibid.
[737] Ibid.
[738] Clapper, interview.
[739] Ibid.; 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.
[740] Clapper, interview.
[741] Forsvarskommisjonen, *(Forsvarskommisjonen av 1990)*, p. 131.

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.[742] According to Kevin O'Connell, who performed the intelligence briefings for 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.'[743]

In Norway, 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.'[744]

2.1.1. The 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 debates following Defence Study 2015.[745] The Admiral did not believe the fiscal circumstances by which he was bound would allow for supplementary capabilities to the existing military force structure, including MPA, 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 could

[742] Clapper, interview.
[743] O'Connell, "PhD interview with Kevin O'Connell at Innovative Analytics & Training."
[744] Grandhagen, interview.
[745] Alf Bjarne Johnsen and Rune Thomas Ege, "Slik blir det nye Forsvaret - hvis forsvarssjefen får bestemme," *Verdens Gang* (www.vg.no), 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* (www.aldrimer.no), 21 August 2015, https://www.aldrimer.no/ma-droppe-antiubatkapasitet/.

be 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.[746]

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'.[747]

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 to-sided. Space technology constituted 'a good supplement' and could well become a major contribution sometime in the future. If satellite technology was 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. And 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 else than the P-8. 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 aircrafts. 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.[748]

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

[746] Bruun-Hanssen, interview.
[747] Ibid.
[748] Rygg, interview.

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…'.[749]

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 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 then would 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.[750]

Less than two months following 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'.[751] The following day, the Chief of 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. To the Chief of 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. [752]

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-8.[753] 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 P-3C Orion. MPA Squadron 333 would operate these aircraft from Evenes airbase and Andøya airbase would be closed.[754] In March 2017, the MoD announced that the Defence Materiel Agency on behalf of the Armed Forces

[749] Jan Eirik Finseth, "Interview with Rear Admiral (Ret.) Jan Eirik Finset, former Inspector General of the Royal Norwegian Navy, 19 December 2016, Akershus Fortress, Oslo, Norway. [In Norwegian]," interview by Tale Sundlisæter.
[750] Jansen, interview.
[751] Rykken, interview.
[752] Jakobsen, interview.
[753] Clapper, interview.
[754] Forsvarsdepartementet, *Kampkraft og bærekraft: Langtidsplan for forsvarssektoren*., p. 65

had signed a contract with US authorities to procure five P-8A Poseidon MPAs, and that the first aircraft would land on Norwegian territory in 2022.[755]

2.2. 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 of satellite ground station activity on the Svalbard archipelago and in Antarctica[756] 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 at the archipelago, and it 'could have become a problem in relation to the treaty' if the Armed Forces got affiliated with that specific facility.[757] 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 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.[758]

On the Norwegian mainland, ground station activity was regulated by the Electronic Communications Act of 2003. Frequency licenses and regulations at Svalbard and in Antarctica were based on this act in conjunction with legal interpretations of international law, predominantly the Svalbard and Antarctic treaties.[759] In the original regulation proposal, the MTC proposed to strictly prohibit all communication with military satellites from ground stations in these treaty areas. Communication with dual-use satellites, i.e. '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.[760]

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[755] 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/.

[756] Samferdselsdepartementet, Nytt regelverk for nedlesning av data fra satellitt på Svalbard og i Antarktis, (www.regjeringen.no: Samferdselsdepartementet, 2015); Samferdselsdepartementet, Utkast til to forskrifter om etablering, drift og bruk av jordstasjon for satellitt på Svalbard og i Antarktis - Høringsnotat, (www.regjeringen.no: Samferdselsdepartementet, 2015).

[757] Bø, interview.

[758] Pedersen, interview.

[759] Samferdselsdepartementet, Høring - To forskrifter om etablering, drift og bruk av jordstasjon for satellitt, henholdsvis på Svalbard og i Antarktis, (www.regjeringen.no: Samferdselsdepartementet, 2015).

[760] Samferdselsdepartementet, *Nytt regelverk for nedlesning av data fra satellitt på Svalbard og i Antarktis*.

MTC issued the proposal to 43 consultative bodies, not including the Armed Forces.[761] KSAT, who owns and operates Norway's satellite ground stations on the Norwegian mainland, at Svalbard, and in Antarctica, inquired with the MTC to 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. And 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. [762] Norwegian space infrastructure owner Space Norway, which owned 50 percent of KSAT, voiced similar concerns.[763] Both 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.[764] NSM noted that Galileo had a government use service, i.e. Public Regulated Services (PRS), where encrypted data were downlinked by Galileo stations at Svalbard and in Antarctica. To ensure adequate protection of the PRS data, they had to be exempted from the proposed data availability requirement.[765] The Norwegian Directorate for Civil Protection (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.'[766]

Prior to the 1999 regulations, FFI had had conducted a classified study considering the Svalbard Treaty and the construction and operation of Svalbard satellite station,[767] and now criticised the new proposal for not accounting for the emerging diversity in satellite applications. Principally, 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 other parties to the treaty negatively.[768] 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 at Svalbard might have to be terminated. NOSA had not identified that the current national regulations had violated

[761] "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=horingssvar&lastvisited=undefined.

[762] Kongsberg Satellite Services AS, Høringssvar - Kongsberg Satellite Services 2, Cor-16-81 (www.regjeringen.no: Samferdselsdepartementet, 2016).

[763] Space Norway, Høringsuttalelse - Forskrifter om etablering, drift og bruk av jordstasjon for satellitt, (www.regjeringen.no: Samferdselsdepartementet, 2016).

[764] Nasjonal Sikkerhetsmyndighet, Forskrifter om etablering, drift og bruk av jordstasjon for satellitt, på Svalbard og i Antarktis, (www.regjeringen.no: Samferdselsdepartementet, 2016); Norsk Romsenter, Høringsuttalelse - To forskrifter om etablering, drift og bruk av jordstasjon for satellitt, henholdsvis på Svalbard og i Antarktis, (www.regjeringen.no: Samferdselsdepartementet, 2016).

[765] Nasjonal Sikkerhetsmyndighet, *Forskrifter om etablering, drift og bruk av jordstasjon for satellitt, på Svalbard og i Antarktis*.

[766] 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, (www.regjeringen.no: Samferdselsdepartementet, 2016).

[767] 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).

[768] FFI, Høringssvar - Forsvarets Forskningsinstiutt 2, (www.regjeringen.no: Samferdselsdepartementet, 2016).

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.[769]

The final regulation entered into force on 1 May 2017 and prohibit 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 that are to perform functions specifically for military purposes, except for emergency situations, whereby the operator is allowed to assist 'all satellites'.[770]

2.3. National satellite-based ISR capability development 2014 – 2022

When Norway launched AISSat-2 in 2014,[771] the country had two satellites in orbit, acquired and operationalised for the net sum of 50 million NOK, and the system was operational nearly around the clock. Along with the receiver on board the ISS, the three platforms had a 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 Norwegian authorities, including the Coast Guard and NJHQ.[772]

During its existence, Program Space had earmarked about ten percent of its resources to FFI's research and development projects such as Norsat and SMART Milspace.[773] The Norsat payloads were developed in cooperation with 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 were. Similarly, the main financial contributors were NOSA and NCA.[774]

In July 2017, Norway launched Norsat-1 and Norsat-2 into similar orbits as the AIS satellites, i.e. 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 weighted about 16 kilograms and cost about 25 million NOK each. They were equipped with AIS receivers and were operated from satellite ground stations

[769] Norsk Romsenter, *Høringsuttalelse - To forskrifter om etablering, drift og bruk av jordstasjon for satellitt, henholdsvis på Svalbard og i Antarktis*.
[770] 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."
[771] "AISSat," Satellitter og baner, Store norske leksikon, updated 13 January 2022, 2022, accessed 13 January, 2022, https://snl.no/AISSat.
[772] Forsvaret, *Romvirksomhet for sikkerhet og forsvar - situasjonsbeskrivelse og analyse*, pp. 66, 70.
[773] Nilsson, interview.
[774] 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.

in Vardø and at Svalbard, Norway. [775] In addition to AIS, Norsat-1 carried space weather and solar studies instruments, and Norsat-2 carried a ship-to-ship communications system, i.e. VHF Data Exchange System (VDES) to test a new SATCOM-based standard for maritime communication.[776]

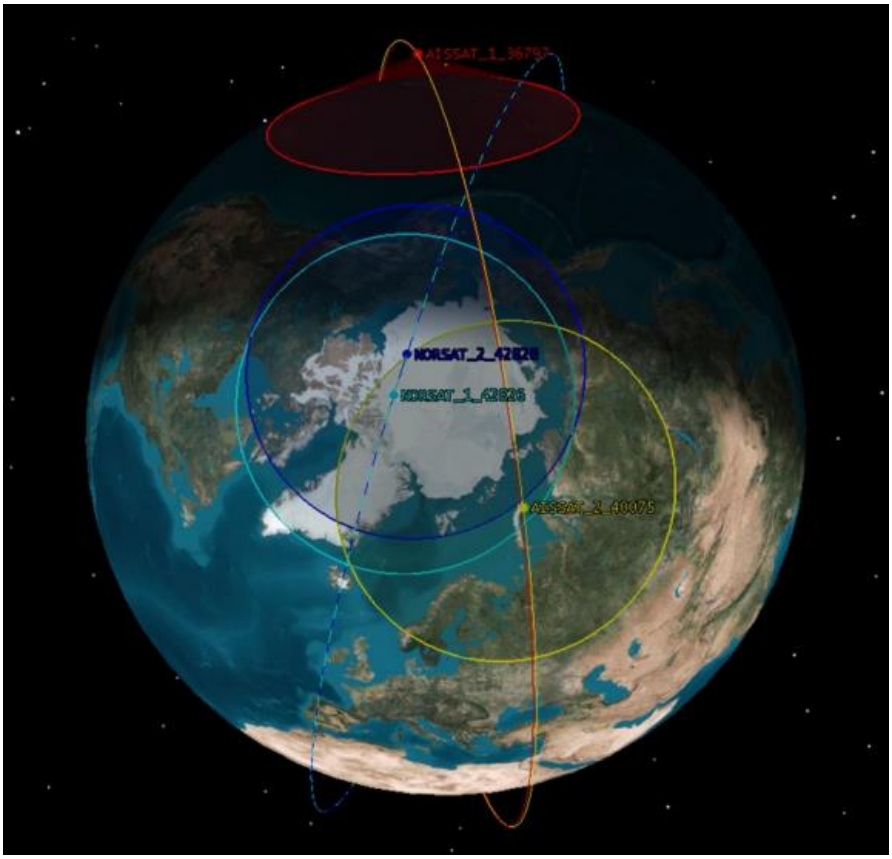

Figure 36: Orbit simulation of AISSat 1 and 2 and Norsat 1 and 2.[777]

In April 2018, 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' in the years to come. FFI's ambition was 'to write the next chapter of Norwegian micro-satellites' 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.'[778]

[775] "NorSat-serien," Satellitter og baner, Store norske leksikon, 2022, accessed 5 May, 2022, https://snl.no/NorSat-serien.
[776] Norwegian Space Agency, "NorSat-1 and NorSat-2 launched!."
[777] Torkild Eriksen et al., "In-orbit AIS performance of the Norwegian microsatellites NorSat-1 and NorSat-2," *CEAS Space Journal* 12, no. 4 (2020): p. 505. Fig. 3
[778] "Slik skal norske mikrosatellitter overvåke skipstrafikk," FFI, updated 9 December 2020, 2018, https://www.ffi.no/aktuelt/nyheter/slik-skal-norske-mikrosatellitter-overvake-skipstrafikk.

Norsat-4 would weigh about 20 kilograms and detect vessels that were approximately 30 metres 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. As the other Norwegian small satellites, it would be fully Norwegian owned- and controlled, meaning the camera could be pointed to certain areas at given times at the behest of Norwegian authorities. The MoD had verbally committed to finance the payload and were currently negotiating with NOSA and FFI, who planned to launch Norsat-4 in 2021.[779] 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. In the longer term, 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.[780]

Norway in late April 2021 launched Norsat-3 into a similar orbit as the other satellites from ESA's space centre in French Guiana.[781] 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.[782] 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.[783] Norsat-3 would help Norway identify vessels that for various reasons tried to evade the AIS system.[784] At first, Norsat-3 satellite data were only transferred to FFI, and in 2021 – 2022, NIS collaborated with FFI to ensure that the data would also be available to the NJHQ in northern Norway.[785]

2.3.1. 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 Norwegian authorities, but other countries 'may also be interested.'[786] Research Director Richard Olsen at FFI, which 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.[787]

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 since long strived to establish.[788] In a wider sense, it followed an international trend

[779] Ibid.
[780] Olsen, interview.
[781] Birkeland, "NorSat-serien."
[782] Ibid.
[783] Hallvard Sandberg, "Norsk selskap skal få egne overvåkingssatellitter," *NRK* (www.nrk.no), 1 May 2022, https://www.nrk.no/urix/norsk-selskap-skal-fa-egne-overvakingssatellitter-1.15948631.
[784] Birkeland, "NorSat-serien."
[785] Stensønes, interview.
[786] Sandberg, "Norsk selskap skal få egne overvåkingssatellitter."
[787] Ibid.
[788] Nilsson, interview.

identified by the Director of ESA Johann Dietrich Wörner in 2016. Private investments were increasingly entering the stream, and it posed 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 supply with additional sources such as privatised or commercial capability.[789]

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 adopt new technology to the platforms. The plan announced in May 2022 entailed launching the first three satellites into 'relatively high Earth orbits', 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.'[790] In July 2022, Kongsberg announced that they were acquiring 77 percent of Nano Avionics, a Lithuanian 'smallsat mission integrator and bus manufacturer'. According to Kongsberg, this was a 'game changer' for their own 'space ambitions.'

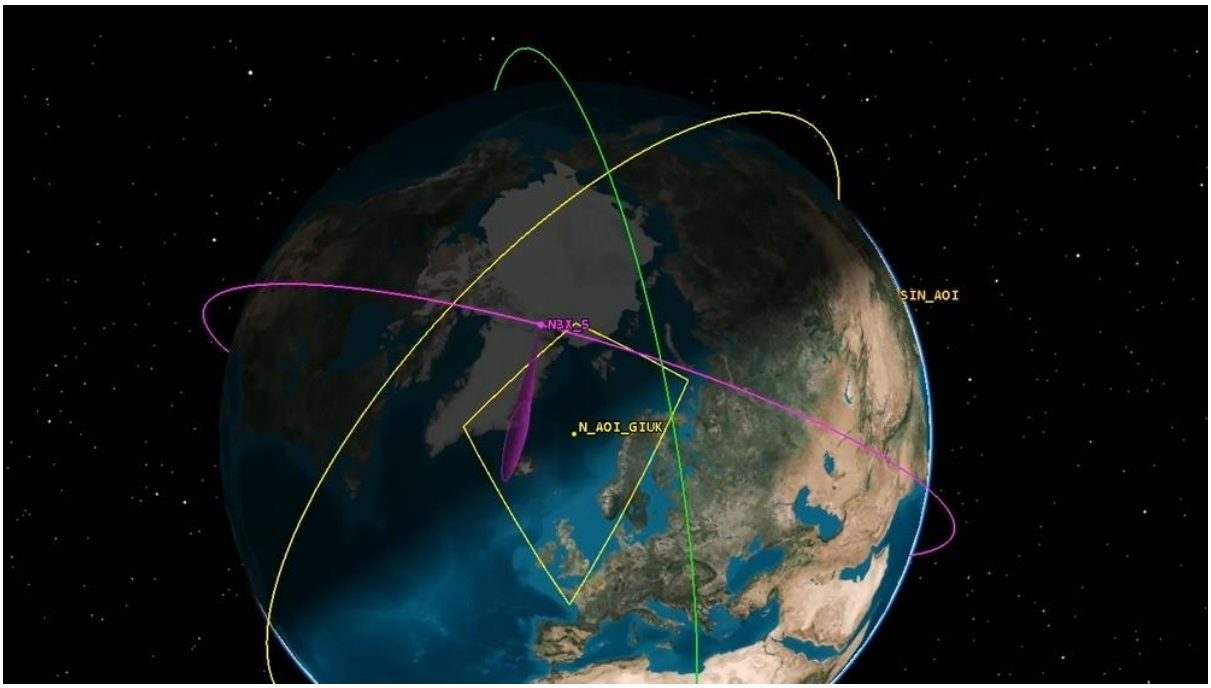

Figure 37: Simulation of the 'Kongsberg satellites'[791]

[789] Wörner, interview.
[790] Sandberg, "Norsk selskap skal få egne overvåkingssatellitter."
[791] Ibid.

2.4. Norway and the exclusive international league

Norway had come a long way since being categorised as an 'opportunistic' space actor in 2004. By 2022, Norway was developing a wide range of capabilities, strengthening its overall position as a space nation and climbing up to the second highest level of 'the inadequate'.[792] Considering 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.[793] With an operational space launch facility, it can also be understood that Norway would soon be standing with one foot in the second highest level of the pyramid, "only" lacking indigenous space launch capability to qualify. While Norway was now about to establish the 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.[794] NOSA was certainly convinced that establishing a space launch base on Andøya would constitute a significant strategic move for the nation.[795] In 2018, former Commander of USSTRATCOM Gen. (Ret.) Cartwright even envisioned 'several spaceports' in Norway, given its 'significant geographical advantage' being situated close to the North Pole.[796]

In June 2020, the Government granted the state-owned space launch complex Andøya Spaceport a conditional commitment of some 280 MNOK in equity and some 80 MNOK in grants to establish a satellite launch facility.[797] Andøya had been used as a rocket launch base since the 1960s, but this activity only entailed relatively small, suborbital rockets.[798] Having teamed up with the German commercial rocket company Isar Aerospace, KDA aimed to become historical by having their satellites launched and deployed into Earth orbit from Norwegian territory.[799] Norway had also signed an agreement on military space activity collaboration with Germany in the fall of 2019.[800]

2.4.1. 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.[801] Norway's budding military space activities were now

[792] Bingen, *Det nære verdensroms strategiske dimensjoner*.
[793] Paikowsky, *Clubs of Power: Why Do Nation-States Join the "Space Club"?*, p. 19.
[794] Sandberg, "Norsk selskap skal få egne overvåkingssatellitter."
[795] Norsk Romsenter, Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser, Vedlegg 1 til HMS/EHM/2018/54 (Norsk Romsenter, 2020).
[796] Cartwright, interview.
[797] Regjeringen, Statsbudsjettet 2021: Nordland, (www.regjeringen.no 2020).
[798] Collett et al., *Making Sense of Space. The History of Norwegian Space Activities*; Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*.
[799] Sandberg, "Norsk selskap skal få egne overvåkingssatellitter."
[800] Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, p. 25.
[801] 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*

explicitly taken into consideration. In February 2020, MTIF issued a national space law proposal to more than 50 consultative bodies. These recipients included FFI and one Norwegian military operating unit within the Norwegian Armed Forces, namely the Air Force.[802] At this point, the dominating perception seemed to be that the Air Force was about to become Norway's military space authority.[803]

MTIF had in 2019 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 number of actors as well as scope, would soon increase. As it was issued by MTIF, the main rationale was that the law should contribute to Norwegian value creation and manage the risks associated with space activity.[804] MTIF focused on space as imperative capabilities for Norway as a maritime nation, considering key industries such as offshore activities, maritime transport, and fishing.[805]

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 Committee incorporated in Paragraph Five Article D that space activity on Norwegian territory could '…not conflict with Norway's foreign or security interests.'[806] Satellite-based infrastructure was increasingly being used to solve several 'socially critical tasks' and posed new opportunities for civilian and military activity. Norway was becoming increasingly vulnerable to attacks towards space-based infrastructure, and this could be exploited by actors who wanted to damage Norwegian interests. Therefore, Norwegian authorities must consider Norway's foreign and security policy interests when assessing whether to grant permissions. That Norway was upfront about these issues would also allow applicants to explicitly address any concerns.[807]

The committee established that space infrastructure was of increasing strategic importance and 'the Norwegian Armed Forces has 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 considering aspect such as legal permits, insurance reporting and inspection rights. The Danish law on space activities did not explicitly

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Space Activities in the Light of Developments in European Space Cooperation, ed. Frans G. von der Dunk (Leiden, Boston: Martinus Nijhoff Publishers, 2011), p. 33.

[802] Nærings- og fiskeridepartementet, Høring om Romlovutvalgets utredning "Rett i bane", (www.regjeringen.no: Nærings- og fiskeridepartementet, 2020).

[803] Nilsson, interview.

[804] Nærings- og fiskeridepartementet, Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet, p. 13 (www.regjeringen.no: Nærings- og fiskeridepartementet, 2020).

[805] Nærings- og fiskeridepartementet, Ny lov om romvirksomhet, (www.regjeringen.no: Nærings- og fiskeridepartementet, 2019).

[806] Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet*, p. 9.

[807] Nærings- og fiskeridepartementet, *Høring om Romlovutvalgets utredning "Rett i bane"*., p. 69

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 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.[808]

At Svalbard, permits for space activity could not be granted if the activity opened for 'warlike purposes', *but de guerre*. The Svalbard Treaty 'clearly entails a ban on the deployment and launching of weapons and other forms of warfare'; however, 'the delineation between such activity and other forms of military activity is not clear.'[809] The dominating opinion amongst Norwegian authorities was that the Svalbard Treaty only applied to 'acts of war' and the space act committee based their views on this interpretation.[810] 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. [811] Since space activity could involve socially critical infrastructure and 'advanced, partly military, technology', several space activities would be subject to the National Security Act.[812]

2.4.2. 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.[813]

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 considering bilateral and multilateral space cooperation and overall assert Norway 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 leadership in the Haag Code of Conduct against the proliferation of ballistic missiles.[814]

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[808] Nærings- og fiskeridepartementet, *Utredning fra utvalg oppnevnt av Nærings- og fiskeridepartementet til å foreslå ny lov om aktivitet i verdensrommet*., pp. 58-60

[809] The wording in the Antarctic treaty was stricter and would allow for the use of space for '"peaceful purposes only"'. See: ibid., p. 62

[810] Ibid., pp. 61-62

[811] Ibid., p. 68

[812] Ibid., p. 118; The addressees were asked provide feedback 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 submission of a new draft was therefore delayed. Wahl, interview.

[813] Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, pp. 41-42.

[814] Ibid.

NOSA proposed that to further reinforce Norwegian space activities, the Armed Forces, FFI and Norwegian defence industry could build on their long-standing collaboration in developing rocket engines, missiles, and 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 its own space capabilities' and anticipated a rapid increase in national military space activities.[815]

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 military space strategy. NOSA expected the MoD would focus even more on space activities in their 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 (FSI) 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.[816]

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 in an alliance perspective. [817] 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 also 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 requirements"' by quickly developing and launching space capability on demand.[818]

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.'[819] 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, Great Britain, and Canada in an RSC to convene

[815] Ibid., p. 27.
[816] Ibid., pp. 27, 36.
[817] Ibid., p. 36.
[818] Ibid., p. 38.
[819] Deptula, interview.

at Andøya. Conclusively, 'there is also interest from our allies for a launch base for small satellites on Norwegian territory.'[820]

NOSA envisioned that the Norwegian defence sector would 'take a more active role' to help materialise the space launch facility at Andøya. However, there had to be a 'right balance' considering civil-military relations as well as considering '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 rather be socio-economically sustainable and provide services which the Norwegian Armed Forces could use.[821] To the MoD, a nationally controlled space launch base at 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.'[822] 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.[823] It would facilitate commercial as well as international cooperation whilst increasing Norway's national security, flexibility, predictability and responsiveness considering Norway's ability to prioritise national needs. [824] For educational purposes, Andøya Space Education (formerly known as Narom) was discussing with the MoD to offer courses and workshops on space and satellite education to the Norwegian Armed Forces.[825]

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.' 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 'significant affect the performance of our satellites' and NOSA therefore urged the Norwegian defence sector to include access to space launch services into their considerations.[826]

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 to 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.[827] Norway would have to compete with

[820] Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, p. 38.
[821] Ibid., p. 37.
[822] Ibid.
[823] Nilsson, *Forsvarssektorens satsing på Space: "Nøkternt og Trinnvis"*, p. 11.
[824] Norsk Romsenter, *Andøya Spaceport: Kartlegging og vurdering av nasjonale interesser*, p. 37.
[825] Ibid., p. 52.
[826] Ibid., p. 37.
[827] Eirik Billingsø Elvevold and Eivind Bøe, "Grønt lys for Andøya Space-finansiering: – En historisk dag," *E24* (www.e24.no), 8 October 2021, https://e24.no/naeringsliv/i/RrOkW2/groent-lys-for-andoeya-space-finansiering-en-historisk-dag.

Sweden, Scotland and Portugal, however, as these countries too were striving to become the preferred space launch base on the European continent.[828] 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 Norwegian space industry. Certainly, the Prime Minister's rhetoric in October 2021[829] 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.[830] The Prime Minister was certainly 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'.[831]

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.[832] On the same day, Chairman of the board at Andøya Space, Rasmus Sunde, announced that Andøya Space's former Chief Operating Officer (COO), 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'.[833]

2.5. 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 underpinning 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

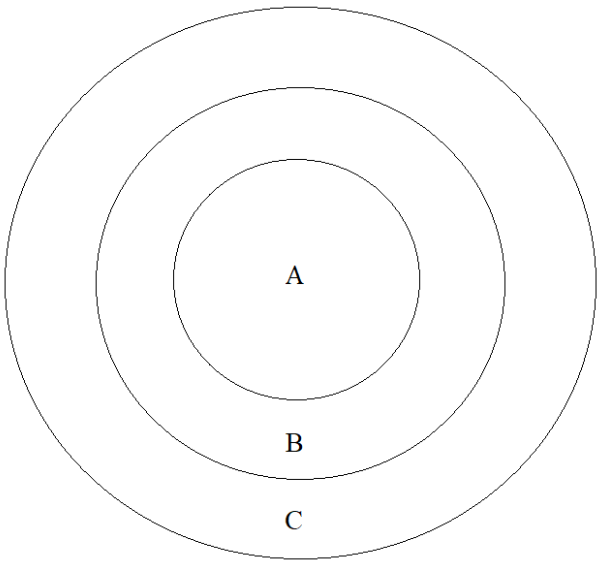
[828] Andreas Nilsen Trygstad, "Andøya Space får 365 millioner: – Dette er startskuddet for romvirksomhet 2.0," 8 October, *NRK Nordland* (www.nrk.no) 2021, https://www.nrk.no/nordland/andoya-space-center-og-andoya-spaceport-far-millioner-i-finansiering-til-satellittbase-1.15682330.
[829] Ibid.
[830] Paikowsky, *Clubs of Power: Why Do Nation-States Join the "Space Club"?*
[831] Andrea Vasholmen Mostue, "Klarsignal for å etablere en oppskytningsbase på Andøya," *Forsvarets Forum* (www.forsvaretsforum.no), 9 October 2021, https://forsvaretsforum.no/andoya-space-innenriks-kongsberg-gruppen/klarsignal-for-a-etablere-en-oppskytningsbase-pa-andoya/221223.
[832] Ole Kåre Eide and Øyvind Førland Olsen, "Odd Roger Enoksen blir ny forsvarsminister," *Forsvarets Forum* (www.forsvaretsforum.no), 14 October 2021, https://forsvaretsforum.no/politikk/odd-roger-enoksen-blir-ny-forsvarsminister/221894.
[833] Eirik Amb Nysveen, "Ketil Olsen er ny sjef for Andøya Space," *E24* (www.e24.no), 14 October 2021, https://e24.no/teknologi/i/oW97OW/ketil-olsen-er-ny-sjef-for-andoeya-space.

power as an instrument in the event of conflict or war. As of late 2022, the proposal is still pending.

Norway's aim to use all its space capabilities as security policy tools to increase its status as a space power and reinforce its relations with its closest allies has emerged as an explicit strategy, and Norwegian politicians, including the Prime Minster, have grown 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 to result from a combination of Norway's long-standing collaboration with Germany on sounding rocket projects, and Norway would likely 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 Norway in 2019 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 underpinned by the appointment of Vice Admiral Olsen as Director of Andøya Space. And 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.



A. United States, Germany
B. NATO
C. RSC (US-led)

Figure 38: 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. It also marks a change in the sense that Norway has traditionally prided itself on taking a sombre approach to space activity, explicitly opposing to embark 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 shine in the light of Norway's first step towards autonomous space capability, which although it has considerable national security implications, the commercial viability of all these projects is fundamental.

Norwegian military commanders during this time advocated national self-sufficiency in space, both considering space-based ISR and SATCOM, relating to the Stractic Intelligence and Force Enhancement doctrines. The Deputy Director of NIS also claimed that the importance of intelligence was a key driver in undertaking the review in the first place. Some military executives believed 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 for General Frisvold in the early 2000s, and Norway ultimately opted for the traditional route by keeping its MPA capability. Still, national capability development supporting both doctrines was now budding in Norway. Considering the strides towards net-centricity, combined with the role of NIS as a military operating unit responsible for intelligence *and* Norwegian military space activity, the space doctrines of Stractic Intelligence and Force Enhancement can be understood to be converging.

Discussion and conclusions

This thesis has examined the evolution of contemporary Norwegian military space activities since the late 1970s until present day, with a geopolitical and regional focus on the High North. Contemplating existing views on space power and Norwegian defence and security policy, it essentially depicts Norway's path towards becoming a considerable space power for a small nation and its implications for the Norwegian Armed Forces. The study has highlighted relations between Norway's overall defence and security policy, military-strategic considerations, and operational and tactical aspects of military space activity.

The purpose of the study has been to examine the role of Norwegian military space activity in Norway's defence and security policy, and it has considered the following hypotheses:

1) Norwegian military space activity has emerged as a strategic asset in Norwegian alliance policy.
2) Norwegian military space activity reflects upon relations between Norwegian policymakers and practitioners.
3) Norwegian military space activity has transformed the notion of civil-military separation in Norway.
4) Norwegian military space activity demonstrates the existence of two competing, unofficial space doctrines in Norway.
5) There is a detachment between space in Norwegian military joint doctrine and Norwegian military space activity.

Norway's impetus for developing national satellite-based capability from the late 1970s onwards was the same as the original motivation for access to space, namely the fact that operating in space gave countries the ability to have a perspective to locations that they would otherwise be denied. The innovation of small satellites has dramatically reduced the costs and enabled small and medium sized states to develop national satellite capability; however, it has been an uphill battle to convince the Norwegian Armed Forces and the MoD to invest in space. Space surveillance satellites could support Norway at 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, crisis management and management of the Coast Guard and other tactical military resources. However, Norway has lacked the SATCOM capability to support space-based ISR. Essentially, Norway has been using satellite-based ISR to improve situational awareness and allocate the Coast Guard's tactical capabilities to execute missions serving to command authority in areas under Norwegian jurisdiction, and has a way to go in terms of tactical use of surveillance satellites.

The military role of space was widely underestimated in Norway until the pivotal year of 2014 – 2015, when Norway undertook its first comprehensive military space strategic review. This led Norway to progressively acknowledge the role of space and incorporate space as a military

domain in the Armed Forces. Space was classified as a joint domain, moving away from the thinking and planning in terms of segregated domains and services. The space domain has itself been stove-piped, as it has been operated by individuals carrying out different functions such as imagery intelligence and satellite communication. In Norway, these functions came to serve as a basis for how to organise and govern Norwegian military space activity. Pondering contemporary military thought, a timely question is whether the Armed Forces overall should be moving towards functionally based military operating units – where the domains are simply where those functions are conducted.

Norway's focus on developing a military space organisation forcefully demonstrates the significance of a functioning and coherent structure and organisation and the inherent link between military doctrine, whether it is official or unofficial. As for official military doctrine in Norway, it has largely been detached from the nation's actual military space activity, which can rather be represented by the two space doctrines of Stractic Intelligence and Force Enhancement considered in this thesis. And while Norwegian military space activity appears to have been incoherent over the years and decades, there has at the same time been a considerable degree of consistency in the sense that these activities have focused on developing national capability to enhance Norway's ability to perform maritime surveillance in the High North. With increased awareness on the military space domain following the military space strategic review in 2014 – 2015 and the following defence study, Norway has consolidated these aspects though its national military space strategy, which focuses on the two key objectives that entail strengthening Norway's access to satellite-based communication and maritime ISR in this region.

Towards present day, Norway has developed a wide range of national space capabilities and established space as a military domain in the Armed Forces. This has ultimately led Norway to incorporate defence and security policy considerations as a central aspect of its national space policy. The country has come a long way since it was one of the 'lost' space actors in the late 1970s and is currently developing national space capability to the extent that it is climbing towards the second highest level of 'the inadequate', where it is nearly able to indigenously develop, maintain, and control satellites. Once Norway establishes an operational space launch facility under national control on Norwegian territory, it can be understood that Norway is about to take another step up in the international hierarchy of nation-state space actors.

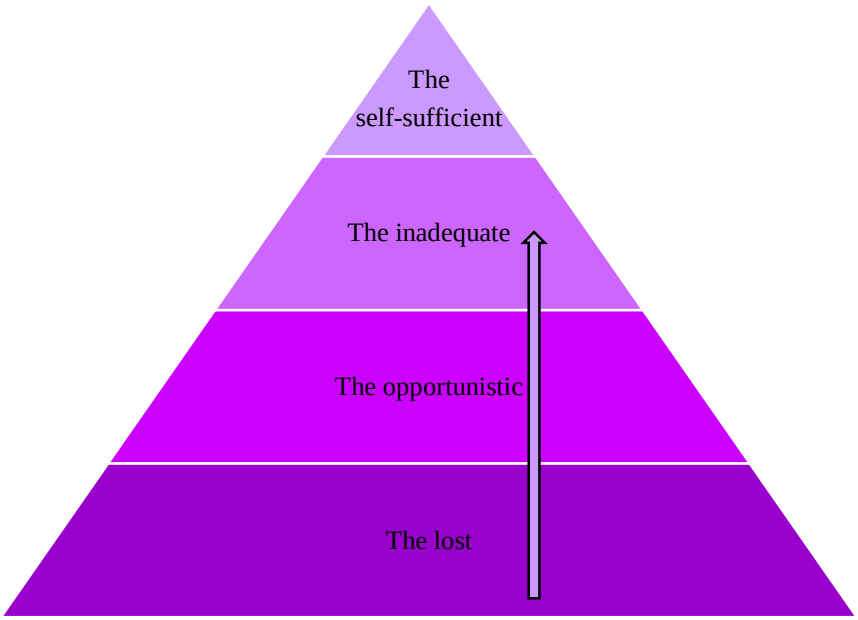


Figure 39: Norway's rise towards the apex of the self-sufficient towards present day.[834]

1. Military space capability as a strategic asset in alliance policy

Norway has throughout the entire period used space as a foreign policy tool to reinforce its integration with the west and its bilateral and multilateral relationships with its closest allies, predominantly the US and NATO. Norway has drawn extensively upon principally civilian, US, Canadian, and especially European satellite programs to develop indigenous military space-based capability and used this capability to reinforce ties with key allies in the military and intelligence realms. ESA has in this sense been Norway's principal facilitator for national space capability development via NOSA, which has served as an important foundation for the military. Niches such as downlink and data processing capability to generate high-quality SAR imagery and IMINT capability allowed Norway to access foreign military and intelligence instruments in return. Other niches are currently developing, most essentially space-based ISR and SATCOM to cover Norway's unique national needs in the maritime and High North domains. These capabilities, as well as the satellite launch facility in northern Norway, underpin Norway's recent, significant strides towards national self-sufficiency and control of space capability, which Norway is using actively to prove itself as a good ally. These capabilities are treated as bargaining tools in exchange for other capability or allied support, which in addition to commercial revenues is necessary to justify the cost of this national effort.

The integration of US military payloads on the Norwegian HEO SATCOM system planned for launch in 2023 demonstrates the absolute dominance of the US in Norway's alliance policy,

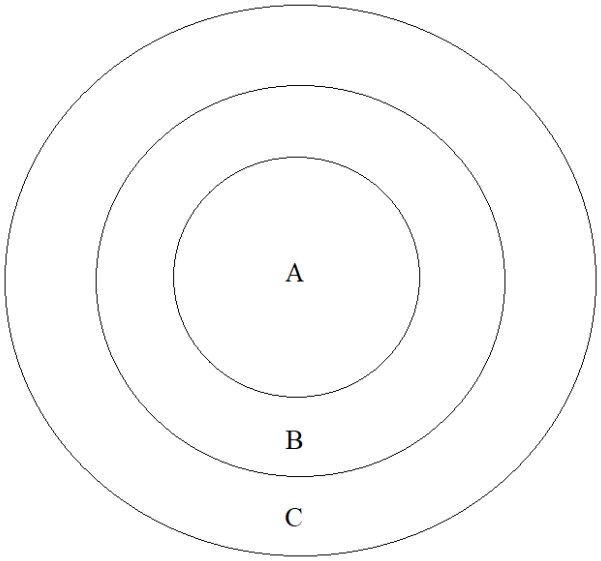
[834] As outlined in the analytical framework, the model is a visualization of Bingen's hierarchical classification of nation-state space actors: Bingen, *Det nære verdensroms strategiske dimensjoner*, pp. 27-28.

whereas the US sees it as a way of spreading risk. This constitutes another form of trade-off between the two countries, and shows that in Norway's relation to Russia, deterrence takes precedence over reassurance in space. Norway acknowledges that in the event of conflict or war, satellites constitute vulnerable targets, but Norway assumes that the threshold for an adversary to tamper with a satellite is higher if it implicates the US. This mind-set will likely only be further reinforced due to Russia's invasion of Ukraine on 24 February 2022.

National military space activity was until late driven from the bottom-up but received increasing attention and top-down coordination following the military space strategic review that commenced in 2014. The following Defence Study reinforced that Norway should use space-based intelligence and SATCOM capability to provide something of use for its allies and use these capabilities as bargaining tools in exchange for other capability and allied support. Norway further underpins its investment in military space activity based on NATO's definition of space as a critical domain. The conception of space as a strategic asset in alliance policy has towards present day become cemented as a political rationale at the highest level of politics. Still, national security and strategy is not the driving force: it is the bottom line that is "the be all end all", and the investment strategy is largely based on commercial revenues.

Norway is not a member of the EU, due to which the EU entirely undermined Norway's interests when the EU took over the helm as owner of European space capabilities. While it is more than 20 years since the EU excluded Norway from the inner circle of the European satellite centre in Torréon in 2001, Norway has not yet made its way to full access at the centre. This indicates that while Norway is not a member of the EU, Norway ought to focus its European efforts within the NATO framework. NATO is not planning to develop satellites dedicated to the alliance, but Norway should collaborate with selected NATO member states. In Europe, military affairs, including military space, is principally a matter of the sovereign nation-states and not of ESA or the EU, with France, Germany, and Italy as the leading space nations.

While the proliferation and duality of space capability presents new options and opportunities in international collaboration, Norway remains loyal to its long-standing, transatlantic alliance policy, also in military space affairs. This includes Norway's use of commercial satellite imagery, exemplified by providers Digital Globe and Maxar Technologies of US origin. The landscape of Norwegian national security space is less dynamic than it appears in existing literature, which suggests that "everyone can collaborate with everyone." The US and NATO remain the cornerstones in Norwegian military space affairs in a High North perspective. This alliance policy has broad political support in Norway, essentially because the defence of Norway against an existential threat is an allied operation. It is also why the MoD instructed its agencies to use NATO as a facilitator for military space activity, such as Space Norway's HEO SATCOM system and SMART Milspace. Through the latter, the MoD is currently forging closer ties with the Dutch MoD based on overlapping interests in the naval domain, which follows political guidelines to bond with geographically close allies in addition to the US. With Finland and Sweden about to become NATO members, the Nordic perspective should be further explored.



D. US, UK, the Netherlands, Germany, Canada
E. ESA, NATO, EU
F. RSC (US-led), MUSIS, Inmarsat

Figure 40: Key alliances in Norwegian military space collaboration.

2. Relations between the political establishment and practitioners of military space activity

Some inconsistencies have been uncovered in the thinking about military space activity within the Government and between Norway's political establishment and those who have conducted this activity and capability development. This was largely driven from the bottom-up, which has likely caused some of the detachment. There are also differing interests between those who are involved in military space activity, including MTIF and NOSA, which focus on industrial development through Europe, and the MoD, which first and foremost maintains US and NATO relations.

The first identified detachment was the way several Norwegian parliamentarians described ESA and Norway's space policy in 1987 as 'purely civilian' and non-military. This was almost paradoxical considering that funding channelled through ESA via NOSA was used to develop capability of military importance to Norway from the onset, and demonstrated a considerable detachment between the political level and the practitioners. ESA essentially served Norway as a tool in national military space capability development since the onset. In this respect, the notion that the civilian or non-military European space programs have become subject to militarisation is a development to which Norway has certainly contributed. The MoD later demonstrated with Hisdesat that establishing national space capability was not a priority and the MoD was principally concerned with identifying the less expensive solution. During the military space strategic review, another discrepancy emerged as several military executives expressed very clearly that civil-military space coordination in Norway was blatantly flawed. The MoD's State Secretary had not observed this and therefore trusted that everything was

working well, which in comparison almost came off as ostrich policy or political superiority. There are also indications that the civilian space funding mechanisms were not well understood within the MoD at this point. And although MTIF's 2013 space policy abstained from addressing any concerns relating to military use and national security, the MoD were convinced in 2016 that NOSA knew what the Armed Forces needed, however; the Armed Forces had hardly understood it themselves. At the same time, the State Secretary did convey that the political establishment would not interfere with how the Armed Forces chose to organise their military space activities.

Discussions and interviews with military officers and political executives show that Norwegian military thought on the space domain, including the notion of a national ambition level for military space activity and capability under national control, was immature when Norway embarked on its first military space review in 2014. National security aspects of space were certainly not consolidated within the military organisation or the MoD, and space technology and operations was lacking in Norwegian officer training. Nevertheless, the proposition to evaluate satellites as an option to replace existing capabilities represented a step forward in the thinking about capability evolution, as consideration was now being given to replacing a capability rather than merely updating a specific platform or sensor system with a more modern version.

With Program Space and the MoD's investment in space, Norway's national thinking on military space aspects and the role of space capability as a strategic asset for the country and intergovernmental coordination developed significantly. The 2019 space policy represented a considerable leap forward as it was the first national space policy to thoroughly address national security and military concerns. This policy underpins said development of cross-sectorial collaboration and understanding of national security and military space affairs in Norway. It can also be understood that Norway's political establishment had finally overcome the notion of military space activity as too politically sensitive to address, as they may have in the past.

The MoD's governance of military space activity has fundamentally been shaped by financial concerns, which is why the ministry has been reluctant to invest in national space capability development. The MoD's fiscal considerations from the onset led Norway from the bottom-up to adopt a pragmatic military space strategy based on civilian space assets and actors. It also led the ministry to instruct the Armed Forces to clarify responsibilities and prioritise military space activities in accordance with Norway's national space strategy issued by MTIF, to follow a civil-military path, and exploit existing national and international space systems, including dual use solutions. The MoD were also wary of intergovernmental coordination disputes, were the Armed Forces to take on a bigger role. Increased bilateral and multilateral collaboration, i.e., *cost-sharing*, allowed Norway to increase its ambitions in national and military self-sufficiency. Norway's national military space capability serves in this respect as an indicator of Norway's overall space capability, as opposed to an indicator of Norway's overall military capability. That is essentially also how the Norwegian three-level model for military access to space capability differs from the French, as the centre square in Norway's policy is based on national, dual-use capability as opposed to dedicated military capability.

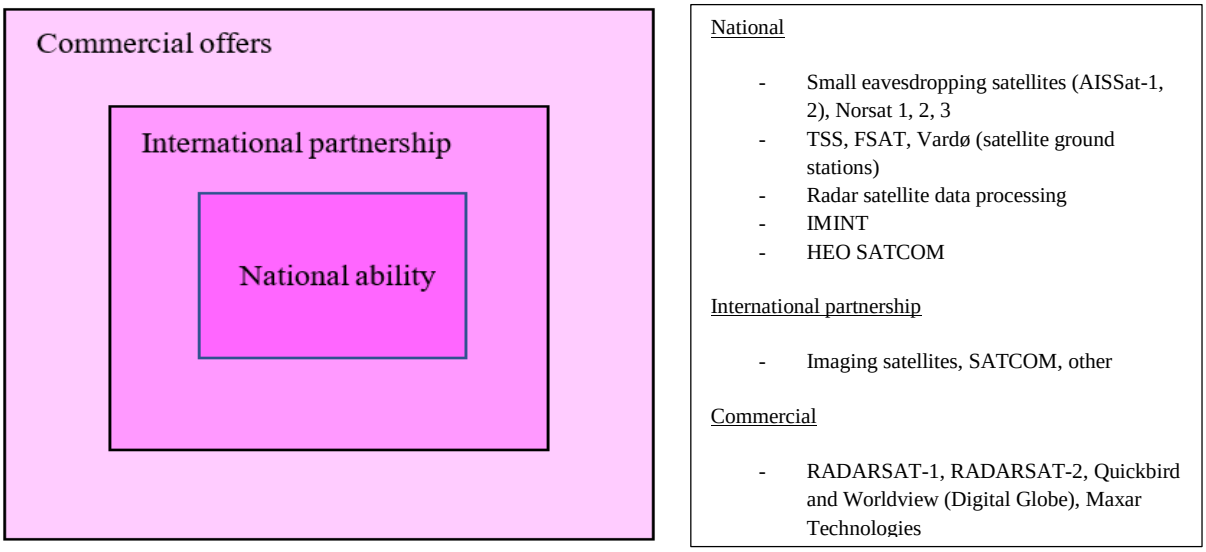


Figure 41: Key capabilities and partnerships ensuring the Armed Forces access to satellite-based capabilities towards 2022.

In the period following Defence Study 2015, Norway took great strides towards national self-sufficiency in space. This marks a change in Norwegian national space policy developed under MTIF since Norwegian space policy has thus far opposed prestigious, national projects. Developments were facilitated through commercialisation and dual-use, cost sharing, however, and would likely not have materialised otherwise.

3. Dual-use considerations

In retrospect, it can be understood that the Conservative Party's Per-Kristian Foss with remarkable accuracy pinpointed in 1987 how space activity complexified the notion of civil-military separation. The bottom line is that monetary concerns forced civil-military collaboration and military space development, which the MoD would otherwise not have justified with a purely military approach. It was essentially FFI who identified alternative possibilities through civilian channels in a bottom-up approach. Foss rightly forecasted that these developments would lead Norway to lose its "innocence" considering the national political tradition of clearly delineating between civil and military affairs. At the practitioner's level, this obfuscation started at least a decade previous, however. In that sense, Foss' statement in 1987 also indicates that the political establishment was far behind in understanding the political implications of technological capability development within FFI and the Armed Forces, although some were now starting to comprehend.

When Norway underwent its first military space strategic review in 2015, FFI and the Armed Forces were explicitly instructed *not* to delineate between military, civilian, governmental, or commercial space capabilities, but to keep all options open for military space exploitation. The approach was substantiated by the MoD's State Secretary in 2016, although the MoD was principally motivated by a reluctance towards spending too much of its budget on space activity.

The Norwegian AIS satellite certainly exemplified the dual-use aspect, as it was a satellite funded through civilian channels, while the Armed Forces immediately became the largest user of AIS satellite data. It was the proliferation of such dual-use satellite platforms that drove the Government to pass new regulations governing satellite ground station activities at the Svalbard archipelago and in Antarctica, which evidently demonstrated how difficult it would be to delineate between civil and military use of satellite capability. Norway chose to ban downlink of military satellites, or satellites *intended* principally for military use, although matters related to intent is of course difficult to assess. While it is not set in stone what the notion of "warlike purposes" entails, Norway's traditional interpretation that it entails "acts of war" was reinforced by the proposal to renew national space legislation in 2020.

It was also the dual use aspect that spurred the public debate instigated by NRK in 2018, where NRK accused the MoD of "hiding" military capability on civilian satellites. NRK's claims that the Government withheld information seem unfounded, however; the MoD had been remarkably open about their space investment program, including their intentions to take advantage of civilian capabilities and actors to the greatest possible extent. The media's involvement did however bring to the fore that Norway acknowledges that civilian or dual-use infrastructure, such as Space Norway's HEO satellites, can certainly constitute legitimate military targets. Although this was nothing new, it increased awareness amongst the public as well as within political and military circles considering the vulnerability of space systems and Norwegian deterrence strategy.

4. The principal value of the role of space systems: space doctrines and organisation

The military space activity considered in this study represent two partly competing space doctrines. It also shows that these schools, or doctrines, that are derived from US doctrine, are applicable to the small state of Norway with some adjustments. For this study, which focuses on satellite-based activity, these doctrines have been labelled Stractic Intelligence and Force Enhancement. The course of events shows that Stractic Intelligence dominated in Norway from the 1970s until the early 2000s, when Force Enhancement took over until Norway launched its first surveillance satellite in 2010 and the MoD terminated the SATCOM project in 2012. Stractic Intelligence then again became the dominating doctrine. Ultimately, the battle for space authority within the Norwegian Armed Forces was a battle between the Stractic Intelligence and Force Enhancement doctrines, where the former took precedence. Furthermore, with the Chief of NIS at the helm of the space management group and the Deputy Director of NIS at the helm of the intergovernmental military space coordinating forum, Norway's military investment in space is now being managed at the highest level of Norway's military chain of command.

1970s – 2000s	2000s	2012 – present
Stractic Intelligence	Force Enhancement	Stractic Intelligence
1977: EEZ/Coast Guard 1978: SEASAT-1 1980s: CESAR 1983: Remote sensing strategy 1987: ESA 1991: TSS, ERS-1 1995: ERS-2, RADARSAT-1 1998: Interpretation Centre (IMINT)	2000: Defence Study 2000 omits satellite surveillance 2001: EU takes over Torréon 2004: MoD terminates NSAT. FSAT operational 2006: Military executives publicly display contempt for national satellite-based ISR 2007: DS 2007 omits satellite surveillance, advocates SATCOM 2008: MoD establishes INI/CYFOR 2009: MoD decides to invest in Hisnorsat 2011: Military space strategy draft under the auspices of INI 2012: INI renamed CYFOR. Hisnorsat terminated	2010: AISSat-1 2014: AISSat-2 2017: Norsat-1 & 2 2019: HEO SATCOM 2020: NIS appointed military space authority 2021: Norsat-3/Andøya spaceport 2022: KDA commercializes Norsat

Figure 42: Norwegian military space activities indicating the dominance of Stractic Intelligence from the late 1970s until 2000; Force Enhancement from 2000 until ca 2012; and Stractic Intelligence from ca. 2012 until present day.

Since at least the 1980s, Norwegian military institutions have harboured ambitions of national self-sufficiency in satellite surveillance, although they were always wary that satellite capabilities might not be available in crisis or war scenarios. These ambitions were mainly driven by the need for military intelligence for operational use in the High North. Stractic Intelligence doctrine was reinforced in the 1990s, when FFI aimed for Norway to be at least as well-informed as other nations in Norway's own areas of interest, and FFI defined satellite surveillance as one of their five main research areas. Norway aimed to use space surveillance capabilities to support all levels of strategy, hence the name of the doctrine.

Stractic Intelligence dominated until the 2000s, when net-centricity worked its way into Norwegian military thought to the extent that the MoD planned to acquire military SATCOM capability under national control. Net-centricity also contributed to obfuscate the delineation between political, strategic, operational, and tactical levels, influencing both doctrines. The dominance of Force Enhancement in the 2000s was underpinned by events such as the termination of NSAT in 2004; a few key military executives demonstrating their public disdain

of FFI's ambitions to develop national satellite-based ISR; and the establishment of CYFOR's predecessor INI in the 2008 LTP. Since SATCOM constituted a considerable national investment, it received more attention than space activity underpinning Stractic Intelligence, and INI/CYFOR became the military operating unit associated with military space activity in Norway. Force Enhancement doctrine eventually recoiled with the termination of Hisnorsat in 2012; SATCOM had been defined as a critical capability to Norway, but it was not critical enough for the MoD to pay the full price under the given fiscal circumstances. In this sense it can be understood that Stractic Intelligence dominated because it did *not* require substantial investments from the MoD.

Norway's first satellite in 2010 was a maritime surveillance satellite, and Norway continued to develop small satellites designed to support the Armed Forces' surveillance mission in the High North. Continuous maritime surveillance in the High North is a primary objective for the Government and the Armed Forces, and the military space strategic review emphasised strengthening Norway's national decision-making basis through surveillance and intelligence activities in the nation's key areas of interest. A reinforced ambition of national self-sufficiency in this domain emerged, which entailed that Norway should own and control space capabilities to ensure sovereign decision-making. The Chief of Defence ultimately prioritised an overall modernisation of NIS to adjust to the increasing need for ISR and early warning of threats against Norway; satellites in this respect constituted a key element in Norway's first line of defence and in ensuring situational awareness and a decision-making basis for Norwegian authorities. While the recommendation to replace existing MPA capability with a constellation of satellites and other aerial platforms did not gain traction at this point, it indicated how satellites could play a more central role in Norway's military operations.

The importance of space for intelligence collection and situational awareness to ensure national command of sovereignty led the MoD's State Secretary in 2016 to anticipate that NIS was a potential candidate to manage the role of Norway's military space authority. At the same time, he suggested that Norway's substantial investment in F-35 combined with the persistently increasing network-centric orientation of the Armed Forces and Norway's investments plan considering SATCOM led the MoD to imply that the Cyber Defence Force could also manage this role. A third alternative was the Air Force, based on the traditional notion of space as an extension of the air domain. Thus, the State Secretary provided arguments supporting Stractic Intelligence on the one hand, and Force Enhancement on the other.

Despite not having had anything to do with space in the past, Program Space tentatively decided in December 2018 that the Air Force was to have a leading role in Norwegian military space activity. With that, Program Space clearly advocated the Force Enhancement doctrine. However, the principal argument was not tied to how Norway valued the role of space systems, but rather it was proposed as a practical solution to ensure parity with the many other states that followed this traditional approach. This proposed direction also demonstrated that NIS did not accept being subordinate to the Air Force in matters of ISR. It also highlighted the lack of clarity considering the question of ISR, which the Armed Forces is struggling to grasp. This is underpinned by how ISR constitutes an element of both doctrines (see Figure 43), where the distinction is how it is *used*. Is it used as a force enhancing element, such as targeting, or is it

used for intelligence purposes? The study indicates that space-based ISR is still largely limited to strategic and operational use in Norway, and that the Armed Forces have not yet come very far in utilising space-based ISR in Force Enhancement. This therefore poses a key focus area for future development that concerns Force Enhancement in Norwegian military operations.

General Kristoffersen's appointment of the Chief of NIS as Norway's military space authority in the fall of 2020 consolidated Stractic Intelligence as the leading space doctrine in Norway. Like the US Space Force has become a member of the US IC, this too demonstrates that intelligence and military functions of space are becoming increasingly intertwined. Still, while NIS remains space authority, Stractic Intelligence will continue govern Norwegian military space activity. This means that ultimately, Norway values military space activity and capability principally for its role in intelligence. The appointment of NIS as space authority also underpins that NIS is becoming an increasingly important institution to the Government.

While it is untraditional in an international perspective to appoint a nation's intelligence service or IC as space authority for the nation's Armed Forces, it correlates with Norway's history in military satellite-based activity. This is centred around the main impetus of constant surveillance in the High North, a national mission that includes monitoring and assessing Russia's conventional military and nuclear capabilities and intentions, where the submarines commanded by the Northern Fleet constitute the flagship of Russia's nuclear triad. At the same time, traditional roles in space are cemented, with CYFOR responsible for SATCOM and Navy for PNT. This is unlikely to change, and Force Enhancement coexists principally supported by CYFOR, Navy and NJHQ as well as NIS. It demonstrates that Norway organises "space" according to the function of the space platform, meaning it is not the space domain or the satellite that is important, but what the satellite *does*. In 2020 the MoD decided that Norway's military space investment would focus on space-based maritime ISR and SATCOM under national control, and it can be understood that operational and tactical space-based ISR acts as a bridging element between the two doctrines. SATCOM, traditionally associated with Force Enhancement, can be understood as a space capability that supports Stractic Intelligence as a dissemination instrument, whereas lack of SATCOM is characterised as the main obstacle to the doctrine. This mutual dependency is visualized as a doctrinal overlap in Figure 43.

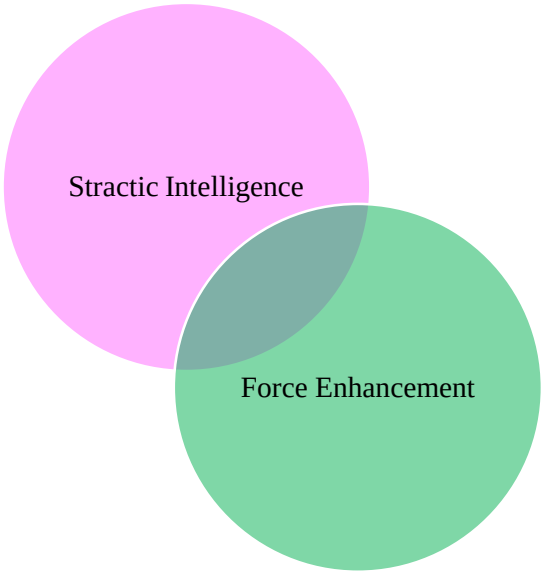


Figure 43: Overlap between Stractic Intelligence and Force Enhancement doctrines.

That NIS is a military operating unit might reduce the gap between the two doctrines, although, with NIS as space authority, Force Enhancement is the subordinate and secondary doctrine. As with any other solution, this poses challenges and difficulties, opportunities, and advantages. It is now up to NIS to support both doctrines. The main challenge is the extent to which NIS is motivated to support the Force Enhancement doctrine, which is now, along with Stractic Intelligence, under the responsibility of the Chief of NIS as force commander for space. The Chief of NIS is no longer only Chief of Norway's intelligence mission, but for the conventional military use of space as well, and this entails supporting Force Enhancement. A cause for concern in this respect is the veil of secrecy within NIS most comfortably operates, which may inhibit the development of Force Enhancement. The question is whether this is compatible, or if one of the missions will suffer?

5. Space in Norwegian doctrine and military space activity

Norwegian military joint doctrines published under the auspices of the Chief of Defence since 2000 have addressed space as an element under the Air Force, where space has been evaluated for its role in air power. They are therefore not "space doctrines" but considers the role of space in air operations. These doctrinal contributions have been written by the Air Force's academic environment and are marked by import of theory from abroad, predominantly the US. In this sense, this observation aligns with and constitutes an exemplification of the overall examination of Norwegian joint doctrine in 2007. The written Norwegian doctrines, not to be confused with the doctrines or schools of thought proposed by this study, have not been principally based on the actual military space activity in Norway, but on what other nations have written about the subject.

When Program Space proposed to appoint the Air Force as Norway's military space authority, it was an argument that this approach would align Norway's space activity with Norwegian joint doctrine. The choice of the Air Force was principally a strategy with which Program Space aimed to achieve parity with other states, as air forces are often responsible for conventional military space activity. That the Air Force's academic environment since 2000 has taken it upon themselves to address space in Norwegian joint doctrine is likely a reflection of this phenomenon. The problem is that this approach has been detached from Norwegian military space activity, in which the Air Force has never had a role. This discrepancy was highlighted during the joint meetings between the working group and the reference group in February – April 2015, when the NIS representative before the group demoted the role of the Air Force. He explicitly conveyed that while space had only been addressed as an element of Air Power in Norwegian doctrine, which gave the impression that the Air Force was somehow responsible for space, this was not the case. As a prelude to the battle for space authority that was soon to come, the NIS representative argued that the Air Force did not have any authoritative role in terms of Norwegian military space activity; the Air Force had merely written the doctrines without having had any de facto space experience or responsibility. The way Norwegian military doctrines have treated space can therefore not be understood to have provided guidance for the operating units in the Armed Forces. This poses the overall question of what is the function or purpose of Norwegian military joint doctrine? In the future, greater consideration should therefore be made to ensure consistency between the map that is Norwegian joint doctrine and the landscape that is Norwegian military space operations.

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Appendix A: List of Participants

In-depth interviews

Norwegian nationals

Name	Interviewed in capacity of role
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.)	Former Inspector General of the Royal Norwegian Navy
Grandhagen, Kjell (Lt. Gen.)	Former Chief of the Norwegian Intelligence Service
Helle, Nils (Commodore)	Head of Information and Communication Technology at the Norwegian Defence Logistics Organization
Jakobsen, Rune (Lt. Gen.)	Chief of the Norwegian Joint Headquarters
Jansen, Petter	Chief of the Norwegian Defence Logistics Organization
Johansen, Henry Kjell	Former Research Director at FFI
Nilsson, Stig Eivind (Col.)	Former Head of the MoD's Program Space, the Defence Staff's Space Operations Section, and the NIS Space Division
Olsen, Richard B.	Deputy Director of the Air and Space Systems Division at FFI
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
Stensønes, Nils Andreas (Vice Adm.)	Chief of the Norwegian Intelligence Service
Wahl, Terje	Director of Research and Earth Observation at NOSA

US nationals

Name	Interviewed in capacity of role
Armor, James (Maj. Gen.)	Former Director of the Pentagon's National Security Space Office
Cartwright, James E. (Gen.)	Former 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.)	Former Commander of US Air Force Space Command
Marquez, Peter	Former Director of Space Policy at the US National Security Committee at the White House
O'Connell, Kevin	CEO 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 SOF position (Chief of Staff to ISAF SOF 2009 – 2010)
Billington, Rolf Arne	Historian at Norwegian Ministry of Defence
Christophersen, Øyvind	Senior Adviser at NSM
Diesen, Sverre (Gen.)	Former 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 *Norsk Militært Tidskrift*
Mæland, Arne Jørgen	Chief Technologist Space Systems, Telenor Satellite
Slensvik, Thomas (Commander)	Head teacher 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 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
Buenneke, Richard	Senior Adviser, Space Policy at US Department of State
Gallagher, Nancy	Director of the Centre 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
Raftery, 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	Consulted in capacity of role
Brachet, Gerard	Led the development of SPOT
Heisbourg, François	Special Adviser for Foundation pour la Recherche Stratégique

Italian nationals

Name	Consulted in capacity of role
Ferrazzani, Marco	Chief Legal Counsel at the European Space Agency
Giannopapa, Christina	Head of Political Affairs Office at the European Space Agency

Appendix B: Ethical approval letter

University of St Andrews

University Teaching and Research Ethics Committee

25 February 2019

Dear Tale,

Your ethical application has now been reviewed by the University Teaching and Research Ethics Committee (UTREC), alongside the following supporting documentation:

1. Ethical Application Form
2. Continuation of Q31
3. Statement Regarding Ethical Approval from the University of Glasgow
4. Data Management Plan
5. Semi-Structured Interviews and Focus Group Guide

I am pleased to confirm that UTREC has granted this application ethical approval and the particulars of the approved ethical application are as follows -

Approval Code:	IR14110	**Approved on:**	20 February 2019	**Approval expiry:**	20 February 2024
Project Title:	The evolution of space power - Norwegian case study				
Researcher(s):	Tale Sundlisaeter				
Supervisor(s):	Professor Phillips O'Brien				

Approval is awarded for five years. Projects which have not commenced within two years of approval must be re-submitted for review by your School Ethics Committee, who may escalate your application to UTREC for review. If you are unable to complete your research within the five-year approval period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

If you make any changes to the project outlined in your approved ethical application form, you should inform your supervisor and seek advice on the ethical implications of those changes from the School Ethics Convener who may advise you to complete and submit an ethical amendment form for review.

Any adverse incident which occurs during the conducting of your research must be reported immediately to the School Ethics Committee who will advise you on the appropriate action to be taken.

Approval is given on the understanding that you conduct your research as outlined in your application and in compliance with UTREC Guidelines and Policies (http://www.st-andrews.ac.uk/utrec/guidelinespolicies/). You are also advised to ensure that you procure and handle your research data within the provisions of the Data Provision Act 2018 and in accordance with any conditions of funding incumbent upon you.

If you have any questions in relation to this ethical approval then please do not hesitate to contact me.

Yours sincerely,

Dr Richard Malham, Senior Research Policy and Integrity Manager, on behalf of UTREC

Ccs School Ethics Committee Convenor, Dr Javier Argomaniz
Supervisor, Professor Phillips O'Brien

University Teaching and Research Ethics Committee
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