Analysis

# Ruptures at the Top of the World
## High North Network Infrastructure Protection

| Anniki Mikelsaar |

September 2025

RKK ICDS
RAHVUSVAHELINE KAITSEUURINGUTE KESKUS
INTERNATIONAL CENTRE FOR DEFENCE AND SECURITY
EESTI · ESTONIA

Title: Ruptures at the Top of the World: High North Network Infrastructure Protection
Author: Mikelsaar, Anniki
Publication date: September 2025
Category: Analysis

Cover page photo: Mount Edgecumbe volcano in Sitka, Alaska, on 7 April 2018. AP Photo/Becky Bohrer / Scanpix

Keywords: Cable systems, high north, Internet infrastructure, satellite ground station security, radars, sensors, undersea infrastructure, critical national infrastructure, Alaska, Arctic, Canada, Greenland, Iceland, North Sea, Norway, the United Kingdom, the United States



ISSN 2228-2076


63/4 Narva Rd., 10120 Tallinn, Estonia
info@icds.ee, www.icds.ee

# Contents



# List of Figures

# List of Abbreviations

| | |
|---|---|
| **AIS** | automatic identification system |
| **APOCS** | Atlantic Provinces Optical Cable System |
| **ASBM** | Arctic Satellite Broadband Mission |
| **ASX** | Atlantic Spaceport Complex |
| **CEF** | Connecting Europe Facility |
| **CLS** | cable landing station |
| **C-OTDR** | coherent optical time-domain reflectometry |
| **DAS** | distributed acoustic sensing |
| **DEUCSI** | US Air Force Defense Experimentation Using the Commercial Space Internet |
| **EO** | earth observation |
| **ESCA** | European Subsea Cables Association |
| **GEO** | geostationary orbit |
| **GIN** | Greenland-Iceland-Norway Gap |
| **GIUK** | Greenland–Iceland–United Kingdom Gap |
| **GNSS** | global navigation satellite system |
| **GPS** | Global Positioning System |
| **GSaaS** | ground-station-as-a-service |
| **HDR** | high-dynamic-range |
| **HEO** | highly elliptical orbit |
| **HiLDA** | High Latitude Data Acquisition Ground Station in Utqiagvik (Alaska) |
| **ICPC** | International Cable Protection Committee |
| **ISR** | intelligence, surveillance, and reconnaissance |
| **IXP** | Internet exchange point |
| **KKFL** | Kodiak Kenai Fiber Link |
| **LEO** | low Earth orbit |
| **LoVe** | Lofoten–Vesterålen Ocean Observatory |
| **MCC** | mission control centre |
| **NORAD** | North American Aerospace Defense Command |
| **NSR** | Northern Sea Route |
| **OTDR** | optical time-domain reflectometry |
| **POCC** | payload operations control centre |
| **PSCA** | Pacific Spaceport Complex (Alaska) |
| **RF** | radiofrequency |
| **SAR** | synthetic aperture radar |
| **SLOC** | sea lines of communication |
| **SOCC** | satellite operations control centre |
| **SOP** | state of polarisation sensing |
| **TAT** | Talkeetna Alaska Teleport |
| **UAV** | unmanned aerial vehicle |
| **VHF/HF** | very high frequency / high frequency radio waves |

# Acknowledgements

The author would like to express her heartfelt gratitude to those who have supported the over-year-long writing process of this paper. In particular, the author thanks Dr Kristi Raik; this research would not have been possible without her support. Dr Raik and ICDS staff have offered feedback at different stages and to very different versions, which became this paper's foundation – Henrik Praks, Tauno Tõhk, and Toomas Hanso. Many thanks to Krister Kasemaa (B.Eng. Aerospace Engineering) for his consultation on the space and satellite sections.

# About the Author

## Anniki Mikelsaar

Anniki Mikelsaar is a DPhil (PhD) candidate and Steve Shirley Scholar at the Oxford Internet Institute, the University of Oxford. Ms Mikelsaar's research focuses on the governance of digital infrastructures with a particular focus on cable networks.

# Introduction

Fibre optic cable disruptions in the Baltic Sea, around the Strait of Taiwan, and most recently in the Red Sea, have received a lot of attention.[1] Meanwhile, the recent incidents with Arctic data cables have been overlooked.

This analysis examines 17 publicly reported cable outages in the high north between 2018 and 2025, excluding Baltic Sea incidents.[2] Fibre optic cables are important for Arctic broadband. Submarine fibre optic cables facilitate time-sensitive earth observation (EO) data transmission from remote and island-based Arctic satellite ground stations to data processing facilities. EO data supports Arctic surveillance and situational awareness, climate science, and safe navigation through polar routes.

Regardless of the incidents' causes, recurring Arctic fibre optic cable damage can disrupt high-bandwidth communications in the high north and cause transmission delays for time-sensitive Earth observation data. All 2018-2025 fibre optic cable incidents have taken place near polar ocean observation facilities, including satellite ground stations, satellite-launching spaceports, a maritime observatory, and an Arctic air base with maritime patrol aircraft.

*The security of Arctic cables is the most significant overlooked vulnerability in global digital infrastructure in the present day*

The security of Arctic cables is the most significant overlooked vulnerability in terms of global digital infrastructure security in the present day. These cables' interoperability with satellites makes northern network infra-structure protection urgently relevant, but collaboration frameworks stay fragmented.

# 1. Network Infrastructure in the High North

## 1.1. The Arctic Connectivity Challenge

Northern latitudes of 66°00' N and higher have not, for a long time, been prioritised for Internet connectivity development due to harsh climate conditions and a small number of inhabitants.[3] This is rapidly changing. The opening of key sea lines of communication (SLOCs) with the melting sea ice is increasing the importance of Arctic broadband.[4] Observing and monitoring the Arctic Ocean has become a priority for Arctic Council nations (Canada, Denmark, Russia, Finland, the

1 See, for example, "Underwater mayhem: Countering NATO energy & critical infrastructure threats," Atlantic Council, 1 May 2025. Andrew Yeh, "Testing the waters: Securing the UK's undersea cables against grey-zone threats," *China Strategic Risks Institute*, 16 June 2025; and Insikt Group, *Submarine Cables Face Increasing Threats Amid Geopolitical Tensions and Limited Repair Capacity* (Recorded Future, July 2025).

2 While every effort has been made to ensure the accuracy of the information presented, this paper relies on open sources. No confidential, proprietary, or classified data has been accessed or used in the preparation of this document. The companies named have had no input and have not been consulted in an analytical capacity. All company names, products, or services mentioned are used for identification purposes only and do not imply endorsement or criticism by the author. This analysis does not make any definitive claims about the security posture, or operational conduct of any named entity. No warranties are given regarding the accuracy or completeness of the information, and any use, reproduction, or reliance on the information is at the user's own risk.

3 Arctic Council Task Force on Telecommunications Infrastructure in the Arctic. Arctic Council, *Telecommunications Infrastructure in the Arctic: A Circumpolar Assessment* (Arctic Council Secretariat, 2017).

4 Pichkov et al, "Digitalization of the Arctic" in *The Handbook of the Arctic* (Palgrave Macmillan, 2022).

United States, Iceland, Norway, and Sweden).[5] Secure network infrastructure is the pillar of economic, scientific, and military activity in the Arctic. It is the foundational architecture for any Arctic strategy, especially for the eight Arctic Council members.

Arctic connectivity is no easy feat. The local infrastructure requirements are different from the rest of the world. Communications satellites, typically in geostationary orbit (GEO), do not cover the Arctic.[6] Other wireless methods of data transmission – like very high frequency / high frequency (VHF/HF) radio communications, with a limited range of up to 50km, and satellite voice and data services (e.g., Iridium) – can provide connectivity in remote northern latitudes, albeit with limited bandwidth.[7] Fibre optic cables support significantly higher bandwidth data transmission compared to other technologies, but remain scarce in the high north.[8] Where they do exist, fibre optic cables often land near satellite ground stations to provide a bridge between space-based links and the global internet backbone. In practice, connectivity in the region is ensured by a blend of technologies: limited fibre capacity paired with satellites and other methods of wireless transmission.

## 1.2. Satellite Ground Stations' Fibre Optic Backbone

Telecommunication cable breaks are recognised threats to satellite operations.[9] This section elaborates on why. While satellites are often seen as alternatives to fibre optic cables, they are interdependent systems.[10] Satellites are not just space-based; satellite connectivity depends on the ground segment. The space-based or ground communication links of the ground stations are particularly important.

*While satellites are often seen as alternatives to fibre optic cables, they are interdependent systems*

The satellite ground segment is made up of multiple elements that collect and disseminate the information from the satellite to the user.[11] The receivers at the ground stations may not always be co-located with the facilities that process data.[12] The ground system will usually have its own fibre optic cable and space communication links connecting the ground station to various control centres. These include the spacecraft operations control centres (SOCC) monitoring the health and status of the spacecraft bus, the mission control centre (MCC) operating the mission, and the payload operations control centre (POCC) managing the payload (e.g. radar, sensor, camera) attached to the bus.[13] These ground elements are not always in the same location, especially where antenna systems are positioned in northernmost remote locations to best communicate with satellites. There, extreme temperatures and remoteness often make it infeasible for operators to live and work on-site. The security of the communication links between different ground segment elements is important in the

5 "Gateway to the High Arctic: The Importance of Ocean Connectivity," Arctic Council, 3 May 2025.

6 As of 2025, there are around 6 operational public fibre optic cables above the Arctic Circle (66°66' N), but the Arctic/high north terms are used interchangeably, including the European Arctic, and the Greenland-Iceland-UK (GIUK) gap in this paper. See, The European Space Agency, "Arctic Poses Communications Challenges," *ESA.Int*, accessed in August 2025.

7 Arctic Council, 2017, 10.

8 Jehaiah P. Ambas et al, "Comparative Analysis of Starlink, Cellular Networks and Fiber Optics: Benefits, Applications, and Future Trends," *Southeast Asian Journal of Science and Technology* (2024): 35.

9 The President's National Security Telecommunications Advisory Committee, *NSTAC Report to the President on Commercial Satellite Communications Mission Assurance,* NSTAC Report (Washington, D.C: November 2009), 11; Cable Cutoffs' in Falco, Gregory; Nicolo Boschetti et al, "Commercial Space Risk Framework Assessing the Satellite Ground Station Security Landscape for NATO in the Arctic and High North," *IEEE* (November 2022): 684.

10 Ambas, 35.

11 NASA, "11.0 Ground Data Systems and Mission Operations," 14 February 2025.

12 Col. John Keese, *Ground System Design* (Pennsylvania State University, 2004).

13 Keese, *Ground System Design*.

Arctic to disseminate information received from satellites.[14]

This is where the security of fibre optic cables in the Arctic becomes critical. Optical fibre is typically the primary link between different satellite ground segment elements, as it allows for higher throughput data transmission with lower latency.[15] Due to the Arctic's fragmented geography, porous terrain, and many islands, the ground-based fibre communication links are often underwater. As cables are few and far between in the Arctic, a few cable faults near a critical satellite ground station can sever its connection with control centres, and prevent satellite data from reaching the users.

*A few cable faults near a critical Arctic satellite ground station can disrupt its connection with control centres, and cause delays for end users from receiving satellite data*

Fibre breaks pose a number of risks to satellite operations. Missed contact windows between a satellite in space, and a specific ground station, can cause delays in uplinks of commands to satellites (earth-to-space). These include orbit correction and collision-avoidance manoeuvres, or payload tasking commands, like imaging specific targets on surveillance missions. Command and control latencies, until the satellite orbits to reach another station, can increase the risks of mission failure.

The second type of risk pertains to the dissemination of already downlinked satellite data (space-to-earth, via radio frequency) from the ground station onwards. Without a functional fibre optic cable, the data may be prevented from reaching the processing facility and end users in similar volumes. This has relevance for military intelligence, surveillance, and reconnaissance (ISR) missions and emergency response scenarios. High volume EO data can become tactically useless quickly, given that 'rapidity for delivery' is everything.[16]

Relative to the growing needs of EO data from the Arctic, downlink is constrained to select ground stations, usually owned by select ground-station-as-a-service (GSaaS) providers.[17] There is currently no viable large-scale alternative to X-band in EO data downlinking, and X-band is licensed only in select ground stations. These factors limit the viable points of satellite downlinking in the event of a ground station fault.[18]

## 1.3. Ground Station Placement and Types of Satellite Missions

The high north has a strategic concentration of remote sensing satellite ground stations with unique access to surveillance and intelligence satellites in polar orbits.[19] The location of the ground station needs to meet the mission requirements and spacecraft orbit.[20] Most satellite remote sensing mission platforms today are in near-polar orbits following a north-to-south trajectory around the globe, as this orbit ensures optimal Earth coverage.[21]

*The high north has a strategic concentration of remote sensing satellite ground stations with unique access to surveillance and intelligence satellites in polar orbits*

And as satellites in polar orbits converge around the polar regions, they communicate

[14] NASA, "11.0 Ground Data Systems."

[15] "The Impact of Optical Fiber on Satellite Communication Systems," Holight Network, 25 October 2024.

[16] Jean Philippe Robin et al, "A Review of SAR Imagery Exploitation Methods in Support of Defence and Security Missions," Proceedings of EUSAR 2016: 11th European Conference on Synthetic Aperture Radar: 6-9 June 2016, *European Union Satellite Centre*, Vol. 5 (VDE Verlag, 2016).

[17] Duncan Eddy et al, "Optimal Ground Station Selection for Low-Earth Orbiting Satellites," *IEE* (March 2025). GSaaS providers examined were Atlas Space Operations, AWS Ground Station, Azure Orbital, KSAT, Leaf Space, and Viasat.

[18] Matteo Emanuelli, "From Space to Earth. The vital role of the X-band Frequency for downlinking Earth Observation data," in Proceedings of the 67th Session of the United Nations Committee on the Peaceful Uses of Outer Space, June 2024, 1–12.

[19] Falco, "Commercial Space Risk Framework," 679.

[20] Keese, *Ground System Design*.

[21] Government of Canada, "Natural Resources Canada," 8 January 2025.

with a point on Earth in the high north (or south) more frequently compared to a point in equatorial regions. The most optimal location for satellite ground stations for polar-orbiting EO missions is the high north.[22] Arctic satellites in highly elliptical orbit (HEO) are best served by ground stations in the high north, within the satellite's coverage footprint.[23]

Polar-orbiting satellites in low Earth orbit (LEO) monitor polar oceans, provide geospatial data on key waterways and chokepoints, and support Arctic broadband.[24] For example, synthetic aperture radar (SAR) imaging missions deliver high-resolution imaging unaffected by polar night and cloud cover.[25] Radar satellites like SAR can detect oil spills, monitor offshore infrastructure, track surface and potentially sub-surface maritime vessels, and provide situational awareness on Arctic emergencies and operations.[26]

Space Norway's Arctic Satellite Broadband Mission (ASBM) uses HEO satellites to host Arctic broadband payloads.[27] Iridium partner, Skytrac, enables satellite communications for Arctic unmanned aerial vehicle (UAV) flights, while Iridium maintains ground stations on Svalbard and in Fairbanks, Alaska.[28] These examples underscore the strategic importance of ground station placement in supporting Arctic broadband, including for drone operations.

## 1.4. Fibre Optic Cables and Arctic Remote Sensing

The Arctic is hard to monitor. Fibre sensing from the seabed can complement satellite observation of the region. Satellite remote sensing, maritime patrol aircraft, automatic identification system (AIS) data, and radar are ways of collecting information on the region. Using fibre under water for seabed sensing is becoming more widespread as a practice.[29]

A 2018 study for the first time proved early successes in seismic monitoring and earthquake detection, using commercial fibre optic data cables as sensors at the same time as they transmit data.[30] Fibre optic cables can be used as sensors in a process called fibre sensing. Different fibre sensing methods can offer insights into the state of the ocean, to monitor climate change and rising sea level, and provide early warning for earthquakes and tsunamis.[31] In 2025, Paap et. al. published a study on fibre sensing as an effective tool for vessel monitoring.[32]

*Fibre optic data cables are a part of the high north network infrastructure that supports network connectivity and data collection on the Arctic Ocean*

Seabed sensing could, therefore, complement space-based sensors. Distributed sensors like distributed acoustic sensing (DAS) have advantages over traditional point sensors like air-launched sonobuoys from surveillance aircraft (especially with ice coverage), or point sensors on the seabed, offering much wider aperture monitoring with real-time

[22] Gregory Falco et al, *Undercover Infrastructure: Dual-Use Arctic Satellite Ground Stations*, http://www.jstor.org/stable/resrep58737 (Centre for International Governance Innovation, 2024), 5.

[23] For the examples of HEO satellite ground station placement, see Alexander P. Trishchenko and Louis Garand, "Observing polar regions from space: Advantages of a satellite system on a highly elliptical orbit versus a constellation of low earth polar orbiters," *Canadian Journal of Remote Sensing*, Vol. 38, No. 1 (January 2012): 12–24.

[24] Falco, *Undercover Infrastructure*, 5.

[25] Carolina Gabarró et al, "Improving satellite-based monitoring of the polar regions: Identification of research and capacity gaps," *Frontiers in Remote Sensing*, Vol. *4 (February 2023)*: 2.

[26] "Submarine Detection and Monitoring: Open-Source Tools and Technologies," NTI, 17 October 2024.

[27] "ASBM 1 & 2.," Space Norway, 25 July 2025.

[28] "Skytrac Supports NASA's Arctic Environmental Monitoring," Iridium Satellite Communications, 19 May 2022.

[29] Valey Kamalov and Mattia Cantono, "Using Subsea Cables to Detect Earthquakes," Google Cloud Blog, 17 July 2020.

[30] Giuseppe Marra et al, "Ultrastable laser interferometry for earthquake detection with terrestrial and submarine cables," *Science* Vol. 361, No. 6401 (3 Aug. 2018): 486–490.

[31] "Connecting Humanity, Understanding the Earth," Smart Cables, August 2025.

[32] Bob Paap et al, "Leveraging distributed acoustic sensing for monitoring vessels using submarine fiber-optic cables," *Applied Ocean Research*, Vol. 154 (January 2025).

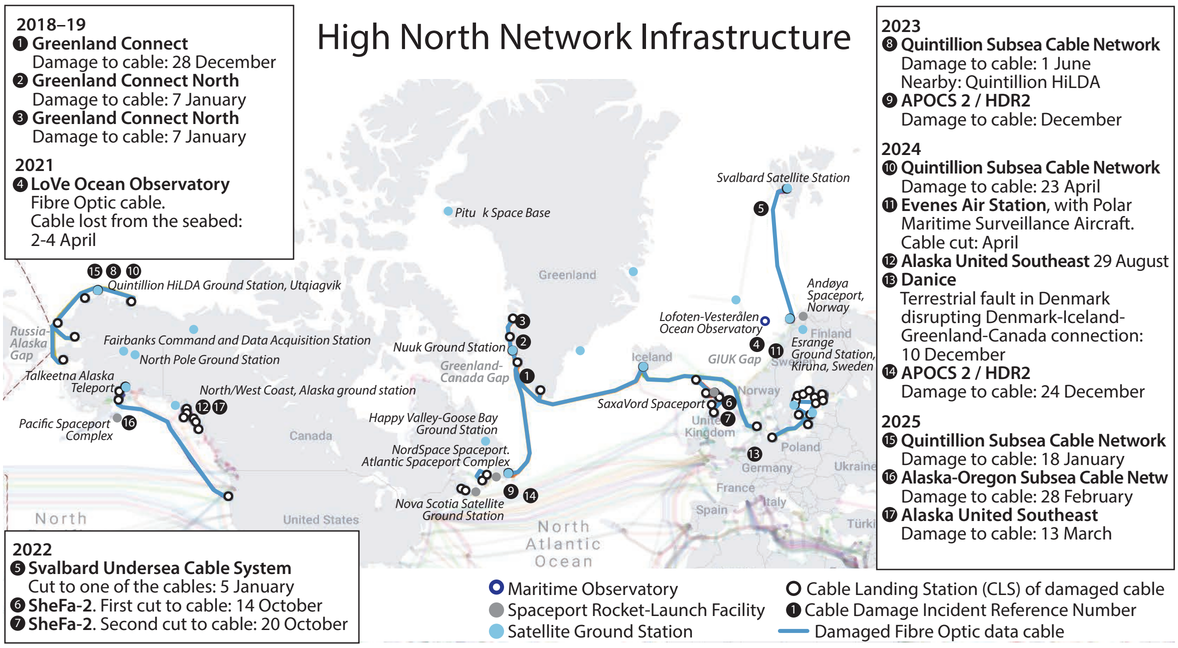


**Figure 1.** Recent incidents with high north network infrastructure 2018-25, with mapped satellite ground stations and Arctic Earth observation facilities in proximity. *Source*: the author. *Background*: Submarine Cable Map.com.

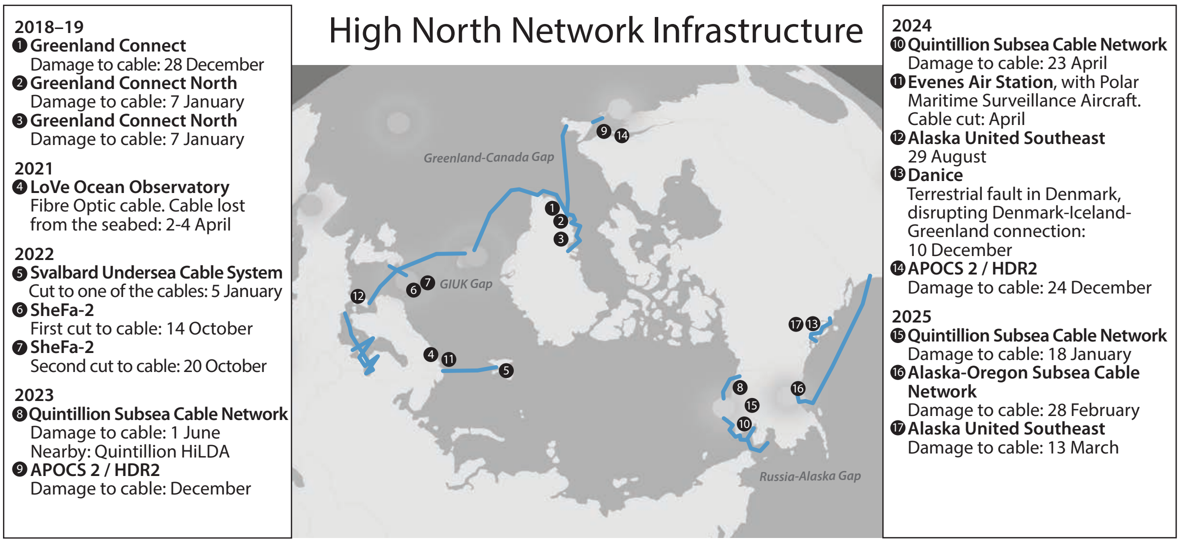


**Figure 2.** Recent incidents with high north network infrastructure 2018-25, with mapped satellite ground stations and Arctic Earth observation facilities in proximity. Arctic Ocean view. *Source*: the author. *Background*: Google Earth and LeafSpace.

updates.[33] In addition to space-based sensor data transmission, increasingly, data collection from the seabed using the same cable as a sensor is becoming a feature of Arctic fibre optic cables.

Fibre optic data cables are a part of the high north network infrastructure that supports network connectivity and data collection on the Arctic Ocean, including satellite ground segments and maritime observation facilities. The SLOCs in the high north chokepoints include:

1) the Svalbard-GIN-GIUK gap;
2  the Canada-Greenland gap;
3) the Bering Strait between Russia and Alaska.[34]

[33] Sergey Shatalin et al, "High definition seismic and microseismic data acquisition using distributed and engineered fiber optic acoustic sensors," *Geophysical Monograph Series* (10 December 2021): 17.

[34] Matthew Boulègue, *Arctic Seabed Warfare Against Data Cables: Risks and Impact for US Critical Undersea Infrastructure* (Polar Institute, 2024), 1.

These regions connect the Arctic Sea routes to global shipping lanes. The development of these sea lanes increasingly depends on situational awareness and reliable connectivity.

# 2. Incidents with High North Fibre Optic Cables

There have been at least 17 disruptions between 2018 and 2025, with 14 incidents since 2021, to the high north network infrastructure (Figure 1, Figure 2, and Annex A).

## 2.1. Cable Damage in Greenland

Three incidents involving fibre optic cables occurred within one month in Greenland at the beginning of 2019 (Incidents 1-3).[35] On 28 December 2018, the Nuuk-Qaqortoc segment of the Greenland Connect cable between Greenland and Iceland was damaged.[36] The other remaining cable, the Greenland Connect North, was damaged, and the fault was discovered three weeks later, on 21 January 2019, north of Maniitsoq, near Sisimiut.[37] During the cable's repairs in March 2019, a third break to the cable was discovered – even further north from the first breaks, on another segment, 70km north of Sisimiut.[38] The CEO of Tusass, Greenland's main telecommunications company, reported that it was hard to believe that three simultaneous cable breaks could occur, especially so far apart from each other.[39] In 2024, a court ruled that one of the ships of a Greenlandic trawling company had been at least partially responsible. [40]

There are several satellite antenna zones in Greenland: including Qaanaaq, Pituffik, and Savissivik in North-West Greenland; Illoqqortoormiit and Tasiilaq on the Eastern coast, and Nuuk ground station in South-West.[41] Not all of these need direct access to fibre backhaul, nor are all of them important for EO data downlink.[42] For example, ground stations in the east coast towns of Tasiilaq and Ittoqqortoormiit receive satellite internet from GEO satellites.[43] Fibre connection matters in Nuuk for Arctic satellite data reception and transmission, including for climate and atmospheric data. Operated by Tusass, it offers coverage and near-continuous contact with polar-orbiting satellites.[44] The recently completed Nuuk ground station (and planned nearby data centre) can receive large amounts of information in near real time, reducing latency between space data acquisition and processing by facilitating the transmission of data to the global network later through the cables.[45] Only two cables, Greenland Connect and Greenland Connect North, connecting Nuuk, currently make up the lifeline of Greenland's connection to the outside world, according to Tusass, highlighting the importance of the security of these cables.[46]

## 2.2. LoVE Ocean Stolen Cable in Norway

In 2021, the Lofoten-Vesterålen (LoVe) Ocean Observatory's cable disappeared from the seabed (Incident 4). LoVe Ocean collects EO and Arctic Ocean surveillance data from the seabed. The cable belonging to the maritime research observatory in northern Norway stopped working around 2-4 April 2021. An investigation revealed that a heavy segment of several kilometres of cable had disappeared

[35] For the full list, see Annex A.

[36] "Tele Greenland Says Cable to Iceland Breaks, Repairs Could Take Weeks," Telecompaper, 28 December 2018.

[37] Kieran Clark, "Tele Greenland Submarine Cable Fault North of Maniitsoq," *SubTel Forum*, 24 January 2019.

[38] Kieran Clark, "Tele Greenland Finds Cable Break South of Sisimiut," *SubTel Forum*, 24 January 2019.

[39] "Tele Greenland Announces Repair to One Submarine Cable Break but Discovery of Another," *Telecompaper*, 14 March 2019.

[40] "Press release on the outcome of the case regarding the breaking of the submarine cable," Tusass, 9 April 2024.

[41] Tusass Greenland, *Tusass Annual Report 2023'* (Tusass, 2023), 8.

[42] *Tusass Annual Report 2023*, 8.

[43] Antonio Bove, "Bringing Fibre-like Connectivity to Arctic Settlements," *SES*, 14 December 2021.

[44] "Nuuk Ground Station," Satellitegroundstation.com, 17 April 2025.

[45] Marie Sikias, "Greenland: A Strategic Location for Receiving Data from the UVSQ-Sat and Inspire-SAT 7 Satellites," *Malaurie Institute of Arctic Research Monaco-UVSQ*, 14 November 2023.

[46] Tusass, "Press release," 9 April 2024.

from the seabed.[47] This cable was a part of the LoVe Ocean Observatory's seabed monitoring node network, spanning up to 20 kilometres offshore.[48]

LoVe Ocean employs hydrophones, echo-sounders, and pressure sensors, which can detect seabed anomalies and signatures of moving objects like vessels.[49] This hydrographic information supports the scientific community with information on the conditions of the Arctic.[50] Love Ocean's location in the GIUK gap is important. The Northern Norwegian peninsula is right on the maritime transit passage for vessels connecting the Arctic to the open North Atlantic.[51] The cable's disappearance was concerning not just due to the costs of damage, which disrupts the ocean observatory's work and monitoring, but also because this could give information to foreign governments on unique Norwegian technology, according to the director of the research institution.[52]

*The cable's disappearance was concerning not just due to the costs of damage, but because this could give information to foreign governments on unique Norwegian technology*

## 2.3. Svalbard Cable Damage in Norway

The Svalbard Undersea Cable System experienced signal loss in one of the cables on 5 January 2022 due to a fibre optic cable cut (Incident 5).[53] The Svalbard Undersea Cable System's cables connect the Svalbard Islands to mainland Norway. The incident caused a temporary loss of redundancy but did not affect Svalbard's connectivity.

The Svalbard Undersea Cable system cables are the most critical communications links for SvalSat, the largest satellite ground station in the world. The data from SvalSat travels through the Svalbard Undersea Cable System to mainland Norway to a control room in Tromsø, mainland Norway.[54] SvalSat is a remote yet important scientific facility, supporting satellite payload downlinking. It is the only commercial ground station which can communicate with polar-orbiting satellites every time they orbit the Earth.[55] In addition to satellite-based EO data downlink function on Svalbard, SvalSat is essential for Arctic broadband – the company, OneWeb, operates many antennas there. It has aimed to provide connectivity to the Arctic, testing LEO satellites with the US Air Force Defense Experimentation Using the Commercial Space Internet (DEUCSI) funding.[56]

SvalSat is a critical ground station for Europe's navigation as well. It is an uplink station for Galileo, Europe's global navigation satellite system (GNSS), an equivalent of GPS. It supports sending precision correction messages and commands, including corrections for satellite orbits, and timing for Europe's Galileo satellites.[57]

47 Antonio Voce et al, "Shadow Fleets" and Subaquatic Sabotage: Are Europe's Undersea Internet Cables under Attack?," *The Guardian*, 5 March 2025.

48 Olav Godø, Ståle Johnsen, and Terje Torkelsen, "The LoVe Ocean Observatory Is in Operation," *Marine Technology Society Journal* 48 (1 March 2014): 24.

49 Godø et al, "The LoVe Ocean Observatory."

50 "The GIUK Gap's Strategic Significance," *Strategic Comments* 25, No. 8 (14 September 2019): 1-3.

51 Benjamin Fredriksen, "Russiske trålere krysset begge kablene før forbindelsen forsvant [Russian trawlers crossed both cables before the connection disappeared]," *NRK,* 26 June 2022.

52 Nina Berglund, "Surveillance Cables Mysteriously Cut," *Norway's News in English,* 7 November 2021.

53 Antonio Voce et al, '"Shadow Fleets" and Subaquatic Sabotage: Are Europe's Undersea Internet Cables under Attack?'," *The Guardian*, 5 March 2025.

54 Henry Fountainy, "Here's the Arctic Station That Keeps Satellites Connected," *The New York Times*, 31 May 2021

55 US Department of the Interior, "Svalsat Earth Resources Observation and Science (EROS) Center," *EROS*, USGS Science for the Changing World, April 2025.

56 Sharyn Nerenberg, "Hughes and OneWeb to Demonstrate Low Earth Orbit Service in Arctic Region for U.S. Air Force Research Lab," OneWeb, 5 May 2021.

57 European Space Agency, "Managing Signals at the Top of the World," accessed in August 2025; Gjesteland E., "Technical Solution and Implementation of the Svalbard Fibre Cable," *Telektronikk 100th Anniversary Issue Perspectives in Telecommunications* (Oslo: Telektronikk, 2004).

## 2.4. Shetland-Faroes Cable Damage

In October 2022, again in the GIUK gap, the SheFa-2 (Shetland-Faroes) cable owned by Føroya Tele, connecting the UK's Shetland to Orkney to the Danish Faroe Islands, was damaged in two different locations (Incidents 6-7).[58] As a consequence, Shetland inhabitants experienced significant outages affecting landline telephone, mobile, and internet services.[59]

It is the SheFa-2 cable that provides Shetland and Orkney with access to high-speed fibre broadband.[60] It is also the cable supporting SaxaVord Spaceport located on the remote Shetland Islands – one of "UK's top launch locations" and Europe's "premier spaceport" for rocket launches, including for launching satellites into polar, sun-synchronous, and highly elliptical orbits.[61] The Faroese Telecom announced research into "Arctic satellite program in partnership with allies in the region."[62] A ground station is operational, a result of an international partnership between the Danish Faroese Telecom Føroya Tele and the UK's SaxaVord, for supporting satellites, including in "low earth (and) polar orbit."[63] Currently, Leaf Space operates 2 antennas in Unst, Shetland, at least one of which supports S-X bands, S-band likely for command uplinks, and X for high-volume downlink, typically used for downlinking EO data.[64]

In addition to the ground station for satellite data reception, spaceports like SaxaVord must coordinate many complicated systems, including rocket telemetry, safety zones, weather systems, and flight termination processes, and they need to be supported by high-speed fibre broadband and 5G.[65]

*A network disruption on an island with a spaceport could pose risks to satellite rocket launches*

Currently, Russia and the United States are leaders in satellite launching, but SaxaVord pioneers a European capability. A network disruption on an island with a spaceport could pose risks to satellite rocket launches. SaxaVord supports such independent UK and European capability – which could be critical in emergency contexts, where more satellites would need to be launched.

The two instances of damage to SheFa-2, on 14 and 20 October 2022, were initially thought to be caused by trawling, but the Shetland Fishermen's Association "strongly refuted" it.[66]

## 2.5. Cable Damage in Alaska

Cable damage incidents have occurred at least 6 times since 2023 in Alaska, the United States. Quintillion's Subsea Cable Network in northern Alaska was damaged on 1 June 2023 (Incident 8). The second damage to Quintillion's cable was reported on 22 April 2024 (Incident 10).[67] On 18 January 2025, the same cable was severed for the third time (Incident 15).[68] All disruptions were attributed to sea ice.

Quintillion operates 1 200 miles of submarine fibre and 500 miles of terrestrial fibre in Alaska.[69] Their submarine network connects Utqiagvik, the northernmost US ground station, to Prudhoe Bay, from there, through terrestrial fibre to Fairbanks and to

58 Jan Müller, "Shefa 2 Kaðalin Riggar NÚ AFTUR [Shefa 2 Cable Rigs Now Back]," *Orkan*, 25 October 2022.

59 Severin Carrell, "Shetland Loses Telephone and Internet Services after Subsea Cable Cut," *The Guardian*, 20 October 2022.

60 SaxaVord UK Spaceport, "Shetland and Faroe Join Forces to Drive Space Industry Developments – SaxaVord," accessed in August 2025.

61 "C6 Launch Systems to Use SaxaVord Spaceport as Primary Launch Site," C6 Launch Systems Inc., 19 June 2020.

62 "Shetland and Faroe Join Forces to Drive Space Industry Developments – SaxaVord," SaxaVord UK Spaceport, accessed in August 2025.

63 "Saxavord Ground Station," SaxaVord, accessed in August 2025.

64 "Leaf Line: Ground Segment as a Service for Satellite Operations," Leaf Space, accessed in August 2025.

65 "Shetland and Faroe Join Forces to Drive Space Industry Developments," SaxaVord, accessed in August 2025..

66 "No Evidence That a Fishing Vessel Caused Telecom Cable Damage – SFA Says," *Shetland News*, 28 October 2022.

67 Alena Naiden, "Another Break in Fiber Network Causes Temporary Internet and Cell Service Outage in Arctic Alaska," *Anchorage Daily News*, Anchorage Daily News, 23 April 2024.

68 "Outage 1/18/25," Quintillion, accessed in August 2025.

69 "The Hilda Ground Station: Why Went Up," Quintillion, 3 March 202.

Anchorage.[70] The Quintillion Subsea cable provides backhaul to the High Latitude Data Acquisition (HiLDA) Ground Station, at 72° latitude, landing in Utqiagvik, North Slope, Alaska. This station in Utqiagvik was built to service polar-orbiting satellite companies that need to downlink data to a ground station and send it through Quintillion's subsea and terrestrial cables to major Internet exchanges, up to Equinix, Seattle, the US.[71]

In addition to the Quintillion breaks in northern Alaska, 3 cable faults have occurred in south-eastern Alaska since 2024. The Alaska-Oregon Subsea Cable Network (AKORN) broke on 28 February 2025 (Incident 16).

There are polar-orbiting satellite data downlinking ground stations near Anchorage.[72] For example, Talkeetna Alaska Teleport (TAT) hosts infrastructure for enabling connection to polar-orbiting satellites.[73] S-X bands suitable for radar satellite data and EO data downlink-ing are supported, offering antennas and links to ground networks.[74] OneWeb is a partner of Microcom, TAT's owner, and in 2021, the two companies announced that OneWeb satellites would connect to antennas at TAT.[75] The AKORN cable is likely the main communication link for TAT's high-bandwidth data from near Anchorage to the lower contiguous 48 states.

The Pacific Spaceport Complex-Alaska (PSCA) on Kodiak Island likely relies on this cable as well. The AU-Aleutian and Kodiak Kenai Fibre Link (KKFL) cables land on Kodiak, but fibre from Kodiak then lands in Homer, Alaska, before it is transmitted to the contiguous US. The shortest transmission path from Homer, Alaska, to the US mainland, according to Fibre Atlantic's chart, would be the AKORN cable.[76] AKORN's breaks could disrupt PSCA's operations. PSCA's location makes it ideal for launching satellites into polar and sun-synchronous orbits, and the spaceport has played a role in missile defence, having intercepted air-launched intermediate-range ballistic missile targets in the past.[77]

Most recently, on 13 March 2025, also in Southeast Alaska, another cable, Alaska United Southeast, lost connection (Incident 17).[78] This same cable was damaged in August 2024 (Incident 12), which caused an 'apocalyptic' outage.[79] In the area, UK Saxavord is planning to build a North/West Coast Alaska ground station.[80]

*Alaska's cables are a matter of importance for Arctic Ocean observation, science, safe navigation, and national security, including for European countries*

The Arctic is at the forefront of American national security, and telecommunications play an essential role, helping the US gain a "competitive edge and increase national security by closing critical gaps in the Arctic."[81] Alaska's cables are a matter of importance for Arctic Ocean observation, science, safe navigation, and national security, including for European countries operating ground stations there, like Norway, Sweden, and in the future, the UK.

## 2.6. Canada-Greenland-Iceland Links' Outage and Evenes Air Base Cable Cuts

In April 2024, two deeper and two shallow cuts were made to the key communication cable of the Evenes Air Station in Norway, according to

[70] Tim Ellis, "New Fiber-Optic Cable System to Turbocharge North Slope Broadband Access," *Alaska Public Media*, 5 December 2017.

[71] Quintillion, "The Hilda Ground Station."

[72] "Alaska Communications Suffers Brief Outage after Damage to Subsea Fiber Cable," *Broadband Breakfast*, 4 March 2025.

[73] "Facility Talkeetna Alaska Teleport," Talkeetna Alaska Teleport, 2022.

[74] Leaf Space, "Leaf Line: Ground Segment."

[75] "Who We Are," Pacific Dataport, accessed in August 2025.

[76] "Kodiak Kenai Fiber Link (KKFL)," Fiber Atlantic, Souisa Consultancy, 16 February 2024.

[77] US Department of Defense, "Pacific Spaceport Complex Alaska Kodiak," 11 July 2017.

[78] N Yadav, "Subsea Cable Repaired after Outage in Sitka, Alaska," DataCenterDynamics, 21 March 2025.

[79] Robert Woolsey, "Why Sitka Lost Almost Everything Else When It Lost the Internet," *Alaska Public Media*, 24 September 2024.

[80] "Saxavord Ground Station," SaxaVord, accessed in August 2025.

[81] "Artic Security: Why National Security Depends on Broadband," Quintillion, 21 November 2021.

the local police (Incident 11).[82] The Air Station is located North of the Arctic Circle and hosts Norway's fleet of Poseidon-8 surveillance aircraft, useful for anti-submarine warfare and anti-surface warfare of the Arctic Ocean.[83] Therefore, like the LoVe Ocean Observatory and many satellite ground stations that handle EO data in Norway, Evenes supports Arctic ocean surveillance.

Another network outage in the communication link connecting Canada, Greenland, Iceland, and Denmark happened on 10 December 2024 (Incident 13) – two weeks before the vessel Eagle-S damaged fibre-optic cables and a power cable in the Baltic Sea on 25 December 2024. Preventive maintenance was scheduled for the Greenland Connect cable in Canada. As this maintenance was taking place, a simultaneous accident to the cable on land, in Denmark, which links to the Greenland Connect via Iceland and the Danice cable, disrupted connectivity. As a result of Canada's maintenance and Denmark's accidental terrestrial fault, Tusass reported "full outage to the outside world" in Greenland.[84]

## 2.7. Cable Damage between Newfoundland and Nova Scotia

Canada is one of the world's leaders in remote sensing. The Atlantic Provinces Optical Cable System (APOCS 2)/ high-dynamic-range (HDR2) cable was cut twice (Incidents 9 and 14). First, in December 2023, and according to Bell, the cable's owner, it was "deliberately cut" a second time on 24 December 2024 – a day before Eagle-S cut cables in the Baltic Sea. Bell added that this cable is "critical infrastructure for residents and customers of Newfoundland and Labrador."[85]

This is one of the cables connecting Nova Scotia – where Leaf Space is building the Spaceport Nova Scotia – to Newfoundland Island, where the Atlantic Spaceport Complex (ASX) is being built by NordSpace.[86] Both provisional spaceports have adjacent ground antennas, and together they would support Canada's sovereign space launch capability.[87] Space infrastructure in the area, including the C-CORE research institute, is important as it hosts experts on Canadian Arctic remote sensing. C-CORE has its headquarters and some antennas at St John's, linked to the Memorial University, and north of there at the Happy Valley-Goose Bay ground station, designed to receive a variety of satellite data, including optical and radar imagery, as well as greenhouse gas measurements.[88]

Canada has many Arctic ground stations which do not rely on submarine fibre optic cables. Inuvik (northern Canada) is critical for polar-orbiting satellite data reception and downlink, and its ground station has terrestrial (overland) fibre backhaul through the Mackenzie Valley Fibre.[89] RADARSAT-1 SAR data has also been downlinked in either Gatineau or Prince Albert, or in Fairbanks, Alaska, in the past.[90]

*Since Canada's continuous landmass extends to the Arctic, it can route northern satellite ground station data overland*

Since Canada's continuous landmass extends to the Arctic, it can route northern satellite ground station data overland, relying less on Arctic submarine cables. Nevertheless, the Newfoundland area, South of the Arctic Circle, has historically mattered for the security of the North Atlantic. Incidents 9 and 14 to APOCS 2/HDR 2 in 2023 and 2024 highlight the importance of supporting Canada's network backbone in the strategic area, and between Nova Scotia and Newfoundland with emerging spaceports.

82 Fritz Hansen, "(+) Mulig Sabotasje: – Kabel Kuttet Med Vitende Og Vilje [Possible Sabotage: – Cable Cut With Knowledge And Will]," *Fremover*, 21 August 2024.

83 Atle Staalesen, "Someone Cut a Key Communications Cable to Norwegian Air Force Base," *The Barents Observer*, 23 August 2024.

84 "Full Outage to the Outside World – Connections Have Been Restored," Tusass, 10 December 2024.

85 "Bell Says Subsea Cable from Cape Breton to Newfoundland Was Deliberately Cut," *The Financial Post*, 19 February 2025.

86 Marc Boucher, "Leaf Space to Install Ground Station at Spaceport Nova Scotia," *SpaceQ Media Inc.*, 25 September 2024.

87 Josh Dinner, "Can Canada Get to Orbit? Companies NordSpace and ProtoSpace Hope to Launch Country's 1st Space Mission (Exclusive)," *Space.Com*, 8 July 2025.

88 "Ground Station Services," C-CORE, 24 July 2025.

89 Trish Fontaine, *Digital Divides in Canada's Northern Indigenous Communities: Supports and Barriers to Digital Adoption* (University of Alberta, 2017), 80.

90 European Space Agency (ESA), "Radarsat-1," *eoPortal*, accessed in August 2025.

# 3. Towards Secure Arctic Network Infrastructure

Accidental or deliberate, all 2018-25 incidents underscore the vulnerability of the high north network infrastructure. Recently adopted proactive measures by EU and NATO member states have the potential to improve the resilience of submarine fibre optic cables in the Arctic. However, collaboration between Arctic Ocean countries in the North American Arctic and the European high north is fragmented. Key measures are summarised below.

## 3.1. EU Investing in Network Redundancy in the Arctic

The EU is driving major investment in Arctic network infrastructure. Since 2021, the Connect Europe Facility (CEF) has backed Cable Projects of European Interests, including parts of a pan-Arctic cable route improving the connection between Europe and Asia.[91] In 2024, CEF committed €540 million for 2025-27, with a total of €64.2 million for 3 different Arctic cable projects.[92] These steps address the high north network infrastructure's scientific, commercial, and geopolitical significance, including European space capabilities. The investments can alleviate existing dependencies on the scarce cables.

*The Connect Europe Facility can alleviate existing dependencies on the scarce cables*

- **The Far North Fibre** project received 2 grants from the CEF worth €38.3 million in total. The consortium was formed in 2022 by Cinia (Finland), Far North Digital (US), and Arteria Networks Corporation (Japan).[93] It is intended to be completed and ready for service by 2029. It can improve North Alaska's ground network security, currently heavily reliant on the submarine cable of Quintillion. The cable is planned to pass from Alaska through the Canadian Arctic to Europe, landing near Tromsø, Norway.

- **Tusass Vision Project** received 3 grants of €20.6 million, improving redundancy in Greenland's fibre optic backbone, currently reliant on Greenland Connect and Greenland Connect North cables, as the 2018-19 incidents showed.[94] A possibility of connecting it to the French overseas Saint-Pierre-et-Miquelon, a Galileo ground station, would enhance Europe's navigation system, the Galileo satellite ground segment, close to Newfoundland in Canada.

- **Polar Connect** cable, connecting Japan and South Korea to Alaska, and Europe via Svalbard, has, by 2024, received 2 grants, €5.3 million in total. This cable creates a link between Svalbard and Alaska, which, in addition to improving connectivity between East Asia and Europe, will create ways to synchronise data collected from satellite antennas in Alaska and SvalSat.

In short, the EU has invested in Europe's sovereign data infrastructure and Arctic connectivity, improving satellite ground segment security. It will take several years until redundancy benefits materialise.

*The EU has invested in Europe's sovereign data infrastructure and Arctic connectivity, improving satellite ground segment security*

[91] European Commission, "CEF Highlight of the Month: Will the Arctic Be the next Digital Gateway?" European Health and Digital Executive Agency (HaDEA), 5 June 2024.

[92] European Commission, "Joint Communication to Strengthen the Security and Resilience of Submarine Cables | Shaping Europe's Digital Future," 21 February 2025.

[93] See Annex A, CEF-funded cables by regions in "New Projects Signed under CEF Digital to Enhance and Strengthen Submarine Cable Infrastructure across and to the EU," Shaping Europe's Digital Future, 5 December 2024.

[94] European Commission, "CEF Highlight of the Month."

## 3.2. The Role of NATO: Investments and Partnerships

Seven of the eight Arctic Council nations are in NATO. Recently, NATO members have adopted measures unilaterally and multilaterally for critical infrastructure protection, with relevance to the Arctic.[95]

- **NATO Satellite Backup Investment.** In a major cable outage, satellites cannot displace all the traffic that normally moves through fibre optic cables. To strengthen resilience in global data flows, NATO invested in improving satellite backup capabilities. In 2024, its Science for Peace and Security fund committed $2.5 million to Hybrid Space-Submarine Architecture Ensuring Infosec of Telecommunications (HEIST).[96] This is an important step in improving satellite and fibre optic cable interoperability. Specifically, HEIST focuses on re-routing more important data up to satellites, exploring technologies for higher bandwidth laser optical systems for satellite communications.[97] In the high north, however, a further constraint is the ground segment. Satellites are imperfect backups for cables in remote regions: if a ground station itself does not perform reliably due to an adjacent cable fault, the uplink of the cable's data could also be affected. Arctic satellite ground segment security is essential for satellites to function as a reliable backbone.[98]

*Arctic satellite ground segment security is essential for satellites to function as a reliable backbone*

- **NATO-EU Collaboration for Critical Infrastructure.** The recently adopted measures for critical infrastructure protection are relevant for the Arctic region. Collaboration between the EU and NATO has deepened recently. The EU-NATO Taskforce on Critical Infrastructure Resilience was embedded in the EU-NATO Structured Dialogue on Resilience in March 2023.[99] Recently improved information-sharing and collaboration practices will be increasingly relevant in the coming years for protecting Arctic infrastructure, especially as many new EU-funded cables will go through the North American Arctic in 2030.

- **UK and Norway.** Between the UK and Norway, a bilateral strategic partnership was formed for high north, North Atlantic, and North Sea undersea infrastructure protection on 18 May 2023.[100] The UK and Norway have been a part of the Joint Declaration between the six North Sea countries for the protection of infrastructure (with Belgium, Denmark, the Netherlands, and Germany) since 9 April 2024.[101] On 20 February 2025, the two countries signed a new defence agreement that focuses on the Arctic and mentions infrastructure protection.[102]

  Norway is driving independent investment into Arctic submarine cable infrastructure. In 2025, Space Norway confirmed plans for the northernmost cable system in the world, the Arctic Way, connecting Svalbard to mainland Norway, where the current Svalbard Cable System is to retire in 2028.[103] Norway joined the Atlantic Private Maintenance Agreement after the Svalbard incident to access fast maintenance support for the Svalbard Cable System.[104]

- **Canada and the United States.** The modernisation of the North American Aerospace

[95] Heather A. Conley et al, "Protecting Undersea Infrastructure in the North American Arctic," *GMFUS*, 3 October 2024.

[96] NATO, "Funded Project to Reroute Internet to Space in Case of Disruption to Critical Infrastructure," July 2024.

[97] Ned Potter, "NATO's Emergency Plan for an Orbital Backup Internet," *IEEE Spectrum*, 24 December 2024.

[98] For great recommendations on how to improve the security of the Arctic Ground Segment, see Falco, "Commercial Space Risk Framework."

[99] European Commission, "EU-NATO Task Force: Final assessment report on strengthening our resilience and protection of critical infrastructure," 29 June 2023.

[100] MOD UK, "UK and Norway to Increase Cooperation on Undersea Capabilities." GOV.UK, 18 May 2023.

[101] Government of Norway, "Six North Sea Countries Join Forces to Secure Critical Infrastructure," 9 April 2024.

[102] MOD UK, "UK and Norway Kickstart New Defence Agreement in Boost for European Security," GOV.UK, 20 February 2025.

[103] "Space Norway Launches 'Arctic Way': The World's Northernmost Subsea Cable System," Space Norway, 14 February 2025.

[104] Conley et al, "Protecting Undersea Infrastructure."

Defence Command (NORAD) is a continuing priority for the United States and Canada, but there is more room for collaboration with European partners on Arctic network security. On the European side, Canada's main partners for the surveillance and control of the Arctic have traditionally been Denmark and Norway.[105] Space Norway's Arctic Satellite Broadband Mission (ASBM) hosts civil and military payloads and has supported US and NATO military command and control, with Arctic broadband – it became operational on 16 December 2024.[106] Norway and the US have recently signed an agreement to authorise US launches from Norway, and vice versa.[107] Space operations rely on cable security. The mutual reliance on cables – for European operations on Alaskan cables, and American operations on European cables – is an important area of cooperation for countries on both sides of the Arctic Ocean.

*There is more room for collaboration with European partners on Arctic network security*

### 3.3. Industry Partnerships: ESCA and ICPC

Protecting subsea cables has been at the forefront of cable operators' thinking since the first trans-Atlantic telegraph cable was installed in 1858.[108] Similarly, in the Arctic, protecting the cables is at the forefront of the cable operators, owners, and suppliers' thinking. Organisations focused on cable protection, like the European Subsea Cables Association (ESCA) and the International Cable Protection Committee (ICPC), have an important role in information exchange and best practice dissemination. Cable cuts are common around the world. The Arctic's harsh weather, sea ice, and difficult maintenance further increase the likelihood of damage from natural causes. It is imperative to place subsea industry experts at the centre of planning future policy measures, to differentiate accidents, ideally with the private space sector.

*It is imperative to place subsea industry experts at the centre of planning future policy measures with the private space sector*

## Conclusion

Recently, all eyes have been on the Red Sea, the Baltic Sea, and the Strait of Taiwan. The numerous cable breaks in the high north have been ignored. The resilience of Arctic cables is currently the single most under-recognised vulnerability in global security of digital infrastructure. These few cables are the backbone of the high north satellite ground segment, disproportionately critical for global EO data and Arctic broadband. The cables are also the pillar for the surveillance infrastructure of the Arctic, increasing its value as potential targets for attacks from NATO's adversaries. The Arctic is rapidly moving into the forefront of global security, and network infrastructure is a central enabler to competition in this theatre.

This analysis has uncovered 17 Arctic network infrastructure disruptions between 2018-25, which no other paper before has systematically analysed.[109] Critically important is the connection between these incidents and their proximity to satellite ground stations, spaceports, and maritime observation facilities.

Any activity which involves human and auto-nomous-systems deployment to the Arctic, including long-fare navigation, mineral resources extraction, scientific and military activity, needs broadband. In addition to broadband, fibre optic cables facilitate space-based and undersea EO sensor data collection and transmission not

105 Government of Canada, *Global Defence Engagement* (Government of Canada, 31 May 2019).

106 Norwegian Ministry of Trade, "Norway Signs Space Agreement with the US,"16 January 2025.

107 Norwegian Ministry of Trade, "Norway Signs Space Agreement with the US."

108 Peter Jamieson, "To Protect and Secure," European Subsea Cables Association, LinkedIn, 18 June 2025.

109 The current most substantive piece written on Arctic network infrastructure disruptions, covers 3 of the 17 fibre optic incidents. Heather A. Conley et al, "Protecting Undersea Infrastructure in the North American Arctic," *GMFUS*, 3 October 2024.

only EO data of the Arctic region but, in the case of polar-orbiting satellites, of the entire Earth. These satellites converge around the high north. Cable breaks endanger vital scientific information transmission, including climate monitoring data, sea ice movement information for the safety of navigation, and military situational awareness of the polar oceans. Imaging of illicit or adversarial activity in the Arctic, including monitoring surface and subsurface vessels, becomes more difficult in the region if time-sensitive data does not reach the end-user in time due to cable breaks.

Satellite-launch capabilities – provided by spaceports – deserve special attention as well. Spaceports on islands like Shetland (UK) or Newfoundland (Canada) are particularly vulnerable to network disruptions if they rely on submarine fibre optic cables for connectivity. Meanwhile, Canada, continental Europe, and the UK have few alternative sovereign launch locations.

This analysis has looked at disruptions to submarine cables in the high north that have impacted Greenland, Norway, the Shetland Islands (UK), Alaska (US), Canada, and the Denmark-Greenland link. Impacts have ranged from mild temporary loss of network redundancies, as in the case of Svalbard, to so-called apocalyptic outages, as was the case in parts of Alaska in 2025. The problem will not resolve itself – further action is required to secure the existing northern network infrastructure.

# Annex A. Summary of Network Disruptions

<table>
<tr><th>Number</th><th>Incident Date</th><th>Fibre Optic Cable</th><th>Nearby Satellite Ground Station/Observatory</th><th>Attribution</th></tr>
<tr><td>1</td><td>28/12/2018</td><td>Greenland Connect (Nuuk-Qaqortoc)</td><td rowspan="3">Nuuk Ground Station<br>Greenland<br>Operator: KSAT, Tusass<br>State clients: United States, Denmark, Norway<br><br>Pituffik Space Base<br>(Further up in the North)<br>Operator: OneWeb</td><td rowspan="3">Trawling</td></tr>
<tr><td>2</td><td>07/01/2019</td><td>Greenland Connect North (South of Sisimiut)</td></tr>
<tr><td>3</td><td>01/2019 (Fault discovered later, exact time of damage unknown)</td><td>Greenland Connect North (North of Sisimiut)</td></tr>
<tr><td>4</td><td>2/04/2021</td><td>Vesterålen Ocean Observatory Link (LoVe Ocean)</td><td>Lofoten-Vesterålen Ocean Observatory<br>State clients: Norway</td><td>Unattributed</td></tr>
<tr><td>5</td><td>5/01/2022</td><td>Svalbard Undersea Cable System<br><br>(Fault: Svalbard-Harstad, 130 km from Longyearbyen)</td><td>Svalbard Satellite Station (SvalSat)<br><br>State clients: Norway, EU, US<br><br>Tromsø Ground Station and Network Operating Centre (NOC)<br><br>Andøya Spaceport, Norway<br>Esrange Ground Station, Kiruna, Sweden</td><td>Unattributed</td></tr>
<tr><td>6</td><td>14/10/2022</td><td>SHEFA-2 (Shetland-Faroes)</td><td rowspan="2">SaxaVord Spaceport and Ground station<br>State clients: UK, Denmark</td><td rowspan="2">Unattributed</td></tr>
<tr><td>7</td><td>20/10/2022</td><td>SHEFA-2 (Shetland-Faroes)</td></tr>
<tr><td>8</td><td>01/06/2023</td><td>Quintillion Subsea Cable Network (Alaska)</td><td>Quintillion HiLDA Ground Station, Utqiagvik, Alaska<br><br>State Clients: United States<br><br>Anchorage, Alaska.<br>Talkeetna Alaska Teleport (TAT)<br><br>Fairbanks (KSAT, Norway)<br><br>North Pole Ground Station (SSC, Sweden), 16km from Fairbanks</td><td>Natural Ice Movement</td></tr>
</table>

| | | | | |
|---|---|---|---|---|
| 9 | 12/2023 | APOCS 2/HDR2, between Nova Scotia and Newfoundland, Canada.[110] | Happy Valley-Goose Bay Ground Station, C-CORE, Newfoundland, Canada<br><br>C-CORE Headquarters, St. John's, Newfoundland, Canada<br><br>NordSpace Spaceport. Atlantic Spaceport Complex.<br><br>Nova Scotia Satellite Ground Station (Canada), Leaf Space[111]<br><br>St Pierre et Miquelon (French Overseas Territory), Galileo Ground Sensor Station[112] | Deliberate man-made damage |
| 10 | 22/04/2024 | Quintillion Subsea Cable Network | Utqiagvik, HiLDA[113] | Sea Ice |
| 11 | 04/2024 | Evenes Air Station, Northern Norway (Near Harstad) | **Evenes Air Station.** Home to Norway's maritime surveillance aircraft[114] | **Deliberately cut**[115] |
| 12 | 29/08/2024 | Alaska United Southeast (AU-SE) | North/West Coast, Alaska ground station. Provisional Ground Station by Saxavord UK[116] | **Unattributed**[117] |
| 13 | 10/12/2024 | DANICE (Iceland-Denmark connection).<br><br>*A fault occurred simultaneously at both ends of the Greenland Connect – Danice segment in Denmark on land, and preventative Maintenance to Greenland Connect in Canada. Together these faults on the Canada-Greenland-Iceland-Denmark link disrupted Greenland's connection.*[118] | **Nuuk Ground Station,** Greenland<br><br>Blönduós **Ground Station** (Leaf Space), Iceland | **First outage: Planned preventative maintenance** on the cable in Canada<br><br>**Second damage: Unattributed** (Danish side) |

[110] Steve Sutherland, "Information Morning - Cape Breton," *CBCnews*, 18 February 2025.

[111] Leaf Space. "Leaf Line: Ground Segment."

[112] European Union Agency for the Space Programme, *Galileo Sites and Ground Stations Status as of 2023* (European Union Agency for the Space Programme, 2023).

[113] Alena Naiden, "Another Break in Fibre Network Causes Temporary Internet and Cell Service Outage in Arctic Alaska," *Anchorage Daily News*, 23 April 2024.

[114] "More Sabotage: Cable Cut at Norwegian Air Base in Arctic," *The Watch*, 25 September 2024.

[115] Thomas Nilsen, "Angle Grinder Used to Cut Telecommunications Cable to NATO's Northernmost QRA Base," *The Barents Observer*, 13 February 2025.

[116] SaxaVord, "Saxavord Ground Station."

[117] Robert Woolsey, "Why Sitka Lost Almost Everything Else When It Lost the Internet," *Alaska Public* Media, 24 September 2024.

[118] "Full Outage to the Outside World – Connections Have Been Restored," Tusass, 10 December 2024.

| | | | | |
|---|---|---|---|---|
| 14 | 24/12/2024 | APOCS 2, between Nova Scotia and Newfoundland. | Happy Valley-Goose Bay Ground Station, C-CORE, Newfoundland, Canada<br><br>C-CORE Headquarters, St. John's, Newfoundland, Canada<br><br>NordSpace Spaceport. Atlantic Spaceport Complex.<br><br>Spaceport Nova Scotia, Ground Station (Canada), (Leaf Space).[119]<br><br>St Pierre et Miquelon (French Overseas Territory), Galileo Ground Sensor Station[120] | **Second deliberate man-made damage**[121] |
| 15 | 18/01/2025 | Quintillion Subsea Cable Network | Utqiagvik, HiLDA[122] | Natural Ice Movement |
| 16 | 28/02/2025 | ACS Alaska-Oregon Network (AKORN) | **Talkeetna Alaska Teleport**, Alaska, United States<br><br>**Pacific Spaceport Complex** – Alaska (Kodiak Spaceport) | Unattributed |
| 17 | 13/03/2025 | Alaska United Southeast (AU-SE) | North/West Coast, Alaska ground station. Provisional Ground Station by Saxavord UK | Unattributed |

**Table A.1.** Summary of Network Disruptions. *Source*: the author.

[119] Leaf Space, "Leaf Line: Ground Segment."
[120] European Union Agency for the Space Programme, *Galileo Sites and* Ground *Stations Stat*us as of 2023.
[121] Saxavord Ground Station," SaxaVord, accessed in August 2025.
[122] Naiden, "Another Break in Fibre Network."

# RECENT ICDS PUBLICATIONS

## Reports

Jermalavičius, Tomas, Henry Rõigas, Oleksandr Sukhodolia, and Dmitri Teperik. ***The Staying Power of Ukrainian Lights. Lessons of Wartime Resilience of the Electricity Sector***. May 2025.

Arjakas, Merili, Kai Kaarelson, Solveig Niitra, Hille Hanso, Ivan U.K. Lyszcz. ***Eesti roll muutuvas rahvusvahelise arengukoostöö arhitektuuris*** [Estonia's Role In the Changing Architecture of International Development Cooperation]. March 2025.

Klyszcz, Ivan U.K., Tony Lawrence, Eric Chan, Jyun-yi Lee. ***Deterrence and Hybrid Warfare: Lessons from Russia's War in Ukraine for Taiwan and the Nordic-Baltic Regio***n. February 2025.

Hosaka, Sanshiro. ***A Mountain to Climb: Russia's Influence in the South Caucasus and EU Policy Options***. January 2025.

Gretskiy, Igor. ***New Russian Immigration to the EU: The Case of the Baltic States, Finland, Germany & Poland***. October 2024.

Atanassova-Cornelis, Elena, Takuya Matsuda, Bart Gaens, and Nele Loorents. ***Japan, NATO, and the Diversification of Security Partnerships***. September 2024.

## Policy Papers

Alatalu, Siim. "**Cyber Solidarity in the Making: Is the EU Stepping into NATO's Blind Spot?**" August 2025.

Lawrence, Tony, Felix Gasper, and Dick Zandee. "**Defending Europe's Skies: Challenges and Prospects**." May 2025.

Klyszcz, Ivan U.K."**Distance is Not a Shield. Russia's Transnational Repression in Wartime**," May 2025.

Praks, Henrik. "**Russia's Hybrid Attacks in Europe: From Deterrence to Attribution to Response.**" April 2025.

Loorents, Nele, and Jun Nagashima. "**Bridging Two Oceans: The Evolving NATO-Japan Relationship**." July 2024.

## Analyses

Gasper, Felix, Lukas Mugele. "**Forward Defence in the Cold War.**" August 2025.

Leveque, Arthur, and Justin Leveque. "**Foreign Interference in Distant Territories: French Territories on Azerbaijan's, Russia's, and China's radars**." August 2025.

Larsen, Henrik. "**Toward a Europeanised NATO**." June 2025.

Hanso, Toomas. "**Central Asia's New Railways: Russia's Pain, China's Gain**." March 2025.

Alatalu, Siim. "**The EU's NIS2 Directive A Business Opportunity for the Defence Sector**." March 2025.

Peterson, Annabel. "T**he Enemy Within: Russians in Ukrainian Army Ranks and the Fracturing of Post-Soviet Identity**." February 2025.

Idarand, Tõnis. "**For as Long as It Works: Russia's Nuclear Signalling During Its War in Ukraine**." January 2025

## Briefs

Sahaidachnyi Security Center. "**Russia's War in Ukraine: Fortification for Drone Warfare**." Russia's War in Ukraine Series. September 2025.

Hosaka, Sanshiro. "**Trump-Brokered Azerbaijan-Armenia Peace Deal: Breakthrough or Another Geopolitical Conundrum?**" August 2025.

Kimoita, Stephen. "**Kenya's Foreign Policy Towards Europe and Estonia**." July 2025.

Huminski, Joshua C., Tony Lawrence, Marianne Paire, Nele Loorents, Katarzyna Zysk, Felix Gasper, ***Hague Summit Series***. June 2025.

Leveque, Arthur, and Justin Leveqye. "**Francophonie: A Subtle Response to Revisionist Powers**." May 2025.

Nazarov, Mykola. "**Returning Ukrainians Home: Mission Possible?**" May 2025.

*All ICDS publications are available from* https://icds.ee/category/publications/.

ICDS.Tallinn
@ICDS-TALLINN.BSKY.SOCIAL
@ICDS _ Tallinn
ICDS-Tallinn
www.icds.ee

International Centre for Defence and Security
63/4 Narva Rd., 10120 Tallinn, Estonia
info@icds.ee

ISSN 2228-2076