COMMERCIALIZATION AND DUAL-USE SPACE CAPABILITIES IN THE ARCTIC

PART TWO OF "GRAY ZONES WITHIN THE ARCTIC SPACE DOMAIN"

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The rise of dual-use infrastructure in the Arctic reflects the growing integration of commercial and military space systems. Companies provide vital connectivity, navigation, and intelligence services, allowing for reduced costs and expanded access. It also introduces risks: dual-use assets blur civilian and military functions, making them potential conflict targets; Arctic ground stations are vulnerable to cyberattacks, jamming, and physical disruption; and private firms may alter service availability in crises, creating operational uncertainty. **This brief examines how the growing reliance on dual-use space infrastructure in the Arctic driven by commercial-military integration creates both strategic opportunities and security vulnerabilities**. It recommends segmenting commercial networks, building robust public-private partnerships with clear liability frameworks, raising cybersecurity standards, and regulations to support innovation.

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CONTEXT

The Arctic has become a critical hub for both commercial and military space operations. The region's geostrategic position makes it ideal for satellite communications, data relay, and Earth observation. Yet the expense of operating in space and in the High North has driven governments and private actors to increasingly rely on dual-use capabilities: systems that simultaneously serve civilian and defense needs. The integration of commercial providers into military space operations has created new efficiencies but also introduced complex risks, particularly in the Arctic where infrastructure is sparse, extreme, and highly vulnerable.

The Rise of Dual-Use Capabilities. Dual-use technologies can serve both civilian and defense users without major modifications. Satellites that provide weather forecasts, navigation, or communications also furnish intelligence, surveillance, and reconnaissance (ISR) to armed forces.[i] This blending of roles is not an anomaly but a structural feature of today's space architecture.

- **Service-Oriented Infrastructure**: Global navigation satellite systems (GNSS), Earth observation satellites, and commercial communications satellites are all prime examples of platforms used interchangeably by militaries and civilian customers.[ii]
- **Ground Stations as a Service**: The shift toward shared infrastructure, where governments and private firms purchase time on commercial ground stations, has expanded dual-use facilities across the Arctic.[iii]

Companies such as SpaceX's Starlink and OneWeb highlight this trend. OneWeb operates at least 14 antennas in Svalbard, Norway, funded in part by the U.S. Department of Defense through the Air Force's Defense Experimentation Using Commercial Space Internet program.[iv] Similarly, SvalSat supports both scientific missions and U.S. Coast Guard operations.[v]

STRATEGIC AND SECURITY IMPLICATIONS IN THE ARCTIC

The Arctic is emerging as a testbed for commercial-military integration in space. Because of its location, the region is indispensable for polar-orbiting satellites and ground connectivity. However, this reliance comes with challenges:

- **Interdependence of Civil and Military Systems**: The overlap between defense and commercial services means disruption of one impacts both. Attacks on dual-use systems, —such as Russia's 2022 cyberattack on Viasat, —demonstrate the cascading consequences for civilian populations when military-linked infrastructure is targeted.[vi] While the U.S. has not formally designated space as a critical infrastructure sector, satellites deliver essential functions, including navigation, communications, and remote sensing, that underpin many sectors already recognized as critical.[vii]
- **Plausible Deniability and Targeting**: Dual-use assets benefit from ambiguity; their roles are difficult to disentangle. Yet under the laws of armed conflict,

infrastructure providing military support can become legitimate targets, even if they primarily serve civilians. States increasingly worry that benign space technologies, like satellite servicing robotics or debris removal systems using harpoons or lasers, could be targeted by adversaries due to their inherent dual-use capabilities.[viii]

- **Vulnerabilities of Ground Infrastructure**: Arctic ground stations are attractive targets because of their remote locations, limited staffing, and reliance on internet connectivity. They are susceptible to cyberattacks, jamming, and even physical disruptions, such as severing undersea cables, which can be difficult to detect and attribute.[ix]
- **Private Sector Autonomy and Uncertainty**: Companies may alter their willingness to provide services in conflict zones based on financial or political considerations, leading to operational unpredictability for governments that rely on them.[x]

COMMERCIALIZATION AND WORKFORCE GAPS

The U.S. government no longer holds a monopoly on space operations. A majority of U.S. satellites are commercially owned, and private firms now dominate launches and orbital services.[xi] SpaceX, OneWeb, Boeing, and others are paving the way for a broader space economy.[xii] SpaceX has steadily expanded and vertically integrated across the space sector, moving beyond launch services into satellite communications, human spaceflight, payload integration, and satellite bus manufacturing for applications such as remote sensing, with the apparent aim of becoming a leading provider of space-based services both in orbit and on Earth.[xiii] This market-driven model offers efficiency but also intensifies competition for skilled labor.

The shortage of cybersecurity and technical professionals is acute, with an estimated 78% global shortfall in IT and technology roles identified across sectors.[xiv] At the same time, the space sector continues to expand rapidly. According to the Space Foundation's Space Report 2025 Q1, U.S. space industry employment grew 27% over the past decade, nearly doubling the pace of private-sector job growth.[xv] This surge reflects growing demand for talent across engineering, data science, cybersecurity, and administrative functions, as commercial launches climb from 157 in 2024 to an expected 172 in 2025.[xvi] The increasing volume of space-based data and the integration of AI and machine learning have intensified the need for professionals skilled in information security, roles projected by the U.S. Department of Labor to grow 32% over the next eight years.[xvii] However, this accelerating demand, coupled with broader workforce shortages, risks undermining the resilience of dual-use infrastructure in the Arctic and beyond unless strategic investments are made in workforce development, education, and cross-sector training pipelines.

POLICY CONSIDERATIONS AND PATH FORWARD

The dual-use space ecosystem in the Arctic presents both opportunities and risks. Effective governance will require public-private coordination, technical safeguards, and regulatory reform. Key steps include:

Segmentation of Infrastructure: NATO and allied governments should require commercial providers to physically and virtually separate their networks to prevent lateral movement in the event of a cyber breach. Ground-based data systems should implement physical and virtual segmentation to contain potential breaches and prevent attackers from moving laterally across networks.

1) **Public-Private Partnerships**: Clear agreements on liability and resilience measures are needed to balance commercial incentives with national security imperatives.
2) **Cybersecurity Standards**: Commercial space operators must adopt higher levels of self-protection, given their role as potential adversary targets.
3) **Regulatory Streamlining**: Streamlining regulatory barriers for dual-use space technologies has the potential to unlock commercial innovation. The 2025 U.S. Executive Order 14335 seeks to simplify licensing and procurement to accelerate commercial space activities.
    a) The executive order targets lengthy and onerous licensing processes that hinder commercial launches and spaceport construction, new missions lacking full authorization under current federal frameworks will benefit from expedited approval procedures to advance U.S. space industry competitiveness. Federal agencies are already executing earlier directives to streamline procurement and expand commercial partnerships. [xviii]

CONCLUSION

The Arctic has become a focal point for the convergence of commercial and military space systems. Dual-use assets reduce costs and expand capabilities, but they also increase exposure to cyber, physical, and operational threats that reverberate across civil and defense domains alike. As reliance on dual-use infrastructure deepens, governments must work closely with industry to build resilience through stronger cybersecurity, clearer governance frameworks, and targeted workforce investments. Sustained coordination will be essential to ensure the Arctic remains a stable and secure hub for global space operations in an era of intensifying gray-zone competition.

Author's Disclaimer: The views expressed in this Brief are those of the author and do not reflect the official policy or position of the U.S. Department of Defense or of the U.S. Government.

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