OneWeb

Whitepaper

Polar Potential: Empowering the Connectivity of Armed Forces and Emergency Responders across the Arctic

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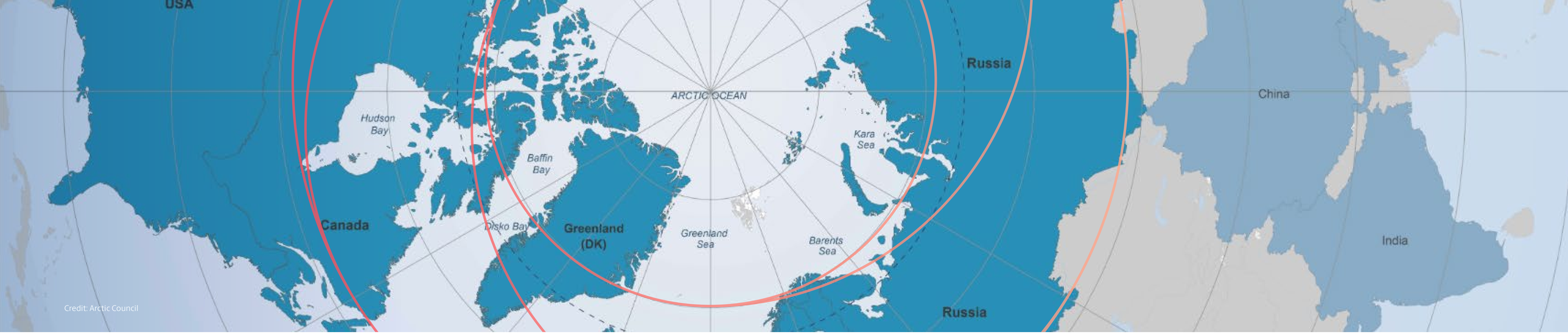
“The Arctic environment presents specific operational challenges that limit communications, including the harsh climate, vast distances, and atmospheric phenomena.”
(2019 US Department of Defence Arctic Strategy)



Introduction

One of the last remaining frontiers on Earth, the Arctic represents a critically important region for state actors seeking to extend geopolitical influence and exploit an untapped wealth of natural resources.

Historically, the Arctic - which includes the Arctic Ocean, its surrounding seas and multiple land masses - has proven largely inaccessible for armed forces and emergency responders including Search and Rescue and Coast Guard, due in part to its remote nature, extreme topography, and inclement weather.

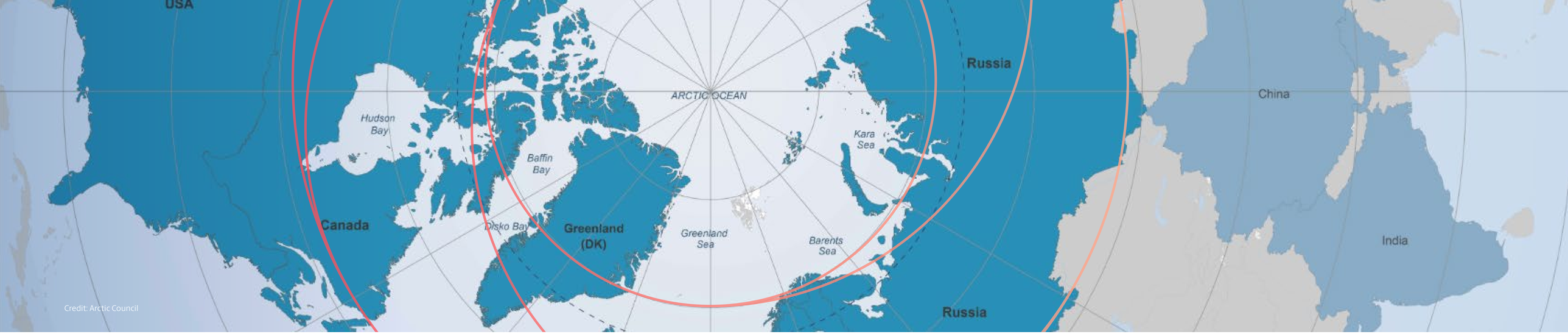
Without the right infrastructure in place, the ability to communicate across this vast and remote region remains difficult. Restrictions include a lack of fixed line communications; poor connectivity with geostationary satellites stationed over the Equator; and the Arctic's unique atmospheric phenomena.

Now, advances in technology and a rapidly warming local climate have unleashed the Arctic's latent economic potential in recent years. Receding levels in ice and snow have made sea passages more accessible than ever before, providing armed forces across the 'High North' (the Arctic Circle and its surrounding area) with freedom to manoeuvre.

Consequently, armed forces from the Arctic Council Member States (also referred to as the 'Arctic Nations') of Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States (US) are expanding their military footprints in the region as their respective governments seek to extend levels in influence; support territorial claims; and exploit valuable, hidden resources including oil and natural gas.

Similar moves are being undertaken by the Arctic Council's.

"Arctic Nations must develop and field rapidly deployable communications and data networks, supported by robust and dynamic communications architecture with ground-based, airborne and space assets"



Introduction (continued)

13 'Observer' states which include France, Germany, India, Japan, the People's Republic of China (PRC) and the United Kingdom (UK).

As described in the US Department of Defense's (DoD's) 2019 Arctic Strategy, armed forces must be able to "quickly identify threats in the Arctic; respond promptly and effectively to those threats; and shape the security environment to mitigate the prospect of those threats in the future."

As they seek to facilitate similar strategies across the region, the Arctic Nations are devising concepts of operation and specialist technology to extend levels of domain and situation awareness through improved communications and intelligence, surveillance and reconnaissance (ISR); in-situ observation; and resilient infrastructure.

The ability to detect threats across the Arctic's extensive land and maritime environments is critical. Understanding how to respond effectively across arduous and extreme terrain to strategic competitor activities in the region is key.

Defence and deterrence is vital, particularly for NATO members in the Arctic as they seek to generate capacity and resilience that will ensure their collective security.

Examples include the "permanent availability" of a Royal Navy Carrier Strike Group to NATO to support "defence and deterrence of the Euro-Atlantic area", as stipulated in the UK Ministry of Defence's (MoD's) Defence Command Plan, published in March 2021; the reinstatement of the US Navy's 2nd Fleet in 2018; and the 10 Nation Joint Expeditionary Force to oversee operations in the Atlantic and Arctic Oceans.

To support such operations, the Arctic Nations must rely upon mature, rapidly deployable communications and data networks, supported by robust and dynamic communications architecture with ground-based, airborne, and space assets.

Only this will improve the Command & Control, Communications, Computers, and ISR (C4ISR) capability of an armed force - essential to ensuring the effectiveness of multi-domain operations above the 65th Parallel.

Problem: Disrupted Connectivity in the Arctic

In the new era of great power competition, the Arctic nations and observer states are already competing to assert their influence across the region.

Reliable, resilient connectivity is critical to any military operation in a region known for its remote nature, harsh climate, and atmospheric phenomena.

As the US NORTHCOM suggests: "Improving our domain awareness, communications systems, and our ability to conduct and sustain multi-domain operations in the High North are all important priorities".

Specifically, the Arctic's extreme topography prevents the laying of fibre networks by terrestrial communications providers while the region's high latitude means armed forces can often find it more difficult to link ground user terminals with Geostationary (GEO) Global Navigation Satellite System (GNSS) satellites sitting over the Equator and Mid Earth Orbit (MEO) satellites which reach no higher than +/- 52 degrees latitude.

Armed force also suffer from high levels in latency - a significant challenge for units seeking to maintain the tactical advantage over near peer adversaries operating throughout the region.

Additional challenges faced by armed forces operating in the Arctic include atmospheric interference from solar and magnetic events which can degrade high frequency (HF) signals.

Over the course of 2020/21, armed forces from across the Arctic Nations continue to conduct joint exercise across the region, often aimed at overcoming such restrictions in connectivity. Examples include the US DoD-led Arctic Edge; ICEX; and Northern Edge exercises which provided invaluable experience in terms of the planning and execution of multi-domain operations in the region.

"Both terrestrial and aerial communications equipment must be designed to function in the harsh Arctic weather conditions, which include rapid cycles of freezing and very low temperatures."

High capability, near peer adversaries including the People's Republic of China (PRC) and Russian Federation also continue to be highly active in the Arctic.

Russian Armed Forces, for example, have conducted amphibious landings on the Chukotka (Chukchi) Peninsula, close to Alaska, in addition to anti-submarine warfare

Problem: Disrupted Connectivity in the Arctic (continued)

operations and the launch of anti-ship cruise missiles within the US Exclusive Economic Zone.

Similar training programmes have been conducted on Alexandra Land with Russian airborne forces inserted by parachute to clear and hold ground with the support of layered air assets including strategic bombers.

As an Arctic Observer state, the PRC is also emerging as an increasingly important stakeholder in the region, declaring itself a "near-Arctic state". The PRC's strategy includes building bilateral relationships with Arctic Nations in addition to the establishment of space-based capabilities including the 'Arctic Environment Satellite and Numerical Weather Forecasting Project' which in the future could support the command and control of ground and maritime forces in the area.

"The escalation of Russian activity and Chinese ambitions in the region demonstrates the strategic importance of the Arctic. Competition will only increase as sea ice diminishes and competition for resources expands,"
the US Northern Command (NORTHCOM) understands.

NATO members in the Arctic are also acutely aware of Russian and Chinese interests in the region. In response, NATO members continue to position themselves to increase their own footprints in the Arctic.

Examples include the UK-led Joint Expeditionary Force (JEF) which comprises a coalition of Arctic Nations including Denmark, Finland, Sweden and Norway in addition to the Baltic States of Estonia, Iceland, Latvia, Lithuania as well as the Netherlands.

Stood up in 2012, the JEF is tasked with deployment of high readiness and adaptable force elements around the Globe, with particular emphasis on the Arctic area of operation. Available assets include a range of surface and sub-surface capabilities in addition to airborne and space-based systems which must interoperate to enable truly Joint All Domain Command and Control (JADC2).

"Even within the Arctic, there is considerable variation between the North American Arctic, which has a harsher climate, and the milder, Gulf Stream-affected, European Arctic," the strategy warns.

"Both terrestrial and aerial communications equipment must be designed to function in the harsh Arctic weather conditions, which include rapid cycles of freezing and thawing. Adequate data coverage requires sufficiently ruggedised sensors to be deployed year- round for longitudinal data-set acquisition," the strategy continues.

Credit US DoD
The appearance of U.S. Department of Defense (DoD) visual information does not imply or constitute DoD endorsement.

Ensuring Connectivity in the High North

As stipulated in the DoD's Arctic Strategy, the connectivity requirements of armed forces operating in the High North must be supported by "time-sensitive and risk-informed investments" to understand and build awareness throughout the region.

Areas of interest being explored by the DoD include the optimisation of situational awareness through a layered approach focused on multi-domain sensors ranging from terrestrial radars through to space-based capabilities.

In 2021, OneWeb's 'Global Connectivity Platform'- a secure and resilient solution which promises to provide high speed and low latency broadband connectivity to armed forces operating in the Arctic Circle for the first time - achieves an Initial Operating Capability (IOC).

A constellation of 648 Low Earth Orbit (LEO) satellites will provide fast, affordable and high bandwidth connectivity to expeditionary forces operating above the 50th Parallel in temperatures as low as - 40 Celsius (104 Fahrenheit). The constellation model boosts resilience to kinetic operations.

OneWeb's network ensures low latency and high throughput connectivity to military assets operating on land, in the air and at sea across the region - a capability which has until now proven almost impossible. OneWeb has prioritized complete coverage of the remote region above 50 degrees North, and its interoperable system is ideal for multi-domain operations in the Polar region and beyond.

"OneWeb's Global Connectivity Platform provides secure, resilient, high speed and low latency Broadband connectivity to armed forces and emergency responders including Search and Rescue and Coast Guard operating in the Arctic Circle for the first time."

Credit US DoD
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Ensuring Connectivity in the High North (continued)

Designed to enhance the domain and situational awareness of armed forces operating across the Arctic, OneWeb's solution is capable of supporting the full spectrum of mission sets which range from intelligence-gathering and direct action through to humanitarian aid/disaster relief (HADR) and search and rescue (SAR).

State-of-the-art user terminals feature electronically steerable arrays, designed with reduced size, weight and power specifications, allowing them to be integrated on board almost any type of tactical ground vehicle, surface vessel or (piloted/remotely piloted) air frame, regardless of payload and environmental restrictions.

User terminals provide platforms with hitherto unseen levels in C2 and Situation Awareness. Supported applications include Blue Force Tracking and Full Motion Video technologies; extension of Mobile Ad Hoc Networks (MANET) networks and ISR feeds across extended areas of operation; generation of Common Operating Pictures; and the support of 'Early Entry' communications teams.

Multi-domain assets operating across the Arctic benefit from data throughput as high as 195 Mbps and latency levels less than 70ms. Assured levels in Precision, Navigation and Timing (PNT) are also scheduled to go live as part of OneWeb's second generation (Gen 2) constellation. Gen 1 will deliver global timing services by the end of 2022.

OneWeb's solution also supports the theatre-wide connectivity of forward-deployed small unit teams; fixed and deployed operations centres; early warning system sites; and surface vessels.

It could also be employed to network together multi-national Maritime Patrol Aircraft deployed to the region such as the P-8 fleets operated by the US Air Force, Royal Air Force and Norwegian Air Force.

OneWeb's solution could also support the connectivity requirements of Finland and Sweden. Both countries share a physical border with the Russian Federation and therefore require maximum levels in situation awareness in order to maintain information superiority over highly capable peer adversaries. The system is interoperable and open architecture, able to enable work with a variety of partners. It also accommodates encryption channels as well as networking and packet slicing/locking.

OneWeb's network is also 5G-ready to support the Internet of Things and provide a truly game-changing capability to expeditionary units in the Arctic with assured, resilient and mission-critical voice and data communications.

Credit US DoD
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Use Cases | Intel-Gathering

To remain as effective as possible in the Arctic, armed forces must be able to gather, process and share information throughout a joint operating environment at pace.

OneWeb assures armed forces the highest levels in domain and situation awareness, allowing governments to remotely monitor the entire area of responsibility from stand-off ranges without resorting to a physical presence on the ground.

In the air, patrolling platforms benefit from near real-time updates of the air domain, including the position of friendly assets in addition to adversarial threats which can include strategic bomber aircraft from Russia.

On the ground, forward deployed units also benefit from hitherto unseen levels in coverage across the Arctic, enabling freedom of movement across the ice shelf to surveillance and reconnaissance missions as and when required.

OneWeb not only enhances levels in Joint All Domain C2 and Precision, Navigation and Timing of multi-domain forces across the region but also streamlines decision-making processes through the generation of a common operating picture.

User terminals can also be integrated on board a variety of manned and unmanned platforms on the ground, in the air and at sea, enhancing levels in command, control and communications across the harsh operating environment.

"Allied and partner naval forces must jointly assess threats, define roles and missions, deepen defence industrial cooperation and develop and exercise new concepts of operations for the Arctic Region."

(US Navy "A Blue Arctic" Strategy, 2021)

Credit US DoD
The appearance of U.S. Department of Defense (DoD) visual information does not imply or constitute DoD endorsement.

Use Cases | Crisis Response

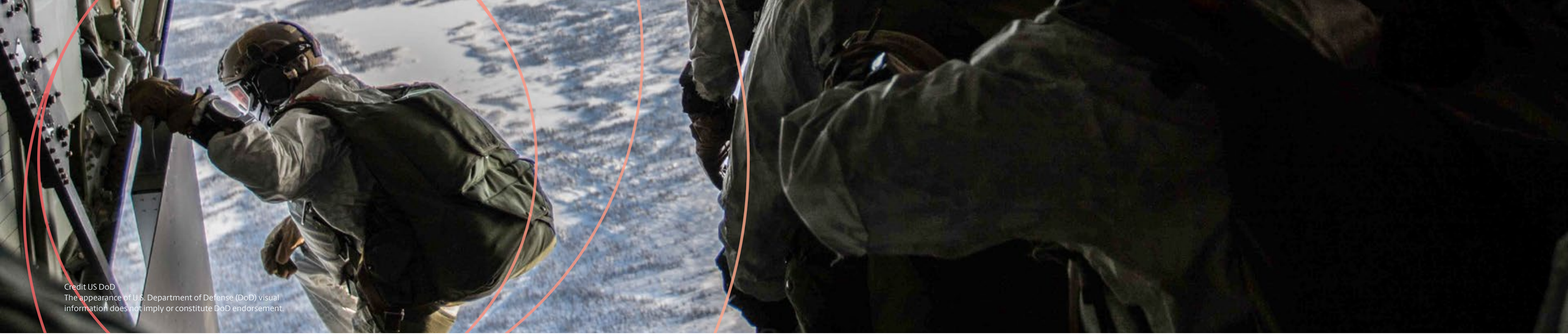
Whether it be the maritime interdiction of non-cooperative vessels at sea or the interception of enemy aircraft across the region, armed forces must be capable of responding accurately and at pace to a multitude of threats.

Examples include incursions into sovereign territory by adversarial airborne, surface or sub-surface platforms in addition to harassment of unprotected and remote assets including gas and oil platforms (GOPLAT); commercial shipping; meteorological and scientific stations.

As a result, armed forces must be capable of rapidly deploying a variety of platforms in response to any given situation. Options range from maritime patrol, strike aircraft and unmanned aerial systems through to helicopters, destroyers, unmanned service vessels and even strategic submarines.

Multi-domain forces in the Arctic might also be required to undertake direct action operations anywhere in the region to respond to rapidly evolving situations, in addition to surgical hostage rescue and personnel recovery missions.

OneWeb's solution provides a multi-domain force with a common operating picture as well as mobile and resilient communications to ensure the maximum chance of mission success, particularly against highly capable adversaries capable.



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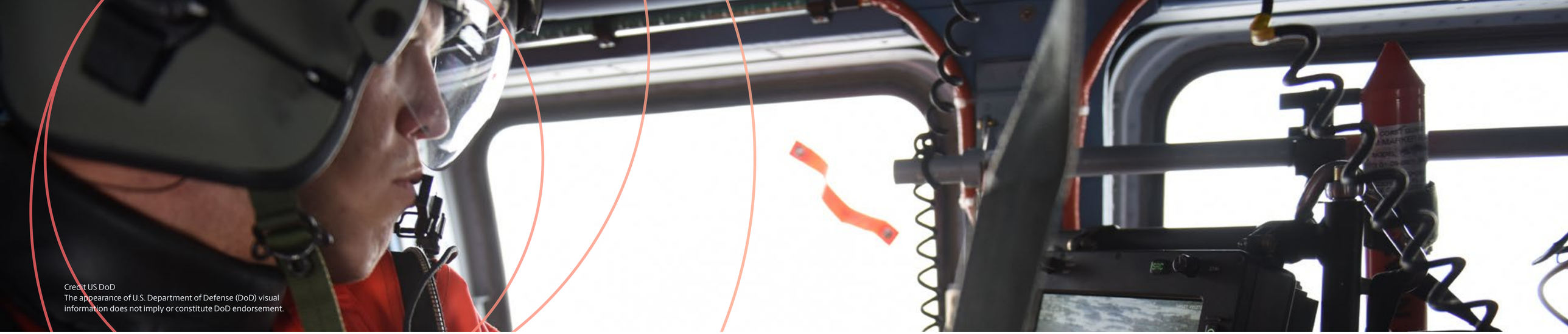
Use Cases | Military Assistance

In order to deter any illegal incursions throughout the region, armed forces can conduct Military Assistance (MA) missions to improve the defensive capability of Arctic Nations in addition providing a deterrence against any adversarial force.

OneWeb is ideally positioned to support the expeditionary connectivity requirements of MA teams deployed across the Arctic in areas which have traditionally suffered from poor levels in communication. This allows strategic reach-back to headquarters and helps to ensure the survivability of units operating in harsh environments.

OneWeb's flexible inventory of small form factor and roll-on/roll-off user terminals allow even the smallest of MA teams to remain connected anywhere in the region, regardless of which platforms they are operating.

Teams also benefit from a regularly updated common operating picture should they be retasked to respond to a crisis and deter or defend assets in the region.



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Use Cases | Search and Rescue/Humanitarian Aid/Disaster Relief

As melting sea ice makes the Arctic Ocean more accessible, the region continues to witness ever-increasing amounts of traffic at sea - a fact which brings with it additional risk of accidents and other malign events.

OneWeb's network supports the Search and Rescue (SAR) efforts of armed forces which might be tasked with finding and recovering personnel and platforms in challenging weather conditions and at extended ranges.

Unable to rely upon fixed communications infrastructures, SAR teams benefit from enhanced domain and situation awareness of the region, including a common operation picture which displays frequent positioning updates of aircraft and surface vessels through automatic dependent surveillance-broadcast (ADS-B) and automatic identification systems (AIS).

SAR teams also benefit from high data rate and low latency connectivity to ensure maximum levels in voice and data communications in fast-changing operating environments where risk to life can be extremely high.

OneWeb's solution is also tailored to supported Humanitarian Aid/Disaster Relief (HADR) missions with specific threats in the Arctic including wintertime earthquake, avalanches and extreme cold weather.

OneWeb also enables maximum levels in interoperability with legacy communications networks, enabling cooperation with other government and non-government agencies which might also be tasked with the support of SAR/HADR missions.

Securing Future Connectivity across the High North

Available to customers as a SATCOM As a Service (SAAS), OneWeb service plans can be customised to support specific connectivity requirements, usage profiles and budgets of armed forces, providing value for money and most importantly, vastly improved mission effectiveness.

This means customers are able to purchase global communications plans from a single source supplier as opposed to dealing with a number of service providers across multiple service contracts.

Products include:

- IP Access (a Best Effort service)
- Business Access (intermediate level of service allowing traffic to be separated into high and low priority streams
- Internet Protocol Virtual Private Networks (IPVPN) (Highest level of service with up to 4 levels of traffic priority

OneWeb also provides a complete suite of interfaces providing armed forces direct access to all operational aspects of the service, including service provisioning; network monitoring; and system performance.

"Advanced concepts include the deployment of co-hosted satellite payloads and specialised third party waveforms for ISR, anti-jam and low probability of intercept/ deception communications."

Securing Future Connectivity across the High North (continued)

OneWeb's Capability Set 1 is supported by a network with Gateways across the Arctic which communicate with the LEO satellite constellation via Ka-Band frequency bands. Each Gateway features up to 30 Full Motion Antennas. Armed forces will also be supported by OneWeb Satellite Operations Centres (SOCs) in London, UK and Virginia, US.

OneWeb is also developing a series of 'Advanced Concept' solutions specifically designed to support the emerging operating requirements of armed forces seeking to effectively operate across the High North, particularly against high capability adversaries.

Examples include modular, non-connectivity kits which enable armed forces to benefit not only from LEO SATCOM but also aggregated communications networks, including 5G, GEO and MEO (Medium Earth Orbit) SATCOM, Mobile Ad Hoc Networks and other Line of Sight communications.

Other advanced concepts include the deployment of co-hosted satellite payloads and specialised third party waveforms for ISR, anti-jam and low probability of intercept/ deception communications - ideally suited to optimising the management of electro-magnetic signatures in contested environments.

Conclusion

Co-owned by the UK Government, Indian telecommunications giant Bharti Global and Eutelsat, OneWeb offers its customers and partners the opportunity to collaborate with a leading NATO and 'Five Eyes' enterprise.

OneWeb looks forward to fulfilling its mission to support the operational requirements of armed forces operating in the Arctic. Please contact the sales team for more information as to how OneWeb can provide low latency, high bandwidth and reliable levels in connectivity to Armed Forces and Emergency Responders in the region.

Connect with OneWeb

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