

## RESEARCH ARTICLE

## Arctic Security and Outer Space

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Journalists often portray the Arctic and Space as rife with economic competition, contested territorial claims, and impending conflicts. In actuality, there is extensive and ongoing cooperation between Russia and Western states in both regions. A number of factors common to the Arctic and to Space contribute to this ongoing cooperation, including 'complex interdependence' and widely agreed rules of international law. This article focuses on three further common factors: the 'cold, dark, and dangerous' character of the regions; the absence of substantial 'weaponisation'; and the relative ease with which information about military activities may be gathered in the Arctic and Space, for instance through Space-based technologies. The latter factor enables Arctic and Space-faring states to avoid classic 'security dilemmas'.

**Keywords:** Arctic; Space; Security; International Cooperation; International Law; Russia; NATO

## 1. Introduction

The Arctic is closely connected to Outer Space ('Space'). The Arctic climate is a consequence of Earth's orbital mechanics, most notably the tilt of the planet, which leads to the absence of sunlight in winter and to 24-hour sunlight in summer. Satellites are vital to Arctic communications, surveillance, navigation, search and rescue, weather forecasting, sea-ice monitoring, fishing, prospecting, and environmental research. Most remote-sensing satellites, used for everything from intelligence gathering to disaster relief, are placed in polar orbits which converge over the Arctic. For this reason, the largest commercial ground station is located in the region, on the Norwegian archipelago of Svalbard. Much can be learned about Arctic security by examining these and other connections with Space.

## 2. Russia and Western States Cooperate in the Arctic

Russia and Western states cooperate relatively well in the Arctic. This cooperation began during the Cold War when, in 1973, the USSR partnered with Canada, Denmark, Norway, and the US and signed the Polar Bear Treaty which prohibited the use of helicopters in the hunting of polar bears, thus arresting a sharp decline in polar bear populations around the region (Canada et al., 1973). In 1982, the US and the USSR led the negotiation of the United Nations Convention on the Law of the Sea, a global treaty containing provisions of direct relevance to the Arctic, including Article 234 on pollution prevention in ice-covered waters and Article 76 on coastal state rights over continental shelves that extend more than 200 nautical miles from shore (UNCLOS, 1982).

Arctic cooperation increased as the Cold War drew to a close. In 1987, Soviet leader Mikhail Gorbachev prompted a process of institution building that—after some additional Finnish and then Canadian leadership—led to the Arctic Environmental Protection Strategy in 1991 and the Arctic Council in 1996 (Arctic Council, 1996; Canada et al., 1991; Koivurova & VanderZwaag, 2007). Significantly, the two languages used at the Arctic Council are Russian and English. Although the Arctic Council does not deal with security matters, it has grown into the central governance mechanism for the region, instigating the negotiation of the 2011 Arctic Search and Rescue Agreement (Arctic Council, 2011) and other new treaties on oil spill preparedness and response as well as scientific cooperation.

In 1998, Russia opened four transpolar air routes that provided significant time and fuel savings for foreign airlines and a revenue stream for Russia in the form of overflight fees (Blagov, 2001). Russia also sought to attract foreign shipping to the Northern Sea Route along its Arctic coast. In 2011, it created the Northern Sea Route Information Office (now the CHNL Information Office) as a joint initiative by Rosatomflot, a Russian state-owned company, and the Centre for High North Logistics, a Norwegian foundation (CHNL, n.d.).

On the security front, a number of arms control treaties were negotiated within the Organization for Security and Co-operation in Europe (OSCE). In 1990, the Treaty on Conventional Armed Forces in Europe set limits on military equipment positioned between the Ural Mountains and the Atlantic Ocean, including the Arctic regions of Western Russia, Finland, Sweden, and Norway (OSCE, 1990). It also prohibited interference with 'National Means of Verification', meaning satellites. In 1992, the Treaty on Open Skies provided for reciprocal surveillance flights, including Russian flights over Western countries and Western flights over Russia (OSCE, 1992).

As the Cold War faded into history, meetings and exercises between Arctic militaries became commonplace. The Arctic Security Forces Roundtable was established in 2011 as a venue for informal discussions among military leaders from the eight Arctic states (Russia, the US, Canada, Denmark, Iceland, Norway, Sweden, Finland) plus France, Germany, the Netherlands, and the UK (Foughty, 2014). Russia and the US partnered in the Northern Eagle naval exercise in the Barents Sea on a biennial basis, beginning in 2004 and including Norway from 2008 (Daniels, 2004; Henry, 2011). Russian, US, and Canadian fighter jets took part in the Vigilant Eagle exercises from 2008, responding to mock hijackings of commercial aircraft in international airspace between Alaska and the Russian Far East (NORAD, 2013).

Even the strategic nuclear balance, which relies on intercontinental ballistic missiles designed to fly through Space over the Arctic, has long involved a degree of Soviet/Russian–Western cooperation. This cooperation began in 1969 with the Strategic Arms Limitation Talks between the USSR and the US, which led to two treaties: the 1972 Anti-Ballistic Missile Treaty (the ABM Treaty) and the 1972 Interim Agreement on Limitation of Strategic Offensive Arms (US & USSR, 1972b, 1972c). More progress was made after the Cold War with the conclusion of the 1991 Strategic Arms Reduction Treaty (START I) and the 1993 Strategic Arms Reduction Treaty (START II) (US & USSR, 1991, 1993). Although President George W. Bush renounced the ABM Treaty in 2002, he concluded the Strategic Offensive Reductions Treaty (SORT) with Russia that same year (US & USSR, 2002). SORT remained in force until 2010, when President Barack Obama negotiated a third Strategic Arms Reduction Treaty (NEW START) with Russia (US & USSR, 2010).

Most military cooperation was suspended after Russia annexed Crimea in March 2014. The Northern Eagle naval exercise was cancelled (LaGrone & Majumdar, 2014), and the cooperation between NATO and Russia was curtailed (NATO, 2017). Essential channels of communication were, however, kept open. For instance, naval commanders on opposite sides of the Russia–Norway boundary in the Barents Sea, which is proximate to large Russian naval facilities, continued talking in order to avoid misunderstandings and accidents (Østhagen, 2016).

Even the strategic nuclear balance came under strain, with President Donald Trump announcing his country's withdrawal from the 1987 Intermediate-Range Nuclear Forces Treaty (INF Treaty) in October 2018 (Reuters, 2018). But while both Russia and the US had repeatedly accused the other of violations of the INF Treaty, another factor in the breakdown seems to have been the failed US efforts to bring China into this treaty, with the concern being that China's development of intermediate-range nuclear weapons could put US allies and forces in Southeast Asia at risk (Hellman, 2018).

In the summer of 2014, the US, the European Union, Canada, and Norway adopted economic sanctions and diplomatic measures that targeted key Russian sectors such as energy, banking, and defence. They imposed travel bans on some Russian officials as well as arms embargoes and restrictions on access to Western capital and technologies (Myers & Baker, 2014; Reuters, 2014a, 2014b). They also prohibited Western companies from providing goods, services, and technologies for offshore oil projects in the Russian Arctic (Mohammed & Trott, 2014), forcing Exxon to cancel a joint venture with Rosneft (Holter, 2014). Russia responded with sanctions against food imports (BBC News, 2014). However, some trade continued, most notably in Russian natural gas—much of it produced in the Arctic.

Cooperation on search and rescue continued. In December 2014, Russian officials requested assistance from the US Coast Guard after a South Korean fishing trawler sank inside the Russian search and rescue zone in the Bering Sea (Parfitt, 2014). The Norway–Russia 'Exercise Barents' still takes place each year (Nilsen, 2018; Staalesen, 2017) as does the Norway–Sweden–Finland–Russia 'Barents Rescue Exercise' (Joint Committee on Rescue Cooperation in the Barents Region, n.d.). Joint exercises under the Arctic Search and Rescue Agreement have also continued (Canadian Armed Forces, 2016). In 2015, the eight Arctic states created the Arctic Coast Guard Forum, which meets on an annual basis 'to focus on and advance operational

issues of common interest in the Arctic, such as search and rescue, emergency response, and icebreaking' (Sevunts, 2015).

Fisheries cooperation continued, with Norway and Russia setting annual quotas together in the Barents Sea (Nilsen, 2017; Sætra, 2018). In 2015, the five Arctic Ocean coastal states adopted a declaration on the central Arctic Ocean in which they signalled their intent to prevent unregulated commercial fishing in that area of the high seas by ships flying their flags, and to seek similar commitments from non-Arctic states (Canada et al., 2015). In 2017, they were joined by China, Japan, South Korea, Iceland, and the European Union in a treaty that commits the countries to refrain from commercial fishing in the central Arctic Ocean until scientific evidence supports its opening (European Commission, 2017). Shipping cooperation also continued, with Western cruise companies chartering Russian government-owned research vessels for Arctic voyages (Canadian Press, 2014; One Ocean Expeditions, n.d.) and Western shipping companies sending vessels through the Northern Sea Route (NSRA, n.d.), and with the Polar Code which sets new safety and pollution rules, adopted by the International Maritime Organization (IMO) in November 2014 (IMO, 2014).

The Arctic Council was not significantly affected by the annexation of Crimea. The biannual meetings of the Senior Arctic Officials continued with Russian delegates always present. In 2015, the Arctic Council established a task force on Arctic marine cooperation (Arctic Council, 2015), a decision that required Russia's support as the Arctic Council operates on the basis of consensus. A Scientific Cooperation Task Force, created in 2013, continued to meet regularly under the joint chairmanship of Russia and the US (Arctic Council, 2016), with the resulting Agreement on Arctic Scientific Cooperation being adopted in 2017 (Arctic Council, 2017a). In 2015 and 2017, Russia joined in the ministerial declarations that allowed the US and then Finland to proceed with the programmes for their two-year chairmanships (Arctic Council, 2015, 2017b). At the Arctic Council's 2019 ministerial meeting, it was US opposition to the inclusion of language on climate change that prevented the adoption of a ministerial declaration for the first time in the Council's history. The biennial rotation of the Council's chairmanship, which had previously been included in the joint declaration, was instead passed on to Iceland through a joint statement. (Quinn, 2019; Arctic Council, 2019).

The UNCLOS process for determining the extent of coastal state rights over seabed resources was unaffected by the annexation of Crimea. In November 2014, Denmark filed a submission with the Commission on the Limits of the Continental Shelf that made the scientific case for an extension of its continental shelf along the Lomonosov Ridge right up to Russia's 200 nautical mile exclusive economic zone (Denmark & Greenland, 2014). Instead of reacting negatively, the Russian Foreign Ministry stated: 'Russia was well aware of the Danish side's plans. Our countries have cooperated actively on this issue ... and they will continue to cooperate on this issue' (MID, 2014). The Russian Foreign Ministry noted that both countries were following an established process and confirmed that after the Commission finished its work: 'Possible adjoining sections of our countries' continental shelf in the high Arctic latitudes will be demarcated on a bilateral basis, through negotiations and in line with international law' (MID, 2014).

### 3. Russia and Western States Cooperate in Space

Russia and Western states cooperate relatively well in Space. During the early Cold War, as the US and the USSR were building intercontinental ballistic missiles designed to fly through Space, they were also negotiating four multilateral treaties setting out the rights and duties for Space-faring states: the Outer Space Treaty, the Rescue Agreement, the Liability Convention, and the Registration Convention (Outer Space Treaty, 1967; Rescue Agreement, 1967; Liability Convention, 1972; Registration Convention, 1975). Key elements of these treaties included: freedom of exploration and use of Space, prohibition on the national appropriation of the Moon and other celestial bodies, prohibition on the deployment of nuclear weapons in Space, and a commitment to rescue and return astronauts in distress.

In 1972, the US and the USSR entered into a bilateral agreement which, three years later, led to their first joint Space mission (US & USSR, 1972a). The Apollo-Soyuz Test Project saw a docking between two capsules and a famous handshake in orbit (NASA, 2010). Another marker of cooperation occurred in 1978 after Cosmos 954, a Soviet nuclear-powered reconnaissance satellite, malfunctioned and re-entered the atmosphere with more than 50 kilograms of uranium-253 on board (Cohen, 1984). The debris was scattered across the Canadian Arctic and, after an expensive recovery effort, Canada requested \$6 million in compensation. The USSR denied legal responsibility, but paid half of the requested amount to the NATO country (Canada & USSR, 1981).

In 1979, the US, the USSR, Canada, and France created the International Cospas-Sarsat Programme, which uses a network of satellites equipped to receive signals from search and rescue beacons anywhere on the planet (Levesque, 2016). The network currently includes five satellites in low Earth polar orbit, 37 satellites

in medium Earth orbit, and eight satellites in geostationary orbit (Inside GNSS, 2018). The satellites are owned and operated by the US, Russia, Canada, France, the European Union and the European Organisation for the Exploitation of Meteorological Satellites. More than 200 countries and territories benefit from the service, which is provided at no cost, either to the owners of the beacons or to the governments receiving notice—including the precise location—of any beacon activated on their territory or off their coastline.

During the Cold War, the rival superpowers also began cooperating on the allocation of radio frequencies and 'slots' in geostationary orbit (Doyle, 1987). They did so because communications satellites can interfere with one another if broadcasting on the same frequency without sufficient physical distance between them. A further incentive for cooperation came from the limited amount of room in geostationary orbit, where a satellite may be locked into position above a particular point on the Earth's equator by placing it at the exact altitude where it falls forward at precisely the same speed as the planet rotates beneath it. Their vehicle for this cooperation was an organisation created during the 19th century: The International Telecommunication Union (ITU, n.d.).

Russia's involvement in the International Space Station (ISS) resulted from the more general US desire to cooperate with Russia during the early post-Cold War period (Sheehan, 2007). Russia had much to offer in terms of technology and experience, particularly in long-duration Space flights. Just as important, its Space scientists were facing unemployment due to the country's steep economic decline. Had they not become engaged in new projects, their knowledge might have been acquired by governments hostile to the US (Muir-Harmony, 2017; Sheehan, 2007). The US paid most of the costs of the ISS, while treating Russia as a full-fledged partner (US General Accounting Office, 1994). When the Space Shuttle programme was shut down in 2011, the US and other Western countries began paying Russia to transport their astronauts to-and-from the ISS in Soyuz spacecraft (Newton & Griffin, 2011). The same motivation—keeping Russian scientists employed at home—underlay the US decision to use Russian-made RD-180 engines for its Atlas V rockets, which entered into service in 2002 (Daniels & Perez, 2007).

Russia has also cooperated with Western companies in the commercial market for satellite launches. International Launch Services, which sells launches to geostationary orbit on Proton rockets, started in 1995 as a joint venture between Lockheed Martin and Khrunichev State Research and Production Space Centre (Daniels & Perez, 2007). Although the Russian state-owned company acquired Lockheed Martin's stake in 2008, International Launch Services remains incorporated and headquartered in the US. The cooperation between Russia and Western companies in this domain also includes Eurockot Launch Services, which was founded as a German–Russian joint venture in 1995. It provides launches to low Earth orbit using 'Rockots', which are refurbished SS-19 intercontinental ballistic missiles. Today, 51 percent of the company is owned by the European multinational ArianeGroup; the other 49 percent is owned by the Khrunichev State Research and Production Space Centre (Eurockot Launch Services GmbH, n.d.). The ArianeGroup also offers launches via its subsidiary, Arianespace, which uses Soyuz-ST rockets as one of its three types of launch vehicles. More than 50 of these rockets have been employed by Arianespace since 2011—after being purchased from Roscosmos, the former Russian Space Agency and now a Russian state-owned company (Arianespace, 2019).

Today, Russia and Western states continue to cooperate in Space, notwithstanding the annexation of Crimea and the subsequent sanctions. The ISS has been functioning normally, with Western astronauts travelling there in the Soyuz spacecraft. Indeed, since 2014, NASA has booked an additional seven seats on Soyuz and taken out options on three more (Grush, 2016; O'Kane, 2017). The Cospas-Sarsat Programme is also functioning normally, and Russian-made RD-180 engines are still being used to launch US intelligence and military satellites (King & Troyan, 2016). Also, all three of the commercial launch services based on Russian–Western cooperation continued to operate after the annexation of Crimea. Since March 2014, 12 commercial launches for Western customers have taken place on Protons, three on Rockots, and more than 20 on Soyuz STs (Space Launch Report, n.d.).

New cooperative initiatives are also underway. Russia and Western states are collaborating in addressing natural hazards in-and-from Space, for instance through the International Asteroid Warning Network, created in 2013 to facilitate cooperation between scientific observatories and national Space agencies in discovering, monitoring, and characterising potentially hazardous near-Earth objects (NEOs) (IAWN, n.d.). Russia and Western states are also working together in the Space Mission Planning Advisory Group, an association of national Space agencies that was established in 2014 to 'prepare an international response to a NEO threat through the exchange of information, development of options for collaborative research and mission opportunities, and to conduct NEO threat mitigation planning activities' (ESA, n.d.). Last, but not least, in 2017 President Trump redirected NASA's plans for human Space travel to the Moon rather than Mars. NASA responded by proposing the establishment of the Lunar Gateway, a Space station in cis-lunar orbit that would serve as a staging point for access to the Moon's surface as well for deep Space missions



(NASA, 2017). Later that year, NASA and Roscosmos issued a joint statement on cooperation in pursuit of this objective (Weitering, 2017).

#### 4. Complex Interdependence and International Law

A number of factors contribute to the continued cooperation in the Arctic and in Space, including 'complex interdependence', a concept developed by Robert Keohane and Joseph Nye during the Cold War to explain aspects of international relations for which traditional 'realist' approaches could not account (Keohane & Nye, 2012). Among other things, Keohane and Nye argued that a multiplicity of issues, actors, transnational channels of contact, and associated interdependencies—as a consequence of complexity—can separate some dimensions of an interstate relationship from others. I have carried this insight further in my own work, arguing that separation can prevent a disruption in one dimension of an interstate relationship from spreading to other dimensions (Byers, 2017). My previous research has revealed that this was what occurred in the Arctic and in Space after the annexation of Crimea (Byers, 2017; Byers, 2019).

Complex interdependence can result from deliberate efforts at engagement and confidence-building. Indices of this approach in the security domain include the OSCE's 1992 Treaty on Open Skies, which enables the verification of arms control agreements. The Arctic Council was created, in large part, to foster communication, build confidence, reduce tensions, and thus help to prevent conflict in the post-Cold War period (English, 2013). The greatest accomplishment of the Arctic Search and Rescue Agreement may have been to regularise contact, and thus confidence-building, among the militaries and coastguards of the eight Arctic states (Exner-Pirot, 2012). The creation of the Arctic Coast Guard Forum has carried this development further. In Space, one of the motivations for the Cospas-Sarsat Programme was to continue the cooperation and confidence-building that had developed during the Apollo-Soyuz Project (Jamgotch, Knappet, & Carpio, 1988). In the 1990s, the same motivation led to Russia being invited to participate in the ISS as a full-fledged partner, despite the US shouldering most of the cost. The recent US decision to include Russia as a major partner in the Lunar Gateway is a continuation of this policy—taking collaborative, confidence-building steps that reduce tensions, create interdependencies, and thus help to prevent conflict.

A host of other international legal instruments reflect the shared interests that Arctic and Space-faring states have in avoiding the uncertainties, risks, and expenses that would result from an absence of rules and norms. Every ship and spacecraft must be registered with a national government (UNCLOS, 1982: Art. 91; Registration Convention, 1975). Rules on liability for accidents are set out in treaties, backed up by globally accepted customary international law on state responsibility (IMO, 1969; Liability Convention, 1972; Crawford, 2002). International rules also exist to protect and manage common spaces such as the high seas, the deep seabed, Earth orbits, and asteroids. The rules are more advanced and detailed with regard to the Arctic as a result of the much earlier exploration and development of the oceans, which led to customary international law: the 1958 Geneva Conventions, and the 1982 UNCLOS—the so-called 'Constitution for the Oceans' (Rothwell & Stephens, 2016). However, the negotiators of the 1967 Outer Space Treaty were addressing very similar issues when they prohibited national appropriation of the Moon and other celestial bodies (Outer Space Treaty, 1967). In addition to the rules found in treaties and customary international law, a great deal of 'soft law' has been developed for the Arctic and for Space—in the form of guidelines, codes of conduct, and even 'soft treaties' that are legally binding but contain provisions that are ambiguous, qualified by non-obligatory language, or redundant (Byers, 2019). For example, the Arctic Council was created by a declaration rather than a treaty, while the challenge of Space debris is so far being addressed by guidelines adopted by the Inter-Agency Space Debris Committee and the UN Committee on the Peaceful Uses of Outer Space (Arctic Council, 1996; IADC, 2007; COPUOS, 2007).

All this risk management through international law can be self-reinforcing, most obviously when the agreed-upon actions deliver their intended benefits, such as enhanced search and rescue coverage or reduced military costs. States that benefit from international rules and norms are more likely to comply with them, and also to negotiate new ones. One example of this is the certainty and stability provided by international rules on territory, maritime zones, and maritime boundaries. As a result of these rules, Arctic states already have undisputed rights over vast landmasses and extensive maritime zones. Indeed, the only disputed land in the Arctic is a tiny islet located halfway between Canada and Greenland, and the only two disputed maritime boundaries are between NATO countries, namely Canada and the US, and Canada and Denmark (Byers, 2013). There is thus no reason for any of the Arctic states to claim more of the Arctic or to fight over it. As for Space, the technology has not yet advanced to the point where states could benefit from claims to the Moon or asteroids, and thus, they have no interest in preparing for conflicts over them, or in developing the specific rules that will help to prevent such conflicts.

Risk management through international law-making is particularly important in those parts of the Arctic—and in all of Space—that are 'areas beyond national jurisdiction' where the legal and political arms

of individual states cannot deliver the same stability and certainty as within their borders and boundaries. The 2017 Central Arctic Ocean Fisheries Agreement is one such example (European Commission, 2017). No state could hope to protect the ecosystem of this large international area on its own, given that the freedom of the high seas includes an unrestricted right to fish unless restrictions (usually specific to a particular area or even a particular species of fish) have been agreed, for instance, in a 'regional fisheries management organisation' (Rayfuse, 2019).

The Central Arctic Ocean Fisheries Agreement is also instructive with regards to how cooperation in areas beyond national jurisdiction can be facilitated through the design of international instruments. The Agreement takes the form of a full moratorium, which is easier to monitor than a partial ban or quotas, and enforcement is based on the existing jurisdiction of 'flag states' over ships registered with them. Similar mechanisms are present in Space through the 1972 Liability Convention and the 1975 Registration Convention, which require that all spacecraft be registered with a state and make the 'launch state' (i.e. the state which procures a launch, and/or from whose territory the launch takes place) liable for any damage caused.

International law thus ensures that activities in areas beyond national jurisdiction are subject to state control, and control carries with it responsibility for ensuring safety and providing compensation if things go badly. The presence of these rules works in the long-term interest of every state, for instance by ensuring that non-state actors are always subject to regulation and oversight. And this, in turn, enhances national security.

## 5. Cold, Dark, and Dangerous

Another factor in continued cooperation concerns the 'cold, dark, and dangerous' characters of the Arctic and Space (Byers, 2019). In every region of the world, natural factors such as geography, climate, and the presence or absence of resources play a role in national interests and policy preferences. In the Arctic and in Space, a combination of remoteness and extreme conditions makes almost any activity extremely expensive, and this in turn creates an incentive for cooperation and burden-sharing. As Russian President Vladimir Putin said in 2010: 'If you stand alone, you can't survive in the Arctic. Nature makes people and states to help each other' (Harding, 2010).

Examples of how states cooperate to overcome remoteness, extreme conditions, and high expenses abound in the Arctic and in Space. For instance, the Arctic Search and Rescue Agreement and the Arctic Coast Guard Forum enable member states to coordinate their responses to emergencies, thus saving time, lives, and money. At the same time, the states which contribute their satellites and ground stations to the Cospas-Sarsat Programme all obtain much greater coverage and therefore faster notification of distress signals than they could obtain on their own, given the high costs of building and launching satellites. This then saves them money by taking the 'search' out of search and rescue. Similarly, all the states involved in the ISS benefit scientifically and commercially from having a laboratory in micro-gravity (Rai et al., 2016). Yet the cost of building and operating such a large, multi-functional, and long-lasting Space station would be prohibitive for any single state, including the US (Zimmerman, 2003).

## 6. Militarised, but Not Weaponised

The 'cold, dark, and dangerous' characters of the Arctic and Space will be among the reasons why the two regions have long been 'militarised', but not substantially 'weaponised'. Militarisation is the use of a region for the transportation of personnel and weapons as well as the placement of supporting equipment, whereas weaponisation involves the actual placement of weapons (Sheehan, 2007). By avoiding the weaponisation of a remote and environmentally extreme region, states can avoid what might otherwise be punishingly high costs. Avoiding weaponisation also facilitates international cooperation and therefore the advancement of mutual interests within that region.

The Arctic Ocean, located directly between the US and the USSR, was a key staging point for nuclear weapons during the Cold War. Long-range bombers circled over the ocean, waiting for the signal to fly into the other country and drop their nuclear bombs. Nuclear missile submarines conducted parallel operations under the sea-ice, and radar systems as well as acoustic sensors were built to surveil all this activity. But neither side was preparing to fight in the Arctic: the region was an avenue for transporting weapons to targets further south.

The end of the Cold War saw a sharp decline in Russia's military spending, with the country closing many of its Arctic airbases and allowing the Northern Fleet to atrophy. More recently, Russia has sought to arrest the decline by re-opening airbases, resuming bomber flights, and building new submarines (BBC Monitoring Former Soviet Union, 2018), but most of the reinvestment in Arctic-specific equipment and infrastructure has focused on search and rescue and constabulary capabilities associated with increased civilian activity, such as shipping and oil drilling (Gurzu, 2016; Staalesen, 2016).

Except for Norway, which shares a land border with Russia, NATO countries have never prepared for a conflict in the Arctic. Most of their armed forces are stationed in more southern regions. Greenland is the world's largest island that is not a continent, yet only 80 Danish soldiers are based there (Danish Ministry of Defence, 2019). Canada's northern territories make up 40 percent of its landmass, but less than 300 of Canada's 68,000 full-time military personnel are based there (Canadian Army, 2018; Kalvapalle, 2018). Although the US has a relatively large military presence in Alaska, those forces are focused on the Russian Far East, North Korea, and China. The US does not have a single deep-water port along its Arctic Ocean coastline.

Space, too, is heavily militarised, with 1000s of military satellites having been launched for communications, surveillance, situational awareness, and targeting since the 1950s (Sheehan, 2007). Modern militaries depend on satellites to the point where fifth generation fighter jets and armed drones cannot operate to their full capabilities without Space-based broadband (Thompson, Gagnon, & McLeod, 2018). GPS is a key component of precision-guided missiles, bombs, and artillery.

However, as mentioned above, there is an important difference between militarisation and weaponization. If Space was ever weaponised, this only occurred with the testing of anti-satellite (ASAT) weapons during the Cold War. These weapons ranged from ground-based missiles, lasers, and jammers to Space-based killer satellites designed to crash into other satellites, capture them, or nudge them off course (Moltz, 2014). But while satellites are fragile pieces of equipment that follow predictable trajectories and therefore are vulnerable to attack, it is unclear whether any ASAT weapons are currently deployed in Space, and no such weapon has ever been used against a satellite from another country. Moreover, states have largely refrained from testing ASAT weapons that rely on violent impacts, because of widespread concern over the risk of runaway Space debris, where collisions between objects in orbit would create thousands of smaller pieces, followed by more collisions, and so on (Billings, 2015). Indeed, it is widely accepted that runaway Space debris, of the kind that could result from the use of ASAT weapons involving violent impacts, would severely damage the economy and military capabilities of every Space-faring state. Together, these factors create a situation of 'mutually assured destruction' with regard to space-based systems, much as with nuclear weapons during the Cold War.

A number of factors contribute to the militarised-but-not-weaponised character of the Arctic and of Space. Again, remoteness and extreme conditions make it difficult and expensive to design, construct, and deploy weapons for-and-in these regions. The same is true of the training, equipping, and deploying of troops. The large exercises that take place in the Arctic are generally confined to northern Europe and northwest Russia, which benefit from ice-free waters and relatively warm temperatures due to the effects of the Gulf Stream. Exercises in the North American Arctic, with its persistent sea-ice and punishing climate, tend to be much smaller. As Canada's then-Chief of the Defence Staff, General Walter Natynczyk, explained with regard to these conditions in 2009: 'If someone were to invade the Canadian Arctic, my first task would be to rescue them' (Deshayes, 2009). On another occasion, Natynczyk commented that it costs more to deploy a Canadian soldier to the Canadian Arctic than to Afghanistan (Canadian Press, 2011). As for Space, humans can only exist there within complex and exceedingly expensive life support systems, making remote and AI technologies more viable and affordable options—if weaponisation were ever to occur in that region.

## 7. Satellites and the Security Dilemma

With Space-based technologies, it is relatively easy to gather information about military activities in both the Arctic and in Space because of the near-absence of other human activities as well as trees, buildings, and other objects that might offer concealment. One example of this concerns how Arctic countries have invested in synthetic aperture radar satellites which can identify and track ships, even at night and through clouds (CSA, 2018; ESA, 2012). Another example concerns thermal imaging satellites which are most effective in detecting human activity when temperatures are cold (CRISP, n.d.). A final example concerns how even amateur astronomers are able to identify the presence and orbits of new military satellites, notwithstanding the efforts of governments and launch providers to keep this information secret (Nash, 2012).

This ability to gather information enables Arctic and Space-faring states to avoid classic 'security dilemmas', where states feel compelled to build up their military capabilities in an escalating series of responses to suspected increases by others (Herz, 1950; Jervis, 1978; Booth & Wheeler, 2007). For instance, the re-opening and expansion of military bases in the Russian Arctic has prompted concern, mostly in the Western media, but also among some politicians (McGwin, 2019; Shea, 2019). Yet it is relatively easy, including with publicly-available Google Earth, to observe the changes—all of which are relatively small in scale. One can only imagine the heightened degree of awareness on the part of those with access to military-grade satellites.

The tracking of submarines is a more complex matter. Satellites can detect the departure and return to port of submarines. Synthetic aperture radar satellites might also sometimes be able to monitor submarines

at sea by detecting changes in wave patterns caused by the vessels as they operate below the surface. But if so, the ability to track submarines throughout their voyages would detract from rather than enhance Arctic security, since submarines provide the 'second strike' capability that maintains mutually assured destruction between Russia and NATO states to this day. For this reason, the surveillance capabilities provided by satellites help to prevent the security dilemma *at the same time* that the limitations of those capabilities with regards to submarines preserve another, quite separate component of the balance between Russia and NATO forces.

## 8. Conclusion

Journalists have warned that competition for Arctic territory and resources could lead to a 'New Cold War' (Shea, 2019; Macalister, 2015; Tremoglie, 2019). Developments in the Arctic, including the refurbishment of bases and the replacement of aged military aircraft and ships, are often portrayed as arms build-ups driven by hostile intent. Many Arctic experts see these warnings as little more than crass attempts to sell newspapers, attract viewers, or generate 'clicks' (Burke, 2018; Exner-Pirot, 2016). Unfortunately, the same reports are read by non-experts and politicians, in Western states as well as Russia, who consequently view the actions of the other side with heightened suspicion. The risk of an Arctic 'security dilemma' is very real, as misinformation leads to misunderstanding and, potentially, to misplaced action.

The same phenomenon of media reports about potential conflicts leading to misunderstanding and the risk of misplaced action, is also visible in Space. President Trump's 'Space Force' is the most salient development here, even though he announced its creation immediately after signing a 'presidential directive' that ordered all US government departments and agencies to cooperate with other countries to address the challenge of Space debris (White House, 2019). In other words, the President's words on the podium were inconsistent with the government-wide policy that he had just adopted.

Russia and Western states have long histories of cooperation in the Arctic and in Space. Factors behind this cooperation include the existence of complex interdependence and a web of international legal instruments. Equally important is the combination of remoteness, extreme conditions and high costs; the fact that neither region has been substantially weaponised; and the relative facility with which information about military activities may be gathered in the Arctic and Space, for instance through Space-based technologies. For all these reasons, it should be possible to avoid security dilemmas in the Arctic and in Space that might otherwise lead to unnecessary and ultimately destabilising arms build-ups. Academic and military experts can help in this regard, by paying attention to actual developments, rigorously exploring the reasons for them, and then testing their analysis and conclusions by comparing developments across the two regions.

## Competing Interests

The author has no competing interests to declare.

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