Sergey Sukhankin

CMSN

REPORTS

FROZEN FRONTIER TO INFORMATION BATTLESPACE

The Evolution of Russia's Arctic ISR Ecosystem

Sergey Sukhankin
Canadian Maritime Security Network
March 2026

Table of Contents

Executive Summary

The Arctic is no longer insulated by distance and climate in the way it once was. Melting sea ice, expanding satellite coverage, and improvements in long-range sensing have reduced the region's operational isolation. Thus, competition in the High North is now shaped less by who can physically remain in the region and more by who can see, interpret, and connect information faster and more reliably.

In this context, Russia is building a layered and integrated Arctic intelligence, surveillance, and reconnaissance (ISR) system. This architecture combines space-based assets, uncrewed aerial vehicles (UAVs), coastal and ground-based radar systems, electronic warfare capabilities, and emerging under-ice autonomous platforms. These elements are framed within the concept of a Unified Intelligence and Information Space designed to improve early warning, reinforce anti-access/area denial (A2/AD) depth, and shorten decision-making cycles. Although many of these modernization efforts predate 2022, the war in Ukraine has accelerated them. Operational lessons related to data latency, UAV vulnerability, electronic warfare exposure, and sanctions pressure have encouraged a shift toward more distributed architectures, hardened communications, domestic production, and greater automation across domains.

AI-enabled tools and uncrewed systems are becoming increasingly important in Russia's Arctic posture. Beyond expanding sensor coverage, Russian military discussions emphasize cross-domain data fusion, anomaly detection, and faster processing of operational information. If these efforts succeed, they could shorten the time available for Western forces to act unnoticed and make submarine and surface operations more difficult.

The next phase of Arctic competition will depend not only on Russia's capabilities but also on the cohesion of Western states and the trajectory of China's involvement. Fragmentation within the Western alliance could slow collective adaptation, while China's growing presence in satellite services, digital infrastructure, and dual-use technologies may intersect with Russian initiatives. The extent and depth of such cooperation remain uncertain, but they warrant close monitoring.

Introduction

The Arctic is undergoing a profound transformation driven by two interrelated strategic processes. On the one hand, climate changes have already made the region significantly more accessible and, according to current projections, are likely to further facilitate its commercial and economic exploitation.[1] On the other hand, the Arctic has re-emerged as a theatre of great power competition. This renewed rivalry not only accelerates the securitization of the region but also attracts the attention and involvement of new, non-traditional stakeholders, most notably China. Clearly, these dynamics illustrate the evolving nature of competition in the Arctic and the High North. While traditional means of power projection remain intact – such as Russia's long-standing reliance, since Imperial and Soviet times, on various classes of icebreakers and submarines – technological transformation is also gaining prominence. For instance, the rapid integration of artificial intelligence (AI)–enabled surveillance systems, autonomous platforms, and persistent sensing architectures is reshaping the strategic environment. Russia, for its part, is constructing a layered Arctic Intelligence, Surveillance, and Reconnaissance (ISR) ecosystem designed to enhance early detection capabilities, strengthen anti-access and area-denial (A2/AD) capabilities,[2] and accelerate decision-making cycles.

These shifts prompt two central questions for policymakers. The first is how Russia's Arctic ISR ecosystem will be structured, integrated, and operationalized across domains. The second is to what extent autonomous and AI-enabled surveillance systems are altering the Arctic strategic balance by compressing warning timelines, complicating Western deterrence postures, and eroding traditional early-warning frameworks.

Less Remote than It Seems: Assessing the Strategic Shifts in the Arctic

Historically, the Arctic served as a natural strategic buffer, defined by its geographic remoteness and extreme climatic conditions and ice. For militaries, these features drastically reduced the intensity of permanent presence and increased the cost of operations.[3] However, due to a combination of climatic and technological changes, one could argue that the geography and climate that once functioned as a natural barrier and, to a certain extent, a "guarantor of security" have lost their former significance – at least in part. Under these conditions, ISR systems and digital infrastructure are no longer just advantages but rather have become essential for maintaining influence in the Arctic.[4]

At least two critical factors are driving this transformation. First, the degradation of sea ice increases the duration of "access windows" and expands the range of economic activity, from shipping to industrial development.[5] At the same time, the emergence of new types of icebreakers[6] capable of operating in both the western and eastern sectors of the Arctic on a year-round basis enhances access to and manoeuvrability in the region, while also enabling the delivery and transport of various technological solutions. The second factor is inseparable from technological shifts that resulted in qualitative shifts introducing advanced versions of satellite constellations, synthetic aperture radar (SAR), uncrewed platforms, and big data analytics systems[7] – variables that diminish the significance of the Arctic's natural barrier by rendering surveillance and targeting increasingly "distance-independent." These changes have marked a strategic shift in the defence-strategic perception of the Arctic region: in addition to the geographic factor (critical for physical access to the region), a state's Arctic posture and ambitions are also increasingly defined by its ability to control the region's information space.[8]

In this new (or, rather, rapidly evolving) configuration, the control and effective employment of multi-layered ISR systems – linking space-based assets, airborne sensors, coastal radars, signals intelligence capabilities, and (prospectively) autonomous surface and undersea platforms – acquire particular importance. It is critical to highlight that the strategic significance of such ISR systems lies not only in expanding the so-called "zone of visibility" but also in their indispensability in reducing the warning time until the first strike. As monitoring becomes faster and more continuous, decision makers have less time to consult and coordinate, especially during crises.[9]

The full and comprehensive realization of this new reality is particularly evident in the case of Russia, which has methodically developed its Arctic military infrastructure, along with an integrated detection and response architecture.[10] Most likely, this more advanced understanding of the evolving situation is inseparable from the value that the Arctic region holds for Russia, which rests not only on economic, diplomatic, and security calculations but is also deeply intertwined with ideological considerations. In this context, the Northern Sea Route (NSR) is positioned as far more than merely a transportation corridor of critical trade significance. That is why, since at least 2014, Russia has invested heavily in developing capabilities in the domain of "comprehensive security provision," reflected in the imperative to construct a sophisticated, layered defence architecture.[11]

Having outlined the main trends and developmental priorities for Russia, it should be acknowledged that the North Atlantic Treaty Organization (NATO) and individual Western states face institutional and technological constraints in their adaptation efforts. For instance, research produced by the North American and Arctic Defence and Security Network (NAADSN) clearly points to not only technological but also command and control (C2)–related needs.[12] A far more troubling dimension of the gap between Sino-Russian and Western technological capabilities in the Arctic may emerge at the strategic level rather than just the operational–tactical level. The challenge lies less in the absence of specific programs than in the risk that competitors' technological advantages will become entrenched through superior connectivity and faster decision-making cycles. Consequently, the North Atlantic Alliance (and its individual members) are compelled to accelerate the modernization of early warning systems and build a more coherent architecture for data exchange. Otherwise, there may emerge a structural risk of losing situational awareness and degrading decision quality due to data gaps and system incompatibilities.[13]

Russia's Arctic ISR Ecosystem: Structure, Components, and Strategic Logic

Similar to many other Western military and defence-related terms, the concept of ISR does not appear in Russian specialized terminology in the same way it is employed within Western academic and policy communities. Instead, Russian military literature refers to the concept of the "*Yedinoye razvedyvatel'no-informatsionnoye prostranstvo Vooruzhonnykh Sil*" (Unified Intelligence and Information Space of the Armed Forces).[14] This concept is understood as an integrated framework for the collection, transmission, and utilization of intelligence and other operational information for the purpose of command and control. It is designed to ensure continuous situational awareness, the systematic processing of intelligence data, and the integration of that data into reconnaissance-strike systems. Between 2022 and 2025, this concept received increased and sustained attention in expert and analytical discussions published in Russian specialized defence and security journals.[15] Given Russia's severe climatic conditions, geographic particularities, and demographic constraints,[16] specialized Russian studies conceptualize the ISR ecosystem not merely as a set of technologies but as an organizational and procedural architecture. This architecture spans multiple operational domains, encompassing the space, air, surface, subsurface, and ground environments.[17]

In this regard, Russian studies portray the primary role of the ISR ecosystem as ensuring and sustaining several interrelated operational functions. First, it is responsible for the prompt and continuous collection of intelligence data across multiple domains. Second, it facilitates the formation of a unified information field that consolidates data from heterogeneous sources into a coherent operational picture. Third, it ensures the timely transmission of processed information to end users, including automated command-and-control systems (ASU), fire assets, and operational headquarters. Finally, it enables effective interaction among diverse systems within a single, integrated network-centric architecture,[18] thereby enhancing coordination, responsiveness, and overall combat effectiveness.[19]

In this regard, it is also important to emphasize that the task of establishing and maintaining a coordinated and fully functioning ISR ecosystem (defined as the Unified Intelligence and Information Space of the Armed Forces), with particular emphasis on the Arctic, has been articulated in at least three Russian strategic documents. First, *Fundamentals of the State Policy of the Russian Federation in the Arctic for the Period up to 2035*, approved in 2020, underscores the importance of information technologies and network-centric structures for ensuring security and sovereignty in the Arctic.[20] Second, the 2022 edition of the *Maritime Doctrine of the Russian Federation* identifies the Arctic as one of the priority areas of naval policy and highlights the need for advanced information support for naval forces operating in the region.[21] Importantly, the *Maritime Doctrine* explicitly emphasizes the need to harmonize information and intelligence systems to ensure effective interaction between the Navy and other branches of the Armed Forces, thereby implying the establishment of a shared and integrated information space. Third, the 2014 *Military Doctrine of the Russian Federation* (with its subsequent amendments) defines the information space as a component of strategic security.[22]

Tracing the evolution of Russia's military-strategic thought and analytical focus on the Arctic-specific ISR ecosystem, one can identify at least one notable trend. Earlier analyses (2012–2021) primarily concentrated on the need to develop a unified situational awareness system in the Arctic, incorporating space-based, surface, and aviation components.[23] After 2022, the analytical focus shifted more explicitly toward ensuring the resilience of systems to external interference (for example, electronic warfare and radio-electronic suppression), increasing the autonomy of individual nodes, strengthening the protection and security of communication channels, and accelerating the development of domestic solutions in the field of artificial intelligence, including their integration into the broader joint ISR ecosystem.[24]

Based on a variety of Russian language sources, it is possible to ascertain several key components of the Arctic-related ISR ecosystem, namely space (*kosmos*), the air "layer" and uncrewed aerial vehicles (UAVs), ground-based and coastal reconnaissance assets, and the maritime and subsurface "layers." The following section of this report provides a comprehensive and policy-oriented assessment of each of these segments, examining their structural characteristics, operational functions, and strategic relevance within the broader ISR architecture. Particular attention is devoted to the role of AI in Russia's evolving ISR ecosystem, which is addressed in a separate analytical subsection in order to evaluate its technological trajectory, doctrinal implications, and potential impact on future force development.

War and Recalibration: A Detailed Analysis of Russia's Arctic ISR Ecosystem and Evolving Priorities

The Forced Modernization and Evolution of Priorities

Following the outbreak of large-scale hostilities in Ukraine and the initial setbacks experienced by Russian forces – stemming in part, as noted earlier, from data- and technology-related deficiencies – Moscow moved to reinforce its regional posture in the Arctic theatre. This effort has centred on the development of a multi-layered ISR ecosystem, in which sensor fusion and the resilience of data transmission and processing in extreme environments constitute critical enabling factors. Against this backdrop, the traditional notion of "geography as a shield" is increasingly giving way to a model of strategic depth defined by data superiority. In practical terms, the side that can spot activity first, interpret it correctly, and pass that information through its command networks without delay gains a decisive edge. Importantly, this shift is not merely conceptual. Rather, it is now explicitly embedded in Russia's policy guidelines calling for the development of a unified information and communications infrastructure for maritime activity, representing an institutional acknowledgment that future Arctic advantage will depend less on physical/geographic remoteness and more on dominance within integrated information environments.[25] A systematic analysis of Russian-language official documents, doctrinal texts, and expert publications demonstrates that Moscow's Arctic and High North–oriented initiatives form part of a broader strategy of great power competition. These measures reflect a deliberate technological realignment centred on the accelerated integration of advanced and AI-enabled systems. The objective is not simply to narrow the capability gap with Western actors but rather to reconfigure the regional balance of power by securing enduring advantages in ISR, decision-making speed, and integrated C2 architecture. Seen from this perspective, Russia's technological upgrades in the Arctic are not merely defensive improvements but part of a broader effort to compete for long-term strategic advantage. This thesis is supported by Russian sources that indicate Moscow's pivot toward building a multi-layered and multi-domain ISR architecture, reflected in the development and ongoing modernization of an integrated infrastructure for monitoring the air, surface, and (sub)sea domains.[26]

The Space Dimension

After 2022, the space component has evolved into one of the key pillars of Russia's Arctic-related ISR ecosystem, becoming increasingly visible at both the doctrinal-strategic and analytical policy-making levels. This "upper tier" of the emerging ISR ecosystem ensures the continuity of observation, the resilient connectivity of command-and-control loops, and navigational support in areas where ground infrastructure is sparse and the radio environment is complex. The above-mentioned Russian strategic documents formally establish the Arctic as a priority and emphasize the role of the information domain and network-centric structures in ensuring security and sovereignty. In practical terms, this means that without the orbital layer, it is impossible to sustain a resilient "single information contour" for joint (inter-service) operations in the North, especially amid the growing intensity of military-political competition.

Building and expanding capabilities in the space-related domain in the Arctic equips the ISR ecosystem with several critical competitive advantages. First, it enhances all-weather situational awareness. High-latitude environments demand sensor suites capable of operating independently of cloud cover and illumination constraints, as well as orbital regimes optimized for persistent polar coverage. Russia's Arktika-M system – deployed in highly elliptical orbits (HEOs) – was specifically engineered to enable the quasi-continuous monitoring of northern territories and the Arctic Ocean basin. Although formally designated as a hydrometeorological constellation, Arktika-M carries clear strategic utility for Arctic defence management. By reducing environmental uncertainty – particularly regarding meteorological dynamics, ice conditions, and storm windows – the system enhances operational tempo, improves the safety of manoeuvres, and supports more resilient C2 in high-latitude theatres.[27] Enhancing space-related Arctic capabilities moreover allows for beyond-line-of-sight (BLOS) connectivity as a key enabler of network-centric operations. The Arctic is characterized by persistent radio communication constraints, unstable coverage geometry, and polar ionospheric disturbances that degrade conventional channels.[28] In this environment, satellite communications and relay capabilities cease to be optional enablers and instead become foundational conditions for command and control over geographically dispersed forces. Russian efforts in this domain include operational and evolving satellite communication and personal data transmission systems such as Gonets, as well as the strategic shift toward HEO communications architectures tailored for polar latitudes, notably the Express-RB system.[29] The latter is explicitly positioned as a solution for ensuring resilient, high-latitude connectivity, compensating for the coverage limitations of conventional geostationary systems in Arctic regions. From a politico-strategic perspective, these initiatives represent an effort to close the "polar communications gap" – one of the most significant operational vulnerabilities in high latitudes. By mitigating connectivity discontinuities, Russia seeks to enhance distributed force coordination, maintain decision-making continuity, and strengthen the reliability of network-enabled operations under Arctic conditions.[30]

Finally, space capabilities in the Arctic have the crucial advantage of facilitating navigation and synchronization (GLONASS and functional augmentation). In the Arctic, navigational resilience is defined not only by accuracy but also by signal integrity and trustworthiness for naval forces, aviation, and uncrewed platforms. Publications by the system operator and infrastructure institutions regarding global navigation satellite system (GNSS) functional augmentation[31] indicate a clear strategic direction toward improving the accuracy and reliability of the national navigation field.

Over the period 2023–2025 – coinciding with significant shifts in the trajectory of the Russo-Ukrainian armed conflict and Moscow's intensified emphasis on "sovereignty" – the concept of "sovereignty" assumed a markedly greater prominence in Russian official discourse. Although the sovereignty narrative had circulated well before 2022 across the socio-economic, technological, and political domains, its usage expanded exponentially following the launch of the full-scale war. This amplification was driven primarily by the ruling elite's heightened preoccupation with security vulnerabilities and information breaches, extending beyond the conventional military and cyber spheres into strategic sectors such as space infrastructure.[32] In this context, "sovereignty" increasingly functioned not merely as a political slogan but also as a framework for consolidating control over critical systems – communications, navigation, data flows, and orbital assets – perceived as essential to regime resilience and strategic autonomy under conditions of protracted confrontation. Beginning in 2022, Russian policy-makers and industry actors increasingly advanced the notion of "sovereign space" (*suverennyi kosmos*). In practical terms, this concept translated into a strategic drive to sharply reduce reliance on foreign components within the domestic space industry and to accelerate the development and production of indigenously manufactured communications and navigation systems. The emphasis on import substitution and technological autonomy reflected broader concerns over supply chain vulnerabilities, sanctions exposure, and strategic dependence. Within this framework, sovereignty in space became synonymous with securing national control over satellite communications, navigation infrastructure, and related critical technologies deemed essential for both civilian governance and defence applications.[33]

While official Russian documents do not explicitly designate outer space as a prospective (or intended) theatre of hostilities, nor directly link Arctic policy to the militarization or weaponization of space (as reflected in the 2023 *Concept of the Foreign Policy of the Russian Federation*), external assessments present a more securitized interpretation.[34] Western think tanks and analytical platforms emphasize that Russia (alongside China) has been expanding its presence and coordination in both the Arctic and space domains, including through initiatives with clear military-strategic and dual-use dimensions. In these analyses, Arctic infrastructure development, satellite communications, navigation resilience, and orbital capabilities are viewed not merely as civilian or economic undertakings but also as components of an integrated strategic posture aimed at enhancing power projection, situational awareness, and operational endurance in high-latitude theatres. Thus, while Moscow's official narrative frames its activities primarily in terms of sovereignty, development, and security, external observers increasingly interpret the convergence of Arctic and space initiatives as part of a broader trend toward systemic competition in strategically sensitive domains.

The Air "Layer"

The air – distinct for the rapid integration of various types of UAVs – is quickly becoming Russia's overall state-indicated strategic priority, both in the Arctic and elsewhere.[35] One important feature distinguishing Russia's approach to UAV employment in the Arctic from its use in other operational theatres (most notably Ukraine) is the functional prioritization assigned to these systems. In Arctic-related planning, UAVs are currently tasked predominantly with surveillance and reconnaissance missions rather than strike operations. This reflects the specific operational logic of the high-latitude environment: vast distances, sparse infrastructure, extreme weather conditions, and limited persistent human presence elevate the value of wide-area monitoring, maritime domain awareness, ice reconnaissance, and infrastructure inspection. In this context, UAVs serve primarily as force multipliers for situational awareness, border monitoring, and early warning, supporting command decisions rather than delivering kinetic effects.[36] This means that within Russia's Arctic ISR framework, UAVs are valued less as strike assets and more as instruments of continuous situational discipline and recognisance. Their functions include monitoring the NSR, overseeing designated operational zones, confirming contacts, providing communications relay, and observing coastal infrastructure. This configuration acquires particular strategic relevance when viewed alongside plans to develop a unified maritime information infrastructure and integrated surface and subsurface domain awareness systems, as reflected in Russia's doctrinal and policy frameworks.

Drawing on the experience of the Russo-Ukrainian armed conflict – which, as noted by former Commander-in-Chief of the Ukrainian Armed Forces Valerii Zaluzhnyi, has effectively eroded the element of operational surprise due to the widespread use of UAVs[37] – it can be argued that Russia's expanding integration of UAVs is intended to increase the frequency of confirmation and the speed of target refinement. As sensor density grows, the temporal window in which NATO subsurface and surface manoeuvres can remain in a "grey zone of uncertainty" correspondingly narrows. In strategic terms, this shift reinforces a transition toward persistent, near-continuous domain awareness in the Arctic, reducing ambiguity and complicating adversary efforts to exploit environmental vastness for concealment or manoeuvre advantage. Incidentally, in 2026, it was reported that UAVs will become an integral part of Russia's strategy aimed at the development of the NSR and the strengthening of Russia's posture in the Arctic in general.[38] Below is a table summarizing the types of aerial UAVs that Russia is using or has tested in the Arctic region.

Table 1: The Aerial UAVs Russia Is Using or Has Tested in the Arctic

Type	Technical Characteristics
Orlan-10[39]	Trials in northern frost conditions (Yamalo-Nenets Autonomous Okrug); use in the interests of the Navy/Northern Fleet for reconnaissance and target designation. Endurance of up to 16 hours (in some reports – up to 10 hours in specific missions), range of up to 120 kilometres (km) (greater with relay), speed of 90–150 km/hour, and payload of up to 5 kilograms (kg). Its Arctic applications include Arctic reconnaissance and surveillance (monitoring coastlines, sea ice conditions, and remote military installations across northern regions), border and NSR monitoring (supporting the patrol of Arctic shipping lanes and strategic infrastructure), cold-weather ISR support (providing ISR for troops operating in extreme sub-zero environments), and search-and-rescue and environmental monitoring (assisting in locating personnel and assessing environmental conditions in remote Arctic terrain).
Forpost-R[40]	Considered for patrol/surveillance along the NSR (in the context of deploying a network of bases). Takeoff weight of around 500 kg, endurance of up to 18 hours, altitude of up to 6,000 metres (m), and an upgraded radio link. It should be noted that although the Forpost-R's capabilities are limited, it is also able to perform certain types of military missions, including carrying guided munitions and light strike payloads such as small bombs or missiles like those of the KAB-20 family.[41] Its Arctic applications include supporting the monitoring of remote northern territories, coastal zones, and naval assets in harsh weather conditions.

Inokhodets[42]	Mentioned in the context of Northern Sea Route missions. Wingspan of 16 m, payload of up to 200 kg, endurance greater than or equal to 24 hours, ceiling of up to 7,500 m, and an anti-icing system for northern latitudes. Critically, this type of UAV could be configured for armed roles, carrying precision-guided munitions and small guided weapons, giving it dual ISR and strike capabilities. It provides targeting data, communications relay, and situational awareness for units operating in extreme cold environments.[43]
ZALA 421-16E (Arctic)[44]	Positioned for Arctic operations. Functions include the monitoring of maritime areas and navigation safety. Equipped with an automatic identification system or AIS (enabling vessel identification up to around 100 km), it has the option of alternative navigation for operation in the absence or suppression of GPS/GLONASS and is designed for operation at low temperatures. The Arctic-oriented configuration emphasizes cold-resistant components and battery systems, improved reliability in low-temperature and high-wind environments, enhanced communication stability in remote areas, and suitability for maritime and coastal monitoring missions.
Supercam S350[45]	Arctic trials/operations (Barneo-2017 expedition) have emphasized its utility in ice survey (at distances greater than 500 km), live photo/video transmission, and thermal imaging. Boasts an AZN-V module. The S350 is primarily configured for ISR, artillery spotting and fire adjustment, border and perimeter monitoring, infrastructure inspection and environmental mapping, and communications relay in remote areas.
Eleron-3[46]	Used in the Arctic expedition "North Pole-38." Has a demonstrated utility for inspecting ice conditions within a radius of around 15 km. In Arctic or sub-Arctic environments, the Eleron-3 would likely be used for localized infrastructure monitoring, short-range border observation, and support to ground patrols in remote terrain.
Takhion[47]	Trials with the Northern Fleet (Kola Peninsula) demonstrated its functions for reconnaissance and the detection of small/low-visibility objects. Takeoff weight of around 7 kg, altitude of up to 4,000 m, range of up to 40 km, endurance of up to 120 minutes, and operating temperature range of between −30 and 40°C. In Arctic planning, its role aligns with localized monitoring and early warning tasks rather than offensive power projection.
Kangaroo[48]	The "Kangaroo" will deliver small uncrewed aerial vehicles to their destination, where an operator will take control to carry out assigned tasks. Such systems can be used, for example, for patrolling forest areas or for Arctic exploration. Its tracked configuration enables movement over snow, ice, and rough Arctic landscapes.

Interestingly, despite repeated doctrinal assertions about the exponential expansion of AI in UAVs, Russian open sources provide little direct evidence of the integration of AI into the UAV categories discussed in the above table. References to autonomy, navigation resilience, or upgraded data links are common; however, explicit confirmation of advanced onboard AI-enabled decision making, adaptive targeting, or fully autonomous mission execution remains notably absent. The contrast between ambitious rhetoric and limited public evidence may reflect intentional secrecy, or it may simply demonstrate a slower and more incremental rollout of AI capabilities than official statements imply. At the same time, it is critical to highlight that unlike many Western UAV platforms, whose Arctic or high-intensity combat credentials remain largely developmental, several Russian systems of this class have undergone extensive real-time battlefield testing. Operational use under contested electronic warfare (EW) conditions and in harsh climatic environments has likely accelerated iterative modifications, particularly in communications resilience, payload integration, and environmental hardening. This operational feedback loop constitutes a distinguishing feature of Russia's UAV development trajectory.

Concurrently, Russia appears to be prioritizing the development of Arctic-optimized uncrewed systems conceived not merely as individual reconnaissance assets but also as delivery platforms within a broader operational architecture. These platforms are designed to transport smaller drones or mission modules to remote or logistically constrained areas – particularly across the Arctic and the NSR – where operators can subsequently deploy them for surveillance, patrol, or infrastructure support missions. This suggests a move away from relying on single-purpose drones toward building flexible systems in which different uncrewed platforms support each other across Arctic missions. Additionally, it should be noted that despite the fact that Russia's UAV-related Arctic capabilities are primarily related to surveillance and reconnaissance-building capabilities, the experience of the Russo-Ukrainian armed conflict has – as shown above – led to Russia repositioning some of its UAVs, which were previously used only for civilian missions, to perform combat and paramilitary missions. This reallocation could drastically strengthen Russia's ISR ecosystem, as well as equipping Russia with yet another competitive advantage in the unravelling scramble for the Arctic. Consequently, it should be noted that Russia's increasing integration of aerial UAVs in the Arctic operational theatre contributes to the establishment of what Russian sources define as "*Sistema osveshcheniya nadvodnoy obstanovki (SONO) / sistema kompleksnogo kontrolya za nadvodnoy obstanovkoy*" (or maritime domain awareness, in Western terminology), enabling Russia to maintain the persistent monitoring and control of Arctic maritime spaces, including the NSR.[49]

Ground-Based and Coastal Reconnaissance Assets

Historically, Russia/the USSR viewed ground-based and coastal reconnaissance assets as the backbone of the country's sensor infrastructure in the Arctic and a critical component of the Unified Intelligence and Information Space. In the high-latitude environment – characterized by limited satellite visibility, a complex electromagnetic spectrum, and an extensive coastline – ground-based radars, radio-technical systems, and electro-optical observation posts provide for continuous monitoring of the air and maritime domains. The Russian Ministry of Defence has repeatedly reported the deployment of next-generation radar systems along its northern frontiers, including the modernization of radio-technical units within the Northern Fleet.[50]

In addition to strategic long-range early warning systems such as the Voronezh-class radars – regarded by the Russian side as a core component of the missile attack early warning architecture, including coverage of the northern vector – Moscow is actively integrating other means of EW, data acquisition, and intelligence gathering into its land-based layer of the ISR ecosystem. By expanding the density and technological sophistication of ground-based assets, Russia is enhancing redundancy, resilience, and domain awareness across the Arctic theatre. These measures are intended to mitigate environmental constraints, compensate for orbital and communications limitations at high latitudes, and ensure persistent situational awareness in both the air and maritime domains.

The table below provides a detailed, facts-based description of the key systems and outlines their main technical characteristics, with particular emphasis on their operational relevance and applicability in Arctic conditions.

Table 2: The Key Russian Ground-Based and Coastal Reconnaissance Systems

Class	System / Family	What It Provides for ISR	Arctic Linkage
Early warning radar (strategic)	"Voronezh"	Early warning for missile directions	Described as an element of Russia's missile attack early warning system (the northern direction context follows from the system's purpose)[51]
Over-the-horizon radars (national level)	"Container"	Over-the-horizon radar (OTHR). Long-range radar illumination at extended distances	An example of a general "over-the-horizon" surveillance architecture; used in discussions about establishing continuous coverage[52]
Arctic-deployed radars (Air Defence / Aerospace Forces)	"Rezonans-N"	Enhanced long-range detection, resistance to jamming	Reported to be on combat duty at "Rezonans-N" in Novaya Zemlya (Arctic)[53]
Coastal over-the-horizon radars (surface-wave type)	"Podsolnukh" (Sunflower)	Coastal over-the-horizon radar. Monitoring of surface and air situations beyond the radar horizon	Deployed in the Arctic region since 2015[54]

Radio-Technical Troops (RTT) network in the Arctic (organizational level)	Units of the Radio-Technical Troops (RTT)	Round-the-clock duty and consolidation of radar information (RLI)	Areas of deployment: archipelagos, Tiksi, Wrangel Island, Cape Schmidt[55]
Long-range surveillance radar (multi-functional)	"Nebo-M"	Long-range radar system. Surveillance of medium/high altitudes, long-range tracking	Ensures airspace control over sections of the NSR[56]
Low-altitude coverage	"Podlyot" / "Podlyot-K1"	Closure of "low-altitude" directions; cruise missiles / small targets	Frequently mentioned as an integral part of Arctic duty operations[57]
Tactical surveillance radar	"Kasta-2-2"	Air situation monitoring	Frequently mentioned as an auxiliary part of Russia's Arctic capabilities[58]
Tactical surveillance radar	"Gamma-S1"	Target monitoring and tracking	Same functions as above
Electronic warfare (EW)	"Murmansk-BN" + "Krasukha" (family) + "Divnomorye"	Electronic warfare cover / monitoring of "chokepoints"	Mentioned as a critical component of the protection of the NSR[59]

In addition to the above-mentioned types of radio-electronic confrontation and intelligence-gathering equipment, there are other far less obvious types of equipment that greatly contribute to Russia's Arctic ISR ecosystem but have almost never been mentioned in Western sources. Namely, the coastal missile systems "Bastion"[60] and "Bal" perform not only strike missions but also reconnaissance functions.[61] They are equipped with their own radar surveillance and targeting systems, enabling them to monitor vast areas of the NSR. Thus, the coastal segment serves a dual purpose: it functions both as a sensor component of the ISR system and as an A2/AD instrument.
Speaking about ground-based and coastal assets that are organically integrated into Russia's Arctic ISR ecosystem, it should be noted that these assets provide Russia with a number of competitive advantages. Namely, they ensure continuity of surveillance, are generally more resilient to harsh climatic conditions, can be directly integrated with strike systems, and reduce reliance on the space-based segment.

Under-Ice Autonomous Systems

The under-ice autonomous domain represents the most strategically consequential layer of Russia's emerging Arctic ISR architecture, and yet, it is the least publicized, primarily due to its still limited application and evolution in the post-2022 period. It is precisely this dimension that is critical to understanding how Moscow seeks to constrain the operational freedom of NATO submarine forces in the High North.

Russia's experimentation with the integration of undersea robotics and autonomous complexes into its Arctic defence architecture dates back to at least 2020, including high-profile platforms such as Vityaz-D, a Russian autonomous uncrewed underwater vehicle (AUV) designed for deep-sea exploration. It was developed by the Rubin Central Design Bureau for Marine Engineering, with support from the Advanced Research Foundation (FPI). The key feature of Vityaz-D is that it is a fully autonomous deep-submergence vehicle capable of diving to extreme ocean depths (up to about 12,000 metres). In May 2020, it successfully reached the bottom of the Mariana Trench, the deepest part of the world's oceans, reaching a depth of over 10,000 metres and conducting mapping, imaging, and environmental measurements.[62] Most likely, Russia's main goal in advancing and strengthening under-ice autonomy is concerned with targeting the informational asymmetry that has historically favoured NATO's undersea forces, aiming to reduce concealment advantages and complicate adversary planning in the subsurface domain.[63]

Despite pre-2022 experimentation, some qualitative shifts – although this is speculative and needs further evidence – may have occurred in 2025, when the team of the Rubin Central Design Bureau was awarded by presidential decree of Vladimir Putin for its substantial contribution to strengthening Russia's defence potential. In a related message, Nikolai Patrushev explicitly emphasized the organization's achievements in the field of autonomous systems, underscoring the direct linkage between this technological direction, state procurement priorities, and its practical military applications. These developments imply that under-ice autonomous systems are no longer just experimental projects but may be becoming a part of Russia's formal defence planning.[64] In this regard, it is critical to note that the implementation of plans related to the establishment of an under-ice autonomous network – even if deployed selectively rather than across the entire Arctic theatre, which does not seem to be realistically achievable at this stage – could significantly reduce the permissive operating space for the covert NATO deployment of multi-purpose submarines.

The accretion of capabilities in advanced seabed mapping and the development of covert infrastructure designed to support anti-submarine warfare (ASW) operations is critical for Russia's ability to conduct precise bathymetric mapping, acoustic characterization of the seabed, and the identification of choke points.[65]

In the final analysis, it is noteworthy that Russian publications tend to conceptualize sea drones primarily as modular platforms defined by a set of technical characteristics capable of carrying various payloads. Such an approach partially removes the need to design separate vehicles for highly specialized missions, potentially increasing the versatility of underwater drones while reducing development and production costs. From a force structure perspective, the introduction and operational employment of uncrewed underwater vehicles (UUVs) is therefore likely to be embedded within the emerging "troops of unmanned systems" that the Russian Ministry of Defence is currently institutionalizing. Russian sources identify several critical tasks to be delegated to UUVs in the near future, including, among others, scientific research, reconnaissance missions, and demining and sapper work. As such, UUVs could become components of a broader, centrally coordinated uncrewed warfare ecosystem in the Arctic and Baltic regions.[66]

From Network Centricity to Resilient Distribution: A Net Assessment of Changes

As demonstrated earlier, both environmental realities and geopolitical pressures have pushed Russia to rethink how it structures its Arctic information systems.[67] In a broader sense, the need to shift away from the "classical" network-centric approach – where emphasis was placed on centralized data-fusion nodes and stable long-range communication channels, including the space segment – can be attributed to two main factors. First, the shift can be ascribed to objective factors primarily driven by climatic-geographic considerations. For instance, the use of geostationary satellite communications is constrained by low elevation angles, while geographic conditions further limit the practical availability of applicable satellite communication systems in the Russian Arctic zone. Second, the need to move from this classical network-centric approach also stems from subjective (perceived) factors translated into Russia's growing preoccupation with external risks, primarily related to foreign economic sanctions (caused by Russia's own behaviour) and the potential for external interference. A combination of those two factors has reinforced concerns about overreliance on externally dependent technological and communication infrastructures. Taken together, these factors encourage the development of terrestrial and coastal "layers" of surveillance and data transmission capable of maintaining situational awareness even in the event of the degradation or denial of external channels.[68]

Therefore, the first major practical shift within the land-based layer of the Arctic ISR ecosystem was reflected in Russia's efforts to integrate previously isolated radar observation nodes – in a way resembling a network of geographically distant "focal points" – and geographically dispersed posts into a unified information field. Russian media and official information outlets, even prior to February 2022, extensively reported on Arctic deployments and the reinforcement of radar capabilities along northern directions, including the areas of Tiksi, Cape Schmidt, and the Arctic archipelagos. These reports also emphasized the establishment of infrastructure designed to ensure round-the-clock duty operations and the continuous monitoring of the airspace.[69]

The second major trend is reflected in the rapid growth of the role of EW and mounting concerns about cyber threats – Russian professional reports underscored multiple structural weaknesses that Russia and the key sectors of its economy faced in this direction[70] – as strategic constraints on ISR operations in the Arctic. Russian publications addressing the northern EW perimeter explicitly refer to the deployment of EW assets along the Northern Sea Route and to the task of "covering chokepoints," which reflects an understanding of the Arctic as a contested electromagnetic domain.[71]

The third notable shift relates to Russia's growing and increasingly comprehensive emphasis (in effect, its obsession) on technological sovereignty. After 2022, the regulatory framework and practical policy measures reinforced the course toward the mandatory use of software from the national registry on significant critical information infrastructure (CII) facilities and toward reducing dependence on foreign platforms. Within the logic of military and state systems, this has implied a restructuring of the foundational digital stack underpinning ISR architecture.[72]

Overall, the Arctic is increasingly serving as a testing ground for how Russia adapts its ISR architecture under pressure.

A Future That Is Already Underway: The Role of AI-Driven Technologies in the Russian Arctic ISR Ecosystem

Russia's strategic official turn – visible both on the doctrinal and practical levels – toward the integration of AI into its defence and military architecture should be viewed as a direct response to the operational lessons that the Russian side has drawn from its post-2022 battlefield experience. The performance of Ukrainian forces, significantly enhanced by Western technological enablers, has exposed critical gaps in Russia's own defence innovation ecosystem, particularly in areas related to AI-enabled decision making, intelligence gathering, processing, and analysis. In response, between 2022 and 2023, Moscow initiated a series of institutional, industrial, and doctrinal adjustments aimed at accelerating reforms across its defence and security architecture. These measures were designed not merely to modernize existing capabilities but also to narrow the capability gap with Western (primarily US) systems and restore strategic parity in emerging military technologies.[73]

In light of its post-2022 operational experience, previous writings on the subject, and the broader technological shifts shaping contemporary warfare, Russian strategists appear to conceptualize artificial intelligence as an important emerging pillar of the Arctic's multi-layered defence and surveillance architecture. Also, one should acknowledge that AI is no longer described as just an auxiliary tool. Instead, Russian strategists increasingly see it as a "glue" that connects different surveillance layers into a coherent system. Within this system, the integration of AI may serve several core objectives.

First, the integration of AI into Russia's defence and surveillance architecture may facilitate data and intelligence collection. At this level, the Russian Arctic ISR ecosystem relies on a distributed network of collection assets, including remote sensing satellites, ground-based radar stations, electronic intelligence (ELINT) systems, crewed aviation and uncrewed patrol platforms, as well as autonomous under-ice vehicles. Together, these assets form a dense, multi-domain sensing grid designed to generate persistent situational awareness across the air, surface, and subsurface environments, particularly along the NSR and around strategically significant Arctic installations.[74] Clearly, the integration of AI would greatly enhance the effective collection of huge volumes of data.

AI may also enhance capabilities in correlation and anomaly detection. At the next stage, collected data is cross-referenced across domains to enable multi-dimensional correlation. This involves the integration of inputs from air, surface, subsurface, space-based, and electronic surveillance assets as a means to identify inconsistencies, detect anomalies, and conduct the preliminary classification of contacts. AI-enabled tools acquire particular importance at this level, as they filter out noise in high-density sensor environments and generate structured alerts for further verification. In strategic terms, as discussed by Russia's top military leadership (including Admiral Nikolai Evmenov[75]), this layer compresses the uncertainty window and transforms dispersed observations into actionable patterns within the broader Arctic battlespace.[76]

Moreover, AI, when incorporated into the Russian surveillance and defence architecture, may assist in interpretation and threat assessment. On this level, data – through the use of AI-enabled analytical tools – is transformed into probabilistic threat evaluations that in turn are further broken down on targets and ranked according to operational priority, enabling decision makers to allocate attention and resources efficiently.[77] Strategically, this layer shifts the system from reactive monitoring to anticipatory positioning, allowing Russian forces to pre-empt or shape adversary actions in the Arctic theatre rather than merely respond to them.

In this configuration, the use of AI plays a particularly important role in the second and third stages, where the transition occurs from "raw data" to operationally meaningful information. In the previously referenced article by Admiral Evmenov, it is emphasized that a modern system for surface and subsurface domain awareness must ensure the continuity and integration of data flows – an objective that inherently presupposes automated analysis and elements of AI processing.

Under these conditions, the Western alliance is facing two distinct categories of challenges in the Arctic in its strategic interaction with Russia. The first challenge is the structural constraints of the Arctic operating environment. The Arctic milieu (challenging from a geographic-environmental perspective) imposes distinctive operational burdens that have been mentioned previously in this report. The presence of these factors necessitate costly modernization cycles and extended deployment timelines. In systemic terms, high capital intensity and long force-generation horizons can place Western countries at a relative disadvantage in sustained competition in the Arctic, particularly when facing an actor that has geographically proximate infrastructure and a centralized mobilization model tailored to the region. Moreover, as the course of the Russo-Ukrainian war has clearly demonstrated, Russia has the ability to rapidly scale up the production of critically important materials and components in the short term and at lower cost.[78] Although this argument does not have a direct Arctic application, it nevertheless warrants close consideration.

The second challenge the West is experiencing when interacting with Russia in the Arctic is institutional compartmentalization and the growing intra-alliance frictions. Russia's approach to the Arctic and the Far East is much more centralized and coherent when compared to the West's. Established in 2012 as the Ministry for the Development of the Russian Far East (and renamed to the Ministry for the Development of the Russian Far East and Arctic), *Minvostokrazvitiya* functions as the federal government's primary institutional coordinator for implementing Russia's Arctic strategy and translating high-level strategic priorities into concrete investment regimes, infrastructure projects, and preferential economic zones. In practice, it serves as the policy integrator that aligns Arctic development goals – such as resource extraction, transport corridor expansion (including the NSR), and demographic stabilization – with federal funding instruments and regulatory incentives. This means that Russia's Arctic strategy is much more coordinated and centralized when compared to that of its Western counterparts. Undoubtedly, Russia will be willing to earmark significant funding for Arctic-related strategic projects that boost Russia's regional foothold. As a result, much of the previous progress in drafting a joint Arctic agenda could face a potential pullback. Specifically, despite official statements from Canada and Finland pledging to continue cooperation with the United States under the Icebreaker Collaboration Effort (ICE) Pact,[79] growing uncertainty persists among Washington's Canadian and European partners regarding the credibility of US commitments amid the ongoing shifts in American foreign and economic policy. Should disagreements within the Western camp deepen, their collective ability to effectively confront Russia – let alone a potential Sino-Russian alignment in the Arctic, which for now is not the case – would be significantly constrained.

Thus, the combination of the above-mentioned factors, Russia's current dominance in the logistical, resource, and infrastructural dimensions of Arctic development,[80] and its increasing emphasis on technological modernization could place Moscow – at least under present conditions – in a relatively more favourable position in the region vis-à-vis Western powers, which prioritize investments in other regions.

Conclusion

The evolution of Russia's Arctic ISR architecture, as demonstrated throughout this report, illustrates that the Arctic and High North is no longer a peripheral theatre insulated by geography and climate. This means that the Arctic region is no longer a remote periphery. Rather, it is increasingly becoming a space where information, connectivity, and autonomous systems (will likely) shape strategic outcomes. Russia's shift from a classical network-centric model toward a distributed, redundancy-based, and sovereignty-driven ISR ecosystem reflects not only adaptation to environmental constraints but also a deliberate attempt to secure structural advantages in detection speed, decision-making compression, and cross-domain integration. In this sense, Moscow's Arctic posture is less about symbolic militarization and more about embedding long-term competitive asymmetries into the region's digital and electromagnetic fabric. While many of these modernization trajectories were initiated well before 2022 – including the expansion of radar coverage, satellite investments, UAV experimentation, and doctrinal emphasis on a unified information space – the Russo-Ukrainian armed conflict has significantly accelerated and operationalized them. Battlefield lessons regarding data latency, EW vulnerability, and the decisive role of UAVs appear to have catalyzed a shift toward greater redundancy, hardened communications, AI-assisted data processing, and distributed autonomy. Russia's key achievements therefore lie not only in expanding the physical density of sensors – space-based, coastal, airborne, and subsurface – but also in improving their integration into a more resilient, sovereignty-oriented architecture designed to function under sanctions pressure and contested electromagnetic conditions. In the near future, two vital trends in Russia's Arctic-related ISR ecosystem (which are, to an extent, interrelated) should be monitored: first, the further integration of AI into the existing ecosystem, which could result in Russia's growing operational capabilities in the region; and second, given Russia's own gruesome experience with sea drones – Ukraine has been actively (and very effectively) using this type of weapon since the second half of 2022 – the likeliness that Russia will start more actively experimenting with the deployment of these weapons in the Arctic.

At the same time, Arctic competition will not be shaped by Russia alone. Internal frictions within the Western alliance, combined with high modernization costs and institutional fragmentation, risk slowing collective adaptation. Similarly, China's growing Arctic engagement introduces an additional variable. Despite the fact that Beijing currently emphasizes scientific research, infrastructure investment, and commercial shipping, its expanding satellite capabilities and dual-use digital technologies could, over time, intersect with Russian initiatives. Whether this develops into deeper technological alignment remains uncertain (and, perhaps, contestable), but even limited coordination in areas such as satellite services or maritime infrastructure could alter the regional balance. Looking ahead, the central policy challenge is not simply how to respond to Russia's ISR modernization but how to prevent the emergence of parallel technological ecosystems in the Arctic. Going forward, future research should examine the interaction between Russian resilience efforts, Chinese digital expansion, and Western alliance coordination. Ultimately, influence in the Arctic is likely to depend less on the number of icebreakers deployed (although their importance is undisputable) and more on whose sensing networks, satellite constellations, and data-processing systems shape visibility, attribution, and control in the High North.

Notes

[1] Arctic Monitoring and Assessment Programme (AMAP), *Arctic Climate Change Update 2024: Key Trends and Impacts. Summary for Policy-Makers* (2024), https://unfccc.int/sites/default/files/resource/Arctic-Climate-Change-Update-2024-Key-Trends-and-Impacts.-Summary-for-Policy-makers..pdf.
[2] Rather than explicitly calling it A2/AD, Russian writings describe this phenomenon as a multi-layered defensive perimeter combining coastal missile systems, long-range aviation, air defence, electronic warfare, and maritime forces. Given the lack of a better term, the Western concept is used in this paper.
[3] Mathieu Boulègue, "The Militarization of Russian Polar Politics: The European Arctic, the Kola Bastion and the High North," Chatham House, June 6, 2022, https://www.chathamhouse.org/2022/06/militarization-russian-polar-politics/02-european-arctic-kola-bastion-and-high-north.
[4] US Department of Defense, *2024 Department of Defense Arctic Strategy* (2024).
[5] Intergovernmental Panel on Climate Change (IPCC), "Regional Fact Sheet – Polar Regions," IPCC, 2021, https://www.ipcc.ch/report/ar6/wg1/downloads/factsheets/IPCC_AR6_WGI_Regional_Fact_Sheet_Polar_regions.pdf; Shuying Wang et al., "Projected Navigability of Arctic Shipping Routes Based on Climate Model FIO-ESM v2.1," *Anthropocene* 47 (September 2024), https://www.sciencedirect.com/science/article/pii/S2213305424000225.
[6] Sergey Sukhankin, "Russia Prioritizes Icebreakers in Scramble for Arctic (Part One)," *Eurasia Daily Monitor* 21, no. 172 (November 25, 2024), https://jamestown.org/russia-prioritizes-icebreakers-in-scramble-for-arctic-part-one/.
[7] For more information, see European Space Agency (ESA), "Introducing the Sentinel-1 Mission," ESA, n.d., https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-1/Introducing_Sentinel-1; Natural Resources Canada, "RADARSAT Constellation Mission," Government of Canada, last modified January 13, 2025, https://natural-resources.canada.ca/science-data/science-research/research-centres/radarsat-constellation-mission.
[8] Douglas Barrie et al., *Northern Europe, the Arctic and the Baltic: The ISR Gap* (London: The International Institute for Strategic Studies, December 2022), https://www.iiss.org/globalassets/media-library---content--migration/files/research-papers/2022/12/northern-europe-the-arctic-the-baltic-the-isr-gap-report_iiss-2.pdf.
[9] James Johnson, "Inadvertent Escalation in the Age of Intelligence Machines: A New Model for Nuclear Risk in the Digital Age," *European Journal of International Security* 7, no. 3 (August 2022), https://www.cambridge.org/core/journals/european-journal-of-international-security/article/inadvertent-escalation-in-the-age-of-intelligence-machines-a-new-model-for-nuclear-risk-in-the-digital-age/D1F1FC47D12FA4DCB12D1648412B696B.
[10] Florian Vidal, "Russia in the Arctic: The End of Illusions and the Emergence of Strategic Realignments," *Russia.Eurasie.Visions* (IFRI Papers), no. 135 (August 2024), https://www.ifri.org/en/papers/russia-arctic-end-illusions-and-emergence-strategic-realignments.
[11] Pavel K. Baev, "Russia's Ambivalent Status-Quo/Revisionist Policies in the Arctic," *Arctic Review on Law and Politics* 9 (2018), https://www.jstor.org/stable/48710574?seq=1.
[12] Nicholas Glesby, "Canada's Arctic Over-the-Horizon Radar: Early-Warning for the Defence of North America?," North American and Arctic Defence and Security Network *Policy Primer*, December 17, 2025, https://www.naadsn.ca/wp-content/uploads/2025/12/25-dec-Canadas-Arctic-Over-the-Horizon-Radar-Policy_Primer-NG-Final.pdf.
[13] NATO, *NATO Integrated Air and Missile Defence Policy* (February 13, 2025), https://www.nato.int/en/about-us/official-texts-and-resources/official-texts/2025/02/13/nato-integrated-air-and-missile-defence-policy.
[14] To avoid confusion, the term ISR will be used in this analysis as a replacement for Russian concepts.

[15] Vasily Ivanov, Mikhail Gudkov, and Valentin Lukyanchik, "Yedinoye informatsionnoye prostranstvo VS RF," *Voyennaya mysl'*, no. 5 (2023), https://cyberleninka.ru/article/n/edinoe-informatsionnoe-prostranstvo-vooruzhennyh-sil-rossiyskoy-federatsii-osnova-informatsionnogo-obespecheniya-voysk-v.
[16] Sergey Sukhankin, "The 'Fourth Battle' for the Arctic: Russia's Capabilities, Strategic Thinking, and Game Plan," Canadian Maritime Security Network *Reports*, March 2025, https://76af1b57-9a2d-4a3b-b4b5-38e252782728.filesusr.com/ugd/e9367f_eb389257c41244edbb0c5846439e26ec.pdf.
[17] A.V. Raskin and V.S. Pelyak, "Setetsentricheskaya voyna — voyna informatsionnoy tsivilizatsii," *Voyennaya mysl'*, accessed via CyberLeninka, https://cyberleninka.ru/article/n/setetsentricheskaya-voyna-voyna-informatsionnoy-tsivilizatsii.
[18] N.N. Tyutyunnikov, comp., Voyennaya mysl' v terminakh i opredeleniyakh: v 3 t. Vol. 3, Informatizatsiya Vooruzhennykh Sil (Moscow: Izdatel'stvo "Pero," 2018).
[19] V. Litvinenko, "Perspektivy primeneniia artilleriiskikh sredstv razvedki v edinom razvedyvatel'nom informatsionnom prostranstve," Armeiskii sbornik, April 27, 2018, https://milportal.ru/perspektivy-primeneniya-artillerijskih-sredstv-razvedki-v-edinom-razvedyvatelnom-informatsionnom-prostranstve/.
[20] Security Council of the Russian Federation, *Strategiya razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2035 goda* (Moscow: Security Council of the Russian Federation, 2020), accessed February 2026, http://www.scrf.gov.ru/security/economic/Arctic2035/.
[21] MID Rossii (Ministerstvo inostrannykh del Rossiyskoy Federatsii), *Kontseptsiya vneshney politiki Rossiyskoy Federatsii* (Moscow: Ministerstvo inostrannykh del Rossiyskoy Federatsii, March 31, 2023), https://www.mid.ru/ru/foreign_policy/official_documents/1860586/.
[22] Security Council of the Russian Federation, *Voennaya doktrina Rossiyskoy Federatsii* [*Military Doctrine of the Russian Federation*] (Moscow: Security Council of the Russian Federation, December 25, 2014), http://www.scrf.gov.ru/security/military/document129/.
[23] RIA Novosti, "Rossiya do 2025 goda sozdaet kompleksnuyu sistemu kontrolya Arktiki" [Russia Will Create a Comprehensive Arctic Monitoring System by 2025], RIA.ru, August 7, 2015, https://ria.ru/20150807/1169094511.html.
[24] RIA Novosti, "Rossiya planiruet povsemestno vnedryat' II v sistemy vooruzheniya" [Russia Plans to Implement AI in Weapon Systems Everywhere], TASS.ru, December 26, 2025, https://tass.ru/armiya-i-opk/26028313.
[25] Ministry of Foreign Affairs of the Russian Federation, *Morskaya doktrina Rossiyskoy Federatsii* [*Marine Doctrine of the Russian Federation*], approved by Presidential Decree, July 31, 2022 (Moscow: Ministry of Foreign Affairs of the Russian Federation), https://www.mid.ru/ru/foreign_policy/official_documents/1688734/.
[26] RIA Novosti, "Severny flot prodolzhit uluchshat' osveshchenie vozdushnoy, nadvodnoy i podvodnoy obstanovki v Arktike" [The Northern Fleet Will Continue Improving Air, Surface, and Subsurface Situational Awareness in the Arctic], RIA Novosti, June 1, 2023, https://ria.ru/20230601/flot-1875432763.html.
[27] RIA Novosti, "Roscosmos otlozhil zapusk vtorogo meteorologicheskogo sputnika 'Arktika-M'" [Roscosmos Postponed the Launch of the Second Meteorological Satellite 'Arktika-M'], RIA Novosti, August 4, 2019, https://ria.ru/20190804/1557149297.html.
[28] Igor A. Kuleshov, Sergey A. Solozobov, and Shevchenko V. Vasilyevich, "Problemy radiosviazi v Arktike," CyberLeninka, 2018, https://cyberleninka.ru/article/n/problemy-radiosvyazi-v-arktike.
[29] TASS, "Zapusk sputnikov 'Ekspress-RV' dlya upravleniia BPLA v Arktike planiruetsia v 2026 godu," TASS, June 9, 2025, https://tass.ru/kosmos/24176453.
[30] Jonas Vidhammer Berge and Max Bergmann, "Addressing Arctic Vulnerabilities: Lessons from Ukraine," Center for Strategic and International Studies (CSIS), December 17, 2024, https://www.csis.org/analysis/addressing-arctic-vulnerabilities.
[31] "Sistemy funktsional'nykh dopolneniy GNSS," GLONASS-IAC, accessed February 17, 2026, https://glonass-iac.ru/guide/function_dop.php.
[32] Anna Shvetsova, "Ledovoe poboishche. 'Roskosmos' predlozhil sozdati setevogo operatora v Arktike, chem zan iat i 'Rosatom,'" ComNews, December 13, 2024,

https://www.comnews.ru/content/236834/2024-12-13/2024-w50/1007/ledovoe-poboische-roskosmos-predlozhil-sozdat-setevogo-operatora-arktike-chem-zanyat-i-rosatom.

[33] TASS, "Gendirektor ISS Reshetnyeva: my razrabatyvaem pyat' sputnikovykh gruppirovok dlia 'Sfera,'" TASS, November 11, 2022, https://tass.ru/interviews/16292261.

[34] Ministerstvo inostrannykh del Rossiyskoy Federatsii, Kontseptsiya vneshney politiki Rossiyskoy Federatsii (utverzhdena Prezidentom Rossiyskoy Federatsii V. V. Putinym 31 marta 2023 g.), https://www.mid.ru/ru/detail-material-page/1860586/.

[35] It is important to remember that, starting in 2024, the development of various types of UAVs has become one of Russia's strategic state-backed priorities: Anton Denisenko, "V Rossii sozdán tsentr proizvodstva bespilotnikov na gosudarstvennyy grant 1 milliard," CNews.ru, June 18, 2024, https://www.cnews.ru/news/top/2024-06-18_v_novosibirske_sozdan_tsentr.

[36] Recent reports and analyses emphasize Russia's testing of unmanned types of drones in the Arctic: Atle Staalesen, "Moscow Says It Will Build Drone Bases Along Arctic Coast," The Barents Observer, April 15, 2024, https://www.thebarentsobserver.com/security/moscow-says-it-will-build-drone-bases-along-arctic-coast/165860.

[37] *Kyiv Post*, "'Protracted War Seems Inevitable' – Key Takeaways from Zaluzhny's Speech (Video)," *Kyiv Post*, October 18, 2024, https://www.kyivpost.com/post/40757.

[38] Anzhelika Stepanova, "Na Severnom morskome puti zapuskaiut eksperiment s bespilotnikami," Sibirnews, December 20, 2025, https://sibirnews.ru/news/2025-12-20-na-severnom-morskom-puti-zapuskayut-eksperiment-s-bespilotnikami/.

[39] Sergei Zabelin, "'Orlan-10': rossiyskiy razvedyvatel'nyy bespilotnyy letatel'nyy apparat s TTX, modifikatsiyami i zadachami," RBC, August 1, 2025, https://www.rbc.ru/base/01/08/2025/6888905a9a79476de7d49e53.

[40] TASS, "Ekspert: rossiyskie bazy BPLA u Sevmorputi nuzhny iz-za eskalatsii v Arktike so storony SShA," TASS, April 12, 2024, https://tass.ru/armiya-i-opk/20524219.

[41] Vasilisa Cherniavtseva, "Razvedyvatel'nyy bespilotnik 'Forpost-R' stal udarnym," NPlus1.ru, August 24, 2021, https://nplus1.ru/news/2021/08/24/forpost.

[42] Sergei Ptichkin, "'Inokhodets' b'et izdaleka i svysoka: istoriia sozdaniia i osnovnye kharakteristiki drona," Rossiiskaia gazeta, September 19, 2024, https://rg.ru/2024/09/19/inohodec-bet-izdaleka-i-svysoka.html.

[43] Kirill Ryabov, "Potential of the Inokhodets UAV," Topwar.ru, September 20, 2024, https://en.topwar.ru/250452-potencial-bpla-inohodec.html.

[44] Rostekh, "'Kalashnikov' predstavil bespilotnik dlia raboty v Arktike," Rostekh, December 7, 2018, https://rostec.ru/media/news/kalashnikov-predstavil-bespilotnik-dlya-raboty-v-arktike/.

[45] Supercam, "Superkam provodit bespilotnuyu razvedku l'din v Arktike," Supercam, accessed February 17, 2026, https://supercam.aero/news/superkam-provodit-bespilotnuyu-razvedku-ldin-v-arktike.

[46] Arseny Valerievich Mitko, "BPLA v usloviiakh arkticheskogo regiona," Neftegaz.RU (journal), July 9, 2019, https://magazine.neftegaz.ru/articles/tsifrovizatsiya/473748-bpla-v-usloviyakh-arkticheskogo-regiona/.

[47] "Na Severnom flote ispytan protivodiversionnyy bespilotnik 'Takhion,'" Voennoe obozrenie (topwar.ru), April 3, 2015, https://topwar.ru/72317-na-severnom-flote-ispytan-protivodiversionnyy-bespilotnik-tahion.html.

[48] Anna Lyubavina, "V Rossii razrabotan bespilotnyy avianosets dlya transportirovki malykh BPLA," CNews.ru, May 14, 2025, https://www.cnews.ru/news/top/2025-05-14_v_rossii_sozdali_dron-avianosets.

[49] Aleksandr Chadnov, "Bespilotnye intellektual'nye aviatsionnye sistemy," Arsenal Otechestva, June 5, 2020, https://arsenal-otechestva.ru/article/1362-bespilotnye-intellektualnye-aviatsionnye-sistemy.

[50] "Arkticheskiy trilistnik i Severnyy klever," Voennyy portal Info.milportal.ru, April 25, 2018, https://info.milportal.ru/arkticheskij-trilistnik-i-severnyj-klever/.

[51] "Russian Defence Ministry soobshchil o shesti udarach po ob'ektam v Ukraine s ispol'zovaniem tochnogo vooruzheniia i BPLA," Interfax, June 27, 2025, https://www.interfax.ru/russia/424531.

[52] Kristina Sizova, "F-22 i F-35: rossiyskaya 'Konteiner' zasekal samolety-'nevidimki' NATO," Gazeta.Ru, December 2, 2020, https://www.gazeta.ru/army/2020/12/02/13383163.shtml.

[53] TASS, "V Arktike prodolzhaetsia razvertivanie radiolokatsionnykh kompleksov 'Rezonans-N,'" TASS, November 20, 2019, https://tass.ru/armiya-i-opk/7158207.
[54] "V Arktike razvernut zagorizontnye RLS poverkhnostnoy volny 'Podsolnukh,'" Interfax, February 17, 2015, https://www.interfax.ru/russia/424531.
[55] Anton Valagin, "V Arktike razvernuta sistema otlova 'nevidimok,'" Rossiiskaia gazeta, December 18, 2017, https://rg.ru/2017/12/18/reg-szfo/v-arktike-razvernuta-sistema-otlova-nevidimok.html.
[56] Valagin, "V Arktike razvernuta sistema otlova 'nevidimok.'"
[57] Valagin, "V Arktike razvernuta sistema otlova 'nevidimok.'"
[58] Valagin, "V Arktike razvernuta sistema otlova 'nevidimok.'"
[59] "Sredstva REB razvernuli vdol' Severnogo morskogo puti," Izvestiya, May 7, 2019, https://iz.ru/875688/2019-05-07/sredstva-reb-razvernuli-vdol-severnogo-morskogo-puti.
[60] Ivan Salo, "Kompleks 'Bastion': kharakteristiki i rol' beregovoy raketnoy sistemy," RBC.ru, November 7, 2025, https://www.rbc.ru/base/07/11/2025/690c8a569a7947617854d592.
[61] "Beregovoy raketnyy kompleks 'Bal': tekhnicheskiye kharakteristiki," RIA Novosti, November 22, 2016, https://ria.ru/20161122/1481896035.html.
[62] Vladimir Baryshev, "Pogruzhenie apparata 'Vityaz-D' na dno Marianskoy vpadiny 8 maya 2020 goda," Science.Mail.ru, May 8, 2025, https://science.mail.ru/articles/1905-pogruzhenie-apparata-vityaz-8-maya-2020/.
[63] Maxim Mayorov, "Bespilotnye tekhnologii v Arktike," GoArctic.ru, July 4, 2020, https://goarctic.ru/kultura/bespilotnye-tekhnologii-v-arktike/.
[64] TASS, "Patrushev vruchil kollektivu CKB 'Rubin' orden Aleksandra Nevskogo," TASS, December 22, 2025, https://tass.ru/obschestvo/25986299.
[65] TASS, "Ekspeditsiya 'Severnyy polyus-42' startuet iz Murmanska 15 sentiabria," TASS, September 12, 2024, https://tass.ru/nauka/21849553.
[66] Maxim Tumbartsev, "Podvodnye drony i ikh primenenie v Arktike i na Baltike," ANNA-News, February 26, 2025, https://anna-news.info/podvodnye-drony-i-ih-primenenie-v-arktike-i-na-baltike/.
[67] V.N. Lukianchik, A.M. Starkov, and V.S. Sarafannikov, "Sistemnye aspekty postroeniia telekommunikatsionnoi seti v vooruzhennykh konfliktakh sovremennosti," Telekommunikatsii i sviaz', no. 1 (2024).
[68] D.A. Kalmykov, "Osobennosti organizatsii sviazi v arkticheskoy zone," CyberLeninka, 2018, https://cyberleninka.ru/article/n/osobennosti-organizatsii-svyazi-v-arkticheskoy-zone.
[69] Anton Lavrov and Anna Cherepanova, "Poliarnyi drug: kak v Arktike uchilis' zashchishchatsia ot bespilotnikov," Izvestiya, June 16, 2021, https://iz.ru/1179073/anton-lavrov-anna-cherepanova/poliarnyi-drug-kak-v-arktike-uchilis-zashchishchatsia-ot-bespilotnikov.
[70] Yana Avezova and Valeriia Besedina, "Aktual'nye kiberugrozy dlia organizatsiy v SNG: H2 2024 — Q3 2025," PT Security (Cyber Analytics), October 30, 2025, https://ptsecurity.com/research/analytics/cis-cyberthreat-landscape-h2-2024-q3-2025/.
[71] "Sredstva REB razvernuli vdol' Severnogo morskogo puti."
[72] Lukianchik, Starkov, and Sarafannikov, "Sistemnye aspekty postroeniia telekommunikatsionnoi seti v vooruzhennykh konfliktakh sovremennosti."
[73] Sergey Sukhankin, "Russia Capitalizes on Development of Artificial Intelligence in Its Military Strategy," *Eurasia Daily Monitor*, March 3, 2025, https://jamestown.org/russia-capitalizes-on-development-of-artificial-intelligence-in-its-military-strategy/.
[74] "Severnyy flot prodolzhit sovershenstvovat' sistemu osveshcheniya obstanovki v Arktike," RIA Novosti, June 1, 2023, https://ria.ru/20230601/flot-1875432763.html.
[75] It is critical to note Evmenov's role and involvement in the Arctic vector of Russia's strategy. Evmenov commanded the Northern Fleet (Russia's key naval formation in the Arctic). Under his leadership, efforts were focused on developing Arctic basing infrastructure, strengthening air defence and coastal defence systems in the High North, and advancing the concept of an "Arctic shield" as part of Russia's strategic deterrence posture.
[76] N.A. Evmenov, "Osnovnye faktory i usloviia razvitiia voenno-morskogo iskusstva," Voennaia mysl', no. 7 (2023), https://cyberleninka.ru/article/n/osnovnye-faktory-i-usloviya-razvitiya-voenno-morskogo-iskusstva.

[77] Vasilii Burenok, "Iskusstvennyi intellekt v voennom dele," *Arsenal Otechestva* 3, no. 53 (2021), published September 22, 2021, https://arsenal-otechestva.ru/article/1503-iskusstvennyj-intellekt-v-voennom-dele.
[78] For more information, see Nordic Defence Review (NDR), "War of Factories: Russia Ramps Up Weapons Production, Europe Falls Behind, RUSI Finds," NDR, April 9, 2025, https://nordicdefencereview.com/war-of-factories-russia-ramps-up-weapons-production-europe-falls-behind-rusi-finds/; Hans Petter Midttun, "Russia's War Is Getting Cheaper. That's the Worst News Europe Has Heard in Years," Euromaidan Press, February 14, 2026, https://euromaidanpress.com/2026/02/14/russias-war-is-getting-cheaper-thats-the-worst-news-europe-has-heard-in-years/#google_vignette.
[79] Malte Humpert, "US, Canada, and Finland Double Down on Joint Icebreaker Effort in DC Meeting," *High North News*, November 21, 2025, https://en.highnorthnews.com/politics/us-canada-and-finland-double-down-on-joint-icebreaker-effort-in-dc-meeting/1094946.
[80] TASS, "Rossiya zakrepliaet svoe strategicheskoe preimushchestvo v Arktike kak logisticheskiy i resursnyy lider," TASS, February 4, 2026, https://tass.ru/politika/26346001.