Russia Facing Problems Developing Arctic Military Communications System

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OE Watch Commentary

The following is an extract from a larger article in the Russian General Staff monthly publication *Voyennaya Mysl*. Although the Russian military has developed communications equipment specifically for Arctic military needs, developing a nationwide system of Arctic communications has some special challenges. Polar orbits, particularly sun-synchronous orbits, are expensive and decay quicker than conventional orbits. Continual thawing and freezing causes soil and permafrost shifts that damage communications infrastructure. Developing the infrastructure to communicate effectively in the Arctic will be expensive and require constant upkeep. (For an article and map of the Arctic fiber-optic cable, see: "Developing Arctic Connectivity," *OE Watch*, July 2019). Nevertheless, this sober Russian analysis is in keeping with their serious focus on Arctic development and will be useful in realizing their objectives.

> "Fiber-optic cable could allow foreign states to create a database of acoustic noise spectrograms of underwater and surface facilities of the Russian Navy. This database will make it possible to identify and track . . . facilities in Russia's territorial waters and in the waters of the world's oceans equipped with fiber-optic lines. . ."

Source: N. A. Ivanov, S. A. Ivanov and G. Yu. Starodubtsev, "Проблема инфотелекоммуникационного развития Арктической зоны России (The Problem of Info-communication Development of Russia's Arctic Zone)," *Voyennaya Mysl* (Russian General Staff monthly) 1 July 2021, pages 88-94. https://vm.ric.mil.ru/upload/site178/pdj6wywh3M.pdf

The strategic importance of the Arctic zone of the Russian Federation (RF) is due to the huge reserves of mineral resources, the efficiency of transport routes, advantages in the military-strategic sphere, and growing claims to the waters from "Arctic" and "non-Arctic" states. IT development of the Arctic zone will speed up the process of assimilation of the region and economic development, and increase the country's defense capability and the status of the Russian Federation on the world stage….

From a technical point of view, the signs of the problem of info-communication development of the Arctic zone of Russia are:

Most communication and automation equipment is not purpose-built for the conditions of the Arctic zone.

The use of artificial Earth satellites placed in geostationary orbit is difficult or even impossible for most of the Arctic zone.

Radio communication, especially using the range up to 30 MHz, is not effective in the Arctic zone due to specific effects affecting the propagation of radio waves.

Copper wire communication will not provide the required throughput, and the construction of ground lines on permafrost reduces their reliability to an unacceptable level.

Laying fiber-optic cable lines across rivers and seas have their own special problems and during the thaw, there is considerable soil movement by soil and permafrost which can destroy fiber-optic cable. In addition, low temperatures significantly affect the quality of the system's optical couplers and connectors.

Power supply to fixed and mobile communications equipment requires the development of Arctic-ready technical solutions.

Melting and shifting soil and permafrost threatens the stability of antenna-feeder devices, mast structures, and grounding devices. Antenna and mast icing can cause their collapse, break feeder cables, and freeze liquids in hydraulic systems.

The lack of a fully-developed navigation system makes it difficult to use radio relay and tropospheric communication lines.

The lack of an extensive road infrastructure and carrying capacity limits the ability to maneuver forces and assets and repair info-communications.

Fiber-optic cables can act as spatially-distributed converters of acoustic or vibration signals. Foreign states many monitor space, water and moving objects using coherent reflectometers with the fiber-optic signals. Coherent reflectometers are rapidly developing; in a short period of time the guaranteed length of the controlled area has increased from 40 to 75 kilometers. Together with self-learning neural networks, reflectometers make it possible to register and later identify objects that generate a vibrational disturbance of the surrounding space. The route of fiber-optic lines laid along the Northern Sea Route pertains to an extended section of the Russian sea area in the Arctic and Pacific Oceans…. Fiber-optic cable could allow foreign states to create a database of acoustic noise spectrograms of underwater and surface facilities of the Russian Navy. This database will make it possible to identify and track …facilities in Russia's territorial waters and in the waters of the world's oceans equipped with fiber-optic lines….

Navigation of ships in a constantly changing environment requires a stable, high-speed information flow for the interaction of services that ensures the safety of navigation, and also increases the efficiency of logistics and the attractiveness of using the Northern Sea Route and the region as a whole. A matrix developed taking into account the existing and planned infrastructure for mining, logistics, navigation, shipping, and so on will make it possible to determine the optimal location of potential centers of information gravity, systematize the placement of large info-communication hubs, and link them with Russia's existing public communication network….