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Agenda Item:C.3

Future Research and Development Satellite Systems

**RUSSIAN PROJECT ARCTICA FOR SPACE MONITORING OF
ARCTIC REGION**

Summary and purpose of the WP

Future Russian multi-purpose space system “Arctica” is intended for meteorology, oceanography, ice cover investigation, disaster monitoring and communication over the Arctic region.

The working paper reports on the system structure, principal characteristics, spacecraft types, onboard instruments and ground receiving and processing station composition.

Action proposed: none.

RUSSIAN PROJECT ARCTICA FOR SPACE MONITORING OF ARCTIC REGION

Two years ago on the 34th CGMS meeting Russian delegation firstly reported about the project of Arctic region monitoring from Molnya high elliptical orbits. At the moment this perspective idea has been enlarged up to a multi-functional and multi-purpose mission called “Arctica”.

This complex space system is being developed not so for meteorology but also for the oceanography, ice cover observation, disaster monitoring and communication tasks. All these purposes, being executed on the large territory of the northern seas near Russia and the appropriate coastal areas, are of great importance for our country because of its high latitude position on the Earth.

The space system structure consists of three sub-systems:

- 1) “Arctica-M” based on two high elliptical satellites for meteorological observation of Arctic region,
- 2) “Arctica-R” consisting of the two satellites located in low near-polar orbits for oceanographic research and monitoring ice cover situation and disasters on the polar seas and coast of Siberia and northern European part of Russia,
- 3) “Arctica-MS” using three high elliptical satellites for large spectrum of communication purposes.

The satellites designed for the 1st sub-system “Arctica-M” are in common identical to the known Russian geostationary “Electro-L” spacecrafts. So the onboard payloads and construction of “Arctica-M” and “Electro-L” satellites are almost the same.

In order to ensure round-the-clock observation of Arctic region the working shifts of the two “Arctica-M” satellites interchange each other. Every shift is about 6.4 hours. The satellite orbital period is 12 hours sharp. That’s why the desired continuous observation of the high latitude segment near the North pole is well provided. To ensure the needed working shift interchanging the ascending node of the 1st “Arctica-M” satellite orbit coincide with the 2nd satellite orbit descending node.

The important feature of the basic spacecraft “Electro-L” is rather large reserve in mass and potential electric power. As a result the future “Arctica-M” spacecrafts will be able to place on their boards some additional scientific instruments for various tasks including international cooperation use.

The project time dates for “Arctica-M” sub-system satellite launching and beginning of exploitation are proposed from 2012 to 2014 years.

The second sub-system “Arctica-R” will consist of two sun-synchronous satellites with the onboard payload devices for remote sensing of ice cover characteristics, sea transport ship and other movable object dislocation, disasters on the shelf and coast, oil pollution, ecological situation and so on. The main observing instrument is going to be a synthetic aperture radar. It will function in several regimes with different combinations of spatial resolution and swath width. The resolution diapason differs from a few meters to several hundred meters. The swath is from 10 to 500 or 700 kilometers.

The third sub-system “Arctica-MS” is proposed to be based on rather big communication satellites. They will have to execute a lot of multi-serviced tasks like direct radio- and TV translation, aero and sea transport control, various data exchange, translating GLONASS and GPS differentiating amendments, multi-purposed movable communication and so on. These satellites are developed to function in high elliptical orbits with 24-hours circulation period.

The ground infrastructure for receiving, processing, storing, exchanging and propagating the space monitoring data from “Arctica-M” and “Arctica-R” subsystems will be based on the three centers submitted to Scientific Research Center “PLANETA”. They are situated near Moscow, Novosibirsk and Khabarovsk. In addition to that an informative-analytical center may be organized in Petersburg on the base of Arctic and Antarctic Scientific Research Institute. This center can process and distribute the space data from “Arctica-R” sub-system in the interest of polar aero and sea transport.

Several local small centers or stations will function on the coastal zone along the Northern Sea Path between the Barents sea and the Bering sea. They can be in Dikson, Tiksi, Pevec and some other places. These stations will receive, process and distribute rather little part of space data from “Arctica-R” satellites: at the resolution not worse than 150 m.

Special ground infrastructure is being developed for “Arctica-MS” communication sub-system.