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Generic Technologies for Nano/Pico Platforms (6B)

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NANOSATELLITES GROUP FOR EARTH ENVIRONMENT OBSERVATION

Abstract

The group of scientists from Bauman Moscow State Technical University (BMSTU) developed and successfully launched two 1.5 U CubeSats Yareelo 1 and Yareelo 2 for space weather monitoring last year. This year it is planned to make a new two.

The nanosatellites Yareelo 3 and 4 have a 3U size. The service systems (power supply systems, VHF radio communications systems, orientation, and stabilization system on magnetic coils, an on-board computer) are modified and upgraded based on the experience of the development and flight tests of the previous satellites.

There are six ICORs sensors (short-wave reflected solar radiation measuring devices) developed by Lebedev Physical Institute of the Russian Academy of Sciences as a payload onboard each satellite. These sensors allow measuring the Earth's albedo. Obtained data make it possible to assess the indicators that affect weather and climate. For example, changes in Earth's surfaces can therefore affect how much of the Sun's energy is absorbed – such as a decrease in snow cover or an increase in the area used for agriculture.

Another feature of the one nanosatellite is a deployable road for orbital orientation due to the gravitational moment. It allows for one sensor (on the bottom panel) always to look towards the Earth. Rod is made of a composite material with non-magnetic properties, and there is a sensor for measurements of the Earth's magnetic field on its end. In this way, exclude the influence of the spacecraft on the measurement results.

A feature of another nanosatellite is an inflatable structure – a ball with a 2 m diameter, designed to demonstrate the technology of deorbiting satellites from orbit by aerobraking maneuver after the end of the active existence period. Using an inflatable ball instead of a propulsion system, taking into account the mass-size and energy limitations of the Cubesat, is a very promising technology in comparison with traditional small-sized propulsion systems.

The Yareelo series spacecraft operated from the BMSTU small spacecraft mission control center. Besides the scientific and applied tasks in the interests of Russian science, the project has an educational goal - to improve the quality of engineering education by involving students in creating real space technology and scientific education.

The launch of the Yareelo 3 and 4 nanosatellites is scheduled under the "Universat" program of the State Corporation Roscosmos in autumn 2021.