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SMALL SATELLITE FOR BIOMEDICAL RESEARCH BASED ON THE “AIST” SMALL
SPACECRAFT PLATFORM

Abstract

The article describes a small satellite “AIST-M” designed to conduct biomedical research under the conditions of microgravity. The satellite was designed in Samara State Aerospace University, Russia in cooperation with Space rocket center “Progress” (SRC-Progress), Russia’s leading organization in the field of space engineering. It is based on the “AIST” small satellite platform for small spacecraft of educational and scientific purpose. On April 19, 2013, at 10:00 UTC the first AIST-type spacecraft was launched on the “Soyuz 2.1A” launcher rocket from the Baikonur Cosmodrome, as a way cargo with “Bion-M” No1 satellite. On December 28, 2013, at 12:30 UTC in the course of the debut launch of the new light launcher “Soyuz 2.1v” developed by SRC-Progress, the second small satellite on the “AIST” platform was put into orbit from the Plesetsk Cosmodrome. The “AIST-M” small spacecraft is developed to study the effects of microgravity on the development and reproduction of living organisms, namely bacteria, on board of a small satellite. Successful testing of small spacecraft platform ”AIST” during two flight experiments allows us to extend the range of the platforms applications by replacing the platform of scientific instruments for research of micrometeorite particles behavior with equipment for medical and biological experiments under low-level on board accelerations conditions. Realization of such an experiment onboard of a small satellite has a number of significant differences compared to conducting this kind of experiments onboard of a big satellite-spacelab like “BION-M”. Among them is inability to return test samples to Earth, which can be compensated with onboard processing of the results that can be sent to the ground station. One of the advantages of the small spacecraft is its considerable life span (up to three years), which can lead to obtaining qualitatively better results from long-term experiments. The article describes the layout of the spacecraft, its energy consumption scheme, purposeful and support systems of the spacecraft. The “AIST-M” small satellite weights 39 kg, or 53 with the adapter. The lifespan of the satellite is not less than three years. The level of microgravity onboard the satellite throughout its whole lifespan is $10e-6 g_0$. The initial orbit parameters are: inclination 64.9; orbital period 96.1 min.; aphelion 583 km; perihelion 569.8 km.