

IAF SPACE SYSTEMS SYMPOSIUM (D1)  
Lessons Learned in Space Systems (7)

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## LESSONS LEARNED OF NANOSATELLITE SAMSAT-ION MISSION: PRELIMINARY RESULTS

**Abstract**

One of the important areas of nanosatellites utilization is the study of geophysical fields. Today there are many implemented and planned missions on this topic in the world. This paper presents the mission of the scientific and educational nanosatellite SamSat-ION developed by Samara University. In the frame of technical program of IAC-74 was implemented report "Mission of SamSat-ION for study of geophysical fields: concept and realization" (session B.2). Current report includes the preliminary results of SamSat-ION mission. The SamSat-ION nanosatellite was launched into sun-synchronous orbit on June 27, 2023 from the Vostochny cosmodrome by the Soyuz-2.1b rocket carrier and taken into operation. The scientific equipment of the nanosatellite consisted of a plasma parameter sensor, a dual-frequency navigation receiver of the GLONASS system and deployable magnetometer. The navigation receiver was intended for measuring of the total electron content of the upper ionosphere. The nanosatellite SamSat-ION had many innovations both technical solutions and original of on-board software architecture. The architecture of the nanosatellite's on-board systems stack allows it to be controlled via a transceiver, even in the event of a complete or partial failure of the on-board computer. The ground station software allows automatically measuring the Doppler frequency shift of the transceiver and correcting the orbital parameters. This is especially important in the first days after launch, when the current TLE orbit files are not known exactly. Information received by the ground station is automatically logged into a database. The report describes the technology for searching for the causes of emergencies that have aroused during the mission. In particular, identifying the reasons for the decrease of energy generation.

Identified drawbacks in the operation of on-board systems were corrected and taken into account when creating a second version of the nanosatellite, which is planned to be launched at the end of May 2024.