

IAF SPACE SYSTEMS SYMPOSIUM (D1)

Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards. (5)

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LABSAT - THE FIRST POLISH SATELLITE TO PROVIDE BIOLOGICAL RESEARCH ON THE LEO

Abstract

Until now, only a few CubeSat biological missions have been successfully conducted. Mainly by NASA's Ames Research Center. The objective is not trivial because it is based on the close collaboration of biomedical, engineering, and legal environments. It requires precise definitions of the test object, the research process, and the expected results. On the engineering side, and custom implementations and out-of-the-box technical solutions. Finally, the launch and operation of the research itself is a challenging logistical and organizational undertaking. This paper presents the process of development of the first Polish satellite for conducting orbital research on biological objects, which was launched to the LEO on 13 January 2022. The project aimed to construct a nanosatellite with a payload, in which the lab-on-chip devices would provide the appropriate environmental conditions for microbial culture. The satellite, on the other hand, had to meet the CubeSat standard with its dimensions, in the range of 2-3U, and its weight that could not exceed 5kg. Limitations and compromises made for the final launch are described in detail. Accepted from the scientific and technical point of view the viable solution has been demonstrated, which was the result of the scientific work of university centres and the R&D work of the SatRevolution company. The paper describes the supporting analyzes performed, the test, integration, flight campaigns, and the results obtained. It concludes with lessons learned from design, implementation, and operational processes and presents implementation options for improved future versions.