

MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Experiments from Sub-orbital to Orbital Platforms (3)

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POST-FLIGHT DATA ANALYSIS OF THE BUGS EXPERIMENT ON SOUNDING ROCKET REXUS-7

Abstract

This paper deals with the post flight data analysis of the BUGS experiment (Boom for University Gravity-gradient stabilized Satellite) which was flown on board the sounding rocket REXUS-7 from the SSC's (Swedish Space Corporation) launch facility ESRANGE Space Center located near Kiruna, in the northern Sweden. REXUS-7 was launched on 2th of March 2010 at 8.25 local time carrying three student experiments onboard. The rocket reached an altitude of 83 km and landed north of Esrange Space Center. The experiment, which used the flight opportunity provided by REXUS launches, was performed involving a joint team of students of the Space Robotics Laboratory of the II Faculty of Engineering of the University of Bologna and of the School of Aerospace Engineering of La Sapienza, University of Roma, with the sponsorship of the ESA's (European Space Agency) Education Office, which supports the participation of students coming from European Countries to the REXUS/BEXUS Programme (Rocket and Balloon Experiments for University Students). This programme is realized under a bilateral Agency Agreement between the German Aerospace Center (DLR) and the Swedish National Space Board (SNSB). The idea of BUGS experiment was to test in microgravity conditions the deployment of two booms, one longer (3 m in deployed configuration) and one shorter (2 m in deployed configuration), to achieve data related to their dynamic behavior in orbit. More in detail, achieved data are related to: reaction of the satellite-body due to the boom deployment in orbit; boom damping time; boom modal frequencies. The boom prototypes, based on an innovative design using tape coiled springs, were developed by researchers and students of the Space Robotics Laboratory (SRL) of the II Faculty of Engineering of the University of Bologna Alma Mater Studiorum. The booms were designed to be boarded on small educational satellites, providing them with nadir pointing attitude by mean of simple passive stabilization, permitting to carry on experiments in the field of Earth Observation. Another technological objective of the BUGS experiment was to test, in operative conditions, the thermal cutter system for boom deployment and ejection system. The paper describes the BUGS experiment, showing the boom concept and design, and focusing on the post flight data analysis.