

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

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DEPLOYABLE STRUCTURES DEMONSTRATOR STRATHSAT-R: A SECOND CHANCE

Abstract

StrathSat proposed an experiment for ESA/DLR's REXUS13 sounding rocket campaign to validate different inflation deployment techniques in space conditions. The primary objective of the experiment is to deploy and validate two structures in micro-gravity and near vacuum conditions by using residual air inflation. The experimental setup consists of two CubeSat-based ejectables. The first of them deploys a pyramidal structure that can be used for passive orbit transfer and de-orbiting. The second ejectable contains a morphing inflatable with multiple cushions that will actively modify its shape during flight by means of pumps.

StrathSat-R was originally selected to be launched from ESRANGE sounding rocket facilities in Kiruna on board of the REXUS13 rocket in May 2013. Unfortunately, due to a procedural omission by the launch service provider, the two ejectable sections of the StrathSat-R experiment were not ejected during flight and remained inside the rocket. The experiment did switch on, performed as expected and recorded the flight, but alas, without being able to eject and deploy the structures.

Due to the fact that the error was not caused by a mistake on StrathSat's side, ESA and REXUS agreed to allow the team an unprecedented second chance to fly the experiments once again during the REXUS15 campaign in May 2014.

This paper presents the improvements in the different subsystems performed by the StrathSat-R team between both launches, as well as the results of the second sounding rocket flight. The new experiment presents a more robust and reliable electronic subsystem, avoiding problematic components in the original design, and includes slight modifications in the design and the fabrication procedures of the two inflatable structures. The recovery system, comprising a GPS receiver, a Globalstar antenna and an RF beacon, has also undergone a series of improvements mainly in the software side. Special focus has been placed on this particularly critical subsystem, to ensure recovery of the two ejectables after the flight. A new ground segment interface software has also been implemented.