

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

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EJECTION AND RECOVERY SYSTEM FOR CUBESAT SIZED EJECTABLES ON SOUNDING
ROCKETS

Abstract

In May 2013, the StrathSat-R experiment will be launched onboard the sounding rocket REXUS13 (DLR/SNSB/ESA's Rocket Experiments for University Students) from ESRANGE in Kiruna (North Sweden). The design, manufacturing, testing and results of a student-led sounding rocket experiment to test novel inflatable structures in space conditions will be presented. This experiment is the first step in what will be the first Scottish university satellite program. A multidisciplinary team of over 25 undergraduate and graduate students was formed to design, build and test the experiment between June 2011 and the REXUS13 launch in early May 2013. The student team is part of StrathSEDS, a subdivision of UKSEDS (UK Students for the Exploration and Development of Space). The experiment aims to test novel inflatable space technology in milli-gravity and milli-pressure conditions. It consists of three distinct sections, the ejection housing on the rocket and two ejectable modules that are based on a CubeSat architecture measuring 10x11x13 cm³. Shortly before reaching apogee, the two satellites are ejected from the rocket and will deploy their individual inflating structure during free flight. After landing, the ejectable modules will be recovered by using a GPS beacon with Globalstar transmission and a RF beacon. The two modules carry two different structures resulting in distinct mission objectives: The aim of FRODO (Foldable Reflective system for Omniaitude De-Orbiting) is to deploy a large, conical reflective sail from a small volume (4x10x10 cm³). This is the first step in the technology development of a passive de-orbiting system for high altitude spacecraft which will in the future utilise solar radiation pressure, the J2 effect and aerodynamic drag. The objective in the REXUS experiment is to test the inflation space conditions, to validate the shuttlecock attitude dynamics and to assess the structural behaviour of the device during re-entry. The aim of SAM (Self-inflating Adaptive Membrane) is to serve as a technology demonstrator for the residual air deployment method with a bio-inspired cell design approach. The unique architecture of the membrane sub-structure opens the possibility of changing the shape of

the membrane to be adapted to various space mission stages or environmental conditions. Proving this concept in milli-gravity conditions will open the door for future space structures serving multiple purposes