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

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REXUS 12 SUAINEADH EXPERIMENT: DEPLOYMENT OF A WEB IN MIRCOGRAVITY CONDITIONS USING CENTRIFUGAL FORCES

Abstract

The benefit of developing large space structures has been acknowledged by many space agencies in successfully supporting the design and operations of numerous missions. Such structures include deploying concentrators, solar sails and/or reflectors. Acting as a proof of concept, a team formed from the University of Strathclyde (Glasgow, UK), the University of Glasgow (Glasgow, UK) and the Royal Institute of Technology (Stockholm, Sweden) aims to deploy a space web – the Suaineadh (pronounced sha-NAID) experiment - in microgravity conditions. The experiment will be launched in March 2012 on a REXUS (Rocket Experiments for University Students) sounding rocket. Following launch, the experiment will be ejected from the nosecone of the rocket. Centrifugal forces acting on the space webs spinning assembly will be used to stabilise the experiments platform. A specifically designed spinning reaction wheel, with an active control method, will be used. Once the experiments motion is controlled and at a specific distance from the rocket a 2 m by 2 m space web will be released. Four daughter sections situated in the corners of

the square web will serve as masses to stabilise the web due to the centrifugal forces acting on them. The four daughter sections contain inertial measurement units (IMUs). Data gained from the IMUs will be used to verify the simulation data. Additional inertial measurements are also recorded from an IMU located on the central hub section. Furthermore, four cameras are also mounted on the central hub section. Each point outwards towards the corner sections and will capture high resolution imagery of the deployment process. Novel electronic architecture has been developed in order to timestamp and compresses the high resolution data. The accumulated experimental data is stored primarily on the experimental module. A bulk of the data is transmitted wirelessly to the REXUS rocket and stored onboard. Moreover, a finite amount of data is transmitted to the ground station using the REXUS downlink. This guarantees functionality of the experiment. After re-entry, the experimental module will be recovered using a GPS-beacon. The paper will therefore outline the entirely new design of the experiment, system engineering and project management between the three participating institutions. An overview of the current status of the manufacturing, testing and the newest simulation results will be also discussed in detail. The project is significant due to its complexity and the involvement of several scientific fields in a single project.