

SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Issues (5)

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REDEMPTION: A MICROGRAVITY EXPERIMENT TO TEST FOAM FOR SPACE DEBRIS
REMOVAL

Abstract

REDEMPTION (REmoval of DEbris using Material with Phase Transition: IONospheric tests) is an experiment proposed by the Space Robotic Laboratory (SRL) of the II Faculty of Engineering of the University of Bologna "ALMA MATER STUDIORUM" selected by a panel of experts of the ESA (European Space Agency), DLR (German Aerospace Agency), SNSB (Swedish National Space Board) and SSC (Swedish Space Corporation) to fly onboard the sounding rocket REXUS in March 2012 in the framework of the REXUS/BEXUS Programme (Rocket and Balloon Experiments for University Students). The experiment was developed by researchers, master and PhD students in the framework of activities of SRL dedicated to hands-on education, being a link between the two main programs of the Group of Space Robotics: nanosatellite manufacturing and space debris observation and tracking with the dedicated observatory "ALMASCOPE". Space debris are an increasing problem in space environment for both operative satellites and human activity in space. According to the most recent studies an almost unstable situation that could lead to a degenerative event known as "Kessler Syndrome" is close to come in low Earth orbital regimes. In order to avoid this situation a number of solutions are under evaluation to shift space junk in a safety orbit. Unfortunately, at the moment a feasible solution has not yet been found and one of the main issues is the system to catch the debris. REDEMPTION proposes a new system based on a sprayed foam that solidifies, which can be used as link between cleaner satellite and debris. This substance is a bi-component poliuretanic foam which expands and becomes rigid; it has never been space qualified or tested in near space condition. Thus, the main goal of the REDEMPTION experiment is to verify mixing and properties of the foam generated in near space conditions. In order to achieve this aim, different experiments will be performed in microgravity, each one located in a dedicated sector of the rocket module to test foam characteristics in microgravity. The paper describes the foam characteristics,

the experiment configuration, concept, design, process flow, mechanical assembling and expected results.