

SPACE DEBRIS SYMPOSIUM (A6)
Interactive Presentations (IP)

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SURREY SPACE CENTRE: A SURVEY OF DEBRIS REMOVAL RESEARCH ACTIVITIES

Abstract

Since the beginning of the space era, a huge amount of debris has progressively been generated. Most of the objects launched into space are still orbiting the Earth and today these objects represent a threat both in space and on Earth. The presence of space debris incurs risk of collision and damage to operational satellites. A credible solution has emerged over the recent years: actively removing heavy debris objects by capturing them and then disposing of them by destructive re-entry in the Earth's atmosphere.

This paper provides an overview of the active debris removal (ADR) activities at the Surrey Space Centre (SSC), University of Surrey, UK focusing on 4 in-orbit missions and other simulated or theoretical research. The EC FP7 RemoveDEBRIS mission due for launch in Q2 2016 aims to demonstrate key technologies for ADR by performing in-orbit demonstrations representative of an ADR mission (net and harpoon capture and vision-based navigation), drawing on the expertise of Airbus DS (UK, DE, FR) and SSTL. The EC FP7 DeOrbitSail project due for launch in Q2 2015 involves the in-orbit test of a deployable system for satellite afterlife disposal, consisting of an SSC aluminised Kapton sail of 4 by 4 m^2 deployed by a motor and four DLR CFRP booms. The 3-axis stabilization (ADCS by Stellenbosch University) guarantees the sail will always face the direction of the velocity vector. The Airbus funded CubeSail mission also possesses a sail and deployment mechanism. Unlike DeOrbitSail, it uses a translation stage payload and 3-axis stabilisation to demonstrate not only deorbiting but also solar sailing technology, based on the possibility to change the relative position of its centre of mass and the centre of pressure. Finally, InflateSail is a 3U CubeSat whose payload consists of a $10m^2$ drag-deorbiting sail, and a $1m$ long inflatable rigidisable mast used as a technology demonstrator satellite for the QB50 mission to be launched early 2016. The inflatable mast is deployed and rigidised using a cool gas generator (CGG) containing approximately $4g$ of nitrogen gas.

In addition to flight missions, the SSC has also been involved in ESA's Service Orientated ADR (SOADR) project performing a phase-0 on deorbiting Envisat. SSC contributes to this project and other

projects with a developed simulation tool that is capable of simulating complex tether dynamic behaviour of target and chaser sets. The paper will also discuss SSC's strategic roadmapping direction in ADR.