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Mitigation and Standards: status, lessons learnt and future with smallsats and constellations (4)

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RESULTS FROM THE H2020 REDSHIFT PROJECT: A GLOBAL APPROACH TO SPACE DEBRIS MITIGATION

Abstract

The ReDSHIFT (Revolutionary Design of Spacecraft through Holistic Integration of Future Technologies) project has been approved by the European Community in the framework of the H2020 Protec 2015 call, focused on passive means to reduce the impact of Space Debris by prevention, mitigation and protection. The overall objective of ReDSHIFT is to study a new paradigm in the planning of space missions where the space debris issue is central, from different perspectives: theoretical, technological (hardware and software) and political. After more than two years of work, the project is nearing its conclusion. Many interesting results were obtained and can be summarized as:

- a complete mapping of the LEO to GEO space was performed and the cartography was exploited to devise "dynamical" disposal strategies for any orbital regime.
- a prototype small spacecraft "debris compliant" was designed and assembled exploiting the advantages offered by the additive manufacturing procedures. Several parts, including optimized debris shields, were designed and 3D printed. The shields were tested with hypervelocity impacts too.
- the materials and components of the spacecraft were tested for Design for Demise (D4D). Moreover the D4D tests included a novel test on an engineering model of a reaction wheel.
- the possibility to exploit area augmentation devices (e.g., solar and drag sails) was studied both from the dynamical and the hardware point of view.
- a software tool (whose web version will be made public at the end of the project) encompassing all the above findings was produced. The software shall help the users to conceive a "debris compliant" space mission from the design to the disposal phase.
- The possible improvements to the international space regulations and standards, stemming from the projects findings, were analyzed.

Given the time frame of the conference, around the end of the project, a comprehensive overview along with a summary of all the above results will be presented. The research leading to these results has received funding from the Horizon 2020 Program of the European Union Framework Programme for Research and Innovation (H2020-PROTEC-2015) under REA grant agreement n. [687500]- ReDSHIFT.