

SPACE DEBRIS SYMPOSIUM (A6)
Mitigation and Standards (4)

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SOLUTIONS TO REDUCE THE VULNERABILITY OF SPACE SYSTEMS TO IMPACTS OF SMALL
DEBRIS PARTICLES**Abstract**

The number of debris in space will continue to increase even if rules are applied by the space community to limit the generation of new debris. Thus, the presence of debris represents an increasing risk for the survivability of space assets. Large debris (≥ 10 cm) can be tracked, allowing satellites to perform avoidance manoeuvres, and small size debris (≤ 1 mm) are usually taken into account in the design of the spacecraft. However, medium size debris which cannot be tracked, but can have a dramatic effect on the space mission, remains a significant threat. A European FP7 project, entitled ReVuS, commenced in 2011 with the objective to define design solutions that will reduce the vulnerability of future low Earth orbit (LEO) satellites to small- and medium-sized debris (typically 1mm to 5 cm). In the beginning, an assessment of the vulnerability of current LEO satellites to these types of debris has been performed on two representative satellites. It has allowed to evaluate the failure probability for the entire satellite, and to identify the critical areas and equipment on the satellites, and the most critical size range for the impacting debris. From this analysis, a set of potential solutions to minimise the vulnerability of the satellite, both at system and architecture levels, has been identified for assessment. The system level solutions cover the fractionated satellite and distributed systems. The use of shielding protection is the main solution at architecture level. The definition of several shielding configurations will take into account areas and equipment to be protected. Several shielding materials will be defined, in line with the proposed configurations. A set of selected shielding solutions, including materials, will be manufactured and tested. Other possible architecture level solutions are also being assessed. The paper will describe the results of the vulnerability analysis and the selected solutions.