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CHARACTERIZING DEBRISAT FRAGMENTS – PRELIMINARY RESULTS

Abstract

The DebriSat project was conceived to provide NASA and the DoD with an updated debris dataset to improve existing satellite break-up models. After four years of processing fragments from the DebriSat laboratory hypervelocity impact test (HVI), over 198,000 fragments have been collected to date, much higher than the 85,000 fragments predicted by the current break-up model. In order to continue recording immense amounts of data while maintaining high quality analysis, the DebriSat team has streamlined and evolved its processes over the last four years by not only improving existing procedures, but also creating automated, robust systems that can withstand an ever-changing number of student technicians. For example, the initial panel processing procedure was only applicable to "full sized" foam panels, defined as panels with greater than 2/3 of its planform intact, but the current panel procedure now includes processing of all broken foam panels. The fragment extraction process has been streamlined by implementing procedures to reduce the foam panels and recover fragments without compromising the integrity of the fragments. The fragment characterization process now includes procedures to handle multi-material (non-homogenous) fragments as well as the methodologies for measuring the mass and size of larger fragments using two independent imaging systems. With updates to the fragment characterization procedures, the associated procedures such as (i) fragment verification and (ii) reproducibility and repeatability tests have also been updated to maintain the high data quality and ensure data integrity.

This paper provides an update of the post-HVI activities to date, a first set of characterization data, and a discussion of the challenges faced while data collection continues alongside system improvements and ever-changing technicians. The objective is to provide the orbital debris community with the latest project status, some preliminary results, and a discussion of the challenges encountered in developing this unique dataset that will significantly improve existing breakup models; i.e., the need for high-quality data versus hastened quantity.