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QUALITY ASSURANCE FOR THE DEBRISAT PROJECT

Abstract

The DebrisSat project was created to provide an updated dataset to improve the current breakup model of modern satellites. The DebrisSat test article was designed to represent a modern-day LEO satellite, and underwent a hypervelocity impact test in a chamber lined with foam panels, where the foam panels were used to capture the debris of DebrisSat. The foam panels were then transported to the University of Florida for processing, which includes fragment extraction and characterization. The processing is ongoing, and fragments are currently being extracted, characterized, and catalogued into the DCS database. Once all catalogue entries are complete, the fragment's catalogued data is verified by experienced DebrisSat technicians. Characterization includes the location within the foam panel where the fragment was embedded, the fragment's material type and physical characteristics (i.e., mass, characteristic length, average cross-sectional area, volume, and area-to-mass ratio). The physical characteristics of the fragments are obtained using the DebrisSat mass and imaging systems. To ensure that the data collected from these systems are accurate and reliable, the extended Gage Repeatability and Reproducibility (Gage RR) test is used. The initial tests involved randomly selecting five verified fragments and three technicians with characterization experience. For each fragment, the physical characteristics were then reacquired by the three technicians in random order, and the results, along with original verified characteristics, compared to identify variations. Since the start of data collection in 2014, the Gage RR procedures used have been implemented and used to identify occurrences of high variability within the operations of mass and imaging systems. These procedures have evolved to increase the effectiveness and efficiency of the Gage RR tests, and to ensure the accuracy and reliability of new characterization systems. This paper discusses the evolution of the Gage RR procedures, rationale for the changes, and the impact of these changes on the overall DebrisSat project.