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DEBRISAT STATUS AND UPDATES ON CHARACTERIZING DEBRIS FRAGMENTS TO
MODERNIZE THE STANDARD BREAKUP MODELS

Abstract

Six years after the DebrisSat test article was subjected to a ground laboratory hypervelocity impact test, the collection and characterization of the resulting debris fragments continues. The debris fragment data recorded throughout the collection and characterization process are forwarded to NASA and DoD to modernize their standard breakup models. To date, over 215,000 debris fragments with at least 2 mm in length have been collected, from which approximately 50,000 fragments have been characterized. A characterized debris fragment is defined as a fragment that has completed qualitative assessment of its physical attributes (material, shape, and identifying color) and quantitative mass and size measurements. During the past year, the emphasis was on collecting and characterizing larger fragments.

One of the main challenges throughout the collection and characterization process has been the size characterization of the DebrisSat fragments. Two imaging systems that utilize point-and-shoot cameras have been designed, realized, and implemented in the characterization process to measure the size of the fragments. One imaging system is used to measure the smaller planar-like or needle-like fragments and the other imaging system is used to measure the larger 3-dimensional fragments. However, there are fragments that are too large for the smaller imaging system while too small for the larger imaging system and also fragments too large for the larger imaging system. To address these two fragment size classes, new imaging systems are in development. Additionally, reflective/specular fragments pose a challenge for the point-and-shoot cameras for size measurements and to overcome these challenges, both hardware and software updates have been implemented.

In this paper, the DebrisSat project status on the collection and characterization process are shared while providing details of the software and hardware updates implemented on the imaging systems. The verification and validation efforts performed on the imaging systems will also be discussed.