SPACE DEBRIS SYMPOSIUM (A6)
Measurements (1)

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AN IMAGING SYSTEM FOR AUTOMATED CHARACTERISTIC LENGTH MEASUREMENT OF
DEBRISAT FRAGMENTS

Abstract

The debris fragments generated by DebriSat's hypervelocity impact test are currently being processed and characterized through an effort of NASA and USAF. The debris characteristics will be used to update satellite breakup models. In particular, the physical dimensions of the debris fragments must be measured to provide characteristic lengths for use in these models. Calipers and commercial 3D scanners were considered as measurement options, but an automated imaging system was ultimately developed to measure debris fragments. By automating the entire process, the measurement results are made repeatable and the human factor associated with calipers and 3D scanning is eliminated. Unlike using calipers to measure, the imaging system obtains non-contact measurements to avoid damaging delicate fragments. Furthermore, this fully automated measurement system minimizes fragment handling, which reduces the potential for fragment damage during the characterization process. In addition, the imaging system reduces the time required to determine the characteristic length of the debris fragment. In this way, the imaging system can measure the tens of thousands of DebriSat fragments at a rate of about eight minutes per fragment, compared to hours per fragment in NASA's current 3D scanning measurement approach. The imaging system utilizes a space carving algorithm to generate a 3D point cloud of the article being measured and a custom developed algorithm then extracts the characteristic length from the point cloud. This paper describes the development, implementation, validation, and results of the imaging system used for automated characteristic length measurement of DebriSat fragments.