

SPACE DEBRIS SYMPOSIUM (A6)
Modeling and Risk Analysis (2)

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THE MASTER-2009 FRAGMENTATION MODEL FOR THE SMALL SIZE REGIME

Abstract

Simulation of the space debris environment in ESA's MASTER Model (Meteoroid and Space Debris Environment Reference) is performed through modelling of the physical generation processes for the different sources. Within the maintenance work leading up to the release of the MASTER-2009 model, changes in the fragmentation modelling are introduced. The motivation for the updating of the model is the recent reinvestigation performed by NASA of the original SOCIT-4 test data upon which the current model is largely based. It was found that the relative occurrence of materials with specific densities representative of plastic, aluminium and steel changes with the fragment diameter. Taking into account differences in the materials used for payloads and rocket bodies, the mean density of fragments smaller than one millimetre will be modelled separately for payloads and rocket bodies. In the current paper, the changes made to the fragmentation model are discussed in detail. The effects of the performed changes on the resulting fragmentation population are then reviewed. This is done by comparing the number of fragments which are initially produced and their reduction rate through interaction with the atmosphere to the simulation results of the unaltered model. The entire fragmentation debris environment is then simulated up to May 2009 with the new fragmentation model. The results are then compared to the historical fragmentation debris environment for small fragments from the MASTER-2005 model. The paper is concluded by giving an overview of the fragmentation debris environment for the time period between May 2005 and May 2009.