SPACE DEBRIS SYMPOSIUM (A6)
Hypervelocity Impacts and Protection (3)

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# THE IMPROVEMENT OF SELF-CONSISTENCY WITH CONSERVATION LAW FOR HYPERVELOCITY IMPACT DEBRIS CLOUD ENGINEERING MODEL

**Abstract**

Based on the reanalysis of the related experimental data and numerical simulation, the empirical formula of perforation is set up. Combined with NASA related study result [1] and conservation of mass and momentum, the empirical formulas of masses, mass velocity and deflecting angle are reformed.On this basis, the engineering model of debris cloud [2] which contains distribution models of debris mass, velocity and spatial angles are improved to be self-consistent with the conservation of mass and momentum. So when sampling the debris using Monte Carlo method, the conservation of mass and momentum needs no further consideration. At last, the comparisons are made for the conserve degree of mass and momentum between debris clouds generated by the old debris model and the improved debris model in this paper. The results are as follows: (1) In the old debris model the sampling number is determined according to the conservation criteria, which cannot be controlled. In contrast, in the improved debris model, the sampling number could be manually controlled according to what need. (2) When the sampling number is the same, the degree of the mass and momentum conservation between debris generated by the old debris model and improved debris model are similar; (3) With the improved debris model, the degree of the mass and momentum conservation could be improved via increasing sampling number. Reference [1] W. P. SchonbergCharacterizing Secondary Debris Impact Ejecta [R], NASA Marshall Space Flight Center, August 1999. [2] Jie Hang, Zhao-xia Ma, Lei-sheng Ren , etc.. A New Engineering Model of Debris Cloud Produced by Hypervelocity Impact [J], International Journal of Impact Engineering , in press , http://dx.doi.org/10.1016/j.ijimpeng.2012.07.003