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

Author: Mr. SHENGWEI LAN
China Aerodynamics Research and Development Center(CARDC), China, sw_lan@aliyun.com

Ms. Jie Huang
China Aerodynamics Research and Development Center(CARDC), China, hai@cardc.cn
Mr. Yi Li
China Aerodynamics Research and Development Center(CARDC), China, hvi@cardc.cn
Dr. Sen Liu
China Aerodynamics Research and Development Center(CARDC), China, liusen@cardc.cn

MASS DISTRIBUTION AND DEPENDENCE ON IMPACT PARAMETERS OF SPACECRAFT BREAKUP DEBRIS

Abstract

To better understand the outcome of spacecraft breakup caused by hypervelocity impact, new integrated analysis of the data from historical and recent spacecraft impact tests are performed. The historical data come from the tests conducted in 1970s to 1990s, including the earliest tests on insulated fiberglass wall conducted by T D Bess, and the subsequent tests such as PSI series, SOCIT series and P78 flight test. The recent data come from the simulated satellites impacts conducted by Hanada's team in Kyushu University of Japan and CARDC's HVI team independently. The impact velocities of these tests are from 1.4 to 7 km/s. Three main results are concluded from these data: 1) the mass distribution curves in the logarithm coordinate could be divided into three sections, corresponding to large debris, middle scale debris and fine particles, which correspond to different debris generation mechanisms respectively; 2) transition points between the three sections exist and they are related to the impact energy; 3) the slope of the mass distribution curves represents the speed at which the debris number grows with the decrease of the debris mass, and the slopes are found to be positively related to the spacecraft bulk density and the relative impact velocity.