

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

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DEBRIS AREA DISTRIBUTION OF SPACECRAFT UNDER HYPERVELOCITY IMPACT

Abstract

Cross section area is an important parameter for spacecraft breakup debris as it is the directly measured data in space observation. It is significant for observing and analyzing the spacecraft breakup event to accurately modeling the area distribution of the breakup debris. In this paper, experimental study has been performed on debris area distribution characteristics of spacecraft under hypervelocity impact. The tests are carried out at the ballistic ranges of CARDC. Aluminum projectiles are launched to normally impact the dummy spacecrafts at about 3.0km/s. The dummy spacecrafts were made up of aluminum plates, filled with some simulated electronics boxes, each of which was installed with a circuit board as the actual payload. "Soft-catch" devices were used to collect the breakup debris. The test results show that: 1) the relationship between the cross section area and the characteristic length of debris, which can be obtained in the logarithmic coordinates by linear fitting, represents the debris shape characteristic in a certain extent; 2) the area to mass ratios of fragments show normal distributions in the logarithmic coordinates; 3) debris made of different materials can be distinguished by different peaks on the distribution curves; 4) the area to mass ratio distributions can be expressed by a linear superimposition of several normal functions which represent the main materials of the spacecraft.