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Impact-Induced Mission Effects and Risk Assessments (3)

Author: Mr. YUMA KITAGURO
Kyushu Institute of Technology, Japan

Prof.Dr. Yasuhiro Akahoshi
Kyushu Institute of Technology, Japan
Mr. Takao Koura
Kyushu Institute of Technology, Japan
Ms. Inoue Miyu
Kyushu Institue of Technology, Japan
Dr. Satomi Kawamoto
Japan Aerospace Exploration Agency (JAXA), Japan
Mr. Taku Izumiyama
IHI Corporation, Japan

EVALUATION OF EJECTA IN HYPERVELOCITY IMPACT OF LARGE STRUCTURES ON GEOSTATIONARY ORBITS AND PROPOSED MEASURES TO REDUCE THEM

Abstract

The problem of space debris, or space-generated rubbish, is currently becoming an issue. This debris exists in large quantities not only in low orbit but also in geostationary orbit. Unlike in low earth orbit, the debris in geostationary orbit is not expected to be removed naturally and is very likely to remain in place. In addition, there is a possibility that ejecta will be generated when debris collides with a spacecraft, further increasing the amount of ejecta. It is therefore necessary to assess how much ejecta will be generated. It may also be necessary to consider methods to suppress the generation of ejecta in the future. In this study, a hypervelocity impact tests were carried out using materials used in spacecraft as targets, and the extent to which ejecta is generated was verified. Targets such as aluminum and CFRP, and projectiles such as aluminum and glass were used to investigate the effects of the materials. The velocity was varied from 1-5 km/s to investigate the effect of velocity, and for the CFRP experiment, two CFRP plates were placed side by side in a crash test, assuming a honeycomb panel as the target. As a result, we found differences in target destruction status and ejecta generation amount. It was also possible to compare the fracture status by changing the thickness of each target. In the future, we plan to compare the difference in the amount of ejecta generated by comparing it with CFRP that has been degraded by irradiation with radiation in an experiment targeting CFRP. Also, buffer materials such as polyimide foam and silica aerogel will be used to investigate how ejecta can be suppressed through hypervelocity impact tests.