

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

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SHIELDED AND UNSHIELDED LOOP HEAT PIPE IN SPACECRAFT TO HYPERVELOCITY
IMPACTS

Abstract

This paper describes impact damage to the shielded and unshielded loop heat pipe (LHP) made of stainless steel, consisting of an evaporator, liquid storage tank, condenser, and lines. Hypervelocity impacts (HVI) to LHP in space may pose a serious threat for equipments in spacecraft such as thrusters, batteries, etc. which depend on LHP's heating and cooling to keep their temperature within the specific period. Thus the failure of LHP will result in abnormal functioning of these critical equipments, which is likely to lead to premature termination of mission in spacecraft. Therefore, it is very important to explore the failure mechanism for the purpose of spacecraft application to LHP. In the test, the shielded LHP has been placed behind spacecraft structure walls such as aluminum honeycomb sandwich based on the configuration in spacecraft. Ballistic limits for failure mode "perforation" are given based on the experiment with a Two-Stage Light Gas Gun. The various components' weakness of LHP to HVI is presented. The test results applied to spacecraft are also analyzed in the paper.

Key Words: Meteoroid/Orbital Debris, Loop Heat Pipe, Hypervelocity Impact, Spacecraft