

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Space Environmental Effects and Spacecraft Protection (6)

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HYPERVELOCITY IMPACT TEST CAMPAIGN OF INFLATABLE MODULES FOR LUNAR  
ORBITAL APPLICATION

**Abstract**

The results of hypervelocity impact test campaign on the Micrometeoroids and Debris Protection System (MDPS) for inflatable modules for lunar orbital application are presented. The intent of the test program was to evaluate the actual performance of MDPS structures undergoing the impact of projectiles representing both orbital debris and micro-meteoroids. The samples have been subjected to the impact of projectiles made of different materials and size, at selected impact conditions. Hypervelocity impact tests are an integral part of the analyses conducted to ensure adequate design of spacecraft micrometeoroid and orbital debris (MMOD) shielding taking into account other space Environmental Effects such as radiation and thermal cycling. Hypervelocity impact mechanics was used to analyze the damage that occurs when a space vehicle is impacted by a micrometeoroid or a space debris particle. Test data is useful to validate numerical simulations. MMOD shielding consists of multiple layers of fabric with spacing between layers, and provides protection to an internal restraint and bladder system. MDPS flexibility and compactness are achieved by the use as screens packets fabric materials. These materials have effective crushing properties due to absorption of impact energy in the breakdown of tissue layers.