

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

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ON-GROUND TESTING OF A RESTRAINT LAYER FOR INFLATABLE MODULES FOR LUNAR
ORBITAL APPLICATION

Abstract

Lightweight adaptive inflatable modules are a great alternative to traditional metallic space modules for lunar orbital infrastructure. Space inflatable modules consist of some different functional layers. There are external layers for micrometeoroid, thermal and radiation protection. Internal layer ensures air retention. A load-bearing restraint layer must be in the middle of the package. Some types of the restraint layer are currently under investigation in TSNIImash. It typically consists of any woven materials or webbings. Different types of both "woven based" and "webbings based" restrained layers were compared with each other. Middle sized on-ground inflatable "webbings based" model survived loadings appropriate to such lunar orbital operations like internal pressure variations, docking, orbit correction and others. Photogrammetry system was used to strain measurements. Numerical model of the restraint layer was verified by the results of on-ground testing. Tests of on-ground models of inflatable structures have shown the workability of this technology in the lunar orbital application. The paper presents results of on-ground testing of inflatable model and numerical modeling of "webbings based" restrained layer.