

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)

Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Mr. Akira Yoshida

Tokyo Institute of Technology, Japan, yoshida@space.enveng.titech.ac.jp

Prof. Hiroshi Furuya

Tokyo Institute of Technology, Japan, furuya@enveng.titech.ac.jp

EFFECTS OF STRUCTURAL PROPERTIES FOR SELF-DEPLOYABLE CONNECTED-CONVEX
BOOMS ON STORAGE AND DEPLOYMENT CHARACTERISTICS**Abstract**

Several deployable booms have been proposed and developed to apply to space booms, deployable membrane for de-orbit systems, solar-sail membrane, and etc.; as STEM boom, CTM boom, TRAC boom, Omega boom, and B-convex boom, etc. To apply the deployable boom to nano satellites, storage efficiency and self-deployment torque are significant. We have proposed self-deployable booms which have convex and corrugated cross-section configuration to improve the storage performance in this research. To apply the self-deployable connected-convex booms to small satellites, the deployment mechanical properties are investigated experimentally and theoretically in this paper. The storage and deployment torque properties have been experimentally measured by connected-convex boom models which consist of PET films connected with thin polyimide tape. The experimental results show that the storage performance are improved with respect to the conventional convex booms quantitatively. Also, the deployment torque histories have been obtained. The effects of forward and the reverse fold for the deployable boom on the deployment torque history have been clarified. To examine the deployment torque properties a theoretical analysis was performed. The theoretical analysis indicates the effects of the cross-sectional properties of the deployable connected-convex booms and the gap length for connection tape on deployment torque. Furthermore, the numerical analyses for deployment properties are performed to examine the experimental and the theoretical results. Finally, the feasibility for applying self-deployable connected-convex booms to nano/small satellite are discussed.