

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Late Breaking Abstracts (LBA) (LBA)Author: Ms. K.P.S.S. PRANATHI
IndiaMATERIAL PERFORMANCE ASSESSMENT OF TENSEGRITY STRUCTURES FOR LUNAR
HABITAT APPLICATIONS**Abstract**

The development of sustainable lunar habitats requires structural systems and materials capable of withstanding the Moon's extreme conditions, including reduced gravity, thermal fluctuations, and the absence of atmosphere. This study explores the application of tensegrity structures—lightweight systems combining isolated compression and continuous tension elements—for their high strength-to-weight efficiency and adaptability to extraterrestrial environments. A simplified three-strut tensegrity prism is used as the baseline model to evaluate three material configurations: (1) aluminium struts and cables, (2) aluminium struts with glass fibre cables, and (3) Monel 400 struts with glass fibre cables. The materials are chosen for their aerospace relevance: aluminium for low density, glass fibre for thermal resilience and potential in-situ manufacturing, and Monel 400 for strength and corrosion resistance. Finite Element Analysis is conducted using ANSYS, incorporating lunar gravity and thermal loading. The framework may be extended to complex geometries. The study aims to identify the most structurally resilient configuration.