Paper ID: 44318
oral
student

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Advancements in Materials Applications and Rapid Prototyping (9)

Author: Mr. Andrea Mazza
Politecnico di Torino, Italy, andrea_mazza@polito.it

Mr. Carlo Giovanni Ferro
Politecnico di Torino, Italy, carlo.ferro@polito.it
Ms. Sara Varetti
Politecnico di Torino, Italy, sara.varetti@polito.it
Mr. Andrea Emanuele Maria Casini
Politecnico di Torino, Italy, andrea.casini@polito.it
Prof. Paolo Maggiore
Politecnico di Torino, Italy, paolo.maggiore@polito.it
Dr. Salvatore Brischetto
Politecnico di Torino, Italy, salvatore.brischetto@polito.it
Prof. Mariangela Lombardi
Politecnico di Torino, Italy, mariangela.lombardi@polito.it

STRUCTURAL ANALYSIS OF 3D PRINTED A LATTICE STRUCTURE FOR LUNAR LANDER FOOTPADS

Abstract

Planetary exploration has been always considered as one of the biggest dream achieved by humankind: the innate willingness to study the universe is a fundamental part of the human natural instincts to be drawn by the unknown. Considering the new renaissance era of space exploration currently experienced by both space and non-space related entities, such as national agencies and private companies, the rising interest for Moon science is driving the future missions targets towards the exploitation of the cislunar space and lunar terrain. If both crewed and unmanned spacecraft are envisioned by the strategic international exploration plans, surface landers will play a major role in delivering payloads for scientific data measurement. The scope of this paper is to study the classical design solutions for a landing gear system of a lunar probe and to enhance them using modern manufacturing technologies. Since 3D printing techniques are the future production trend, they have been adopted for this research work, especially because they can realize impossible structures with respect to traditional methods. In particular, a sandwich footpad has been analysed both using static and dynamic structural loads, and comparing different core configurations. Lattice geometries have been tested during simulations instead of the classical aluminium honeycomb composites. This project provides an important opportunity to advance the understanding of the mechanical behaviour of negative Poisson ratio non-stochastic cells. Additionally, experimental data complemented the results obtained from the finite element method analyses.