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IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

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TENSEGRITICAL MODEL ROCKET FUSELAGE BASED ON PRISMATIC UNIT CELLS STRUCTURES FOR IMPACT ABSORBING AND ENERGY DISTRIBUTING PURPOSES.

Abstract

Due to uncertain factors during the flight, such as wind and air resistance to the parachute, a given complexity on predicting possible landing spots of the rocket takes place. Additionally, the ejection of said parachute and landings on irregular surfaces generate impacts and vibrations that can damage the fuselage structure. In response to these problems, it is proposed to apply a set of integrated systems to optimize the flight and recovery of model rockets in reduced areas safely and effectively. On that wise, as part of the systems it is intended to develop a fuselage based on prismatic tensegrity structures, selected for their ability to absorb and redistribute energy at the time of impact, which would allow the reduction of the parachute's dimensions to control the speed of fall and minimize horizontal trajectories produced by air resistance. Thereupon, the fuselage structure will play a primary role in achieving an optimal recovery for subsequent reuse and not depend on the traditional retrieval method.To effectuate the above, the use of mechanical design software along with flight and structural analysis simulations are foreseen to be implemented in order to develop a new fuselage suitable for the proposal, and study its integrity against the several environmental factors that influence the trajectory. Likewise, an analysis of the possible behaviors during the flight will be carried out for an accurate manufacturing process of the prototype and a successful test-run. Thus, it is expected that this tensegrity fuselage, alongside the other integrated systems in the rocket, can manage to reduce the influence of external factors and significantly help attain the main goal of using the smallest possible area to perform safe launches and recoveries, as well as protect its soundness upon the potential damage it may endure.