

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Upper Stages, Space Transfer, Entry & Landing Systems (3)

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THE ACHIEVEMENTS OF THE EFESTO-2 PROJECT: INFLATABLE HEAT SHIELDS AS
INNOVATIVE SOLUTION FOR A SAFE RE-ENTRY OF REUSABLE LAUNCH VEHICLES'
SEGMENTS.

Abstract

EFESTO-2 (European Flexible Heat Shields: Advanced TPS Design and Tests for Future In-Orbit Demonstration – 2) is a project funded by the EU program Horizon Europe. It aims to further increasing the European know-how in the field of Inflatable Heat Shields (IHS), an innovative technology adoptable for thermal protection during re-entry deemed very effective in the realm of space transportation systems to safely re-enter and protect elements of reusable launch vehicles. The project builds upon the great achievements of the father project EFESTO (H2020 funds No 821801) and seeks to improve further the Technology Readiness Level (TRL) of IHS. The project built around four main pillars: (1) consolidation of use-case applicability through a business case analysis; (2) extension of investigation spectrum of the father project EFESTO to other critical aspects of the IHS field; (3) increase of confidence-level and robustness of tools/models; (4) identification of a roadmap for future initiatives. This paper presents the project’s work and achievements up to completion obtained during the 24-month project cycle. It will go across the project’s main work-items of: execution of a mission and system design loop for a reference application in a baseline use-case scenario; implementation of a sound testing effort covering the key aspects of structural characterization of the inflatable structure as well as deformable shape investigation from the aerodynamic standpoint including stability; verification and improvement of numerical models both at structure (FEM) and aero-shape (CFD) levels; identification of the roadmap and near-future effort toward maturation of the IHS technology for a systematic use on real re-entry missions. This project has received funding from the European Union’s Horizon Europe research and innovation program under grant agreement No 1010811041.

Keywords: Inflatable Heat Shields, Re-entry, Reusability, Reusable launchers