

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

Author: Dr. Giuseppe Rufolo

CIRA Italian Aerospace Research Centre, Italy, g.rufolo@cira.it

Mr. Paolo Vernillo

CIRA Italian Aerospace Research Centre, Italy, p.vernillo@cira.it

Mr. Giovanni Cuciniello

CIRA Italian Aerospace Research Centre, Italy, g.cuciniello@cira.it

Dr. Angelo De Fenza

CIRA Italian Aerospace Research Centre, Italy, a.defenza@cira.it

Dr. Francesca Maria Pisano

CIRA Italian Aerospace Research Centre, Italy, f.pisano@cira.it

SYSTEM DROP TEST FOR THE VALIDATION OF SPACE RIDER DESCENT AND LANDING  
MISSION PHASE: STATUS OF DESIGN AND DEVELOPMENT ACTIVITIES.**Abstract**

ESA Space Rider Program has the ambitious objective to enable European routinely access to LEO and return back to earth, allowing a wide spectrum of in-orbit experimentation capabilities while reducing mission costs through reusability. The final phase of the Space Rider mission, consisting of a guided descent under parafoil up to a precision landing on ground, is a very critical part that requires a robust validation approach for the verification of the integrated functioning of all the key aspects. In this frame, the Italian Aerospace Research Center (CIRA), is responsible for the design and implementation of a system level test for the in-flight verification of the Descent and Landing phase of the mission. A dedicated flight test is foreseen to demonstrate the integrated parafoil /GNC capability to operate in representative flight conditions, ensuring the guidance of the re-entry model under the parafoil up to the achievement of a precision landing. The test article is a full-scale vehicle model fully replicating the Space Rider Re-entry Module in shape, mass distribution and size; furthermore, it is also representative of some interfaces/layout arrangement and functioning of critical subsystem as Descent System, Landing System, Mechanism, GNC. The Descent and Landing Test Model will integrate the following items: an ad-hoc load-carrying structure able to withstand the foreseen loads of the test scenario; a Flight Model version of the Descent Landing S/Ss, including the parafoil with winches acting as attitude control actuators and a dedicated control unit, the landing system with nose and main landing gears, some other related Mechanisms; an 'ad-hoc' designed Test Avionic (OBDH, Power, Telecommunication System) replicating Space Rider functionalities for the Descent and Landing Phase. The industrial team lead by CIRA in charge of the System Drop Test design and implementation, includes: the Romanian National Institute for Aerospace Research (INCAS), for designing and manufacturing the Space Rider Mock-Up as well as for procuring the test site and carrier; and Deimos Space Romania, providing support for the mission analysis. The paper describes provides details over the development process from the analysis of the SR mission constraints, the design of the system and the test campaign, until the validation of all the functions expected to be reproduced.