

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

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DESIGN AND DEVELOPMENT OF A SYSTEM DROP TEST FOR THE VALIDATION OF SPACE  
RIDER DESCENT AND LANDING MISSION PHASE**Abstract**

In the frame of the European Space Agency Space Rider (SR) Program, the Italian Aerospace Research Center (CIRA), under the supervision of the Prime Contractor Thales Alenia Space, 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. In that perspective, 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 replicating 1:1 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, includes: the Romanian National Institute for Aerospace Research (INCAS), in charge of designing and manufacturing the Space Rider Mock-Up as well as of the procurement of the test site and carrier; and Deimos Space Romania, providing support for the mission analysis.

The paper describes the strategy being adopted to achieve the qualification of the DLS of Space Rider and 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.