

SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)Systems and Infrastructures to Implement Future Building Blocks in Space Exploration and Development
(2)

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ENABLING TECHNOLOGIES FOR SPACE EXPLORATION: DEVELOPMENTS IN THE
PIEDMONT AEROSPACE DISTRICT**Abstract**

The Space Exploration scenario and the associated Global Exploration Roadmap (GER) have been recently updated by the International Space Exploration Coordination Group (ISECG) involving several international Space Agencies. The so-called GER 2.0 roadmap identifies the International Space Station (ISS) as the starting point of the human and robotic exploration of the Solar System, and Mars as the target for human presence by the middle of the century. Additional intermediate destinations are indicated such as Moon surface and vicinities, Asteroids, Mars moons, and the associated technical capabilities derived. In this context, a list of enabling technologies was derived by Thales Alenia Space (TAS) and their developments proposed in a co-financed scheme to the Piedmont Region in Italy inside the Piedmont Aerospace District (PAD). This initiative, called STEPS (Sistemi e Tecnologie per l'Esplorazione Spaziale), was carried on in the 2009-2012 timeframe. Its second phase STEPS 2 is in progress since beginning 2013 and is supposed to terminate by end 2014. A subsequent phase STEPS 3 is under investigation and might start in 2015. The STEPS project was specifically aimed at developing the following space exploration enabling technologies up to TRL 2/3:

- Entry Descent and Landing, Surface Navigation
- Surface Mobility
- Rendez-vous and Docking (RVD)
- Protection from planetary environment
- Inflatable structures and multifunctional Smart Skin
- Landing legs including shock absorbers
- Thermal protection and Aerothermodynamics
- Energy management and Regenerative Fuel Cells

- Health Management System (HMS) and composite structures modeling
- Human Machine Interfaces (HMI)
- Virtual Reality and Collaborative Engineering

At the end of the project in May 2012, a series of real and virtual demonstrators (i.e., Pressurized Rover and Lander), demonstrated the validity of the adopted approach and of the technical choices performed during the project.

A continuation of the project (STEPS 2) was then proposed to the Piedmont Region and approved in January 2013, carrying on the technologies with higher possibility to be validated in space in a short-term timeframe:

- Precision Landing
- Surface Navigation
- Smart Skin
- Landing Legs
- Regenerative Fuel Cells
- RVD Mechanisms
- Inflatable and Environmental Protection
- Ablative / Aerothermodynamics
- Health Management Systems / Ultralight Structures

The paper will present the STEPS 2 recent results and their perspectives.