

9th SYMPOSIUM ON STEPPING STONES TO THE FUTURE: STRATEGIES, ARCHITECTURES,
CONCEPTS AND TECHNOLOGIES (D3)

Concepts, Technologies, Infrastructures and Systems for the Exploration and Utilisation of Space (2)

Author: Dr. Maria Antonietta Perino

Thales Alenia Space Espana, Italy, mariaantonietta.perino@thalesalieniaspace.com

Mr. Piero Messidoro

Thales Alenia Space Italia, Italy, piero.messidoro@thalesalieniaspace.com

Mr. Enrico Gaia

Thales Alenia Space Italia, Italy, enrico.gaia@thalesalieniaspace.com

Mr. Dario Boggiatto

Finpiemonte, Italy, dario.boggiatto@finpiemonte.it

STEPS PROJECT - TECHNOLOGIES AND SYSTEMS FOR SPACE EXPLORATION

Abstract

STEPS - Sistemi e Tecnologie per l'Esplorazione Spaziale - is a joint development of technologies and systems for Space Exploration supported by Regione Piemonte and carried out by Thales Alenia Space Italia, SMEs, Universities and public Research Centres belonging to the network "Comitato Distretto Aerospaziale del Piemonte".

The project intends to develop virtual and hardware demonstrators for a range of technologies for the descent, soft landing and surface mobility of robotic and manned equipment for Moon and Mars exploration. The two key hardware demonstrators – a Mars Lander and a Pressurised Lunar Rover - fit in a context of international cooperation for the exploration of Moon and Mars, as envisaged by the leading Space Agencies worldwide.

The STEPS project includes also the development and utilisation of a system of laboratories equipped for technology validation, teleoperations, concurrent design environments, and virtual reality simulation of the typical Moon and Mars environments.

This paper will present the initial results becoming available in several technology domains like:

- A vision-based GNC for last leg of Mars Entry, Descent & Landing sequence, Hazard avoidance and complete spacecraft autonomy;
- Autonomous Rover Navigation, based on the determination of the terrain morphology by a stereo camera;
- Mobility & Mechanisms providing an Integrated Ground Mobility System, Rendezvous & Docking equipment, and protection from Environment effects;
- Innovative Structures such as Inflatable, Smart & Multifunction Structures, an Active Shock Absorber for safe landing, balance restoring and walking;
- Composite materials Modelling and Monitoring;
- Human-machine interface features of a predictive Command and Control System;
- Energy Management systems based on Regenerative Fuel Cells;
- Commercial Transportation Systems and Technologies for Atmospheric Re-entry Vehicles and Landers;

- Novel Design & Development Tools, such as a Rover S/W simulator and prototypes of the DEM viewer and of a S/W Rock Creator/visualizator.