

Lunar Exploration (3)

Lunar Concepts (3)

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LUNAR POLAR SAMPLE RETURN MISSION

Abstract

In the last years, the interest in the Lunar South Polar region has grown significantly within the international exploration and science community, fuelled by the abundance of new data acquired by the fleet of orbiter missions which have been sent to the Moon in the past decade. The next step in exploration of this important region requires direct investigation of the surface and the material there, both through in-situ measurements and via a sample return. Thales Alenia Space has lead an ESA study (Lunar Polar Sample Return (LPSR) mission) as a joint ESA-ROSCOMOS exploration mission, which main objective is the retrieval of water ice samples from the lunar South Pole and to Earth, by the implementation of a double mission composed of several modular stages. The principal objective of this activity is the definition of a feasible mission scenario and assess the European system elements of the Lunar Polar Sample Return (LPSR) mission architecture with particular regard to the sampling return phases, including:

- Sample Handling preservation from the lunar surface to retrieval on Earth
- Lunar Ascent Vehicle
- In-orbit Rendezvous and Capture
- Orbiter Module
- Earth Return Vehicle
- Earth Return Capsule

In parallel, a different activity, addressed to the system concept and feasibility of a small Rover (Lunar Volatile Prospector) designed to collect iced, volatiles-rich samples on the lunar south pole region (Cabeus rim) was developed as well, with a focus on the possibility to optimize a surface travers path ensuring survival and speed as well as direct communication to ground.

This paper will present the results of the study for both the LPSR and the Lunar Volatile Prospector activities.

Keywords: Lunar Polar Sample Return (LPSR), Lunar Volatile Prospector, Volatiles, Sample return