

SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration - Part 2 (2B)

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PREPARING THE TECHNOLOGIES FOR FUTURE ESA LUNAR MISSIONS

Abstract

OHB-System AG is conducting a Phase A Study for a small European Lunar Lander, which is preparing the technologies needed for a future autonomous soft precision landing within the planned international exploration scenario on the lunar South-Pole. It is intended to develop a descent and landing expertise with associating technologies, that could also be used for a Cargo Lander, the European contribution for the international Lunar Station, planned by NASA for the years 2025

The Lunar Lander Phase A Study, under contract to ESA, is providing a baseline mission architecture for a single stage GTO transfer to the Moon where a sequence of elliptical orbits lead the lander to a circular orbit. Afterwards the lander will be manoeuvred into an elliptical descent orbit to finally descent down to the Lunar South Pole, which is a relatively rarely mapped area. It is intended to use currently available mapping information of the lunar South-Pole to select a preferred landing area with relatively low resolution prior to launch. Therefore, final navigation and guidance under consideration of Hazard Avoidance aspects has to be processed fully autonomously on-board during final descent to the lunar surface without ground station involvement. The investigated sensor concept and the identified Hazard Avoidance processes have to assure a precise and safe landing.

To prepare the required technology for this ESA mission, an extensive development program is under way to have the elements and processes for Hazard Avoidance, precise navigation, fully autonomous descent and soft safe landing ready for an earliest launch date of the small European Lunar Lander in 2016.

For the European Lunar Lander precursor mission, the Soyuz-2-1b-Fregat launch vehicle has been selected for a launch from Kourou for the definition of the baseline architecture. As a consequence of the limited launch mass of this launcher, this currently does not allow the inclusion of mobility aspects for lunar exploration activities. Further alternative investigations subjected to ARIANE 5 shared launch for GTO are under way, with the intension to increase the payload capability of the Lander up to 150 kg, allowing the inclusion of a Rover for mobile exploitation.

Arriving on the lunar surface, a number of payload instruments for exploitation are deployed. Specific instruments are for lunar exploitation and science, which will be controlled and monitored from the ground station on Earth. The defined payload package will cope with different science activities and the preparation of instruments, which will be needed for future exploitation activities.

The paper will describe the Mission Architecture for the small Lunar Lander and the exploitation and science goals of this precursor mission as well as a description of the preparatory program for the development of the critical technologies for the small Lunar Lander and its exploitation elements.