SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

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CAPABILITIES OF A LUNAR LANDER BASED ON ARIANE 5 SHARED LAUNCH OPPORTUNITY

Abstract

The concept of a small Lunar Lander is under on-going investigations since spring 2008 within a Phase A feasibility assessment study under ESA contract. The mission aims at demonstrating key technologies for autonomous and soft precision landing and doing in-situ science, both in preparation for future human and robotic lunar missions.

The technology aspect focuses on preparation, development and validation of descent/landing and touch-down. This includes trajectory optimization for the descent, GNC algorithms and landing legs design. The autonomous approach required for landing and the expected terrain force the development of a Hazard Detection and Avoidance System (HDA) able to identify safe landing sites in reach of the lander.

The science is dedicated to environment and resource characterization as well as fundamental research. The payload is supplemented by technology demonstration experiments for enabling technologies. A rover might be included, in order to provide a local mobility to improve scientific research.

Throughout the Phase A studies 'NEXT-Lunar Lander' and 'Lunar Lander based on Shared-Ariane-5' different mission architectures have been analysed in detail. They lead to different transfer strategies, Lunar Module designs and payload capacities on the Lunar surface driven by different launcher selections and technology limitations. Based on the results of these activities the launcher and staging impacts on the mission can be compared in terms of system design and programmatic aspects all for a launch in the 2018 timeframe.

The currently envisaged landing area is at the lunar South Pole. There is a very rough terrain imposing comparatively high requirements on the GNC and the HDA of the lander and also on its subsystems and components. The legs have to meet the requirements of the touchdown shock but are also in charge to prevent toppling while touching ground. Also the rover needs to be compatible to these environmental challenges, e.g. illumination and ground station contact times.

This presentation/paper will show the latest results of the Lunar Lander mission studies conducted by OHB and the industrial team, highlighting how a mission based on Soyuz differs from a mission compliant to a dual-launch on Ariane 5 below the SYLDA dual-launch adapter. The mission, the lander design and a brief summary on investigated rovers will be discussed, addressing main challenges and specialities of this mission like environmental constraints and their reflection in design and operations.