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LUNAR PROSPECTING AND SCOUTING ROVER (LPSR): A STEPPING STONE TO POST-2030 LARGE LOGISTIC LUNAR ROVER MISSIONS

Abstract

LPSR will implement an end-to-end mid-size lunar rover demonstration mission in 2030. LPSR is a precursor of a subsequent large logistics rover. ESA has selected Space Applications Services to lead the LPSR Phase 1 definition activity with a potential follow-on contract to implement the rover and mission.

The main objective is to establish the design of a mid-size rover platform (350kg with payload) which will be used for the testing and validation of relevant technologies. These technologies will be selected for their relevance and benefit in perspective of the anticipated post-2030 large rover missions. As an initial technology selection, LPSR will include high speed (¿1ms) navigation capability (both locomotion and GNC), Regenerative Fuel Cells System (RFCS) for night survival, a Moonlight / Pathfinder communication module experiment, as well as a robotic manipulation capability and dust mitigation technologies. A share of the rover payload capacity will be assigned to payloads of opportunity (science instruments primarily) and a share of the payload slots will be offered commercially, as a mean to reduce the mission cost.

As the LPSR mission will be launched in 2030, the time for pre-developments will be limited. As a consequence the LPSR rover (with the exception of technology demonstrators introduced above) will be based on components with flight heritage or at least TRL6 maturity. A workshop and RFI campaign will be conducted early in 2025 to identify candidate European technologies for the rover subsystems (hardware and software) as well as ground segment. This will result in a consolidated baseline of preferred equipment and suppliers. Finally, where TRL gaps remain, a selection of prototyping and derisking activities will be conducted as part of the Phase 1.

The outcome of the Phase 1 will serve to inform ESA and European member state representatives and support them in their funding decision for the Phase 2 (B-C-D-E).

This paper will provide details on the LPSR mission architecture, proposed lunar rover concept, selected technology demonstrators as well as prototyping and derisking activities preliminary outcomes.