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Title

EUROHAB: A Secondary Habitat concept for the South Pole of the Moon

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Abstract

The ARTEMIS program was launched by NASA with the intention of sending astronauts back to the Moon and establishing a permanent presence there. The ARTEMIS missions will pave the way for the next big step—the launch of the first humans to Mars—by utilizing the Moon.

Unlike the Apollo missions, ARTEMIS missions are targeting the Lunar south pole because of the Points of Interest such as the presence of water ice in the Permanently Shadowed Regions (PSR) in the craters, Peaks of Eternal Light (PEL) with high solar illumination, and constant contact with Earth. On the lunar surface, a crew can travel two kilometers on foot, ten kilometers in an unpressurized rover, and twelve kilometers in a pressurized rover from the Human Landing System (HLS). Security reasons dictate these distances, enabling the crew to return to the HLS in an emergency.[1] There is a clear gap between the points of interest and the safe landing spots identified in the frame of ARTEMIS program.

A Secondary Habitat such as EUROHAB will close the gap between the safe landing spots and the points of interest. EUROHAB is an inflatable, deployable habitat delivered as a payload of a robotic Lander (such as the ESA Argonaut) to the surface of the Moon. If placed strategically on the Lunar surface, EUROHAB not only will act as an outpost or a base camp to extend the range of exploration but also as a safe haven in case of off-nominal scenarios where the crew needs to take refuge. Additionally, EUROHAB can also serve as a teleoperated science station with experiments running autonomously, a storage place that can be utilized by the next missions, and assist Lunar surface assets like a rover for lunar night survival. Ultimately, a web of EUROHABs can be utilized to cover and connect all the settlements and the In-Sit Resource Utilization activities on the South Pole of the Moon.

The first full-scale prototype was developed in 2021 that was exhibited at International Astronautical Congress in Dubai and was utilized for some simulations like the desert trails in Abu Dhabi in 2022 and at the ESA Rover Challenge in Luxembourg in 2022. A second full-scale functional breadboard is under development that will be used as a technology testbed and for analogue simulations.

The paper elaborates on the EUROHAB concept covering from the concept of operations to the systems to the development plan. Also, it highlights the foreseen use cases for the functional breadboard currently under development.

References

[1] Gawronska A.J. et al. (2020) Geologic context and potential EVA targets at the lunar south pole, Advances in Space Research 66.