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

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HUMAN LUNAR EXPLORATION AT EAC – THE LUNA ANALOGUE FACILITY AND SPACESHIP EAC PROJECT

Abstract

The operational capabilities of the European Astronaut Centre (EAC) in terms of training and support for human spaceflight operations on the ISS are well known. With increasing attention now being given to post-ISS human spaceflight and potential lunar exploration missions, teams at EAC and the broader ESA are collaborating on projects that will leverage the capabilities and experience available at EAC to further these exploration objectives.

Two exploration focused projects underway at EAC are detailed in this paper; the LUNA analogue facility and the Spaceship EAC initiative. The LUNA analogue facility is a large scale regolith test ground area and attendant analogue habitat module. When operational, it will provide the capability to run high-level integrated simulations, combining a habitat, lunar terrain, a Mission Control Centre (MCC) and related communication infrastructure. The planned facility will comprise of a large regolith test bed area located between the existing EAC facility and DLR EnviHab building situated in Cologne, with a half spherical fully enclosing dome structure housing the testbed. The perimeter of the structure is given with a diameter of 34m – the effective surface operations area is projected to be approximately 900m2, inclusive of experiment preparation areas. The testbed will comprise of 600t of lunar regolith simulant sourced from the local Eifel region. The material is shown to be a reasonably close match compositionally to published basaltic Apollo samples, and has been determined to be of sufficient practical fidelity for use in LUNA.

A second exploration initiative at EAC is the "Spaceship EAC", a multidisciplinary innovation-driven team within the centre and beyond which aims to utilise the spaceflight experience of the centre to develop and validate operational concepts and low-TRL-level technologies in support of lunar human exploration scenarios. The individual concept/technology development and demonstration projects within the "Spaceship EAC" initiative are coordinated with ESA centres (mission scenarios, technology roadmaps) and exploit synergies with EAC facilities and operational competencies as well as with the surrounding DLR campus and European research groups. It is envisioned that the Spaceship EAC team will compliment and utilize the LUNA when completed, and support external parties in using the facility.