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LUNAR LAYERED BASE: AN EXPLORATION OF ARCHITECTURAL DIVERSITY WITH A LUNAR LAVA TUBE.

Abstract

The project aims to investigate a permanent expandable lunar base inside a lava tube, that critiques a balance of the scientific requirements against human centric design.

The chosen site is located between the Schomberger and Schomberger (A) craters at the South pole. On the surface, there is a series of exposed impact melts pits, which appear to be connected via a lava tube that runs beneath them. Additionally, the location features nearby permanently shaded regions suitable for in situ resource utilization, exposed areas for energy harvesting, and flat land suitable for landing sites.

The design starts with an unique architectural approach of a layered base allowing for the exploration of multiple levels of protection and therefore variation within spaces, both architecturally and in their function. The layers are fabricated as follows: a small Earth sent module, 3D printed architectural radius, inflatable perimeter, and finally, the lava tube it sits within.

The Earth sent module is at the heart of the plan, where it provides services, waste management, and relevant scientific equipment. It is a unit that can be pre-assembled and shipped directly from the Earth, all within a 7m diameter, dictated by the load limits of near future launchers. This module is then utilized as a platform for our 3D printed zone, acting as a cantilever point where the rest of the inhabitation spaces are printed in a radial form, to create a connected community feel. Thirdly, inflatable layers encase the 3D printed modules to form 'external' spaces, gardens, and cultivation areas functional and useful for the human psyche.

Initially, the base will start with a 'typical' module which is capable of accommodating a crew of four and past their basic needs, and then a future expansion that includes the addition of more modules, eventually allowing for a maximum capacity of 32 thriving individuals, exploring the ideas of connectivity, human physiology and psychology.

In conclusion, from a design point of view, the fundamental principles are to convey 'a home feeling' to those who will occupy the space. Using the 3D printed layer, the proposals also gives the architecture freedom of expression, despite the restrictions dictated by the unfavourable environment. Within these multiple layers one can interact with different unique spaces, views and environments, allowing for the feeling of exploration and variety, thus helping to combat the isolated feeling of the extreme suppressive lunar environment.