

"Lunar Base 1 – Conceptual architectural design studies for a base on the Moon"

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Abstract

Building a base on the Moon will be a complex endeavour based on an international collaboration of spacefaring nations involving different public and private actors. The design and configuration of the base will strongly depend on the contributing parties as well as aims and objectives associated with the mission. For long-term missions, such as a settlement on the Moon, inhabitants will be confronted with harsh environmental, social and psycho-physiological conditions. Far from Earth, the living spaces of a Moon base will be isolated and confined. Living for a long time in such environment puts extra emphasis on the habitability and human factors as critical determinants for the design. The architectural design of a base will have a strong influence on the success of the mission and therefore requires not only a technical expertise of space and civil engineers, but also considerable contributions from architects and other humanities experts in creating liveable spaces. In addition, a permanent base on the Moon will need to become self-sustaining over time. Manufacturing structures in-situ from local resources will decrease the mission costs and will limit the dependability from Earth. Therefore, developing in-situ resource (ISRU) derived manufacturing techniques of habitats become a key element for the establishment of a base.

This paper describes the results of a first conceptual design study done by students of architecture and civil engineering in the framework of a MSc semester project at the University of Stuttgart, Institute of Design and Construction (IEK), with support from the European Space Agency and the Institute of Space Systems (IRS) and the involvement of multidisciplinary and international field experts. The aim of the project was to investigate architectural design solutions for an ISRU derived sustainable lunar base at three different candidate locations, such as Shackleton crater, Schroedinger basin and lava tubes near the equator. In addition, an expansion strategy and incorporation of the possibility for commercial projects and partners had to be part of the design. During the project six different design solutions for a base on the Moon were developed.

lunar base 1

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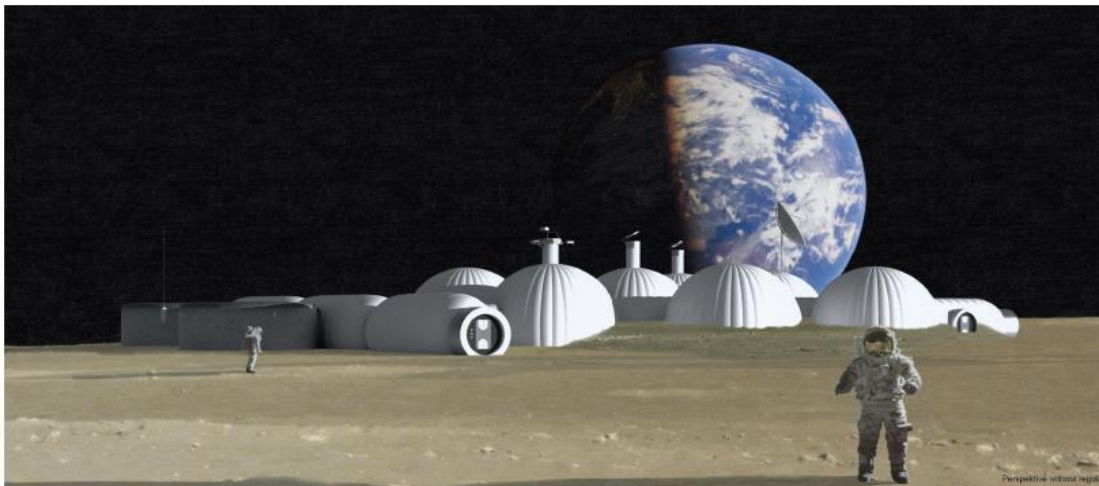


Figure 3 - regolith free view of design solution group B

Short Summary

A conceptual design study was performed as a semester project at the University of Stuttgart, Institute of Design and Construction (IEK). The aim was to investigate architectural designs for an ISRU derived sustainable lunar base. An expansion strategy and incorporation of the possibility for commercial projects and partners had to be part of the design.