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Space Architecture: Habitats, Habitability, and Bases (1)

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LUNARES ANALOG RESEARCH STATION – OVERVIEW OF UPDATED DESIGN AND
RESEARCH POTENTIAL

Abstract

LunAres is an analog research station for manned space mission simulation, located at the post-military airport in Poland. The facility provides full isolation, allowing for complex research on the psychological and physiological impact of long-term extra-terrestrial human presence. The general objective of LunAres is to create a research platform to support scientific and technological development in manned space exploration. The broad range of specialists are involved in the study from fields like extreme medicine, psychology, biotechnology, robotics and engineering, sociology, architecture. The possible observation and control of indoor environment, as well as telemetry of the crews physical and psychological states, provide large quantities of data for complex studies.

LunAres is designed for 6-member crew with the current habitats floorplan spanning 176m² of habitable space and 250m² of indoor Extravehicular Activity (EVA) Area. The habitat is divided into 7 modular containers providing different conditions and functions (Laboratory, Kitchen + Storage (Galley), crew quarters in form of a small capsule hotel, an office with personal workstations, a gym, Workshop, and a Sanitary Module). The modules are connected with a common area in a form of an atrium covered with a dome creating an open, multifunctional space. The concept of functional plan and space dimensions was determined through research on associated literature and existing references. However, since the completion of the first arrangement of habitats structure in 2017 the design developed in terms of both, functionality and equipment. The improvements were implemented based on the feedback from analog astronauts and scientists from carried missions.

This paper will present the decision-making process regarding upgrading the habitat design and research potential. The conclusions and following design updates determined based on the surveys on LunAres facility conducted after carried missions will be included. Detailed drawings regarding architectural and technical solutions as well as future steps will be introduced.