

25th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
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ASCLEPIOS II: SECOND ITERATION OF THE STUDENT-LED ANALOG MISSION SIMULATING
A HUMAN EXPEDITION TO THE LUNAR SOUTH POLE

Abstract

The Asclepios project is a community-based analog space mission program run by an international team of students. Supervised by the eSpace Center, Asclepios provides a platform for simulating space missions, training aspiring astronauts, and conducting cutting edge human spaceflight research.

This paper explores the level to which the mission objectives of Asclepios II, the second mission, were achieved and elaborates on the effectiveness of implementing lessons learned from the previous mission to help to attain the new objectives. Asclepios II, the program's second mission, took place in July 2022 and simulated a short research expedition to the Lunar south pole. Six analog astronauts were isolated in an analog lunar habitat in the Sasso San Gottardo Fortress (Switzerland) for 14 days. Throughout the simulation, the astronauts' primary objective was to conduct experiments investigating methods for

sustainable water extraction from the Lunar surface, as reliable access to water will be essential to the viability of future habitation of the Moon. The secondary objective of the mission was to complete experiments in medicine, engineering, physics, and environmental sciences. All aspects of the simulation were monitored by a Mission Control Center, which was in constant communication with the crew. This allowed for data collection, rapid resolution of problems, and time management. Asclepios II was launched during the final phases of the previous mission, Asclepios I. This allowed for the rapid iteration of mission design, implementing lessons learned from Asclepios I into Asclepios II from the beginning of the design process.

During the Post Mission Review of Asclepios I, successes and failures of mission design and development were assessed to determine how the next mission could be improved. These lessons learned are described in this paper. Key aspects included the improvement of simulation realism as well as designing a more functional and natural organizational structure for both the team members and the astronauts. Furthermore, new strategies were established to improve the efficacy of Asclepios as an organization. An improved internal communication architecture was implemented between the operational teams and the mission management. To increase cultural and disciplinary diversity, collaboration with international space-related organizations was a primary goal for Asclepios II. Asclepios I and II's outcomes demonstrated that students could plan and conduct successful analog space missions while providing a low-cost, low-risk entry point for scientists and engineers to test technologies, validate operations and procedures under more authentic, mission-like conditions.