

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

Author: Ms. Elfie Roy

Space Engineering Center (eSpace), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland,
elfie.roy@alumni.epfl.ch

Ms. Chloé Carrière

Space Innovation, Swiss Federal Institute of Technology in Lausanne, Switzerland, chlocarriere@gmail.com

Mr. Kevin Pahud

Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, kevin.pahud@epfl.ch

Mr. Benoit Cornet

Space Engineering Center (eSpace), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland,
benoit.cornet@epfl.ch

Mr. Theodore Bellwald

Space Engineering Center (eSpace), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland,
theodore.bellwald@epfl.ch

Mr. Léonard Freyssinet

Space Engineering Center (eSpace), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland,
leonard.freyssinet@epfl.ch

Mr. Marcellin Feasson

Space Engineering Center (eSpace), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland,
feasson.marcellin@gmail.com

Prof. Jean-Paul Kneib

Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, jean-paul.kneib@epfl.ch

ASCLEPIOS, LUNAR ANALOG MISSION: STUDENT-LED SCIENCE RESEARCH PLATFORM FOR
HUMAN SPACEFLIGHT SIMULATION**Abstract**

A crewed mission to the surface of Earth's natural satellite is an extremely challenging endeavor, especially with the objective of building a permanent settlement. Therefore, it is essential to develop and test the technologies and mission operations on ground in the most effective and realistic way. This is the purpose of analog missions and it is in this context that Asclepios was created, providing an international and interdisciplinary platform, run by 60 students, to allow scientists, researchers, students, and individuals from private and public institutions to put their payloads and technology to the test in realistic mission conditions.

Asclepios consisted in isolating 6 analog astronauts, all students, during 9 days in a base in the Swiss Alps to simulate what life will be like in a lunar base and perform the provided experiments. They had to communicate and broadcast the results remotely with a five seconds delay in the communications with the Mission Control Center and simulated communication issues, which enabled to realize the logistic difficulties behind a human spaceflight.

The 15 experiments conducted on the platform span over many scientific fields, thus addressing issues faced during a space mission. Examples include the development of a method to reduce the perchlorate content in Martian soil by 90% and the remote operation of a water ice mining system for the Moon

and Mars. Protocols to install seismometers on the Moon surface were also tested while performing simulated Extra-Vehicular Activities, along with the creation of a precise map of the surroundings of the base through the test of a new geomorphological mapping method.

Researchers have also been able to delve into several aspects of human factor studies. From validating NASA psychological standards to measuring stress, reactivity and fatigue; psychological and physiological data were collected to better understand how highly demanding missions have an impact on the physical and mental health of astronauts.

Asclepios is the first of a set of student-led analog missions intended to develop, test, and improve technologies and procedures required in upcoming crewed missions. It is a way to bring students, scientists and industry professionals together to tackle some of the scientific and technological challenges intrinsic to space exploration.