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

Author: Mr. Marcellin Feasson

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

Ms. Chloé Carrière

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

Ms. Elfie Roy

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

Mr. Matthieu Leydier

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

Mr. Louis Kunz

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

Mr. Léonard Freyssinet

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

Ms. Anne-Marlene Rüede

Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, anne-marlene.ruede@epfl.ch Prof. Jean-Paul Kneib

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

## ASCLEPIOS, LUNAR ANALOG MISSION: SCIENCE RESEARCH PLATFORM FOR HUMAN SPACE FLIGHT SIMULATION

## Abstract

Although already accomplished in the past, a crewed mission to Earth's satellite remains an extremely challenging endeavor, especially in the objective of building a permanent base. Therefore, it is inevitable to test and develop as much as possible the technologies on ground in the most realistic way, and that is the purpose of analog missions. It is in this context that Asclepios was created, providing an interdisciplinary platform to allow researchers to conduct their experiments in-situ.

Asclepios consisted in isolating analog astronauts during 7 days to perform the provided experiments, communicating and broadcasting the results remotely with simulated communication issues as it would be on the real celestial body.

The simulation of the environment has been successful: the crew was isolated in the mountains with a delay in the communications with the Mission Control Center, which enabled to realize the logistic difficulty behind a human flight. Among the 14 different experiments tested on the platform, an emphasis was made on food production and consumption, like the development of a method that reduces the perchlorate content of the Martian soil by 90%, the test of an automatic aeroponic garden, or the impact of a plant-based diet on the crew. The remote production of other resources has been tested: water, but also liquid hydrocarbon fuels. Some researchers have been able to delve into several aspects of human factor studies: from NASA psychological standards to interactions in stressful situations. Asclepios also enabled to practice in-situ data analysis by the crew, using measurements from a radio-astronomy antenna built on site and from the InSight probe on Mars.

As an analog lunar mission, Asclepios enables innovative techniques and experiments to be tested in a simulated environment and technical conditions close to those of a real space mission. It is a way to bring together science and technology challenges intrinsic to the Moon exploration, and to try to address them on Earth as realistically as possible.