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

Author: Ms. Nityaporn Sirikan
European Space Agency (ESA), The Netherlands

Prof. Bernard Foing
ESA/ESTEC, ILEWG & VU Amsterdam, The Netherlands
Dr. Michaela Musilova
Slovak Organisation for Space Activities (SOSA), Slovak Republic
Ms. Annelotte Weert
VU University Amsterdam, The Netherlands
Mr. Benjamin Pothier
Plymouth University, France
Mr. Joshua Burstein
United States
Mr. Sebastian Mulder
VU University Amsterdam, The Netherlands
Mr. Andrew Cox
International MoonBase Alliance, United States
Mr. Henk Rogers
International MoonBase Alliance, United States

EUROMOONMARS IMA HI-SEAS 2019 CAMPAIGN: AN ENGINEERING PERSPECTIVE ON A MOON BASE

Abstract

The EuroMoonMars IMA HI-SEAS 2019 campaign is an initiative led by the International Lunar Exploration Working Group (ILEWG) of the European Space Agency (ESA), in collaboration with the International MoonBase Alliance (IMA) and Vrije Universiteit Amsterdam. The purpose of this field research campaign is to conduct scientific experiments and test technological instruments relevant for human space missions. The team consists of six crewmembers based at Hawaii Space Exploration Analog and Simulation (HI-SEAS) habitat with support from the Mission Control Centre (MCC) based at the Blue Planet Research Lab in Hawaii and remote support based at Vrije Universiteit Amsterdam. The campaign is simulating a Moon mission for a duration of two weeks from 20 February to 6 March 2019.

The crew's research includes geological and drone surveys, lava tube exploration and space technology testing. This paper will provide details on the activities, challenges and lessons learned from an engineering perspective during the two-week Moon simulation and isolation mission at the HI-SEAS habitat. HI-SEAS is located in an isolated environment on the slopes of the Mauna Loa volcano on the Big Island of Hawaii. The area has Moon and Mars-like geological features and an elevation of approximately 2,500 metres (8,200 feet) above sea level.

The technological research includes testing of analogue Extra Vehicular Activity (EVA) space suits and life support system; HI-SEAS habitat design, operations and maintenance; network communication systems and data exchange; protocols for voice communications and operations. For these activities, it is essential to have at least one crewmember serving as an engineer with strong analytical, troubleshooting and hands-on technical skills. The engineer crew is responsible to ensure nominal operations and main-

tenance of the EVA equipment (EVA suits, life support system, communication network and devices; the habitat equipment (power system, solar panel, inverters, battery, generators, weather station, surveillance system, heating system and network communication systems). The engineer crew checks the status of the EVA equipment prior to and after each EVA as well as gathering feedback from the EVA team. Daily Engineering Report is prepared and provided to the MCC with a summary of engineering specific activities, status of equipment, recommendations for improvement and any requests for further support from the MCC Engineering Support Team.

The research and technological experiments conducted at HI-SEAS will be used to improve the habitat in order to build a Moon base in Hawaii and ultimately to create an actual moon base on the Moon.