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Author: Mr. Marc Heemskerk
Vrije Universiteit Amsterdam, The Netherlands

Mrs. Charlotte Pouwels
ILEWG "EuroMoonMars", The Netherlands
Prof. Bernard Foing
ILEWG "EuroMoonMars", The Netherlands
Mr. Maneesh Kumar Verma
Delft University of Technology (TU Delft), The Netherlands, The Netherlands
Ms. Benedetta Margrethe Cattani
European Space Agency (ESA), Germany
Mr. Stijn Rovers
The Netherlands
Mr. Christian Cardinaux
Western Switzerland University of Applied Sciences - HEIG-VD, Switzerland
Mr. Manohar Joel Mura
ILEWG "EuroMoonMars", United Kingdom
Mr. Mohamad Wahidi
France
Mr. David Smith
ILEWG "EuroMoonMars", United Kingdom
Mr. Sebasthian Alejandro Ogalde Castro
ILEWG "EuroMoonMars", Italy

ROBOT-HUMAN EXPLORATION AND INTERFACES DURING THE CHILL-ICE ANALOGUE LUNAR MISSION CAMPAIGN

Abstract

The CHILL-ICE (Construction of a Habitat Inside a Lunar-analogue Lava tube - Iceland Campaign of EuroMoonMars) analogue mission campaign is a student and young professionals project by EuroMoonMars / ILEWG. The mission revolves around two short analogue astronaut missions of 48 hours each. These analogue missions will focus on the in-simulation construction of a small habitat designed and prototyped by students from the Wilson School of Design from Kwantlen Polytechnic University, inside a lava tube on Iceland. The three-person analogue astronaut crews largely consist of students who will be trained by CHILL-ICE partners in medical, psychological, and geological fields before the mission commences. To ensure a high-fidelity of the mission, no communication with Mission Control will be possible until after a successful deployment of the system, there is an 8-hour time limit for habitat deployment, and the analogue astronauts will be wearing field-tested astronaut suits from Astroland Interplanetary Agency.

After initial habitat, power supply-, and communication systems deployment, the analogue astronauts will explore the lava tubes of the Hallmundarhraun lava field, where the habitat will be located in, during research Extra-Vehicular Activities (EVAs). One of the partners of CHILL-ICE in these lunar-analogue

field tests, is the Lunar Zebro team from the TU Delft. Lunar Zebro is a small robot with a unique six-legged type of locomotion, designed to explore the lunar surface by on-ground imaging over the course of a lunar day. In the future, swarms of these rovers might be able to enter a lunar lava tube for the first time and map the insides, prospecting the suitability for human settlement. During the CHILL-ICE campaign, the effectiveness of robotic exploration of lava tubes versus human exploration will be tested.

Another robotic contribution is from students of the Ruhr-University of Bochum, which will focus on the assessment of the mental wellbeing of the astronauts before, during and after the mission, using NAO-robots. The humanoid NAO-robot can replicate human behavior within certain limits. NAO is also capable of processing video and audio data. Speech recognition, natural language processing, and face recognition technology can be used to assess the tasks such robot could play as part of a human crew or as an extension of the habitat in social exchange with the analog astronauts. Testing for crew reactions to and interactions with the NAO will give further insight into habitat interface design and human-machine interaction during analogue missions.