Challenges of Life Support/Medical Support for Human Missions (8)
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MEDICAL RESOURCE LIMITATIONS AND SOLUTIONS FOR HUMAN SPACE FLIGHT LESSONS LEARNT FROM TERRESTRIAL SPACE ANALOG MISSIONS

Abstract

Evaluating human physiology through terrestrial analog missions is part of the global space exploration roadmap to the Moon and Mars. Terrestrial space analog missions exemplified by the seven Austrian Space Forum missions test proof of concepts for new technologies, procedures and operations prior to a human space flight mission.

In February 2018, the Austrian Space Forum conducted such an analog mission in the isolation of the deserts of the Dhofar region, in the sultanate of Oman. 15 individuals from across 9 European countries made up the group deployed to the field, supported by a team in the Mission Support Centre (MSC) located in Innsbruck, Austria.

Analog Astronauts were selected and trained to perform a peer-reviewed battery of experiments during simulated Extravehicular Activities (EVAs). EVA suits were designed to simulate the pressure, movement range, dexterity and sensory deprivation in hypo-gravity. This space analog environment required specific occupational considerations, such as local poisonous animals, heat and dust, as well as providing real life medical response in an austere and remote location.

From a medical point of view, the mission posed many challenges in terms of capabilities, particularly with monitoring and communications to the MSC having a 20-minute time delay (Figure 1), that impacted on the biopsychosocial elements of health. Pre-mission, potential resources were extrapolated from anticipated risks.

On site, there were limited resources and there was a mismatch between expected and actual resources (Figure 2), some of which could be replaced using ISRU techniques for future missions. During the simulation, three experiments were relevant for Biomedical ISRU – working towards autonomous communities to populate a Lunar or Martian habitat. These ISRU experiments included a 3D printer (ADAPT 3D), a geo-node water recognition experiment (Water Explorer) and a greenhouse to cultivate rocket (Hortextreme). These experimental techniques enabled self-sufficiency of the crew to a certain extent, however medical requirements were not wholly fulfilled. For example, the generation of Oxygen and high pressure oxygen to treat medical emergencies as a first line treatment intervention. This paper will evaluate the

current applications of ISRU to deliver optimised medical care and identify gaps that need further research prior to journeying to Israel for Amadee 20202, Moon and Mars.