

Ground-Based Preparatory Activities (11)
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PHYSIOLOGICAL AND INVENTORY DATA OF CREWS OF ARES-III AND LEARN ANALOG
MISSIONS IN THE LUNARES HABITAT

Abstract

Analog missions offer a comparatively safe and focused alternative to real human spaceflight missions, thus offering a test and discovery environment for many aspects of future crewed missions to space. In addition, the controlled and often isolated conditions allow to consistently collect a large number of data that reflect the circumstances and constraints of the analog mission. This paper is a report of the environmental and physiological data from two analog missions that occurred during the summer of 2018 - a Mars analog mission Ares-III and a Lunar analog mission LEARN, both conducted in the same isolated habitat : the Lunares Research Base based in Piła, Poland. Each mission was two weeks long and performed in full isolation from the outside world, with finite inventory of food and drinking water. Both crews used the same format to track a variety of data categories, consistently doubling the volume of available data. Categories of data collected included nutritional data and daily measurements of physiological and medical data (weight, heart rate, blood pressure, sleep duration and quality) both in the morning and in the evening. The outcomes of daily physical exercise were also collected, including calories burned by running, yoga and strength exercises respectively. Both missions worked with a custom spreadsheet to track their per-crew member food consumption in relation to the mission inventory. This tool also includes automatic calculation of nutrients consumed for each crew member and compares it to the calories burned during the day, thus providing a daily insight into the caloric balance of the crew. Water consumed and expelled was recorded, as well as waste water used for cleaning, personal hygiene and work in the biolab. The consistency of the database thus allows to analyse the data as a whole for both missions, or to compare the effects of aspects differing between the two missions on other human factors. Examples of these include the differences in diets, since LEARN mission provided purely lyophilised food, while ARES-III crew consumed a combination of conventional meals and lyophilised food, or the difference in crew composition, as ARES-III had a crew larger by one member. For the LEARN mission, audiometry data collected several times across the mission are also provided. Included is also a brief comparison with relevant data from the International Space Station.