IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (IPB)

Author: Mr. Diego Ernesto Cortes Guaje
Colombia, DIEGO.CORTESG@fac.mil.co

Dr. Diego Malpica
Colombian Air Force, Colombia, dlmalpica@me.com
Dr. Agata Kolodziejczyk
Analog Astronaut Training Center, Poland, fichbio@gmail.com
Dr. Jorge Giovanni Jiménez Sánchez
Colombian Air Force, Colombia, giovannijimenez2002@gmail.com
Mr. Joseph Nestor David Sequeda Ramon
Colombian Air Force, Colombia, joseph.sequeda@fac.mil.co
Mr. Cristhian Campos
Colombia, CRISTHIAN.CAMPOS@fac.mil.co
Mrs. Ingrid Xiomara Bejarano Cifuentes
Colombian Air Force, Colombia, ingrid.bejarano@fac.mil.co
Mr. Matt Harasymczuk
Analog Astronaut Training Center, Poland, matt@astronaut.center

ASTRONAUT TRAINING AND ANALYSIS ON HUMAN PERFORMANCE
DURING THOR SPACE ANALOG SIMULATION

Abstract

Many analog astronaut crews from different countries have conducted space mission campaigns during isolation and confinement to conduct science, technology, engineering, and physiology experiments in a simulated scenario for the advancement of science and to prepare for the demanding and dynamic environment of space travel.

The THOR mission will take place in August 2022 and the crew will be supported by mission control, this exercise will be conducted during a seven-day isolation and confinement period that will promote the development of cognitive, physiology and technology applications to extend the crew's capabilities, skills and scientific abilities related to space science. The THOR mission has a crew of five analog astronauts with specific roles based on their expertise and background. The composition of the team is as follows: commander and communication officer (D. Cortes), space engineer (X. Bejarano), biomedical engineer (C. Campos), data officer (J. Sequeda), and crew medical officer (D. Malpica). During the assignment period, a series of sensory-motor speed, spatial learning, working memory, abstraction, concept formation, spatial orientation, emotion identification, abstract reasoning, risk decision making, vigilant attention, team dynamics, sleep quality, quantity, and fatigue scores, indirect VO2, R-R interval, activity via wrist actigraphy and anthropometrics. Psychomotor vigilance and time perception will be measured simulating a short Lunar surface mission and critical tasks in the habitat will be observed using NASA-TLX and the effect of cryotherapy on these variables. Baseline tests will be performed before, during and after the isolation and confinement assignment. At the same time, the team will be developing a portable low power consumption environmental monitor to gather temperature, barometric pressure and relative humidity using open source and develop the software code to save and correlate exposure with physiological parameter, likewise, in a second experiment, a camera will be used to capture the facial expression of

the crew members and using an artificial intelligence model to identify the current emotional status and further correlate it with physiological data. The third experiment consists of assembling a rover equipped with a robotic arm for the collection of samples and objects implementing electronic components that will be used to assist analog astronauts in extravehicular activities. The fourth experiment involves the use of an altitude training mask during aerobic and anaerobic exercise to measure its impact on heart rate, SpO2, calculated VO2 max, perceived exertion via the Borg scale and during bed rest with a six-degree head-down tilt and the last experiment consists of carrying out a validated written test to identify the predominant autonomic nervous system tone in crew members during the mission to better characterize the stress response. The results obtained during the mission will extend our scientific understanding and the effects of isolation in a space analog habitat.