Paper ID: 63211
student

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medicine in Space and Extreme Environments (4)

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CAVE DIVING AS AN APPROPRIATE HIGH-FIDELITY ANALOG TO STUDY BEHAVIOURAL HEALTH IN SPACE

Abstract

Aquanauta.space is a project aiming to answer if cave diving could be regarded as high-fidelity analog t space exploration. The project studies the adverse effects of isolation, confinement, darkness, extreme environments, threat among cave divers working in underwater caves and mines.

Our rationale to organise such high fidelity mission simulations are: The findings, particularly the behavioural findings, obtained from low and mid-fidelity space analogies and simulations may not be reliable and valid, and skills and knowledge learned from these contexts may not be transferable to real manned space missions. Further, astronauts regularly train as divers in large artificial pools, where they can explore the effects of microgravity and practice specific protocols and skills later carried out or used on the International Space Station. Astronauts also often train together in caves in order to get used to confined and isolated contexts and preparing for missions in the Moon's lava tubes. Despite significant efforts to understand, human factors in extreme contexts remain understudied and are usually mitigated with meticulous sampling and training processes. In the not too far future, human space exploration will impose new needs where the human factors may not be "factored out" so easily.

In our missions, crews of four to six cave divers, or 'aquanautas' live in a camp/habitat underground that is connected to a diverse tunnel system completely underwater. In our work, we focus on the effects isolation, confinement, darkness, and microgravity on humans, and to understand how the systems and solutions we design may benefit teams in conducting meaningful work in these extreme environments.