

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support, habitats and EVA Systems (7)

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A PROPOSED LIFE SUPPORT SYSTEM FOR SPACE TRAVEL

Abstract

The human journey to the Moon, Mars, and beyond is fraught with dangers including radiation, microgravity, and psychological stressors. Research conducted by our group has focused on numerous aspects of space travel, with a special emphasis on circadian rhythms and thermoregulation. With partners such as the Technical University of Berlin, Airbus, and other work groups of Charité University Berlin, we are currently working on the concept of a modularized life support system for humans in future long-term space missions.

Our vision is a private capsule for every astronaut that modulates the various physiological systems of the human body while also catering to the mind of the passenger with an emphasis on reducing physical and psychological stress during the missions. This aim goes hand in hand with improving sleep quality and extending sleep duration and thereby the circadian rhythm, creating a short "hibernation" effect. Based on the knowledge that physical reparations and antioxidant levels are dependent on sleep and the circadian rhythm we plan to modify sleep phases and onset using different techniques including medication, CO₂ training, light stimulation and thermic stimulation. This concept is based on technologies and experiments in system biology, molecular modelling, classical physiology and clinical research on hypothermia. The capsule itself will contain the described means for stress reduction, but it will also be the travellers' tiny private area with their own communication system, and their private virtual entertainment area designed following the latest design of modern aircraft interior. We present our preliminary experiments and findings and our aims for the future. Moreover, we present our first draft of this integrated system capsule in cooperation with Airbus Defence and Space.