

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

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ASTRONAUT'S HEALTH AND WELL-BEING ON LONG TERM MISSIONS TO MOON AND MARS -  
TECHNOLOGY, CONCEPTS AND CLOSED LOOP AUTOMATION

**Abstract**

Three years ago, we envisioned providing every astronaut with a private capsule that could regulate their physiological systems and cater to their mental well-being, with a focus on reducing physical and psychological stress during missions. To achieve this, we collaborated with Airbus Defence and Space to develop models based on physiological measurements and the needs of long-term space travel.

One of our key considerations was the limited space available on a spaceship, which had to provide privacy and quietness while also allowing for teamwork and crew meetings. To address this, we developed methods to improve sleep quality and duration, which could create a short "hibernation" effect and positively impact physical repairs and antioxidant levels. These methods incorporated known physiological effects, such as medication, CO<sub>2</sub> levels, light stimulation, and thermic stimulation, drawing on our expertise in system biology, molecular modelling, classical physiology, and clinical research on hypothermia.

We integrated these concepts into the structural design of the space traveler's habitat, which had to serve as a training instrument, provide artificial gravity, and be a pleasant living space. The personal area would feature an automated system to train the astronaut's body and mind, reduce daily stress, and include a communication system and private virtual entertainment area, similar to the latest modern aircraft interiors.

We plan to present preliminary tests on physiological experiments, sensor miniaturization, and earlier and latest construction plans for this habitat, as well as our future goals for collaboration with Airbus Defence and Space.