

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)

Human and Robotic Partnerships in Exploration - Joint session of the IAF Human Spaceflight and IAF
Exploration Symposia (6-A5.3)

Author: Dr. Christiane Heinicke

ZARM, University of Bremen, Germany, christiane.heinicke@zarm.uni-bremen.de

Mr. Saurabh Band

University of Bremen, Germany, saurabhband2905@gmail.com

Ms. Ksenia Appalganc

University of Bremen, Germany, appalganc@uni-bremen.de

Mr. Paul Große Maestrup

University of Bremen, Germany, p.grosse-maestrup@tu-braunschweig.de

Prof. Vera Hagemann

University of Bremen, Germany, vhagemann@uni-bremen.de

Prof. Anna Förster

University of Bremen, Germany, anna.foerster@uni-bremen.de

THE “LIVING” HABITAT: INTERACTION BETWEEN LIFE SUPPORT SYSTEM, SENSOR
NETWORKS AND HUMAN INHABITANTS

Abstract

Living inside a habitat on Mars will be an unprecedented psychological challenge, imposed by the isolation from other human beings and the nearly uninterrupted confinement. The environment outside the habitat is lethal for humans, meaning that inhabitants must entrust their lives to the habitat and, more specifically, to the life support system (LSS) of the habitat. This trust will be influenced greatly by how well the human crew can understand and control the LSS. Our long-term vision is to develop and investigate human-centered habitat technologies such that they, together with the human crew, form a union that will result in a safe and overall successful stay on Mars.

Here, we present our progress in integrating an LSS component into the habitat as part of this vision. Our use case is a photobioreactor (PBR) as the air revitalization component of an LSS, to be integrated into the MaMBA habitat laboratory at the ZARM, University of Bremen. Our approach is cross-disciplinary: we combine aerospace and electrical engineering with psychology to create a prolific union between the PBR, the human inhabitants, and the interface that enables the two to interact.

To this end, we are developing situationally aware and interactive sensor networks that will be instrumental for the crew in monitoring the PBR. Since both the PBR and the sensor network will actively respond to crew input, we consider them part of the “living habitat”. From a psychological perspective, we investigate the living habitat and the crew as members of the same human-agent team.