

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
Enablers for the Future Human Missions (7)

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RESEARCH OF HUMAN FACTORS FOR SPACE EXPLORATION

Abstract

In 2001, when ESA received the mandate to prepare for future human space exploration missions beyond the ISS, it became clear that research in various areas need to be performed in order to answer questions related to how to maintain health and performance of astronauts in extended deep space missions and on planetary surfaces. During these missions, astronauts will have to cope with long duration in a weightless environment (e.g. min 6-8 months cruise phase to Mars) and to withstand challenging conditions ranging from living in a isolated and confined environment to operating on a planetary surface. To enable these future missions and reduce risks, we need to improve our knowledge of the impacts on the astronauts' health of these harsh conditions, to identify appropriate countermeasures to mitigate all possible negative effects and to prepare adequately the astronauts through specific training in analogue environments. Consequently bed rest studies were restructured to take into account this new driver by implementing a stronger focus on countermeasure evaluation and by developing a more strategic approach for the organisation of such studies. For parabolic flights, recently a first set of experiments have been selected for partial-g parabolas e.g. with lunar and Martian gravity. The Antarctic station Concordia is a unique analogue for space exploration missions. ESA has been cooperating with the operators of Concordia on issues like operational validation of technologies, medical monitoring as well as physiological and psychological research, in 2010 there was a selection of new experiments for Concordia. The well known Mars500 mission simulation started in June 2010, with two European crewmembers and a set of ESA selected experiments. Mars500 has passed the mid-point of the simulation and the perspectives for a successful conclusion of this challenging project looks very promising. For the crucial topic of space radiation protection, a programme focussing on Investigations into Biological Effects of Radiation (IBER) was initiated through a cooperation with the accelerator facility of the "Gesellschaft für Schwerionenforschung (GSI)" in Darmstadt, Germany. A second batch of experiments are currently under review and selection. In addition to these ground based settings the International Space Station is being considered as a highly representative analogue in space for the transit phase of an exploration class mission. With some changes in ISS operations and an international coordinated effort it would be possible to simulate challenges unique for deep space missions with a very high fidelity.