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Life support Challenges for Human Space Exploration (10)
Supporting Crews for Exploration Missions (2)

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THE MARS-500 PSYCHOLOGICAL CREW SUPPORT PROGRAMME

Abstract

ESA, as many other stakeholders in space activities, is preparing for future Human Exploration missions. Making sure that astronauts are mentally and physically fit for the demands of exploration missions is imperative for mission success. The Mars-500 project, undertaken jointly with the Institute for Biomedical Problems (IBMP) in Moscow, is part of ESA's effort to prepare for human space missions beyond Low Earth Orbit. The full 520-day Mars mission simulation with an international crew of 3 Russians, 1 Chinese, 2 Europeans (French, Italian) from ESA has been implemented in a simulation facility at IBMP between June 2010 and November 2011. It included the simulation of a 245-day journey to Mars, 30 days of "Mars surface activities" with 3 EVAs and a 245-day return transfer to Earth. The crew was faced with an environment and constraints as close to a realistic Mars mission as possible, such as limited volume and privacy, no real-time communication with mission control, limited resources and the need for full crew autonomy. At the same time they have been performing an extensive science programme covering a wide range of scientific and technological topics. Some of the main psychological challenges in such a mission scenario are physical, communicative and emotional isolation from the outside world, sensory deprivation and limited social contacts, cultural differences and potential incompatibilities of crew members from different countries, permanent awareness about the need for full crew autonomy also in emergency situations and continuous exposure to a hazardous environment. The maintenance of mental crew health can only be achieved through a comprehensive psychological support programme consisting of measures to efficiently counteract the negative effects of the constraining mission environment. The Mars-500 project provided a unique opportunity to elaborate and test new long-duration human mission operations concepts and procedures. These differ from the established approach presently implemented for ISS, specifically in the area of psychological crew support. This paper will provide an overview of the constraints which potentially will impact psychological crew health in future interplanetary missions in general and the Mars-500 mission in particular. The psychological support programme implemented during the Mars-500 mission will be described and some of the results in terms of efficiency of the psychological countermeasures will be discussed. Finally a detailed analysis of private crew communication with the "outside world" will be presented with some basic indication in terms of private crew communication requirements for future human exploration missions.