

HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Astronaut Training, Accommodation, and Operations in Space (5)

Author: Dr. Igor G. Sokhin
Yu.A. Gagarin Research and Test Cosmonaut Training Center, Russian Federation

Dr. Andrey Kuritsin
Gagarin Cosmonaut Training Center, Russian Federation
Mr. Yuri Lonchakov
Gagarin Cosmonaut Training Center, Russian Federation
Dr. Valeriy Sivolap
Russian Federation

ISSUES OF CREW TRAINING FOR INTERPLANETARY MISSIONS

Abstract

The paper studies the problems of making a crew training system for future long-duration deep-space missions that are related to the risk of crew performance errors due to training deficiencies. Crew performance errors are an essential factor of loss in safety of space missions. One of the error causes is an inadequate ground-based and on-board training of crew. The existing paradigm of crew training is based on the established doctrine of flight control of low-earth orbit manned space vehicles. According to this doctrine the negative factors of astronaut performance errors are mitigated by the way of permanent monitoring and support of their activity by ground control personnel in real-time. During interplanetary missions beyond Earth orbit, including missions to the Moon, Mars and asteroids, an essential time delay of a radio signal from the board of a spacecraft and back as well as the loss of communication with a crew for a long time (from several hours to some days) due to failure of communication channels can take place. In this case, the execution of a mission plan and ensuring of safety in off-nominal situations should be entrusted to a crew in an autonomous mode, under conditions of uncertainty and limited operational support from Earth. The quality of ground and on-board training of crews plays a crucial role for ensuring their dependable and safe performance in the face of high autonomy. It is necessary to change the paradigm of crew training. Competence-based training must replace task-based rehearsal to support the ability to deal with unexpected, untrained tasks and opportunities. Crew training should be directed towards a quantitative control of their knowledge and competences in the context of autonomous activity under conditions of uncertainty. The paper presents a number of problems that should be resolved in order to create an efficient system of crew training to decrease likelihood of errors in interplanetary space missions. Also several decisions of the problems are considered in principle.