SPACE LIFE SCIENCES SYMPOSIUM (A1)
The International Space Station in LEO and the Deep Space Habitat in Cis Lunar Space as platforms for simulated Mars voyages (4)

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EXTREMELY LONG SPACE MISSIONS: EXPERIENCE AND PERSPECTIVES OF THEIR TESTING IN MODEL EXPERIMENTS

Abstract

Since 1961, when first 108-minute space flight of Yury A. Gagarin was made, duration foR the flights has been gradually increasing. Ground-based experiments such as dry immersion, antiorthostatic hypokinesia, isolation allow simulating variety of microgravity effects. The most interesting in this regard is Russian experience in model experiments conduction with record durations such as dry immersion experiment of 56 days, antiorthostatic hypokinesia experiment of 370 days, isolation experiment with duration of 520 days, which simulated an interplanetary mission to Mars. The knowledge, accumulated in model ground experiments, allowed increasing gradually duration of orbital flights and making the duration requirements close to the ones, which will be used in interplanetary missions with an appropriate level of health maintenance and working capacity of cosmonauts. As a result, at present 7 Russian cosmonauts have already performed extremely long space flights with the duration from 312 up to 438 days. The success of these missions was provided by knowledge mostly accumulated in preliminary model experiments. The advantages of ground space flight experiments should be considered the folloeing: - Possibility of new methods and equipment preliminary testing; - Usage of wider, taking into account existing requirements on board, spectrum of scientific equipment; - Wider in comparison with an actual flight statistical sampling. Currently, IBMP RAS has begun preparation for conduction of series of international isolation experiments to solve psychological and physiological problems of long-term space flights. In scales of the project, which will be conducted from 2017 till 2021, several isolation studies with increasing length of stay of subjects in the ground experimental facility of IBMP will be carried out. It is planned to conduct three main experiments with increasing duration of isolation: the first experiment of four months, the second one of eight months, the third one of twelve months. Before the main series of the experiments short-term test missions with the duration of 2-3 weeks are planned for preliminary data collection. 6 persons aged 30-55 years will participate each isolation mission of the experiment. It is planned to create mixed-gender crews of international composition. The aim of the planned isolation experiments is modeling of significant events during the long stay of cosmonauts on the space station and on the surface of the planet after landing.