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ROLE OF SUPERLONG SPACE FLIGHTS (SF) IN THE DEVELOPMENT OF COUNTERMEASURES

Abstract

Increasing the length of piloted SF is bounded indissolubly to the progress of countermeasures for negative effects of SF factors on the physiological functions of the body. The superlong real and simulated flights play an important role in the development of the countermeasure's system, revealing its weak points and defining its efficacy. Thus the Russian countermeasures system, that is used in SF on ISS, is based on the results of two experiments with a year long exposures to microgravity – onground bed rest (BR) and SF provided in 1998. In BR there were compared the efficacy of a number of regimens of physical exercises (PhE) including the regimen of restoration of the physical performance (PhP) under conditions of continued exposure to microgravity. There were obtained as well answers to a number important questions concerning monitoring the efficacy of PhE and cosmonauts' state during flight, opportunities and effects of a combination of different countermeasures methods and others. Inferences and conclusions of the experiments were confirmed in the practice of a year long flight and the following long term SFs on "Mir" Station including 14-months' flight of V.V. Polyakoff, and also in ISS SFs. Thus in ISS flights 3 Russian crew members were depleted of possibilities to run on treadmill TVIS due to its failure for a time interval up to 42 days. Use of the restoring regimens, that were elaborated in year long BR, allowed them to reestablish the PhP and the abilities to return to the board protocols of the PhE without short cutting the flight.

The year long flight on ISS is planned to start a new stage of researches and elaborations, directed to the realization of the future superlong SF and to obtaining answers to the new questions, important for accomplishment of task. In the program of this flight there are included a number of experiments "Motocard", "Sprint", "Efficacy" and "Field test", dedicated to the development of the countermeasures system. The most important of them – "Field test", dedicated to study the first time in the practice of long term SFs the physical and functional performance of crew members immediately after loading using the battery of comparably simple contemporary technological methods. The results of these studies are expected to answer the questions about efficacy and specific influences of regimens of PhE that are used differently on ISS by Russian and American teams.