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IMITATION TASKS OF SPACECRAFT MANUAL CONTROL AND COSMONAUT'S PSYCHOPHYSIOLOGICAL PARAMETERS IN THE SPACE EXPERIMENT "PILOT-T"

Abstract

The space experiment Pilot-T, launched on the RS ISS in July 2014, is a logical continuation of the experimental series Pilot from 1987. The purpose of the space experiment Pilot-T is the enhancement of methods and hardware of assessing of the cosmonaut's professional activity at various stages of long space flight (LSF). The basic hypothesis is that professional reliability is the correlation measure of activity indicators and functional state of the central nervous system. Whereas psychophysiological reactions are the indicators of the complex reaction - the psychophysiological "price" of activity. It is possible to assess the quality of the professional activity of an astronaut under the conditions of the LSF with the help of adequate models, such as piloting a spacecraft and docking it with another spacecraft. To assess the functional state of the operator, his individual psycho-physiological characteristics, as well as to identify the mechanisms of cognitive processes of maintaining and optimizing skills in the performance of professional activities, an analysis of a set of indicators using polygraphic methods is widely used. Among them, electrocardiography, registration of electrocutaneous resistance and determination of peripheral skin temperature. At present thirteen crew members have completed the full cycle of the first phase of the experiment "Pilot-T", and three crew members are at different stages of the experiment of performing. While performing imitation tasks in the space flight and the post-flight period it was obtained the decrease fuel consumption, task execution time, speeds during docking, and the angles of the coupled axes error of interacting objects in comparison with the pre-flight period. However, no statistically significant changes were found, which may indicate the high qualification level of all crew members. The physiological data showed changes similar to former results on MIR and ISS. The heart rate was significantly decreased inflight; also the post-flight heart rate was lower than preflight. The indicator of parasympathetic control of the heartrate RMSSD decreased significantly from preflight to inflight. The pulse transit time decreased significantly from pre to inflight, however the correlation between PWT and blood pressure is not known under weightlessness. A highly significant decrease was also found for periphery finger skin temperature indicating serious vasoconstriction as far as the environmental temperature was rather increased than decreased. Finally the changes of the sympathetic correlate skin conductance did not reach significance level. No of the physiological measures showed significant differences between the five flights with different difficulties.