

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)  
Astronauts: Those Who Make It Happen (5)

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INTEGRATED STUDY OF THE ISS AS AN ENVIRONMENT FOR HUMAN-OPERATOR' LIFE AND  
ACTIVITIES

**Abstract**

A long duration operation of the International Space Station (ISS) makes it possible to conduct research for studying the space station as a technical environment, while performing various experiments and service operations by human-operators, determining operating conditions for human-operators, and requirements for onboard systems and research equipment. For this purpose, special investigations are performed on the ISS Russian Segment, and "Timer" experiment has been prepared. The crew time expenditures and motion characteristics to perform operations using various types of equipment are measured and recorded within this experiment. All the factors associated with the investigated operations are also recorded. Human-operators' ability to work is mainly characterized by the time spent to perform the operations, and number of errors made. The ISS environment parameters (temperature, pressure, humidity, etc.), external flight factors (solar activity, radiation, etc.), crew training factors, motivating factors are taken into account as factors affecting the crew ability to work. The ISS environment parameters are obtained on the base of measurements made on board the station. The departments participating in the ISS project provide the external flight factors data. The crew training data and motivating factors are determined on the base of crew training results and crew activities assessment. During the investigations, mathematical models will be developed, which describe a variation of human-operators' ability to work as a function of relevant factors (ISS environment parameters, external factors, etc.). During the experiment, while video data is processed, differences of cosmonaut motions in zero gravity and in normal gravity conditions are determined. When processing data received in special sessions of crew motions, variations of crew in-flight characteristics are identified (position of center of mass, head posture, etc.). As a result of the investigations described above, which are performed both on the ISS and on the ground, qualitative data characterizing service and research activities of human-operators is obtained, equipment and facilities enabling to restore crew ability to work are evaluated, impact of flight factors on human activity for different time of being in weightlessness is estimated. The results of this study are essential to optimize human-operators' activities on the ISS and in future missions to the Moon and to the Mars.