

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support and EVA Systems (6)

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INTERACTION ANALYSIS IN THE MAN-IRLSS SYSTEM UNDER MARS-500 PROJECT ON BASE
OF VIRTUAL SIMULATORS**Abstract**

The Mars-500 Project is to obtain the data to refine the concept of the Martian crew biomedical support and to formulate basic requirements to the concept of the mission at large including the Martian Expeditionary Complex and the Integrated Regenerative Life-Support Systems (IRLSS). Real participation of test subjects in service of the LSS in the first ground imitation of the Mars spaceflight is extremely complicated and economically unprofitable. More rational approach is application of the LSS Virtual Simulators of the separate system function incorporated in the uniform Hardware and Software Complex intended for the LSS Crew Service Operation (CSOHSC). First version of the CSOHSC was considered at the 58th IAC in 2008. In subsequent years, this complex is to provide greater information content has been complicated by increasing the number of the separate Life-Support System Virtual Simulators and the Biomouse Hardware-Engineering Assembly (BHEA) for carrying out of psycho-physiological examinations. PURPOSE of this paper is to examine the results of interaction analysis in the Man - IRLSS System, obtained during the main 520-day experiment on the Mars-500 project in applying the new version CSOHSC. APPROACH to the CSOHSC developing is based on the use of the simulation modeling for the LSS function in the nominal, off-nominal and emergency conditions, the monitoring of the environmental controlled feature values and the estimation of the crew activity efficiency under the LSS off-nominal and emergency situations (ONS) and its localization. Crewmember's psycho-physiological parameters register simultaneously and continuously by the built-in combined sensors of the BHEA mouse-manipulators. The BHEA software integrated in the CSOHSC server section software on the IWP is presented by specific database, which executes following functions: storage of a database surveyed crewmembers; formation of a set of tests for examination; processing results of examination and storage of results in an archival file. CONCLUSION: 1. Approach to the analysis of interaction in the Man-IRLSS system, in which human-operator interacts with a technical system is considered. 2. CSOHSC use has allowed solving the following primary problems: to conduct an estimation of crewmember action efficiency at service of the IRLSS and at ONS localization caused by probable failures in its functioning and deviations of the environment controllable parameters from preset values in view of a degree of readiness of crewmembers and conditions of long isolation; to research interactions in the IRLSS-Crew system in real time for formation of medical/engineering and ergonomic requirements to IRLSS systems.