

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

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SPACE ECOLOGICAL/ENGINEERING SYSTEM FOR THE MANNED INTERPLANETARY
VEHICLES CREW: STATUS AND KEY TECHNOLOGIES FOR ITS DEVELOPMENT

Abstract

Conditions of maintenance of a life and activity of crew in independent interplanetary flights essentially differ from conditions, characteristic for orbital flights at a surface of the Earth. PURPOSE of this paper is to examine the approaches to development the Man-made Ecological Systems (MES) intended for maintenance of the crew and other biological environment in conditions of the interplanetary autonomous manned spaceflights and/or the planetary orbital station. APPROACH to the Man-made Ecological Systems is based on System Analysis Results of the features and functions of the integrated regenerative LSS (IRLSS) as the MES part with account to conditions of the planetary orbital and interplanetary flights and the acting restrictions on its accomplishment. It is shown, that man-made ecological system including the interplanetary vehicle pressurized modules, onboard systems, crew and biological objects, and the environment on the essence is an Ecological/Engineering System (EES) in which the transformation processes of the metabolism products in initial components of an environment implement in technical assemblies and units. The EES definition is resulted, its features as complex system are described and is shown, that the given concept integrates the Life Support Systems (LSS) based on the physical/chemical and biological processes in a single whole. The analysis results of the of acting restrictions and mass/power features for the applied IRLSS show that for the Planetary Stations and the Interplanetary Vehicles ES main systems will be the systems based on physical/chemical methods of crew's metabolism product transformation in initial components of an environment. The key technologies of the IRLSS development for the crew's life and activity maintenance in the Man-Made Space Ecological System of Planetary Stations and the Interplanetary Vehicles based on the long-term operation use of given systems aboard the Mir Space Orbital Complex and International Space Station are considered. The preliminary analysis results of space EES development capabilities for the interplanetary vehicles and planetary orbital station are examined. CONCLUSIONS: 1. It is shown, that man-made ecological system on the essence is an Ecological/Engineering System (EES) in which the transformation processes of the metabolism products in initial components of an environment implement in technical assemblies and units. 2. Results of the features and functions of the integrated regenerative LSS (IRLSS) as the MES part with account to conditions of the planetary orbital and interplanetary flights and the acting restrictions on its accomplishment are examined. 3. The key technologies of the IRLSS development for the crew's life and activity maintenance in the Man-Made Space Ecological System are defined.