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NEW TECHNOLOGIES FOR COSMONAUT TRAINING FOR FUTURE EXPLORATION MISSIONS

Abstract

The paper considers the methods of cosmonaut training to carry out scientific research at the International Space Station (ISS) using new technologies and professional conditions aimed at their application for the training of crews of manned space complexes (MSC) designed for flights outside the low Earth orbit (LEO). A simulation model is proposed that can identify technologies with the lowest quality of cosmonaut training, which will make it possible to develop the necessary measures to finalize (improve) training methods. In addition, the paper presents a method for analyzing the effectiveness of proposed technologies, considered, in general, as a complex system, the implementation of which can and should lead to maximizing the effectiveness of a complex system of this kind. Since the processes of cosmonauts training using current technologies, as well as their activities onboard the MSC, take place under the influence of many random factors, they are stochastic in nature, and their impact on the actual results of operator activities will be also random. In this regard, it is proposed to use probabilistic indicators in the analysis and evaluation of training technologies. In this context, random factors include the timing and duration of training, the initial level of professional training of cosmonauts, the availability or absence of spaceflight experience, the quality of interaction between the crew and the mission control center (MCC), the duration of communication sessions with the MCC during the flight, etc. The paper analyzes the problems of execution by cosmonauts of future human space exploration programs, taking into consideration that the service support activities of the crewmembers during flights beyond LEO are considered as the first priority. Such activities include movement control of the MSC during landing and take-off operations on the surface of the Moon and other celestial bodies, maintenance of the MSC during the mission, construction of planetary infrastructure (lunar base, for instance), etc. It is concluded that in the context of such operations, for each type of activity of crewmembers, it is optimal to develop and implement specialized (most effective in the application for each specific case of operator activities) technologies of cosmonauts training for the proper execution of the flight program. This approach can be seen as a characteristic of the complex system under consideration, which characterizes the adaptability of the process of implementing specialized technologies for training of crews to achieve the goal of an exploration mission.