23rd IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Human and Robotic Partnerships in Exploration - Joint session of the IAF Human Spaceflight and IAF Exploration Symposia (3-B3.6)

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ROBOTIC SURFACE MISSIONS ARCHITECTURE TO SUPPORT HUMAN LUNAR EXPLORATION

Abstract

Human-machine interaction during the implementation of manned missions' scenarios with the support of planetary robotics will significantly expand the range of tasks during the exploration of the Moon. At the initial stages, within the framework of the implementation of automatic missions, an indirect interaction of cosmonauts and planetary robotics will occur. With the beginning of the first manned missions, cosmonauts will interact directly with robotics that will significantly expand the capabilities of the cosmonauts and will make it possible to carry out construction and reconnaissance work, transport scientific equipment and provide it with electricity, provide additional opportunities for conducting experiments on the lunar surface and for servicing of lunar base elements. This report describes the architecture of lunar missions with the use of robotics (lunar rovers), including a description of possible design of lunar rovers, their functionality and preliminary characteristics, as well as the mechanisms of their interaction with cosmonauts (operators). This paper shows that such robotic techniques supporting manned missions will significantly expand the capabilities of cosmonauts at all stages of lunar exploration and ensure the development of key technologies for the further human expansion into deep space. In addition, the activities and tasks that can be solved both by robotics and cosmonauts within each mission are considered, as well as options for their joint work in solving scientific research and technological problems. Special attention is paid to the problems of developing an effective human-machine interface in the control of lunar rovers and provides an overview of the planned space experiment on board the ISS related to the testing-out of remote control technologies for planetary rovers (project Kontur-3).