

HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)  
Joint Session on Human and Robotic Partnerships to Realise Space Exploration Goals (3-B3.6)

Author: Dr. Igor G. Sokhin

Yu.A. Gagarin Research and Test Cosmonaut Training Center, Russian Federation, isokhin@yandex.ru

Dr. Boris I. Kryuchkov

Yu.A. Gagarin Research and Test Cosmonaut Training Center, Russian Federation, bic43@mail.ru

Prof. Vitali Usov

Gagarin Cosmonaut Training Center, Russian Federation, V.Usov@gctc.ru

DIALOG INTERACTION BETWEEN COSMONAUTS AND A ROBOTIC ASSISTANT FOR A CREW  
SUPPORT WHILE PERFORMING FLIGHT TASKS

**Abstract**

The active introduction of the new generation of robotic devices – robotic assistants for a crew support (RACS) – in a manned spaceflight practice is expected in years to come. Among the preferred options of robotics application there is a variety of flight operations, such as: maintenance of the onboard assemblies and systems, monitoring of the artificial environment and extraction of harmful contaminants and dust, hand-carrying and storage of materials and supplies, utilization of biological and organic wastes, etc. Today a large number of robots of various complexity and sophistication in intellectual, sensory and motor capabilities has already been developed for using them on the ground. We have good reasons to believe that the robots, designed for functioning as the robotic assistants for a crew support in spaceflight should have the advanced sensory capabilities and capabilities for verbal and gesture communication. At that as applied to manned cosmonautics there is a number of specific requirements for professional dialoging between a cosmonaut and a RACS in the subject area - “carrying out flight tasks”. It is assumed that the scope of this type communication is defined by: 1) the content of executive actions stored in the knowledge base of a RACS as applied to the specific set of flight tasks; 2) the prescriptions of a flight data file for each flight tasks; 3) the crew commander’s instructions on prescribed procedure of carrying out each flight task for crewmembers and 4) the orders in the form of reports downlinked for the MCC’s experts. On the basis of these orders it is proposed to find the methods of operative dialoging between crewmembers and a RACS in the interests of joint activity, to find the options of natural and organic “embedding” of executive actions of robots in the scope and content of the crew activity and as far as possible to exercise dialog interaction between crewmembers and a RACS via habitual ways of human communication (verbal and gesture communication). Besides, it is proposed to design the joint activity of cosmonauts and a RACS in a manner not to disturb communication within the crew but on the contrary to improve it. At that the dialog interaction between cosmonauts and a RACS via voice communication should be considered as a kind of an executive action that complies with the general rules of the creation of communication medium.