

HUMAN SPACEFLIGHT SYMPOSIUM (B3)  
Astronaut Training, Accommodation, and Operations in Space (5)

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POST-FLIGHT EXPERIMENTAL RESEARCH IN THE INTERESTS OF MANNED FLIGHTS TO  
DEEP SPACE

**Abstract**

The paper evaluates the results of the post-flight experiments that were carried out for the first time in the manned spaceflight history. The studies were performed in the interests of manned spaceflight to the planets and bodies of the solar system. The subjects of experiments were crew members of the ISS expeditions. In real manned missions to deep space the crews of the interplanetary expedition complexes will be affected by many various negative factors. When evaluating the flight conditions of the crew on Mars the authors highlight the six groups of factors: general conditions (mission duration, autonomy, etc.), closed environment factors, psycho-physiological factors, physical factors of interplanetary space, dynamical factors of interplanetary space, and conditions of stay on Mars. Most of them will differ from factors that affect cosmonauts in orbital flights even at the comparable mission duration. Accordingly, the impact of factors listed above on cosmonauts' efficiency as a whole and on the quality of complex operator activity in particular will be different too. This experimental research is aimed at evaluation of the feasibility of complicated operator activity, carried out by cosmonauts immediately after the completion of a long-duration flight under conditions of reduced gravity and g-loads as well as obtaining experimental data on the quality of the performed operations. Among the main tasks of operator activity, characteristic for the given conditions, are the control over dynamic modes of space objects and cosmonaut activity on the planet surface. These tasks, in particular, include manual controlled descent (MCD) and landing, extravehicular activity (EVA) and operation of complex engineering systems on the planet surface. Up to date, studies of the feasibility of complicated operator activity, carried out by cosmonauts (key flight tasks) immediately after completion of a long-duration flight have not been conducted neither in the interests of the ISS program nor prospective spaceflight (almost semiannual flight is comparable with the duration of a mission to Mars). All experiments were carried out on the training facilities at the Gagarin ResearchTest Cosmonaut Training Centre. The unique data on feasibility of complex operator activity immediately after completion of the six-month spaceflight has been obtained due to the experiments described.