

Lunar Exploration (2)
Lunar Exploration (1) (1)

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APPROACH TO LUNAR EXPLORATION SPACECRAFT RANGE SUBSTANTIATION. RUSSIAN
LANDING AND TAKEOFF-AND-LANDING SPACECRAFT USAGE SCENARIOS TO SUPPORT
FUTURE MANNED LUNAR MISSIONS

Abstract

Within the framework of the Russian Federal Space Program, starting from 2021, a number of robotic lunar missions is planned. The missions given are to start a new stage of lunar exploration and utilization. At this stage it is planned to develop and launch "Luna-Glob", "Luna – Resurs-1 (Orbiter)", "Luna – Resurs-1 (Lander)", "Luna – Grunt" robotic spacecraft (RS). These RS will have not only to solve scientific tasks, but also to test a number of systems and subsystems necessary for future missions.

The next stage of the lunar exploration RS development shall be a transition to RS usage to support manned missions. On the basis of the platforms to be tested orbital and reusable unmanned takeoff-and-landing systems can be developed, that will increase the efficiency of manned missions. International cislunar space station Deep Space Gateway (DSG), that is to become a gateway between the Earth, the Moon and the Mars, or reusable electric propulsion Earth-Moon orbital transfer vehicle may be used as an interface of interaction between manned and robotic missions at the first stage.

Taking into account the duration of advanced spacecraft development and construction, it is necessary to determine the range of spacecraft to provide the lunar exploration program adjustability and sustainability, as well as to effectively solve scientific tasks changing over time.

Within the framework of the presented paper, an approach to the determination of the required range of lunar exploration spacecraft baseline platforms and their preliminary performance is considered. Furthermore, possible scenarios of interaction between manned missions and advanced landing and takeoff-and-landing robotic spacecraft are considered in order to improve the scientific effectiveness of the tasks to be solved within the scenarios of applied and scientific activities on the lunar surface. The program of lunar exploration and utilization by robotic spacecraft plays a significant role at this stage.