

Key Technologies (7)
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KEY TECHNOLOGIES DEVELOPMENT FOR HUMAN LUNAR EXPLORATION FOR THE PERIOD
THROUGH 2035

Abstract

According to the strategic documents on space activities of the Russian Federation, the main direction of manned missions after 2025 is the Moon. The Russian lunar exploration program includes four major phases that are based on a balance between manned and robotic missions. The first phase is preparative and is based mainly on the first robotic spacecraft that will investigate the most advantageous lunar landing sites and test a number of technologies. In the second phase, the lunar communication and navigation systems will be deployed. The first Russian manned circumlunar mission will be launched. The third phase is a human lunar base development in its' minimal configuration and infrastructure development for resources utilization, scientific and experimental complexes development. The fourth phase is a lunar base enlargement and closed-loop life-support system development that will operate using lunar resources. The task of key space exploration technologies development is being solved by the International Space Exploration Coordination Group (ISECG), in which Russia also takes an active part. The status of this work is documented in Global Exploration Roadmap. According to the investigation results, we can place emphasis on the key technology areas that are critical for lunar exploration. According to the Russian lunar exploration program the second phase starts with the manned missions to cislunar space. Using the possibilities of special robotic means the crews will remotely prepare lunar infrastructure for long-term missions. The basis for the sustainable human lunar exploration will be formed in this phase: a transportation system will be designed for manned missions to the Moon, key technologies for short-term missions will be developed and tested. The transition to the third phase - the deployment of the lunar base and the performance of long-term manned expeditions will require development of new key technologies and improvement of the existing ones. In the first instance, these technologies will be associated with the task of long-term stay and operations on the lunar surface. It will require development of technologies for prospective habitats design, life support systems, medical-biological support, energy generation and storage systems with improved characteristics, large-scale transformable structures, robotic systems of crew support, etc. The paper will show the approach to the implementation of key technologies development roadmaps for the sustainable manned lunar exploration missions for the period through 2035 with the example of critical technologies needed for the first long-term manned lunar expeditions and spacecraft development.