

21st IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)

Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Systems (2A)

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INVESTIGATION ON MARS GREEN HOME SYSTEM DESIGN AND KEY TECHNOLOGIES

Abstract

Aiming at the requirements of manned Mars exploration and establishing a second home in the future, combing with the development plan of China's deep space exploration and the characteristics of Mars in-situ resources, this paper carries out research and design from the functions and components of the system, the development roadmap (scientific research station level - village level - town level), and the key technologies that need priority breakthrough (Intelligent Robot, In-situ Resource Utilization, Life Support System, et al.), and proposes a design scheme of Mars Green Home system that can effectively support unmanned long-term Mars exploration and human short-term survival. The research results lay a solid foundation for the demonstration and implementation of subsequent projects and the continuous and in-depth development of Mars exploration. Specifically, (1) Intelligent Robot technologies includes but is not limited to autonomous environment perception and multi-source information fusion, cluster complex behavior and collaborative control and autonomous maintenance. (2) In-situ Resource Utilization technologies includes but is not limited to in-situ resource survey and application path analysis, comprehensive energy acquisition (solar energy, nuclear energy, wind energy, geothermal energy, et al), consumable material preparation (water, oxygen, methane, et al), resource exploitation and construction molding (sintering, pressing, 3D printing, et al) (3) Life Support System technologies includes but is not limited to soil modification, biological selection adapted to the growth of the Martian environment, radiation protection in closed cabin and internal circulation balance.