

SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 3 (2C)

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STUDY ON THE CONCEPTUAL DESIGN OF MANNED LUNAR ROVERS ACCORDING TO  
DIFFERENT TASK CHARACTERISTICS AND TOPOGRAPHICAL FEATURES

**Abstract**

With the development of landing technology on the lunar surface, the contents of human scientific exploration increase step by step. Landing terrains become more and more complicated and challenging, extending from flat mare to the boundary between mare and highland, even to rugged highland. According to manifold topographical features above, three manned lunar rovers of different task characteristics are designed and studied, including manned exploration vehicles, scientific expedition vehicles and extreme environment exploration vehicles. Manned exploration vehicles are mainly suitable for flat mare. As reliable vehicles with proper payloads, they take people as the foremost and have the corresponding ability of emergency handling. Manned exploration vehicles adopt soft inflatable bag and intelligent chassis. Soft inflatable bag unfold on the lunar surface. Its outer surface consists of flexible battery wings and common type antennae, and its inner surface consists of spherical split screen display. Intelligent chassis adopts active suspension, and it can adjust height, wheelbase and gauge to complex lunar landform. Scientific expedition vehicles are mainly suitable for the boundary between mare and highland. As intellectualized vehicles with various payloads, they have the corresponding abilities of independent detection and collaborative detection. All kinds of vehicles share universal mobile systems. Payloads are classified by scientific goals and installed on the mobile system selectively. The vehicle is divided into operator area and load area. Extreme environment exploration vehicles are mainly suitable for rugged highland. As high through vehicles with strong environmental adaptability, they can carry out scientific missions independently or remotely-controlled and help astronauts release from a predicament. Their structures look like the spiders. They can fold when their legs bend. They can crawl when their legs extend. They

can bounce when their legs adduct. They can roll when wheels are installed to the end of their legs. Their body can rotate freely on their chassis to observe surrounding environment. Each kind of manned lunar rovers can detect independently to meet different task characteristics and topographical features. All kinds of manned lunar rovers can work together to form powerful lunar surface supporting system. Manned exploration vehicles are used to detect unknown area as scouts. Scientific expedition vehicles are used to accomplish scientific research tasks as principal forces. Extreme environment exploration vehicles are used to detect special environment as special soldiers. The proposed conceptual designs of manned lunar rovers could provide reference value for the future task of manned landing moon.