

SPACE EXPLORATION SYMPOSIUM (A3)
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Author: Dr. Baogui Qiu
China, qiubaogui@zju.edu.cn

Dr. Yanlong Li
China, liyanlong@tongji-auto.cn

Mr. TANG PING
China Aerospace Science and Technology Corporation (CASC), China, tangping219@sohu.com

Dr. Zhenyu Hu
China, hzy_021@163.com

Mr. xiao jie
China, 13585863125@163.com

STUDY ON THE CONCEPTUAL DESIGN OF MANNED LUNAR ROVERS ACCORDING TO THE
BOUNDARY BETWEEN MARE AND HIGHLAND

Abstract

If astronauts choose to carry out exploration activities at the boundary between mare and highland, multiple types of geological sampling will be obtained in a plan. And the scientific return is higher than single type of geological sampling. Due to the diversity of the terrain, higher requirements including various payloads and remote endurance of manned lunar rovers are put forward. Scientific expedition vehicles are designed, and they have the corresponding abilities of lunar surface assembly, carrying various scientific payloads, a wide range of motor and building temporary lunar base. As intellectualized vehicles, they own modes of independent detection and collaborative detection. The vehicle is divided into operator area and load area. In fact, the operator area stands the manned exploration vehicle, which consists of an extreme environment exploration vehicle and an intelligent track travelling mechanism. The cockpit is undertaken by the extreme environment exploration vehicle, which can crawl up and down from the track travelling mechanism independently, and escape from it in an emergency situation. The load area includes gantry crane skeletons, mounting cabins, boom, and parabolic antennas. As for skeletons of gantry crane, they are assembled by modular structures. The outer walls of the mounting cabin are square modules of the same size. Mounting cabin is divided into two parts, personnel area and device area respectively. Personnel area includes decompression cabin, life cabin, experiment cabin and security cabin. Device area includes energy cabin, material cabin, robot cabin and robot parts cabin. The boom can be used as the engineering machine, assisting lifting goods, transporting astronauts to the investigative environment. The parabolic antenna is designed in similar to the umbrella, collapsed and placed on the gantry crane for transportation. The scientific expedition vehicle is sent to lunar surface dispersedly, and assembled as a whole by astronauts. Mounting cabins and fold parabolic antennas are hung on the gantry crane. Then it covers a wide range draw by a manned exploration vehicle. When arriving at destinations, the scientific exploration vehicles build the parabolic antenna and solar array on the ground, and construct the expedition base with the cabins. All kinds of robots in the scientific expedition vehicle cabin are released. Astronauts and the robots carry out collaborative detection in group. Similar to principal forces, scientific expedition vehicles are required to complete the main task. The home range is unrestricted due to astronaut's safe distance, which is connected with discrete scientific objectives.