

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 2 (2B)

Author: Mr. Mingyo Seo  
Korea, Republic of

Mr. Beom-joon Park  
Korea, Republic of  
Dr. Woosub Lee  
Korea, Republic of

A LIGHT-WEIGHT ROVER PROTOTYPE WITH MECHANISM TO SECURE RELIABLE  
ACTUATION FOR A LONG-TERM LUNAR EXPLORATION

**Abstract**

This paper presents the development of a light-weight lunar rover prototype with the sophisticated power-transmission mechanism to increase the reliability of the rover system. The Korean government announced the lunar exploration mission of sending a lunar rover to the lunar surface to explore and collect scientific data. According to the mission requirements, the weight of the rover is limited to 20kg with payloads and the exploration period is set to be longer than one month. To guarantee the reliability of the rover's actuation system during the mission period, each actuator is required to be shielded from cosmic rays. To satisfy the specified weight limit and implement shielding systems for the actuators, we suggest the mechanism where all the actuators are installed in the warm box, which does not require additional shielding outside the warm box. In the mechanism, the actuators' driving power must be transmitted by mechanical components. To further decrease the weight of the rover, we analysed the 2D kinematics of the rover's explicit-steering to design the rover that has the advantages of both explicit steering and minimizing redundancy of DOFs. On the other hand, we applied the dual-motor driving mechanism to guarantee the controllability of the rover's mobility even in the case of a motor's failure. To verify the feasibility of the rover system, we built an approximately 10kg-wight prototype rover without payloads. In particular, lab and field experiments verifying the performance of the prototype rover during locomotion were conducted on rough terrains. In the experiments, the rover's explicit-steering performance and fail-safe driving performance against a motor's failure are demonstrated.