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# CHASSIS SYSTEM DEVELOPMENT FOR LUNAR EXPLORATION

**Abstract**

We have developed a chassis system tailored for a crewed, pressurized rover, specifically designed to operate effectively in lunar environmental conditions. On the lunar surface, vacuum conditions, extreme temperature fluctuations, and radiation exposure prevent the use of conventional terrestrial materials such as rubber and lubricating oils, requiring a novel design approach. To address these various challenges, we developed sliding bearings capable of sustained durability under high-load and extended vacuum conditions, incorporated within a trailing-arm suspension system. Large-diameter metallic wheels were selected to enhance climbing ability and obstacle-crossing performance. Additionally, electric-based absorbers utilizing motors compatible with lunar environmental conditions were employed, eliminating the need for oil-based hydraulic mechanisms that are unsuitable in lunar conditions. The rover is equipped with independently driven motors and independent steering actuators for all six wheels. The steering actuators incorporate reduction gears capable of handling high torque loads expected in the lunar environment. A six-degree-of-freedom controller with rollover prevention functionality was implemented to detect and mitigate rollover risks associated with uneven terrain, inclined surfaces, and the reduced lunar gravity (one-sixth of Earth's gravity). Furthermore, an emergency mechanism capable of escaping from a stuck condition is integrated. This chassis system ensures stable and reliable mobility on the lunar surface and provides a foundational technology for future lunar exploration missions.