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

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CRITICAL MOBILITY TECHNOLOGIES TO ENABLE LONG TERM LUNAR SURFACE ACTIVITY

Abstract

Long term human or robotic presence on the lunar surface will require development of new mobility technology that will be considerably evolved compared to existing planetary rover technology. To date, all human activity on Martian or lunar surfaces, either robotic or manned missions, has relied on lightweight, highly specialized equipment designed for short-term use and optimized for low mass rather than durability. Future activity on the lunar surface will likely be longer in duration and involve ISRU as our endeavors on the moon shift from pure exploration and science and begin to include commercial elements. Some crucial areas of hardware development include chassis frame design, electronics integration, suspension design, and traction systems. Ontario Drive and Gear and its partners have designed and demonstrated a fleet of light of medium size utility rovers that were designed to be especially rugged, modular, and low cost. While currently at TRL 4, the basic rover designs are highly conducive to achieving higher TRL due mostly to design characteristics such as motor selection/placement, payload carrying ability, battery and electronics placement/protection, and traction elements (wheels and tracks). These rovers have been successfully operated at various field demonstrations and exhibitions, and currently comprise the majority of the Canadian Space Agency rover fleet. ODG has recently completed the fabrication and demonstration of its fourth generation rover design called Artemis Junior as a successor to Artemis Rover and the Juno I and Juno II rovers. A major factor in the durability and utility of these rovers is the unique suspension and drivetrain design. The geometric suspension ensures even ground pressure and can provide some level of pitch control, and its three major components are arranged around an open payload bay designed to easily accept a wide variety of payloads. All thermally sensitive components are protected inside the monocoque frame, and the stern positioning of the differential link does not encroach upon the payload bay. Another critical aspect of the rover design is the traction system, since it is generally accepted that the terrestrial standard, rubber tires (pneumatic or otherwise) will not be used on the lunar surface. A more lunar appropriate wheel was designed that has proven to be lightweight and durable, while provided excellent traction in soft sand as well as in rocky terrain. Additionally, a lightweight metallic track was designed, built, and tested for use on the smaller utility rovers.