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

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PLANETARY ROVER DEVELOPMENT FROM CONCEPT TOWARDS FLIGHT

Abstract

Since 2007, the Canadian Space Agency has been developing planetary surface mobility technology in preparation for a lunar or Martian rover mission. One potential lunar project, known as Resource Prospecting Mission, involves a Canadian-built rover and drill that would search for water and other volatiles near the Lunar South Pole. The rover currently under consideration for this project is based on a family of mobility platforms developed during the last 6 years in a series of CSA contracts. This vehicle has evolved from a low cost, low fidelity demonstration vehicle in 2009 to a TRL-5 platform with a well-demonstrated path to flight. In 2008, Ontario Drive Gear developed and proposed a mid-size, four-wheel rover as a part of a CSA concept study. Upon the completion of this project, ODG was contracted to complete the design and produce a number of working prototypes for use in a Lunar Mining demonstration. The resulting vehicle, named Juno Rover, featured a simple geometric suspension, two traction motors, and a unique U-shaped chassis that contained batteries and electronics and provided a large contiguous volume for payload. In total, 11 of these vehicles were produced; six of these were demonstrated at a lunar analogue site in Hawaii in 2010. Since 2010, the vehicle has evolved in response to various field test campaigns and feedback from CSA and NASA. The most current platform, known as J5 Rover, features an enclosed chassis which protects sensitive componentry from both dust and thermal extremes, necessary to withstand the harsh lunar environment for an extended period of time without the need for a radioactive heat source. The vehicle is designed to carry a large, centrally located payload, and a non-rubber compliant wheel has been developed in an effort to endow the rover with adequate traction while still providing the requisite durability. J5 Rovers have been subjected to both natural terrain and lab testing since December 2013. Initial results indicate that the rover platform will remain stable on slopes up to 40 degrees with 55 cm of individual wheel motion allowable for terrain conformation. A non-rubber compliant wheel has been developed for this vehicle that will have the ability to withstand the hard vacuum and temperature swings on the moon. Testing of the wheel has shown it to match the traction characteristics of traditional rubber pneumatic wheels with excellent durability over rocks and gravel.