SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Part 2 (3B)

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CANADA'S SUSPENSION AND LOCOMOTION SUBSYSTEM FOR EXOMARS 2018

Abstract

The 2018 ExoMars mission will place a rover on the surface of Mars to search for possible biosignatures of Martian life, past or present. As an associate member of ESA, Canada will play an important role by providing the Suspension and Locomotion elements for the rover. Canada has a long history of participation in the ExoMars mission including several ExoMars-derived prototypes built by MDA since 2004. The core Suspension and Locomotion elements of these prototypes are common with minor variations, and it is these elements that are to be Canada's central contribution to the 2018 ExoMars mission.

As the overall ExoMars mission architecture has evolved, the design challenges facing the Suspension and Locomotion elements have remained. Carrying the structure, 2m drill and sophisticated science package over rough Mars terrain drives a need for excellent agility. Mass and the stowed volume for the Suspension and Locomotion elements are also tightly constrained, as is the need to comply with stringent planetary protection measures. Another challenge is the operation of lubricated actuators and locomotion drive electronics in Mars' harsh environmental conditions.

The ExoMars Suspension and Locomotion elements are designed to meet these challenging requirements. Unique features include a three-bogie suspension design to passively adapt to rough terrain and flexible/deformable metal wheels to improve mobility performance. Each wheel also has a cluster of three actuators that enable several key operational behaviours including: active deployment, accurate point turning and six-wheel explicit steering for maximum maneuverability. At the core of the actuators are high-performance DC motor modules designed and built by maxon motor based on their proven Mars heritage on MER.

There are several technologies being developed as part of the ExoMars Suspension and Locomotion

work that have strong multi-mission potential. They include the high torque density actuator design and cold temperature drive electronics, which could be used on a variety of space exploration applications both on surface and in orbit. Another aspect is the flexible wheel design that could be employed for low ground pressure / high mobility surface mission applications such as the Resource Prospector Mission (RPM).

Work is ongoing at MDA with preliminary design and subassembly breadboard test program scheduled for completion in the first half of 2014. The ExoMars mission and the corresponding contracts are funded by the European Space Agency (ESA), through TAS-I as the mission Prime contractor and Airbus Defense and Space as the Rover Module Prime contractor.