IAF SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – missions current and future (3A)

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DEVELOPMENT OF THE SAMPLE FETCH ROVER LOCOMOTION SUBSYSTEM

Abstract

A novel system for planetary surface missions is being designed in response to the challenging requirements of the Sample Fetch Rover (SFR) mission, part of the NASA/ESA Mars Sample Return campaign (MSR). The rover will have to retrieve tubes with rock and soil samples, previously acquired and cached by NASA's Perseverance rover in depots on the Marian surface, and deliver them to the Sample Return

Lander in a tight time window. This will require high speed and mobility capabilities, unprecedented for Mars rovers. The highly time-constrained traverse needs, together with the strictly limited mass and volume imposed by the accommodation on the lander, have pushed the design of the SFR locomotion to seek innovative solutions. In response to that, a four-wheel drive system is being developed, integrated with a deployable pitch-averaging suspension. This will be the first time four-wheel locomotion is used on Mars and on robotic planetary rovers in general. The system, relying on high-efficiency drive actuators designed to operate in Mars environment, shows potential for terrain and obstacle negotiation performance comparable with those of larger vehicles. The implementation also takes advantage of the Superelastic Spring-Tyre technology currently being developed by NASA Glenn Research Center, which, thanks to its traction and obstacle compliance properties, will allow SFR to navigate difficult ground and achieve its mission objectives.