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ATMOSPHINDER ROBOT - TESTING AND RESULTS AT THE MARS DESERT RESEARCH STATION

Abstract

Atmosphinder's mission is to investigate the geomorphic processes of seasonal eruptions in the south polar region of Mars to determine their role in the climatic system and dust storms. A prototype robot was created and tested at the Mars Desert Research Station during a two week analogue astronaut mission. Atmosphinder's design is a singular wheel with sails extending from the side faces to harness wind for passive propulsion, with the electronics sensor payload bay located internally along the central axis. The robot underwent quantitative and qualitative testing during 7 extravehicular activities (EVAs) in locations analogous to the south polar region of Mars. By the end of the mission, Atmosphinder had accomplished: 1) 100 meter unassisted roll as propelled by the wind; 2) Operation of the robot from analogue astronauts fully donned in spacesuits displaying coloured card combinations to the embedded computer vision system; 3) Sail trim control responding dynamically to present anemometer readings. Geological features analogous to the south polar region of Mars were observed at the EVA testing locations including: areneiform patterns, south polar layered deposit, sediment ejecta, and jet vent fractures. The teamwork of the analogue astronaut crew was instrumental to Atmosphinder's success during the mission. The key insights derived from the plethora of testing and work conducted demonstrates the value in pursuing the idea further towards a higher fidelity prototype. The results from Atmosphinder's testing at the Mars Desert Research Station indicate the applicability of a passively wind propelled rover for science and exploration.