

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)

Joint session on Human and Robotic Partnerships to Realize Space Exploration Goals (6.-A5.3)

Author: Dr. Bruce Betts
The Planetary Society, United States

Dr. Tomas Svitek
Stellar Exploration Inc, United States

Dr. Bill Nye
The Planetary Society, United States

Dr. Mason Peck
Cornell University, United States

Dr. James Bell III
Cornell University, United States

MICROROVERS ASSISTING HUMANS ON THE MOON AND MARS

Abstract

Microrovers, which we define as one to several kilograms, can greatly assist human presence on the Moon, Mars, and other bodies. There have been a variety of studies of large rovers designed to transport humans, and “medium” sized robotic rovers like those used now on Mars, but until now, microrovers have been a largely unstudied niche, particularly how they could enhance human exploration and settlement.

Because of their low cost and mass, several microrovers could be piggybacked on other missions, and used at a landing site or outpost, and would be easy to customize and deploy. Several small rovers would provide a robustness to single failure that a monolithic system would not.

Microrovers could assist human explorers with basic tasks outside their habitat, while humans remain safely inside, thus increasing efficiency and safety and helping to limit extra vehicular activity to human-optimized tasks. They could perform facilities inspection, science, reconnaissance, and a variety of other activities. During reconnaissance, several microrovers could quickly explore a far larger area than one large rover. They could act as scout vehicles for larger robotic rovers, or for humans themselves. Like the CubeSat model for spacecraft, a standardized microrover with built-in chassis, electronics, and driving abilities would enable competing of specific scientific and engineering payloads for a variety of applications. This would allow flexibility and encourage participation by a variety of types of people and institutions. Another microrover advantage is related to power: a solar array on a rover gives a much higher power-to-weight ratio for a small vehicle than for a large one. Microrovers can be teleoperated by Earth operators (in the case of the Moon or a NEO) or astronauts, but could include some autonomy. Microrovers also have potential applications in precursor robotic and science missions. Results of multi-institutional studies of capabilities, requirements, trade-offs and designs for microrovers for human exploration and settlement will be presented.

Acknowledgements: This work was supported by an agreement with Cornell University, Center for Radiophysics and Space Research, under Prime Agreement NNX10AC20A from NASA, and supported by members of The Planetary Society.