

Robotic Precursors to Human Exploration (03)
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LUNAR MOBILITY FOR ROBOTIC PRECURSORS AND THE EVOLVABILITY DEBATE

Abstract

While now a topic for US space history books, the international impact of the 2004 VSE and its subsequent Constellation Program will likely be felt for years to come. In Canada the alignment of human exploration with lunar exploration led to a CSA review of key national capabilities that could form part of future exploration contributions, and mobility was highlighted as a key candidate. Canadian rover developments traced back to 2000, with MDA focusing on autonomy and locomotion developments for science-class mobility, in particular ahead of the ExoMars mission. The VSE announcement and the transition beyond ISS further galvanized the mobility conversation in Canada and a program of lunar development began.

Since that time, global plans have evolved through various permutations of human and robotic lunar scenarios, from solely robotic, to solely human, to an evolutionary program of robotic through human missions, right up to the current a tbc mission sequence. More than a dozen rover concepts – and in some cases prototypes - of varying size and application have been explored with CSA. Unsurprisingly, given the lunar architectural evolutions, a recurring question was the idea of evolvable rover designs with versatile applicability to a range of mission scenarios – from initial science, to resource prospecting and acquisition, even up to and including human sortie assistance and outpost servicing pre-and post human presence. This topic of is a common yet sensitive one, beset as it is with scope traps – not least of which being the up-front cost of designing vehicles for either dual purpose or easy modification to expanded future (even human) activities.

This paper reviews some of the mobility concepts that have been developed in recent years, together with the Canadian Space Agency, and their role in precursor exploration – from micro-scale and small

science and prospecting rovers to large evolvable rovers capable of supporting human activities. Consideration is given to areas of mobility development that have thus far lent themselves well to evolvability issue, and a summary of key subsystem testing and deployments is provided. Finally an update is provided on the 2012 status of lunar rover prototypes currently being developed for the CSA, and their role in preparation for near-term international robotic lunar precursor missions.