

## **Nadeem PTMSS 2011 Talk #2**

### **Science Preparations for Early Exploration and Resource Characterization**

*N.Ghafoor<sup>1</sup>, C.Dickinson<sup>1</sup>, R.McCoubrey<sup>1</sup>, L.Chappell<sup>1</sup>, M.Barnet<sup>1</sup>, J.Allport<sup>1</sup>, P.Dietrich<sup>1</sup>, P.Jaziobedski<sup>1</sup>, T.Barfoot<sup>1</sup>, G.Osinski<sup>2</sup>, E.Cloutis<sup>3</sup>, W.Pollard<sup>4</sup>, G.Slater<sup>5</sup>, M.Daly<sup>6</sup>*

<sup>1</sup> MDA, <sup>2</sup> U. Western Ontario, <sup>3</sup> U. Winnipeg, <sup>4</sup> McGill U., <sup>5</sup> McMaster U., <sup>6</sup> York U.,

Science is a pervasive theme throughout space exploration. To the policymaker, scientific inquiry represents one of the fundamental drivers for exploration itself. To program planners and mission designers scientific investigation yields crucial information about the environments in which future human and robotic explorers must survive and, in the longer term, about the prospective resources that could some day enable them to thrive. To the instrument developer science requirements provide the measurement and performance specifications of a system, while to the spacecraft or vehicle designer scientific instruments represent a significant subset of payloads that will likely require delivery by their exploration system. Science themes are particularly dominant during these early days of exploration where we still seek to truly understand the opportunities and challenges facing our gradual (sometimes painful) expansion beyond earth orbit.

In Canada science has been a notable driver within exploration since the start of the planetary exploration program over a decade ago, with two planetary instruments launched to date, another awaiting launch in 2011 and two more instruments just recently approved for flight missions within the next five years. This heritage has established a strong national foundation in exploration upon which broader capabilities may now be developed, all in preparation for the longer-term goal of human exploration and sustainable expansion beyond low earth orbit.

A number of the scientific systems being developed in Canada, from tools of inquiry to tools of delivery, are reviewed in this talk and consideration is given to the collective state of readiness for near-term flight missions, particularly in light of the impending Gap that bedevils the exploration community today and the foreseeable near-term opportunities. Key Canadian science instruments are described, from instrument development as well as vehicle payload standpoints, and science deployment and analogue mission preparations are discussed, from early Moon and Mars prospecting and site characterization to medium-term sample return and human surface exploration.

Of particular interest to this symposium, consideration is given to the potential complement between the ISRU-focused advancements presented elsewhere this week and the above science preparations. Discussion is given to some of the opportunities for coordination of exploration-related preparations between the two different communities, domestically and internationally, as preparations are made for an all-important flight opportunity that could engage and yield valuable return across both exploration areas.