SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

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SURFACE ENVIRONMENT MODELLING AND TECHNOLOGY DEVELOPMENT FOR SMALL MISSIONS & PAYLOADS AT THE LUNAR SOUTH POLE

Abstract

The world is changing rapidly and recent years have witnessed marked growth in global efforts to extend some of the micro-space approaches and technologies that have so transformed EO and Sat Com to missions beyond earth orbit and similarly revolutionize space science and exploration. With platform, subsystem and payload capabilities available in ever smaller packages and secondary hosted payload opportunities becoming ever more prevalent, it is now possible to envision exploration mission architectures where small platforms can make a genuine contribution – scientifically, technologically and even commercially. The first wave of small spacecraft exploration missions are now underway to orbital destinations (NASA HEOMD-SMD cubesats) as well as short duration surface missions (e.g. GLXP).

At the same time, significant challenges remain. The next generation of small missions will feature more remote destinations, more challenging environments, greater unknowns, longer durations and / or more ambitious in situ capabilities. All under the tighter resource constraints associated with smaller, lower cost missions. Success will likely demand a combination of state of the art technology advancement, close consideration of the target environment and careful, clever system design to eke out the maximum possible performance from subsystem combinations pushed to their limit.

This paper reviews several of the challenges facing micro and nano approaches to near term space exploration, and summarizes several modelling and technology development activities currently being undertaken by Canadensys and partners which aim to address these. Testing of a range of components under lunar thermal vacuum conditions are discussed, from a TRL6 lunar rover drivetrain collaboration with CSA and ODG, to small-platform thermal control and energy storage technology developments currently underway at Canadensys. A 3D simulation of visual conditions that may be expected at the surface of the Lunar South Pole is also described, in collaboration with the International Lunar Observatory Associ-

ation (ILOA), with important implications for thermal, power and communications design of small lunar surface systems, as well as social components of several commercially targeted lunar initiatives.