

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 1 (2A)

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PROCESS VERIFICATION UNDER FLEXIBLE GRAVITY GRADIENTS  
FOR FUTURE MOON, MARS, AND SMALL BODY MISSIONS**Abstract**

Landing on a celestial body is one challenge. Staying there for a longer time, utilising life support systems, performing research activities and paving the grounds for future manned missions is another challenge.

Biological, and physical processes are often gravity sensitive. Plants and biological cells response on changing gravity conditions within a very short time. Chemical reactions are influenced, and mechanisms are experiencing deviating loads in absence of earth gravity.

Testing and qualification for the long-term microgravity environment of long space travel undergoes subsequent steps from drop towers to space stations, prolonging the experimenting time in advancing the platforms. But what happens once we settle on Moon or Mars. How are our systems qualified and process functions proven under the influence of the reduced gravity environment of the hosting celestial body?

Parabolic flight campaigns have been setting the baseline for the research under reduced gravity using aircrafts to provide the Moon and Mars gravity environment for the short range of 20-30 seconds.

Considering the next logical step for easily accessible platforms, this paper discusses the opportunity of using sounding rockets to provide the desired accurate Moon or Mars gravity conditions the range of several minutes, undisturbed.

Utilising the established platform for microgravity experiments with a different focus, offers a whole new field of opportunities for research activities and evaluation of technological developments, long before entering the long way to our neighbouring planets or to the asteroid belt. Cell behaviour can be studied, mechanical systems verified, and processes evaluated - close to earth and with immediate access to the results.

SSC – Swedish Space Corporation is providing the platform within the SubOrbital Express Sounding Rocket Program on a dedicated mission or on a ride share approach with focus Moon and Mars gravity research from Esrange / northern Sweden.