

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 3 (2C)

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MOON AND MARS GRAVITY TEST PLATFORM, UTILIZING SOUNDING ROCKETS FOR FAST  
AND SIMPLE ACCESS TO REDUCED GRAVITY ENVIRONMENT**Abstract**

Technological and biological processes are often gravity sensitive. Plants and biological cells respond to changing gravity conditions within a very short time. Chemical reactions are influenced, and mechanisms are experiencing deviating loads in absence of Earth gravity.

Testing for the microgravity environment of long space travel encompasses subsequent steps from drop towers to space stations, prolonging the experimenting time from seconds to months by utilizing increasingly advanced platforms. But what happens once we settle on the Moon or Mars? How should systems be qualified, and samples tested under the influence of the reduced gravity environment? Parabolic flight campaigns have been setting the baseline for the research under reduced gravity, using aircraft to provide the Moon and Mars gravity environment for a range of 20-30 seconds. Considering the next logical step for easily accessible platforms, this paper discusses the opportunity of using sounding rockets as providers of even higher accuracy Moon or Mars gravity conditions for several minutes, undisturbed.

Exploiting the well-known platform for microgravity experiments with a different focus, a whole new field of opportunities for research and evaluation of technology is offered long before entering the long travel to our neighbouring planets. Organisms' cell behaviour can be studied, in situ resource utilisation processes (ISRU) and technological systems are evaluated close to Earth with immediate access to the results.

SSC – Swedish Space Corporation provides the multi-gravity platform within the SubOrbital Express sounding rocket program on a dedicated mission or rideshare approach with focus for Moon and Mars gravity research from Esrange Space Center in northern Sweden. SSC has a long heritage on microgravity and low gravity missions with defined gravity levels within the SubOrbital Express / MASER program and in dedicated missions such as CRYOFENIX.