

PEGS: PLANETARY EXPLORATION GEOPHYSICAL SYSTEMS. A. Feustel¹, J. Reilly², J. Rice³, and M. Brzostowski, ^{1,2}NASA Astronaut Office, ³Arizona State University.

Introduction: PEGS is a prototype system for future lunar and Mars missions designed to acquire active seismic data and QC those data in near real time. The system has undergone three years of testing at Meteor Crater and a season of testing in Antarctica. The subsequent operational lessons and actual seismic data records may be compared to the Apollo experience and seismic records. Considerations of weight, safety, repeatability and deployment will be compared as well as source and receiver sampling considerations will be discussed based on the velocities and reflection times seen in the Apollo data.

Discussion: Consistent with NASA's new vision for exploration, the Planetary Exploration Geophysical Systems (PEGS) project was initiated in 2004. The goal of this project is to develop guidelines for seismic hardware suitable for lunar and Martian exploration. The system must have minimal volume and mass, be self-powered and recharging, wireless and suitable for planetary exploration and astronaut training. Seismic and other geophysical systems will be key elements of planetary exploration, sub-surface assessments and resource development.

The system will be required to be deployed robotically and to provide RF command and telemetry back to the human base station where rapid processing and evaluation of the returned data will be carried out. The system will also be required to perform both shallow penetration, high resolution surveys and deep penetration scientific studies resulting in a flexible deployment pattern and wide-aperture acquisition capabilities utilizing the same equipment. The system must be developed and integrated with any future operational surface and sub-surface reconnaissance program in order to facilitate efficient use of crew exploration efforts and understand mass and volume constraints based on exploration vehicle development.

Field work using a base-line system was carried out in 2004, 2005 and 2006 at Barringer Crater and 2005 in the Dry Valleys of Antarctica. The field work focused on acquiring seismic data using an RF seismic system and an accelerated weight-drop source. A portable system was used in the Dry Valleys of Antarctica. The 2005 and 2006 Barringer surveys were carried out in conjunction with a much larger NASA effort to test advanced EVA suits, exploration rover capabilities with remote vehicle command and data transfer. The tests were significantly successful in terms of building a framework for future planetary seismic systems intended for use by exploration astronauts.

Conclusion: PEGS has provided a platform to plan and test systems and procedures for acquiring additional seismic data on the Moon. It has also provided a framework for including additional geophysical measurements such as ground penetrating radar and could easily be extended to potential fields methods such as controlled source electromagnetics. The system is the basis of acquiring useful data and the evaluation of the data in real time to further accentuate the success of any future exploration.