25th IAA SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY (E5)
Space Architecture: Designing Human Systems Interaction (3)

Author: Dr. Melissa M. Battler
University of Western Ontario (UWO), Canada

Mr. Matthew Cross
University of Western Ontario (UWO), Canada
Mr. Volker Maiwald
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany
Ms. Ayako Ono
Tohoku University Graduate School of Medicine, Japan
Ms. Csilla Orgel
Eötvös Loránd University, Hungary
Mr. Hans van t' Woud
BlackShore, The Netherlands
Prof. Bernard Foing
European Space Agency (ESA/ESTEC), The Netherlands

SCIENTIFIC STUDIES, HUMAN-ROVER INTERACTIONS, AND TECHNOLOGY DEMONSTRATIONS CONDUCTED BY EUROMOONMARS CREW 125 AT A GALE CRATER ANALOGUE SITE

Abstract

The International Lunar Exploration Working Group (ILEWG) EuroMoonMars 2013 campaign was conducted near Hanksville, Utah at the Mars Desert Research Station (MDRS), at sites analogous to Gale Crater landforms. The EuroMoonMars-B crew (MDRS crew 125) conducted a 2-week human Mars mission simulation and carried out scientific studies in the areas of geology, human-rover interactions, human factors, and psychology, as well as technology demonstrations. Studies were led both by remote investigators around the world, and MDRS crew 125 researchers. Mars analogue geological investigations included: an evaluation of Gale Crater analogue sites around MDRS, treating Curiosity data as robotic precursor data for a human mission; a comparison of surface vs. orbital quality data of sulfate minerals around MDRS, working backward to determine the best way to use orbital spectral data as a precursor to a human mission; and analysis of the geochemistry of rock formations called concretions. An evaluation of human-rover interactions specifically looking at field geologists was conducted. The site investigations provided context for proposing robotic assistants and automation technologies for increasing the amount of science conducted in-situ. Observations of field explorers during 3 EVAs showed that approximately 25% of a target investigation was the actual sample collecting process, while 55% was devoted to tasks that could be off-loaded to automation and mobile robotic assistants conducted in parallel. In addition, a habitat engineering investigation focused on the implementation of a micro harvesting unit within the habitat; an analysis of crew time was conducted; and a habitability and sound study was completed. The technology demonstrations involved crowdsourcing and low-bandwidth communications. These made use of technology to reduce astronaut workload in the areas of mapping and mission planning. Crew 125 was made up of crew members from Canada, Germany, the Netherlands, Hungary, and Japan. The authors thank ILEWG, NASA Ames, ESTEC, VU Amsterdam, George Washington University, and partner institutes for the operational, scientific and experimental support for the EuroMoonMars campaigns. We

thank the Mars Society and the MDRS Support team (VU Amsterdam and partners) for access to the MDRS and remote support.