

Human Robotic Partnerships for Exploration (04)
Poster Session (P)

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HUMAN ROBOTIC PARTNERSHIPS: EXPERIENCE FROM TERRESTRIAL ANALOGUES
CAMPAIGNS**Abstract**

The International Lunar Exploration Working Group (ILEWG) through means of the EuroMoon-Mars missions investigates the feasibility and limitations of human and robotic planetary exploration. Field tests have been performed since 2008 up to 2012 at the Mars Desert Research Station (MDRS) in Utah which included telepresence assistance and joint human/robotic activities.

In two week rotations crews of six members came to the station to perform new missions and established the knowledge, conditions, systems, and equipment necessary to perform successful and optimized planetary exploration activities.

The activities carried out during the EuroMoonMars campaigns include the usage of a Rover(from NASA Ames) and an Unmanned Aerial Vehicle(UAV) for reconnaissance purposes and investigations into: system requirements; Operator interaction and tele-operation; Combined Rover UAV excursions; Human Robotic Partnership as EVA assistance/replacement; extending of the RF robotic remote control network as well as the human factor and there living conditions.

The MDRS environment constrained the crew to working and living together in a closed extreme environment designed on the basis of an early Moon or Mars outpost. This simulation offers a reality where space activities can be experienced first hand and therefore essential to an increased understanding for Human and Robotic Partnership during exploration being either on Moon, Mars, Asteroids or other destinations.

The environment allowed additional research to be performed in parallel into Extra-Vehicular Activities (EVA) communication efficiency stress factors, Moon Mars Habitability Project (environmental aspects of habitat, human factors, food and sleep study).

This Paper will highlight the lessons learned throughout all the practical analog simulations from the ILEWG EuroMoonMars missions and partners since 2008 up to now with a focus on the experiments and research performed related to remote controlled Rovers and UAV's, and their partnerships during reconnaissance and during EVA's.

Derived from these practical experiences the paper will list a cost effective proposal for a platform to allow remote analog simulations at different analog sites in the world to investigate the operations of joint human/robotic activities. E.g. where Mission Control is located in The Netherland, Robotics remote control located in Germany, Analog sites located in La Reunion or Utah Dessert with Robotics hardware and crew in simulation mode. Such a platform will not only test theories cost effectively but also will allow the optimization and cost reduction of the operation part of such missions where teams need to be delegated in potential multi-tasking assignments.

Acknowledgment: <http://sci.esa.int/ilewg> - <http://mdrs.marssociety.org>