Paper ID: 15802
oral
student

HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
Joint Session on Human and Robotic Partnerships to Realise Space Exploration Goals (3-B3.6)

Author: Mr. Alexandre Mangeot
University of Orléans, France

Mr. Dipl. Physiker. Jeffrey Hendrikse
Airbus DS GmbH, Germany
Mr. Pierre Darneaux
The École de l'Air of France, France
Mr. Baptiste Moeglin
The École de l'Air of France, France
Mr. Angel Wable
The École de l'Air of France, France
Dr. Irene Lia Schlacht
Politecnico di Milano / Technische Universitaet Berlin, Italy
Dr. Balwant Rai
The Netherlands
Ms. Yue Zhao
Vrije Universiteit Amsterdam, The Netherlands
Mr. Wouter Poos
The Netherlands
Ms. Irina Rammos
Free University Amsterdam, The Netherlands
Ms. Luísa Rodrigues
Vrije Universiteit Amsterdam, The Netherlands

HUMAN-ROBOTIC PARTNERSHIPS AND PERFORMANCE: LESSONS LEARNED FROM ILEWG EUROMOONMARS CAMPAIGNS 2012 AND 2011

Abstract

The International Lunar Exploration Working Group (ILEWG) uses the annual and ongoing EuroMoonMars/DOMEX campaigns to investigate the feasibility, limitations, and optimization of human and robotic planetary exploration. Field tests are carried out at the Mars Desert Research Station (MDRS), a space analog environment in Utah. Future locations such as La Réunion are under negotiation. The research performed during the 2012 and 2011 campaigns included tele-presence to assist EVA and joint human/robotic activities.

In two-week rotations, crews of six members went 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; combined Rover/UAV excursions; human-robotic partnership as EVA assistance/replacement; extension of the RF robotic remote control network as well as the human factors and the living conditions.

The MDRS environment forced the crew to work and live 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 is therefore essential to increase understanding for human-robotic partnership during exploration either on the Moon, on Mars, the Asteroids or other destinations.

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

This paper describes the specific results from four six-member crews taking part in two-week rotations in 2011 and 2012, with a focus on the experiments and research performed related to the analysis of human-robotic partnership, such as: Remote-controlled Rover and/or UAV: their partnerships and efficiency for reconnaissance and EVA support; Human-robotic operations with remote engineering/scientific support; (tele-presence); RF communications network extension for robotic remote control and EVA support; Cooperative robotics tele-presence from Earth and/or from a lunar base for reconnaissance and EVA support; Efficiency analyses between human-to-human interaction protocols during Rover and/or EVA partnerships as well as during crew rotation. Knowledge transfer towards crew and between crews using tutorials, audio files, and motion picture.

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