Paper ID: 29951
oral

HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Astronaut Training, Accommodation, and Operations in Space (5)

Author: Mr. Yuval Brodsky
The Mars Society, Italy, Israel, yuval.brodsky@gmail.com

Mr. Franco Carbognani
The Mars Society, Italy, Italy, franco.carbognani@marssociety.it
Mr. Ezio Melotti
The Mars Society, Italy, Finland, ezio.melotti@gmail.com

THE USE OF VIRTUAL REALITY (VR) IN ASTRONAUT TRAINING AND SPACE SYSTEM DESIGN

Abstract

The development of space systems, habitats, protocols, procedures, and operations are all activities with very high stakes. As such, their reliability must be very high, resulting in long development cycles and high costs. The use of virtual reality (VR) can reduce development time and costs, and increase design reliability through interactive and iterative testing. This is particularly relevant for spacecraft and habitat design, planetary surface exploration, procedure and protocol testing and equipment design testing.

V-ERAS is the virtual implementation of ERAS; the **E**uropean Ma**R**s **A**nalog **S**tation for Advanced Technology Integration. V-ERAS has been developed to reduce ERAS development time and costs, and to validate its design prior to construction. Through multiple field tests it has demonstrated its capabilities to serve teams working on nearly any phase of crewed missions to any extra-terrestrial destination.

While the use of VR is not novel, V-ERAS has tested its synergistic use with a gravity offload system, an omnidirectional treadmill, and a virtual rover, within simulated environments for a Mars surface habitat and surface terrain.

The following sub-systems have been developed for V-ERAS: camera-based body tracker, VR simulator, gravity offload system, omnidirectional treadmill, vitals monitoring server, multi-user integration, and solar storm forecasting server. The simultaneous use of these systems has increased the fidelity of virtual mission simulations. V-ERAS has been used to train analog astronauts in EVAs and other procedures, train mission support teams in handling complex EVAs and other mission procedures, validate and iterate the designs of ERAS and a Mars surface All Terrain Vehicle.

V-ERAS presents game-changing innovation that will increase reliability, affordability, and efficiency of all phases in future space missions. The following paper details the use of VR for astronaut training, mission design, and mission support. It will focus on V-ERAS' design and functionality, results obtained from three separate missions, future work, and applications.