REMOTE OPERATION OF THE EXOGEOLAB LANDER AT ESTEC & LUNARES BASE

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Introduction: The ExoGeoLab lander is a project at ESA/ESTEC initiated in collaboration with ILEWG task groups [1-5]. It is a structure with a rover deployment hatch, that can be equipped with several instruments such as UV-VIS, NIR and Raman spectrometers, environmental sensors, cameras and a telescope. Those payloads can be remotely operated from a laptop connected via a Wi-Fi to the Lander.

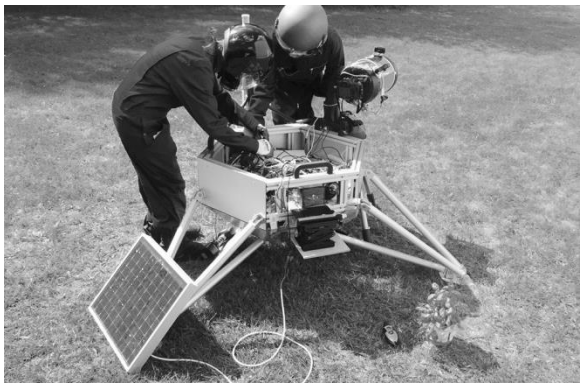

Figure 1 Manipulation of ExoGeoLab instruments by analogue astronauts during EuroMoonMars Workshop 2017 at ESTEC

Goals: The ExoGeoLab Lander is intended to demonstrate on a small class prototype and with off-the-shelf technology how remote operation of scientific instruments can be used jointly with Extra-Vehicular Activities (EVA) on the Moon or Mars. The Lander is thus made to be operated in analogue conditions from close or distant stations. The three main goals are science (spectrometry and astrophotography), technology (remote control), and ergonomics (joint operation with astronauts).

Technical improvements: Over 2016 and 2017, a database of minerals was established at ESTEC to calibrate the spectrometers, and the former Arduino+laptop architecture was replaced by a centralised Raspberry-Pi architecture [6,7], allowing development of a robust, modular, user-friendly and community-supported interface for remote control based on the software K-Stars Ekos. The computerized telescope allows now to make astrophotography and take pictures of remote geological features, and the webcam mounted on its motorized mount can be used for panoramic context or to remotely follow the rover or astronauts' activities with 360 degrees rotation, or for visual check of the Lander's subsystems.

EuroMoonMars campaigns at ESTEC and Lunares: the Lander was deployed on an analogue simulation conducted at ESTEC for EuroMoonMars Workshop 2017. The spectrometer, the telescope and an electric drill were remotely operated from the ExoHab module while astronauts brought rock samples and calibrated the instruments. In August, the Lander was deployed in the Moon/Mars analogue environment of the new LunAres base in Piła, Poland. It has been operated by the astronauts of the PMAS mission and remotely from ESTEC, where spectral and environmental data are being processed, along with videos of the EVAs captured by the cameras onboard. The Lander is also expected to be used during Lunar Expedition 1 at LunAres base after PMAS.

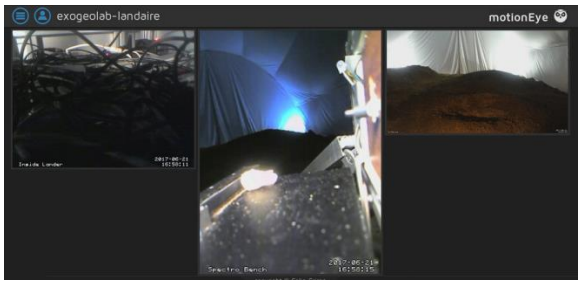

Figure 2 Livestream recorded at ESTEC during remote operation, showing Lander's interior, spectrometer bench and LunAres analogue environment from Lander's cameras

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References:

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