

31st IAA SYMPOSIUM ON SPACE AND SOCIETY (E5)
Virtual Presentations - 31st IAA SYMPOSIUM ON SPACE AND SOCIETY (VP)

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LUNARES III (SPECTRA): TRIDENT OIL RING MAIN UNIT (RMU) HIGH VOLTAGE SWITCH
EVA AND VR TO SUPPORT FUTURE WORK IN ON-SITE LUNAR POWER DISTRIBUTION.

Abstract

The prominent design of LunAres III (SPECTRA) lunar analogue mission focused on putting into practice systems thinking, innovation and human factors in the operations of a remote lunar outstation. For example, a high-fidelity simulated Loss of Power [LoP] emergency scenario that required the manual operation of the Trident oil Ring Main Unit (RMU) hardware in a dark simulation crater under time-tagged and evaluation pressures. The EVA comprised of three stages: the build, the training, and the procedure. 1) Lucy Electric LLC builds industrial electrical equipment. Products such as a High Voltage Switch will be required for a lunar power distribution system. We installed a Trident oil Ring Main Unit (RMU) in LunAres to evaluate the crew ability to safely manually operate the machinery within a Loss of Power (LoP) scenario in the darkened crater. 2) Practon Group develop training for operating the Trident fixed FRMUs with VR developers Sentient Computing. All crew learn to the operate equipment via paper-based manuals, and presenter-teaching models. Two crew members have additional VR training. 3) Two days later, the Mission Commander signals to the Flight Director to initiate two scheduled surprise (simulated) power-outages which required Emergency Loss of Power (LoP) response EVAs. Crew had to locate tools, find the Trident oil RMU and safely restore power to the habitat life support system without assistance in a set time. Teams were assessed on readiness for problem-solving under pressure, mechanical operation, teamwork, recall and understanding of new technical knowledge to derive insights for future training. Crew provided vital user-experience feedback, and technology partners examined opportunities for a formal study under controlled conditions, and comparative space analogue mission simulation sites. A post-mission review conducted by the author/mission commander and the Monash Immersive Visualisation Platform investigated further tools for immersive visualisation /representation of the performance data including real-time multi-person keypoint detection to support future work in augmented assistive technologies for complex high-risk operational planning of lunar power distribution.