



Artemis Lunar Surface VR/ARGOS Trainer

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Technology Taxonomy Area (TX): 11.3.4 - Simulation-based Training Decision Support Systems;
13.4.2 - Team Preparedness and Training

TRL: start 4 / current 6

FY20 IRAD PROJECT OVERVIEW

This proposal aims to provide insight by identifying potential risks and unknowns of lander egress and surface operations through a Mixed Reality (MR) planning, training, and analysis capability that integrates Virtual Reality (VR) simulations and the Active Response Gravity Offload System (ARGOS).

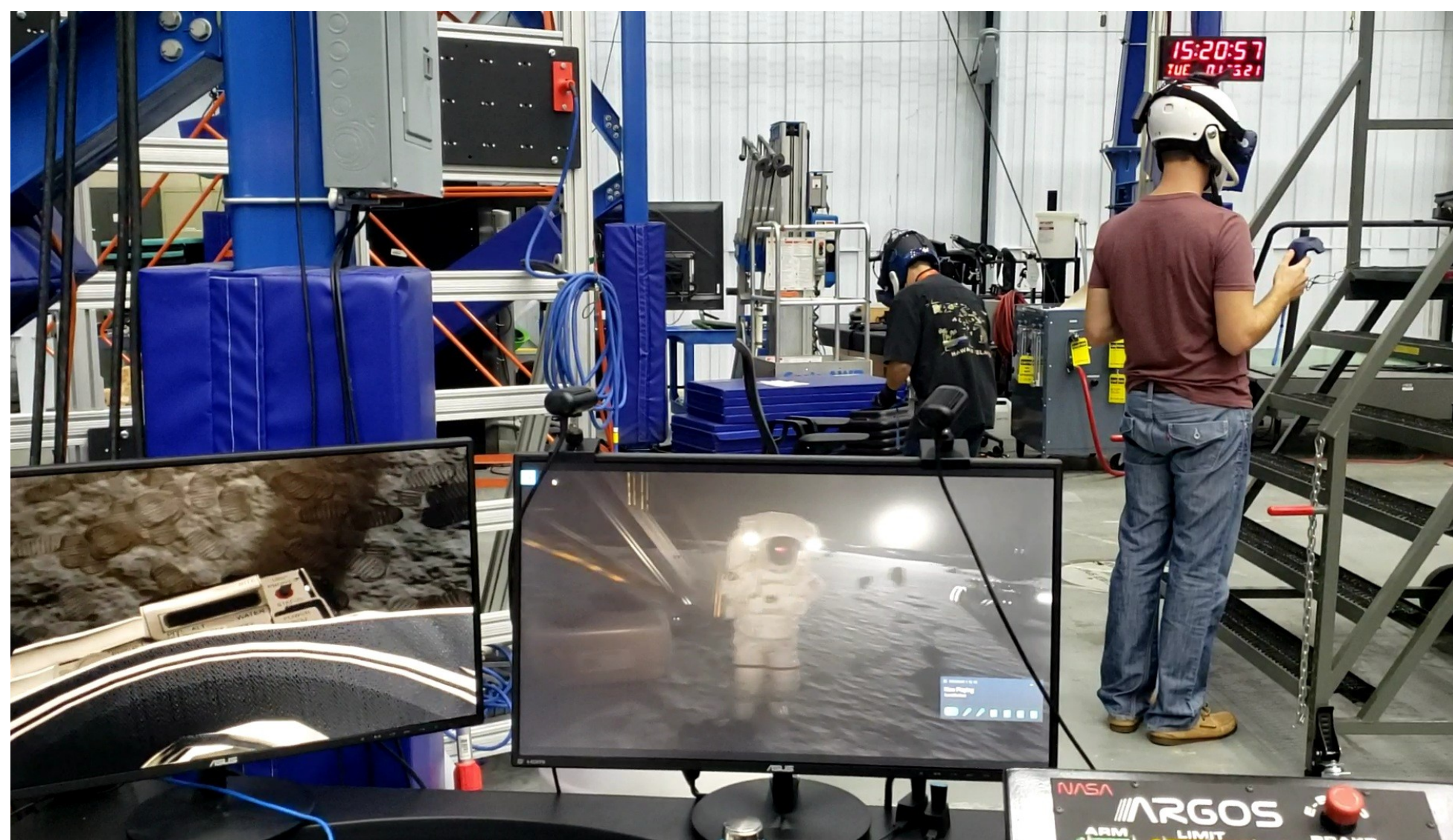
INNOVATION

This project aims to provide a digital representation of the lunar south pole for risk reduction, training and engineering design evaluation. This digital environment will be combined with a human-rated gravity off-load system and a mockup of the lander porch and ladder to simulate an initial egress from a lander to the lunar surface. The fusion of physical objects with a higher fidelity virtual representation creates an immersive experience at a lower cost than constructing an entire physical environment.

OUTCOME

- The Artemis Lunar Surface VR/ARGOS Trainer has accomplished creating a unique tool that implements the best data available to create an accurate digital representation of the lunar south pole for EVA planning and training within a reduced gravity environment.
- The development of core capabilities related to this project creates an extensible toolset that can be used for additional exploration and training activities. These capabilities include adjustable gravity and dynamics models for interaction with the environment, full-body tracking, multiple modalities of ambulation and navigation, and multiple concurrent users within the simulation.

INFUSION SPACE / EARTH



Lunar Surface VR at ARGOS Facility



Lunar Surface VR Simulation render at the Shackleton Crater rim site

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- This capability has applications for analysis and con-ops of lunar vehicle design concepts of the porch, ladder, or additional egress or offloading mechanisms.
- Potential evaluation of artificial lighting designs to aid in EVA ops or navigation within the extreme environment of the lunar south pole.
- The Lunar Site Analysis, Design, and Planning team for Artemis Base Camp is leveraging the visualization capabilities of this simulation for synchpoint products through a derived application, the Digital Lunar Exploration Sites Visualization Tool (DVT).

PARTNERSHIPS / COLLABORATIONS

This work has been developed in collaboration with Edward Mohr from the EVA Management Office (XX), Brian Mader with the EVA, Robotics and Crew Systems (CX) to help develop potential training requirements, and Paul Valle with ER's Dynamic System Test Branch (ER5) to provide ARGOS support.

FUTURE WORK

This work will continue as a second year Center Innovation Fund award project that seeks to improve the visual fidelity and include additional capability within the simulation. Collaboration with Samuel Lawrence's (XI) team, the Astromaterials and Research Exploration Science (ARES) group, to provide input in site crafting and the latest authoritative digital elevation maps from the Lunar Reconnaissance Orbiter (LRO). This paired with a SPICE based plugin that can set date/time specific ephemerides within the simulation and the ability to interchange surface assets such as landers, rovers, tools, and equipment, will assist in creating as accurate of an environment at any proposed sites of interest. Human-in-the-loop engineering test runs within ARGOS will be used to refine performance of the Mixed Reality interface with the mockup platform and define procedures for training.