LUNAR AUTONOMOUS ROBOTIC ROVER SYSTEM. Tara Sweeney[1], Racheal Schrock[2], Judith Hoyt[3], and Jose M. Hurtado, Jr.[4], Department of Earth, Environmental, and Resource Sciences, The University of Texas at El Paso, 500 West University Avenue, El Paso, TX 79968, [1]tsweeney@miners.utep.edu, [2]rgschrock@miners.utep.edu, [3]jrchapman@miners.utep.edu, [4]jhurtado@utep.edu.

Introduction: Artemis science and exploration will require the documentation of astronaut extravehicular activities (EVAs) on the lunar surface to be comprehensive, near-real-time, and representative of the advanced technological capabilities of the day. Lunar astronauts, mission control personnel, and members of the science support team will desire the still cameras, video cameras, lighting equipment, communications and navigations equipment, sensors, instruments, consumables, tools, etc. to be co-located with astronauts during an EVA to ensure astronaut safety and to accomplish the mission. Public engagement personnel and educators will desire access to the accumulated images, video, and data that can be presented to the public and students in a multitude of applications. These objectives can be met through the development of the Lunar Autonomous Robotic Rover System (LARRS), which will be able to follow the astronauts on EVA to document their activities and transport necessary equipment to support the EVA.

Concept: In this concept, a wheeled rover would accompany the astronauts on their EVA. The rover would be capable of either operating autonomously or driven by command from either an intravehicular crewmember (IVA) or from Earth. The rover would serve multiple EVA support functions, primarily as an imaging platform to record the events of the EVA from a standoff distance from the crew. To this end, the rover would be equipped with cameras to obtain still and video images as well as lighting to illuminate the astronauts' work site. The rover's mobility and automatic tracking capabilities of the cameras would allow the rover to follow the astronauts during their traverse to capture complete footage of the entire EVA. In addition, the rover could serve a logistical function as a tool and sample carrier for EVAs without a crew-capable pressurized or unpressurized rover. Additional capabilities that could be incorporated into the design are onboard stowage of emergency life support and power for spacesuits.

An additional perspective on EVA activities could be afforded by overhead views, similar to what is possible to capture with an uncrewed aerial vehicle on Earth. To obtain analogous aerial imagery, 2 or more autonomous rovers could be deployed to follow the EVA crew, each equipped with a mast and connected by a cable system between the masts. Along this cable, a small, gimbaled camera system could be deployed. The masts could host additional lighting to illuminate the astronauts' traverse path and worksite. The masts could also serve as antenna for communications and navigation.

Future Work: Demonstrating the utility of documenting EVA activities and evaluating the impact, if any, obtaining that data has on EVAs requires analog field tests. At UTEP, we are anticipating an analog field test opportunity using a small, modified all-terrain recreational vehicle, equipped with a mast and representative equipment/technology as a concept of operations demonstration for the LARRS. The intention is to deploy the vehicle to the Kilbourne Hole maar crater in New Mexico. This venue is an identified training location for astronaut field training and lunar exploration projects.