

Enabling Artemis deployed surface instruments with Lunar Experiment Survival System and Handling (LESSH). Michael Amato¹, Kelsey Young¹, Russ Snyder¹, Justin Cassidy¹, Cherie Achilles¹, and Mike Adams¹,
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Introduction: The Lunar Experiment Survival System and Handling (LESSH) is being designed to house and support deployed surface instruments for Artemis missions. The LESSH team is developing the system to support a variety of instruments needed to meet various community and NASA science and exploration goals. It allows instruments to be deployable and movable by Artemis astronauts or the planned Lunar Terrain Vehicle. The system is designed to meet complex astronaut and Artemis interface, compatibility, safety requirements and drivers so the instrument providers don't bear the entire responsibility and effort. LESSH fills the need to provide instruments power, thermal control electronics, basic command and data handling interface, data storage, communications and housing. LESSH is being developed by a small team at NASA GSFC led by Michael Amato.

The Lunar Experiment Survival System and Handling approach and architecture: There is a need for a safe and operationally compatible packaging, interface, and survival solution for astronaut handled surface instruments. There is limited schedule to develop and build lunar surface instruments for the first few Artemis missions. Those instruments will often need to live in a package which solves human interface and safety requirements and provides the instrument the housing, thermal, power, data management, and communications solutions compatible with Artemis designs and requirements. LESSH is an effort to fill that need by providing a common, customizable, safe and approved astronaut deployable package. LESSH should enable faster instrument development of astronaut placed instruments and sensors by maturing and building a flyable prototype which supports instruments and handles interfaces. LESSH is a common but somewhat customizable and modular placed package for instruments and sensors astronauts can handle, place and move. The package is designed for use with the LTV as well with the addition of the LESSH robotic arm interface. A hand-held version of LESSH exists as well and will be pursued after the 'placed version' is matured.

Typically instrument and sensor power, thermal and communications are largely handled by a spacecraft. Our goal is to replace this missing element, reducing design challenges for instrument providers, and enabling a wider variety of sensors from a wider variety of teams and organizations with less modification from previous versions. LESSH is being designed to be

delivered by the HLS but could also be delivered by a CLPS supply payload. Artemis mass and volume limits may limit the total power and mass delivered, however the design is modular allowing some customization and expansion as mass and volumes grow in future Artemis surface human exploration missions. The early design uses a system consisting of C&DH, power, thermal control board, Artemis compatible comm system along with astronaut compatible batteries and mechanical interfaces, see Figure 1. The instrument housing is customizable with the goal of allowing instruments which need to look down into the regolith, sideways or up or even deploy beyond the housing. We are not currently designed to survive the lunar night, the system is primarily designed to enable science during active human exploration missions and during and between astronaut sorties, however features allowing some night survival may be considered in the future. LESSH is designed to be rechargeable within the lander and the team is exploring an option to enable recharging on the surface.

One of the additional benefits of LESSH work has not been solely maturation of an instrument and sensor support package people can use and design to. LESSH has also started to serve as an early pathfinder to adjust Artemis systems design and requirements for science packages. A number of Artemis volume, mass, attachment, safety and communications for science and sensor packages and operations are works in progress and LESSH can serve as an early example, enabling interfaces and accommodations for other science and measurement needs.

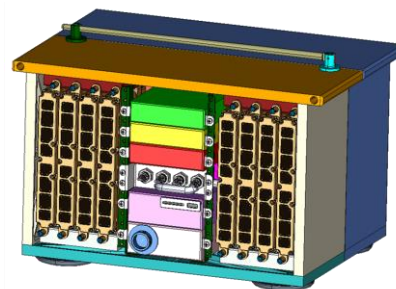


Figure 1 – LESSH early design,

Acknowledgments: We would like to acknowledge the rest of the LESSH team, instrument teams which have helped inform our capabilities and NASA Lunar Discovery and Exploration Program (LDEP)