BAE SYSTEMS

Lunar Compact Infrared Imaging System

On a mission to uncover secrets of the Moon's surface, the Lunar Compact Infrared Imaging System (L-CIRIS) instrument will collect multispectral infrared images to help scientists create maps of derived surface temperature, inferred mineral composition, and inferred water-ice presence in previously unseen detail—all from a payload that can be carried by a lander or rover.



Cover credit - NASA

Overview

BAE Systems built and delivered the L-CIRIS instrument for the NASA Lunar Surface Instruments and Technology Payloads (LSITP) program to study the mineral composition, temperature and other surface and sub-surface characteristics of the Moon. The L-CIRIS payload will be flown aboard an Intuitive Machines robotic lunar lander provided through NASA's Commercial Lunar Payload Services (CLPS) CP-22 mission.

As a multispectral longwave infrared imaging radiometer, L-CIRIS will produce images in the infrared region of the electromagnetic spectrum. Further processing will yield temperature and mineral composition maps, with the capability to reveal features at never-before-seen scales less than 1 cm across. Data from L-CIRIS will support lunar geological studies, as well as preparation for future lander, rover and astronaut missions by determining the density, compactness and composition of lunar soil.

L-CIRIS is planned to land near the lunar South Pole, where no astronaut has been before. Here L-CIRIS will map out cold pockets and shadows in the south polar region where it is believed ice deposits may be trapped. Finding ice on the Moon is key to potential resource utilization supporting future mining, manufacturing and long-term infrastructure.

Our Role

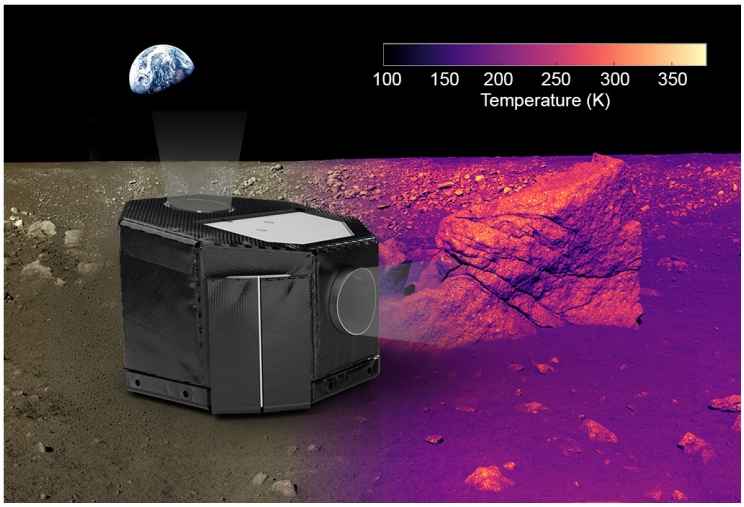
Leveraging decades of expertise in developing highly calibrated instruments, BAE Systems built the L-CIRIS instrument under a subcontract with the University of Colorado, Boulder's Laboratory for Atmospheric and Space Physics (PI: Dr. Paul Hayne).

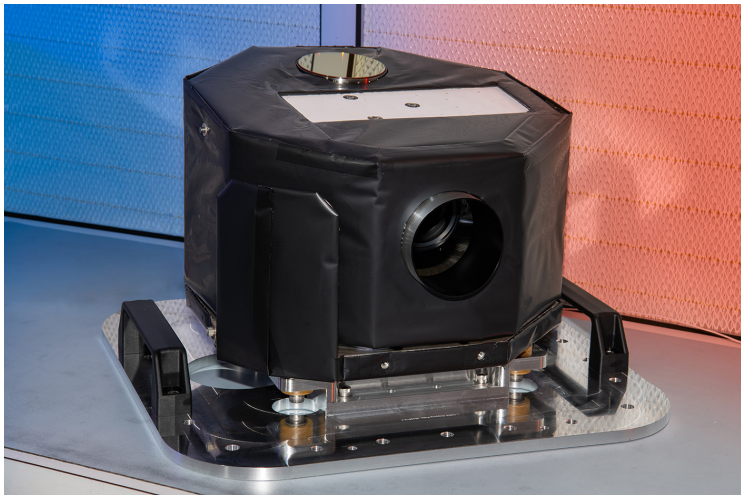
The L-CIRIS design is an adaptation of the CIRIS instrument built by BAE Systems. L-CIRIS generates the calibration for its own images in a miniature unit with a design that has been space-qualified on the precursor CIRIS mission. The calibration process converts raw data in each image pixel into scientific quantities such as scene temperature and radiance. L-CIRIS uses flat panel substrates with exceptionally high emissivity coatings to achieve high calibration accuracy in a very small volume.

The overall instrument design has been optimized for operation with an uncooled infrared microbolometer focal plane array, eliminating the need for the cryocooler required by many other infrared detector types. Features of L-CIRIS specifically added for lunar operation include a mechanism for panoramic scanning of the lunar scene and an enclosure to regulate the instrument's temperature while on the Moon.

Quick Facts

- L-CIRIS will acquire infrared images through panoramic scans of the lunar surface from its mounting location on the outside of a lunar lander
- L-CIRIS data will support key scientific discoveries, such as identifying locations of water ice on the lunar surface
- The capabilities of L-CIRIS are applicable to studies of other planetary bodies, including Mars, asteroids, comets and the moons of other planets
- L-CIRIS is planned for a mission to the lunar south pole, a relatively unexplored area that has never been visited by astronauts





Top: A false-color representation of L-CIRIS's infrared camera capturing temperature and mineral details of the Moon's surface; Bottom: L-CIRIS flight instrument pre-ship testing

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