

Advancing Distributed Lunar Surface Sensing: Progress and Testing from the Great Lunar Expedition for Everyone (GLEE)



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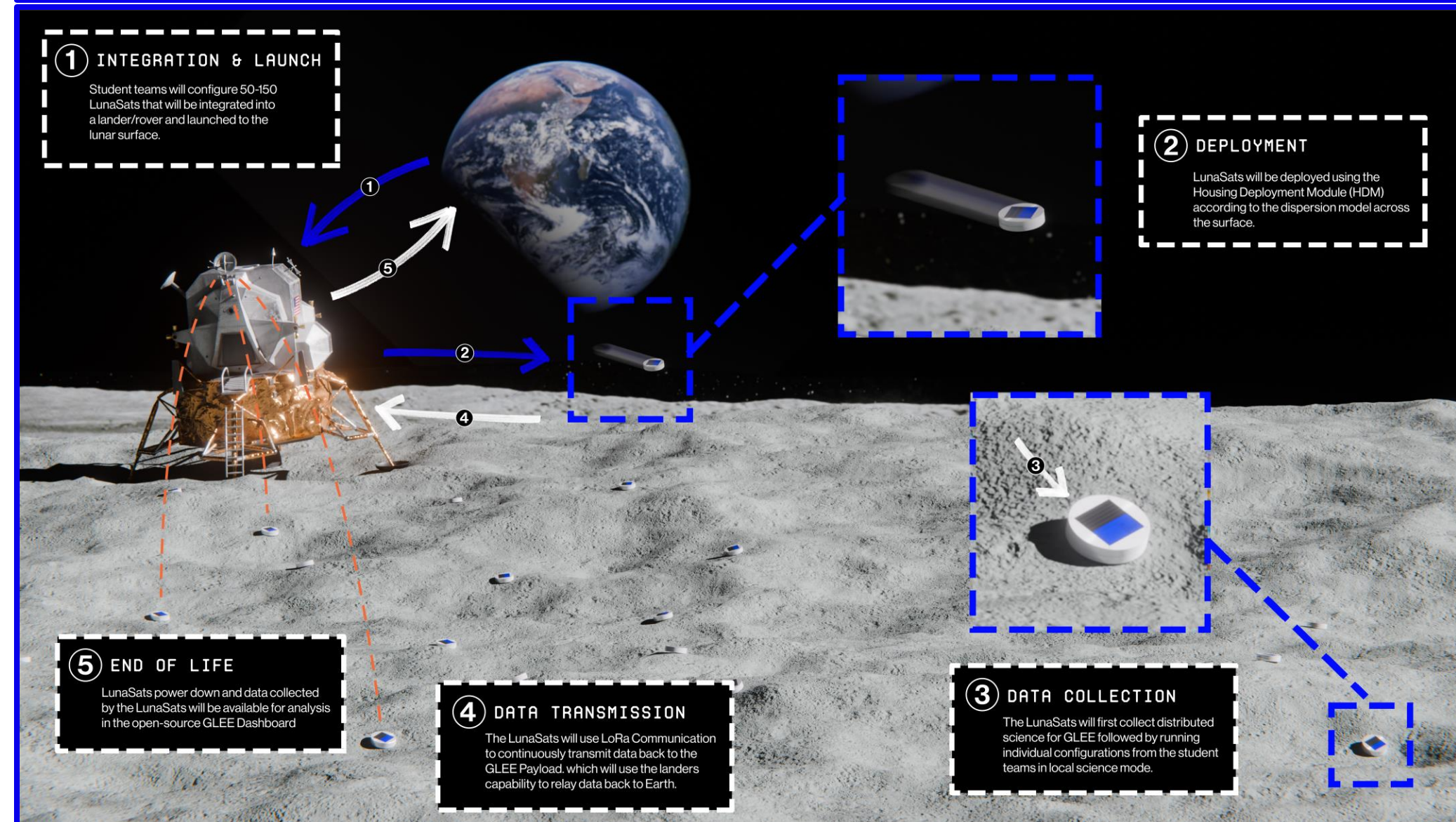
University of Colorado Boulder, Colorado Space Grant Consortium



ABSTRACT

The Great Lunar Expedition for Everyone (GLEE) is a student-led initiative developing a distributed network of LunaSat sensors for in-situ lunar data collection. These low-cost nodes measure shock propagation, thermal gradients, magnetic fields, and other regolith properties to support space resource prospecting. Recent progress includes survivability testing at the Colorado School of Mines Lunar Regolith Testbed, fabricating the V8 LunaSats, upcoming launch with NASA through RockSat this month, updates to the HDM for precision launch control, and our Global sensor Challenge to further engage our global outreach.

MISSION CONCEPT OF OPERATIONS (CONOPS):



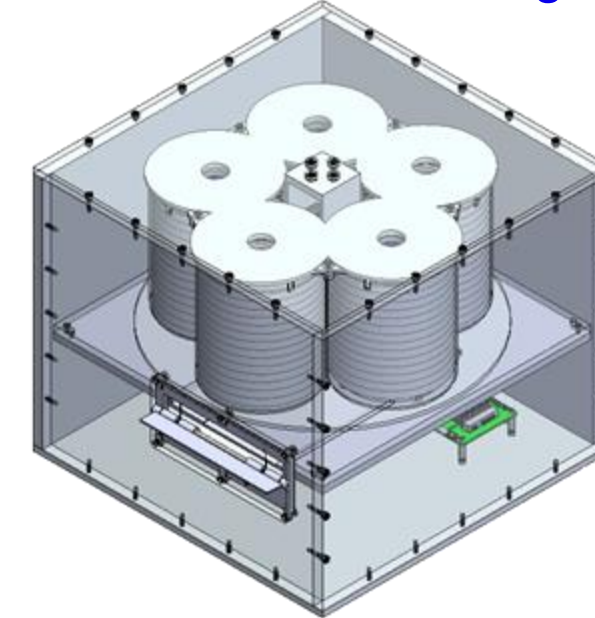
TESTING AT MINES' REGOLITH TEST BED

Testing at the Colorado School of Mines Lunar Regolith Testbed successfully verified the HDM at **Technology Readiness Level 6 (TRL 6)**. The module demonstrated fully autonomous loading, reloading, barrel swapping, and launching within a regolith simulant environment, operating entirely without human intervention. While these trials provided valuable insights for final flight-ready iterations, they also revealed unpredictable landing behaviors from the spinning LunaSats upon contact with the regolith. These dynamics must now be factored into our lunar distribution pattern.



HDM Updates

The Housing Deployment Module (HDM) will be updated to involve yaw control for launch, fit more LunaSats, and fit within a more standard form factor from this current design:



GLOBAL OUTREACH AND ENGAGEMENT

GLEE is not only a technology demonstration and science mission, but also an outreach mission engaging thousands of students from around the world in the process of scientific discovery. In October 2021, GLEE hosted an in-person workshop in Boulder, Colorado, with over 100 students from around the country taking part in a multi-day educational program about GLEE, the LunaSats, planetary science, electronics, and coding. Each team received a LunaSat kit and worked through the training modules. Now, this team will compete in a challenge to incorporate an additional sensor on the LunaSats to involve their ideas for potential science we may have not considered.

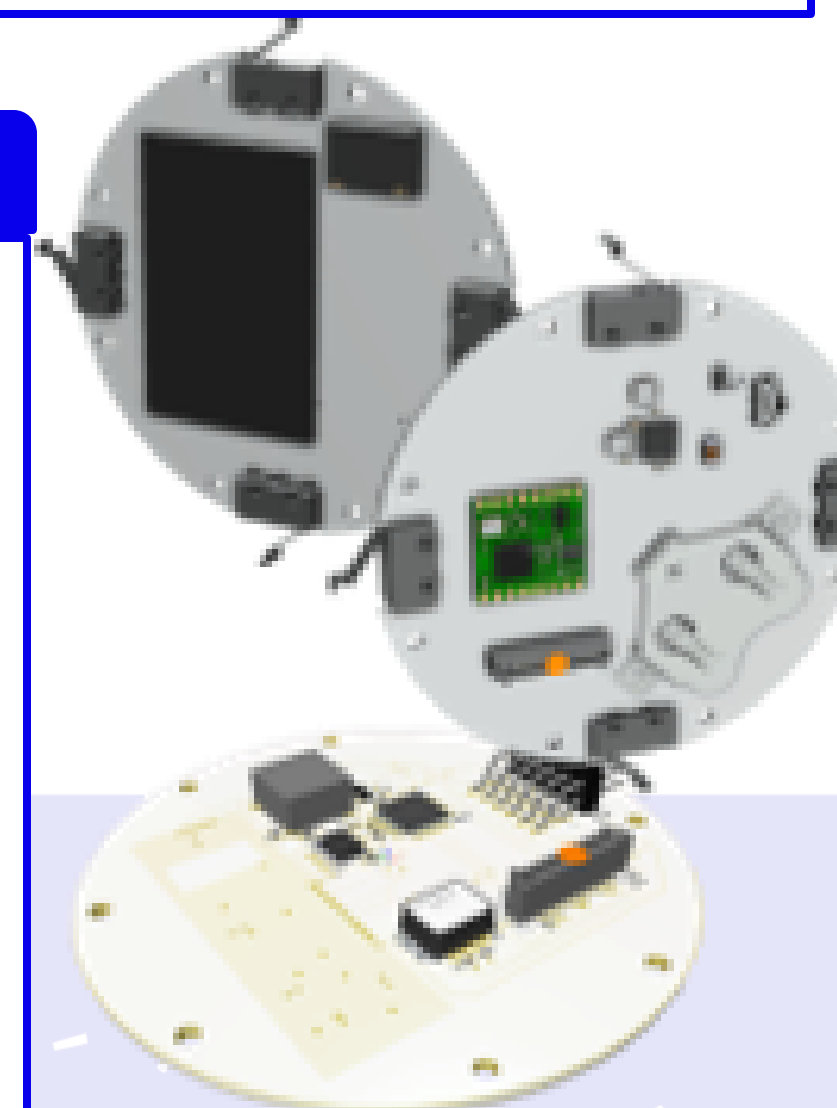
GLEE GLOBAL ENGAGEMENT MAP



LUNASAT V8 SPECIFICATIONS

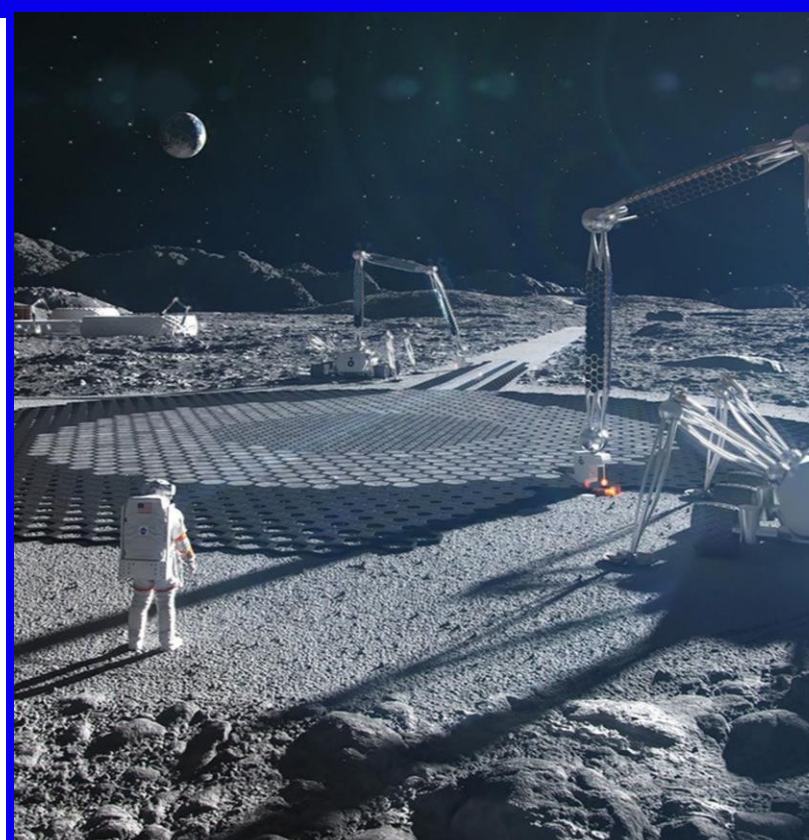
The LunaSat V8 is the latest iteration of the GLEE sensor platform, currently at TRL 6, with PULSAR targeting TRL 7. For RockSat compatibility, V8 design incorporated a battery to ensure reliable power independent of solar panel orientation and kill switches to inhibit activation before deployment per WFF safety requirements.

PULSAR flies three LunaSat v8s: two operating as a mesh network once ejected, and a third retained in the hermetic seal as a redundant baseline via serial in case of RF link degradation.



PERTAINING TO SPACE RESOURCES

GLEE supports future lunar resource utilization by characterizing regolith properties and environmental conditions across the lunar surface. Recent advances in deployment systems, communications, and lunar regolith testing also help mature technologies needed for future ISRU and sustained lunar operations.



FUTURE PLANS

Over the next year, GLEE will focus on advancing mission maturity through next-generation hardware development, integrated testing, and flight demonstrations. Major efforts include development of the V9 LunaSat platform, continued validation of mesh networking and packet-based communications, refinement of autonomous deployment systems, and the RockSat PULSAR flight demonstration. The team also plans to strengthen systems-level testing and coordinated development efforts, ensuring that hardware, software, communications, science, and deployment architecture mature as a unified mission. Together, these activities will increase technology readiness and move GLEE closer to a flight-capable distributed lunar science system.

ROCKSAT PAYLOAD

