



TOPIC # - TDC - 301

Lunar Worksite Mapping & Construction Verification

BACKGROUND

Future lunar construction systems will need to verify how terrain changes during grading, excavation, compaction, and berm construction. Useful measurements include elevation change, displaced material volume, grade, rut depth, surface roughness, and berm geometry. Cislune is developing rover-based lunar site-preparation technology through NASA-funded research and is interested in a complementary, low-cost method for measuring a worksite before and after an operation.

PROBLEM/ DESCRIPTION

Develop and demonstrate a portable or rover-mountable approach that creates repeatable before-and-after measurements of a small lunar-regolith-analog worksite. The team will begin with a sensor and architecture trade study, then select one primary technical path with the Cislune mentor based on team skills, schedule, and available equipment:

- Sensor mast or portable mapping fixture using a depth camera, low-cost LiDAR, or calibrated photogrammetry.
- Calibration and registration methods for repeated worksite scans.
- Software that produces digital terrain models and quantifies a focused set of terrain-change metrics.
- Reduced integrated demonstration combining sensing and analysis on a prepared granular test bed.

Scope note: The team is not expected to complete every path or metric. Additional integration may be pursued only as schedule allows. The challenge is independently scoped adjacent to Cislune's GRASP work and is not on the critical path for NASA contract deliverables

DELIVERABLES

- Documented trade study, selected semester objective, and success criteria
- One functional prototype, measurement fixture, or analysis pipeline
- Repeatable calibration and test procedure plus a granular-test-bed demonstration
- Design files, code where applicable, test data, results, limitations, and recommended next steps.

DESIGN TEAM PROFILE

NASA MENTOR:	Erik Franks, Cislune Inc. (erik@cislune.com)
LEVEL:	Undergraduate students of any level
MAJOR/DISCIPLINE:	Mechanical, Civil, Electrical or Computer Engineering; Robotics; Computer Science; Geomatics; or related fields
TEAMS:	1 team of approximately 3-6 students
DURATION:	One semester; optional second semester for rover integration or a larger demonstration

