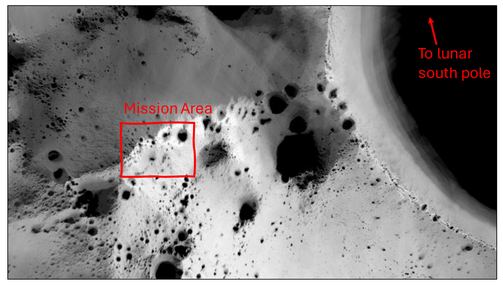
Fleet for Lunar Autonomous Reconnaissance and Exploration (FLARE)

Mission Statement

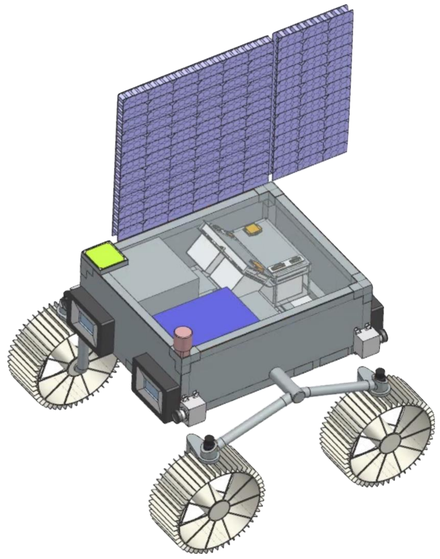
Many areas of the lunar poles have never seen sunlight. These Permanently Shadowed Regions (PSRS) are largely unexplored, and scientists hypothesize that these regions may harbor trapped water and other volatiles. FLARE aims to develop an understanding of lunar water content and potentially the lunar water cycle at PSRs at the lunar south pole. Using these three NASA instruments, FLARE aims to better understand the Moon's history and enable future missions and lunar development.



Mission Goals

- Explore the lunar south pole over the course of one lunar day (one Earth month) using a fleet of six rovers
- Traverse the lunar surface using autonomous navigation and guidance
- Study surface, subsurface, and exospheric water content in and around several PSRs using three NASA instruments: TENS, T-S, and T-G
- Report data back to Earth using the network of collaborative rovers

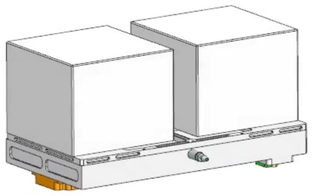
Rover Design



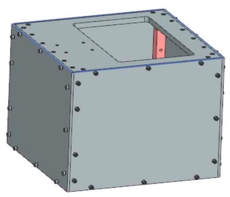
- Homogenous fleet of six rovers
- All three science instruments on all rovers. Maximizes potential science density
- Equipped with lidar, hazcams, sun-tracker, and IMUs for autonomous navigation
- Four-wheel steering for maneuvering and instrument positioning

Instrumentation*

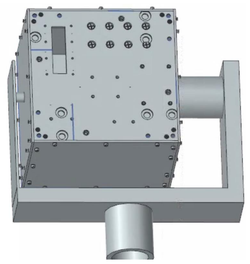
* Instruments simplified to protect NASA proprietary information



TENS
- Analyzes neutron moderation to search for water **beneath** the surface

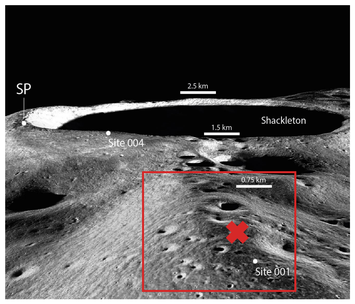


T-S
- Analyses surface material to search for water **on** the surface

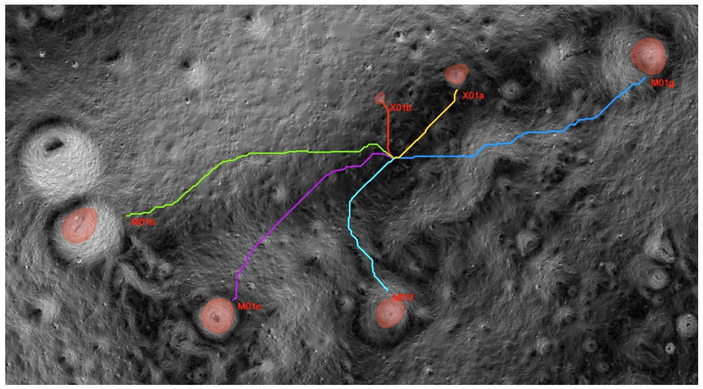


T-G
- Analyses sunlight through the lunar exosphere to search for water **above** the surface

Mission Site

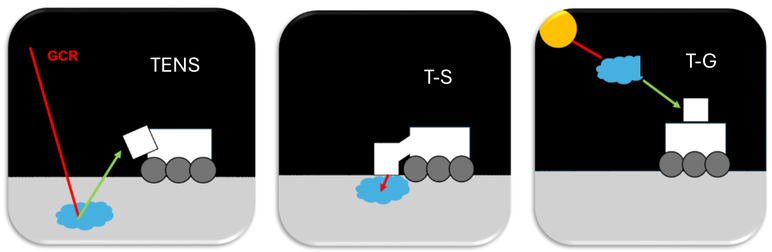


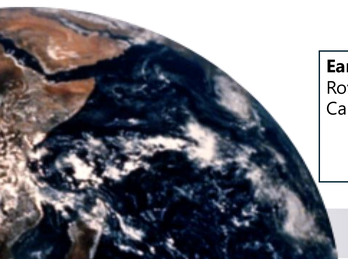
- FLARE's mission will begin at the peak of Shackleton-de Gerlache Ridge, given:
  - High average illumination
  - Low terrain inclination and variation
  - High PSR density



Landing site (center) with primary PSR targets highlighted and anticipated rover paths drawn. PSRs (clockwise from top center): X01b, X01a, M01g, M01f, M01c, M01b

- Rovers will split up at the landing site and each travel to one of six PSRs
- Autonomous path planning will be used to identify the path of least slope
- Rovers will conduct a spatially and temporally complete survey of each PSR





Mission Timeline

Earth day 1:
Rovers are launched from Cape Canaveral, FL

Earth day 29:
Griffin Lander arrives on the moon at the Shackleton De-Gerlache ridge. Rovers power on and complete initial checks

Earth day 30:
Rovers exit the lander using ramps and extend their solar panels. Rovers complete final systems checks and test measurements

Earth day 31:
The fleet splits up and each rover travels to its designated PSR. Path planning is determined autonomously via SLAM (Simultaneous Localization And Mapping)

Earth day 31-58:
Measurements are taken and sent back to the ground station on Earth. Operators can adjust rover objectives for unexpected terrain or instrument data.

Earth day 58:
End of lunar day, rovers move away from areas of high scientific interest and power down to die overnight