

S.C.R.E.W DRIVER

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Agenda

- | | |
|--|-----------------------------|
| 1 - Team Introduction | 7 - Navigation |
| 2 - Mission Overview | 8 - Collection/Relay |
| 3 - Industry Partner | 9 - Communication |
| 4 - Landing site | 10 - Future Missions |
| 5 - Instrumentation/ Power Source | 11 - Conclusion |
| 6 - Software | |



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MEET THE TEAM

Team Org Chart



Systems Specialist

Jocelyn Garcia



Luke Appleby



Hardware Specialist

Jonathan Kiser



Xingzhe Li



Software Specialist

Jeffrey Rivera



Surface Op Specialist

Isaac Kim James Ross



Science Com Specialist

Yousef Nasr



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MISSION OVERVIEW



Fundamental Requirements For A SUCCESSFUL MISSION

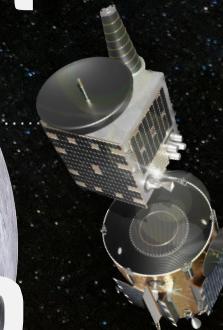
Design a lunar robot capable of charting the topography of the moon

Can endure a 12-day period on its surface

Capable of maneuvering through rough terrain.

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INDUSTRY PARTNER

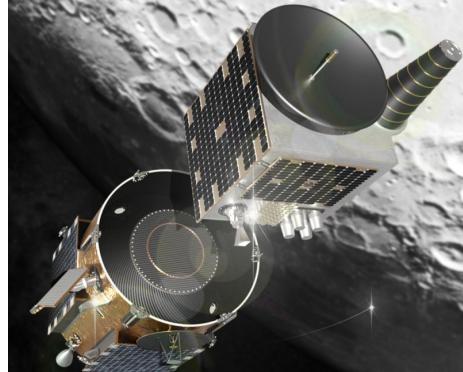


MARSHAL SPACE FLIGHT CENTER NAVY



CLPS Provider

- Firefly Aerospace - Blue Ghost Mission 2
 - Scheduled for delivery to lunar far side in 2026
 - Consists of the Blue Ghost Lunar Lander / Transfer Vehicle
 - Planned Payloads:
 - LuSEE-Night Radio Telescope (NASA)
 - UT (User Terminal) (NASA JPL)
 - Lunar Pathfinder satellite (ESA)
- Partner Selection Criteria / Considerations
 - Feasibility
 - Landing Site - No unnecessary design challenges
 - Communication - Made simple with Pathfinder
 - Cost - Conserve resources without





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LANDING SIGHT





Mission Landing Site

- Mare Ingenii : “Sea of Cleverness”
 - One of the few Lunar Mare features located on the far side of the moon
 - Located near the southern hemisphere at $33.7^{\circ}\text{S}, 163.5^{\circ}\text{E}$
 - Has a diameter of 282 km





Mission Landing Site

- Terrain and Features
 - The terrain of Mare Ingenii is varied which makes it perfect for an expedition mission.
 - Mixture of flat plains and rugged mountainous regions.
- The Swirls of Mare Ingenii
 - High in albedo and 15 km across. Similar to Reiner Gamma Swirls
- Thompson Crater
 - Located within the Mare Ingenii and in the past filled in by Lava



INSTRUMENTATION

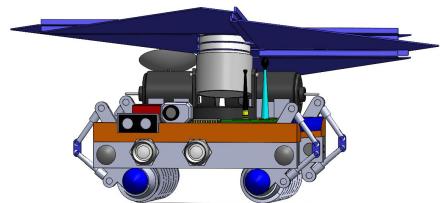
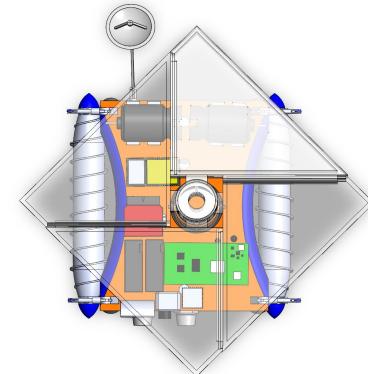
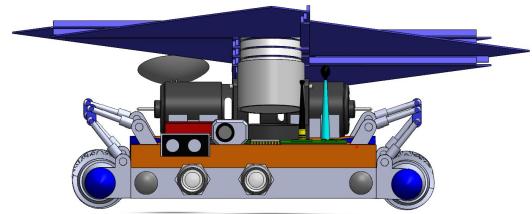
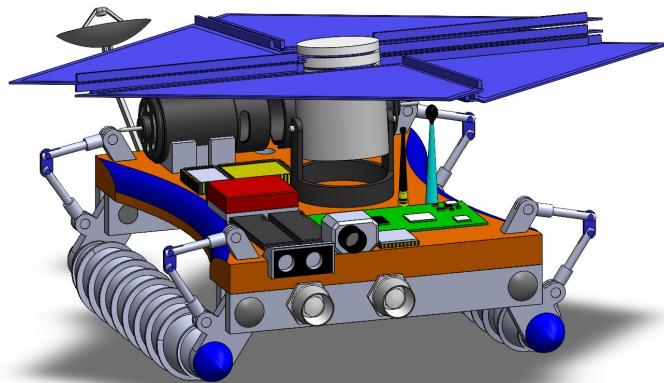
POWER SOURCE

The S.C.R.E.W. DRIVER

- 67 components
- Material: Aluminum
- Weight: 1.5kg
- Size: 8"x6"x6"

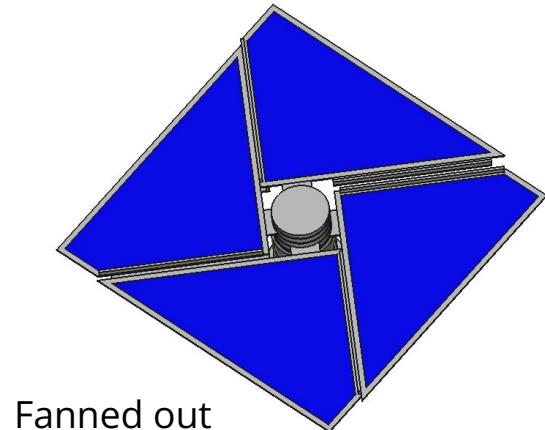
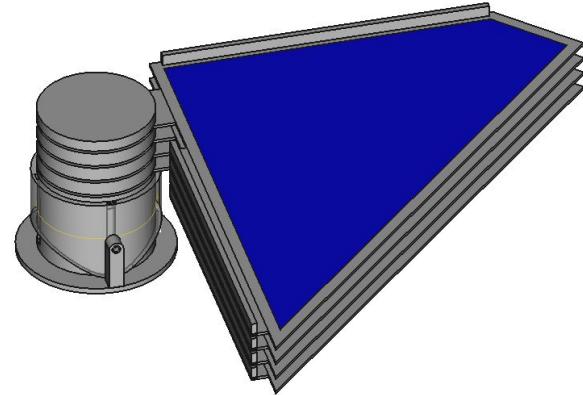
Includes:

- Infrared Camera
- Stereo Camera
- Thermistor
- Solar Panel
- Radiator
- Antenna
- IMU
- Batteries
- USB Hub
- Lights
- Digital Data Links
- Motors
- Hydraulics
- Screw Wheels
 - Four Directions of Movement



Solar panels

- Fans in and out
 - Motor turns bottom panel counter-clockwise and each panel pushes one above with ridge, fanning out
 - Bottom panel turns clockwise and another ridge pushes panel above, fanning in
- Adjustable height and angle
- 462.88 cm^2 total of solar panels
 - 1.5 W with direct sunlight, assuming 1300 W / m^2 of sun and 10% panel efficiency
 - Will help sustain rovers during the mission with adequate power during sunlight



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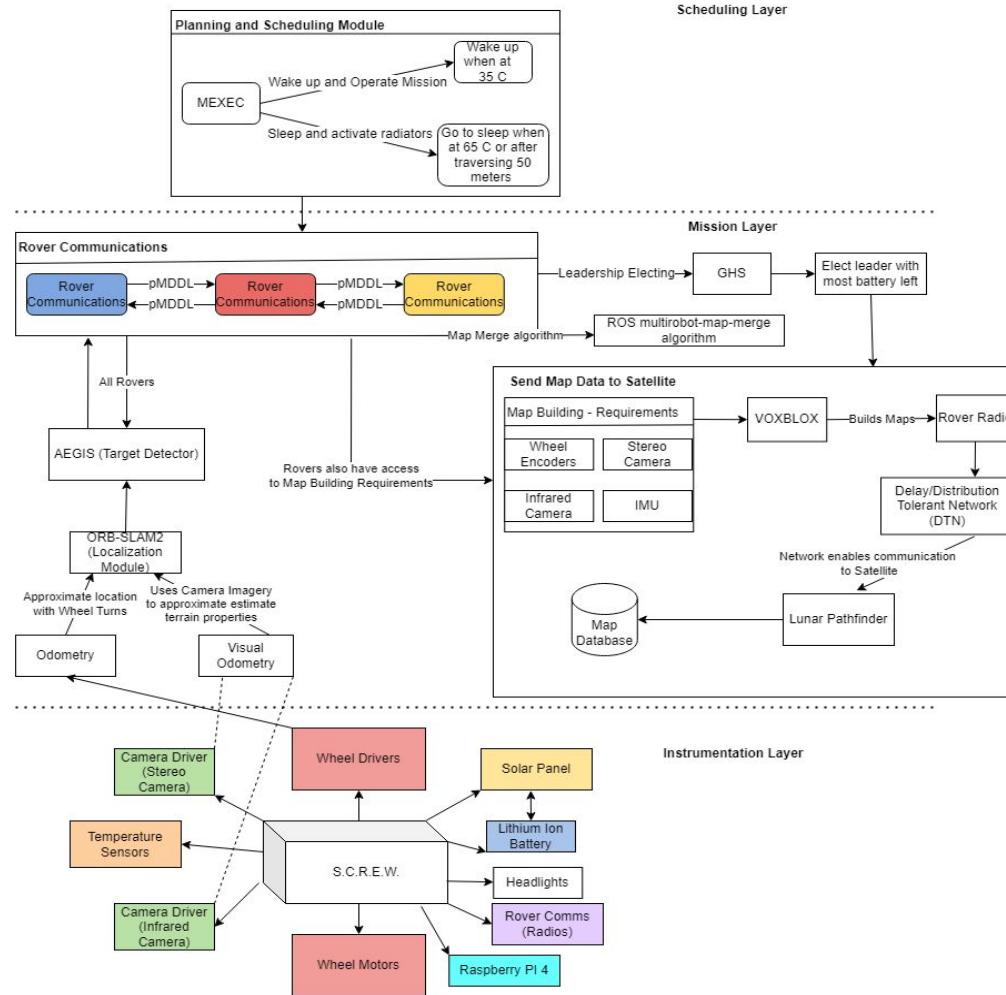


SOFTWARE

OPEN SOURCE



Software Architecture





Software

Scheduling Module:

- MEXEC

Rover Communications:

- Rover-to-Satellite Comms - Delay/Distribution Tolerant Network (DTN)
- Map Merging Algorithm - Robot Operating System (ROS)
multi-robot-map-merge algorithm
- Leadership Electing - GHS

Map Building:

- VOXBLOX - Creates Volumetric Maps
- Localization - ORB-SLAM2

Target Detection:

- Autonomous Exploration for Gathering Increased Science (AEGIS)



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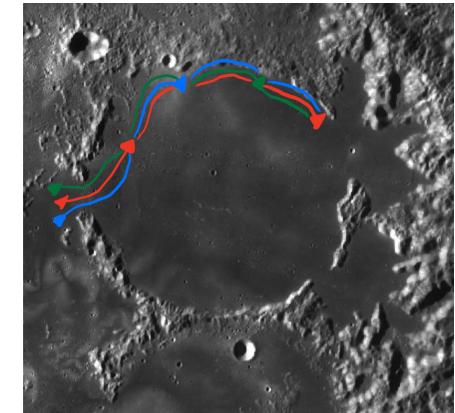
NAVIGATION





Navigation

- Using specialized software, our rovers will be able to navigate through Mare Ingenii fully autonomously and fulfill our expedition goals.
- Navigation will be led by a leader, who will receive mapping data from other rovers and itself and send that information to the Pathfinder Satellite.
- Travelling together, rovers will map the same area as the leader rover, creating more accurate and precise charts of the topography.
- Slower, but more accurate mapping data.

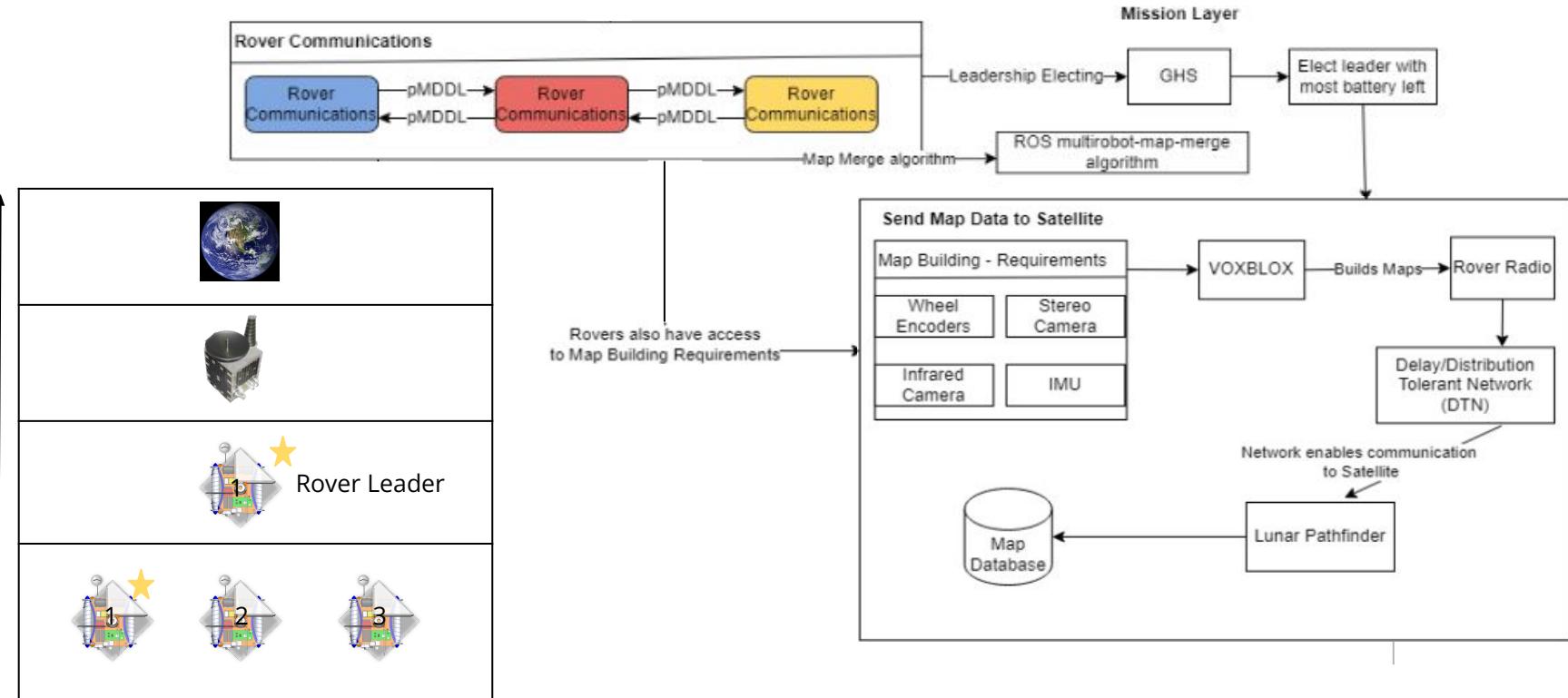


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COLLECTION/RELAY

Plan for transporting/relaying findings to Earth (Lunar Pathway)



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Public Communications



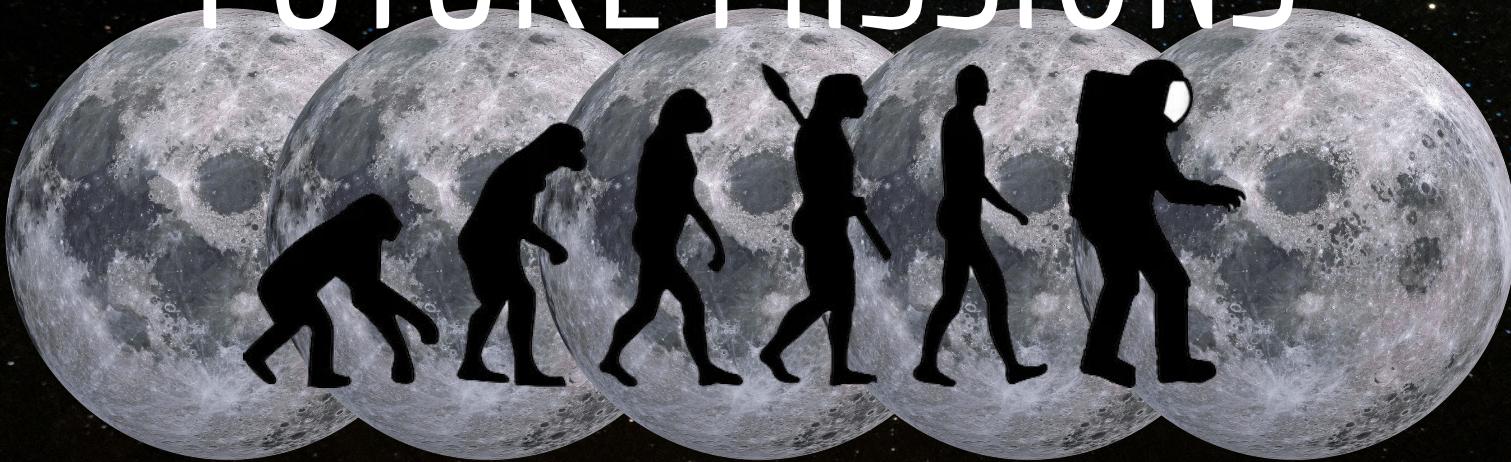


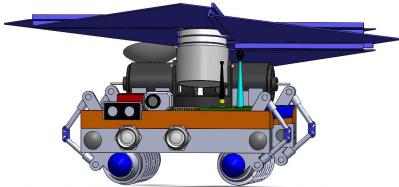
Marketing



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FUTURE MISSIONS





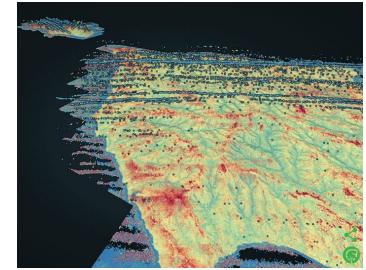
Future



This mission will lead to NASA's goals

- Exploration and research of lava tubes
- Human Presence on the moon
- The inevitable expansion to Mars

Exploration with the purpose of exploring lava tubes is worthy of more research and NSFC Navy should be considered for the role.

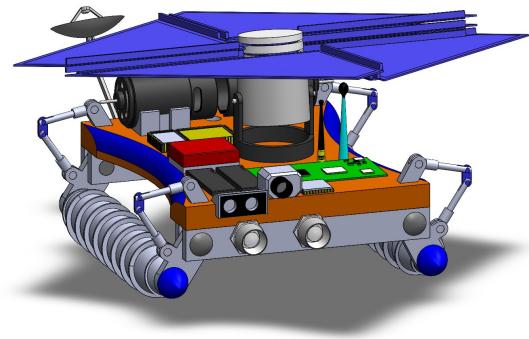


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CONCLUSION

CONCLUSION



This mission has everything it needs for success. A mission partner to take us to the moon, a robot to survey the moon, plan to search for lava tubes, and a way for the information to be sent back to the Earth.



Questions/Feedback?



Jeffrey Rivera



Jonathan Kiser



Luke Appleby



Milton Schober



Yousef Nasr



James Ross



Xingzhe Li



Jocelyn Garcia



Isaac Kim

