LUNAGRID-LITE

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Overview provided by:
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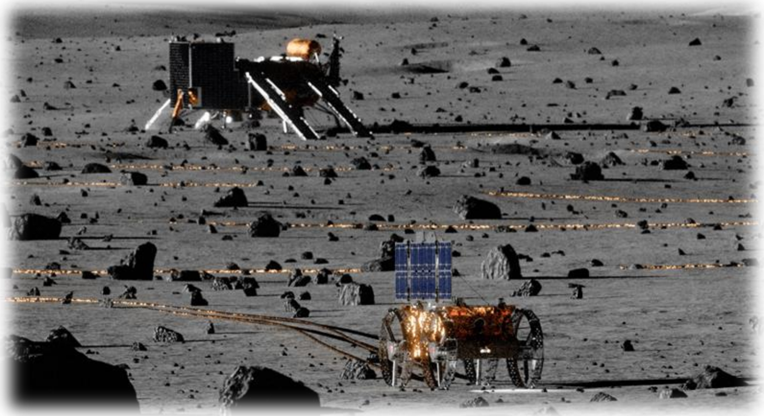
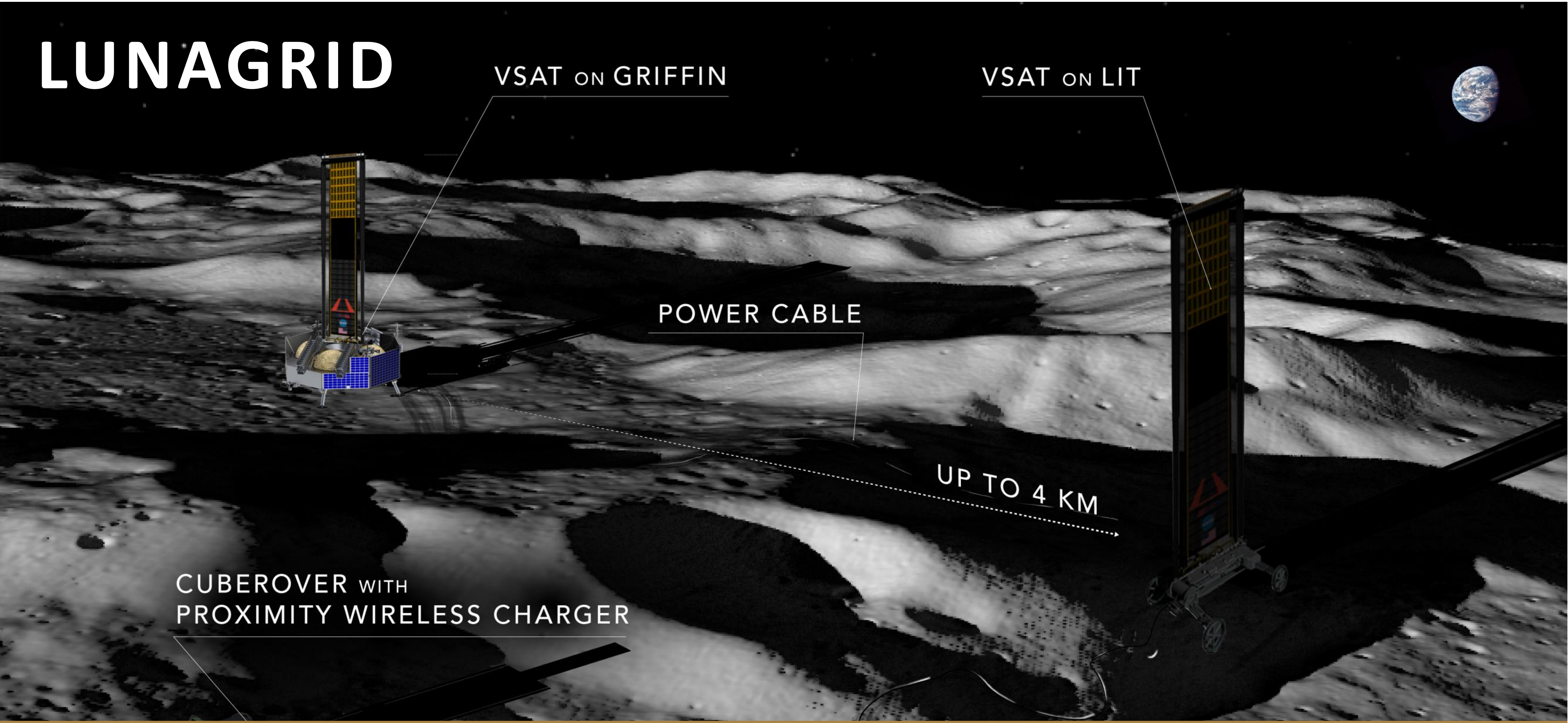
MISSION OVERVIEW



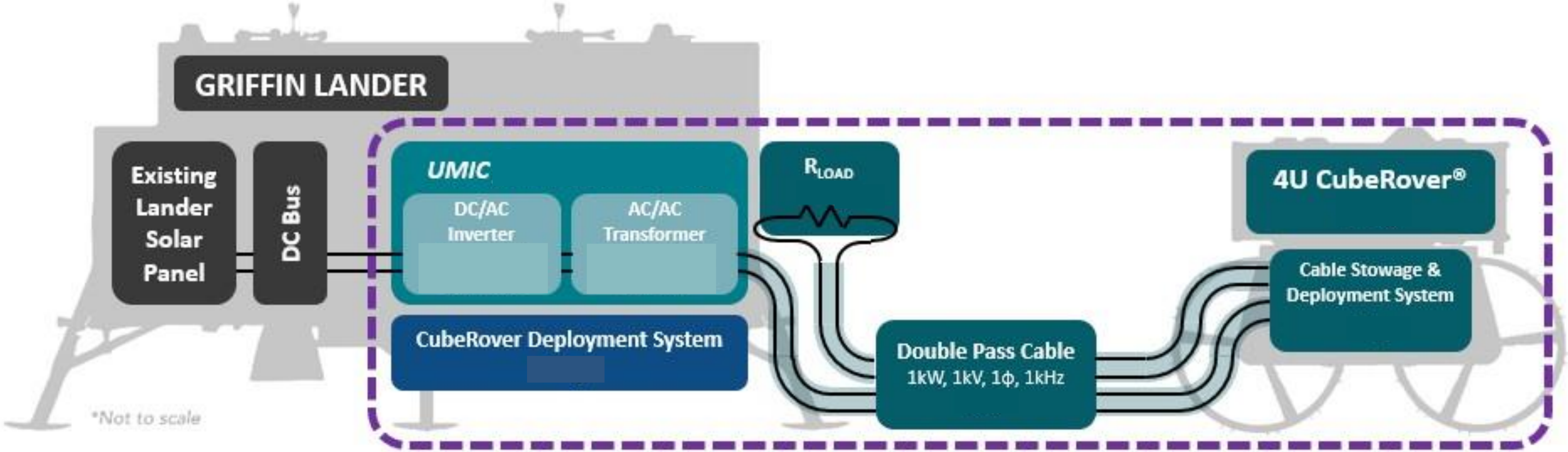
Astrobotic will demonstrate long-distance (500m), high power (1 kW @ 1kV, 1khZ, 1ϕ AC) transmission on the Moon by maturing and delivering a technology demonstration payload, named **LunaGrid-Lite (LGL)**

LUNAGRID



The first LunaGrid can be deployed on a single Griffin lander to the lunar South Pole. VSATs can be added over time to scale the grid, increasing coverage over more parts of the South Pole. Note, while LunaGrid will provide service over kilometers, this image is not to scale.

SYSTEM ARCHITECTURE OVERVIEW



MISSION OBJECTIVES

1. Mature the technology readiness of the following key LunaGrid technologies:
    - Lunar DC/AC Power Converter (i.e., UMIC)
    - High Voltage, High Efficiency Lunar Power Cable
    - Lunar Cable Deployment System

2. Operate these components as a functional system on the lunar surface

3. Test how lunar cables perform in a lunar environment vs. terrestrial environment, and provide data to scale and design cables for LunaGrid

4. Advance Astrobotic lunar power grid infrastructure technologies that will support Astrobotic as a commercial lunar power service provider

KEY MISSION CONSTRAINTS

1. 20kg of total system mass (UMIC, cable + load, cable deployment system, CubeRover)

2. Maximum of 200 hours of mission operation time

KEY CHALLENGES AND RISKS

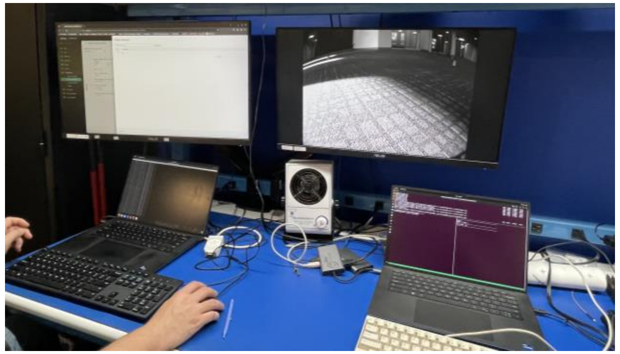
- **Cable Breaking and Tangling**
  1. Tensile strength testing
  2. Obstacle avoidance simulations
  3. Un-reeling mechanisms for controlled payout
- **Vision at South Pole**
  1. Camera and sensor selections
  2. Simulated lighting environment mission ops
- **System Mass < 20kG**
  1. Limits mass of cable and distance that can be traversed
  2. Limits power levels achievable
- **CubeRover Drive Distance**
  1. Limited surface time (night survival not planned)
  2. Maximize vision capabilities
  3. Power testing with cable not fully unspooled
- **Communication Disruption**
  1. WiFi planned for local communications
  2. Occlusion and topology characterization of effects on signal
- **Regolith Intrusion to Cable Deployment System**
  1. Design (and terrestrial testing) needs to consider regolith affecting cable deployment operations

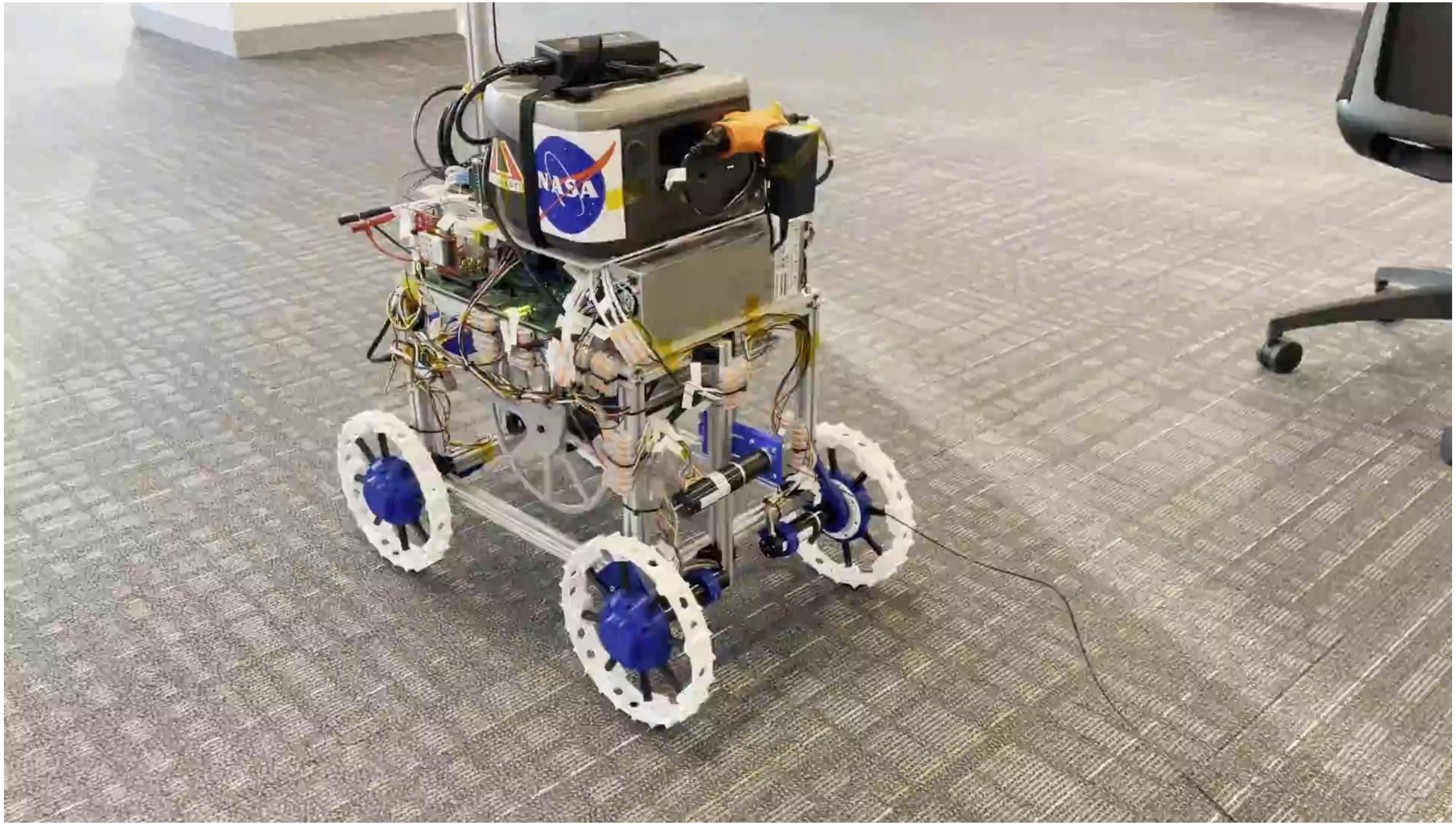
BRASSBOARD CUBEROVER DRIVE TESTING

Highlights

- ~50 m of remote waypoint traverse
- cFS flight software with flight-representative:
    - CPU (dev board)
    - Front camera
    - Motor controllers
    - Wifi antenna
    - Drive + cable control kinematics
- Mock cable

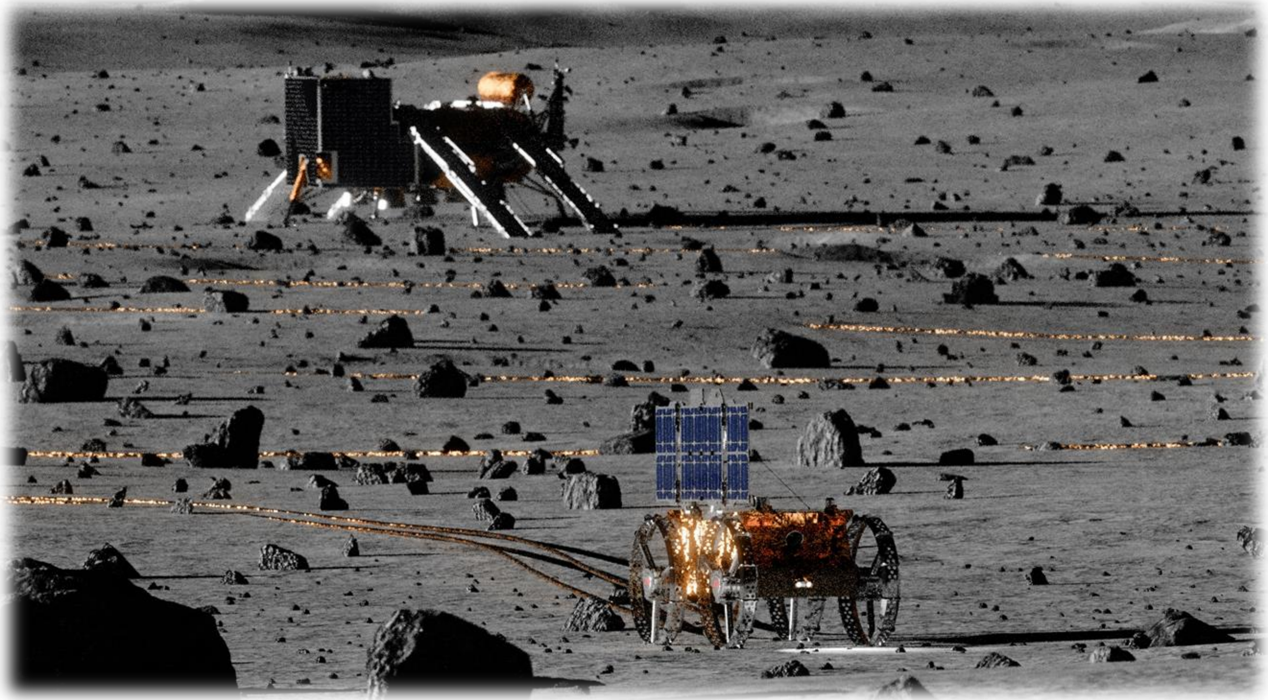
Remote Operations Workstations





CABLING OVERVIEW

1. 500m of cable will be paid out onto Lunar Surface via Reel + CubeRover
2. Load will be located at Lander
    - (there and back cable configuration)
3. Key concerns
    - Magnetic interaction with Lunar regolith
    - Thermal rise of small cable
    - Cable jacket strength



CABLE DEPLOYMENT SYSTEM

- **Reel**
  - Houses power cable
  - Contains tensioning/reverse mechanism
  - Integrated to primary rover structure to support large cable mass

- **Feeder**
  - Feeds cable out of rover using a motor
  - Cable interfaces to splined cogs to prevent slip
  - Design derived from 3D printer filament feeding mechanism

THANK YOU!