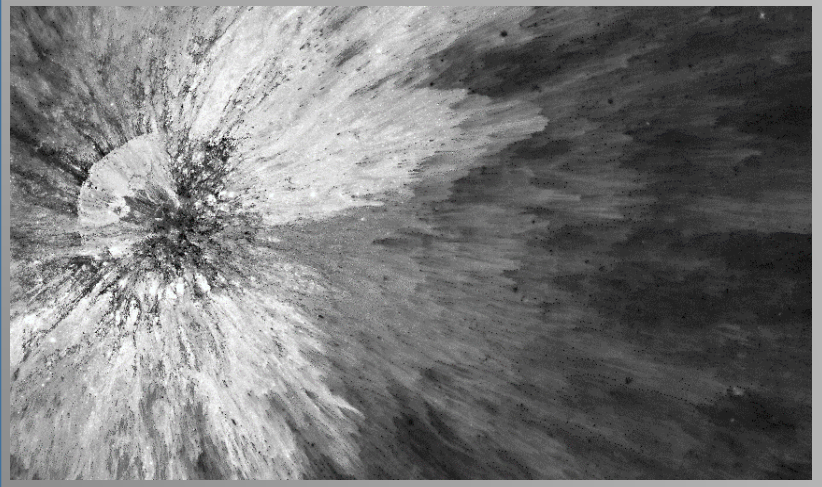
Commercial Lunar Payload Services (CLPS)



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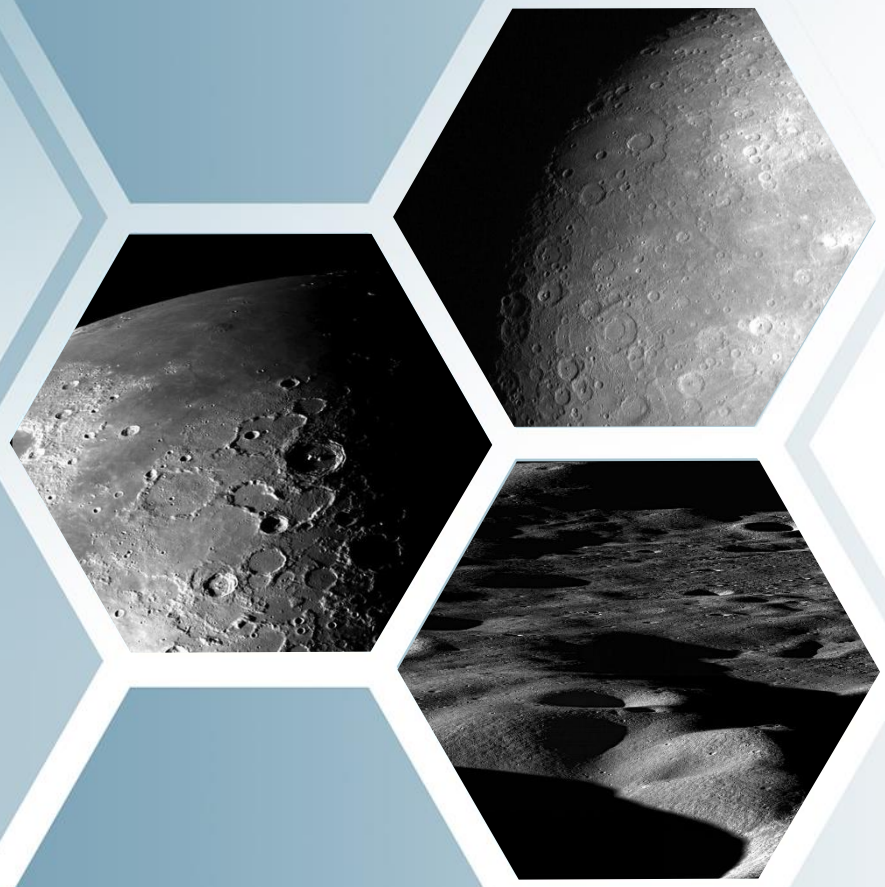
Agency Priorities

To achieve a sustainable presence on the moon through innovative public-private partnerships with US commercial companies and international partners.

Phased Approach

- Gateway to Lunar Surface *will facilitate*
  - Human lunar landing by 2024
  - Sustainable missions by 2028
- New Lunar Science and Technology *enabled by*
  - Small commercial lunar landers as early as 2020
  - Medium-size landers and rovers by 2023



Commercial Lunar Payload Services

- NASA wants to be a marginal customer, one of many payload providers. NASA does not intend to manage or direct these commercial missions.
- Sponsored (programmatic and funding) by the Science Mission Directorate in support of NASA's science, human exploration and technology goals.
- Master contract awarded to vendors to safely integrate, accommodate, transport, and deliver NASA payloads using contractor-provided assets, including launch vehicles, lunar lander spacecraft, lunar surface systems, Earth re-entry vehicles, and associated resources.

Contract Details

- **CONTRACT TYPE:** The Government awarded 9 fixed-price, indefinite delivery indefinite quantity contracts in November 2018 and added 5 more vendors in November 2019.

Contract cont'd

- **ESTIMATED VALUE: Min** $25k **Max** $2.6B per each contract awarded. The maximum ordering value of the firm fixed price contracts and associated task orders is $2.6B, individually and cumulatively.

- **CONTRACT PERFORMANCE PERIOD:** 10-year Effective Ordering Period.

- **ON-RAMPING:** Every two years, or as needed, the government will perform a market analysis to assess capability growth across the industry and space transportation sector.
  - If warranted, the government will issue requests for proposals to on-ramp additional vendors as industry emerges with new candidates and capabilities.
  - No further on-ramping will occur after Contract Yr. 8
  - First on-ramp completed in November 2019

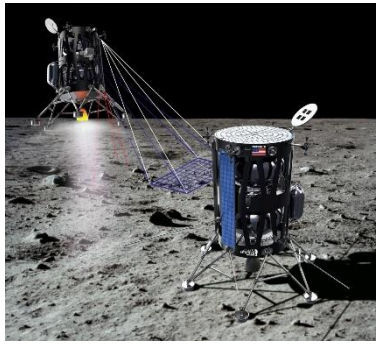
Task Order Process

- Task orders will be issued on an “as needed basis”
- Vendors must respond to each task plan requested by NASA
- Task Order’s SOW will describe the specific requirements
- The period of performance shall be specified on each individual task order
- Mission success criteria will be defined for each task order
- Task orders will be competed among all vendors in the contract pool

Task Order History

- Task Order #1 – Payload User's Guides
  - Received from first 9 companies; reissued to 5 new companies
- Task Order #2 – First Payload deliveries to the Moon
  - Selected 3 companies
- Task Order #3 – Study on mid-sized landers
  - Selected 2 companies and finished studies in July 2019
- Task Order 19C – Collection of science instruments
  - Going to a lunar pole
  - Awarded to Masten April 2020
- Task Order 20A – VIPER Mission
  - Mid-size lander to deliver NASA rover and instruments to the South Pole
  - Awarded to Astrobotic June 2020

CLPS Delivery Task Order Selections



- May 31, 2019 NASA selects first Commercial Moon landing delivery services for Artemis Program to deliver science and technology to the Moon
  - Astrobotic of Pittsburgh awarded $79.5 million to fly as many as 14 payloads to Lacus Mortis, by July 2021
  - Intuitive Machines of Houston awarded $77 million to fly as many as five payloads to Oceanus Procellarum by July 2021
  - Orbit Beyond of Edison, New Jersey awarded $97 million to fly as many as four payloads to Mare Imbrium, by September 2020

2021 CLPS Delivery Manifests

Payloads largely selected from NASA Provided Lunar Payloads (NPLP)

Astrobotics

- Surface Exosphere Alterations by Landers (SEAL)
- Photovoltac Investigation on Lunar Surface (PILS)
- Near-Infrared Volatile Spectrometer System (NIRVSS)
- Mass Spectrometer Observing Lunar Operations (Msolo)
- PROSPECT Ion-Trap Mass Spectrometer for Lunar Surface Volatiles (PITMS)
- Linear Energy Transfer Spectrometer (LETS)
- Neutron Spectrometer System (NSS)
- Neutron Measurements at the Lunar Surface (NMLS)
- Fluxgate Magnetometer (MAG)
- Navigation Doppler Lidar for Precise Velocity and Range Sensing (NDL)

Key

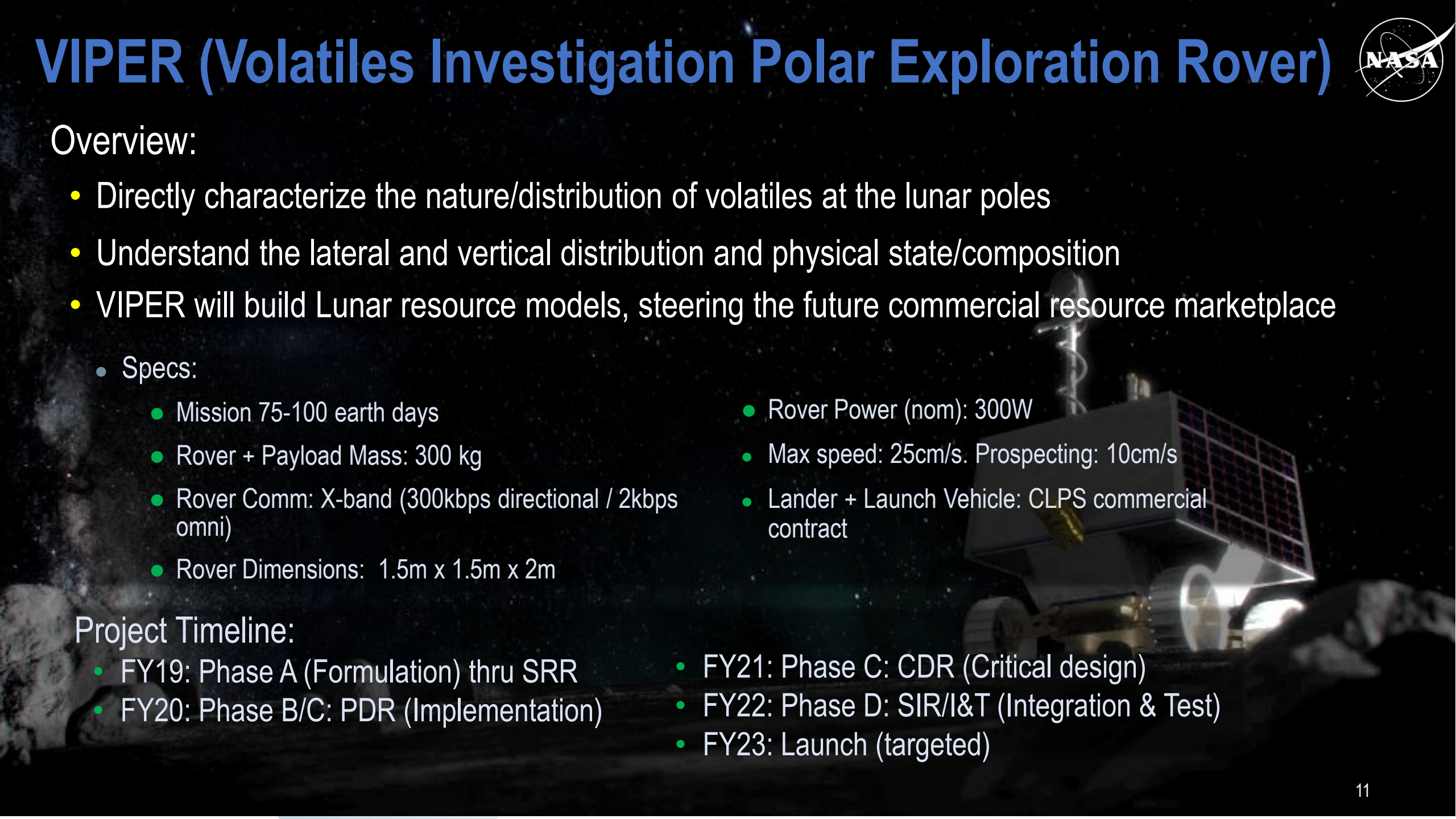
- Science
- Technology
- Exploration
- HEOMD/STMD In-line tech demo

Intuitive Machines

- Lunar Node 1 Navigation Demonstrator (LN-1)
- Stereo Cameras for Lunar Plume-Surface Studies (SCALPSS)
- Navigation Doppler Lidar for Precise Velocity and Range Sensing (NDL)
- Low-frequency Radio Observations from the Near Side Lunar Surface (ROLSES)
- Radio Frequency Mass Gauge (RFMG)
- Cryo Methane Propulsion Data Buy

GSFC Laser Retroreflector Array (LRA) included on each lander.

VIPER (Volatiles Investigation Polar Exploration Rover)



Overview:

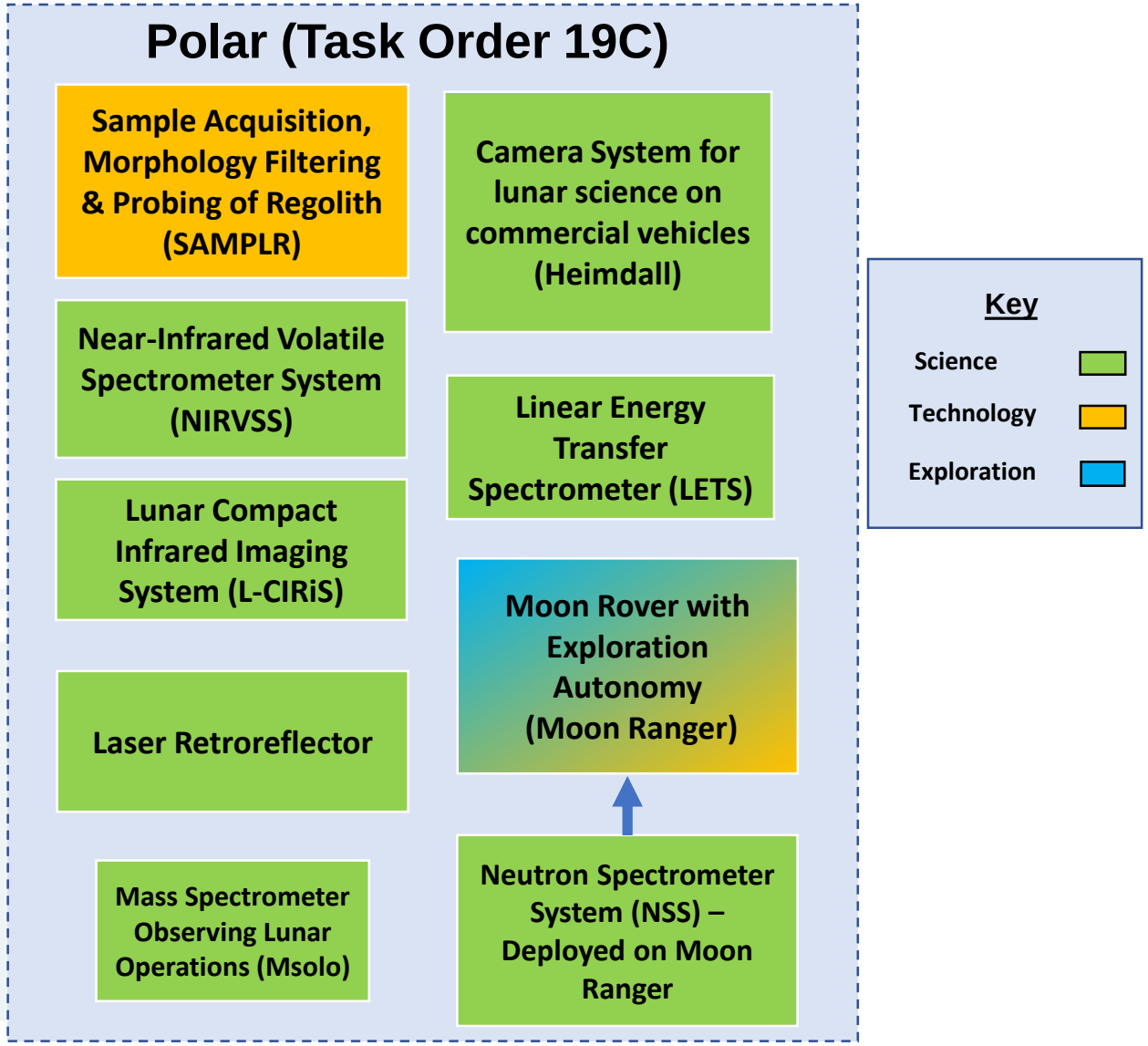
- Directly characterize the nature/distribution of volatiles at the lunar poles
- Understand the lateral and vertical distribution and physical state/composition
- VIPER will build Lunar resource models, steering the future commercial resource marketplace
  - Specs:
    - Mission 75-100 earth days
    - Rover + Payload Mass: 300 kg
    - Rover Comm: X-band (300kbps directional / 2kbps omni)
    - Rover Dimensions: 1.5m x 1.5m x 2m
    - Rover Power (nom): 300W
    - Max speed: 25cm/s. Prospecting: 10cm/s
    - Lander + Launch Vehicle: CLPS commercial contract

Project Timeline:

- FY19: Phase A (Formulation) thru SRR
- FY20: Phase B/C: PDR (Implementation)
- FY21: Phase C: CDR (Critical design)
- FY22: Phase D: SIR/I&T (Integration & Test)
- FY23: Launch (targeted)

Task Order 19C CLPS Delivery Manifest

Payloads largely selected from Lunar Surface Instrument and Technology Payloads (LSITP)



Lessons Learned

- NASA is a critical player in establishing early commercial capability
- The vendor pool is both capable and robust but future market projections are very incomplete
- To create the right partnership between NASA and commercial entities requires both sides to adapt and make adjustments
  - NASA has a very hard time sticking to a set of requirements
  - NASA has to approach mission concepts in a different way when using commercial services
- Areas such as Mission Assurance and cross payload responsibilities need a lot more discussion
- The opportunity to fly to the Moon multiple times per year will have a significant impact on both Lunar science and human exploration