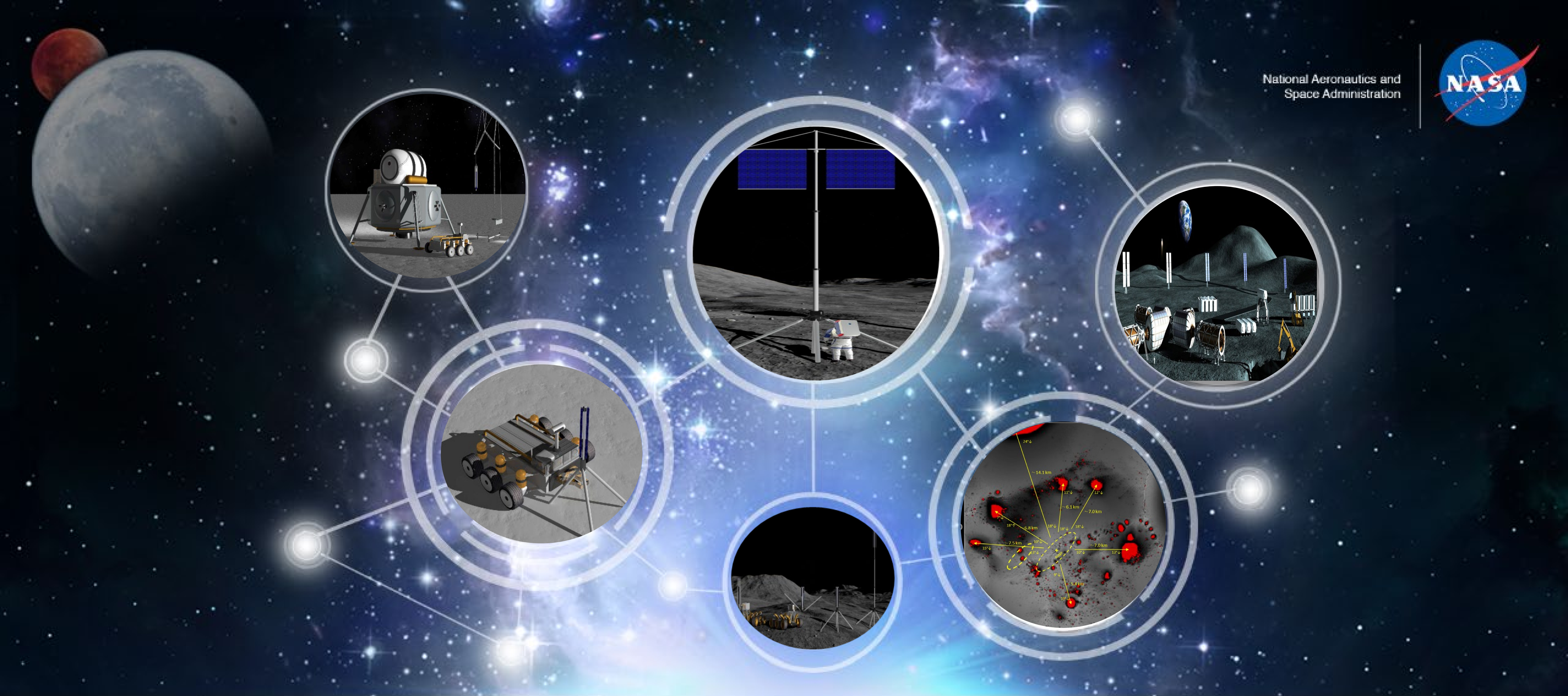


National Aeronautics and Space Administration

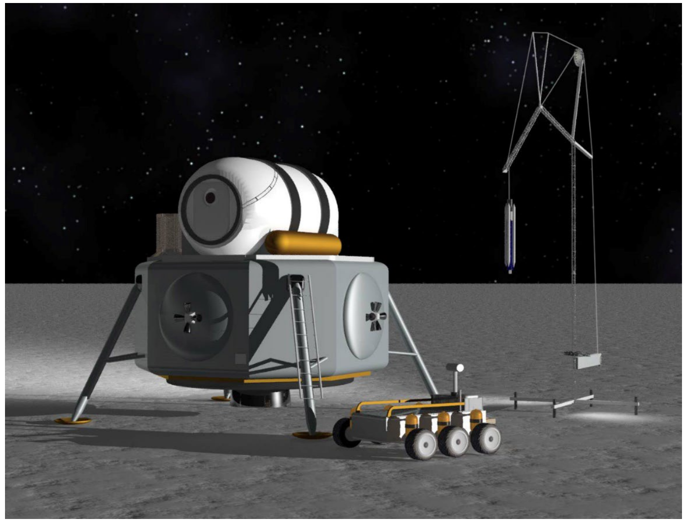
Space Technology Mission Directorate

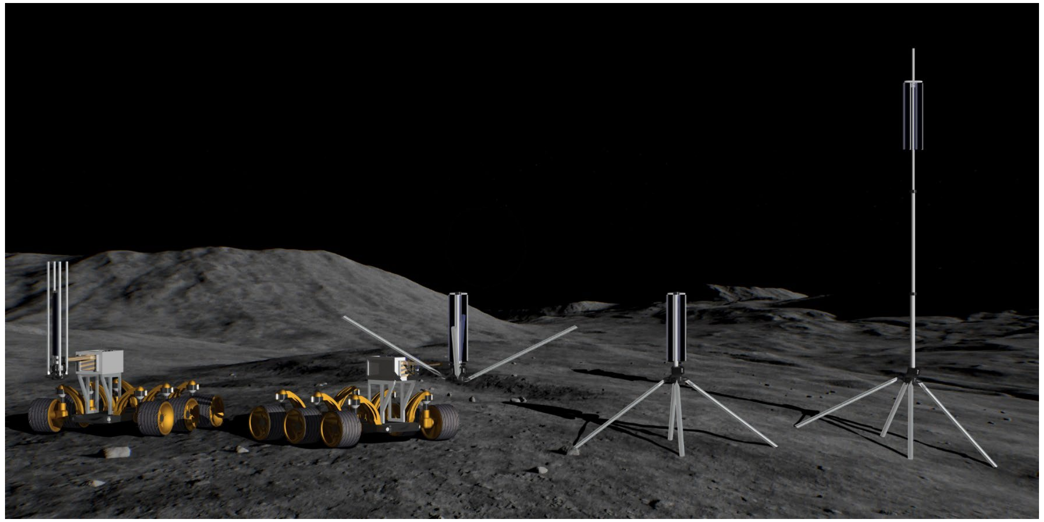
Game Changing Development Program - Vertical Solar Array Technology Project

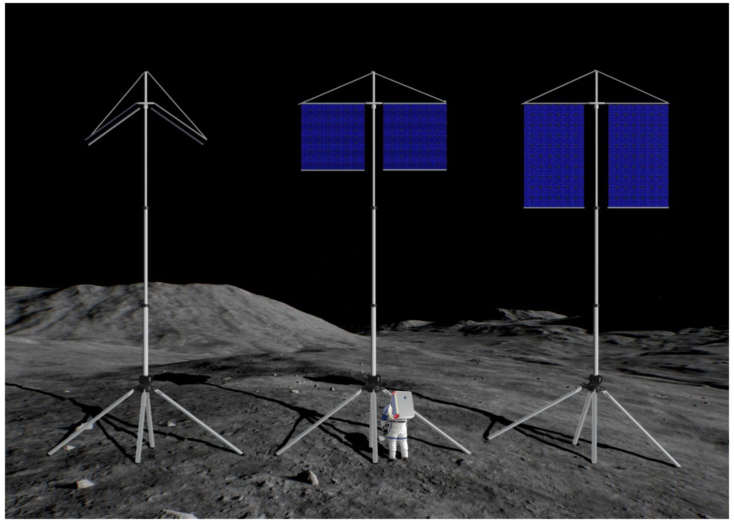
Chuck Taylor PM/Richard Pappa PI

VSAT Overview

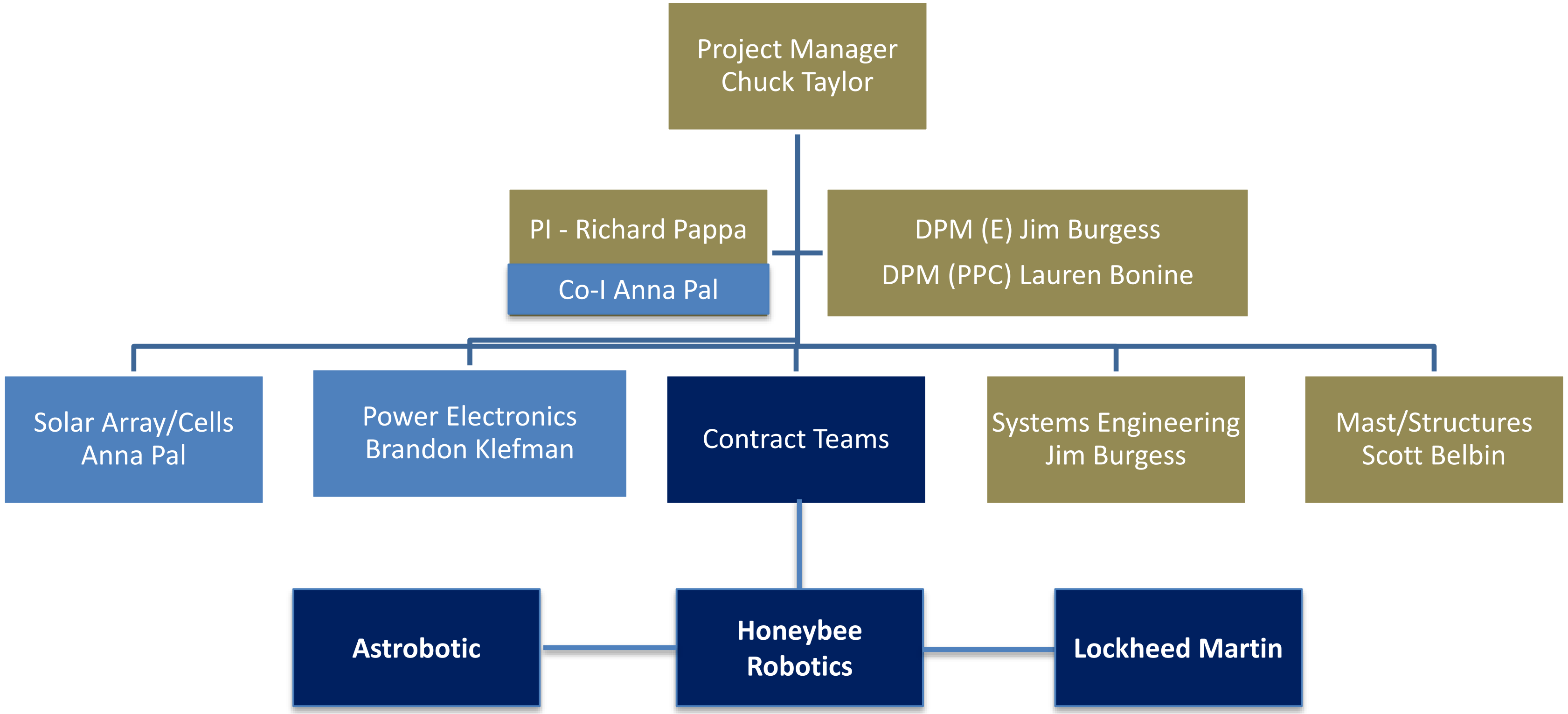
The Vertical Solar Array Technology (VSAT) project is focused on the development of solar array technologies necessary for sustained presence on the lunar surface circa 2028. Existing solar array structures and deployment system technologies are designed for either zero-g or horizontal surface deployment. VSAT will explore vertical array deployment on extension masts of up to 10m in length in order to capture near continuous sun light at the lunar south pole.







Team Members / Project Org Slide



-- LaRC

-- GRC

Mission Infusion & Partnerships

- Contributing partners and/or stakeholders
  - STMD and HEOMD sponsor the project
  - HEOMD is an obvious long term stakeholder as the owner of future Lunar Exploration architectures

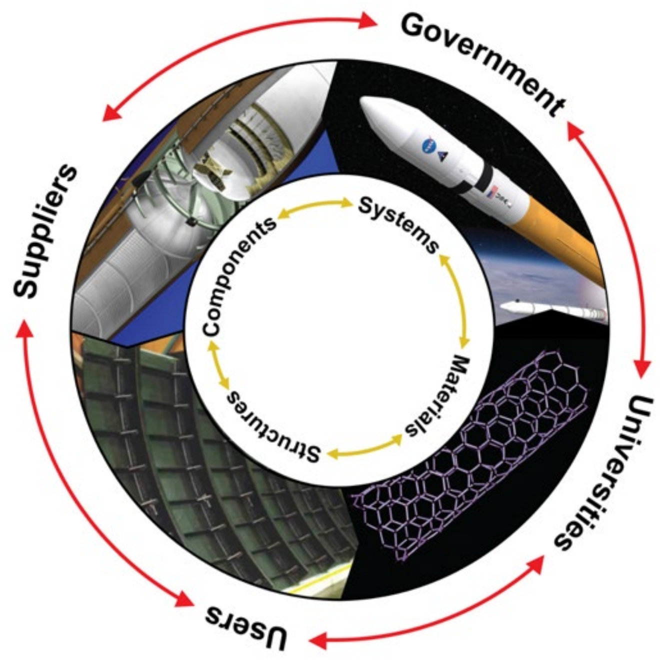
- Infusion/transition plan
  - The primary infusion path is via NASA's "Sustained Presence" period of Lunar Exploration circa 2028 and beyond
  - Providing primary power generation capability to lunar surface activities is the sole focus of VSAT
  - Transition plan calls for VSAT technology adoption by prime contractors engaged in Lunar Sustainment exploration architecture development

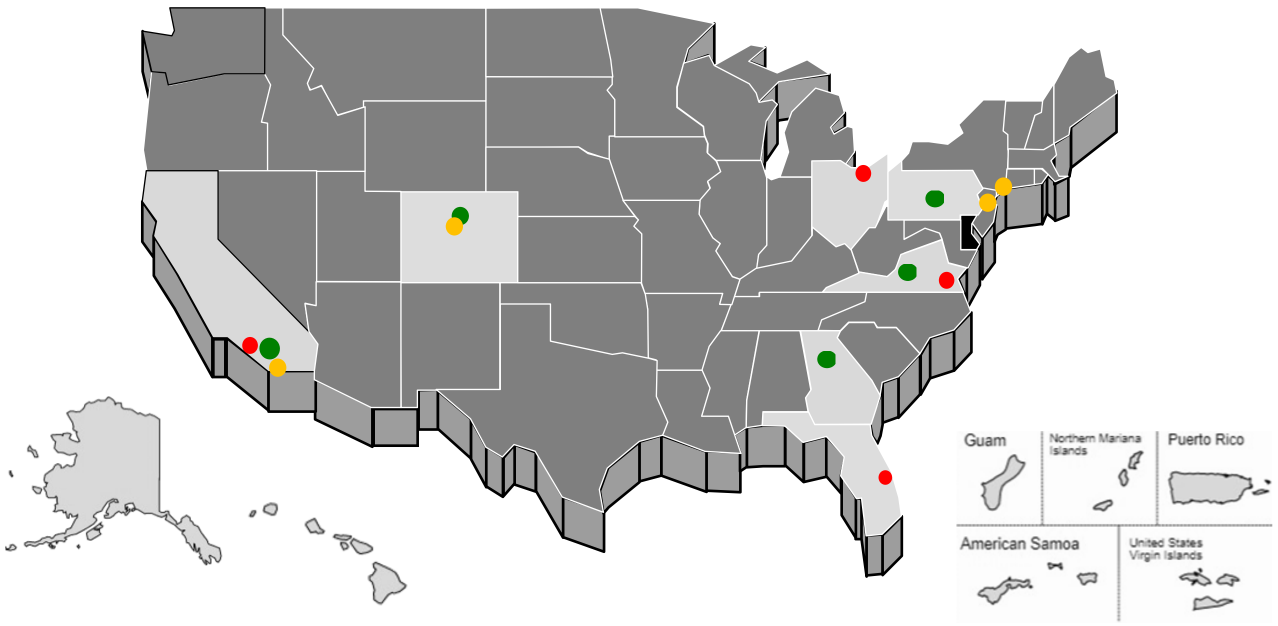
Collaborations & Partnerships

NASA Centers
- LaRC
- GRC
- KSC
- JPL

SBIR/STTR
- Dynovas
- Folditure
- Opterus
- PVT Clean Energy

Industry/Academia
- Astrobotic
- Honeybee Robotics
- Lockheed Martin
- VMI
- Georgia Tech





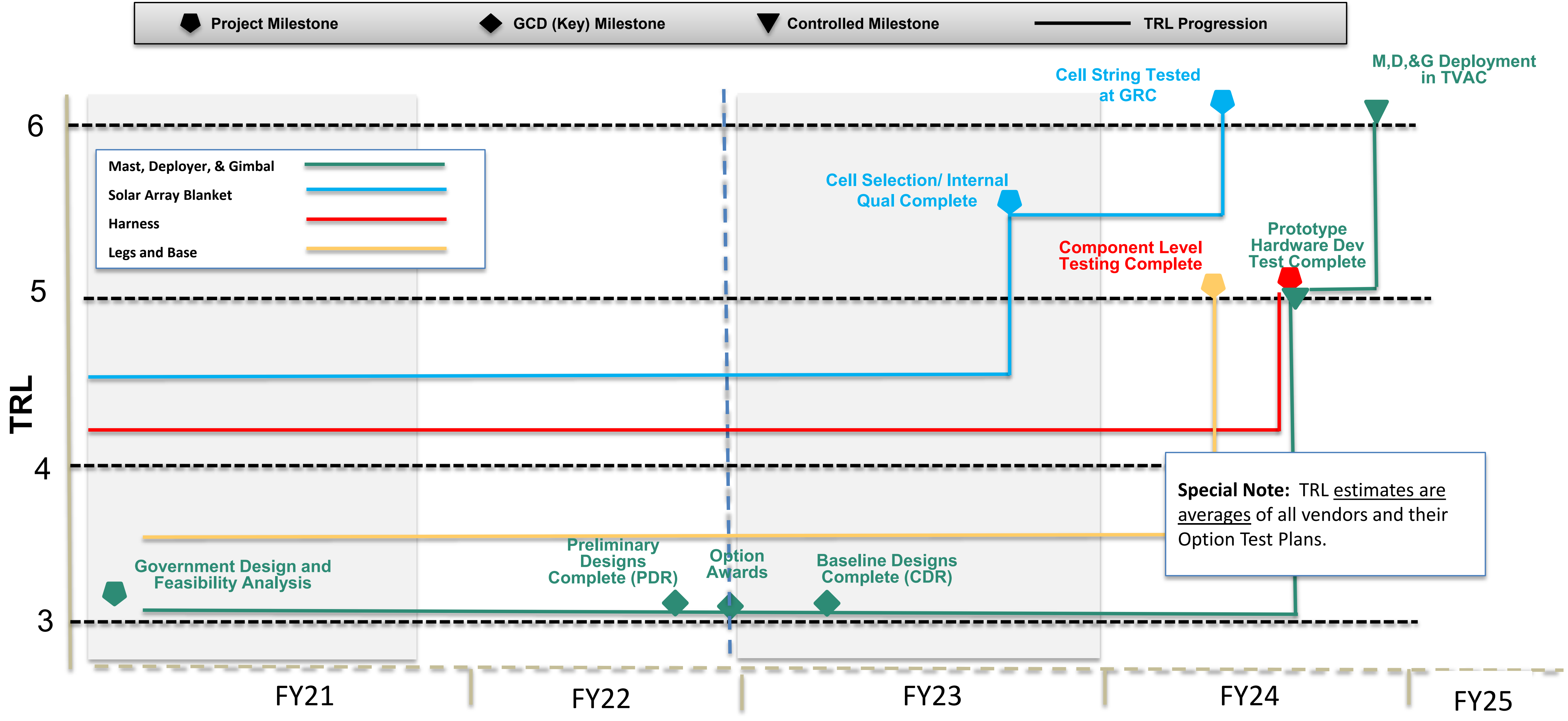
Collaborative multidisciplinary partnerships to leverage fiscal resources, ideas, knowledge & expertise.

VSAT
Technology Goals & Project Objectives

Technology Goals	
Goal #1	Autonomous system capable of vertical array deployment on extended mast on uneven terrain
Goal #2	Deployment mechanisms designed for reliable, autonomous retraction, and system mobility
Goal #3	Modular architecture component, adaptable to multiple mission architectures, designed to minimize mass and packing volume

Project Objectives	
Objective #1	Develop Design Reference Mission and Designs
Objective #2	Solicit competitive awards to industry to study (1) above and develop their own designs for a Lunar South Pole VSAT concept
Objective #3	Award hardware development contracts to one or more vendor for the development of a prototype VSAT system
Objective #4	Build and Test VSAT prototype hardware with an objective of reaching TRL 6 by project completion

VSAT
Lifecycle Milestone/Maturity Schedule

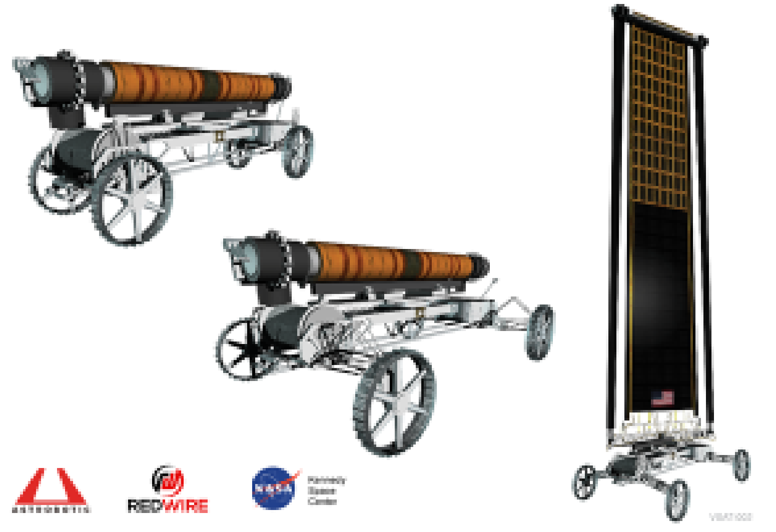


Accomplishments

- During the Base Period, all five vendors completed initial designs and analyses to approximately a PDR level
  - In the process each created:
    - Structural designs for 10m mast
    - Power Management and Distribution System designs
    - Test Plans for Option Phase
    - Dust Mitigation Strategies
    - Power and Thermal Analyses related to surviving a 96-hour sun shadowing event
  - At the conclusion of the Base Period each vendor presented their design and analytic findings
  - After the conclusion of these presentations the VSAT project team met and scored each competitor and selected those determined to be most beneficial to NASA's architecture goals for an Option Award
- The contractors receiving Option Awards are:
  - Astrobotic
  - Honeybee Robotics
  - Lockheed Martin

Astrobotic VSAT

Astrobotic VSAT: Affordable Lunar Mobile Power
NASA SpaceTech-REDDI-2020, Appendix 80HQTR20NOA01-20GCD_C1



PROJECT OVERVIEW

Period of Performance:

Base: .....2021 Sep 22 – 2022 Sep 21

Option: ..2022 Sep 22 – 2024 Sep 24

Price:

Base: $631,410.00

Option: $6,225,078.63

Technology Approach: Our key objectives are to mature the overall design of our VSAT system and raise its Technology Readiness Level (TRL) using proven design, analysis, prototyping, testing, and validation methods.

Major Technical Milestones:

- Kickoff Technical Coordination Meeting: ARO + 2 weeks
- Technical Progress Report: Quarterly on the 15th of the subsequent month
- Concept of Operations, Hardware Plan, Software Plan: ARO + 3 months
- Preliminary Design Review: ARO + 12 months
- Draft CAD of VSAT Design: ARO + 18 months
- ROSA Fabrication Complete: ARO + 28 months
- Final CAD of VSAT Design: ARO + 30 months
- EDS Fabrication Complete: ARO + 31 months
- TVAC Test Complete: ARO + 33 months
- Critical Design Review and TRL 6 Assessment: ARO + 36 months
- Delivery of VSAT prototype: ARO + 36 months

TECHNOLOGY OVERVIEW

Description: Astrobotic's VSAT is an end-to-end, self-contained, mobile power solution for the lunar surface. It can be delivered on existing Commercial Lunar Payload Services (CLPS) landers and features innovative solutions to complex tasks, including lander egress, mobility, self-leveling, and the management of ≥ 2 km of cable. This minimizes its dependency and the constraints it places on NASA rovers and landers, thus lowering future mission risks and costs. The VSAT features a space heritage Roll-Out Solar Array (ROSA) from Redwire, electrodynamic dust shield (EDS) solar cell covers from NASA KSC, and a Lunar Infrastructure Trailer (LIT) that leverages Astrobotic's deep expertise in lunar mobility and commercial services.

TRL: 3/4, based on the following systems:

- ROSA is the only array to have achieved TRL 9 for multiple deployment/ retraction cycles in space, but drops to TRL 4/5 for the lunar environment.
- EDS has achieved TRL 5, but drops to 4 for scaling and integration.
- LIT derives from Astrobotic's highly mature CubeRover and lander structures and subsystems, but drops to 3 for VSAT.

Commercial Impact: VSAT's independence from an external rover allows it to be brought to market quickly and affordably using our "power-as-a-service" model.

COMPANY OVERVIEW

Name: Astrobotic Technology, Inc. Employees: 180

Address: 1016 N Lincoln Ave., Pittsburgh, PA 15233

Business Contact: (502) 593-9249, dan.hendrickson@astrobotic.com

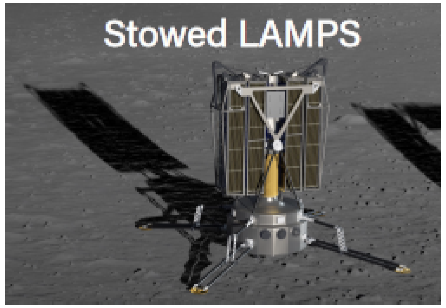
Partners: Redwire, NASA Kennedy Space Center (KSC)

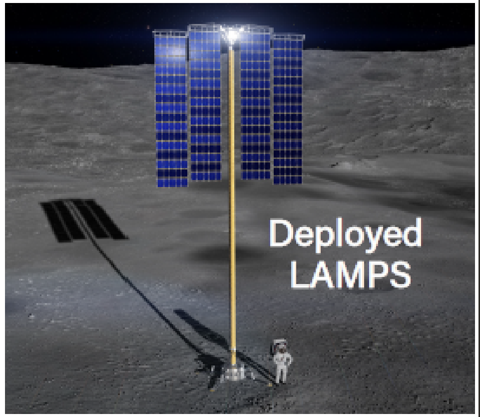
Company Description: Astrobotic is the world's leading lunar logistics service provider, with the goal of making the Moon accessible to all. Their fleet of lunar landers and rovers deliver payloads to the Moon for companies, governments, universities, non-profits, and individuals. The company has contracts to deliver 18 payloads to the lunar surface and four lunar surface missions scheduled before the end of 2025: Peregrine, which will become the first American lander on the Moon since Apollo when it touches down next year; MoonRanger, which one year later will become the first rover to search for water ice at the lunar south pole; Griffin, which will deliver NASA's VIPER to the lunar south pole one year after that; and CubeRover, which is Astrobotic's flagship rover for mobility as a service and will fly in 2025. In all, Astrobotic has more than 50 prior and ongoing NASA and commercial technology contracts.

Honeybee Robotics

Lunar Vertical Solar Array Technology Option Phase
LAMPS = Lunar Array, Mast, and Power System

Technology Image





Project Overview

Honeybee Robotics (HBR) with mPower during the option phase will mature the technology by demonstrating multiple, unaided deployments and retractions in a TVAC environment. The technologies matured during the option phase are:

- Deployable/Retractable mast with bellows for mast dust/thermal protection
- Accordion folded solar sails using flexible solar power modules
- Solar sail stowage
- High power flat umbilical & storage reel

The key option phase milestones are

- Jun 2023 – Design Review
- Nov 2023 – Solar Cell Delivery
- Jun 2024 – Thermal-Vacuum Test

LAMPS is a deployable solar array system that allows for operation 10 meters above the service. LAMPS provides 10kw of power at beginning of life. It is retractable into its base; this allows transportation with rovers to other sights near the south pole of the moon. It is designed for a 10-year mission with one relocation per year. The flexible design supports multiple rover transport options. The design is scalable between 1kW-32kW. It consists of the following subsystems:

- Fixed base with leveling legs and dust tolerant power connectors
- DIABLO deployable/retractable mast with bellows
- Masthead with local electronics and deployable/retractable sail frames holding the solar sails
- Four deployable/retractable solar sails

Technology Overview

Honeybee Robotics (HBR) is a subsidiary of Blue Origin. HBR is an AS9100C certified, NASA-approved flight system supplier with extensive experience in robotics for planetary missions. Honeybee employs 250 people across Longmont, CO and Altadena, CA. HBR is vertically integrated in terms of flight mechanical systems, avionics, software, actuators, and via sister company, release mechanisms. To date, all HBR-provided flight hardware met or exceeded performance goals. For LAMPS, HBR will leverage technologies from VIPER, PRIME-1, LISTER, PlanetVac, and 3PO payloads planned to fly to the Moon in 2023 and 2024.

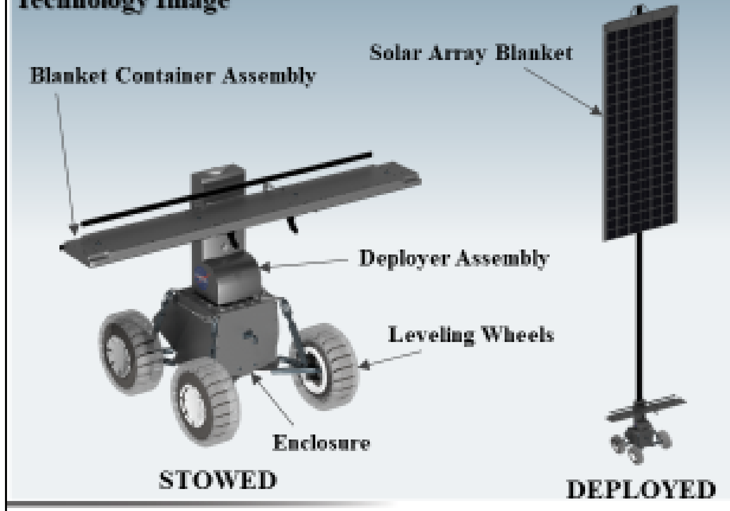
mPower Technology is a solar power system company headquartered in Albuquerque NM. mPower is a certified small business with SBIR awards for groundbreaking work with high flexibility and lightweight solar panels called DragonSCALES.

Company Overview

Lockheed Martin

Lunar Vertical Solar Array Technology (LVSAT)
Lockheed Martin

Technology Image



Project Overview

Summary of Technology Approach:

LM's technical approach ensures successful future infusion of LVSAT technologies by evaluating operational system risks and requirements and including risk burn down in the maturation, prototype development, and test process through the Base and Option Periods. Starting with the operational LVSAT mission, LM identified critical enablers for further analysis, design incorporation, and technology advancement through prototype testing and internal investment.

Technology Overview

Technology Description:

The LVSAT operational system concept combines innovative modifications to existing solar array technology, deployment and retraction mechanisms, and a composite mast design with leveling wheels, gimbal, sun sensors, avionics, power and thermal systems while testing for the challenging lunar environment.

TRL at MPP/Proposal Submission:

21 Technologies addressed are at TRL 3-9 at MPP/Proposal submission

- 15 @ TRL 3 & 4 – based on modifications to flown systems or designs for systems yet to be flown (heritage programs or common products)
- 6 @ TRL 9 – technologies have flown and do not require modification
- This categorization touches all areas of LVSAT development (mechanical, thermal, EPS, software)

Commercial Impact of the Technology Product:

1) Reduce barrier of entry for lunar surface assets by providing mobile power station (reducing functionality required of surface assets)
2) Catalyzing a commercial services by reducing environment risk for long-term lunar surface assets (i.e. dust mitigation, surviving lunar night)
3) Offering new, affordable capabilities for lunar surface applications

Company Overview

Lockheed Martin Corporation (LM)
Lockheed Martin Space
12257 S. Wadsworth Blvd.
Littleton, CO 80125

LOCKHEED MARTIN

Company Description: LM is a global security and aerospace company engaged in the design, development, manufacture, integration, and sustainment of advanced technology systems, products, and services. LM employs 110,000 people worldwide. LM has proven deep space robotic and human-rated systems experience in developing sophisticated technologies and capabilities.

Teaming Partners:

NASA

- Dr. Aaron Olson, NASA Kennedy Space Center, Electrostatics & Surface Physics Laboratory (dust mitigation)

Colorado School of Mines

- Dr. George Sowers, Center for Space Resources (dust mitigation)

Project Assessment Summary

Project Name	Performance				Comments
	C	S	T	P	
Mid Year					Technical – System mass above Project goals at PDR for all selected vendor designs Cost – Schedule – Programmatic -
Annual					Technical – System mass above Project goals at PDR for all selected vendor designs Cost – Schedule – Programmatic -

Plans Forward and Transition / Infusion Plan

- Immediate infusion plan is to advertise the three selected vendor prototype efforts as possible steppingstones to both NASA and Industry efforts to put Power Architectures on the Lunar Surface

- Internal to STMD we will advocate for the VSAT project to begin work on a “Next Steps” Flight Demonstration solicitation where industry will be encouraged to build a flight version of the their VSAT concept for demonstration on the Lunar Surface circa 2026/7.

Education/Public Outreach

EPO Involvement

- Participated in multiple LSIC working group meetings
- Funded 4 Student Interns
- Mentored 2 Governors School High School Interns

EPO Calendar Outlook (High Priorities):

6 Month Look-Ahead	
None	

Summary

- Completed Base Period VSAT design and analysis

- Over the next year three vendors will fabricate and begin testing on VSAT prototypes
    - Astrobotic
    - Honeybee Robotics
    - Lockheed Martin

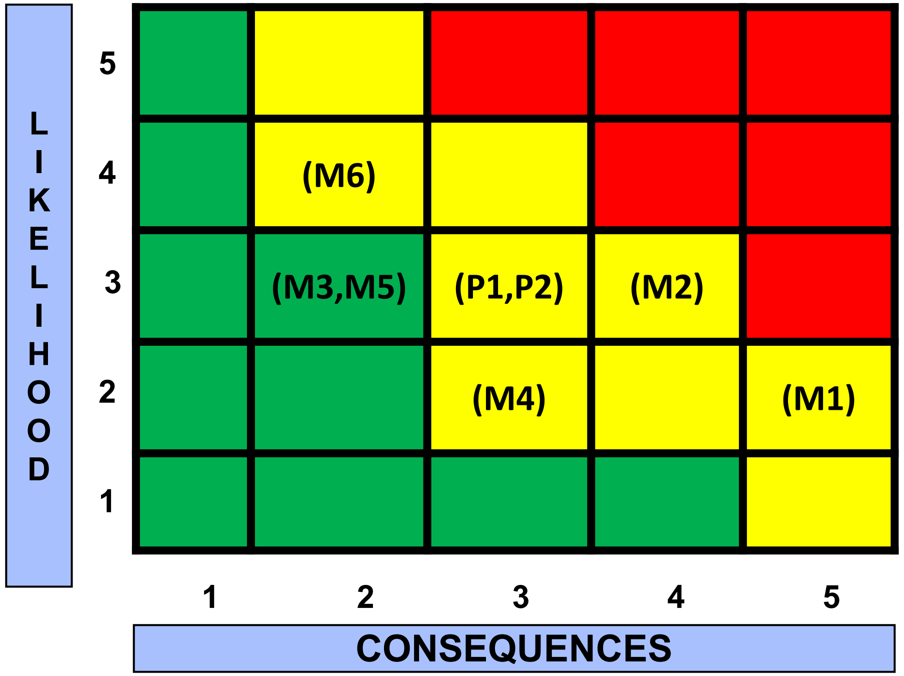
- The three approaches are very different and represent unique approaches to providing power on the lunar surface

Back Up

Project Plan - Milestone Status

Milestone Title (Mirror Project Plan)	Baseline Date	Actual Date	Variance Explanation
Status of milestones due since March 2022			
Milestone Title	10/1/17		Expected to slip 1 month due to test facility availability
Milestone Title	10/15/17	10/12/17	Completed ahead of schedule
Status of milestones due between September 1, 2022 – March 30, 2023	**Baseline Date**	**Planned Date**	
Milestone Title	11/1/17		Delays with the widget
Milestone Title	11/15/17		Delay of abc, CR submitted

Risk Summary



Risk ID	Affinity/ Approach	Description/Status	Trend
M001	T/W	Terrain Stability using three leg platform carries operational risks related to falling over on sloped terrain.	→
M002	T/M	Lunar Dust fouling mechanisms	→
M003	T/R	Lack of terrain knowledge, impacts understanding of power output	↓
M004	T/M	Lunar Dust Degrading Solar Array Performance	→
M005	T/W	Specific Power (W/kg) less than project plan KPP	→
M006	T/W	Specific Volume (kW/m3) less than project goal	↑
P001	C-Sc/W	TVAC Test Campaign may require more set up and take longer to execute than planned	→
P002	C-Sc/W	Deployment Testing may be more costly than planned due to gravity off-load designs and height of system	→

Criticality
- High
- Med
- Low

L x C Trend
- ↓ Decreasing (Improving)
- ↑ Increasing (Worsening)
- → Unchanged
- New Since Last Period

Approach
- M - Mitigate
- W - Watch
- A - Accept
- R - Research

Affinity: **T**-Technical **C**-Cost **Sc**-Schedule **Sa**-Safety

VSAT

Terrain Stability- Taylor

Risk ID #
M001

Trend

Criticality

Current L/C
5x2

Affinity Group
Technical

Planned Closure
TBD

Open Date
09/15/2021

Risk Statement :

Approach: Watch

Given that the VSAT concept of operations calls for autonomous deployment on lunar surface and this surface is not level, there is a risk that the VSAT system may tip over during deployment or operations.

Context

The VSAT system has a requirement to be stable on a terrain slope of up to 15 degrees. However, the deployment may take place where there are rocks or other unevenness beyond the general “measured theoretical slope”. When combined with the fact that this system is very tall ~16m, designing a center of gravity and leg stabilizers such that the system does not tip is of paramount importance to the mission.

Date	Status (Please provide the last 3 status)	LxC (at time change/update)

Mitigation Steps	Dollars to implement	Trigger/ Start date	Schedule UID	Completion Date	Resulting LxC

(Note: The Schedule UID is the unique id no of the mitigation step in your schedule if appropriate.
Dollars to implement are not extra approved $ from the Program Office but $ set aside as part of project budget to mitigate.)

VSAT

Lunar Dust Mechanical - Taylor

Risk ID #
M002

Trend

Criticality

Current L/C
4X3

Affinity Group
Technical

Planned Closure
TBD

Open Date
09/15/2021

Risk Statement :

Approach: Mitigate

Given that the VSAT concept of operations calls for autonomous deployment on lunar surface followed by multiple retractions and redeployments, there is a risk that lunar dust may penetrate the working mechanisms of the VSAT boom and deployer. Once dust is present within the system mechanical components there is a risk for both wear and seizure.

Context

The VSAT system has a requirement to deploy a mast on the lunar surface and be able to retract that mast and redeploy it up to 5 times. Every deployment/retraction cycle has the possibility of introducing lunar dust into the internal mechanisms of the VSAT system. Lunar dust is known to be very abrasive, and its presence could cause a failure of a drive mechanism related to mast actuation.

Date	Status (Please provide the last 3 status)	LxC (at time change/update)

Mitigation Steps	Dollars to implement	Trigger/ Start date	Schedule UID	Completion Date	Resulting LxC

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VSAT

Lack of Terrain Knowledge- Taylor

Risk ID #
M003

Trend
⇩

Criticality

Current L/C
2X3

Affinity Group
Technical

Planned Closure
TBD

Open Date
09/15/2021

Risk Statement :

Approach: Research

Given that the exact location of a VSAT landing is unknown, and that information relative to terrain shading will still be imperfect even when the landing site has been chosen, there is a risk that terrain shadowing may be greater than anticipated, causing longer periods of total darkness and/or periods of partial shading that will reduce planned output power of the VSAT system.

Context

Terrain knowledge of the lunar surface is not very granular at the moment. There have been several attempts made to characterize the lunar topography in order to find areas for landing that have the most continuous sunlight but the calculations are made using data with cells 10's of meters to a side. There is a real chance that performance predictions will be impacted by where we land.

Date	Status (Please provide the last 3 status)	LxC (at time change/update)

Mitigation Steps	Dollars to implement	Trigger/ Start date	Schedule UID	Completion Date	Resulting LxC

(Note: The Schedule UID is the unique id no of the mitigation step in your schedule if appropriate.
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VSAT

Lunar Dust Electrical - Taylor

Risk ID #
M004

Trend
New

Criticality

Current L/C
3x2

Affinity Group
Technical

Planned Closure
TBD

Open Date
03/15/2022

Risk Statement :

Approach: Mitigate

Given that the VSAT concept of operations calls for autonomous deployment on lunar surface and that the existence of Lunar Dust is well documented, there is a risk that lunar dust may adhere to deployed solar array panels, thus reducing array performance

Context

The VSAT system will deploy on the lunar surface in an environment very likely to include “airborne” dust. This dust is known to be both abrasive and have electrostatic properties that may allow for it to adhere to solar array panels. Dust build up on the solar array panels is likely to degrade performance.

Date	Status (Please provide the last 3 status)	LxC (at time change/update)

Mitigation Steps	Dollars to implement	Trigger/ Start date	Schedule UID	Completion Date	Resulting LxC

(Note: The Schedule UID is the unique id no of the mitigation step in your schedule if appropriate.
Dollars to implement are not extra approved $ from the Program Office but $ set aside as part of project budget to mitigate.)

VSAT

VSAT Specific Power - Taylor

Risk ID #
M005

Trend
New

Criticality

Current L/C
2x3

Affinity Group
Technical

Planned Closure
TBD

Open Date
03/15/2022

Risk Statement : **Approach**: Watch

Given that the VSAT project plan has a Key Performance Parameter for Specific Power and that system mass is a key to system adoption and use, there is a risk that the present designs will not be able to achieve the specific power metric as specified in the project plan.

Context

Mass is an important performance metric for all space flight systems. The cost to launch, and in this case land, large systems is very high in terms of fuel and can drive multiple aspects of an overall mission. The present estimates for the five VSAT designs under consideration during the Base Period are close to, if not exceeding, the KPP metric in the project plan. This metric was specifically chosen to drive technology development rather that a specific mission, but it is still important.

Date	Status (Please provide the last 3 status)	LxC (at time change/update)

Mitigation Steps	Dollars to implement	Trigger/ Start date	Schedule UID	Completion Date	Resulting LxC

(Note: The Schedule UID is the unique id no of the mitigation step in your schedule if appropriate.
Dollars to implement are not extra approved $ from the Program Office but $ set aside as part of project budget to mitigate.)

VSAT

VSAT Specific Volume - Taylor

Risk ID #
M006

Trend
New

Criticality

Current L/C
2x4

Affinity Group
Technical

Planned Closure
TBD

Open Date
03/15/2022

Risk Statement :

Approach: Watch

Given that the VSAT project plan has a Goal for Specific Volume, and that stowed volume is a key to system adoption and use, there is a risk that the present designs will not be able to achieve the stowed volume metric as specified in the project plan.

Context

Stowed Volume is an important performance metric for all space flight systems. The cost to launch, and in this case land, large systems is very high in terms of fuel and can drive multiple aspects of an overall mission. Volume is particularly important in determining rocket and lander size. The present estimates for the five VSAT designs under consideration during the Base Period exceed the stated goal in the project plan. This metric was specifically chosen to drive technology development rather that a specific mission, but it is still important.

Date	Status (Please provide the last 3 status)	LxC (at time change/update)

Mitigation Steps	Dollars to implement	Trigger/ Start date	Schedule UID	Completion Date	Resulting LxC

(Note: The Schedule UID is the unique id no of the mitigation step in your schedule if appropriate.
Dollars to implement are not extra approved $ from the Program Office but $ set aside as part of project budget to mitigate.)

VSAT

TVAC Test Campaign - Taylor

Risk ID #
P001

Trend
New

Criticality

Current L/C
3x3

Affinity Group
Technical

Planned Closure
TBD

Open Date
03/15/2022

Risk Statement :

Approach: Watch

Given that the VSAT prototype is required to be undergo a deployment test in a TVAC chamber and that the VSAT system is expected to reach 16m in height, there is a risk that this complex test may require a longer time period and go over budget.

Context

The VSAT system is expected to reach TRL 6 during the Option Phase of the project. The centerpiece of the test campaign and the achievement of TRL is a full system TVAC deployment test. There are very few chambers in the country capable of conducting this test on a system the size of VSAT. Set up time and number of tests is always difficult to estimate during the early stages of a project. Given the complex nature of the tests and the size of the unit under test, cost and schedule growth is a risk.

Date	Status (Please provide the last 3 status)	LxC (at time change/update)

Mitigation Steps	Dollars to implement	Trigger/ Start date	Schedule UID	Completion Date	Resulting LxC

(Note: The Schedule UID is the unique id no of the mitigation step in your schedule if appropriate.
Dollars to implement are not extra approved \$ from the Program Office but \$ set aside as part of project budget to mitigate.)

VSAT

Deployment Testing - Taylor

Risk ID #
P002

Trend
New

Criticality

Current L/C
3x3

Affinity Group
Technical

Planned Closure
TBD

Open Date
03/15/2022

Risk Statement : **Approach**: Watch

Given that the VSAT prototype is required to be undergo a deployment test during the Option Phase of this project and that these tests will require a very large facility (16m high) and some mechanism for gravity off-load, there is a risk for both cost and schedule growth

Context

The VSAT system is expected to reach TRL 6 during the Option Phase of the project. Prior to TVAC testing the system will have to undergo deployment/retraction tests in earth gravity which will necessitate a gravity off-load system as well as a large test chamber. GSE design, test set up time, and the degree of test difficulty all point to the risk of cost and schedule growth.

Date	Status (Please provide the last 3 status)	LxC (at time change/update)

Mitigation Steps	Dollars to implement	Trigger/ Start date	Schedule UID	Completion Date	Resulting LxC

(Note: The Schedule UID is the unique id no of the mitigation step in your schedule if appropriate.
Dollars to implement are not extra approved $ from the Program Office but $ set aside as part of project budget to mitigate.)

VSAT Key Performance Parameters (KPP)

Key Performance Parameters				
Key Performance Parameter	**Units**	**State of the Art**	**Threshold Value**	**Project Goal**
KPP 1: Terrain Stability	Terrain Slope in degrees, combined with mast height	N/A	10^{o} / 5	15^{o} / 10
KPP 2: Mast Height[1]	Meters	N/A	5	10
KPP 3: Autonomous Deployment and Retraction	Deployment and Retraction Cycles	1	5	10
KPP 4: Specific Power[2]	W/kg	100	45	65
Known Mission Requirements:				
Array Power[2]		50kW	10kW	
Sun Tracking	Single Axis Degree Rotation	360	360	
Thermal Environment[3]	Degrees Celsius	-180C +175C	-180C +175C	
Specific Stowed Volume[2]	kW/M3	60	40	60

Notes:

1) Mast Height – Mast height measured from the surface to the point at which the solar array blanket attaches to the lower cross boom.

2) State of the Art refers to Zero-G solar array, Threshold and Goal values calculated for entire system mass at array Beginning of Life (BOL)

3) Thermal Environment - System must be capable of surviving and operating in Lunar South Pole thermal environment (-180C^{0} to 175C^{0}) without external systems

Technical Assessment

Technical Capability Elements	TRL			TRL Verification
	Entry	Exit	Current	
Array Deployment Drive Unit	3	6	3	Option Test Period (MS ID C5)
Array Gimbal	3	6	3	Option Test Period (MS ID C5)
Array Blanket	4	6	4	Option Test Period (MS ID C5)
Harness/PMAD	4	6	4	Option Test Period (MS ID C5)

Assessment is based on GRD, several vendors proposed significant heritage sub-system reuse from zero G assets

<Project Name> Key Performance Parameter (KPP) Status

Key Performance Parameters

Parameter	Units	State of the	Threshold	Project	C	… for the provided …ected Exit Value
<KPP paramete						…mate based on …e Carlo analysis
<KPP paramete						…antiated based …P ground test [4]
<KPP parameter						Verified

Notes:
Technical Basis of E…
[1] SOA comparison …
[2] Terrestrial day/ni… … addtl. cycles.
[3] SOA comparison …
[4] Test concluded M…
[5] Lunar Equator day…

Please provide KPP Current Status updates via the **Measuring Advancements of KPP Evolution (MAKE) tool**:

Location on Teams: 'MAKE' ---> 'MAKE_FY22_APR ---> Files (Identify the Excel file for your project)

This location can be found via this Link

Complete the table on this slide of the APR presentation via either:

1) Utilizing the 'PowerPoint Table' tab from MAKE and then copy and paste status information on this slide

2) Entering data in both the MAKE tool and on this slide template

(contact Will Grier – will.j.grier@nasa.gov for further help)

If KPPs have not yet been approved via PCD or PP, please keep this note:

KPPs are not yet in an approved state.