

NASA Flight Opportunities

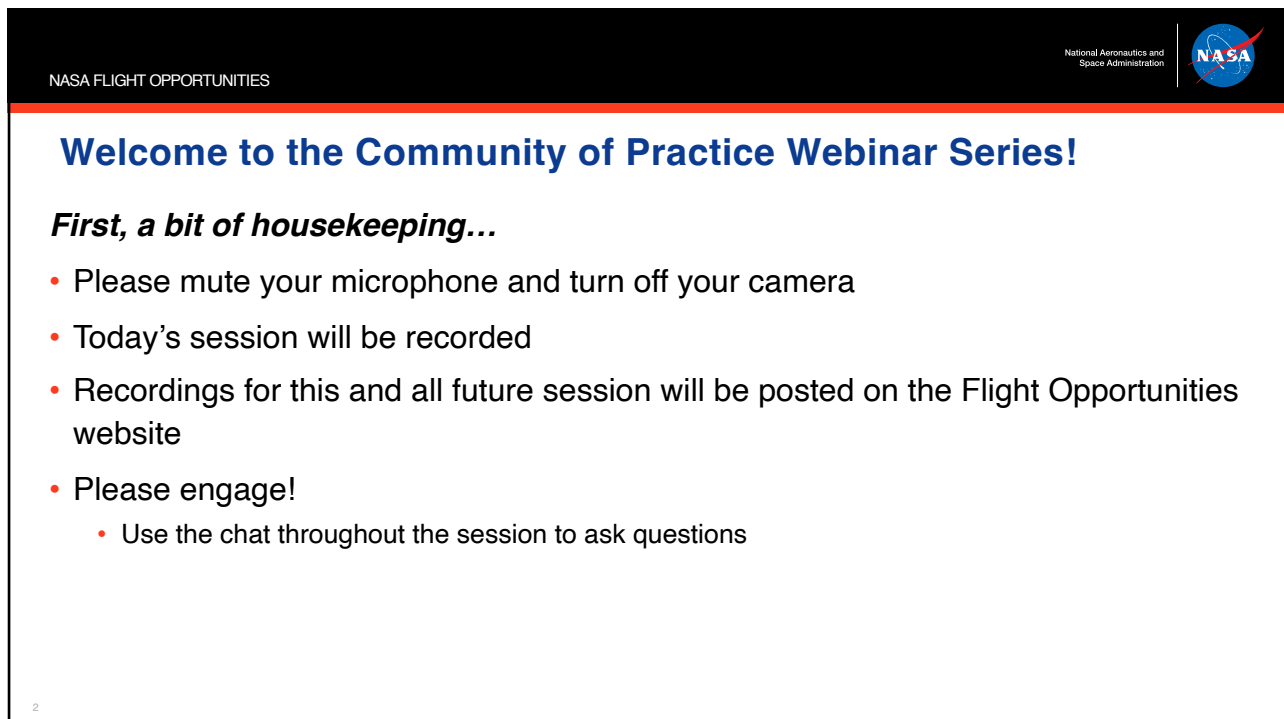
## The Pace of Space: What's New in Suborbital Flight

Michelle Munk, Acting Chief Architect, NASA's Space Technology Mission Directorate  
Lucas Moxey, Lead – Commercial Suborbital Initiative, NASA's Science Mission Directorate  
Danielle McCulloch, Deputy Program Manager, NASA Flight Opportunities

**Community of Practice Webinar Series – October 5, 2022**  
Session will start at 10 a.m. PT – Please mute your microphone and turn off your camera

[www.nasa.gov](http://www.nasa.gov)

1



NASA FLIGHT OPPORTUNITIES

National Aeronautics and Space Administration

## Welcome to the Community of Practice Webinar Series!

***First, a bit of housekeeping...***

- Please mute your microphone and turn off your camera
- Today's session will be recorded
- Recordings for this and all future session will be posted on the Flight Opportunities website
- Please engage!
  - Use the chat throughout the session to ask questions

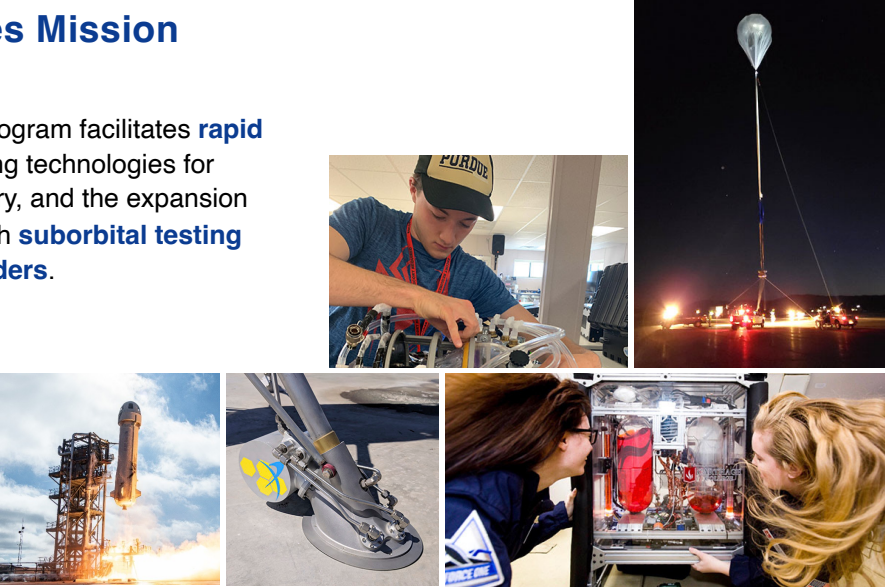
2

NASA FLIGHT OPPORTUNITIES

NASA  
National Aeronautics and Space Administration

## Flight Opportunities Mission

The Flight Opportunities program facilitates **rapid demonstration** of promising technologies for space exploration, discovery, and the expansion of space commerce through **suborbital testing with industry flight providers**.



3

3

NASA FLIGHT OPPORTUNITIES

NASA  
National Aeronautics and Space Administration

## Join us for future Community of Practice webinars!

**Watch our website and newsletter for next month's topic**


[nasa.gov/directorates/spacetech/flightopportunities/newsletter](https://nasa.gov/directorates/spacetech/flightopportunities/newsletter)

### Future webinars

- Webinars are held 1<sup>st</sup> Wednesday of each month at 10 a.m. PT
- Topics will be announced in the Flight Opportunities newsletter and website
- Session recordings will be posted on the Flight Opportunities website
- Let us know session topics you would like to see covered

4


4

NASA FLIGHT OPPORTUNITIES National Aeronautics and Space Administration 

---

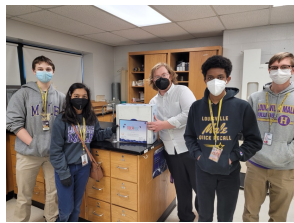
## TechRise Student Challenge

- TechRise invites teams of **sixth to 12th grade** students to design, build, and launch experiments on suborbital rockets and balloon flights. Winning teams receive \$1,500 to build payloads and an assigned spot on a NASA-sponsored high-altitude balloon flight via a commercial provider.
- Provides students of *all* experience levels with hands-on engineering and technical skills through close mentorship. Students go through the same design, build, and test process as NASA-supported researchers.
- Please share with students/educators or visit the website below to volunteer as a judge




### Current challenge closes Oct. 24th!

[futureengineers.org/nasatechrise](https://futureengineers.org/nasatechrise)




5


NASA FLIGHT OPPORTUNITIES National Aeronautics and Space Administration 

---


## Today's Speakers



**Danielle McCulloch**  
Deputy Program Manager,  
NASA Flight Opportunities

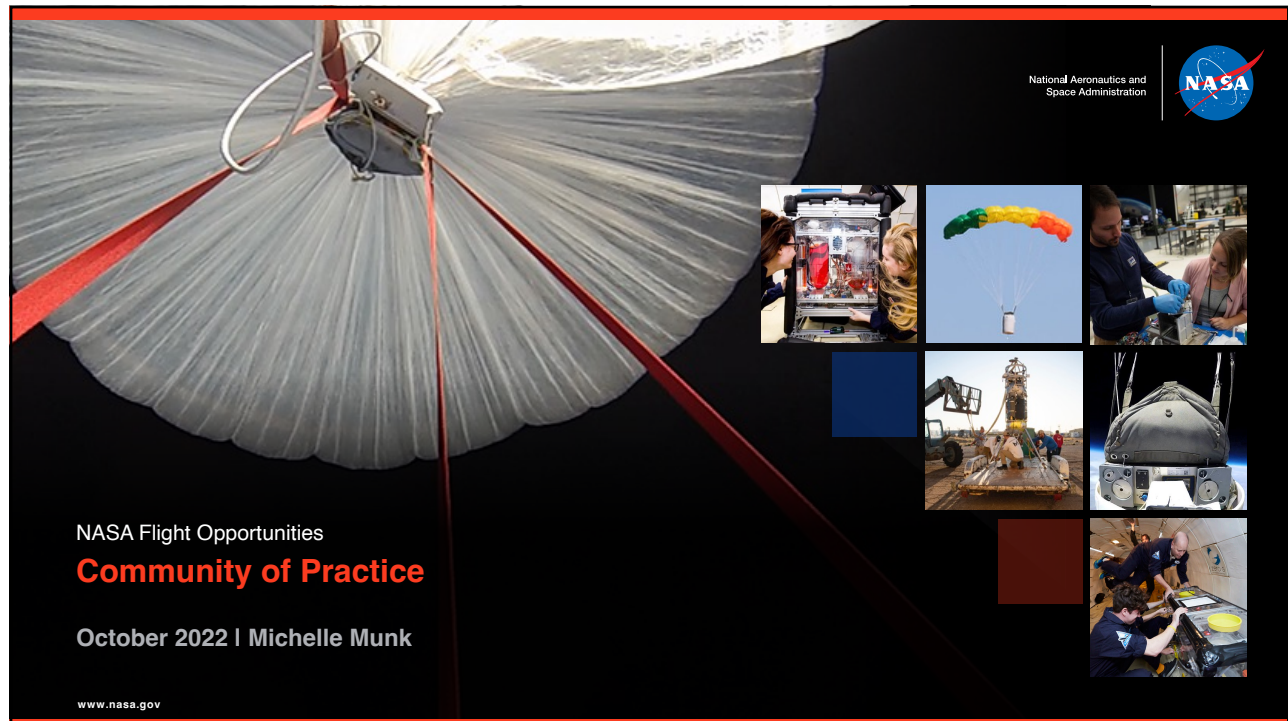


**Michelle Munk**  
Acting Chief Architect  
Space Technology Mission  
Directorate



**Lucas Moxey**  
Lead, Commercial Suborbital  
Initiative  
Science Mission Directorate

6



7

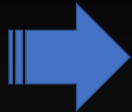


8



## Space Technology Mission Directorate

The 2022 NASA Strategic plan outlines the goals and objectives NASA will pursue to fulfill its mission (see Table 2). STMD has primary lead responsibility implementing Strategic Goal 3, Objective 3.1. Additionally, STMD contributes to achieving all NASA strategic goals and objectives through developing crosscutting technologies for multiple customers. The STMD Technology Portfolio is the vehicle by which Strategic Objective 3.1 is implemented.



**Strategic Objective 3.1 Innovate and advance transformational space technologies.**  
 Develop revolutionary, high-payoff space technologies driven by diverse ideas to transform NASA missions and ensure American leadership in the space economy.

In addition, the 2020 National Space Policy provides the direction for NASA to lead in:

"the responsible and constructive use of space, promoting a robust commercial space industry, returning Americans to the Moon and preparing for Mars, leading in exploration, and defending United States and allied interests in space."

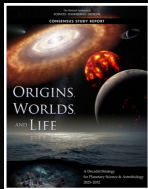
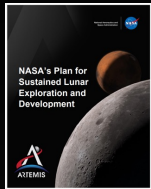


The policy emphasizes the importance of facilitating the growth of the commercial space sector, continuing the sustained US leadership in space. As NASA's technology mission directorate dedicated to developing state-of-the-art and advanced cross-cutting technologies, STMD develops technologies that enable science and human exploration goals and support the space economy, working with industry and academia ensuring a robust national space technology engine to meet national needs.

9

## Strategic Technology Architecture Roundtable (STAR) Process

In order to achieve the NASA Strategic Objective, the STAR process led by the Space Technology Mission Directorate was implemented to bring together the various inputs from stakeholders to produce a set of gaps that can be closed through STMD investments.



Draws directly on Artemis architectures and Science Mission Directorate Decadal to identify technology gaps.

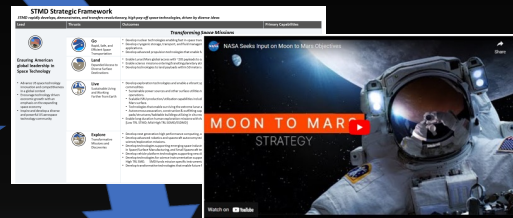
Space Community's participation is obtained through Conferences and Requests for Information (RFIs) to validate envisioned futures, the current state of the art and the gaps between those two.



STAR process inclusive of Center Chief Technologists, ESDMD and SMD Representation.






Maps to OTPS Taxonomy.

STMD Strategic Framework describes the STMD investment priority strategy. Strategic Technology Framework aligned to Agency Moon to Mars Strategy along with science and industry partner needs, prioritized by Agency Strategic Capability Leads (SCL's) and Principal Technologists (PT's).

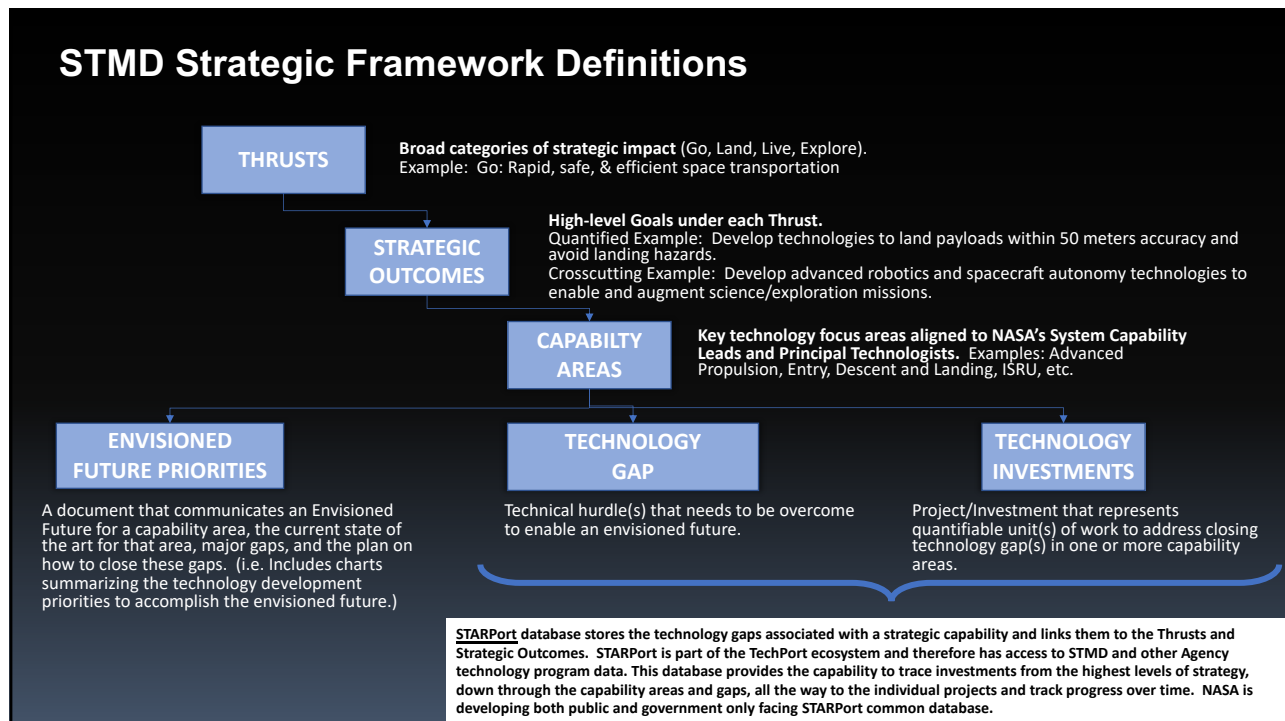


STARPort is the database of all Capability Area gaps for both STMD and ESDMD. Envisioned Future Priorities (EFPs) are developed by SCL/PT's to show the future state envisioned and suggested path forward to inform Planning, Programming, Budgeting, and Execution (PPBE) process.

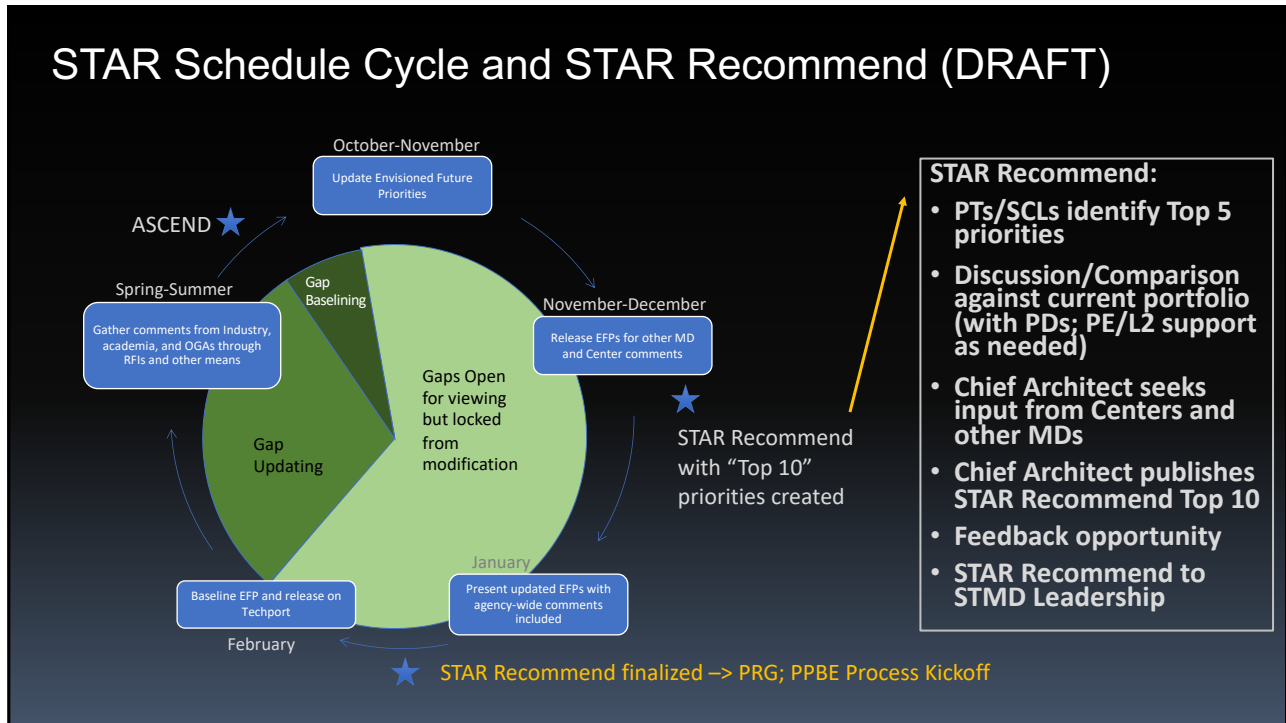
10

Lead	Thrusts	Outcomes	Primary Capabilities
 <p><b>Ensuring American global leadership in Space Technology</b></p> <ul style="list-style-type: none"> <li>Advance US space technology innovation and competitiveness in a global context</li> <li>Encourage technology driven economic growth with an emphasis on the expanding space economy</li> <li>Inspire and develop a diverse and powerful US aerospace technology community</li> </ul>	<b>Transforming Space Missions</b>		
	 <p><b>Go</b> Rapid, Safe, and Efficient Space Transportation</p>	<ul style="list-style-type: none"> <li>Develop nuclear technologies enabling fast in-space transits.</li> <li>Develop cryogenic storage, transport, and fluid management technologies for surface and in-space applications.</li> <li>Develop advanced propulsion technologies that enable future science/exploration missions.</li> </ul>	<ul style="list-style-type: none"> <li>Nuclear Systems</li> <li>Cryogenic Fluid Management</li> <li>Advanced Propulsion</li> </ul>
	 <p><b>Land</b> Expanded Access to Diverse Surface Destinations</p>	<ul style="list-style-type: none"> <li>Enable Lunar/Mars global access with ~20t payloads to support human missions.</li> <li>Enable science missions entering/transiting planetary atmospheres and landing on planetary bodies.</li> <li>Develop technologies to land payloads within 50 meters accuracy and avoid landing hazards.</li> </ul>	<ul style="list-style-type: none"> <li>Entry, Descent, Landing, &amp; Precision Landing</li> </ul>
	 <p><b>Live</b> Sustainable Living and Working Farther from Earth</p>	<ul style="list-style-type: none"> <li>Develop exploration technologies and enable a vibrant space economy with supporting utilities and commodities</li> <li>Sustainable power sources and other surface utilities to enable continuous lunar and Mars surface operations.</li> <li>Scalable ISRU production/utilization capabilities including sustainable commodities on the lunar &amp; Mars surface.</li> <li>Technologies that enable surviving the extreme lunar and Mars environments.</li> <li>Autonomous excavation, construction &amp; outfitting capabilities targeting landing pads/structures/habitable buildings utilizing in situ resources.</li> <li>Enable long duration human exploration missions with Advanced Habitation System technologies. [Low TRL STMD; Mid-High TRL SOMD/ESDMD]</li> </ul>	<ul style="list-style-type: none"> <li>Advanced Power</li> <li>In-Situ Resource Utilization</li> <li>Advanced Thermal</li> <li>Advanced Materials, Structures, &amp; Construction</li> <li>Advanced Habitation Systems</li> </ul>
 <p><b>Explore</b> Transformative Missions and Discoveries</p>	<ul style="list-style-type: none"> <li>Develop next generation high performance computing, communications, and navigation.</li> <li>Develop advanced robotics and spacecraft autonomy technologies to enable and augment science/exploration missions.</li> <li>Develop technologies supporting emerging space industries including: Satellite Servicing &amp; Assembly, In Space/Surface Manufacturing, and Small Spacecraft technologies.</li> <li>Develop vehicle platform technologies supporting new discoveries.</li> <li>Develop technologies for science instrumentation supporting new discoveries. [Low TRL STMD/Mid-High TRL SMD. SMD funds mission specific instrumentation (TRL 1-9)]</li> <li>Develop transformative technologies that enable future NASA or commercial missions and discoveries</li> </ul>	<ul style="list-style-type: none"> <li>Advanced Avionics Systems</li> <li>Advanced Communications &amp; Navigation</li> <li>Advanced Robotics</li> <li>Autonomous Systems</li> <li>Satellite Servicing &amp; Assembly</li> <li>Advanced Manufacturing</li> <li>Small Spacecraft</li> <li>Rendezvous, Proximity Operations &amp; Capture</li> <li>Sensor &amp; Instrumentation</li> </ul>	

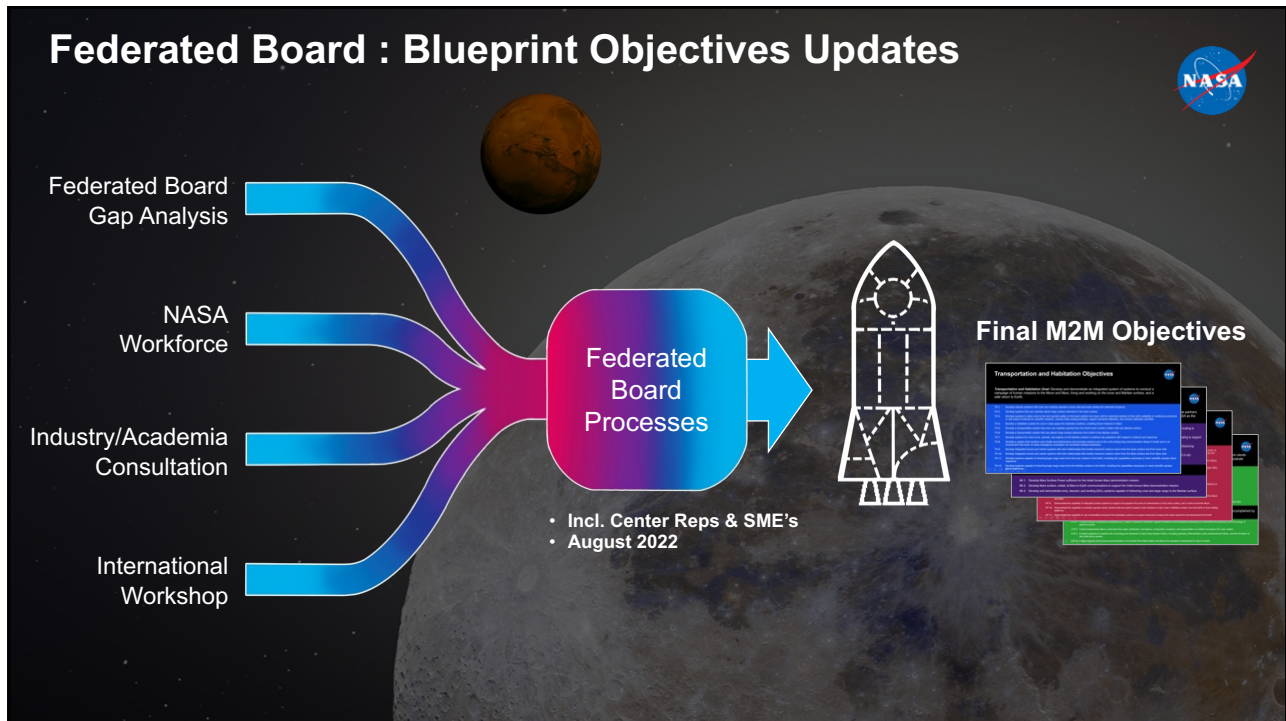
11



12



13



14

## Architecture Update Timeline

- **IAC (18-24 Sep)**
    - Public release of final M2M objectives
  - **Architecture Updates (Oct – Dec)**
  - **Gap Assessment Updates (early 2023)**
  - **Feedback Opportunity**
    - Form through NASA Techport
  - **Next version of Envisioned Future Priorities**
- **Envisioned Future Priorities for LAND and EXPLORE are currently open for comment: [NSPIRES](#)**

15

15

National Aeronautics and Space Administration

NASA

NASA Flight Opportunities  
**Community of Practice**  
October 2022 | Lucas Moxey

[www.nasa.gov](http://www.nasa.gov)

16



## Addition of Commercial Suborbital Platforms to ROSES-22

### Research Opportunities in Space and Earth Sciences 2022 (ROSES-22)

- D.3 Astrophysics Research and Analysis Program (APRA)

Focus: investigations (scientific & technology payloads) aligned to NASA's astronomy and astrophysics programs

NOI Due: 11/4/2022

Full Proposals (invited): 12/15/2022

- B.9 Heliophysics – Low Cost Access to Space (H-LCAS)

Focus: investigations to advance the development of technologies and their application to enable new investigations of heliophysics science questions

NOI Due: 11/17/2022

Full Proposals (invited): 1/12/2023

17



18


## NEW IN ROSES-22 FOR SUBORBITAL RESEARCH

### Important Guidelines for APRA (D.3) and H-LCAS (B.9) Solicitations

1. Proposals must follow suborbital flight guidelines detailed in Sect. VIII(c) ROSES-2022 Summary of Solicitation
2. **Mandatory** brief NOI-stage Payload Requirements Document (PRD) (available via NSPIRES)
  - Provides basic information about the proposed payload needs (e.g.: vehicle type, dimensions, mass, launch location, flight date, min/max altitudes, etc.)
  - Used by NASA to conduct preliminary assessments of compatible suborbital platforms
  - PRD information will not be used as part of proposal evaluation process
3. **Mandatory** Proposal-stage Payload Requirements Document (PRD) (Available via NSPIRES)
  - Provides more detailed information about the payload needs
  - Used by NASA to match payload requirements with suitable suborbital platforms
4. **No quotes or cost estimates related to flight services** should be included in the proposal
5. If selected, NASA Campaign Manager will serve as liaison between PI and commercial flight provider
6. Informational webinar will be held on Oct. 11 at 1pm ET (10am PT) via Webex (detailed info via NSPIRES)

19


NASA FLIGHT OPPORTUNITIES

National Aeronautics and Space Administration 

# Thank you!

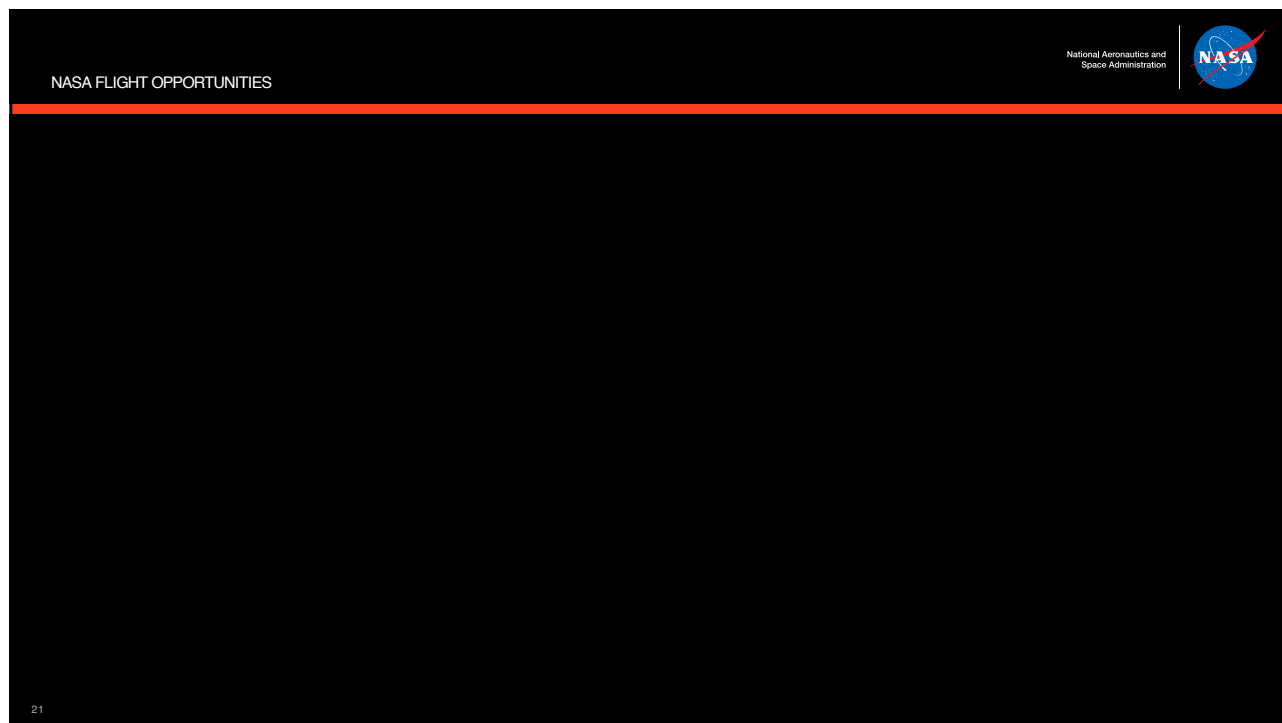
Flight Opportunities website:  
<http://nasa.gov/flightopportunities>

Contact us:  
[NASA-FlightOpportunities@mail.nasa.gov](mailto:NASA-FlightOpportunities@mail.nasa.gov)



20 www.nasa.gov

20





21

NASA FLIGHT OPPORTUNITIES

NASA  
TechLeap  
PRIZE

- Designed to rapidly identify and test solutions to specific NASA technology needs
- Format allows NASA to select winners and flight test their technologies in less than a year
- Open to businesses, universities, entrepreneurs, and other innovators
- Previous awards have been up to \$650K to build payloads, plus access to a suborbital flight test
  - 2022: Nighttime Precision Landing Challenge No. 1
  - 2021: Autonomous Observation Challenge No. 1



22

22