Policy Considerations for Space Logistics to Enable Lunar Missions

Dr. Erica Rodgers
Director of Advanced Programs
NASA Office of Technology, Policy, and Strategy

The Space Logistics Conference
September 26, 2024

Office of Technology, Policy, and Strategy

Office of Technology, Policy, Strategy

OTPS provides analytic, strategic, and decisional support to NASA senior leadership on core agency issues. We are the NASA Administrator's principal advisor on agencywide technology policy matters.*

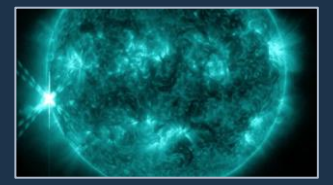
Proactive Focus Areas for CY24

- Space Environment Sustainability
- Sustained Lunar Presence
- Technology Disruption
- Economic Strategy

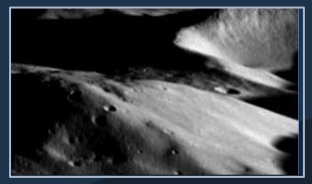
Activities and Contributions

- Reports
- Analyses
- Workshops
- Policy Demos
- Strategy Support
- Education and Thought Leadership

Recent OTPS Reports



Space-Based Solar Power



Artemis, Ethics and Society: Synthesis from a Workshop

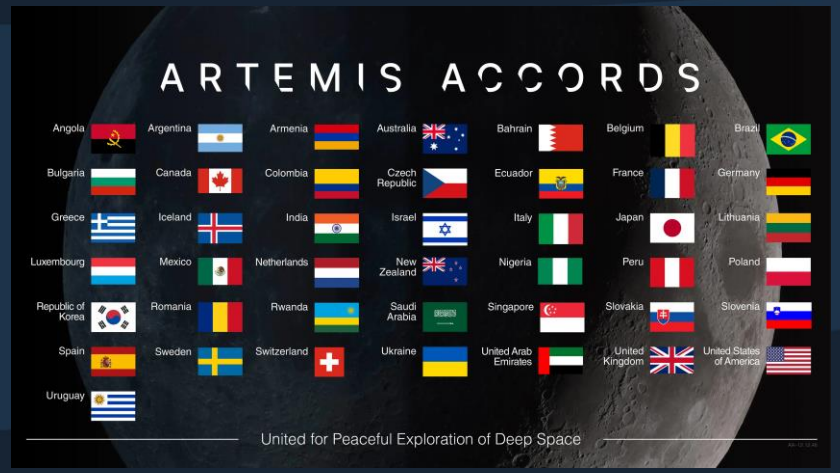
Visit the OTPS Website

* OTPS mandate as defined by NPD 1000.3E

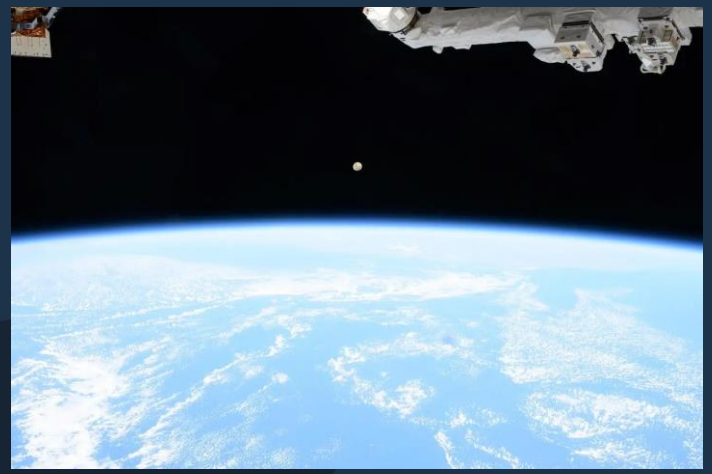
Office of Technology, Policy, and Strategy

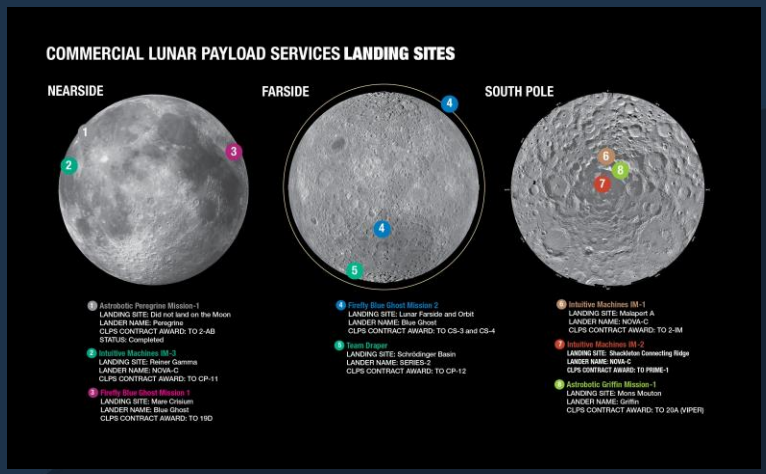
The “How” is Important

Global Engagement



Government and Commercial Owned





Office of Technology, Policy, and Strategy

The "How" is Important

How to consider policy implications from technical and economic factors?

Space Based Solar Power

- First-order Lifecycle Assessment to Generate Electricity from SBSP
  - Cost: 12-80 times more expensive than renewables
  - Emissions: Similar to renewables
  - Cost and emissions can be reduced with launch and manufacturing improvements
- Consider NASA partnerships to further ISAM, autonomous systems, power beaming capabilities that are applicable to NASA missions and SBSP

Models for Facilitating Government-Funded Activities in the Post-ISS LEO Ecosystem

- Identified 6 models for how NASA could facilitate activities with future CLDs
  - ISSNL model was used as a baseline for comparison
  - Considered relative strengths and weaknesses of each model under different LEO growth scenarios
- Information was used to inform NASA's Low Earth Orbit Microgravity Strategy

Commercial LEO Destinations Asset and Liability Insurance

- Identified CLD providers' insurance and liability concerns and provided potential options for addressing them
  - Asset Insurance
  - Liability Insurance
- Considered what the role of NASA and the broader USG should be going forward

Office of Technology, Policy, and Strategy

Sustained Lunar Presence

Influencing best practices for lunar missions within the space community and the advancement of NASA's Moon to Mars Strategy.



Office of Technology, Policy, and Strategy

Photo credit: NASA

Policy Implications for Moon to Mars

Lunar Landing and Operations Policy Analysis Report

- Addresses technical and policy considerations NASA should account for when:
  - Selecting lunar landing and operations sites
  - Implementing tools to protect operations and U.S. interest
- Provides options and recommendations to address seven identified challenges to lunar operations potentially mitigated by policy measures.

Artemis, Ethics and Society: Synthesis from a Workshop

- Mission planners and social scientists explored how to think about the ethical, legal, and societal implications (ELSI) of the Artemis Campaign
  - Identified key questions
  - Mapped cultural and practical challenges to identifying ELSI
  - Identified collaboration and engagement opportunities
- Provides a range of methods for forward progress

Policy Questions Framework

- 12 broad policy questions based on the M2M Objectives that can be used as a framework for future science and exploration missions:
  - To be used early in a program or project's lifecycle to help mission directorate leadership, program managers, and mission teams think through potential policy questions.
- To be used by NASA, US, and international space communities to minimize negative impacts while maximizing positive ones

Office of Technology, Policy, and Strategy

Policy Questions Framework

12 policy questions based on the M2M Objectives that can be used as a framework for future science and exploration missions

"policy questions" refers to the potential impacts, in the broadest sense, to NASA, national, or international space community interests

M2M Objectives[1]

- Science
- Infrastructure
- Transportation & Habitation
- Operations

Policy Questions

Sustainable Development	Interference Avoidance Among Actors
Role of NASA and Partners	Human Heritage
Protection of Valuable Locations	Effect on Earth by Operations
Planetary Protection	Cultural and Ethical Implications
Level of Transparency	Crew Safety Risk Posture
Interoperability and Standards	Benefit to All Humanity

Office of Technology, Policy, and Strategy

[1] NASA's Moon to Mars Strategy and Objectives Development, 2023

Community Input Informs Policy

- Feedback from the lunar community received Summer 2024
  - Clarify the breadth of interference and contamination concerns
  - Clarify community usage of the terms “interference,” “contamination,” and “deconfliction.”
- Feedback to inform
  - How to mitigate impacts of interference or contamination?
  - How to determine the change in value of a lunar site should certain interference or contamination activities occur?



Photo credit: NASA

Office of Technology, Policy, and Strategy

Space Sustainability

NASA defines *space sustainability* as the ability to maintain the conduct of space activities indefinitely into the future in a manner that is safe, peaceful, and responsible to meet the needs of the present generations while preserving the outer space environment for future activities and limiting harm to terrestrial life.



NASA'S SPACE SUSTAINABILITY STRATEGY

VOLUME 1: EARTH ORBIT

Office of Technology, Policy, and Strategy

Photo credit: NASA

OTPS Publications

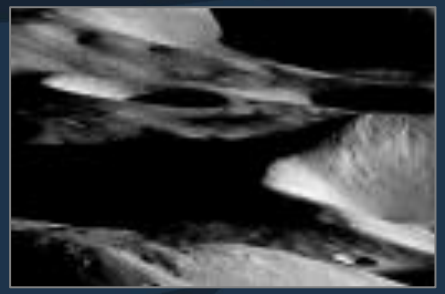
Commercial LEO Destinations Asset and Liability Insurance: Findings and Options



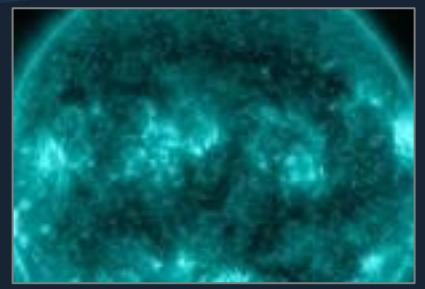
Models for Facilitating Government-Funded Activities in the Post-ISS LEO Ecosystem



Artemis, Ethics and Society: Synthesis from a Workshop



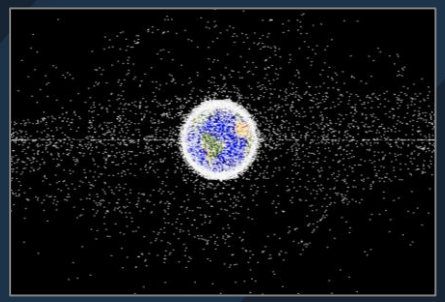
Space-Based Solar Power



NASA OTPS Lunar Landing and Operations Policy Analysis Report



Cost and Benefit Analysis of Mitigating, Tracking, and Remediating Orbital Debris



View All OTPS Publications

Office of Technology, Policy, and Strategy

Questions?

Visit NASA OTPS

Office of Technology, Policy, and Strategy