



Office of Technology, Policy, and Strategy

Bhavya Lal, Ph.D

NASA Associate Administrator for
Technology, Policy, and Strategy



Office of Technology, Policy, and Strategy



OTPS Mandate

**"The greatest deception men suffer is from their own opinion."
-Leonardo da Vinci, c. 1500**



November 2021 Genesis of OTPS

In his letter to the Chair of the Congressional Committees on Appropriations requesting the creation of the office, Administrator Bill Nelson wrote that

- “Establishment of OTPS within the Office of the Administrator ...will enable a **more focused leadership** on technology, strategy, and policy.”
- OTPS will “serve as the NASA Administrator’s **advisor on strategic engagement** in key areas to align Mission and Agency-level activities, supported by assessments to inform NASA senior leadership.”
- OTPS will “continue to serve as the NASA **Administrator's principal advisor and advocate on matters concerning Agency-wide technology policy and programs**, including advocacy for NASA research and technology programs through communication and integration with technology efforts being conducted by other Federal agencies.”

National Aeronautics and Space Administration
Office of the Administrator
Washington, DC 20546-0001



October 12, 2021

The Honorable Jeanne Shaheen
Chairwoman
Subcommittee on Commerce, Justice,
Science, and Related Agencies
Committee on Appropriations
United States Senate
Washington, DC 20510

Dear Madam Chair:

The purpose of this letter is to notify the Committee of a reprogramming action, in compliance with Section 505 of Division B of the FY 2021 Consolidated Appropriations Act (P.L. 116-260), involving a reorganization of Agency offices.

Specifically, I have determined that it is in the Agency's interest to establish an Office of Technology, Policy and Strategy (OTPS) within the Office of the Administrator. OTPS will consolidate the previous Office of the Chief Technologist and the previous Office of Strategic Engagements and Assessments into a single office, perform the functions of those previous offices, and incorporate the staff of those previous small offices.

Establishment of OTPS within the Office of the Administrator recognizes the importance of technology as a key driver of sound policy and strategy to guide NASA's current and future missions, and will enable a more focused leadership on technology, strategy, and policy. I appreciate the strong support of the Committees on Appropriations for NASA. I look forward to working with you to implement this reorganization expeditiously.

Sincerely,

Bill Nelson
Administrator

Enclosure





OTPS Enshrined in NASA Procedural Requirements

2.1.2.6 The **Associate Administrator for Technology, Policy and Strategy** directs the Office of Technology, Policy and Strategy. This position is responsible for developing and shaping Agency policy in response to Administration direction, as well as coordinating strategy across the Agency, in support of the Administrator.

2.1.2.9 a. **Office of Technology, Policy and Strategy (OTPS)**. The OTPS provides data and evidence-driven advice to NASA leadership to assure an integrated enterprise approach to technology, policy, and strategy. The office supports and promotes the Administration's and NASA leadership's top policy agenda and priorities, providing special studies as needed. The OTPS maintains awareness of critical emerging issues, both internal and external to the Agency. The OTPS includes the position of the Chief Technologist, as a senior representative for NASA.

- **Develop and shape** Agency policy in response to Administration direction, as well as **coordinate strategy across the Agency**, in support of the Administrator.
- **Provide data and evidence-driven advice** to NASA leadership to assure an integrated enterprise approach to technology, policy, and strategy.
- **Support and promote** the Administration's and NASA leadership's **top policy agenda and priorities**, providing special studies as needed.
- Maintain **awareness of critical emerging issues**, both internal and external to the Agency

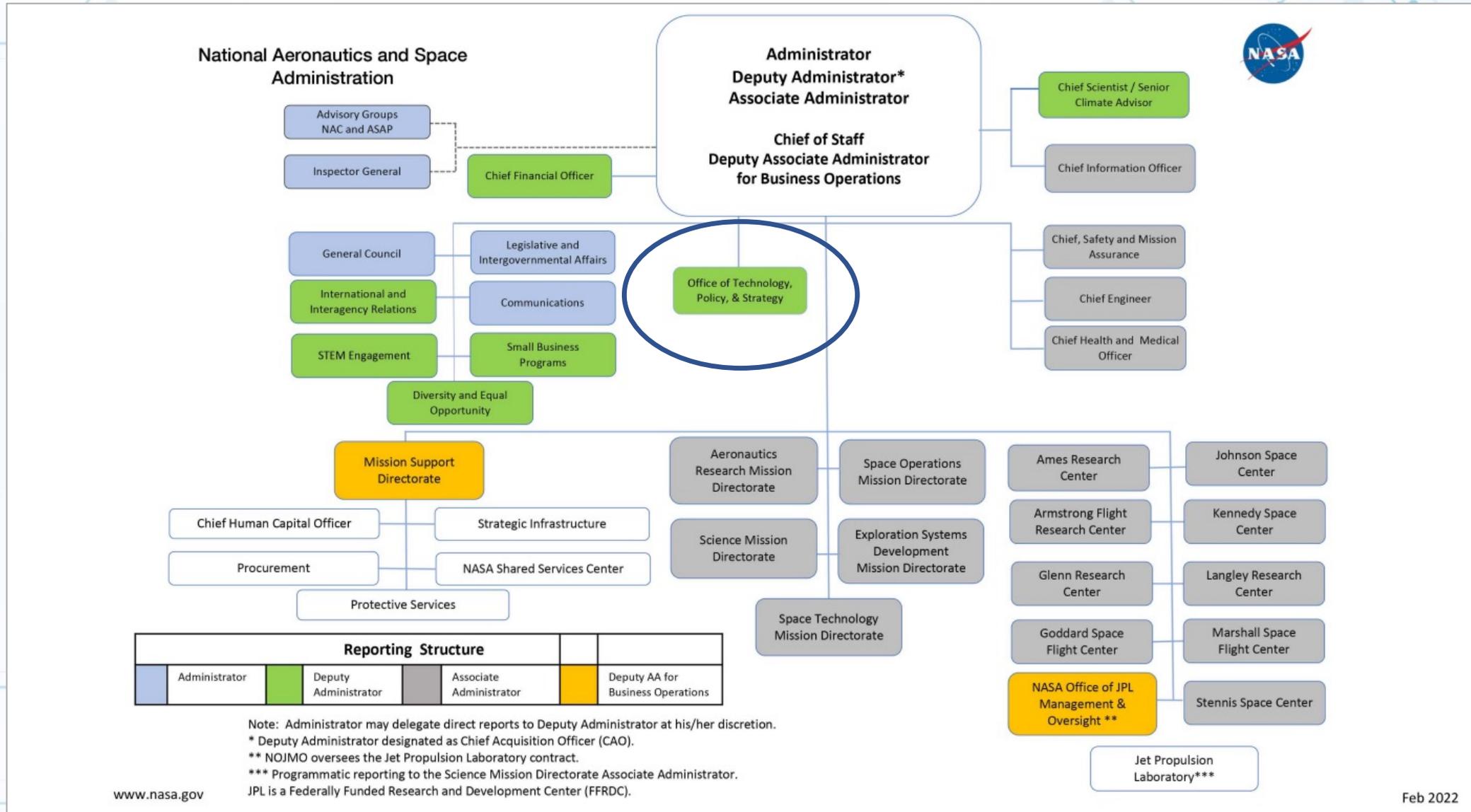


OTPS Organization





OTPS in the NASA Organizational Chart





OTPS Values

Build on NASA's core values: safety, integrity, teamwork, excellence, inclusion

- **Rigor and Objectivity**

- OTPS provides objective, evidence-driven analyses to drive policy, strategy and technology decisions through focused projects with defined questions and deliverables.
- OTPS relies on a deliberate study initiation process to ensure the study has been properly scoped and maintains regular communications with the customers throughout the study phase.

- **Focus on the Future**

- OTPS provides analyses on emerging issues related to the future of NASA and its role in the broader space community.
- The issues that OTPS study profoundly impact what NASA does across multiple time horizons and help shape the future of space exploration.

- **Collaboration**

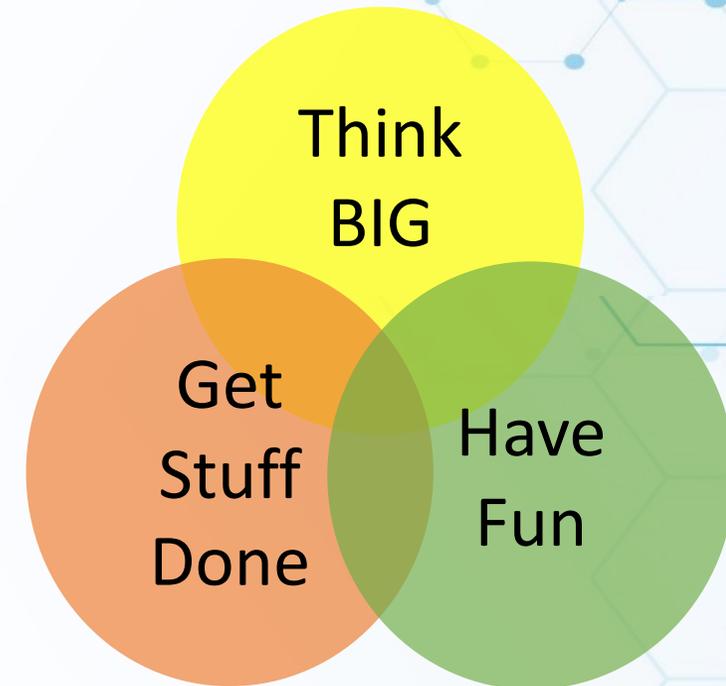
- OTPS weights in on matters that touch on all three parts of its name (technology, policy, and strategy) by relying on the diverse skill sets and areas of expertise across the entire team.
- Project teams will be created to take advantage of each team member's strengths and areas of interest and will work in partnership with the Mission Directorates, Centers and the broader space community

- **Transparency**

- Members of the OTPS community have regular opportunity to gain insight and contribute to on-going analyses.
- Once the work is complete, OTPS is committed to sharing the final deliverables as broadly as possible.

- **Growth Mindset**

- OTPS is committed to providing all members of the team with the opportunity to contribute to NASA's goals and to grow professionally.
- Rotating study roles provide multiple opportunities for staff to demonstrate leadership, grow their skills, and engage with members of the broader space community.

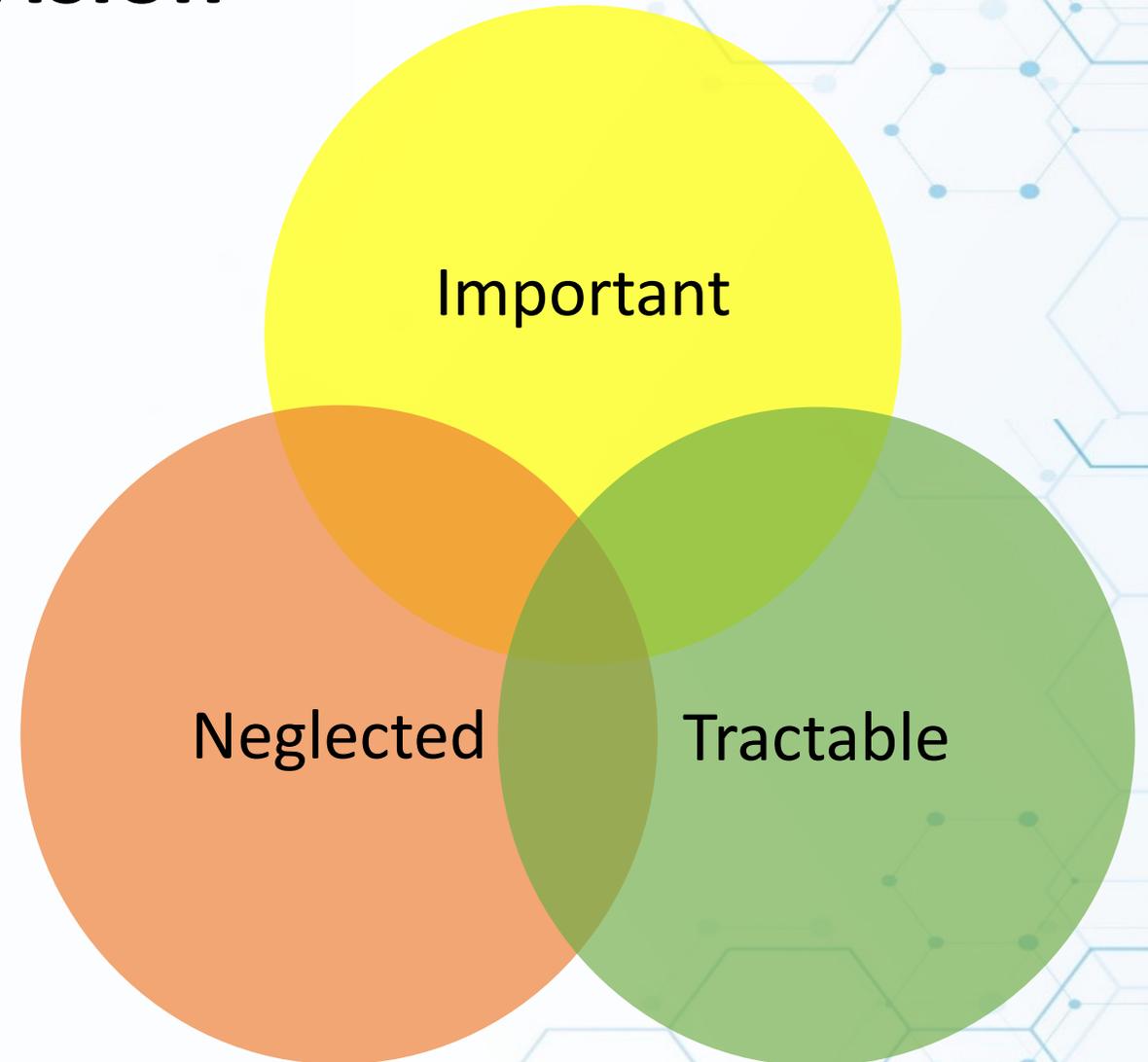




OTPS Vision

Working transparently and in collaboration across NASA and with the broader space community...

...OTPS research and analysis informs NASA's most consequential decisions about its future





NASA/Administration Priorities



Office of Technology, Policy, and Strategy



NASA Leadership Priorities

(Leader's Intent Memo 2023)

- **Moon-to Mars-Exploration:** Solidify and work to implement a technically and politically resilient architecture for sustained U.S. presence on the Moon, Mars, and throughout the solar system; continue to forge ahead on readiness for Artemis II, prepare to return Perseverance's samples from the surface of Mars, and ensure that our space communications and navigation assets are ready to support these missions.
- **Protecting Our Planet:** Equip policymakers with the best information possible to protect our planet.
 - Improve climate data quality and quantity through Earth observation missions and the rollout of the Earth Information Center; continue to develop and implement innovative efficient technology options with our commercial partners through successful X-plane demonstrations.
 - Respond to potentially dangerous objects from space by expanding our toolsets in vigilant search and detection, consistent early warning, and timely response; help leaders align Government agencies to maximize our likelihood of success should we need to use these defenses.
 - Develop policy and technology options for leaders to address growing hazards in near space caused by increasing traffic and human-made space debris, to protect the lives and property of all nations and future generations.
- **Workforce:** Continue to learn and adapt to meet the needs of our workforce.
- **Acquisition Reform:** Reinforce the integrity and excellence of our acquisition practice. Overarching priorities include advancing acquisition innovation and rigor as well as strengthening the acquisition workforce and culture.



White House/Administration Priorities

- The United States will **maintain its leadership** in space exploration and space science
- The United States will advance the development and use of **space-based Earth observation capabilities** that support action on climate change
- The United States will foster a **policy and regulatory environment** that enables a competitive and burgeoning U.S. commercial space sector
- The United States will **protect space-related critical infrastructure** and strengthen the security of the U.S. space industrial base
- The United States will **defend its national security interests** from the growing scope and scale of space and counterspace threats
- The United States will **invest in the next generation**
- The United States will lead in **strengthening global governance** of space activities
- The United States will **bolster SSA sharing** and space traffic coordination
- The United States will **prioritize space sustainability** and **planetary protection +planetary defense**



OTPS Portfolio

“In God we trust, all others bring data.”

Edwards Deming



Office of Technology, Policy, and Strategy



OTPS Mandate

“Establishment of OTPS within the Office of the Administrator ...will enable a more focused leadership on technology, strategy, and policy.”

**-Administrator Nelson Letter to Congress,
Nov 2021**

- 1) Develop and shape Agency policy in response to Administration direction, as well as coordinate strategy across the Agency, in support of the Administrator.
- 2) Provide data and evidence-driven advice to NASA leadership to assure an integrated enterprise approach to technology, policy, and strategy.
- 3) Support and promote the Administration's and NASA leadership's top policy agenda and priorities, providing special studies as needed.
- 4) Maintain awareness of critical emerging issues, both internal and external to the Agency



Thematic Areas and Priorities - FY22

- Establishment of OTPS and initial focus areas
- Created organization, systems and processes to perform high quality work
 - >40 projects/activities initiated
 - >100 internal or external presentations/briefings
- Focus on team-building with the right skill mix
- Recruitment of key staff including Deputy AA and XO
- Capacity building (ISPN, policy fellow, university capstone, seminar series, etc.) initiated
- Relationship-building within NASA and with interagency partners

Technology, Policy and Strategy Related to **Moon to Mars**

- Tech/Policy Issues Related to Lunar Landing Sites

Technology, Policy and Strategy Related to **Sustainability in Space**

- Orbital Debris Mitigation and Remediation

Technology, Policy and Strategy Related to the **Future of NASA**

- Space Sector in 2040 and beyond
- Models for Post-ISS NASA Engagement

Special Administrator Priorities and Ad Hoc Projects

- ISAM
- In-space Authorization and Supervision

Capacity Building



Summary of Project: Futures Roundtables

Goals

- Develop future scenarios in 2040 and beyond that identify potential disruptions to the future world that NASA should plan for
- Provide input that can inform NASA response to Aerospace Safety Advisory Panel (ASAP) recommendation that NASA should develop a strategic vision for the future of space exploration and operations that encompasses the next twenty years...

Methods

- Conduct a series of futures roundtables and associated activities internal and external to the agency designed to consider future scenarios that might impact NASA's ability to accomplish its mission

Findings

Most resilient strategic options identified in roundtables include:

- NASA leading the frontier by going as far and fast as possible to explore the unknown in areas no one else is
- NASA Catalyzing access for all to participate in exploration and science
- Increasing the value proposition for attracting and sustaining talent at NASA

Potential Impacts

- Key questions derived from roundtables can be used to drive enterprise level strategic planning to help NASA be best prepared to pivot when unpredicted technological or societal disruptions occur

Next Steps

- Communicate findings from study throughout agency and work with stakeholders to identify challenges and develop/communicate guiding policies and coherent actions throughout the agency



Summary of Project: Cost-Benefit Analysis of Orbital Debris Remediation

Goals

- To provide a landscape-view of debris remediation methods, quantifying their costs to implement and the benefits they create for spacecraft operators, that can inform NASA's technology and policy development
- Note: Debris remediation is any action to reduce the risks posed by orbital debris by moving, removing, or reusing it

Methods

- Developed a model to estimate the financial risks to spacecraft operators posed by space debris
- Estimated the cost per debris remediated for a broad spectrum of remediation methods
- Combined both models to estimate the risk reductions associated with each debris remediation method
- Held discussions with 40 organizations that have relevant expertise to inform the analysis

Findings

1. The benefits of some remediation methods can outweigh the costs in a short time.
2. Laser-based systems break even fastest and can:
 - Remove small, non-trackable debris (1-10cm)
 - Nudge large debris to avoid collisions
3. A combination of laser-based systems and a reusable method for controlled reentry may be an economical path to remediating risks posed by all debris >1cm

Potential Impacts

- Results will inform STMD's strategy for development of debris remediation capabilities
- Responsive to National Orbital Debris Implementation Plan

Next Steps

- Reduce the largest uncertainties in the analysis that may affect the high-level results
- Determine if new policy development is needed



Summary of Project: Lunar Landings and Operations Policy Analysis

Goals

Answer the questions:

- What technical and policy considerations should NASA take into account in the selection of lunar landing and operations sites
- What technical and policy considerations should NASA take into account when implementing tools such as safety zones in order to protect these operations and U.S. interests?

Methods

Multiple rounds of discussion, input, and analysis from:

- Internal NASA SMEs
- External SMEs
- International partners

Findings

We identified seven challenges to lunar operations that are amendable to mitigation by policy measures and provided options and recommendations to address each

Potential Impacts

Ensure implementation of USG legal and policy commitments, shape behavior on the Moon to support sustainable, safe, and predictable operations

Next Steps

- Work with Mission Directorates and mission teams to implement recommendations
- Build on findings in Artemis Accords Signatories Working Group meetings to implement recommendations jointly



Summary of Project: Models for Facilitating Government-Funded Activities in the Post-ISS LEO Ecosystem

Method: Scenario-driven analysis to rate distinct models based on how they may perform in the 2030 timeframe

Potential Impacts: Inform NASA's options for facilitating government funded activities in the post-ISS LEO ecosystem

Next Steps (OTPS + SOMD):

- SOMD to leverage OTPS findings and OSTP Interagency Working Group feedback to define best model(s) to facilitate and fund government-funded activities on LEO commercial platforms
- SOMD to leverage OTPS findings to recommend steps to transition from the ISSNL to the new model
- SOMD + OTPS to present recommendations to National Space Council (Spring 2023)
- OTPS to release full report to public



Goal 1: Identify potential models to facilitate government-funded or subsidized activities in a National Lab on a commercial LEO platform.

Findings: Six illustrative models identified with more to less government oversight that can be further adjusted to meet leadership priorities:



Model 1: Anchor Tenant

Long-term agreement for leasing space on a commercial platform



Model 2: Government Research Broker*

Customizable research missions using both transport vehicles and CLDs



Model 3: Innovation Campus

Modern terrestrial campus with workforce focus



Model 4: Matchmaker

Neutral third party connecting users to platforms



Model 5: Institute Network

Network of separate but related efforts to enable commercial scaling and U.S. leadership



Model 6: Fee for Service

Free market approach with coordinated grants and data/service buys

Goal 2: Identify near term modifications to the current ISSNL-CASIS partnership and the NASA management processes to prepare for the transition of the ISS by 2030.



Findings: Four near term actions identified to leverage strengths from current ISSNL and from top-performing models to improve NASA's posture for success post-ISS:



Action 1. Create pathway for ISSNL to access commercial platforms as they come online

Enable research throughout mission



Action 2. Elevate ISSNL incubation role to support movement towards industrialization

Catalyze innovation



Action 3. Establish terrestrial campus for microgravity R&D

Provide a dedicated place for LEO stakeholders to collaborate



Action 4. Determine ramifications of buying data from commercial providers

Allow agile, alternative approaches to meet R&D needs

*Government Research Broker illustrative model may perform most favorably in 2030 to: meet NASA's needs; be adaptable to infrastructure, service provider offerings, and user demands; allow opportunities for collaboration; and enable equity and accessibility



Select Activities and Projects – FY'23-'24

- Bridging skills gaps and adding to bench strength – policy analysis, cost benefit analyses, analysis of alternatives
- Recruitment of ACT and building a technology portfolio
- Shifting focus to shorter term (Type 1 and Type 2) projects
- Being more discerning about activities/projects to conduct

Technology,
Policy and
Strategy Related
to **Moon to Mars**

Technology,
Policy and
Strategy Related
to **Space Safety
and
Sustainability**

Future of NASA

Technology,
Policy and
Strategy Related
to **Commercial
Space**

Technology Policy and Strategy for NASA

Capacity Building



FY '23 Concluded Activities/Projects



- M2M Technology and Policy
 - Artemis and Ethics (Workshop)
 - M2M Policy Implications (Memo)
 - Lunar Mining (Memo)
- Space Safety and Sustainability Technology and Policy
 - NASA's options to address space sustainability (Memo)
 - Cost Benefit Analysis of Active Debris Removal (Report)
 - NASA's orbital debris organizations and challenges (Memo)
- Future of NASA/Ad Hoc Priorities
 - Planetary Defense Strategy and Action Plan
 - Administrator's Intent (collaboration with OCFO)
 - Designating Space as Critical Infrastructure (Memo)
- Commercial Space Strategy/Policy
 - Cislunar commercial communication policy challenges (Memo)

- Technology Policy and Strategy
 - SNPP
 - Policy impediments to international collaborations (Memo)
 - NASA Technology
 - Tech scouting (Report)

Continued Capacity Building Activities

A-suite technology, policy and strategy seminar series

NASA-wide informal space policy network (ISPN)

Internships/GEM Fellow

Policy Fellows

Solver in Residence

University Capstone Program

