Planning for the Future of Astrophysics and the ASTRA Initiative

Innovation for Astrophysics Missions: Preliminary Findings

Rashied B. Amini ***on behalf of the organizing committee***
NASA Exoplanet Exploration Program
September 2, 2026

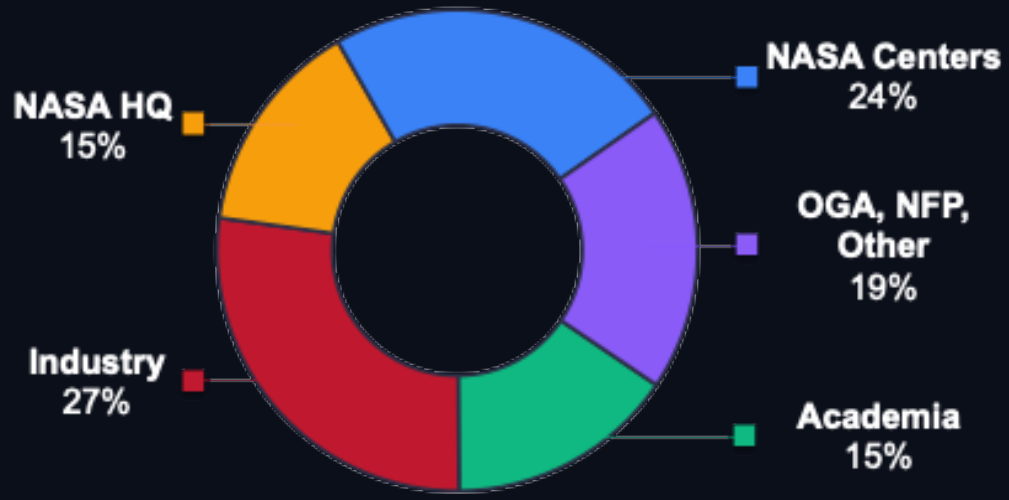
Take Away & Disclaimer

This talk highlights findings that inform your ASTRA concept definition

- **“Preliminary findings” are a summary of the organizing committee’s work toward a final report**
- **This presentation does not reflect all the ideas discussed or qualifying nuances of the workshop**
- **This talk presents ASTRA-relevant summaries of findings that will motivate final recommendations language – not the recommendations themselves**

The Workshop In Context

- Innovation Workshop convened on May 27, 28 at JHU's Bloomberg Center in Washington, D.C.
- 100 experts participated from across the astrophysics and exploration ecosystems
- The workshop's goals were to identify structural bottlenecks within the ecosystem and uncover strategies that can accelerate mission development timelines and increase flight cadence
- Final report comprised of findings & recommendations will be released this Fall



ASTRA-Relevant Findings by Domain

Build flexibility in your science case

- **Rideshares**
- Partnerships & Contracting
- Mission Development
- Technology Development
- Strategic Direction
- Risk
- Moon-to-Mars

Credit: Exolaunch

- **Teams should define acceptable orbital ranges, mission-sensitive parameters, and science sensitivity to rideshare parameters early in formulation**

ASTRA-Relevant Findings by Domain

Think of how to leverage ecosystem players

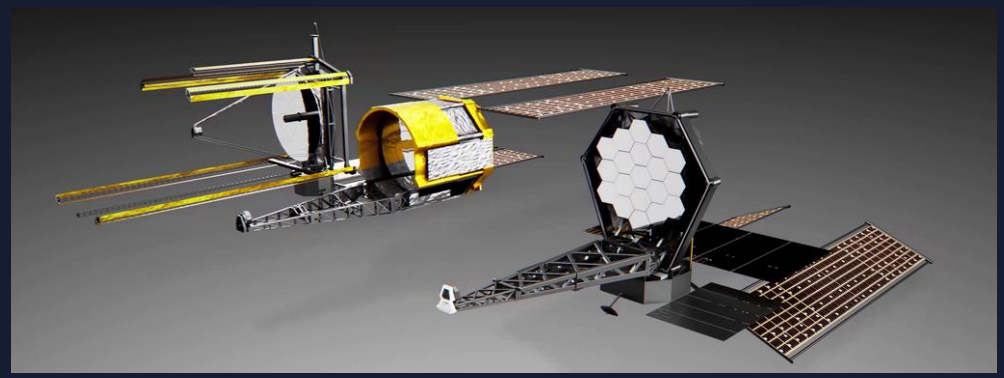
- Rideshares
- **Partnerships & Contracting**
- Mission Development
- Technology Development
- Strategic Direction
- Risk
- Moon-to-Mars

- **Study and communicate where flexibility exists to trade off hard-to-achieve requirements**
- **There is great value in leveraging the interconnected aerospace ecosystem that consists of many government agencies and large/small industry contractors.**

ASTRA-Relevant Findings by Domain

Focus on parameter studies to explore trade space before closing requirements

- Rideshares
- Partnerships & Contracting
- **Mission Development**
- Technology Development
- Strategic Direction
- Risk
- Moon-to-Mars



Credit: NASA

- **Study and communicate where flexibility exists to trade off hard-to-achieve requirements**
- **Comprehensive Pre-Decadal pre-formulation study benefits from funded participation across all stakeholder categories**
- **Go slow then fast. Work on HWO can offer a template for pre-Decadal studies: focus on architecture studies evaluating science and technical parameter sensitivity (CML 3) before closing requirements and design**

ASTRA-Relevant Findings by Domain

Identify your enabling/enhancing technologies and pathways to maturity

- Rideshares
- Partnerships & Contracting
- Mission Development
- **Technology Development**
- Strategic Direction
- Risk
- Moon-to-Mars

Credit: NASA

- **Barriers exist to effectively infuse technology developed from other agencies or customers into NASA missions**
- **Astrophysics lacks strategic flight opportunities to mature and fully deploy APD- and SBIR-developed technologies, creating a mismatch between selected SAT proposals and near-term mission needs**

ASTRA-Relevant Findings by Domain

Consider architectural options that leverage existing products and post-launch enhancements

- Rideshares
- Partnerships & Contracting
- Mission Development
- Technology Development
- **Strategic Direction**
- Risk
- Moon-to-Mars

Credit: NASA

- **Custom, one-of-a-kind spacecraft designs may not be required in the context of landscape advances, disaggregated architectures, and reusable launch interfaces**
- **Teams should consider the value from extended operations, post-launch technology demonstrations, and emerging in-space servicing capabilities to repair or upgrade operating spacecraft**

ASTRA-Relevant Findings by Domain

Start brainstorming what makes your concept brittle

- Rideshares
- Partnerships & Contracting
- Mission Development
- Technology Development
- Strategic Direction
- **Risk**
- Moon-to-Mars

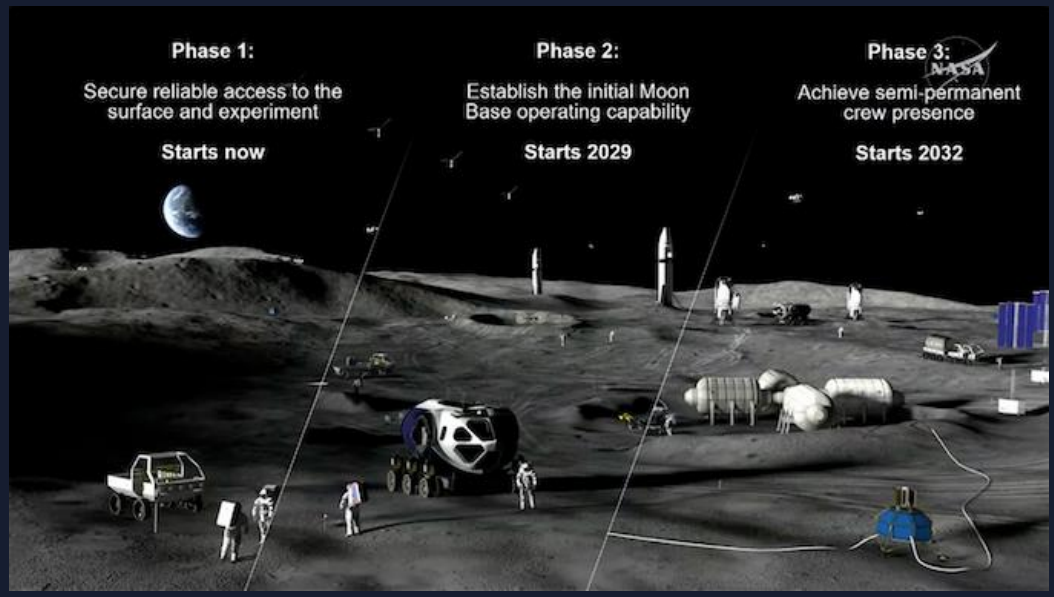
Credit: Bounce Magazine

- **Accelerating the cadence of science missions demands greater acceptance of informed risk**
- **"Downtailoring" a program-defined risk class can be excessively time-consuming, superseding the unique expertise and judgement of the project team**
- **Cost models tend to heavily penalize risk but reward potential schedule benefits far less**

ASTRA-Relevant Findings by Domain

Consider how the lunar surface may benefit your mission

- Rideshares
- Partnerships & Contracting
- Mission Development
- Technology Development
- Strategic Direction
- Risk
- **Moon-to-Mars**



Credit: NASA/Spaceflight Now

- **NASA has an incomplete portfolio of the astrophysics science cases that either benefit from or require instruments on the lunar surface and/or in lunar orbit**

Final Comment

Understand how your science return depends on your architectural parameters and you'll be ready for the next steps!

Backups/Old

PRELIMINARY FINDINGS

Ecosystem Friction Points

AO Process & Extensive Duration

The traditional Announcement of Opportunity (AO) lifecycle can be a lengthy process. AOs response with long timescales levy a resource burden that can strain budgets of proposing institutions and limit our ability to leverage innovation. Technical/Management/ Cost (TMC) cost modeling can inhibit innovation by forcing adherence to old models.

Risk Perception Asymmetry

There are so few opportunities that "Every mission is Class A on the Pad." NASA treats individual flight failures as catastrophic agency events, leading to conservative practices that can inhibit innovation. Conversely, industry and OGAs design around iterative, statistical risk profiles built to tolerate individual component anomalies.

Penalization of New Technologies and Architectures

Proposal evaluation scorecards reward high-TRL, legacy hardware choices, creating a penalty for cutting-edge tech. Proposals seeking to fly new instruments or spacecraft technologies are punished for doing something a new way while there are few bridges across the TRL "valley of death."

Timescale Mismatches & Oversight

Commercial development can move in months servicing non-NASA customers, while NASA approval loops work on multi-year timelines. Intrusive, day-to-day engineering with a "do it our way or no way" mentality and risk oversight profiles force standard commercial platforms to match custom, cost-heavy designs.

PRELIMINARY FINDINGS

New Ecosystem Opportunities

Low-Cost Platforms, Frequent Rideshares

Expansion of New Space has resulted in a larger number of suppliers and notable investments in non-recurring engineering resulting in launch vehicles and space systems offerings increasingly capable of meeting the performance needs of astrophysics missions at lower cost. Other NASA divisions offer examples of how to leverage these.

Agile Contracting and Reenvisioning Risk

Multiple pathways exist to expedite contracting, including options for Indefinite Delivery, Indefinite Quantity (IDIQ) and pre-negotiated contracting that can produce a fleet of standard busses for astrophysics missions. Changes in NASA risk posture can permit flexibility to reduce the scope of requirement and contract oversight, reducing contract costs and delivery schedules.

In-Space Servicing

Demonstrating both agile contracting and in-space servicing, Katalyst's Swiftly mission will boost Gehrels/Swift's orbit and extend its life. HWO has already included servicing a key part of its mission. Further adoption of in-space servicing and robotics can impact how astrophysics missions are architected in the future.

(Cis-)Lunar Access & Hitchhiking to the Moon

Commercial Lunar Payload Services (CLPS) has demonstrated continuous delivery of payloads to the lunar surface. Artemis promises 100s of tons of payload delivered to the moon and access to power, data resources. Whether or not astrophysics is best served in lunar space may not matter if you're not paying for the ticket.

Convergence vs Divergence

There was much convergence on “what” and some divergence on “how”

Topics of Convergent Discussion

Multi-Mission Platforms Smaller mission classes can migrate away from bespoke builds and leverage standardized designs.

AO Response As Resource Sink Current AO processes are slow and drains significant time/resources. PIs will always propose at cap, anyway.

TMC Process as Inhibitor of Progress Early overreliance on TMC, risk standards, and cost modeling based on historic costs can inhibit science-forward concepts with innovative execution.

Risk Class & Reviews as Schedule Driver Adherence to NPR 7120.5 and low-level requirement drives cost and schedule. Reviews are disruptive to implementation progress. “Up-tailoring” and self-assigned risk may be a resolution.

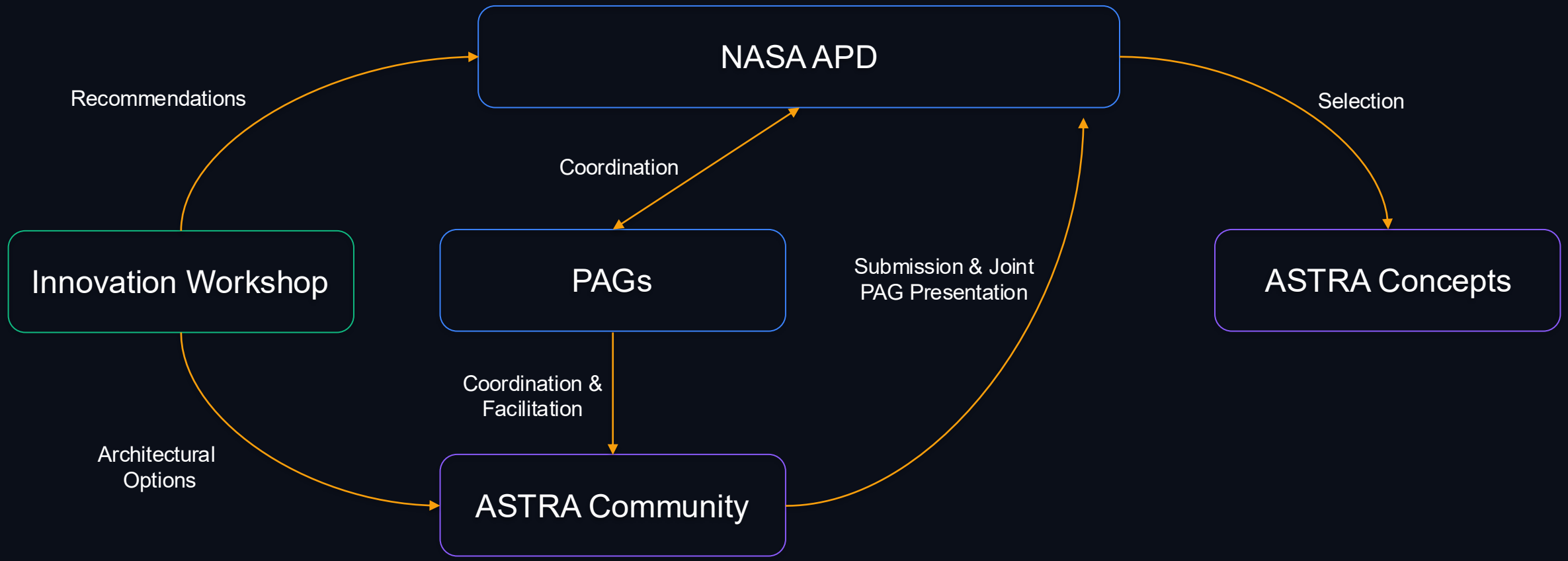
Regulatory Bloat Federal procurement regulations and risk aversion have increased over time.

Topics of Divergent Discussion

Structuring Payload Rideshare/Accommodation as Service If APD adopts programs for funding payloads for pre-developed busses (e.g., IDIQ, NASA VADR), it is unclear how this would or should map to existing programs (e.g., Pioneers, Explorers).

How Many Step Proposal? The scope of 1-Step proposals and when 2-Step proposals are still value-positive to NASA and the community?

How to Leverage Lunar & New Tech Opportunities? While CLPS has demonstrated regular cadence, it is unclear how exploration programs will enable payloads to ride on Artemis missions. This challenges potential strategic mission planning. Similar concerns about servicing and fleet capabilities.

Right-Sizing Oversight Industry accepts that PIs will drive toward deeper project insight than commercial projects - but how can we arrive at the “right” level?

Feeding the ASTRA Incubator Program