

MODELS FOR FACILITATING GOVERNMENT-FUNDED ACTIVITIES IN THE POST-ISS LEO ECOSYSTEM



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OBJECTIVE

This study helps elucidate NASA's future options for facilitating government-funded activities in the post-International Space Station (ISS) low-Earth orbit (LEO) ecosystem. NASA is preparing for the retirement of the ISS and transition of LEO activities to one or more Commercial LEO Destinations (CLDs) by 2030. This transition necessitates new models for connecting NASA and other users of the LEO environment to platforms and opportunities. As the LEO ecosystem evolves through growth of the commercial space industry and NASA's strategic goal to support the development of a robust LEO economy in which many stakeholders on Earth can participate, so must the way NASA facilitates government activities to ensure citizens realize the highest return on their investment in LEO. Specifically, this study aims to answer the question: **What are potential models for an ISS National Lab facilitating government-funded or -subsidized activities on a commercial LEO platform after the transition of the ISS to one or more private platforms?**

MODELS

To address this question, OTPS conducted over 40 discussions with stakeholders internal and external to NASA and reviewed over 35 documents related to legislation, governance, LEO commercialization, potential models, and activities performed in microgravity and LEO. This study describes for consideration six models for facilitating government-funded activities in the post-ISS LEO ecosystem. The current ISS National Laboratory (ISSNL) model is included as it may be possible to extend processes, parties, and agreement types to a leased portion of a CLD. The six models represent a wide trade space of potential options, each relying on unique mechanisms for facilitating activities on one or more commercial LEO platforms and/or vehicles. OTPS assessed each model across three possible future scenarios varying in number and diversity of LEO activities and commercial offerings—1) dynamic growth, 2) steady growth, and 3) limited growth—and across five stakeholder-driven model evaluation criteria—1) ability to meet NASA's needs; 2) adaptability to infrastructure, service provider offerings, and user demands; 3) opportunity for collaboration, especially with international and other government agency (OGA) partners; 4) market sustainability; and 5) equity and accessibility.

Current Model: ISS National Lab (ISSNL)

Description	Model Definition	Model Evaluation
A NASA-funded nonprofit, Center for the Advancement of Science in Space (CASIS), with input from a board of directors and a user advisory committee, provides management to promote and broker a diverse range of research in life science, physical science, remote sensing, technology development, and education, to benefit the U.S. taxpayer and foster a scalable and sustainable low-Earth orbit economy within 50% of the U.S. allocation on the ISS.	<ul style="list-style-type: none"> Nonprofit, CASIS, manages investigations within 50% allocation for non-NASA, non-exploration activities NASA-CASIS relationship defined by cooperative agreement that prohibits CASIS from engaging in non-ISSNL activities Leverages network including Implementation Partners, Commercial Service Providers, incubator partnerships, and OGA-sponsored research Broad outreach to users for opportunities 	<ul style="list-style-type: none"> Ability to Meet NASA's Needs: N/A Adaptability: Users, processes, and facilities not easily reconfigurable due to 50/50 allocation and cooperative agreement Opportunity for Collaboration: NASA, OGAs, and international users cannot easily collaborate among each other Market Sustainability: User experience and facility scheduling impacted by limited visibility into planned resource allocations Equity & Accessibility: Inclusive of and active outreach to academic, government, and commercial users; trusted as honest broker

CONCLUSION

The Government Research Broker model performed best in the analysis across multiple future scenarios, followed by Innovation Campus, Anchor Tenant, and Fee for Service. While Matchmaker and Institute Network exhibited positive aspects, they performed most favorably in future scenarios with well-established communities and markets. The models presented in this study are representative of the potential trade space and are illustrative examples. Further, each of the six models requires change to current legislation. NASA leadership may adjust models as desired to align closer to their priorities using combinations of the unique model mechanisms provided in our analysis. The best-performing model that meets leadership priorities is likely a combination of features from multiple models.

Model 1: Anchor Tenant

Description	Model Definition	Model Evaluation
A NASA program office, with input from user communities, leases space on a commercially owned platform, providing a reliable revenue stream for one commercial LEO destination (CLD).	<ul style="list-style-type: none"> NASA program office coordinates NASA and non-NASA activities Long-term commitment between NASA and one CLD with potential to host NASA equipment/facilities Variety of agreements can support NASA partnerships with non-NASA users Final authority for all activities lies with platform owner 	<ul style="list-style-type: none"> Ability to Meet NASA's Needs: NASA "front door" and long-term agreement with platform leads to reliable access for NASA Adaptability: Long-term contracts and large investments lock NASA into one provider Opportunity for Collaboration: NASA-dedicated space and level of involvement lead to numerous opportunities for collaboration—if identified early on Market Sustainability: Supports a CLD, but can reduce competition/increase barriers to entry for others, dampening long-term growth Equity & Accessibility: Grants encourage participation, though competition may be high in scenarios with more opportunity

Model 4: Matchmaker

Description	Model Definition	Model Evaluation
An independent third-party connects NASA and non-NASA users to LEO platforms based on mission and technical requirements and provides technical expertise and support.	<ul style="list-style-type: none"> Third-party matchmaker manages process but has no direct connection to infrastructure May coordinate research activities, facilitate tech transfer, foster emerging companies, and support multi-agency programs Aggregates clear demand signal from diverse users and understands offerings from various providers Potentially provides a mechanism to negotiate on behalf of government 	<ul style="list-style-type: none"> Ability to Meet NASA's Needs: Inability to focus on NASA limits the ability to meet NASA needs Adaptability: Highly adaptive to varying supply and demand scenarios Opportunity for Collaboration: Trust must be earned through successful matches Market Sustainability: Potential for bias, which may hinder market sustainability Equity & Accessibility: Lacks low-cost pathways for research

Model 2: Government Research Broker

Description	Model Definition	Model Evaluation
A NASA program office, with input from a user advisory committee, provides funding and coordination support to NASA and non-NASA users to complete exploration-enabling research activities on mixed-used orbital vehicles and space stations in LEO.	<ul style="list-style-type: none"> NASA program office guides activities and brokers relationships based on mission and technical requirements Reconfigurable infrastructure with mixed facilities and crew options Length of contracts and built-in flexibilities may vary between vehicle and space station providers User input considered from science decadal surveys and multi-user advisory committees 	<ul style="list-style-type: none"> Ability to Meet NASA's Needs: NASA "front door" prioritizes science and tech that meets exploration needs Adaptability: Users can mix and match objectives over time and space Opportunity for Collaboration: Users share limited research volumes Market Sustainability: Providers must differentiate their value propositions (e.g., why can't a user conduct this activity in the transport vehicle instead?) Equity & Accessibility: Inclusive of academic voices and government trusted as an honest broker

Model 5: Institute Network

Description	Model Definition	Model Evaluation
Network of institutes, created by NASA and OGAs with joint funding from industry, to enable commercial scaling and U.S. leadership.	<ul style="list-style-type: none"> Institutes created/funded by NASA and OGAs with some joint industry funding Sponsored by a government consortium and managed by a third-party non-profit Users lease infrastructure and have access to a wide network of mutually beneficial focus areas Focus on government-identified needs, with input from many user communities 	<ul style="list-style-type: none"> Ability to Meet NASA's Needs: Best met in dynamic scenario with many users/capabilities Adaptability: Correlates with level of opportunity—more flexibility in research areas, platforms, and users Opportunity for Collaboration: Encourages collaboration/access to networks in a dynamic environment Market Sustainability: Focus on commercialization drives market growth—applicable in dynamic scenario Equity & Accessibility: May be limiting due to heavy focus on commercialization, depends on specific institute teams

Model 3: Innovation Campus

Description	Model Definition	Model Evaluation
A third-party with NASA sponsorship operates a terrestrial campus with an open-door policy to serve as a lodestone for microgravity and orbital research and operations and to maintain critical skills and promote innovation on the ground.	<ul style="list-style-type: none"> Third-party operator provides support and expertise through design and development Terrestrial infrastructure hosts specialized facilities, equipment, and other hardware for multi-stakeholder use Stakeholders contribute via academic exchanges, partnerships, and projects Overarching agreement between government sponsor and third-party operator for innovation campus management and operations 	<ul style="list-style-type: none"> Ability to Meet NASA's Needs: Covers complementary terrestrial objectives and pre- and post-flight activities with NASA as sole government sponsor Adaptability: Financial constraints could limit adaptability Opportunity for Collaboration: Open-door policy for international and OGA users; terrestrial value propositions realized for basic R&D OGAs Market Sustainability: Limited and indirect connections to flight opportunities may not enable market growth Equity & Accessibility: Does not directly connect users to LEO platforms. Relies on in-space infrastructure and sufficient funding for access to orbit

Model 6: Fee for Service

Description	Model Definition	Model Evaluation
No explicit model; users are free to engage directly with commercial LEO providers within the free market while NASA signals demand and provides some funding through grants and service/data buys.	<ul style="list-style-type: none"> Free market exchange between NASA and commercial service operators; NASA is just another paying customer NASA may signal demand through issuing grants for specific services Supply limitations may drive costs and competition in ways disadvantageous to NASA Requires robust ecosystem with many players and high-level private-sector investments 	<ul style="list-style-type: none"> Ability to Meet NASA Needs: NASA can only signal demand Adaptability: Provides flexibility and scalability of activities, available platforms, and infrastructure options Opportunity for Collaboration: Coordination not orchestrated by NASA; players are free to engage Market Sustainability: Encourages and provides incentives for market growth by allowing market-driven solutions and offerings to flourish Equity and Accessibility: Provides identifiable points of access, but cost may be a barrier