



COMMERCIALIZING LOW-EARTH ORBIT

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NASA Headquarters

NAC Meeting
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Vision: A World of New Possibilities



Working with our partners, NASA aims to enable a robust economy in low-Earth Orbit (LEO), where we are one of many participants.

NASA National Performance Plan



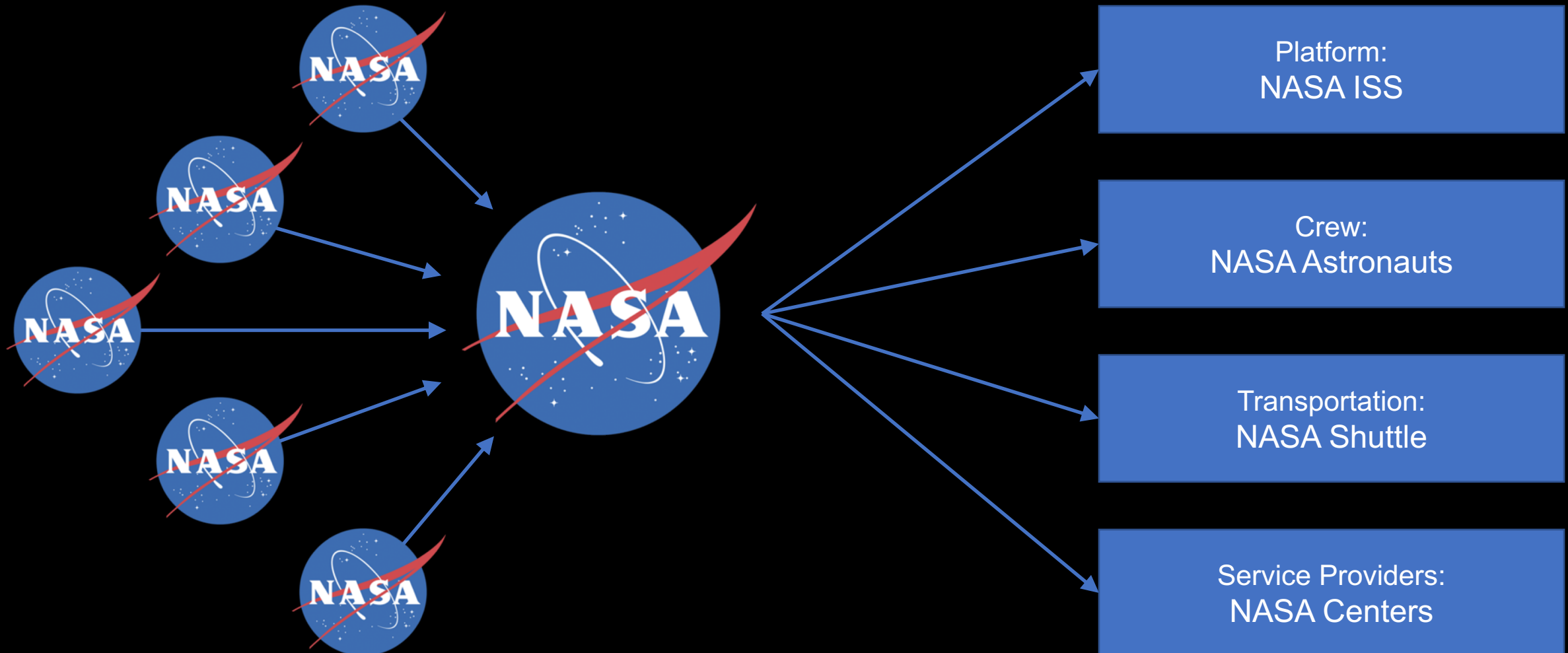
Strategic Objectives		
Discover	1.1	Understand the Sun, Earth, Solar System and Universe
	1.2	Understand Responses of Physical and Biological Systems to Spaceflight
Explore	2.1	Lay the Foundation for America to Maintain a Constant Human Presence in Low Earth Orbit
	2.2	Conduct Exploration in Deep Space, Including to the Surface of the Moon
Develop	3.1	Develop and Transfer Revolutionary Technologies to Enable Exploration Capabilities for NASA and the Nation
	3.2	Transfer Aviation Through Revolutionary Technology Research Development, and Transfer
	3.3	Inspire and Engage the Public in Aeronautics, Space and Science
Enable	4.1	Engage in Partnership Strategies
	4.2	Enable Space Access and Services
	4.3	Assure Safety and Mission Success
	4.4	Manage Human Capital
	4.5	Ensure Enterprise Protection
	4.6	Sustain Infrastructure Capabilities and Operations

NASA's LEO Commercialization Strategy



- NASA is revamping its approach to LEO commercialization as we learn from past years
 - Creating a dedicated organization and management structure
 - Expansion of Enabling Policies
 - Better engagement with industry
 - Reshaping CASIS
 - More Business-focused decision process
 - Early demonstrations of success

PRE-2005: A NASA Low-Earth Orbit (LEO) Monopoly



Commercial Cargo



Space X C1
Launch
December 8,
2010



SpaceX C2+
Launch May 22,
2012



Orbital A-ONE
Launch
April 21, 2013



Orbital ORB-
D1 Launch
September
18, 2013

SpaceX Dragon
Capture
May 25, 2012



Orbital Cygnus
Capture
September 29, 2013





Cargo and Future Crew



Commercial Crew and Cargo on ISS

Commercial partnerships enable continuous and ongoing cargo and crew operations aboard the space station and advance human exploration at a sustainable pace.



Future Cargo



www.nasa.gov/station

NORTHROP GRUMMAN

Cargo



BOEING

Future Crew



Photo Credit:
NASA/Frank Michaux

Commercial Hardware on ISS



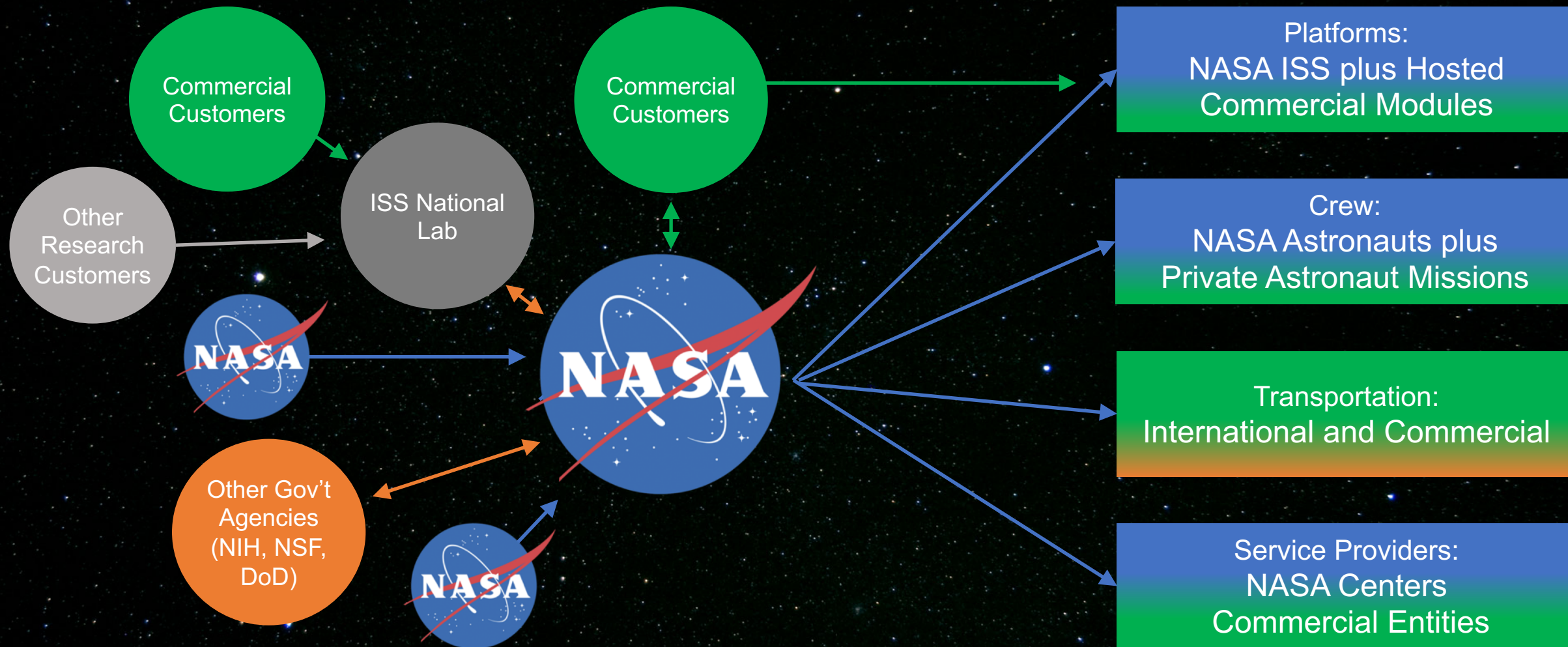
Made In Space:
Additive Manufacturing
Facility (AMF)

AMF is the first permanent commercial manufacturing platform to operate in LEO

- **Alpha Space:** External materials exposure platform
- **Bigelow Aerospace:** Expandable module
- **BioServe:** Space biology platforms and services
- **Space Tango:** TangoLab space biology platforms
- **NanoRacks:** Internal and external platforms; satellite deployers; airlock
- **Sierra Nevada Corp:** Small mass measurement device
- **STaARS:** Space biology platform
- **Techshot:** Bone densitometer, centrifuge facility
- **Teledyne Brown Engineering:** External precision pointing platform

TODAY: Transitioning from NASA-centric to a Multi-user LEO Economy

● NASA ● Other Government Agencies/International ● Commercial

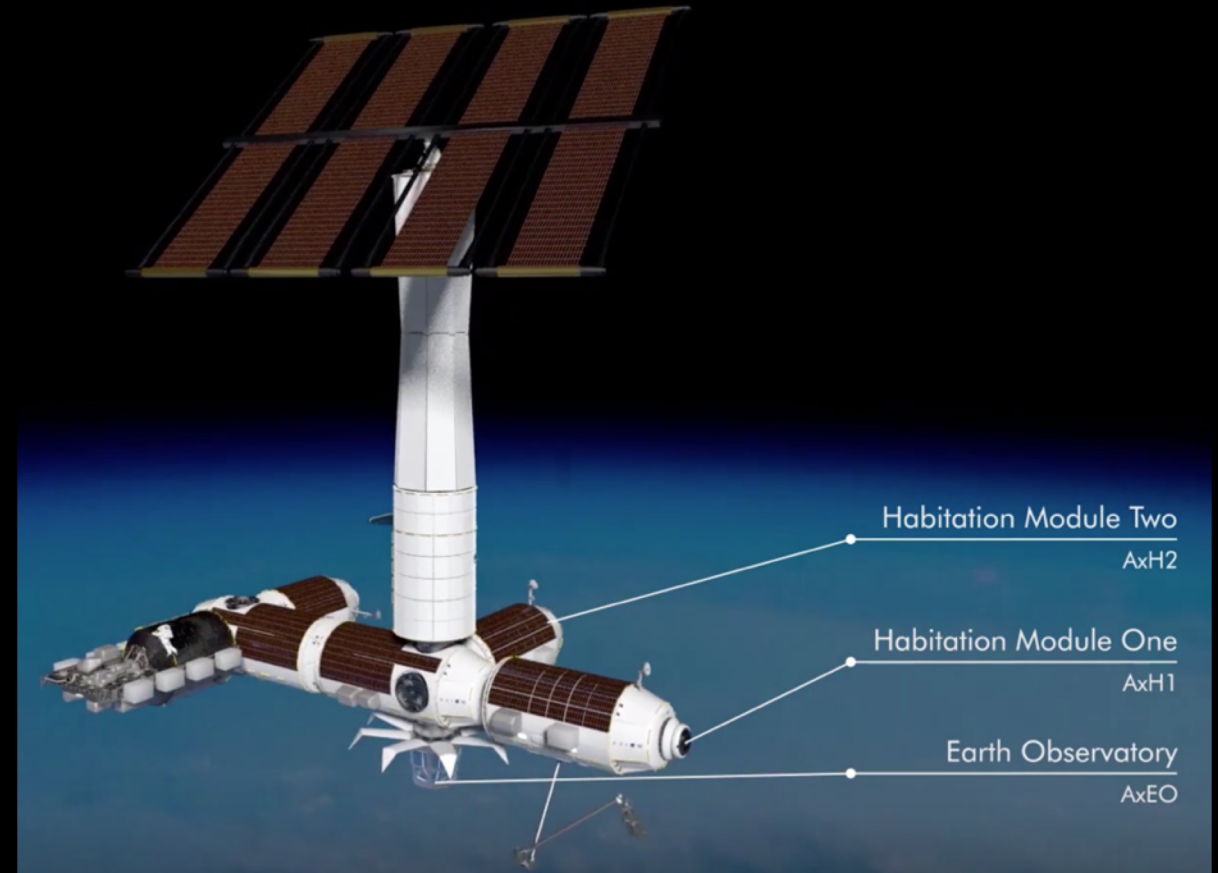
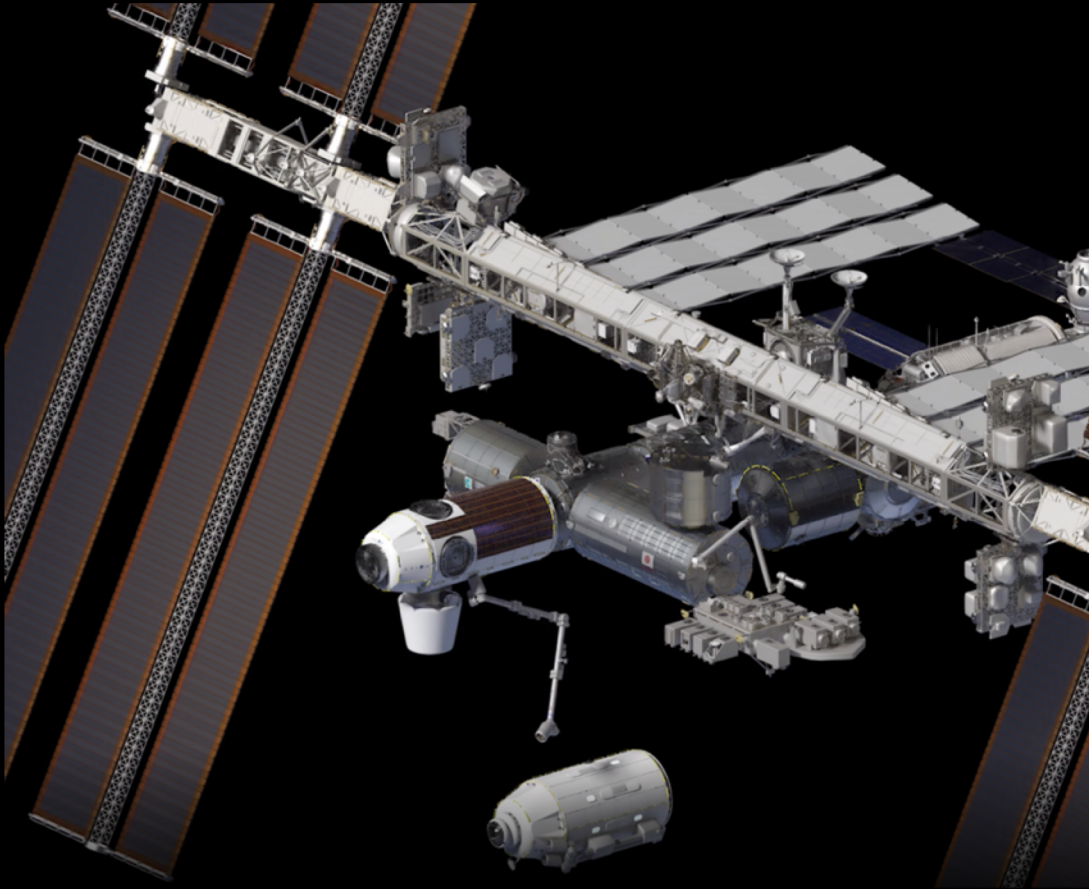


Interim Pricing Policy



	Resources	Reimbursable Value	Annual ISS Resources	Maximum Allowed per Company per Year
Available Immediately	Upmass (Passive Cargo)	\$3,000 per kg	175 kg	50 kg in a form factor of single CTBE*s
	Trash Disposal (Passive Cargo)	\$3,000 per kg	175 kg	50 kg
	Downmass (Passive Cargo)	\$6,000 per kg	125 kg	35 kg
	Conditioned Cargo (Round Trip)	\$13,500 per kg	Not available at this time	--
	Powered Cargo (Round Trip)	\$18,000 per kg	Not available at this time	--
	ISS Expedition Crew Member Time	\$17,500 per hr	90 hrs	25 hrs
Available for Private Astronaut Missions				
	Regenerative Life Support and Toilet	\$11,250 per crew per day	Available as needed	--
	Crew Supplies (Food, air, crew provisions, supplies, medical kit, exercise equipment, etc.)	\$22,500 per crew per day	Available as needed	--
	Stowage	\$105 per CTBE per day	Available as needed	--
	Power	\$42 per kWh	Available as needed	--
	Data Downlink	\$50 per GB	Available as needed	--

Axiom Space Selected (Port Solicitation)



Stimulating Sustainable Demand



- NASA is providing seed money to enable enterprising companies to mature their concepts and stimulate demand to develop their future markets

- Projects just recently announced:

- Universal Glass Optics Manufacturing Module
- Thin Metal-Coated Optical Fiber Manufacturing
- Glass Alloy Manufacturing Machine
- Semiconductor Chip Facility
- Production of Stem Cells for Personalized Medicine Applications
- Protein-based Retinal Implant Manufacturing
- Regenerative Medicine Laboratory
- Action Plan for Barriers to Entry



DSTAR Communications



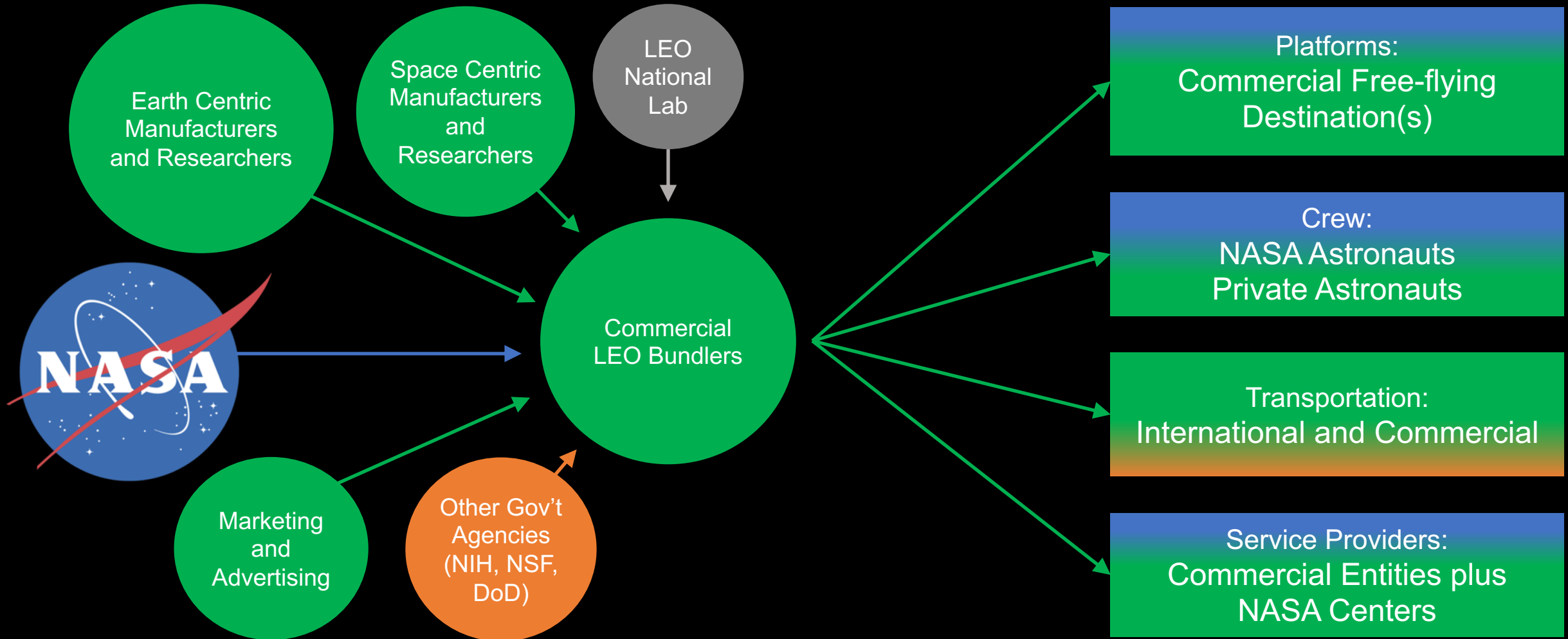
SPACE TANGO



2030 and BEYOND: Commercially Provided LEO Services



● NASA ● Other Government Agencies/International ● Commercial





COMMERCIAL & MARKETING
ACTIVITIES ON ISS
OR A FUTURE PLATFORM



PRIVATE
ASTRONAUT
MISSIONS



COMMERCIAL
DESTINATIONS
IN LEO



A
ROBUST
ECONOMY



NASA'S
LONG-TERM NEEDS
ARE MET

COMPONENTS OF A *LEO ECONOMY* & A NEW FUTURE IN SPACE



QUESTIONS?