Public—Private Partnerships:
NASA as Your Business Partner

Gary Martin
Director, Partnerships
Partnerships at Ames

Partnering with external organizations to access capabilities under collaborative agreements

Entering into reimbursable agreements for partner access to NASA capabilities

Expanding overall landscape of space activity (maximizing public and private sector growth)

Spurring innovation
Government’s Role in Commercializing Space

“What role should the government play in the commercialization of space?”
National Advisory Council for Aeronautics

Established in 1915 by Congress
Developed key technologies to enable air travel to become effective, economical and safe
Studied the problems of flight to identify and resolve risks that kept air travel from being safe and commercially viable
Government worked closely with industry to fund studies that retired technological risks and enabled private enterprise to successfully create a new industry
### Changes at NASA

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“Develop a robust and competitive U.S. commercial space sector”

“Energize competitive domestic industries to participate in global markets”

NASA is to achieve this by:

• Purchasing and using commercial space capabilities and services to the maximum practical extent
• Actively exploring the use of inventive, nontraditional arrangements for acquiring commercial space goods and services
• Refraining from conducting U.S. Government space activities that preclude, discourage, or compete with U.S. commercial space activities
• Pursuing potential opportunities for transferring routine, operational space functions to the commercial space sector where beneficial and cost-effective.
FAA Office of Commercial Space Transportation

Founded 1984, to:

- **Regulate** the commercial space transportation industry, *only to the extent necessary*
- **Encourage**, **facilitate**, and **promote commercial space** launches by the private sector
- **Recommend appropriate changes** in Federal statutes, treaties, regulations, policies, plans, and procedures:
- Facilitate the strengthening and **expansion of the U.S. space transportation infrastructure**
Why Commercial?

Commercial companies must be competitive and governments have other priorities (safety, jobs, etc.).

*Example*: comparison of SpaceX to NASA Development Costs

- NASA initial estimates using its normal cost estimating software for Falcon 9 were 10 times more expensive than SpaceX actuals.
- Even when NASA made adjustments its estimates were still 4 times more.

Conflicting goals

- US Congress focused on jobs in their districts.
Commercial Orbital Transportation Services (COTs) 2006
• NASA investment $800M produced 2 new launchers 2 new ISS cargo carriers

Commercial Crew Development (CCDev) 2009 – 2011
• Stimulate development of privately operated crew vehicles

• Advance multiple integrated crew transportation systems
• Develop a Commercial Transportation System capability to LEO

Commercial Resupply Services
• 12 missions for SpaceX and 8 missions for Orbital Sciences ($3.5B)

Collaborations for Commercial Space Capabilities – SAAs
• Advance private sector development of emerging products and services commercially available to government and non-government customers

Flight Opportunities Program 2010 – Suborbital
• Commercial Reusable Suborbital Research Program (CRuSR) – supports commercial suborbital spaceflight by providing a steady, guaranteed market for research payloads
• Facilitated Access to Space Technology (FAST) – funding microgravity research
Alternatives to Government Funding

Google Lunar X-Prize (GLXP) 2007 - 2016
- Eighteen teams currently in competition for $30M in prizes
- Land a robot on the Moon then travel more than 500m and transmits high definition images and video to Earth

NASA Innovative Lunar Demonstration Data
- Indefinite delivery/indefinite quantity (IDIQ) contracts totaling up to $30.1M

Crowdfunding
- Kickstarter: Lunar Space Elevator (Liftport Group), CubeSat Ambipolar Thruster (CAT) (UMich), Arkyd Telescope $1.5M (Planetary Resources) etc.
- Spire
The Role of Private Industry

NewSpace Investments (NSG 50)

$200M-$2B

SpaceX
Virgin Galactic*
Blue Origin*
Vulcan Aerospace*
O3B
OneWeb
Planet Labs
Cloudera

Crunchbase Data 2015

$20M-$200M

Skybox
Spaceflight Industries
MapBox
Spire
Moon Express
SpaceIL
Kymeta

(*) SVSC estimates

$2M-$20M

Dauria
Aerospace
Planetary
Resources
OmniEarth
Satellogic
Astroscale
Nanoracks
XCOR
Rocket Lab
Firefly
Reaction
Engines
Accion
Systems
Orbital
Insight
ClearStory
Data
SpaceKnow

Source: Sean Casey (SVSC)

From 2005-2015 $12B in private investment
Source: Silicon Valley Space Center
How does NASA partner?

**Non-Reimbursable Space Act Agreements**

Agreement benefits both parties, with each funding their own participation.

Proposed activity must be relative to a NASA mission or program requirement.

The level of the other party’s contribution is relatively equitable to NASA’s contribution.

**Reimbursable Space Act Agreements**

Requires transfer of funds or other financial obligations from the other party to NASA.

No goods or services are provided to NASA.

NASA provides unique facilities, equipment, or expertise.
**Technology Areas of Common Interest**

**Common Technologies**
- **Autonomy**
  - Advanced planning & scheduling algorithms, etc.
- **Human-Autonomy Teaming**
  - Robotic supervision including human/robotic interactions, etc.
- **Networked Operations**
  - Remote vehicle management, etc.
- **Prognostics and Diagnostics**
  - Including state management, etc.
- **Sensor Technologies**
  - Data processing / fusion methodologies, etc.
- **Verification & Validation**
  - Methodologies & application experiences, etc.

**NASA Missions**
- Planned human-machine interaction in natural and time delayed environment
  - Space & planetary navigation
  - Spacecraft autonomy
  - Cyber-security for “one-off” systems
  - Space environment
  - Limited ability to address/recover faults

**Self-Driving Cars and UAVs**
- **Partners’ Requirements**
  - Diverse human-machine interaction in a structured environment
  - GPS & map-based navigation
  - Distributed and cloud-based autonomy
  - Cyber-security for consumer product
The mission of the SBIR program is to support scientific excellence and technological innovation through the investment of Federal research funds in critical American priorities to build a strong national economy.

NASA’s SBIR and STTR programs have awarded over $3.3B to research-intensive American small businesses to date.
NASA Centers and Installations

**Occupants:**
~1,130 civil servants
~2,100 contractors; 1,650 tenants
~1,344 summer students in 2015

**FY2016 Budget:** ~$915M (including reimbursable/EUL)

**Campus:** ~1,900 acres (400 acres security perimeter); 5M building ft²

**Airfield:** ~9,000 and ~8,000 ft runways
Major Research Facilities

- Wind Tunnels
- ARC Jet Complex
- Range Complex
- Simulators
- Advanced Supercomputing
Core Competencies at Ames Today

- Air Traffic Management
- Entry Systems
- Advanced Computing & IT Systems
- Intelligent/Adaptive Systems
- Cost-Effective Space Missions
- Aerosciences
- Astrobiology and Life Science
- Space and Earth Sciences
NASA Research Park

An established regional innovation cluster that facilitates commercialization by serving as a technology accelerator through vital and robust onsite collaborations.

70+ Partners Today

- University Associates-Ground Lease
- PV “Google” (North East Section) Ground Lease
- M2MI Corporation-Bldg. 19
- Carnegie Mellon University-Bldg. 23, 19
- Kentucky Science & Technology Corporation-Bldg. 19
- Bloom Energy-Bldg. 543, 154 (Fuel Cell Research)
- UAV Collaborativer-Bldg. 18
- Singularity Education Group-Bldg. 20
- BAER Institute-Bldg. 19
- Chandah Space Technologies-Bldg. 19
- IDM Technologies-Bldg. 19
- Logyx LLC-Bldg. 19
- Made in Space-Bldg. 153
- Neurovigil Inc.-Bldg. 19
- Rhombus Power-Bldg. 19
- Scanadu Inc.-Bldg. 20
- SkyTran-Bldg. 14
- Verdigris Technology-Bldg. 19
- ZeeAero-Bldg. 210
- LatIPnet-Bldg. 19
- Wyle Laboratories-Bldg. 19