

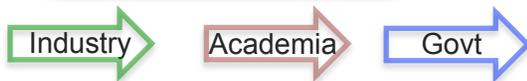
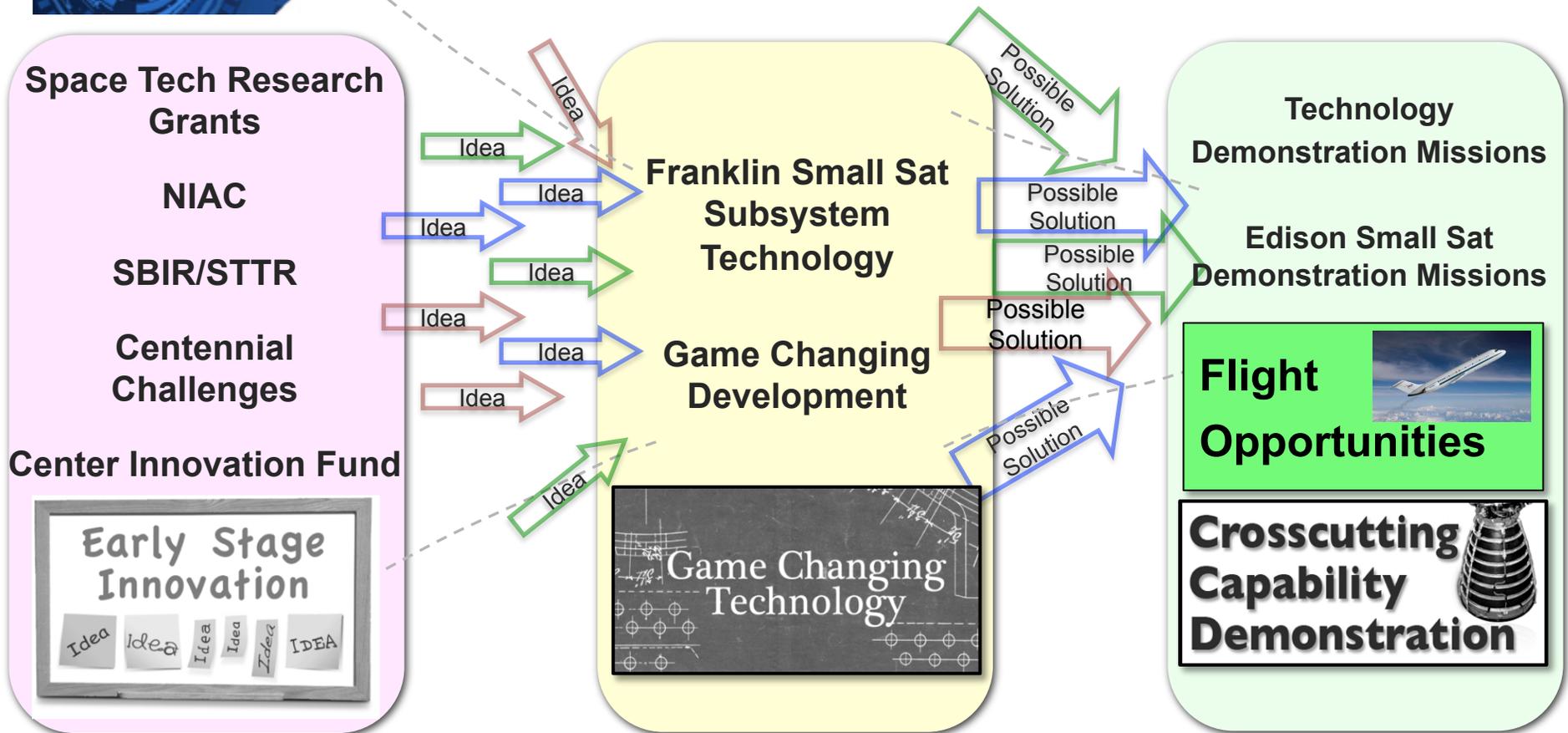


Office of the Chief Technologist

# Flight Opportunities Program

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GSFC Emerging Commercial Suborbital Capabilities Workshop  
September 7, 2011

# Office of the Chief Technologist – Program Map



Technology Readiness Level (TRL)

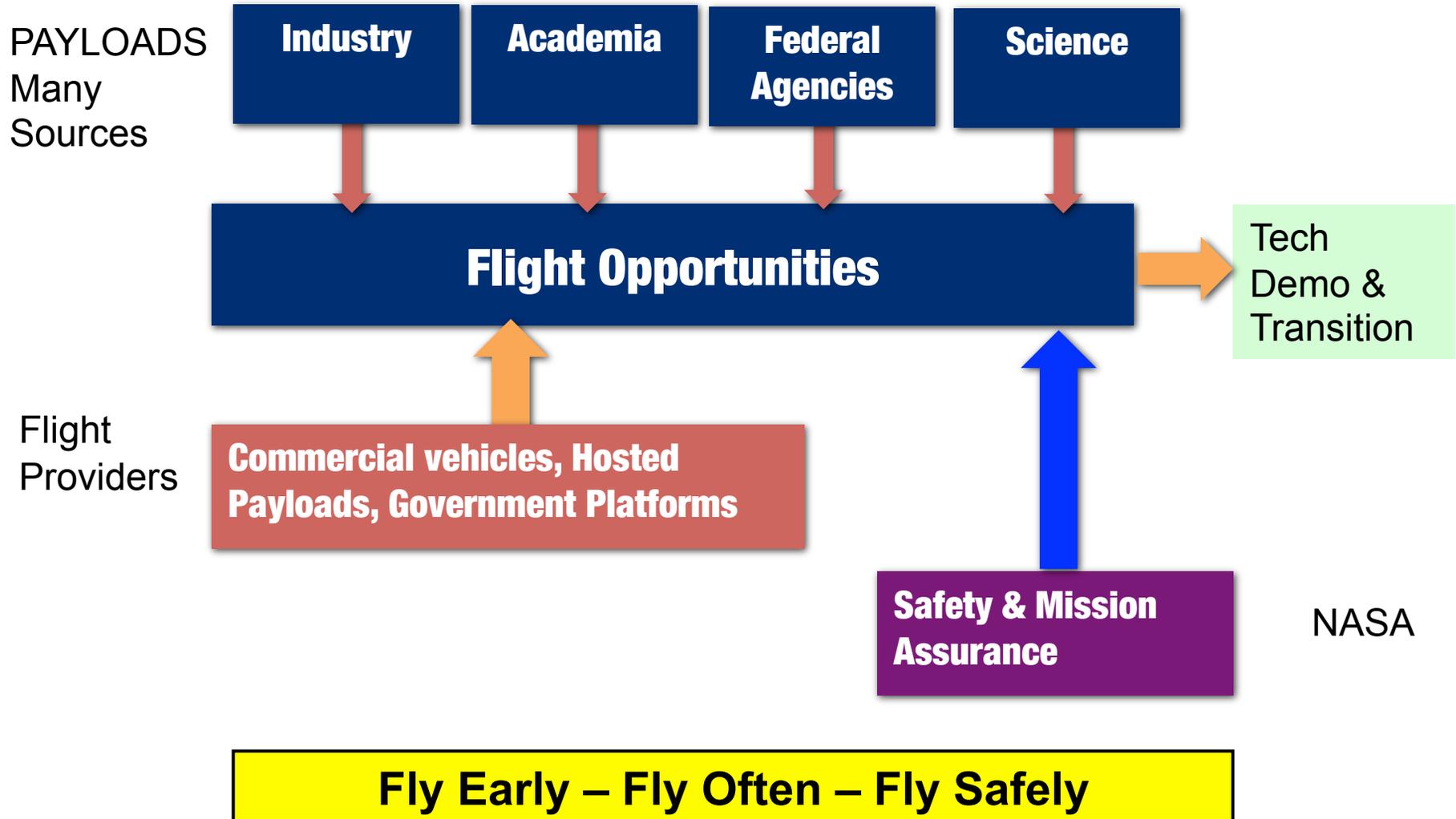


## Flight Opportunities Program

- The Program was established in FY11
- Provides flight opportunities in reduced-gravity and high-altitude environments toward maturation of technology for application in future space missions.
- Combines FY10 CRuSR and FAST efforts
  - CRuSR (Commercial Reusable Suborbital Research) will procure commercial suborbital space transportation and payload integration services to provide 3-4 minutes of microgravity environment for tech development, scientific and university research
  - FAST (Facilitated Access to the Space Environment for Technology) will procure commercial parabolic flights to test technologies in environments that simulate microgravity and the reduced gravity environments of the Moon or Mars

**Mission: Provide Space Relevant Environment to Mature Space Technology & Foster Commercial Space**

# Flight Opportunities Program Flow



- Parabolic Flight
  - Up to 4 flight weeks/year with ~10 payloads/flight week
  - Uses Existing Contract with Zero-G Corporation
- Suborbital Flight
  - Commercial Focus
  - Flights and payload integration services to be purchased through multiple vendors
  - Flight Frequency of one flight/month
  - Re-flight within 5 days
  - Easy access to Payload

# Flight Opportunities Program Funding



- \$17M FY 2012 budget, based on FY 2012 President's Budget Request
- Flight Opportunities Program funds:
  - Flight Opportunities & Payload Integration
  - Development of Technology Payloads to “Prime the Pump” (Through GCT)
  - Vehicle Technology Enhancements (Through GCT)
  - Onboard Research Facilities (Through GCT)



ESI: Early Stage Innovation GCT: Game Changing Technology CCD: Crosscutting Capability Demonstrations MD: Mission Directorates  
ROSES: Research Opportunities in Space and Earth Sciences



## Announcement of Opportunities for Payloads

- Announcement Released on December 21, 2010
  - Parabolic Flights
  - Developmental/Suborbital Flights
- Technology Payloads Solicited from All Organizations
- Open Call until December 31, 2014 (<http://go.usa.gov/04w>)
  - Current Opportunities Closed June 28, 2011
  - Evaluation criteria
    - Applicability to OCT Technology areas (Roadmaps)
    - Risk reduction
    - Current TRL
    - Benefit to OCT (Demonstration & Transition)
    - Readiness to fly
    - Experience of team

**Next Opportunity Window Opens in Sept 2011**

## OCT Draft Roadmap Technology Areas



- TA01 Launch Propulsion Systems
- TA02 In-Space Propulsion Technologies
- TA03 Space Power and Energy Storage
- TA04 Robotics, Tele-Robotics and Autonomous Systems
- TA05 Communication and Navigation
- TA06 Human Health, Life Support and Habitation Systems
- TA07 Human Exploration Destination Systems
- TA08 Science Instruments, Observatories and Sensor Systems**
- TA09 Entry, Descent and Landing Systems
- TA10 Nanotechnology
- TA11 Modeling, Simulation, Information Technology and Processing
- TA12 Materials, Structures, Mechanical Systems and Manufacturing
- TA13 Ground and Launch Systems Processing
- TA14 Thermal Management Systems

# TA08 Scientific Instruments, Observatories & Sensor Systems



## 8.1 Remote Sensing Instruments / Sensors

- 8.1.1. Detectors & Focal Planes
- 8.1.2. Electronics
- 8.1.3. Optical Systems
- 8.1.4. Microwave/Radio
- 8.1.5. Lasers
- 8.1.6. Cryogenic/Thermal
- 8.1.7. Space Atomic Interferometry

## 8.2. Observatories

- 8.2.2. Structures & Antennas
- 8.2.3. Distributed Aperture
- 8.2.4. High Contrast Imaging and Spectroscopy Technologies
- 8.2.5. Wireless Spacecraft Technologies

## 8.3. In Situ Instruments/Sensors

- 8.3.1. Particles, Fields, and Waves: Charged & Neutral Particles, Magnetic and Electric Fields
- 8.3.3. In Situ
- 8.3.4. Surface Biology & Chemistry Sensors: Sensors to Detect and Analyze Biotic and Prebiotic Substances

TA08 Link: <http://go.usa.gov/04v> & NRC Interim Report on NASA Technology Roadmap



- Solicitation of Proposals for Earth/Space Sciences Investigations utilizing CRuSR Platforms
- Intrinsic Merit of Proposals to include following factors
  - The extent that the proposed vehicle offers a unique advantage (e.g., scientific, technical, or cost) over other suborbital platforms
  - The likelihood that the proposed vehicle will be available at the proposed time for flight and that it will be capable of providing the required technical capabilities
  - The feasibility of the proposed technical investigation
  - The quality of the plans for completing the preliminary design prior to the investigation confirmation review; and
  - The affordability of the proposed vehicle vendor cost for the flight and other required services.

ROSES Link: <http://go.usa.gov/04G>



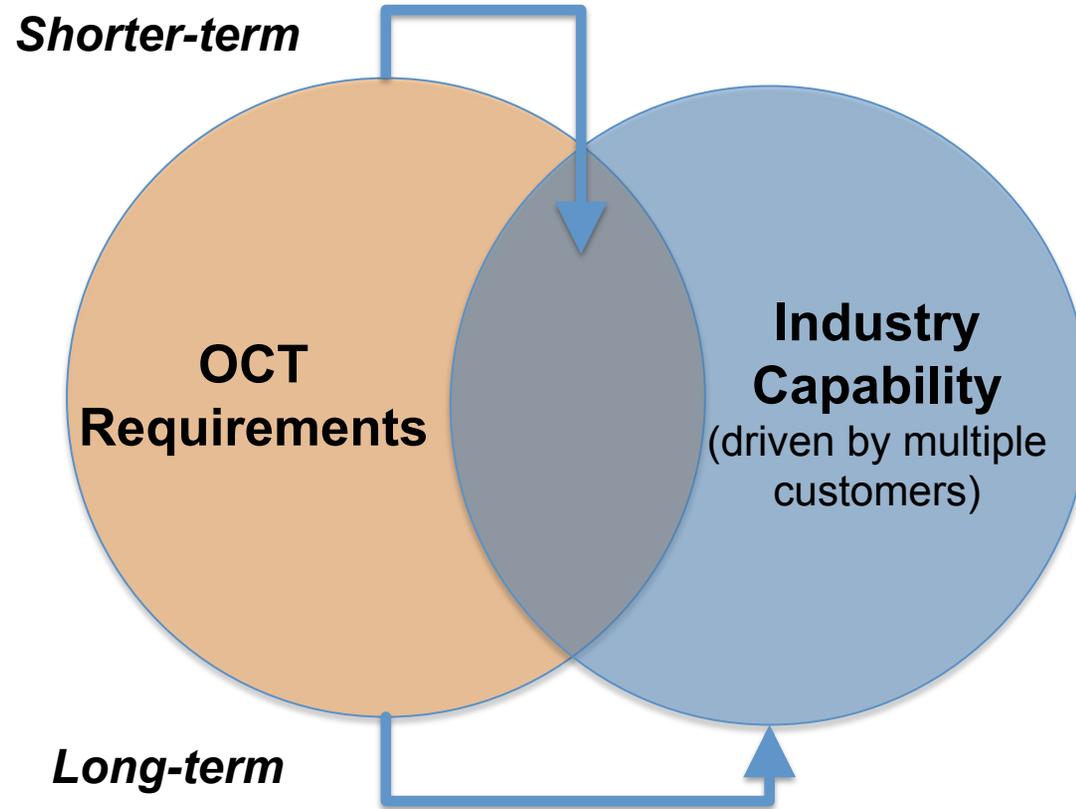
- Directly addresses the NASA FY2011 Authorization Act mandate:
  - shall fund the development of payloads for scientific research, technology development, and education
  - shall plan for maintaining, renewing and extending suborbital facilities and capabilities
- Flight Opportunities Program Implementation
  - Amendment to Game Changing Development Broad Agency Announcement Planned
  - A Request for Information (RFI) was released September 2, 2011
    - Payloads to Develop and Demonstrate Space Technologies
    - Demonstration of Vehicle Technology Enhancements
    - Onboard Research Facilities for Technology Testing

RFI Link: <http://go.usa.gov/0gp>

# OCT Needs & Industry Capability



Government as a customer, utilizing Industry current capability, prompting Industry readiness



**OCT Requirements  
Drive Industry to Expand Capability**



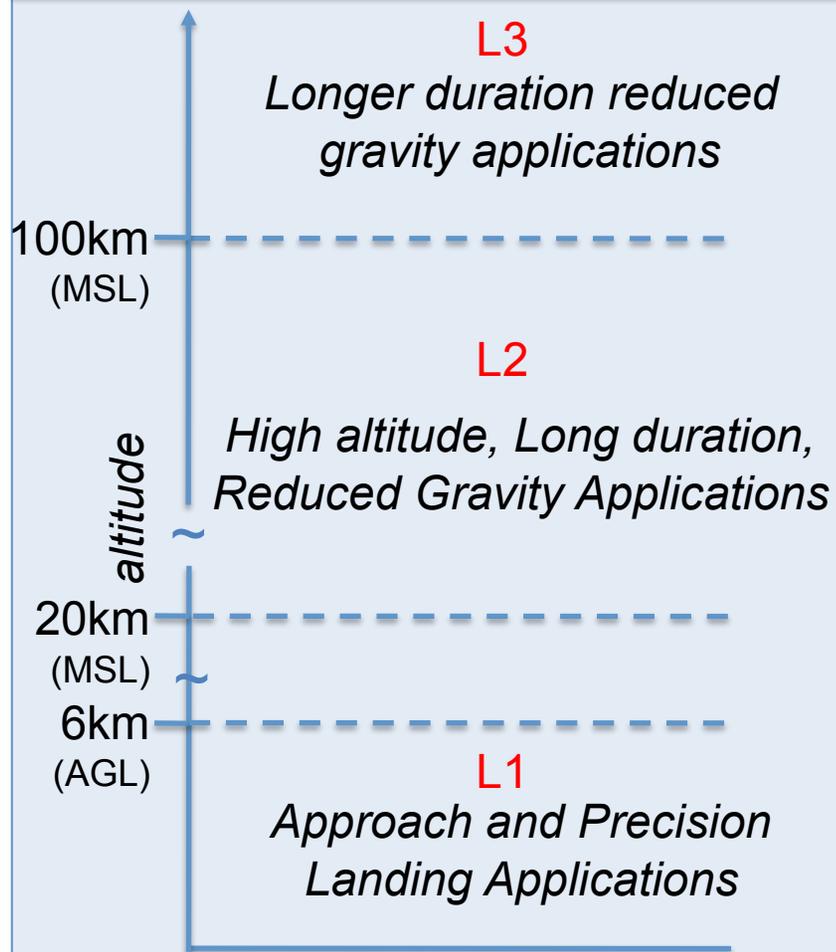
## Acquisition Strategy for Flight & Payload Integration Services

- Technology Needs for Space Relevant Environment drive OCT Platform Requirements
  - Technology development at a rapid pace requires frequent flights
  - Commercial service from Multiple Vendors
    - NASA one of several customers
  - Low cost access
- Acquisition Strategy
  - Flight services from Commercial Suborbital Reusable Launch Vehicle Providers
  - Payload integration services
  - Standard commercial services
  - Firm, fixed-price contracts
  - Multiple awards
  - Subsequent solicitations, as required

# Commercial sRLV RFP Requirements



## Basic Service Requirements



Performance Area	Requirement
Vendor to provide flight and payload integration on qualified vehicles	
Qualified Vehicle:	
Commercial, Reusable	80% reusable by mass, not incl. consumables
Frequent Flight	Payload 2x in 5 consecutive days
Min payload mass, volume	1kg, 1U CubeSat
Successful flight	Return payload undamaged
Customer access to payload prior to launch and post launch	3h prior to/post-hazardous op
System safety insight	Payload value
Number of successful flights at the required condition	1



- Flight Opportunities Program has selected Seven Companies to provide flight and payload integration services
  - Armadillo Aerospace, Heath, Texas
  - Near Space Corporation, Tillamook, Ore.
  - Masten Space Systems, Mojave, Calif.
  - Up Aerospace Inc., Highlands Ranch, Colo.
  - Virgin Galactic, Mojave, Calif.
  - Whittinghill Aerospace LLC, Camarillo, Calif.
  - XCOR, Mojave, Calif.
- Period of performance – Two Years



- Current Program focus is Suborbital flight
  - Frequent
  - Commercial
  - Low Cost Access
- Program Solicits & Flies Payloads in Relevant Environment
  - Payloads through Open Calls
  - Payloads from OCT pipeline
  - Payloads from NASA Mission Directorates
  - Payloads from Other Government Agencies