



SUBORBITAL OPPORTUNITIES AND INDUSTRY UPDATE

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Commercial Spaceflight Federation

About the Federation

- The **Commercial Spaceflight Federation** is the industry association of leading businesses and organizations working to make commercial human spaceflight a reality. We have more than 45 member companies and organizations spread across the country.
- **Our Mission:** to promote the development of commercial human spaceflight, pursue ever higher levels of safety, and share best practices and expertise throughout the industry.

SARG
*(Suborbital
Applications
Researchers Group)*

As a coordination and advisory committee of the CSF, the Suborbital Applications Researchers Group (SARG) is composed of experienced scientists, researchers, and educators dedicated to furthering the research and education potential of commercial suborbital launch vehicles.

Virgin Galactic *SpaceShipTwo*



Masten Space Systems *Xaero*

Blue Origin *New Shepard*



Armadillo Aerospace *STIG*



XCOR Aerospace *Lynx*

Payload Integration

Payload User's Guides:

Virgin Galactic:

http://www.virgingalactic.com/uploads/VG_Web_PayloadUsersGuide_201112_06.pdf

• *Masten Space Systems:*

<http://masten-space.com/wp/wp-content/uploads/MSS-payload-guide-2011-1.2.4OSR.pdf>

• *Blue Origin* provides details on website:

<http://www.blueorigin.com/research/research.html>

• *Armadillo Aerospace* and *XCOR* announced at NSRC 2012 that their Payload User's Guide will be published on their website soon.

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Is there an Interest?

Next-Generation Suborbital Researchers Conference

- Organized by SARG and SwRI
- Brought 400+ attendees
- A few of the talks this year:



Harnessing Precision Landing Testbeds to Advance Technologies Necessary for Exploration

Risk Mitigation Through Realistic Flight Simulation – Space Shuttle Engineering Development and Pilot Training at the Vertical Motion Simulator

Reflections on X-15 and Early Suborbital Flights

Slow and Low: The Microgravity Geophysics of Asteroids, Comets and Planetesimals

Mitigating Radiation Impacts on Humans and on Spacecraft Safety Critical Components

Long Duration Microgravity Experiments on Planet Formation - Suborbital Flights and Drop-Tower Precursors

Atsa Suborbital Observatory Armrest Camera: Optical System, and Hardware/Software Integration

Taking Teacher Research Experiences to New Heights: Boosting the Research on Best Practices to Space

Reusable Long Dwell Stratospheric Platforms for Suborbital Research

Sharing Knowledge Through Educational Outreach to Help Ensure a Qualified Workforce

Mesospheric Facilities for Astrophysical Observations

Using the Next Generation of Suborbital Vehicles to Revive Space Astrophysics

Suborbital observations of meteor showers: finding the parent bodies of our daytime showers

Atlas V External Payload Carrier (XPC) Development Status and Risk Reduction Flight Plan

Flight Opportunities Program

Provides funding for:

- Technology payloads (latest call due March 26)
- Flights for science or technology payloads (latest awards on March 21)
- Capability upgrades to vehicles

Types of flights:

- Parabolic planes (ZeroG)
- Low-mid altitude for precision operations
- Suborbital

Twenty four new flight awards announced on March 21

(<http://flightopportunities.nasa.gov/>)

Flight Opportunities Payloads

Some examples, from the latest round of awards:

- "Near-Zero Gravity Cryogenic Line Chillover Experiment in a Suborbital Reusable Launch Vehicle," Jacob Chung, University of Florida
- "Polar Mesospheric Cloud Imaging and Tomography Experiment," Space Science Institute
- "Collection of Regolith Experiment on a Commercial Suborbital Vehicle," and "Collisions Into Dust Experiment on a Commercial Suborbital Vehicle", Univ. of Central Florida
- "Flight Demonstration of an Integrated Camera and Solid-State Fine Steering System," Southwest Research Institute, Boulder, Colo.
- "OSIRIS-REx Low-Gravity Regolith Sampling Tests," Lockheed Martin Space Systems Company

A New Tool for Science

New tools bring new scientific opportunities

- Many scientists have never considered microgravity/high altitude experiments because they were expensive and time-consuming
- New vehicles will have functional and operational improvements:
 - Fly high
 - Fly often
 - Various environments, from fully protected to fully exposed
- Experiments will be:
 - Built with off-the-shelf parts
 - Recovered intact
 - Available just before takeoff and soon after landing
 - Alterable and turned around quickly for next flight
- Experiments can be human-tended

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