



PERSONAL SPACEFLIGHT FEDERATION

Commercial Human Space Flight Industry Overview

Bretton Alexander,
President

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Commercial Human Spaceflight

What is commercial human spaceflight?

- Systems designed for passengers
- Developed by the private sector
- Using predominantly private funds
- Serving multiple markets, including government needs

Two realms of activity

- Suborbital – *short flights above atmosphere, providing 3-5 minutes of weightlessness*
Adventure travel, scientific and industrial research, and astronaut training
- Orbital – *reaching orbit around Earth, providing hours or days of weightlessness*
Adventure travel, scientific and industrial research, manufacturing, Space Station servicing

The Personal Spaceflight Federation is the industry association of leading businesses and organizations working to make commercial human spaceflight a reality.

Our mission:

- *Promote the development of commercial human spaceflight*
- *Pursue ever higher levels of safety*
- *Share best practices and expertise throughout the industry*

About the PSF:

- *Non-profit organization*
- *Based in Washington, DC*
- *CEO-level board of directors*



Executive Members include developers and operators of:

- Spaceships
- Spaceports
- Orbital spaceflight facilities

Associate members include providers of training, medical, and life support products and services

Membership



SPACEX

ArmadilloAerospace™

SpaceDev



OSIDA



SPACE
adventures

MOJAVE
AEROSPACE TEST CENTER

XPRIZE
FOUNDATION



SPACE FLORIDA



XCOR
AEROSPACE

NASTAR
CENTER

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PERSONAL
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Suborbital systems

- Building upon success of SpaceShipOne and the Ansari X PRIZE
- Systems under development
- Piloted flight testing to begin in next year or two
- First commercial passenger flights possible thereafter

Orbital systems

- Development of spaceships under way
NASA Commercial Orbital Transportation Services (COTS) investments
- Orbital habitats under development
Bigelow Aerospace testbeds in orbit, two demonstrators
- First commercial orbital passenger launches possible early next decade

Spaceports

- Commercial spaceports licensed in Mojave, California, Oklahoma and New Mexico
- State-sponsored spaceports under development in other states

Armadillo Aerospace / X PRIZE Level I Lunar Lander Challenge



- Two 90-second hover flights to win Northrop Grumman Lunar Lander Challenge – Level I
- \$350,000 from NASA's Centennial Challenges program

Space Adventures Flight of Richard Garriott to ISS



Virgin Galactic, Scaled Composites WhiteKnightTwo First Flight



SpaceX Falcon I Successful Flight to Orbit



- **Liftoff from Omelek Island, September 28, 2008**
- **Achieved an elliptical orbit of 500 km by 700 km, 9.2 degrees inclination**
- **Successfully restarted second stage engine for circularization burn**
- **Also completed 9 engine MDC for Falcon 9**



Widespread Industry Progress

XCOR Aerospace

- First hotfire of Lynx engine

Spaceport America

- Spaceport License

Orbital Outfitters

- NASA Contract

SpaceDev

- Merger with Sierra Nevada Corporation

Space Florida

- Dedication of new launch complex

Additional progress by various companies

Other Markets Besides Space Tourism

NASA Human Space Flight

Science

Education / STEM

Military Space

NASA Human Spaceflight



- **ISS resupply for both cargo and crew**
- **Increased access to ISS for science research**
- **Demonstrate technologies, increase TRLs**
- **Suborbital astronaut training**



- New flight regimes for experiments
- Repeatability
- Fast call-up times
- Low-cost access

PSF/NASA Ames Human-Tended Suborbital Science Workshop

American Geophysical Union Conference, San Francisco

December 2008



- **US needs to find ways to excite kids**
- **Inspire careers in science and engineering**
- **Paid for with corporate sponsorships, education grants**

Military Space



- Experiments
- Pilot training
- Technology development for future systems
- Direct use of commercially developed systems

Contact information

Bretton Alexander

President

703-627-1692

brett@personalspaceflight.org

John Gedmark

Executive Director

202-349-1121

john@personalspaceflight.org

Personal Spaceflight Federation

www.personalspaceflight.org

1725 I St. NW, Suite 300

Washington, DC 20006

