COMMERCIAL SPACEFLIGHT FOR SCIENCE AND EXPLORATION

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Executive Members

- Alaska Aerospace Corp.
- Bigelow Aerospace
- Blue Origin
- Jacksonville Spaceport
- Masten Space Systems
- Mojave Air & Space Port
- Moon Express
- Orbital Outfitters
- Paragon SDC
- Planetary Resources
- Sierra Nevada Corp.
- Southwest Research Institute
- Space Adventures
- Space Florida
- Spaceport America
- SpaceX
- Virgin Galactic
- Virginia Commercial Space Flight Authority
- XCOR Aerospace

Associate Members

Aerojet Rocketdyne
ARES Corporation
ASRC Federal
Arizona State University
Barrios Technology
Colorado Space Coalition
David Clark Company
ETC - NASTAR Center
Firestar Technologies
Golden Spike Company
Griffin Communications
Houston Airport Systems
Jacobs Technology
Logyx LLC
MDA Corporation
Midland Development Corporation
Moon Express
Near Space Corporation
ORBITEC
Penn State Applied Research Laboratory
QinetiQ North America
Qwaltec
RS&H
Satwest
Scaled Composites
Space Coast Spaceflight Alliance
Spaceflight Services
Spaceport Sweden
Waypoint 2 Space
Worldview
X PRIZE Foundation

Commercial Spaceflight Industry

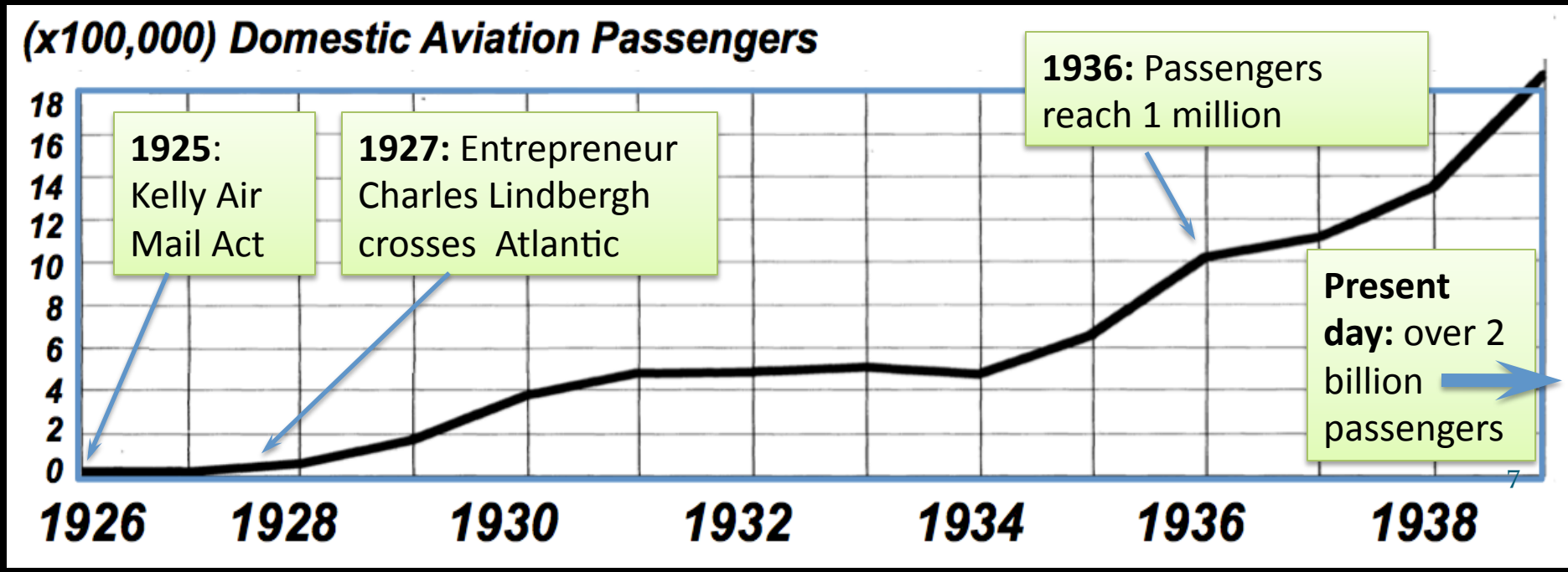
- Self identified
- Includes companies involved in:
  - Commercial human spaceflight
  - Spaceflight innovation (technology and business practices)

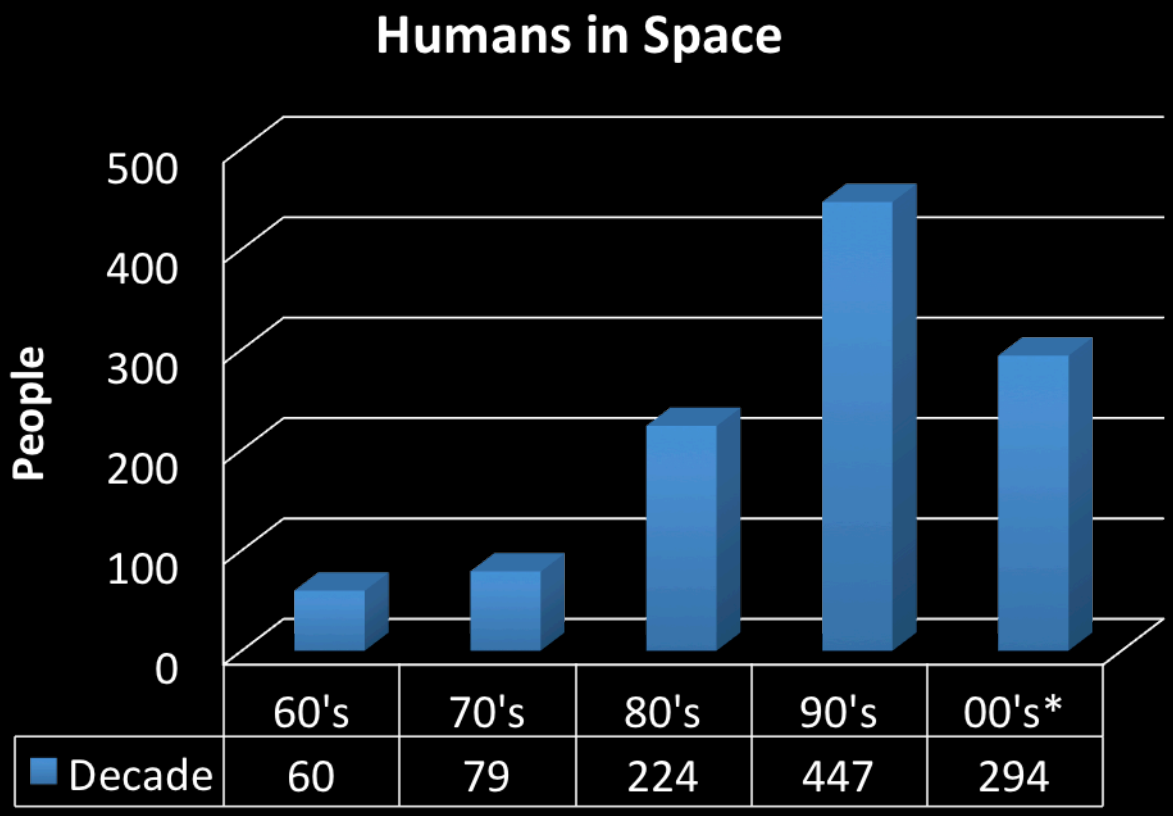
Commercial Space Timeline

- 1984 – Commercial Space Launch Act
  - "Encourage, Facilitate and Promote"
  - Establishes a licensing regime (not certification)
- 1996 – X Prize established
- 2004
  - SpaceShipOne wins Ansari X Prize
  - Commercial Space Launch Amendments Act
    - Amends original act to include human spaceflight
    - Establishes regulatory learning period
    - NASA should seek "greatest possible commercial use of space
- 2006 NASA Commercial Orbital Transportation Services announced
- 2010 NASA Commercial Crew Program announced
- 2012 NASA Commercial Resupply Service begins
- 2013 SpaceShipTwo first powered flight

Why Commercial Spaceflight?

- Open the space frontier to more people
  - High flight rates, improved infrastructure, and lower barriers to entry will allow thousands of explorers, scientists, engineers, artists, teachers and many others to travel to space

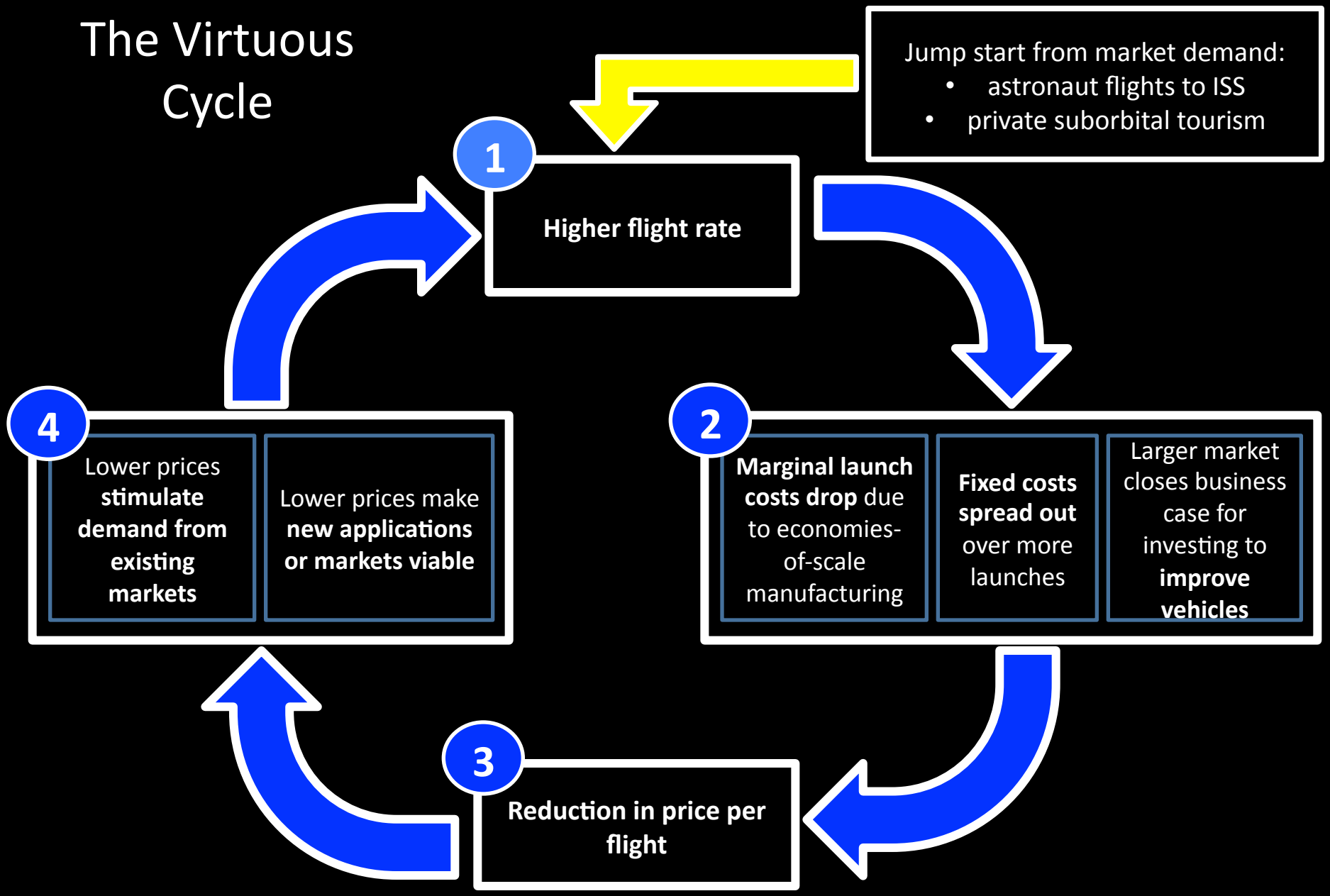

(x100,000) Domestic Aviation Passengers
18
16
14
12
10
8
6
4
2
0
1926
1928
1930
1932
1934
1936
1938
1925: Kelly Air Mail Act
1927: Entrepreneur Charles Lindbergh crosses Atlantic
1936: Passengers reach 1 million
Present day: over 2 billion passengers


Humans in Space
People
500
400
300
200
100
0
60's
70's
80's
90's
00's*
Decade
60
79
224
447
294

Why Commercial Spaceflight?

- Lower the spaceflight cost barrier
  - The high cost of space launch has been the single biggest barrier to the broader exploration and development of space in the last forty years
  - Commercial spaceflight, both orbital and suborbital, leverages the power of competition, innovation, and multiple design approaches to pursue lower development and operating costs and greater long-term safety

The Virtuous Cycle



Why Commercial Spaceflight?

- Expand existing space activities and enable new ones
  - Suborbital flights by individual private citizens
  - Cargo and crew missions to the International Space Station
  - Scientific and technology demonstration research flights
  - Satellite launches
  - Education and outreach activities

Why Commercial Spaceflight?

- Promote economic competitiveness and excite the public
  - Generate jobs in a dynamic industry that is entrepreneurial, high-tech, and inspirational
  - Many space entrepreneurs were inspired to enter technology careers by Apollo, and now, several decades later, they are aiming to inspire a new generation

Why Government Engagement?

- SpaceX and Orbital have now launched many successful cargo flights to the ISS
- Commercial Crew is progressing well
- Milestones, fixed prices, contractor design control, staged competition and multiple customers together produce:

LESS EXPENSIVE MISSIONS ->

MORE MISSIONS

“Commercial” can mean:

- Vehicles designed, developed and operated by the private sector
- Private investment
- Systems designed to serve more more than one customer (government and/or private)
- Development based on fixed-priced, streamlined contract vehicles in which payment is based on achieving milestones
- Services and data also purchased fixed-price via commercial services contracts
- Driven by the method of doing business, not size of the company. Both large, traditional contractors and small, entrepreneurial firms are engaging in commercial spaceflight

What is next?

- COTS model has successfully been demonstrated
- But NASA (and other agencies) still think commercial contracts are the exception
- There are good reasons to use cost-type contracts, but their use should be justified
- This is a cultural change, and cultural change is hard

Commercial partnerships for human exploration

- NASA has little money for human exploration, beyond that currently spent on SLS and Orion
- Commercial and international partnerships must be involved
- NASA has started to create partnerships through ILDD and asteroid BAA
- But not all technologies have been developed, making this a different beast
- NOAA, DOD also ripe for partnerships

How does commercial change technology development?

- NACA helped jumpstart commercial air industry
- In the process, dramatically improved aircraft technology
- NASA should look for technologies that will apply to both NASA and commercial missions
- Money will flow from both NASA and companies -> faster development

In praise of failure

- Currently, early technology development is often done in partnership or by SBIR contracts
- Cost-type contracts and top-down management emerge for system dev, to avoid failure and create flexibility
- But failure is part of the process
- Failures open the door to other solutions
- No program should be “too big to fail”

Recommendations

- NASA should continue cooperative outreach for sustainable human exploration and avoid a linear, single point of failure program
- NOAA and DOD should create more commercial partnerships and reward program managers/contracting officer who think differently
- Congress should strengthen and not restrict alternative contracting mechanisms

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