
# Citizens in Space

# Testing Interplanetary CubeSat Payloads Using Reusable Suborbital Spacecraft

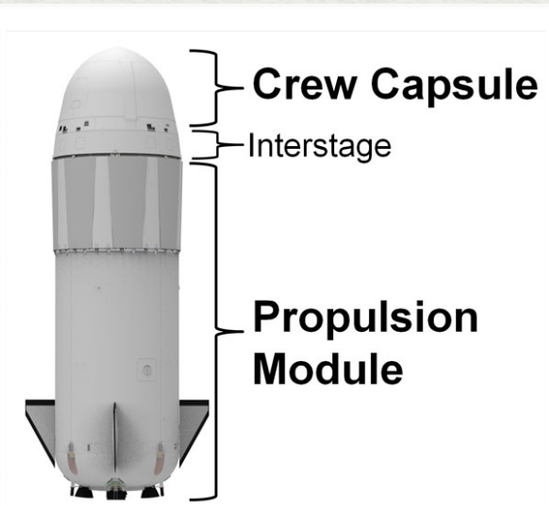
# Reusable Suborbital Spacecraft: A New Paradigm

- Cheap, frequent access to space
- Aircraft-like" operations
- Reusability -> affordability
  - Reliability
  - Maintainability
  - "Save"-ability (intact abort)
  - Operability (ready response, rapid turn times)
  - Flexibility (many possible payloads)

# Commercial Competition

Virgin Galactic

XCOR Aerospace




Blue Origin

Masten Space

?

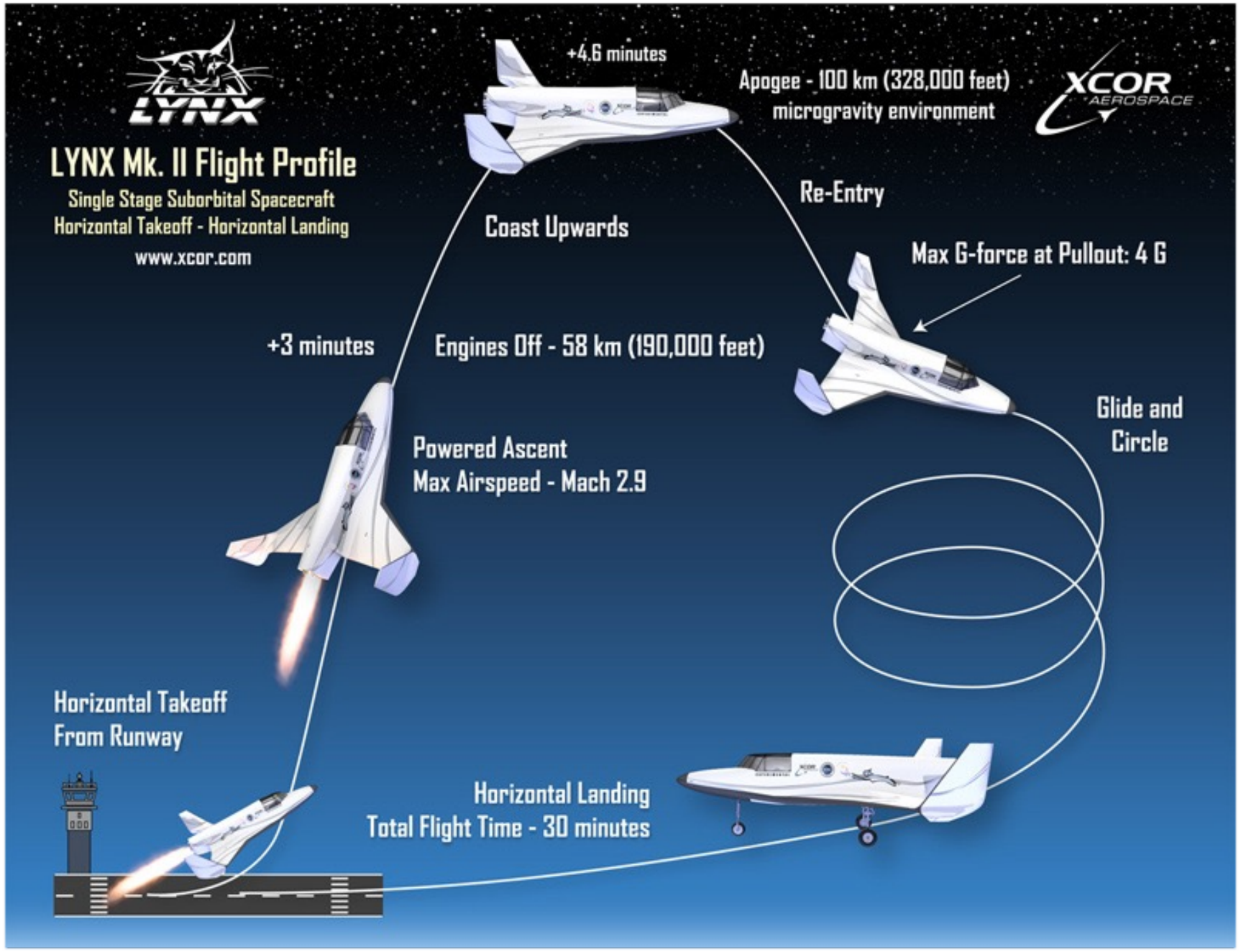
Exos Aerospace

# DARPA Experimental Spaceplane (XS-1)

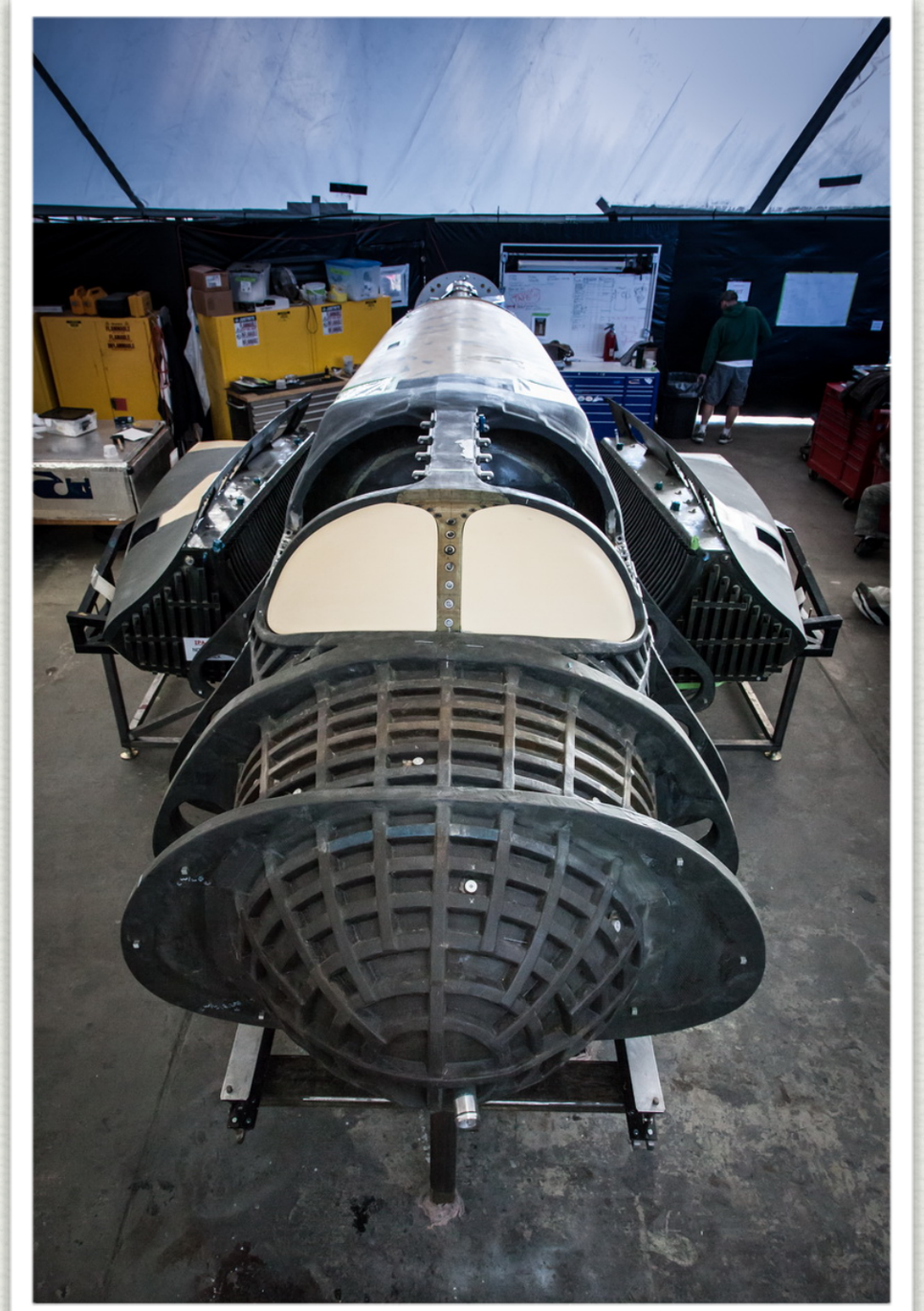

# XCOR Lynx


- Low Cost (~$100K / flight)
- Rapid Turn-around / High Flight Rate (4x per day)
- 1 pilot, 1 payload operator / spaceflight participant

# Lynx Flight Profile

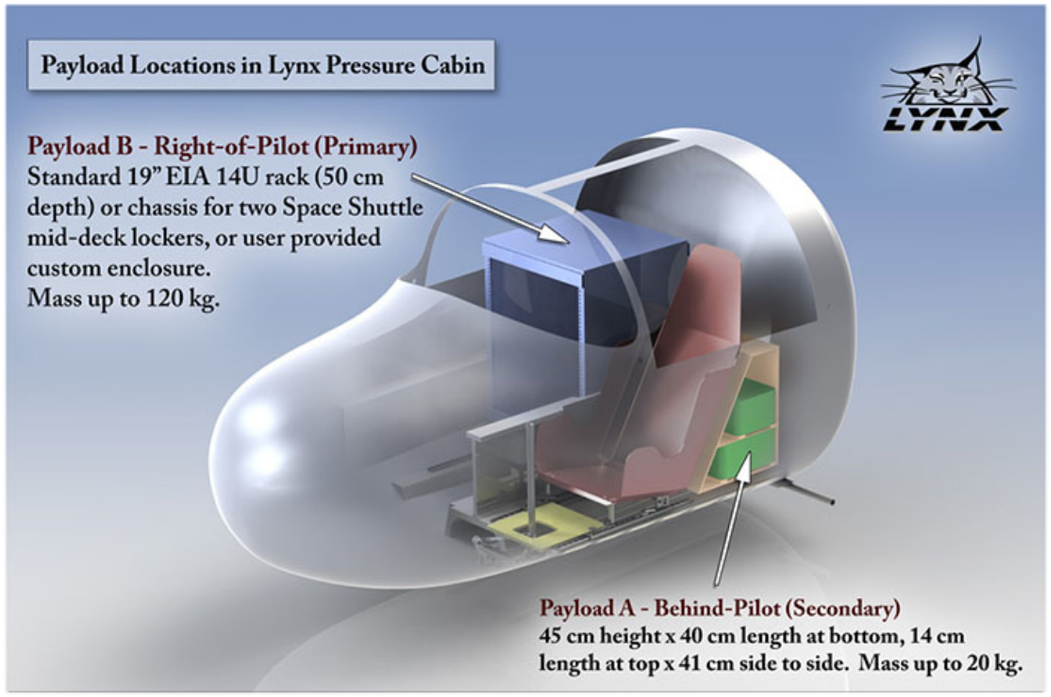


# Lynx Spacecraft Status



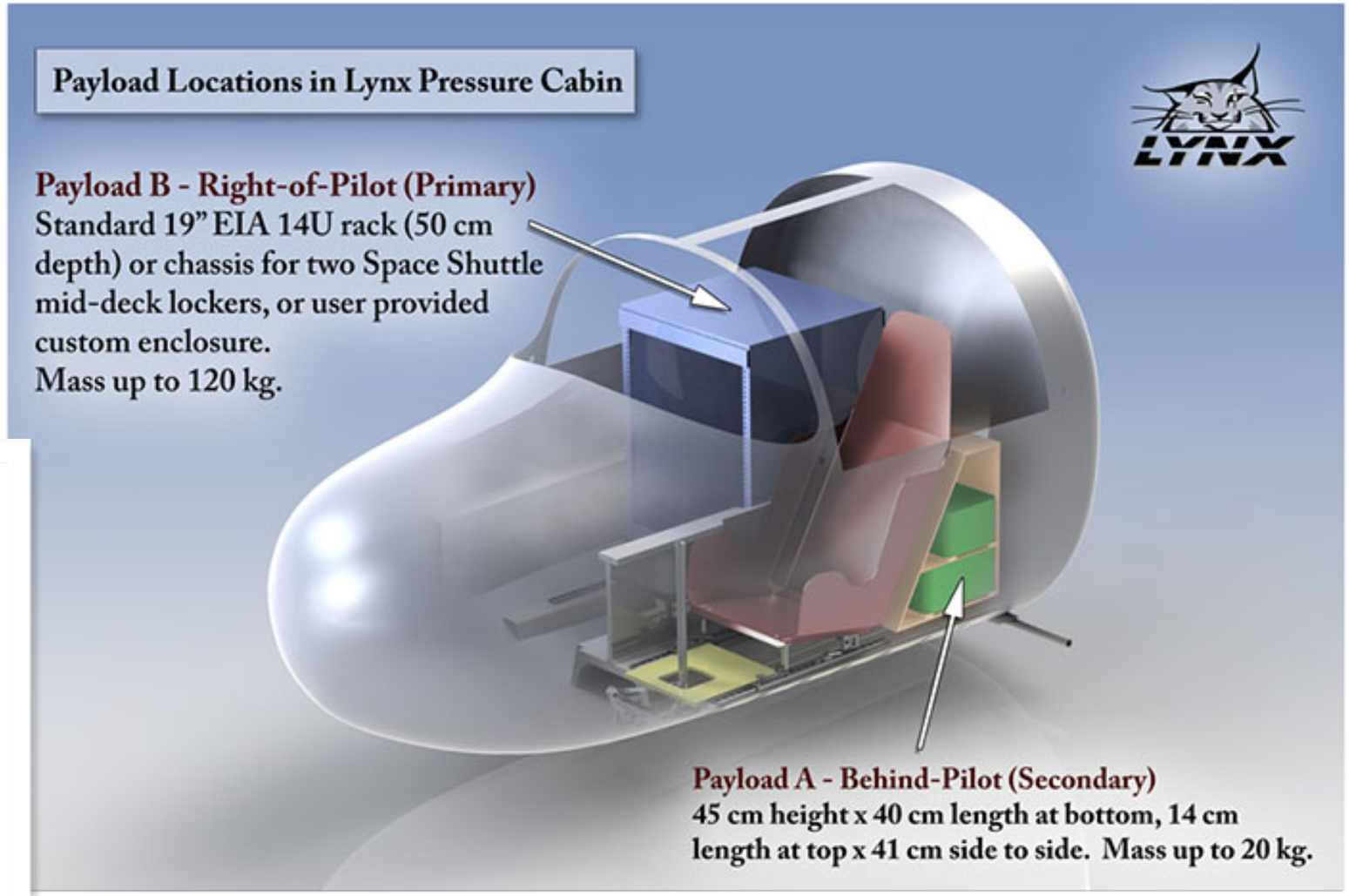
- Mark 1 (prototype) now under construction
- First flight – 2015
- 12-18 month flight test program
- The time to start building payloads is now

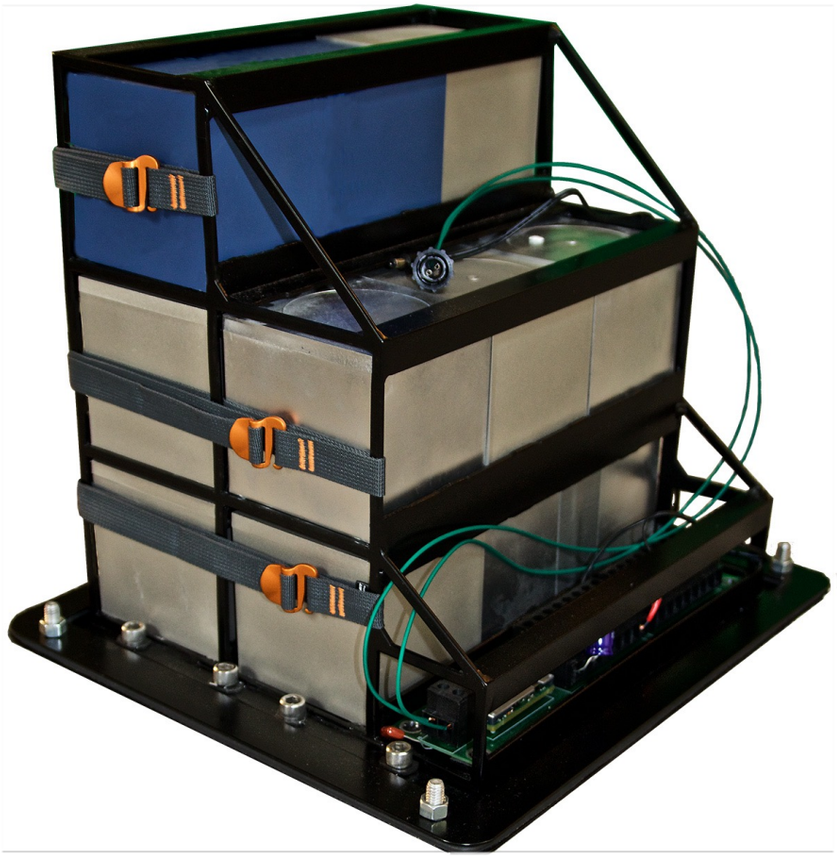
# In-Cockpit Payloads



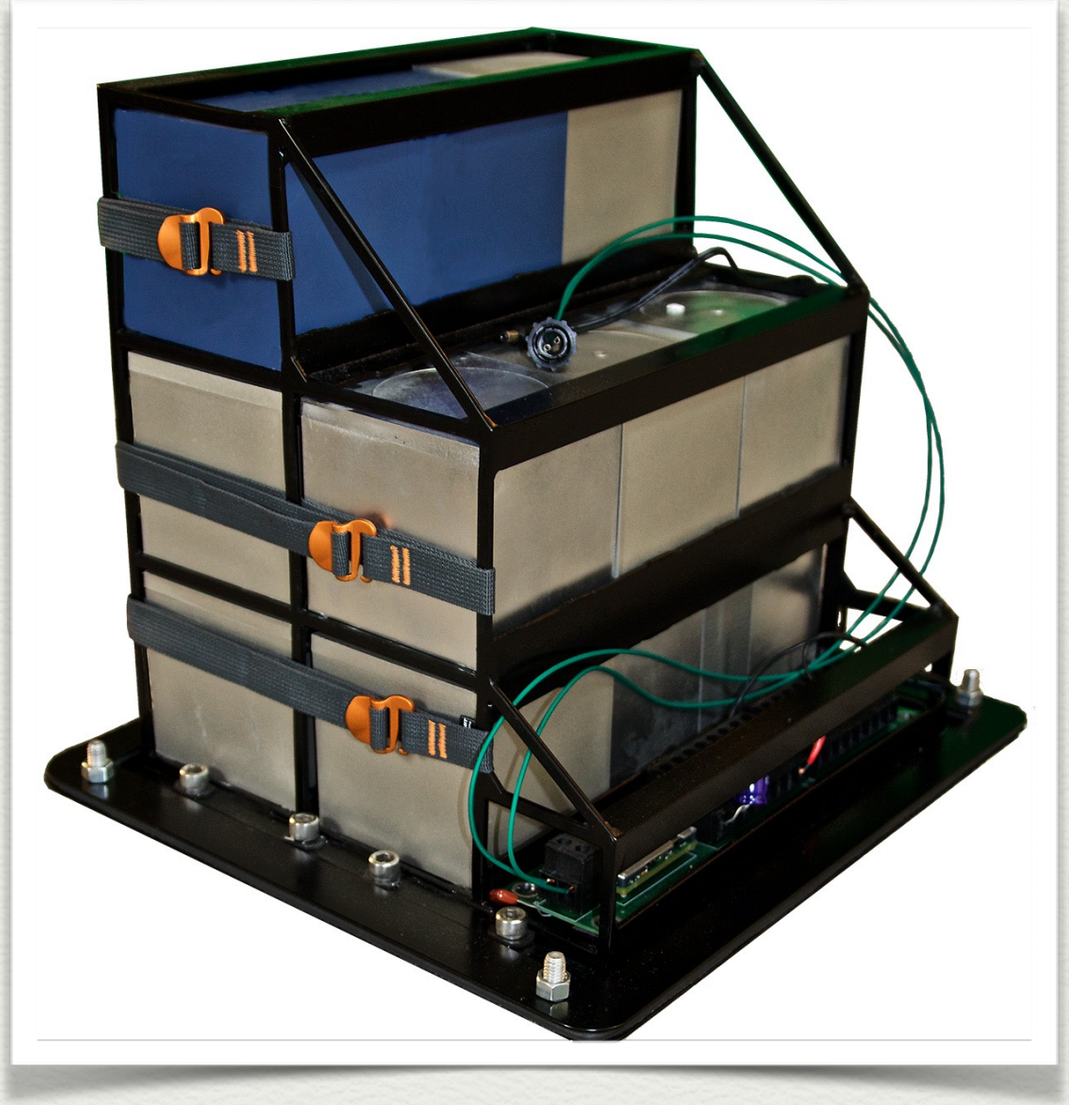

- Pressurized environment
- Short-duration microgravity, radiation
- Low cost (~$3,000/U)
- Repeatable

# Lynx Cub Payload Carrier



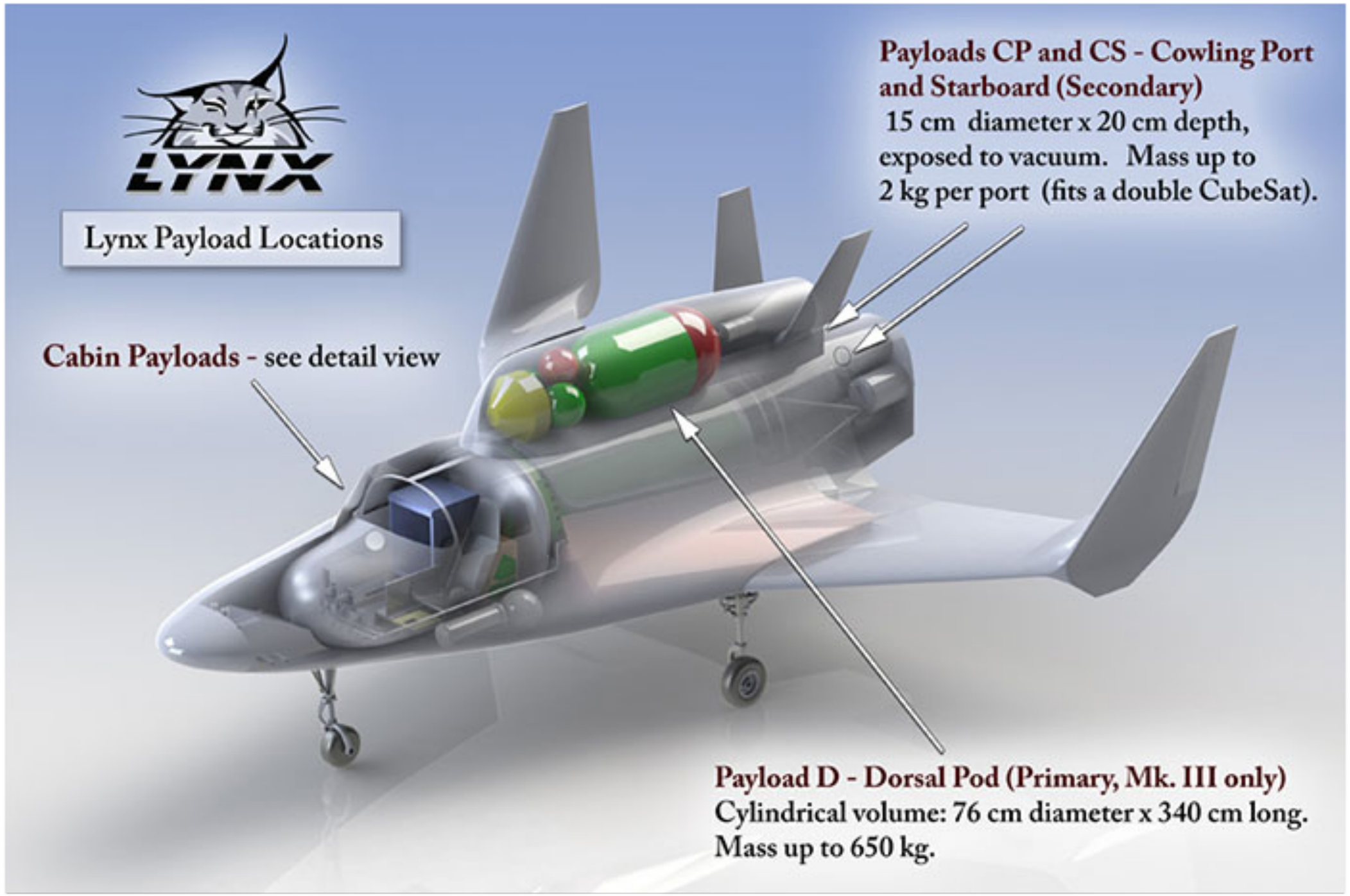



# Lynx Cub Payload Carrier



- Accommodates 1U, 2U, 3U payloads
  - Up to 15U total
  - 1 unit = 10 cm or 4”, 1 kg max
- 5V or 12V electrical power
  - Configurable prior to flight
  - 2.1mm center-positive barrel connector
- 140W maximum electrical power
- 200W maximum thermal
- Double containment (soft cover not shown)
- Payloads can be autonomous or controlled by payload operator (wireless or wired; iOS, Android, or arm panel)

# Aft Cowling Payloads



# Aft Cowling Payloads

- Exposed to the space environment (temperature, pressure, radiation)
- Hatch opens in flight, allowing
  - Sensors -- direct view of Earth/space
  - Extendable probes, antennas, etc.
- Payloads are optionally ejectable

# Example: High-Altitude Astrobiology Challenge

- Demonstrate the ability to collect microorganisms from extreme altitudes from a suborbital spacecraft
  - Global epidemiology
  - Bioprospecting
  - Astrobiology
- Enable repeatable science
- Greater reliability than high-altitude balloons
- Trajectory can be tailored to mission requirements
- Automated or manual control (payload operator astronaut)

# Citizen Astronaut Training





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