



Citizens in Space

The Lynx Cub Payload Carrier

and

Suborbital Flight Opportunities on the
XCOR Lynx Spacecraft

Lynx Spacecraft

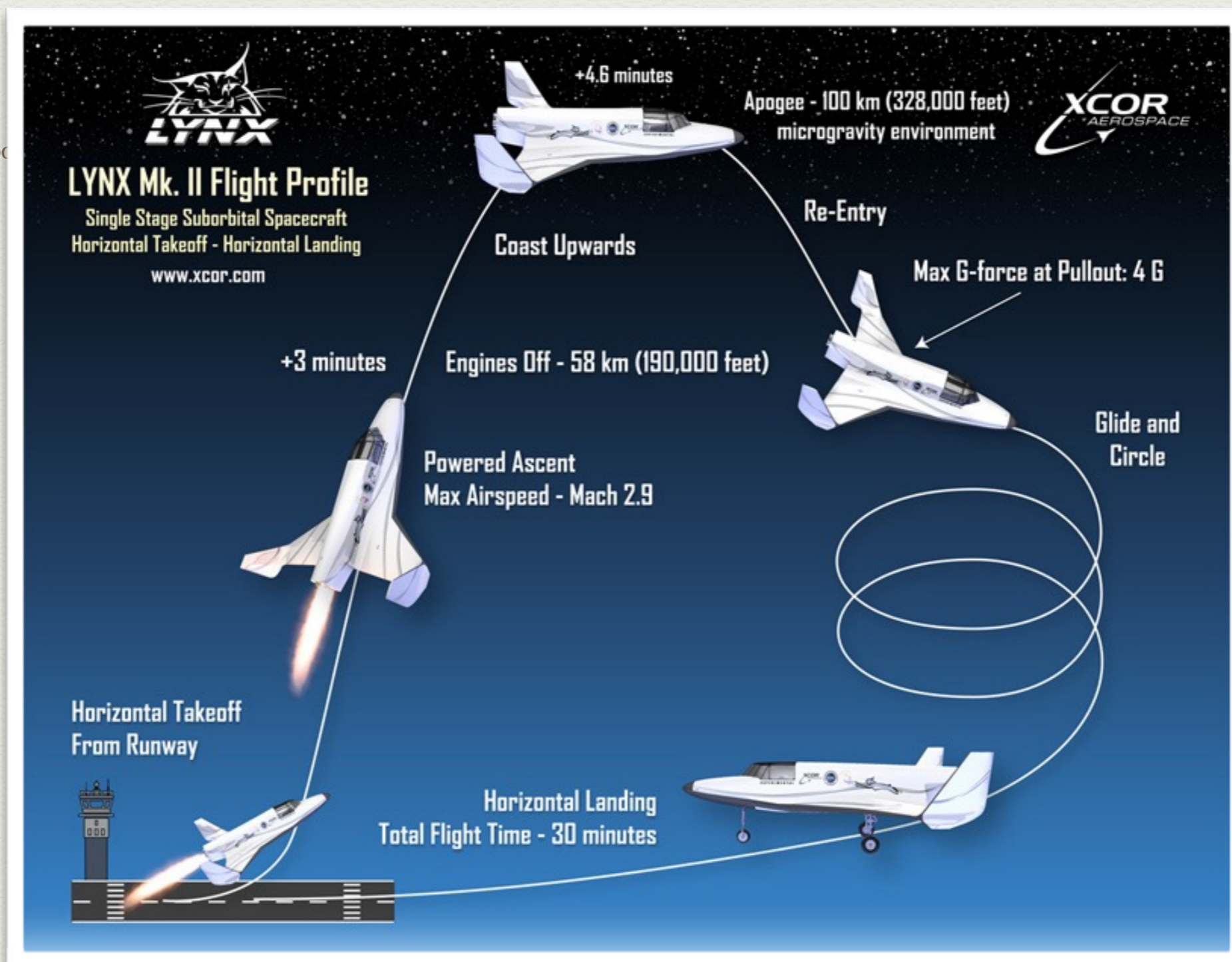
- Fully Reusable
- Low Cost (~\$100K / flight)



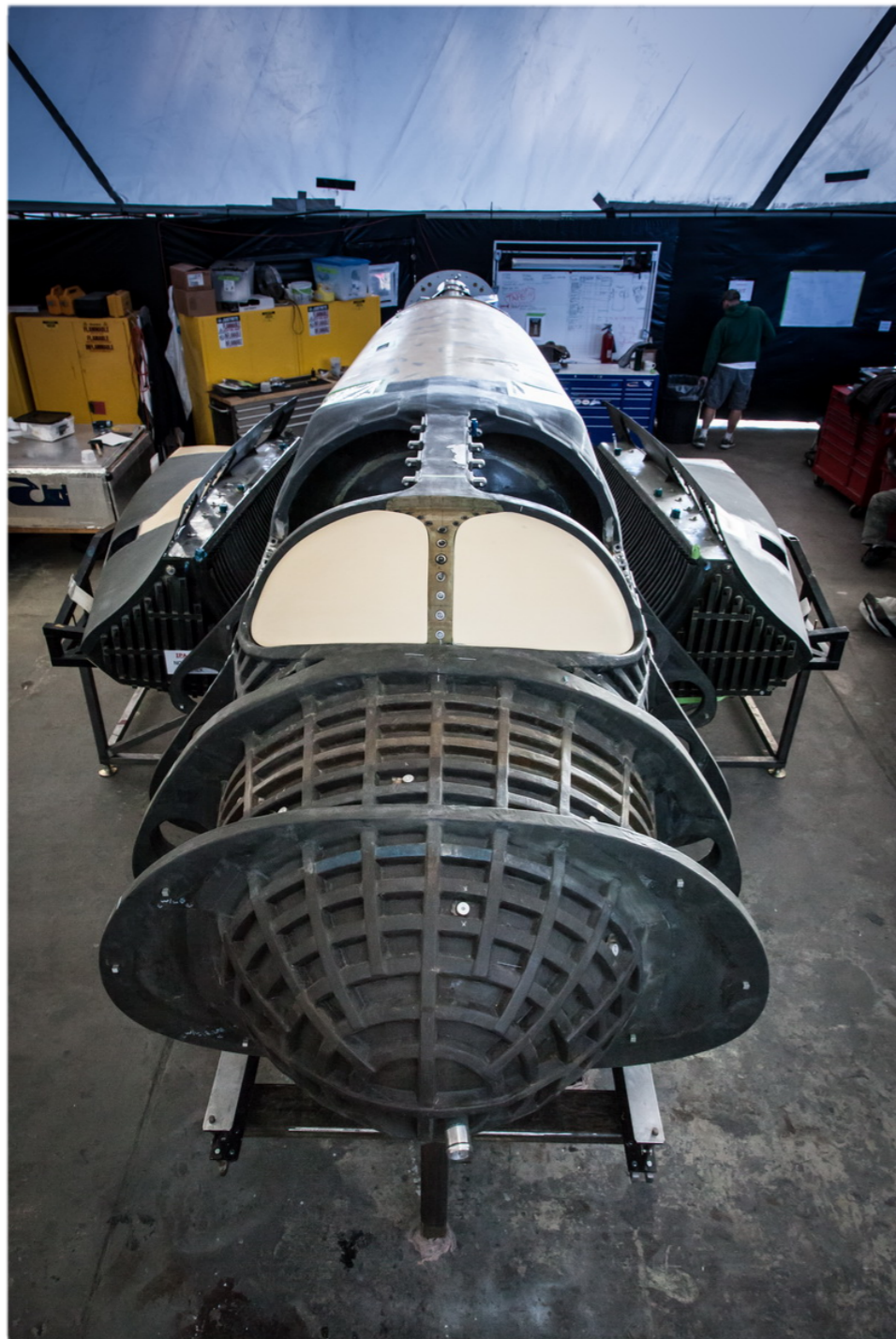
- Developed by XCOR Aerospace
- Fully reusable
- Low Cost (~\$100K / flight)
- Rapid Turn-around / High Flight Rate (4x per day)
- 1 pilot, 1 payload operator / spaceflight participant

Lynx Flight Profile

- Fully Reusable
- Low Cost (~\$100)



Lynx Spacecraft Status



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

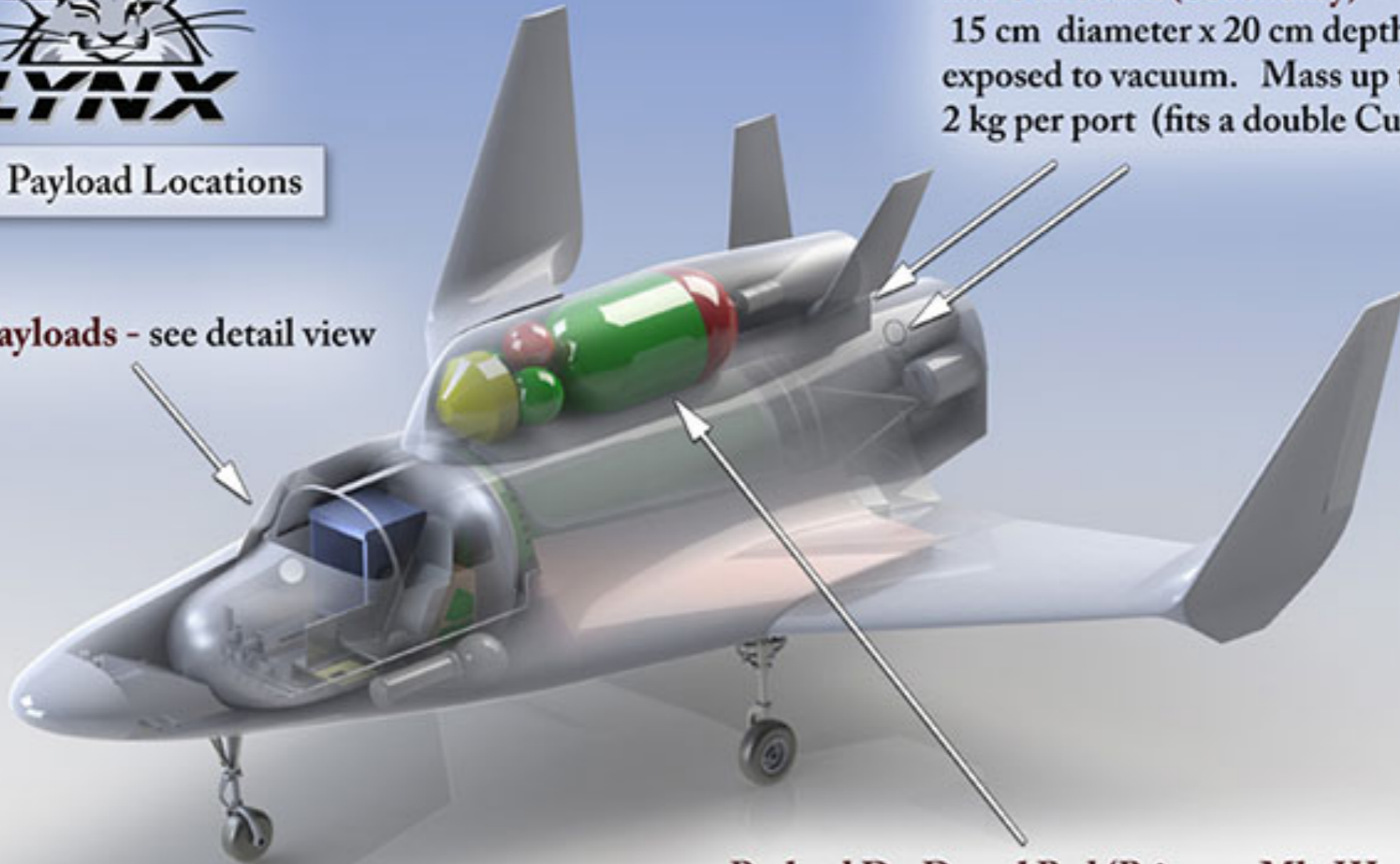
Payload Accommodations

- Fu
- Lo



Lynx Payload Locations

Cabin Payloads - see detail view



Payloads CP and CS - Cowling Port and Starboard (Secondary)

15 cm diameter x 20 cm depth, exposed to vacuum. Mass up to 2 kg per port (fits a double CubeSat).

Payload D - Dorsal Pod (Primary, Mk. III only)

Cylindrical volume: 76 cm diameter x 340 cm long. Mass up to 650 kg.

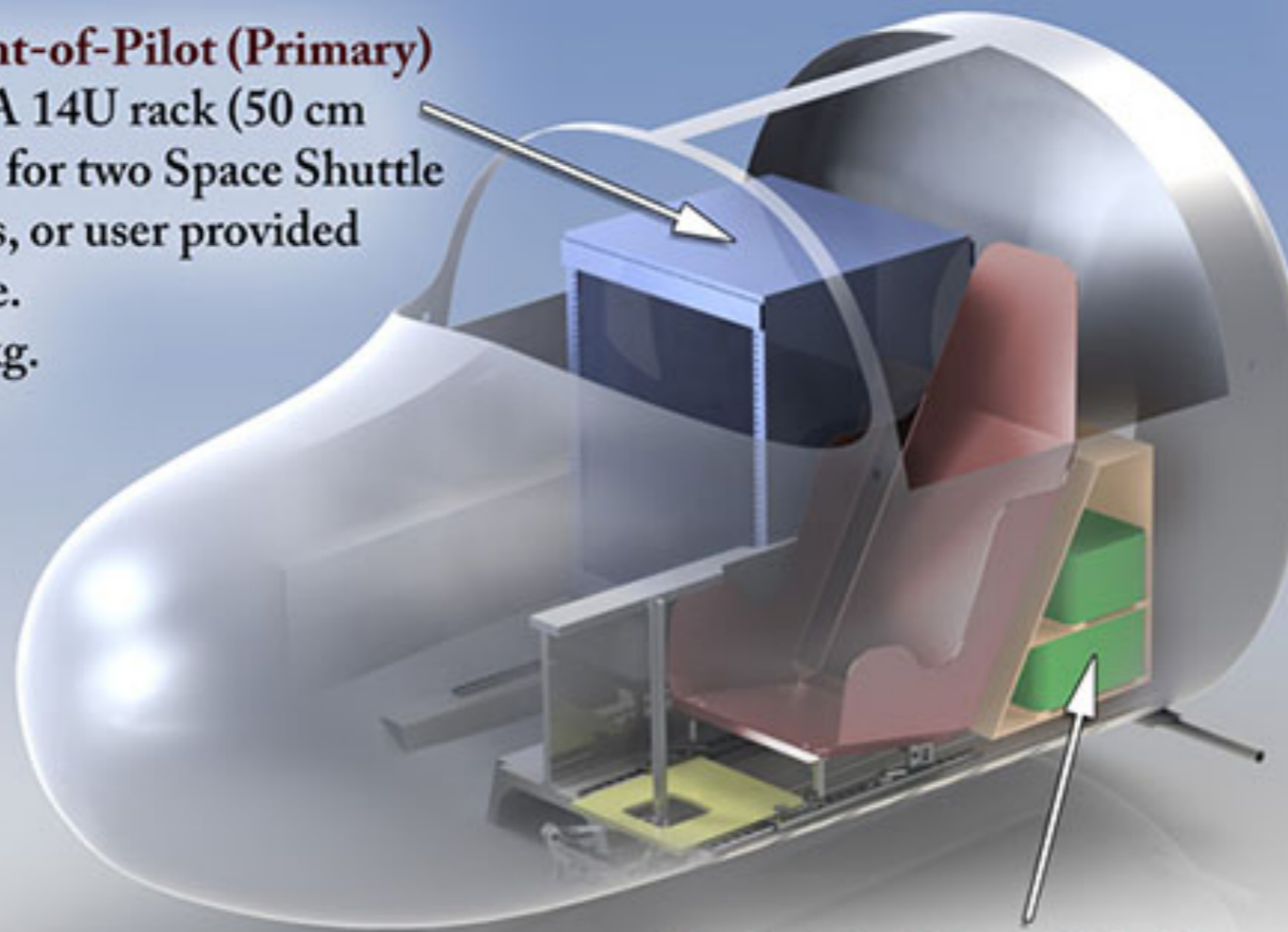
Payload Accommodations

- Fully
- Low

Payload Locations in Lynx Pressure Cabin



Payload B - Right-of-Pilot (Primary)
Standard 19" EIA 14U rack (50 cm depth) or chassis for two Space Shuttle mid-deck lockers, or user provided custom enclosure.
Mass up to 120 kg.



Payload A - Behind-Pilot (Secondary)
45 cm height x 40 cm length at bottom, 14 cm length at top x 41 cm side to side. Mass up to 20 kg.

Citizens in Space

- A project of the United States Rocket Academy
- Promoting citizen science and citizen space exploration
- Phase I — 10 flights on XCOR Lynx spacecraft
 - Largest single bulk purchase of suborbital flights for scientific purposes
 - 10 citizen astronauts, 100 citizen-science experiments
 - First five citizen-astronaut candidates currently in training

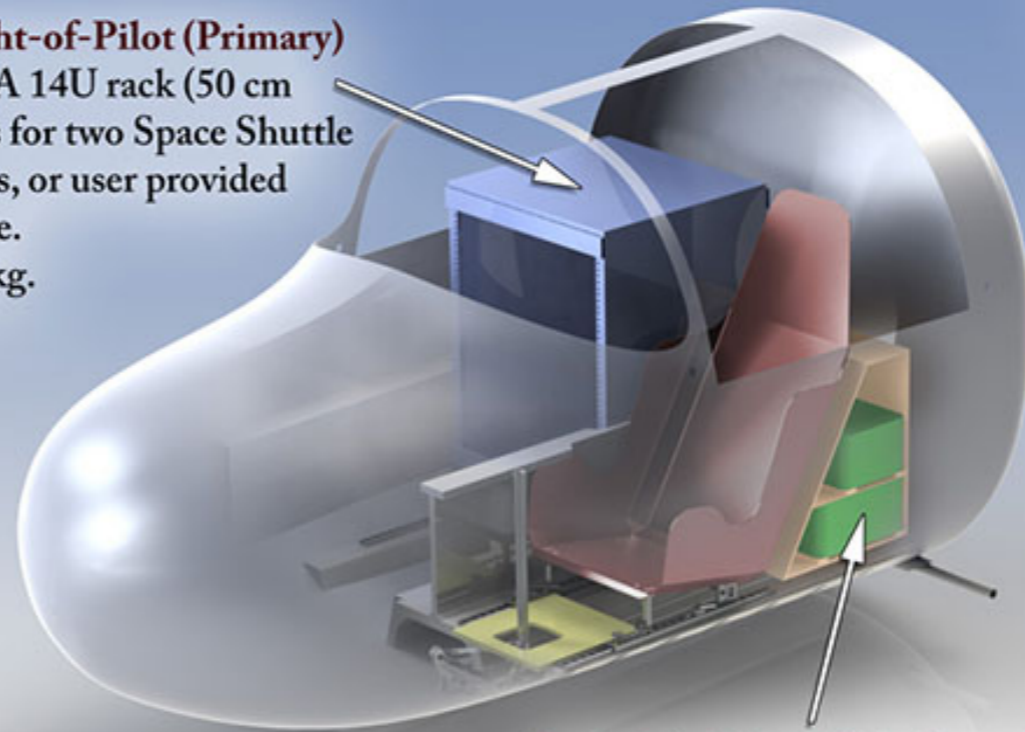
Citizen Astronaut Training



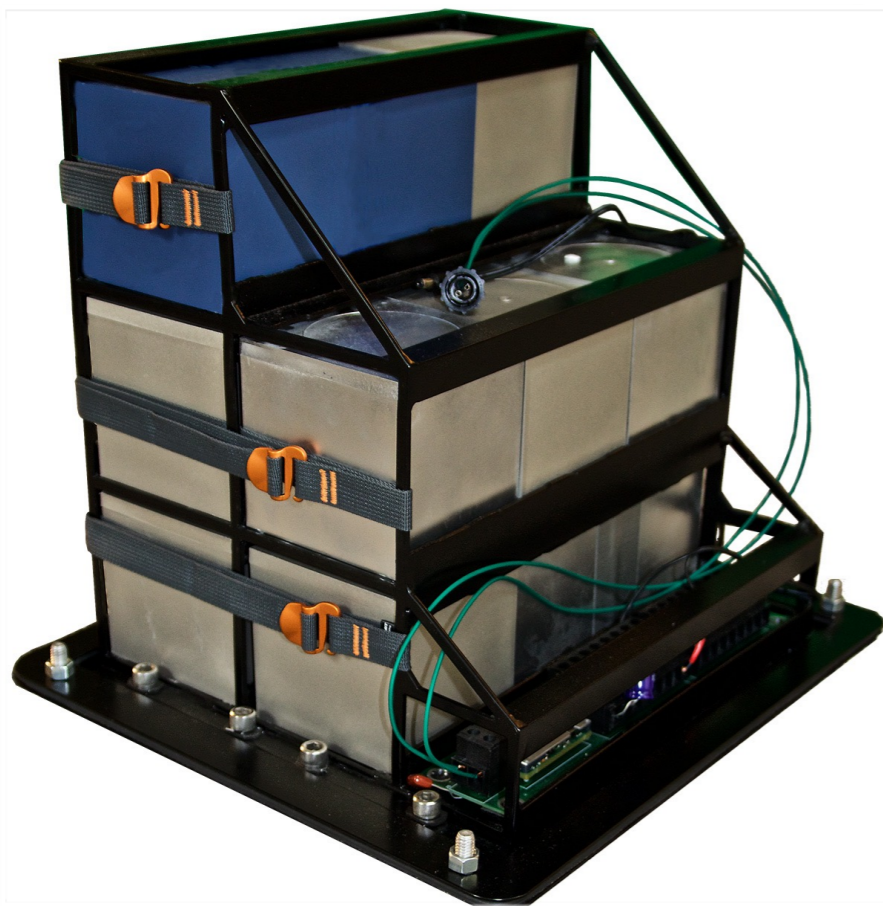
Lynx Cub Payload Carrier

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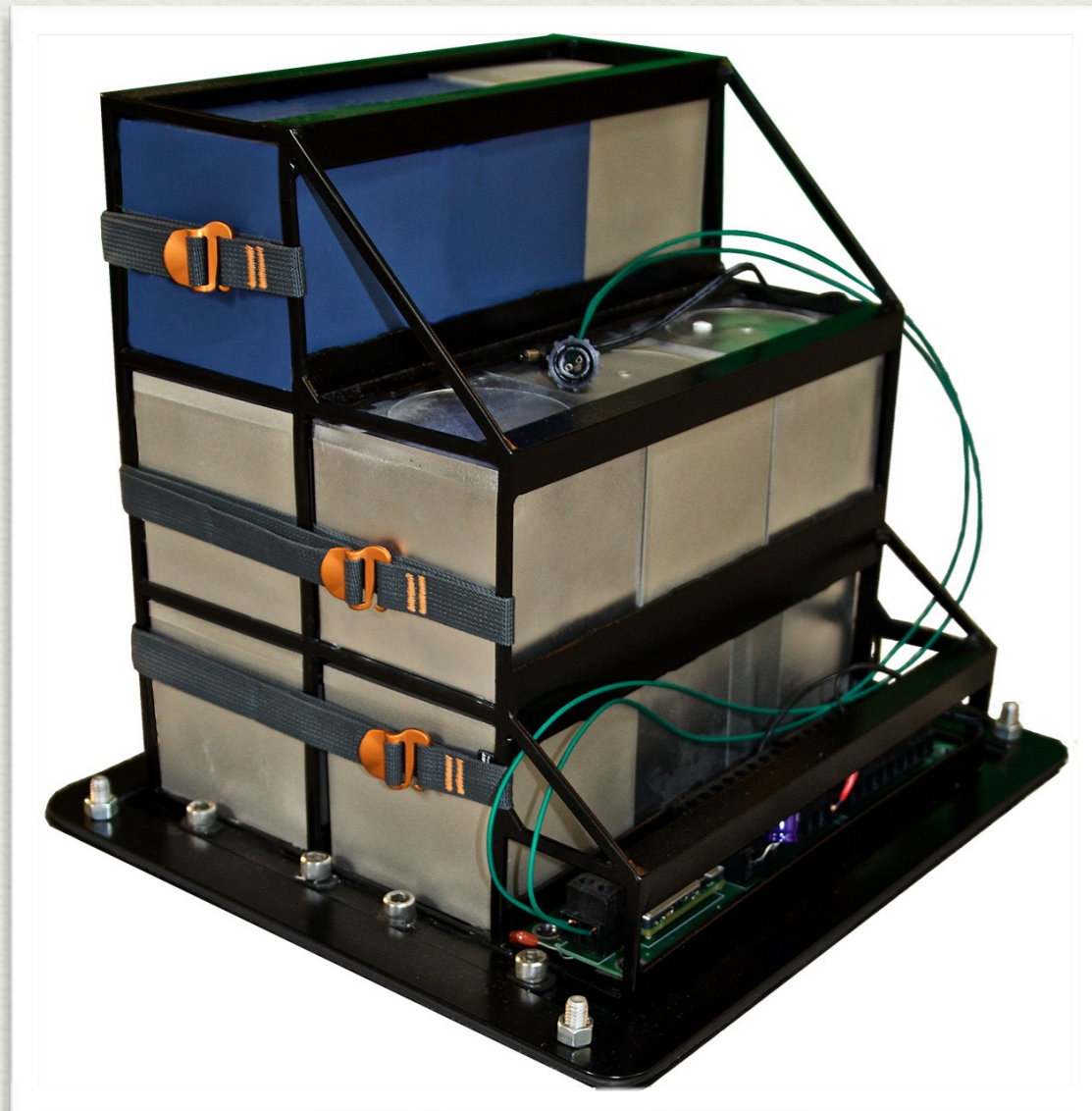


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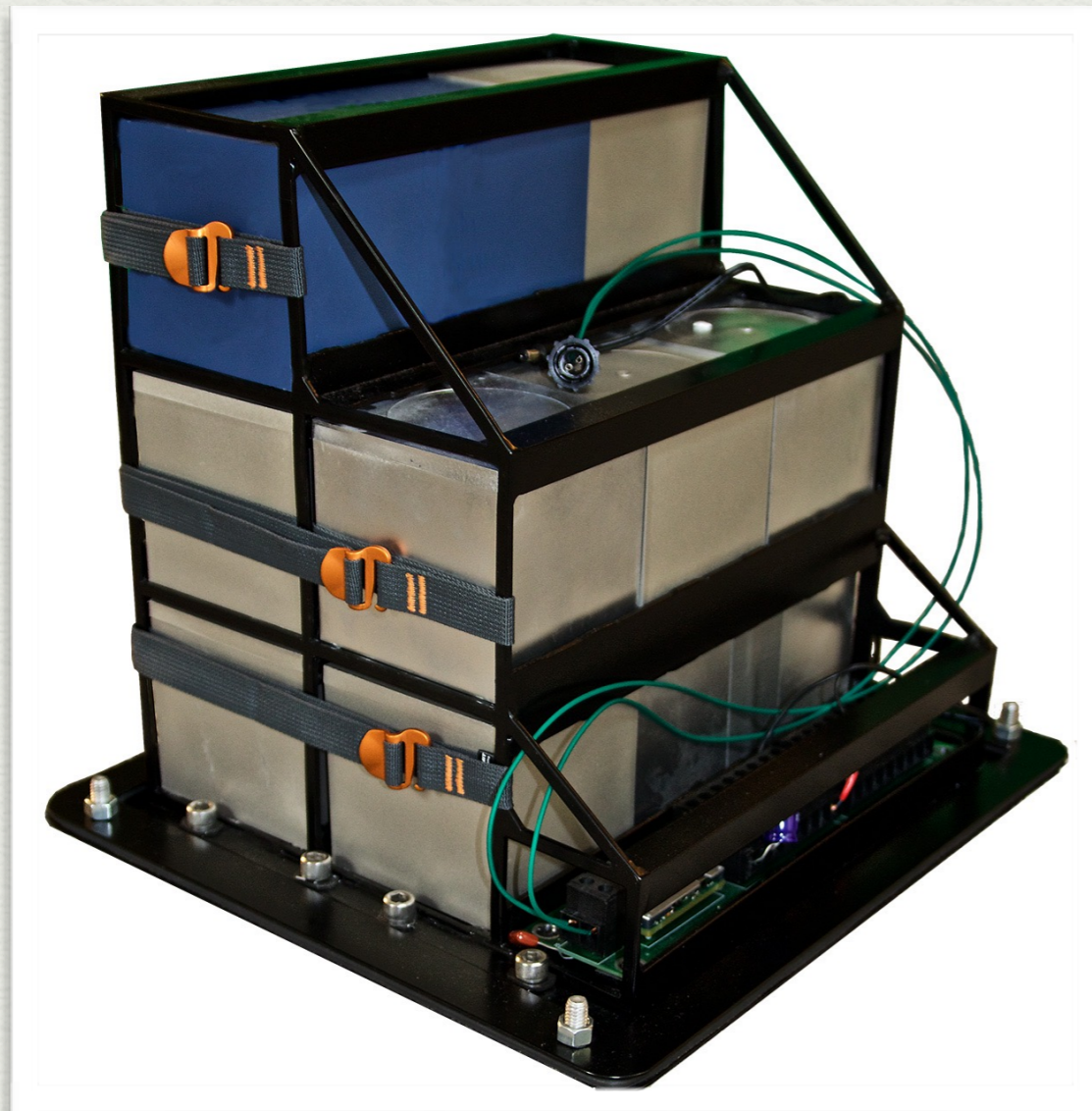
- “Payload A”

Lynx Cub Payload Carrier



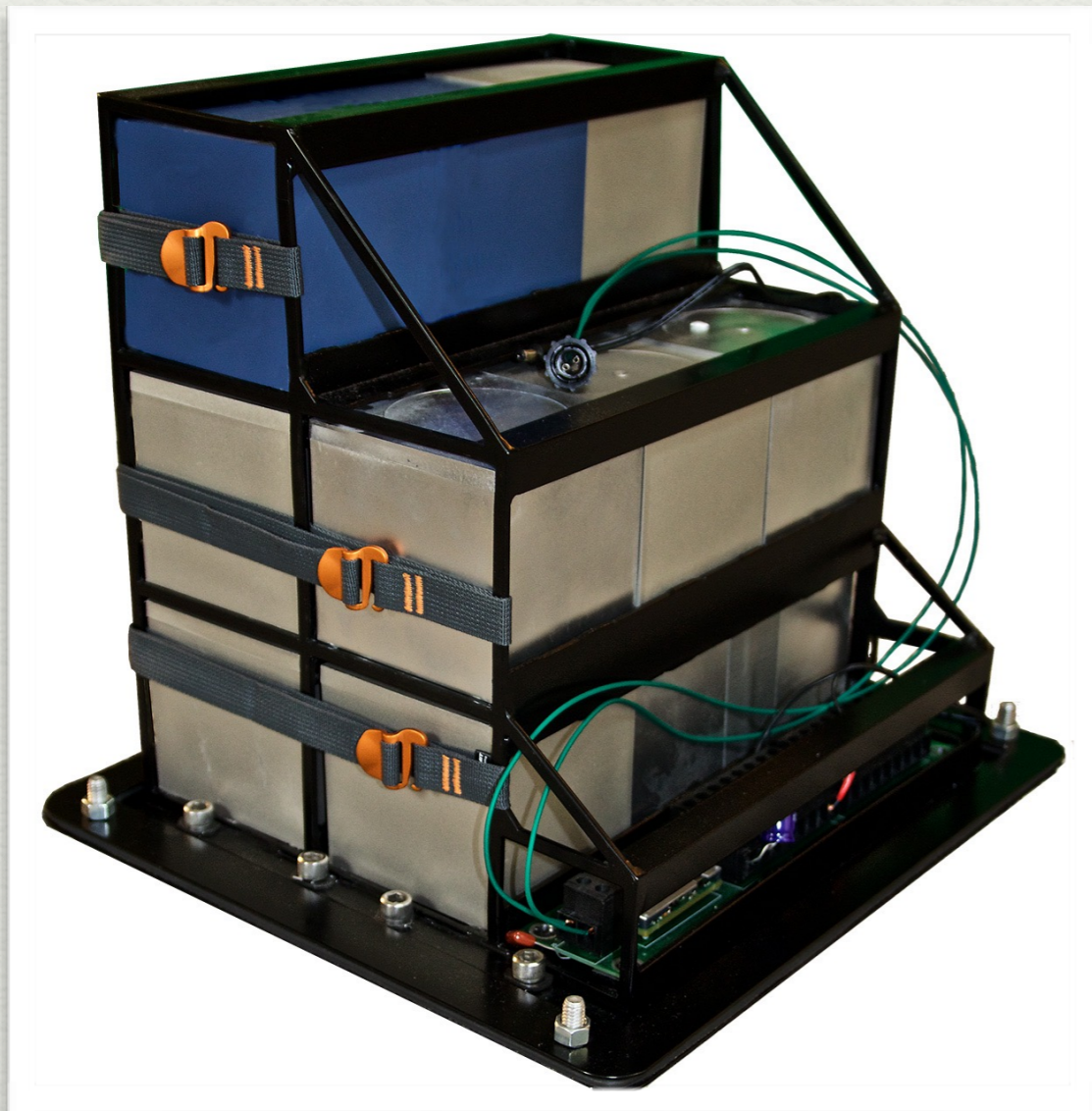
- Developed with assistance from:
 - Texas A&M University
 - State of Texas (Space Engineering Research Center)
 - XCOR Aerospace

Lynx Cub Payload Carrier



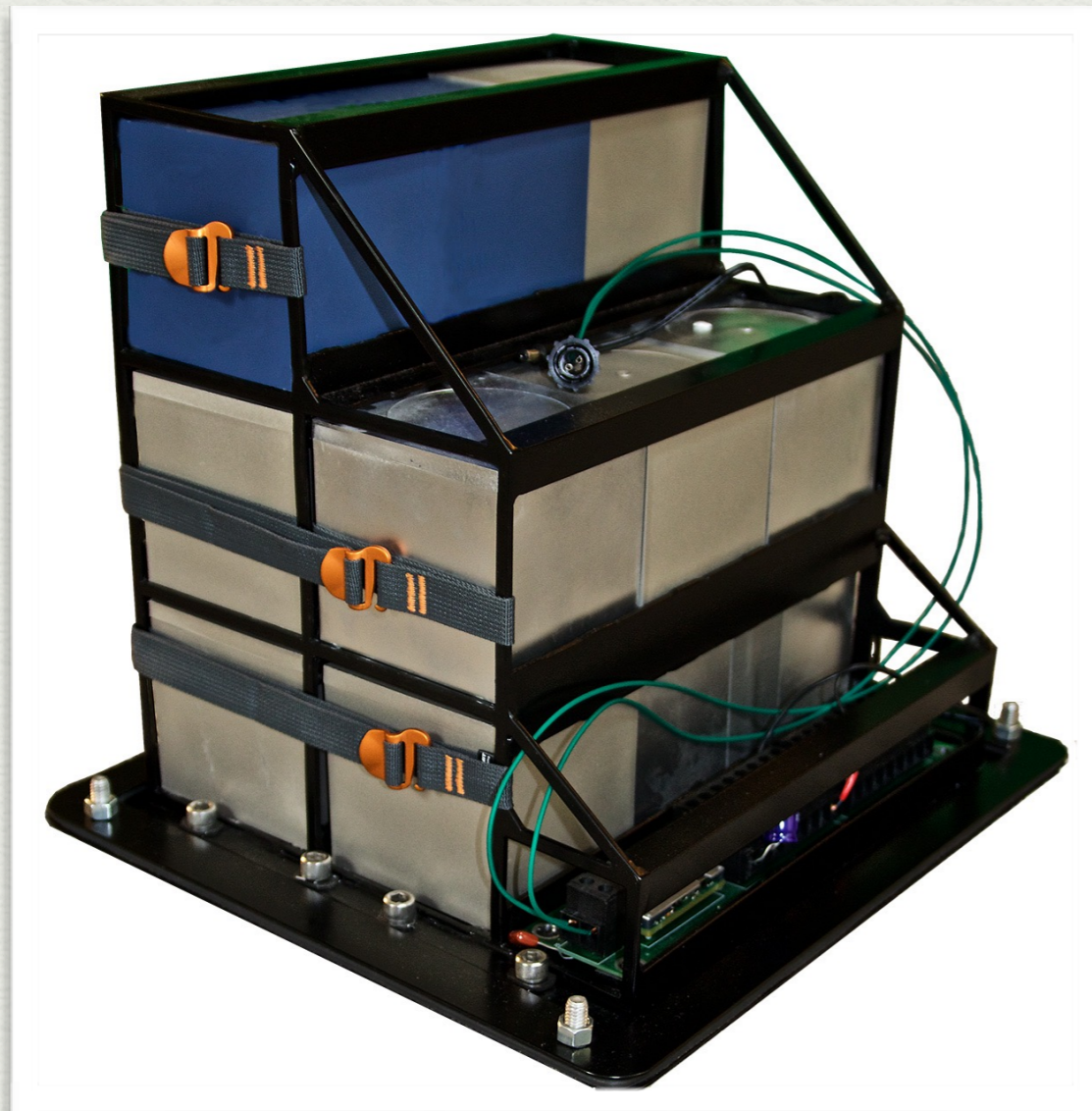
- Accommodates 1U, 2U, 3U payloads
 - Up to 15U total
 - 1 unit = 10 cm or 4", 1 kg max
- 5V or 12V electrical power
 - Configurable prior to flight
 - 2.1mm center-positive barrel connector
- 140W maximum electrical power
- 200W maximum thermal
- Double containment (soft cover not shown)
- Payloads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

Lynx Cub Payload Carrier



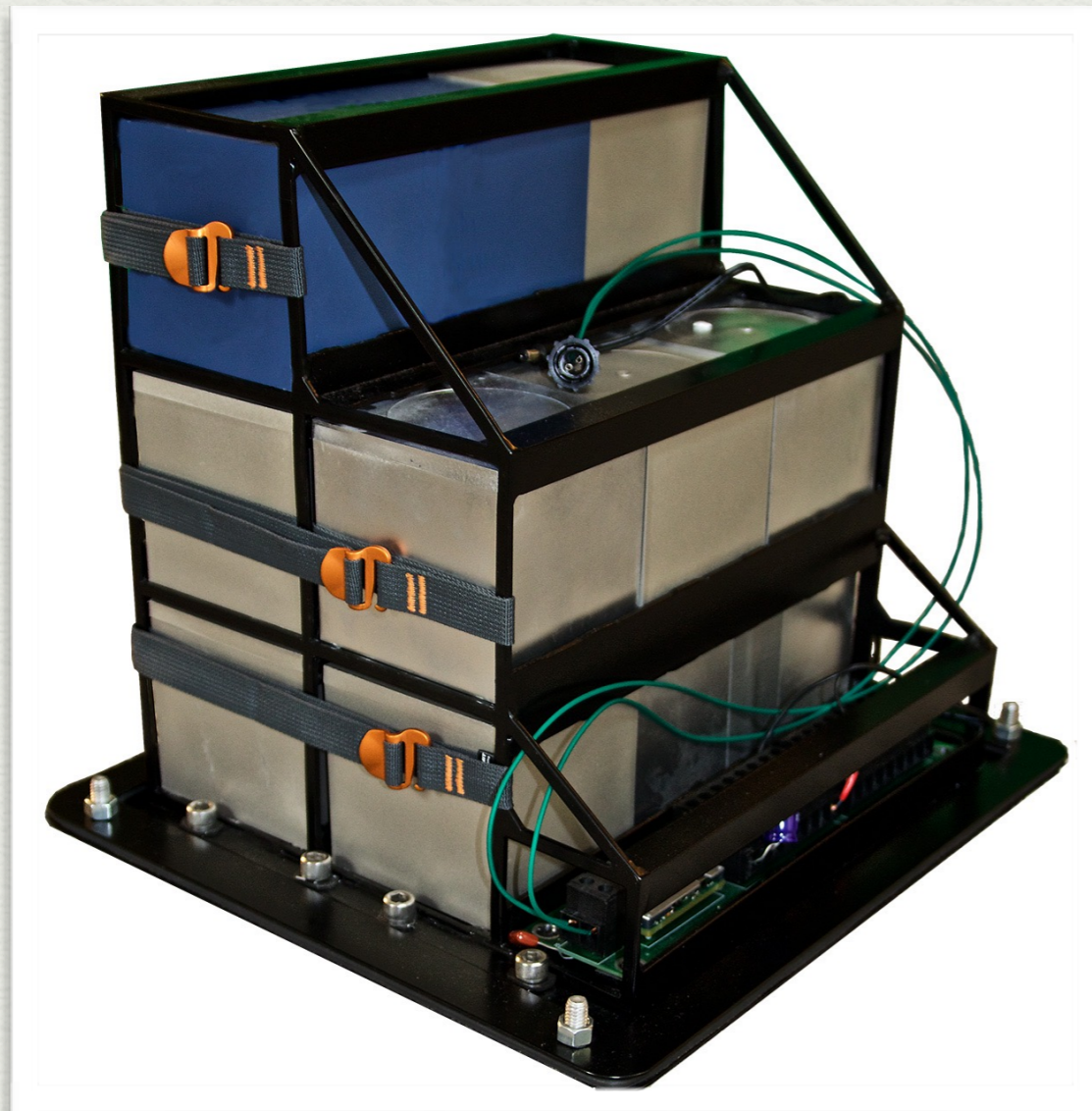
- Open-source hardware design
- Payload development with low-cost, off-the-shelf hardware
 - Arduino, BeagleBone Black, etc.
 - SD cards for data storage
 - Standard brackets, etc. will be available through Terran Sciences Group (or print your own)
- Cub Cam — under development for in-flight photo and video
- Online component catalog

Lynx Cub Payload Carrier



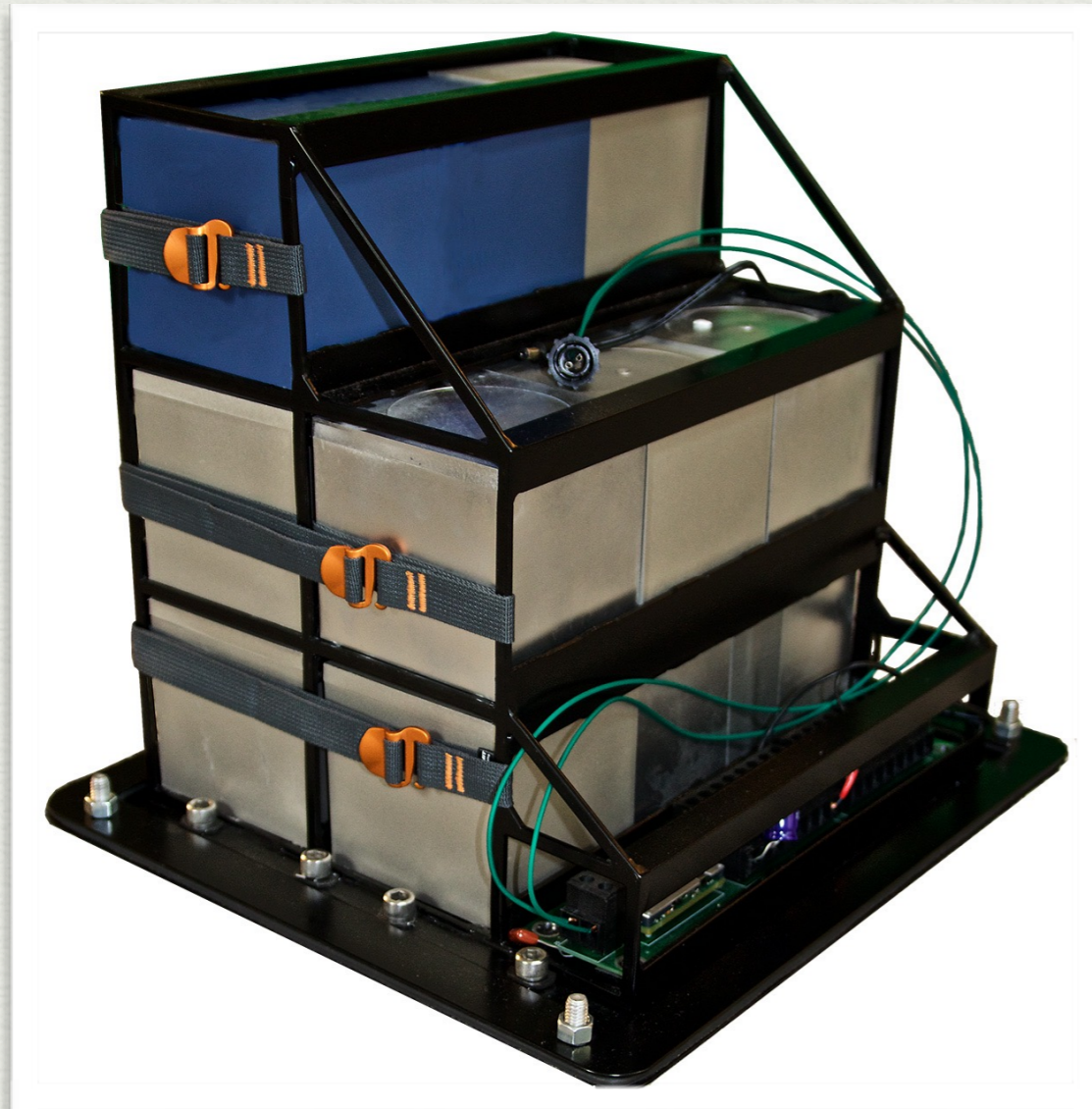
- Documentation (in progress):
 - Payload Design and Manufacturing Guide
 - Payload Testing and Qualification Guide
 - Payload Handling and Integration Guide
- Training and education
 - “Hello, World” experiments
 - Space Hacker Workshops

Lynx Cub Payload Carrier



- Flight-test program will gather baseline data for experiment designers:
 - Accelerometer
 - Gyroscope
 - Magnetometer
 - Temperature
 - Pressure
 - Acoustic
 - Radiation

Lynx Cub Payload Carrier



- Third-party integrators:
 - Nanoracks
 - Arrete STEM
 - ???

Call for Experiments

Requirements

- Real citizen science – address legitimate scientific or engineering questions (not just textbook demonstrations of known principles)
- Reproducible by other citizen scientists
 - Budget (low-cost)
 - Facilities (community machine shop, hackerspace, DIYbio lab)
 - Documentation
 - Open-source license

Call for Experiments

<http://www.citizensinspace.org/call-for-experiments/>

www.citizensinspace.org
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