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 (~$100K / flight)
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

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

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).

Cabin Payloads - see detail view

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

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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“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
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- 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/