

The CanX-4 and CanX-5 Formation Flying Mission

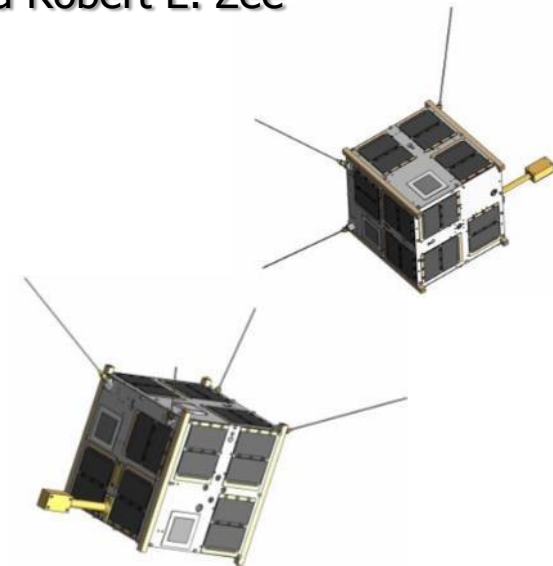
A Technology Pathfinder for
Microsatellite and Small Satellite Constellations

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UTIAS Space Flight Laboratory



Presented by Ben Risi

August 10th, 2013



Mission Overview

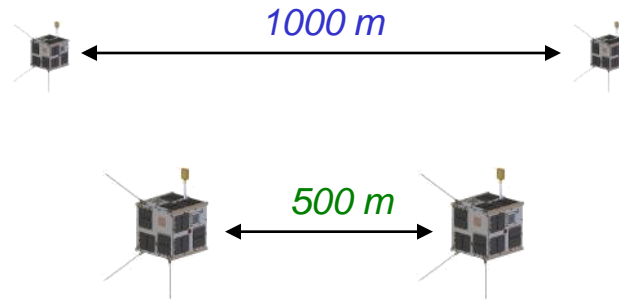
- Two identical satellites
 - Less than 7 kg, cubic form factor 20 cm per side
- Launch on Polar Satellite Launch Vehicle (PSLV), late 2013
- Ejected from separate deployment systems on launch vehicle
- Demonstration of autonomous formation flight

Performance	Minimum Requirement
Position Control	1 m
Relative Position Determination	10 cm
Minimum Relative Distance	50 m
Maximum Relative Distance	1000 m
Attitude Control	5°
Intersatellite Link Range	5 km
Intersatellite Link Data Rate	10 kbps

Formation Flying

- Two Formation Types:

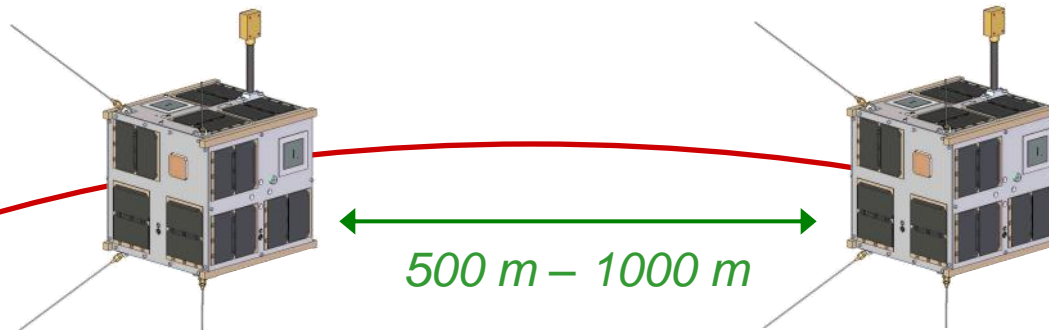
1. Along Track Orbit



2. Projected Circular Orbit

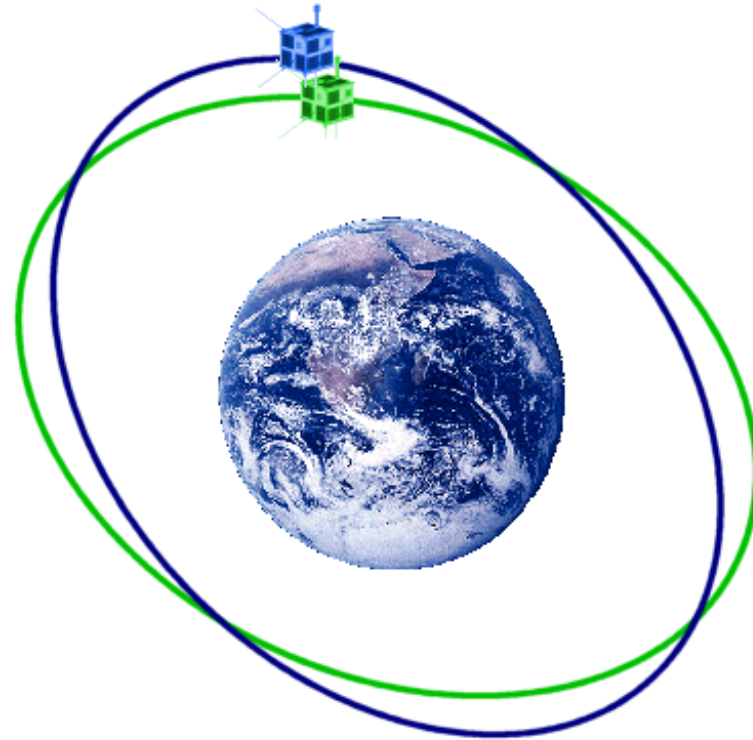
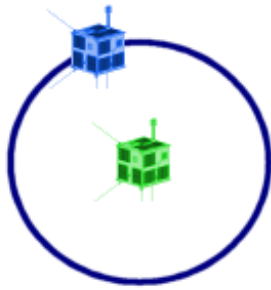


Along Track Orbit

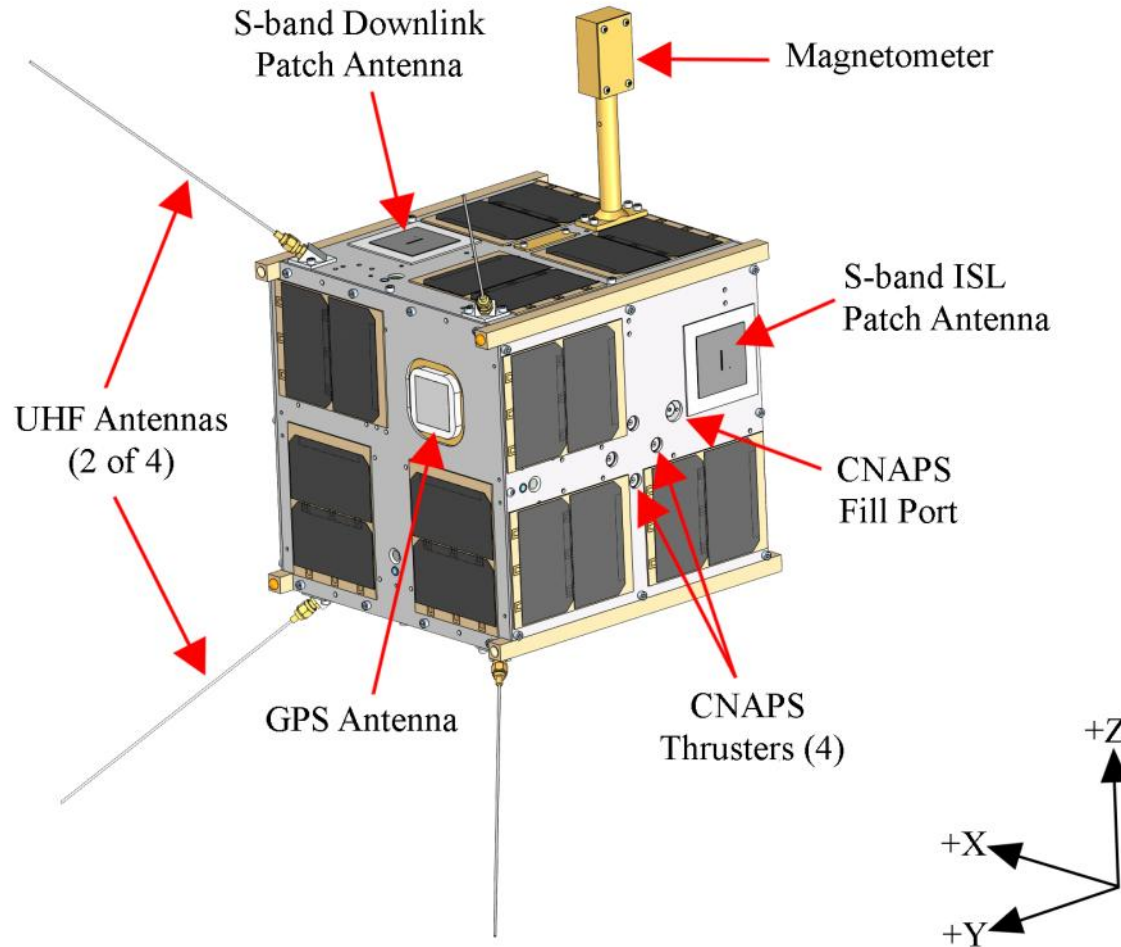


Projected Circular Orbit

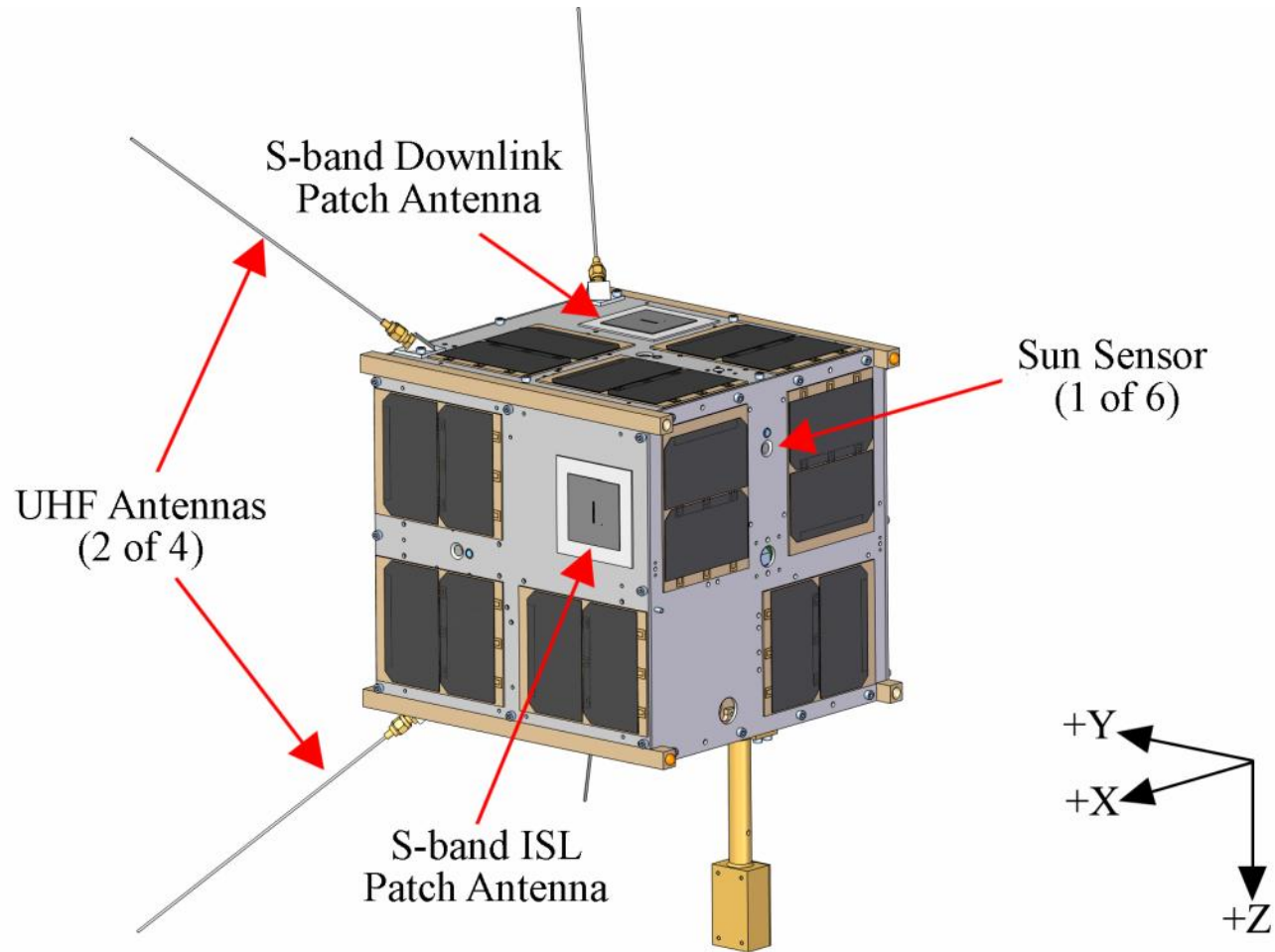
Viewed from Earth



Satellite Layout

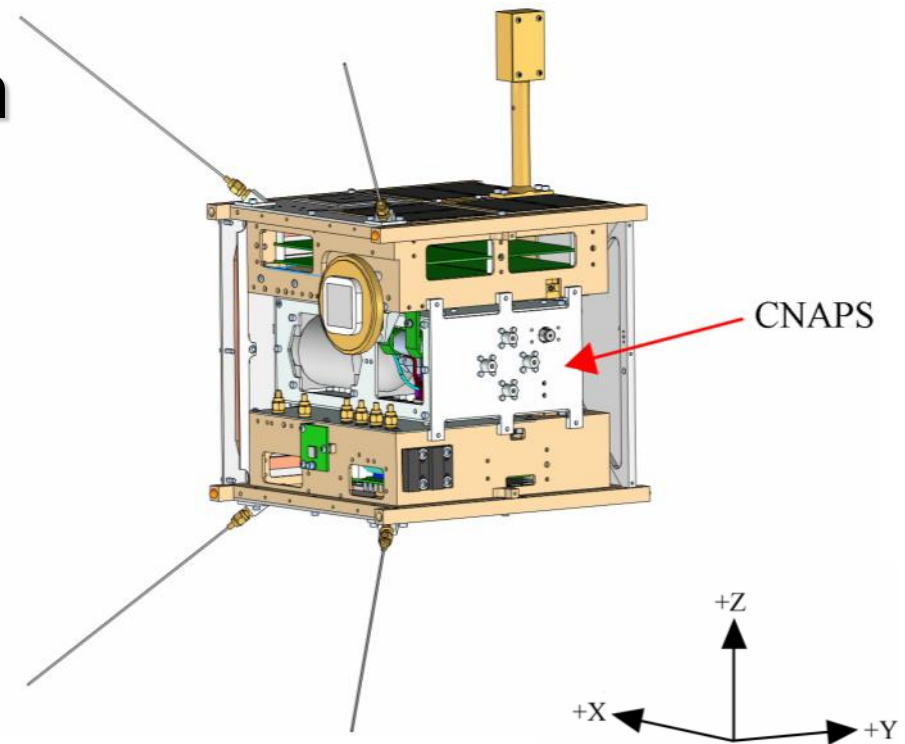


Satellite Layout



CanX-4/-5 Payloads

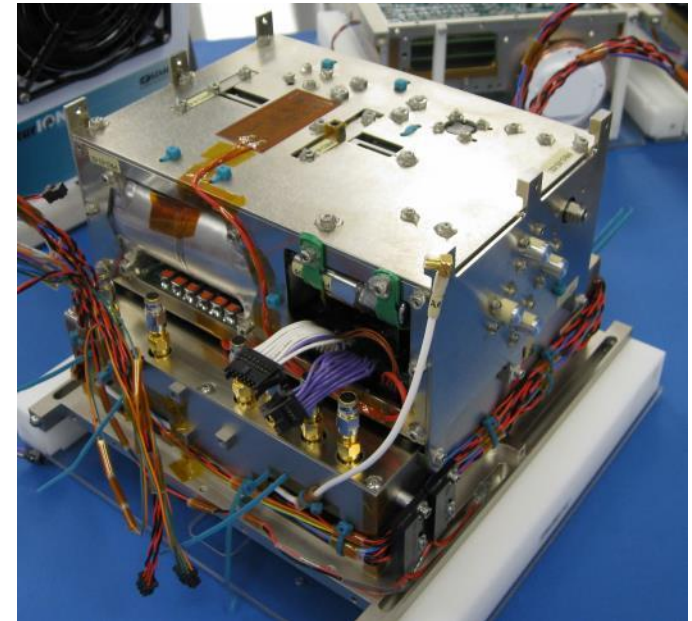
- 1. Propulsion System**
- 2. GPS Receiver**
- 3. Intersatellite Link**



CNAPS

Canadian Nanosatellite Advanced Propulsion System

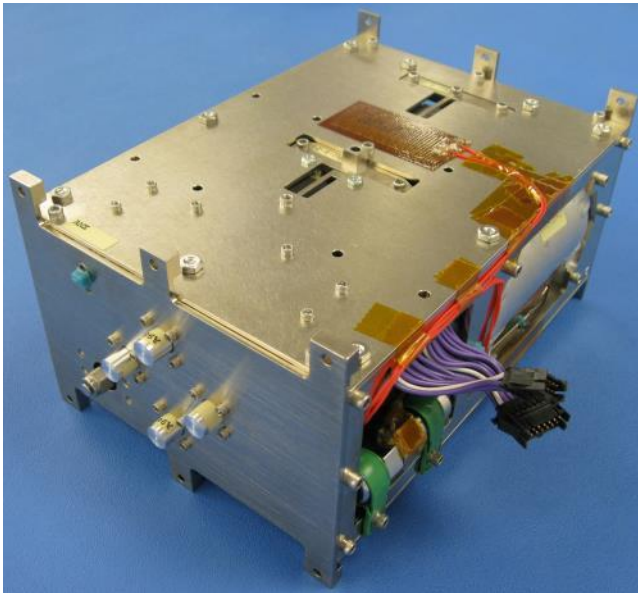
- Four-nozzle liquefied cold-gas thruster
- Sulfur hexafluoride (SF_6)
- $I_{sp} > 35$ seconds
- Thrust range of 10 to 40 mN
- Total $\Delta V \approx 14$ m/s



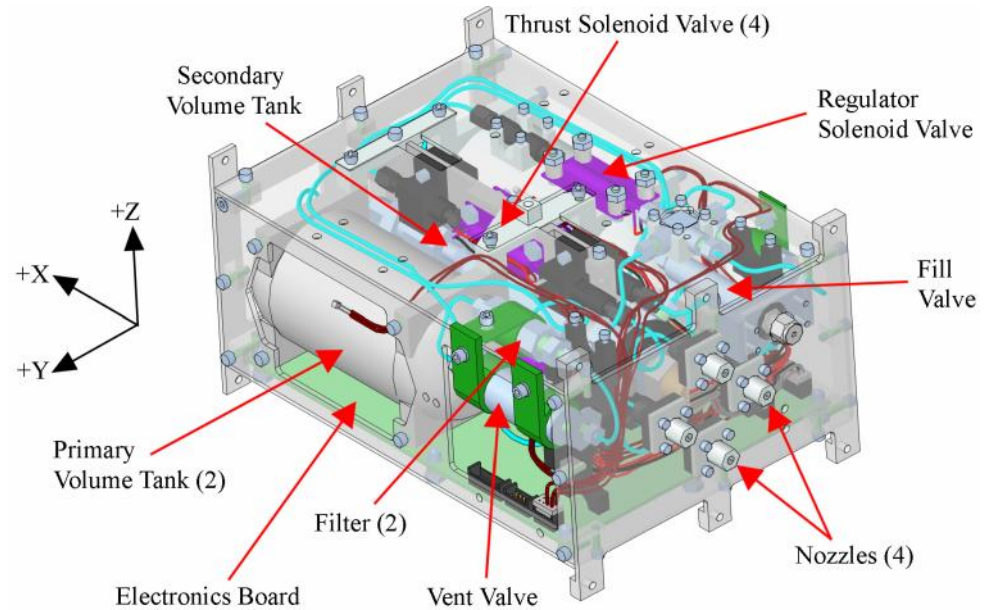
CNAPS-01 integration with CanX-5

CNAPS

Canadian Nanosatellite Advanced Propulsion System



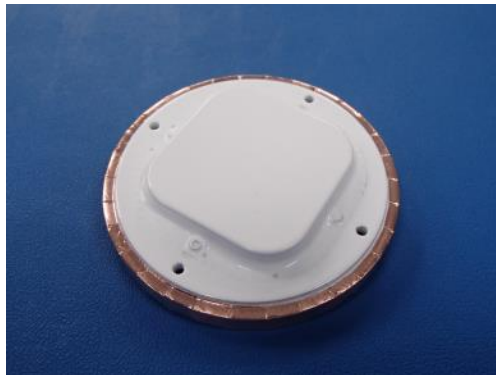
CNAPS-02 flight unit



CNAPS model

CanX-4/-5 Payloads

1. Propulsion System
- 2. GPS Receiver**
3. Intersatellite Link



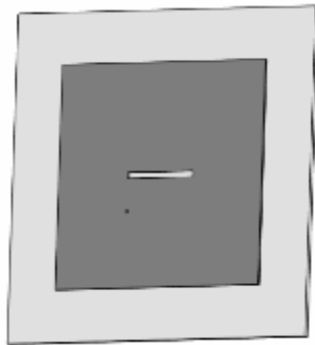
GPS antenna



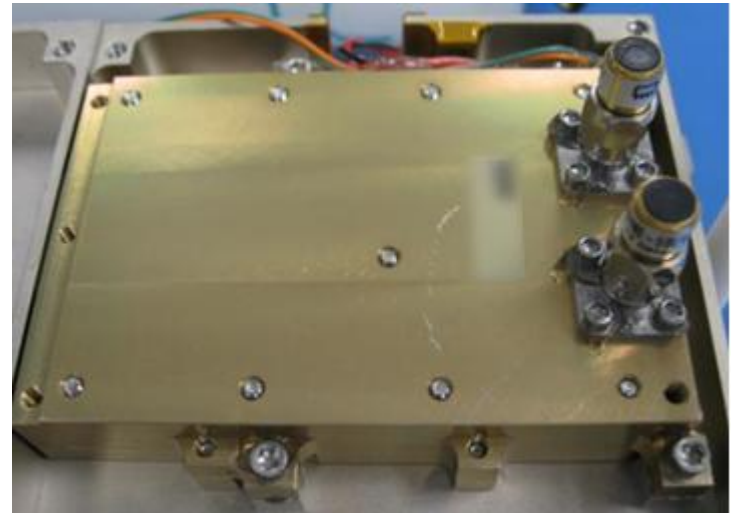
GPS receiver

CanX-4/-5 Payloads

1. Propulsion System
2. GPS Receiver
- 3. Intersatellite Link**

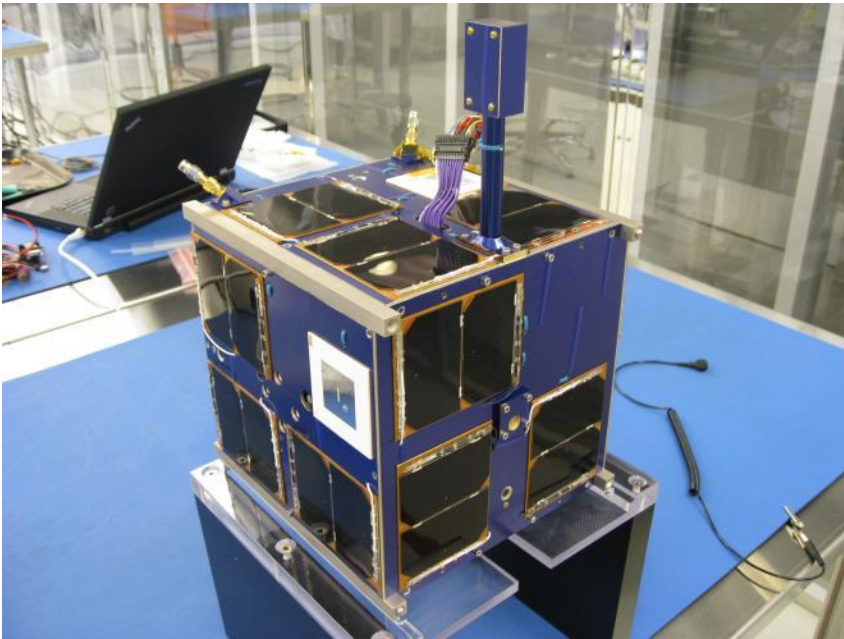


S-band patch antenna

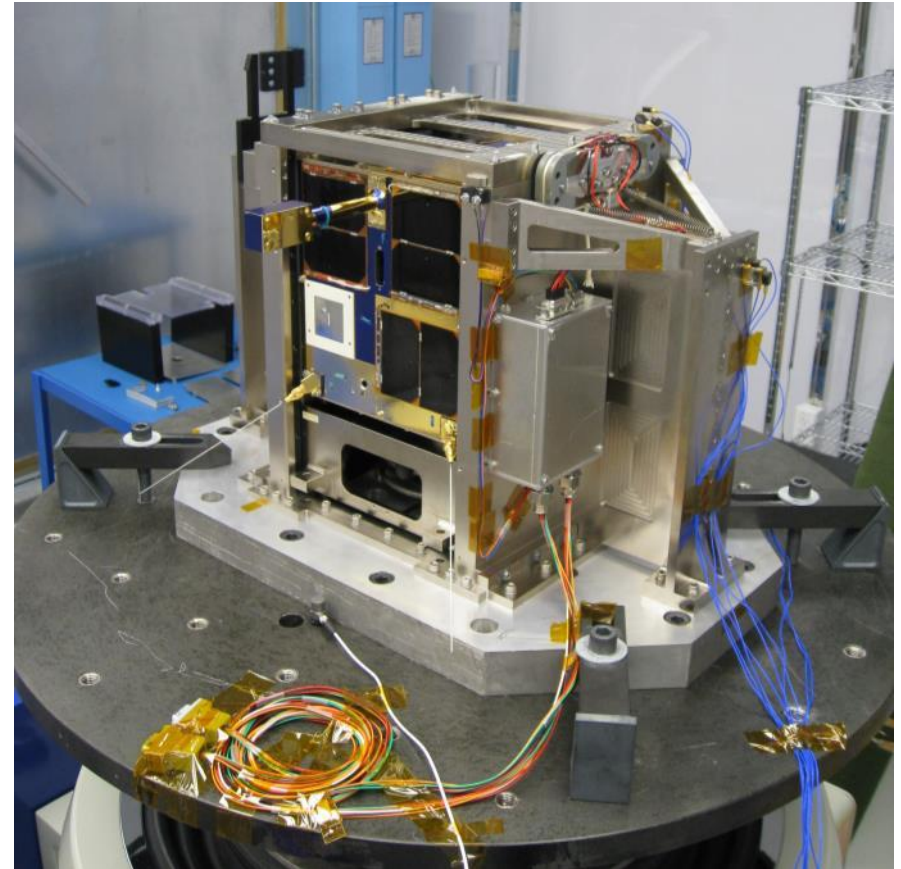


Intersatellite S-band radio transceiver

Environmental Testing



Completed assembly of CanX-5



Vibration testing of CanX-5

Future Work

- Assembly of CanX-4 spacecraft
- Thermal vacuum testing of both spacecraft
- Launch planned for late 2013



UTIAS/SFL Thermal vacuum chamber



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