CANYVAL-X

CubeSat Astronomy by NASA and Yonsei using Virtual Telescope Alignment eXperiment

Mission Goal: *CubeSat Demonstration of Virtual Telescope Alignment Technology in Space*

Mission Description

CANYVAL-X is a technology demonstration CubeSat mission with a primary objective of validating technologies that allow two spacecraft to fly in formation along an inertial line-of-sight (i.e., align two spacecraft to an inertial source). Demonstration of precision dual-spacecraft alignment achieving fine angular precision enables a variety of cutting-edge heliophysics and astrophysics science.

Project Status

The George Washington University Micro-propulsion and Nanotechnology Lab

- Developed mCAT analog electronics and control design, based on system developed for BRICSAT mission.
- Delivered mCAT thruster heads

Yonsei University

- Designed, built, and tested the 1U and 2U spacecraft and are currently integrating the mCAT.
- Spacecraft environmental testing at KARI.
- Developed ground system to conduct mission operations and alignment experiment.

NASA

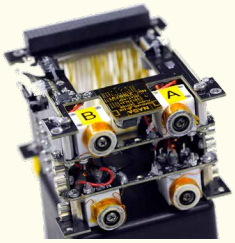
- Delivered Miniature Fine Sun Sensor – provides attitude measurement for 2U spacecraft.
- Completed George Washington University Micro Cathode Arc Thruster (mCAT) flight electronics, performed system testing, and delivered mCAT - provides thrust for 2U cubesat.
- Conducting an assessment of CANYVAL-X's GN&C in regards to formation acquisition and alignment.
- Traveled to Yonsei to collaborate with team.

Launch on Falcon9 in mid-2016.

NASA Delivered Hardware

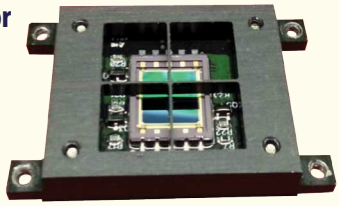
mCAT
(GWU/NASA)

Delivered Sept 2015

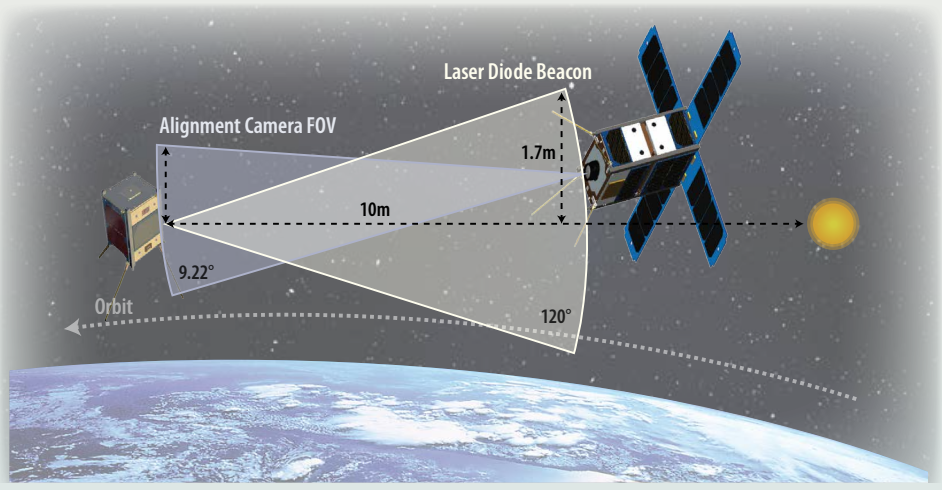


Fine Sun Sensor
(NASA)

Delivered June 2015



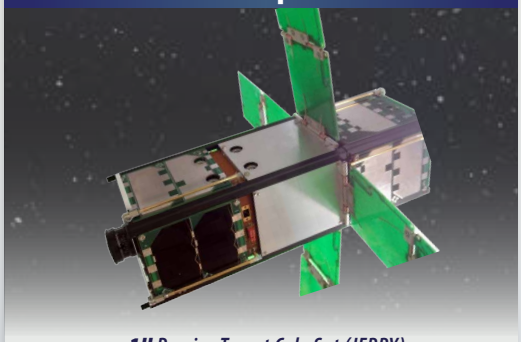
Virtual Telescope Inertial Alignment



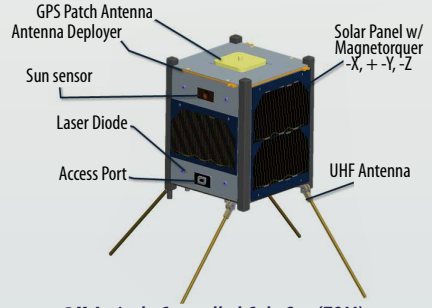
Partnership

NASA, Yonsei University, and The George Washington University are collaborating to develop the mission.

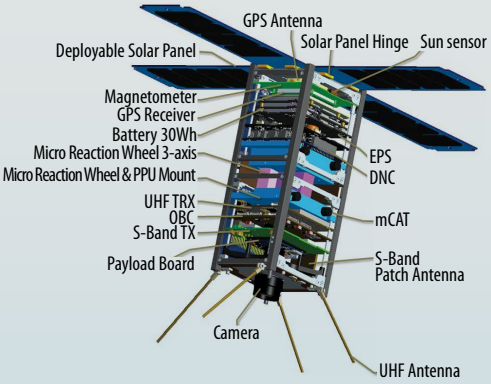
CANYVAL-X Spacecraft



***1U** Passive Target CubeSat (JERRY)*



***2U** Actively Controlled CubeSat (TOM)*



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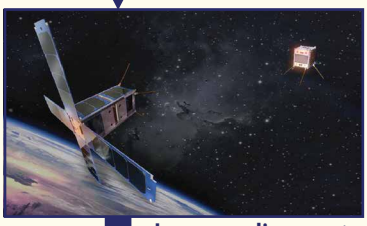
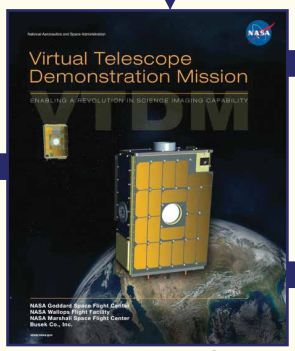
Road Map to Cutting Edge Science

Ground/Lab Demo of Component Technologies

CANYVAL-X matures formation alignment technology enabling the next-generation of distributed space virtual telescopes.

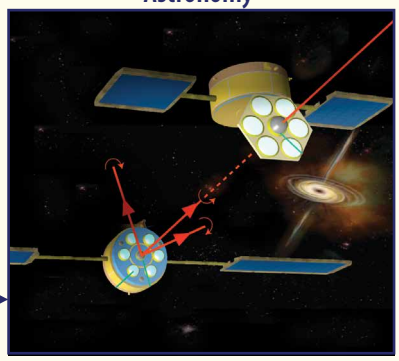


In-space alignment experiment



In-space science-class virtual telescope

Astronomy



Heliophysics

Credit: ESA

Mission and GNC Specification

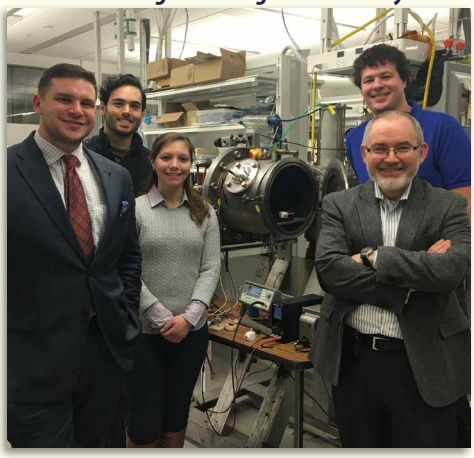
Properties	Value	
	JERRY	TOM
Mission Life Time	3-6 month	
Payload	3 Laser Diodes	Visible Camera (NanoCam)
Payload Performance	Half Intensity Beam Angle = ±60° Minimum angle (15.5°) intensity > 96%	2048 x 1536 pixels CMOS sensor 35mm lens/ F1.9, 9.22° FOV
GN&C	(Magnetorquer, sun sensor)	mCAT, Sun Sensor, NanoCam, Reaction Wheels, Mag TorqRods
Data Rate	Up/Downlink: 4.8 kbps (UHF)	Uplink: 4 Bkbps (UHF) Downlink 100 kbps (S-band)
Mass	1.0 kg	2.7 kg
Relative Distance	> 10m (Collision Avoidance)	
Orbit Control	GWU	20cm (1 DOF mCAT x4+3axis Reaction Wheel)
Orbit Determination	Each Axis ± 10cm (GPS)	
Attitude Control	5° (Magnetorquer) 10m x tan(5°)=88cm	1° (Reaction Wheel) 10m x tan(1°)=18cm

CANYVAL-X Teams

NASA

Yonsei

The George Washington University



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