



# Testing a Cubesat Attitude Control System in Microgravity Conditions

## Problem Statement

- Test a magnetic torque attitude control system for pico-scale satellite applications
- Near zero gravity environment enables testing the 2-axis attitude control system in the Earth's magnetic field
- Potential users are scientists studying Earth dust environment, stellar and planetary astronomy

## Technology Development Team

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## Proposed Flight Experiment

### Experiment Readiness:

- May 1, 2013

### Test Vehicles:

- Parabolic aircraft

### Test Environment:

- This will be the first flight for KnightCube. KnightCube has been tested in the lab setting for nearly 2 years.

### Test Apparatus Description:



- Crew members will release KnightCube during zero-g
- Knightcube is attached to the ESU via a 152 cm chain.
- Another crew member will video KnightCube in free-float mode

## Technology Maturation

- Attitude control system must perform for 2 DOF rotational axes using Earth's magnetic field.
- The microgravity flight will help identify potential errors in the hardware and software associated with the attitude control system.
- The technology will be TRL 6 if the onboard ADCS meets the goal during the microgravity flight.

## Objective of Proposed Experiment

- Characterize accuracy of quaternion and angular velocity measurement for random initial orientations
- Determine pointing accuracy of magnetic torque coil based attitude control system in the Earth's magnetic field
- Obtain real-time data that identify potential flaws in KnightCube systems
- Data includes the current time, full quaternion attitude, three angular rates, desired control torques, current to each of the three torque coils, ambient magnetic field in three axes, and processor utilization
- Data will be used to inform flight design of attitude control system