CubeSat Club Meeting
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Our CubeSat

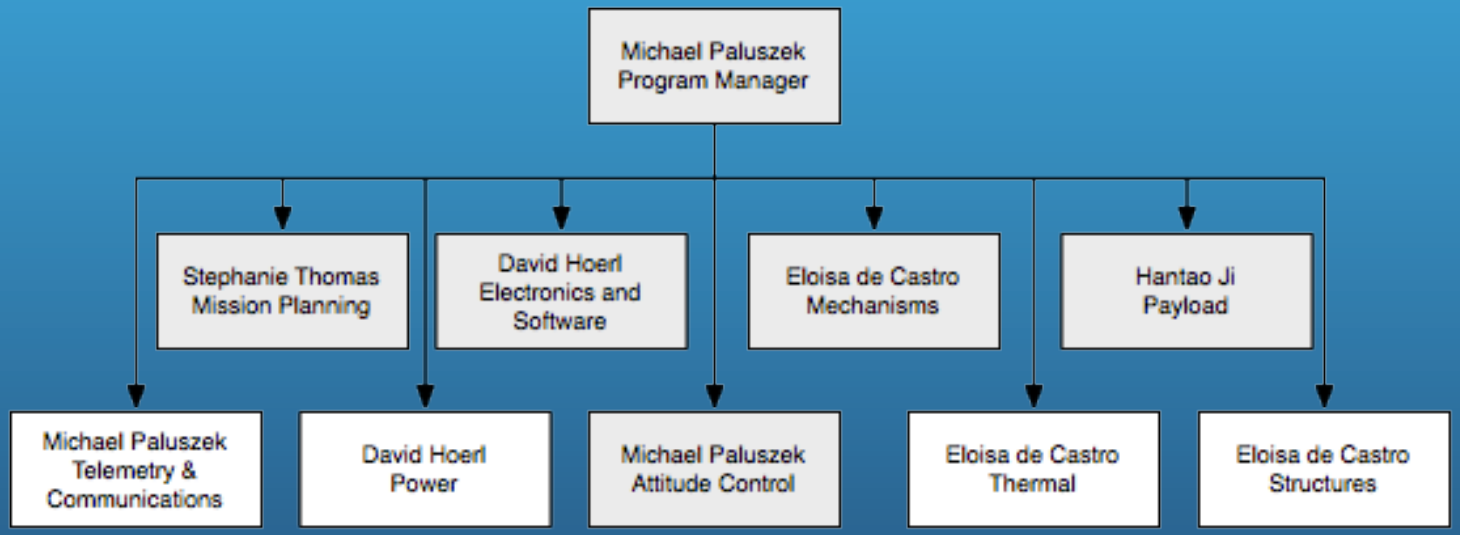
- A 10 cm by 10 cm by 30 cm satellite to measure space weather
- 3 of our CubeSats will fly in a 800 km altitude polar orbit (an orbit that goes over the North Pole)
- The CubeSats will be designed by a team of Princeton Satellite Systems engineers, Princeton University students and Princeton Regional School students
- We hope to launch in 3 years!

The Mission

- The goal of the mission is the measure the electric and magnetic fields in orbit and to measure the electron and ion particle fluxes
  - We will use 3 spacecraft for this purpose
- This will help scientists understand space weather

How Satellite are Built

- Engineers are divided up by specialty
- Each specialty designs a subsystem

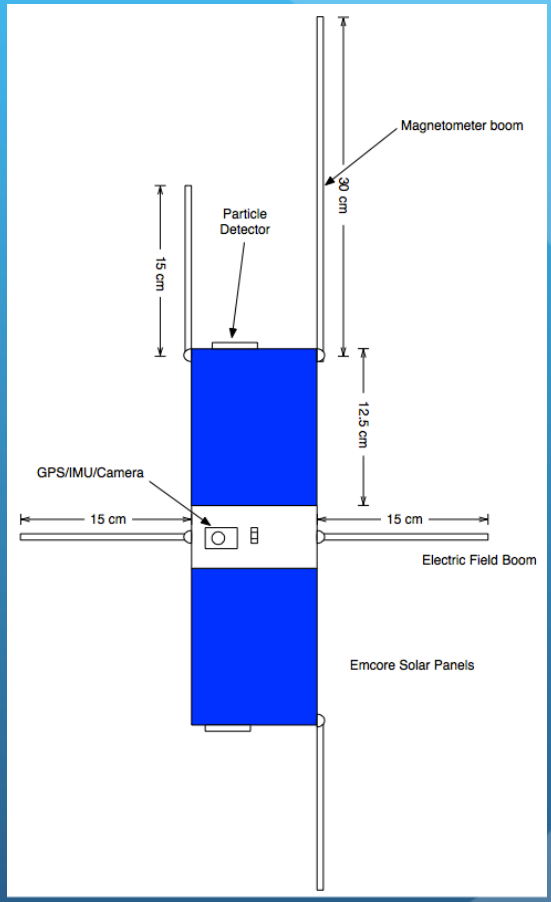


Subsystem Descriptions

- Attitude control – designs the hardware and software that points the spacecraft in the right direction
- Thermal control – designs the hardware and software that keeps the satellite at the right temperature
- Structures – designs the structure which makes sure the spacecraft won't break during launch
- Power – designs the hardware that makes sure the satellite always has enough power
- Mechanisms – designs and builds all moving parts
- Telemetry and Command – designs all the communications hardware
- Payload – designs the experiments on the satellite
- Mission Planning – designs the orbits

Our CubeSat

- Power provided by 8 solar panels with a battery to store the unused power
- 6 electric field measurement booms
- 3 particle detectors
- 1 magnetic field measurement boom
- 30 cm by 10 cm by 10 cm
- Attitude sensing by
  - Magnetic field measurement boom
  - Camera
    - Looks at star patterns
  - Inertial Measurement Unit (IMU)
    - These devices measure angular rate and linear acceleration



Almost a CubeSat

GPS measures position and velocity
We will have a GPS receiver too!

Accelerometers detect linear acceleration
Our Inertial Measurement Unit will have gyros!

Powerful computer
We are using the same processor in our CubeSats!

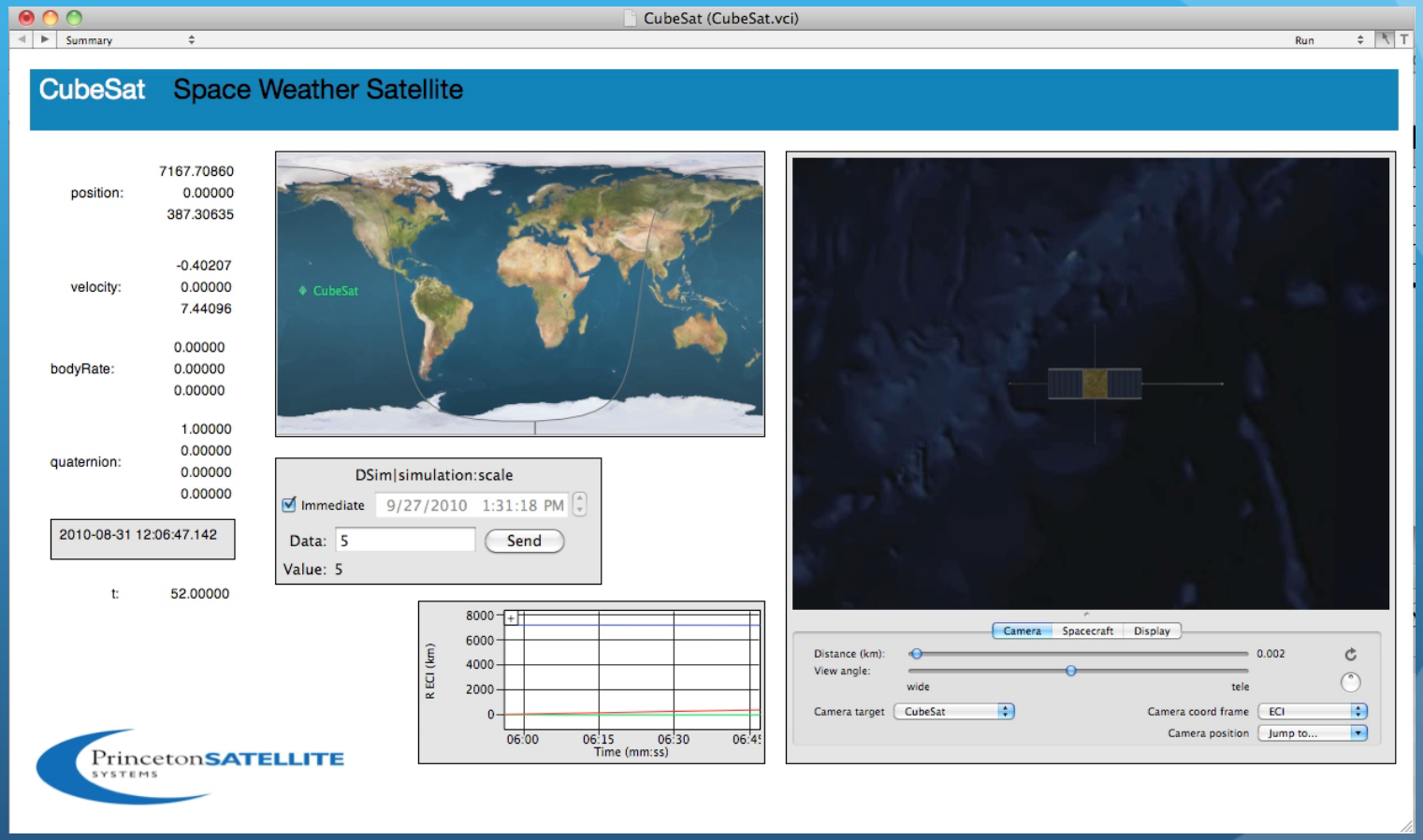
Gyros measure angular rate
We will use similar gyros!

Wireless communications
Like our telemetry and command system!

A CubeSat Simulation!

- A simulation is a computer model of the CubeSat in orbit
- Much like a video game
  - Many video games are simulations!
- You will be using this simulation as part of your work
  - We can't test our CubeSat in space so we will rely on simulations to test before launch

An Attitude Maneuver Simulation



What we will do this year

- In the fall
  - Learn about spacecraft
  - Do experiments with hardware similar to that which will fly on our CubeSats
  - Learn how to use new software packages
- In the spring
  - Begin designing our CubeSat

Rules

- Have fun!
- Everybody makes mistakes
  - Engineers learn from mistakes
  - “Spacecraft have a way of making you look stupid”
- Engineers work in teams
  - Everyone gets to state their opinion
  - Everybody contributes
  - Anyone can say “Stop”
- Ask questions

Who we are

- Ms. Eloisa de Castro
  - Chief Mechanical Engineer, Princeton Satellite Systems
  - MIT (Massachusetts Institute of Technology) graduate in Mechanical Engineering
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- Mr. Michael Paluszek
  - President, Princeton Satellite Systems
  - MIT graduate in Electrical Engineering and in Aeronautics and Astronautics
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Now to learn about vectors!

- Get out your handout on orbits
- This is difficult material!
- Don’t be afraid to ask questions!
- You can find this presentation and the CubeSat book (which is evolving) at www.psatellite.com/CubeSat/index.php
- Homework: Watch the movie “Apollo 13” with Tom Hanks