Plug and Play Attitude Control

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ADCS Design Objectives

- Single board ADCS solution
- Handles complete ADCS task
  - Limited interaction from OBC required
    - Ability to set the autonomous mode transitions
  - Telemetry form the ADCS unit will keep you updated
- Include low power/safe mode ADCS on board
- Easily adapatable to different sensor and actuator technology.
- Inherently low power, low mass, minimal volume, low cost, low system overheads and high performance.

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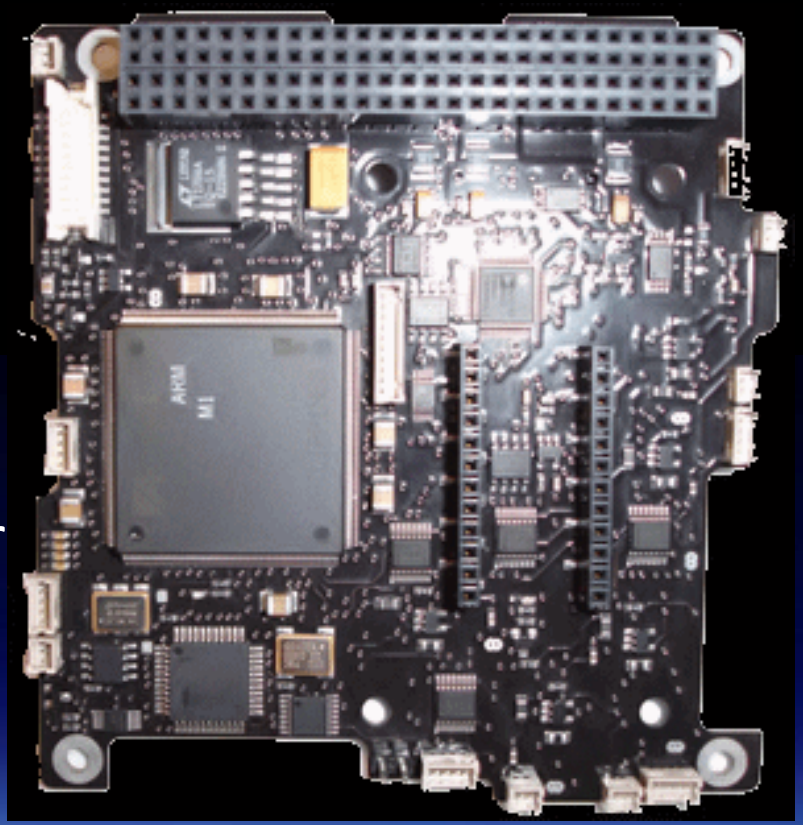
Just add Magnetorquers…

- Complete ADCS task runs on board
  - I2C telemetry and telecommand
- On board sensors include:
  - Magnetometers
  - Rate gyro's
  - Optional GPS
  - Interfaces for available for SIX 2-axis Analog Sun Sensors
- SIX current controlled Magnetorquer Drivers On Board
- Internal Parameters can be optimised easily for different mission requirements.



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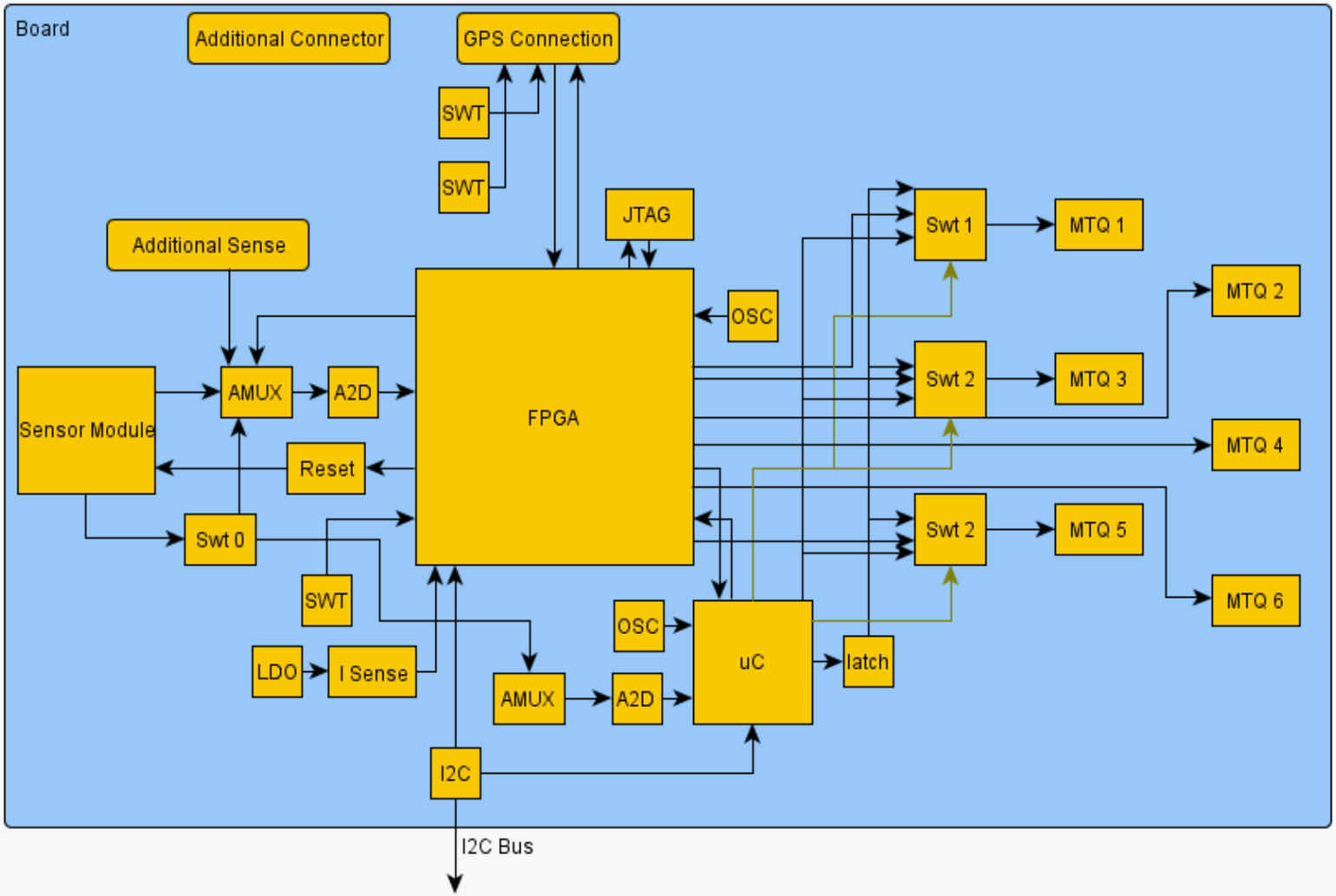
ADCS Architecture



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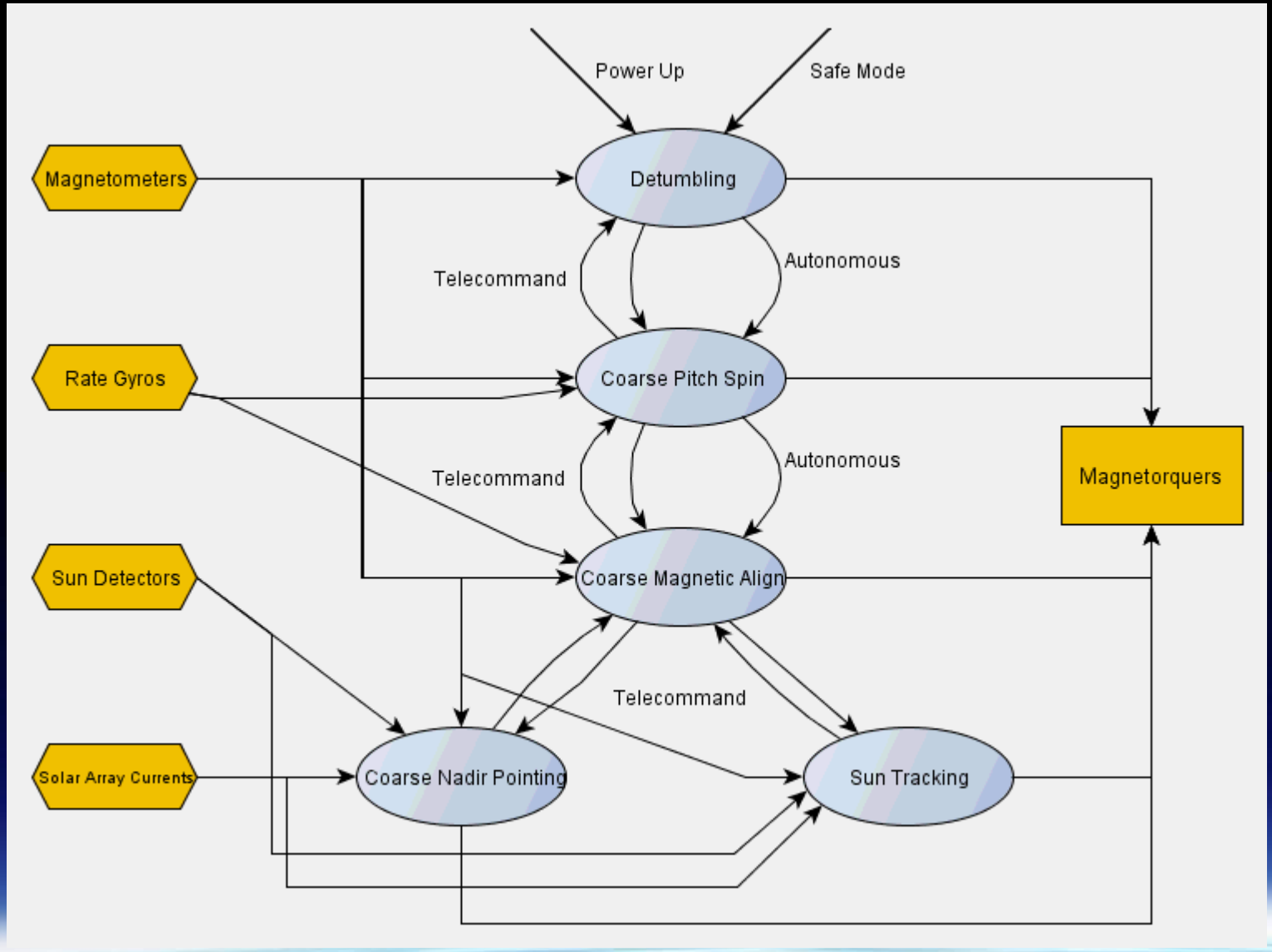
Attitude modes



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ADCS Simulation

- To provide confidence in the performance for specific missions, bespoke orbits and parameters can be simulated within our Matlab model.
- From this, changes can be made to the control parameters to obtain the optimally performance
- The basic controller design suitable for most scenarios unmodified (plug and play).

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Matlab Simulation Model

- All sensors outputs based on measured data from real sensors.
- All actuators models based on measured data
- Disturbances modelled using high fidelity models

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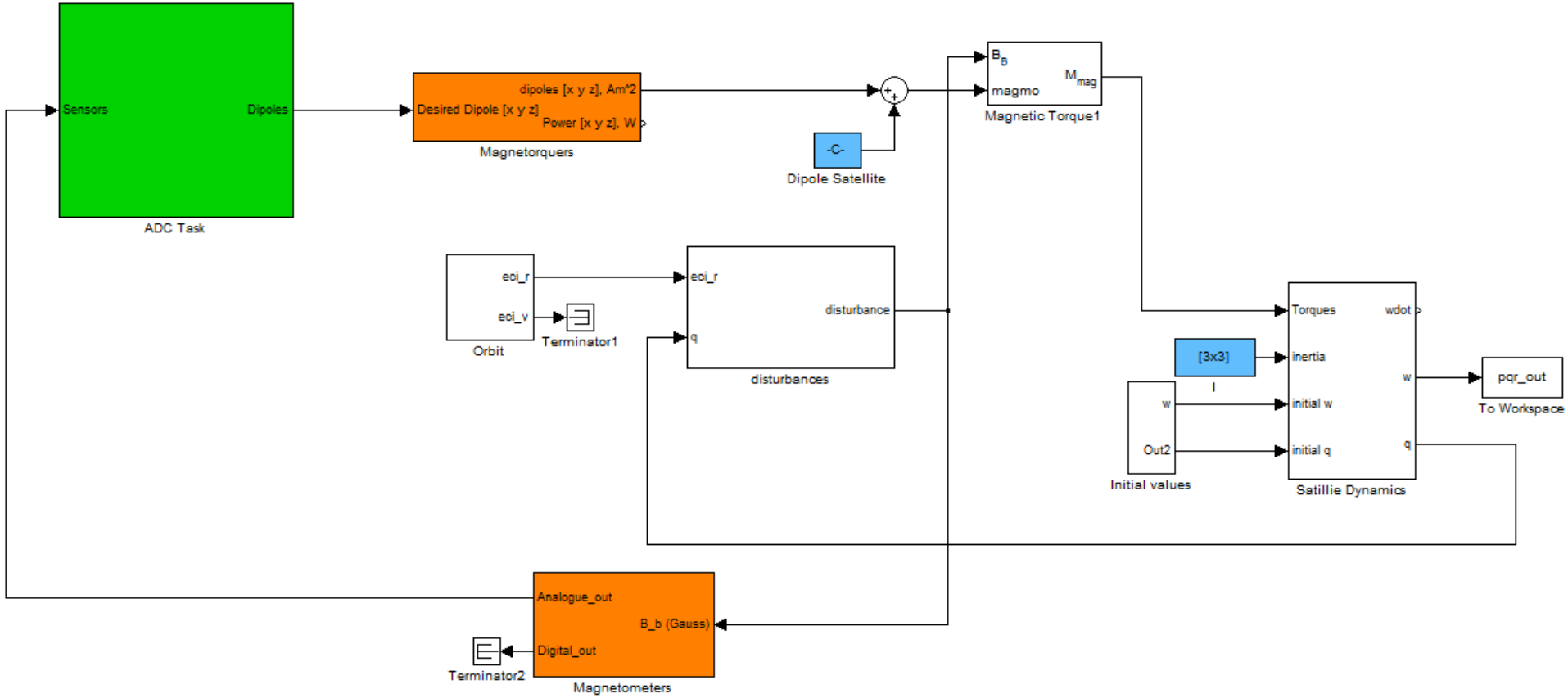
Simulation Model



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ADCS Customisation

- Additional modes can be included
  - If additional modes or experimental modes are required, they can be included
- Additional sensors can be included
  - New sensors? Improved sensors?
  - Interfaces exist for these to be added in and they can be easily combined with the other sensor data
- Additional actuators can be included
- FPGA can be reprogrammed in flight
  - Upload new versions of HDL code to improve performance.
- Development roadmap includes the addition of mass memory for log data

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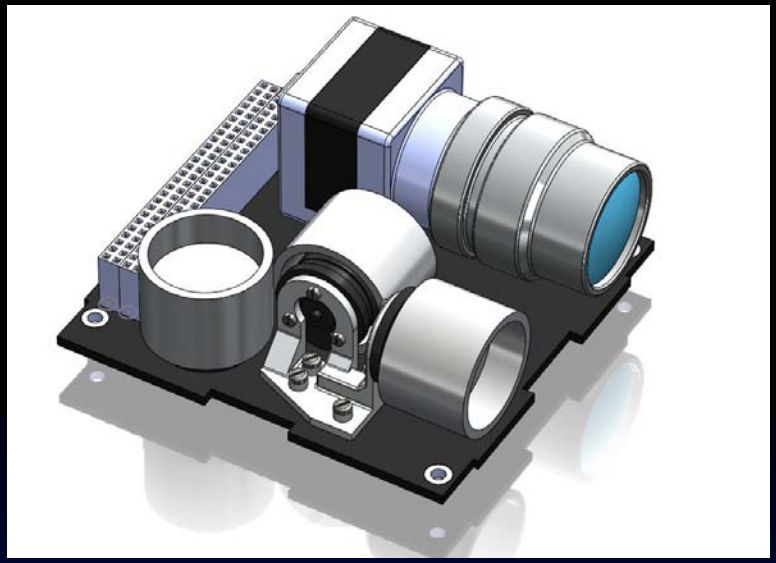
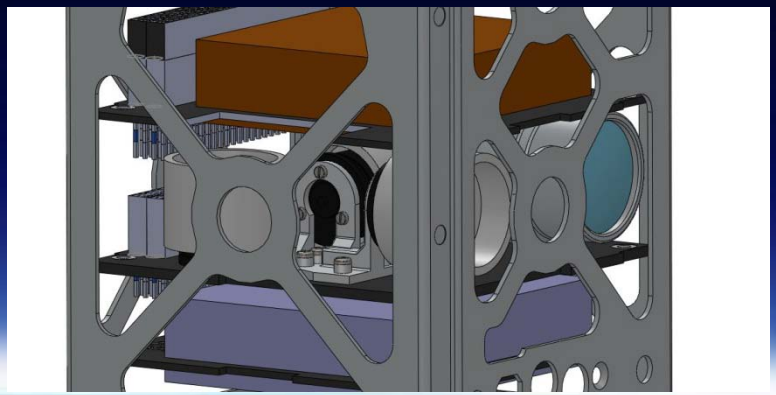
3 Axis Reaction Wheels

- Inertia disk $5x10^{-6}kgm^2$
- Angular momentum $2.6x5x10^{-3}kgm^2/s$ @ 5000RPM
- Nominal torque 2-3mNm
- Estimated total mass (3 wheels plus electronics) <200g.
- Ready for Ukube-1 end 2011.





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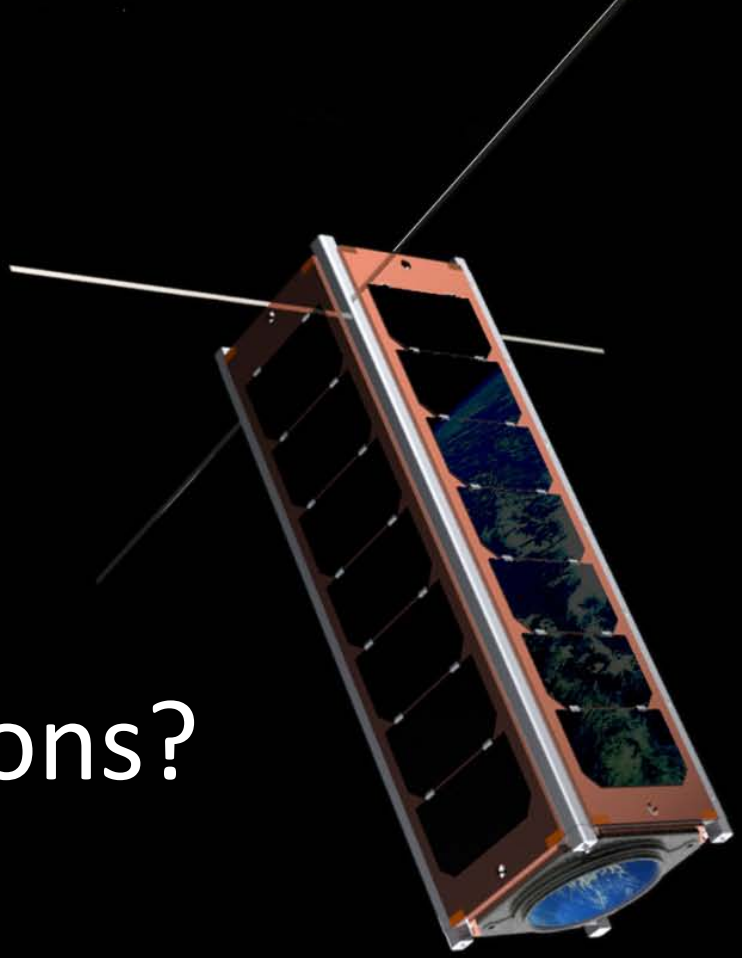

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