CubeSat Command Control and Communications System

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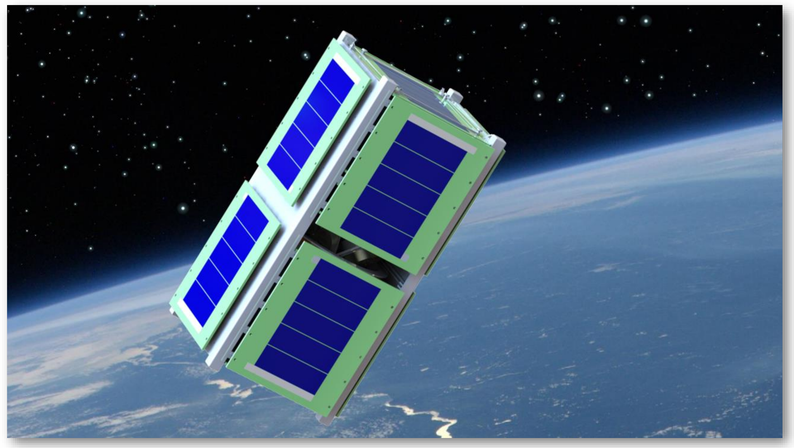
Introduction

The Portland State Aerospace Society (PSAS) is the lead on the Oregon Small Satellite Project. “OreSat” is a CubeSat form-factor nanosatellite designed for a low-earth orbit of 400 km.

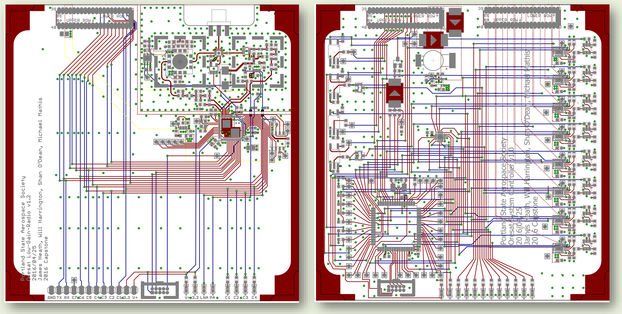
OreSat requires a robust command, control, and communication (C3) system to control the satellite. The C3 system must communicate to the ground over 1,400 km (at acquisition of signal) at low data rates (9600 bps) while monitoring and controlling the power system of the satellite.



Design

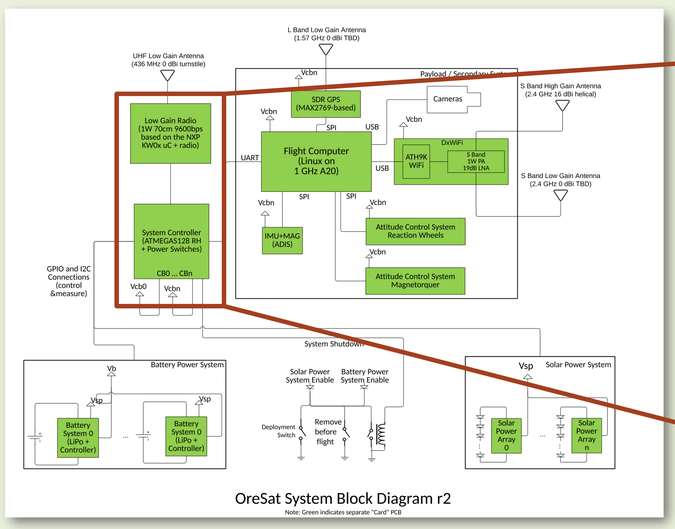
We split our design into two parts, the Low-Gain Radio (LGR) which handles communication and the System Controller (SC) which is in charge of command and control for the module

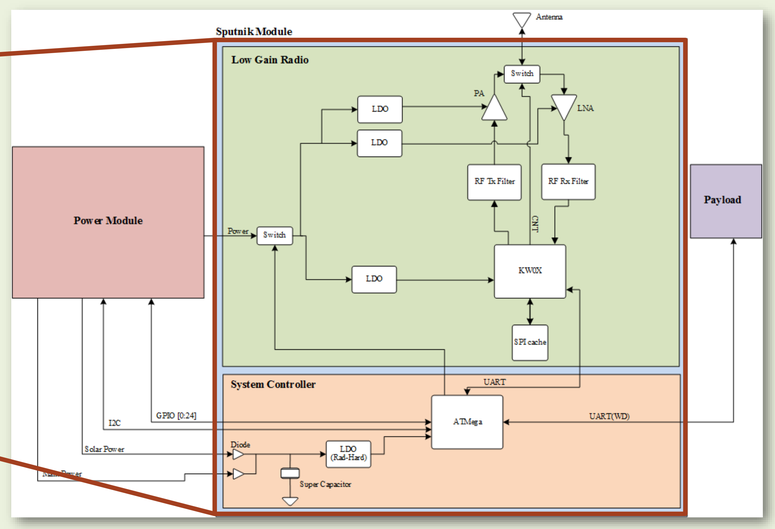
Our design is only two of the many modules in OreSat. The LGR is used for communication with the Cubesat, supplying 1 Watt of transmission power to cover the long distance. The System Controller, which will be accessible from the ground station via the LGR, will inform the ground crew in the case of radiation latch-up and can restart the whole satellite if necessary.



The boards need to be cut in order to fit properly.

The layout of the LGR (left) and the SC (right)

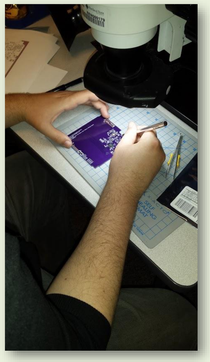




Current Results

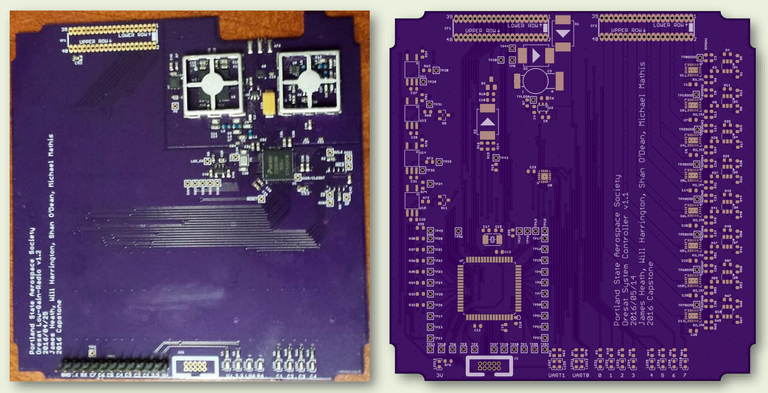
As of 5/24/2016 the accomplishments of the project include:

- Finished Low-Gain Radio board
  - Current limited power tests have worked
  - Carrier signal at desired power and frequency has been transmitted
  - Working on packet transmissions
- Finished System Controller design
  - Waiting for board delivery to commence building
  - Firmware complete on evaluation board.



Jake Heath working on an LGR module

Carrier Signal (Left) and the 10km test location (Right)



Completed boards for the LGR (left) and the SC (right)

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