Design and Development of AntSat 01’s 2U CubeSat Flight Subsystems

UCI CUBESAT

MISSION & RESEARCH SIGNIFICANCE

Objective
- Take initiatives to ensure software and firmware mission success, and then find ways to make the lives of our developers easier

Initiatives
- Software development, specifically in the context of safety and embedded systems.

PAYLOADS

Variable Emissivity Device
- Changes color and emissivity in response to varying voltages. We will test its performance under direct solar radiation.
- Similar materials will be used as a method of thermal management on future spacecraft.

COMMUNICATIONS

Contributions to the project
- Work with the antenna team to set up a notification system that will send notifications to an email list.
- Design and develop a PCB to transceive and receive communication from satellite and the ground station.

SYSTEMS

Primary focus
- Develop objectives, requirements, and stakeholders needs for the mission.
- Build research to develop and build the satellite.

Contributions to the project
- Updated concept of operations document
- Coordinate with other subsystems to design hardware and plan for systems integration
- Prototype panel and antenna deployment mechanisms, as well as the burn wire system
- Conduct FEA analysis on structural components

POWER

Purpose
- Provide, store, distribute and control CubeSat electrical power.

Functionality
- Absorb energy from photovoltaic (PV) cells and supply it to the system
- Battery storage system used to feed load when energy produced insufficient and to store excess energy as possible
- To select appropriate configuration, mission profile of UPSat is studied to evaluate environmental conditions and energy required

Subteam responsibilities
- Create the PCBs to support mission, select components such as MCUs and solar cells, and build the entire design.
- 7 (30%) PV cells in parallel to a battery array through voltage step-up boost converters
- Implement a P&O MPPT algorithm with EPS microcontroller
- Battery Array: 3 Li-Po batteries (3.7V, 4Ah)

GROUND STATION COMMUNICATIONS

Objective
- Create a preliminary dashboard for displaying and analyzing log data.

Accomplishments
- Established the database to store logs using a MySQL database
- Created a server (using an Express backend) that will be used to fetch and manage log data
- Developed a frontend that has basic views for the data using React

CONCLUSION & FUTURE RECOMMENDATION

Concluding Comments:
- The Cubesat project is a continuously developing project and builds upon previous designs.
- Work being done will enable future teams at UCI and other universities around the globe to replicate our results and build upon our open source designs

Recommendations:
- The team will focus on the following quarters on updating designs and consolidating documentation

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