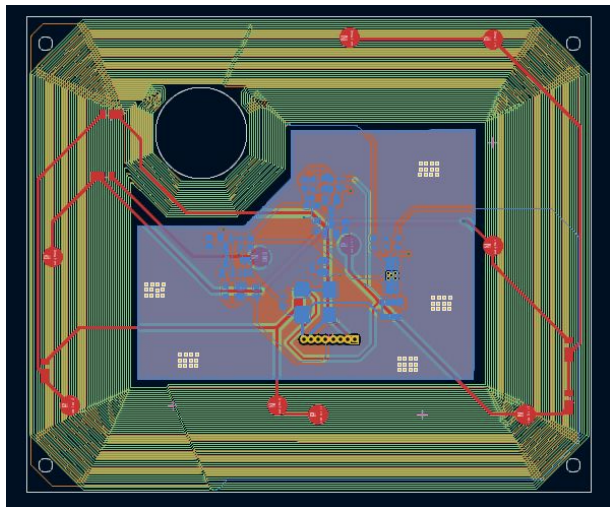# Avionics Week 10 16/18-873F23

Blockers
- FPrime requires WSL on Windows, Zephyr not supported on WSL

Requirements

Weekly Results
- Updated solar/torque coil boards
  - Selected LUX sensor instead of incidence angle
  - Selected GPS patch antenna to integrate
- Compiled Zephyr for PyCubed hardware

Next week
- Update Pycubed hardware
  - (Jetson relay, Jetson comm, solar sensor connections, redundant IMU)
- Continue Zephyr board configuration
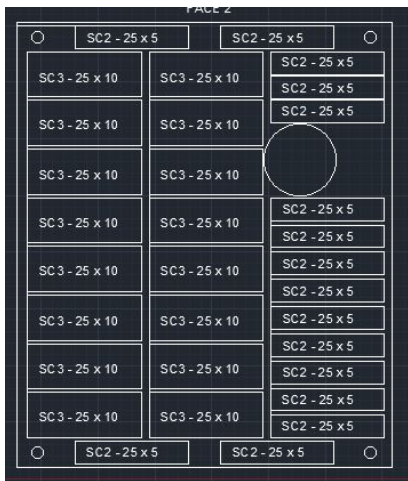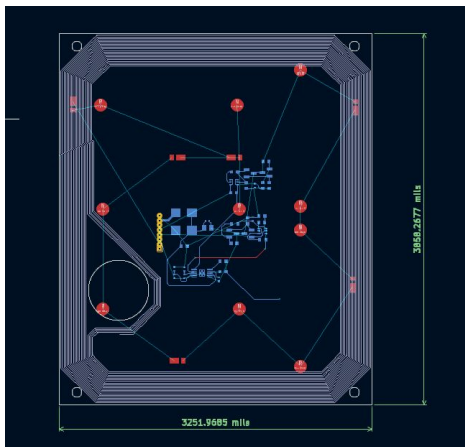- Continue Zephyr integration with FPrime
- Build battery boards

Interfaces

Vision: Jetson power estimations

GNC: Attitude workload for Jetson power estimate

Ops: PyCubed RFM driver

Mech: RFM antenna positions (keepouts)

Blockers

- FPrime deployment setup

Requirements

-

Weekly Results

- Solar cell layout for outer boards
- Torque coil boards v1
- Ordered parts for solar/torque board v1

Next week

- JPL Meeting
- Update PyCubed hardware (solar sensor & Jetson support)
- FPrime deployment setup
- Driver development

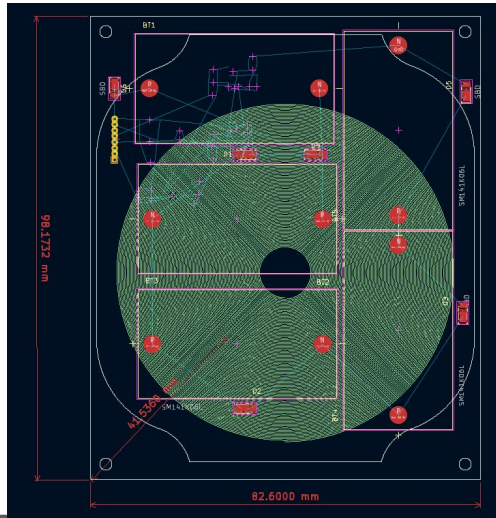## Interfaces

Vision: Communication interface between Jetson and PyCubed, Jetson power estimate
GNC: Attitude workload for Jetson power estimate
Ops: PyCubed RFM driver
Mech: Antenna keepouts, deployable panel outline and keepouts

Avionics Week 8 16/18-873F23

Blockers
- Mechanical: Camera keepout region, limit switches location for solar/torque coil boards.

Requirements
- Mechanical: Mounting holes for internal stackup
- Vision: Camera interface selection

Weekly Results
- Development of solar/torque coil boards
- Chose GPS module (easy integration to PyCubed)
- Power budget updates

Next week
- Solar/Torque coil board
  - Finish the torque coil integration to PCB
  - Integrate selected solar sensor
- Plan PyCubed redesign
- Finish FPrime deployment setup

Interfaces

Vision: Power estimates for Jetson, waiting for camera hat, connection adapters

GNC: FPrime development, solar sensor selection, GPS selection

Ops: None

Mech: Chose silicon solar cells, number of burn wires

To-do 15

▼ Hardware 23 ... +

📄 Develop Camera Mounts? ✏️ ...

Master BOM

📊 List of Data from Avionics for Ops
- Ⓡ Rohan Raavi

🤖 GPU Payload Board (ML Board)
- Ⓡ Rohit Bangal
- Ⓝ . Nischal Mahadeshwar Ⓡ Rohan Raavi

☀️ Solar Estimation for Solar Board Design
- Ⓗ Harry Rosmann Ⓡ Rohit Bangal

+ New

In progress 8

🔄 Solar & Torque Coil Boards
- Ⓝ . Nischal Mahadeshwar

📄 Choose solar sensor
- Ⓝ . Nischal Mahadeshwar
- Ⓚ Karen Abruzzo Ⓗ Harry Rosmann

📊 Update Block Diagram
- Ⓗ Harry Rosmann

📄 Burn Wire Mapping
- Ⓝ . Nischal Mahadeshwar

Plan PyCubed Redesign
- Ⓗ Harry Rosmann
- Ⓝ . Nischal Mahadeshwar

📄 Order GPS
- Ⓗ Harry Rosmann

⏻ Power Budget
- Ⓗ Harry Rosmann Ⓡ Rohit Bangal
- Ⓡ Rohan Raavi Ⓨ Yifan Yan
- Ⓚ Karen Abruzzo

Complete 13

🖥️ PyCubed Hardware Overview
- Ⓗ Harry Rosmann Ⓡ Rohit Bangal
- Ⓝ . Nischal Mahadeshwar

SOLVED: USING PYCUBED LORA; Meeting with Ops team for LoRA module selection and power consumption associated with it.
- 💬 1

Find Suitable Jetson Carrier Board

Find solar boards

📄 Specification of LoRA module recommended by OPS.
- Ⓝ . Nischal Mahadeshwar

💾 Select IMU based on GNC requirements
- Ⓡ Rohan Raavi Ⓗ Harry Rosmann
- 💬 1

📄 Integrate GPS into PyCubed
- Ⓗ Harry Rosmann

▼ Software 13 ⋯ +

Driver for RFM

Driver for Cameras

Driver for IMU

Driver for GPS

Driver for Torque Coils

Driver for Solar Sensors

Driver for SD Card

Driver for Watchdog

Driver for Jetson/Pycubed Comm

Driver for Burn Wires

+ New

Generate FPrime Executable

Karen Abruzzo   Yifan Yan
Rohan Raavi   Harry Rosmann

+ New

Configure FPrime to compile for PyCubed

Harry Rosmann

Driver Implementation Timeline

Harry Rosmann

+ New

Sprint Planning Timeline

Add new sprint

▼ @Next Wednesday for 🏃 Sprint #1 (11/1/2023)

Finish deployment setup for PyCubed

▼ @November 8, 2023 for 🏃 Sprint #2 (11/8/2023)

Driver for IMU

Driver for Torque Coils

Driver for Solar Sensors

Driver for Burn Wires

▼ @November 15, 2023 for Sprint 3

Driver for RFM

Driver for Jetson/Pycubed Comm

▼ @November 22, 2023 for Sprint 4

Driver for RFM

Driver for Jetson/Pycubed Comm

▼ @November 29, 2023 for Sprint 5

Driver for GPS

Driver for SD Card

▼ @December 6, 2023 for Sprint 6

Driver for GPS

Additional Overflow

Avionics Week 6 16/18-873F23

```
s/Utils.dir/CRCChecker.cpp.obj
[ 98%] Linking CXX static library ../../lib/pycube
d/libUtils.a
[ 98%] Built target Utils
[ 98%] Generating TlmLinearChanComponentAc.cpp, Tl
mLinearChanComponentAc.hpp
[100%] Generating TlmLinearChanComponentAi.xml
Scanning dependencies of target Svc_TlmLinearChan
[100%] Building CXX object Svc/TlmLinearChan/CMake
Files/Svc_TlmLinearChan.dir/TlmLinearChan.cpp.obj
[100%] Building CXX object Svc/TlmLinearChan/CMake
Files/Svc_TlmLinearChan.dir/TlmLinearChanComponent
Ac.cpp.obj
[100%] Linking CXX static library ../../lib/pycube
d/libSvc_TlmLinearChan.a
[100%] Built target Svc_TlmLinearChan
```

Successfully compiled FPrime for PyCubed

Blockers

- None

Requirements

- Keepouts for camera on solar boards

Weekly Results

- Integrated toolchain to compile FPrime for ARM device
- Battery board verified and ordered

Next week

- Flash one of the Pycubed boards with FPrime (need toolchain to output executable)
- Implement a blink test on Pycubed board using FPrime
  - IMU data
- Develop and order torque coil boards

Interfaces

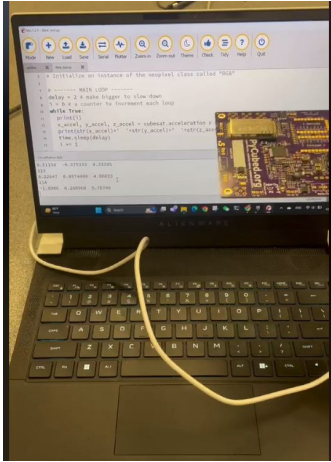**Vision**: Software support for interfacing with cameras using Jetson. 6 Camera HAT board discussion.

GNC: Get GNC setup to start developing flight software

Ops: Develop RFM interface on FPrime

Mech: Deployables, solar cells, mounting holes

Avionics Week 5 16/18-873F23

Collecting IMU data:
https://drive.google.com/file/d/1Q1CBaLEFpnNZ1WbjKNR-YIwaFHFr0KiW/view?usp=sharing

Blockers

-

Requirements

- Mechanical: Need to know internal layout of cameras so we can adjust board designs

Weekly Results

- 2 more PyCubed assembled and powered successfully
- Basic example codes tested - NeoPixel, IMU

Next week

- FPrime onboarding, run FPrime on PyCubed
- Start development of Solar Cell/ Magnetic torque coil board.
- Start development of battery board.

Interfaces

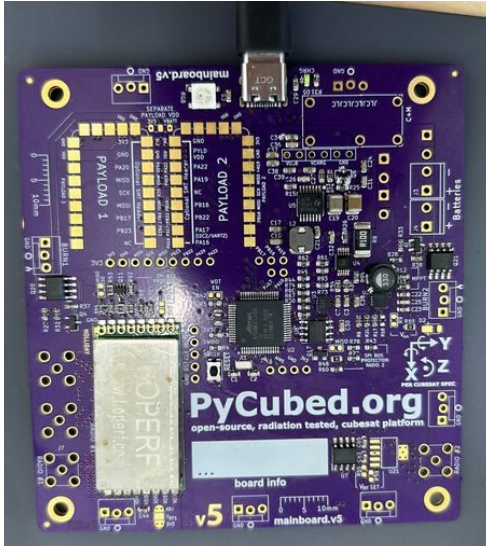**Vision**: Software support for interfacing with cameras using Jetson

GNC: F' meeting

Ops: F' & RFM meeting

Mech: Internal layout, deployables, solar cells

Avionics Week 4 16/18-873F23

Blockers
- Camera selection for hardware development

Requirements

- Actual compute module power consumption

Weekly Results
- First PyCubed assembled and powered successfully
- Updates to power budget

Next week
- Initial interfaces test on PyCubed module.
- Build 2 more PyCubed boards.
- Start designing Camera/ Solar and magnetic torque coil boards.
- Evaluate off the shelf/ design the Carrier Board for Jetson compute Module.

Interfaces

Vision: Communication interface with ML module and control module

GNC: Meeting about software stack

Ops: Meeting about software stack

Mech: Fitting all six cameras with telephoto lens inside the CubeSat (PCB outline and arrangement)

Avionics Week 3 16/18-873F23

Block Diagram V1.1

Blockers
- Waiting for the PyCubed board to arrive
- Parts selections for more accurate power budget estimation

Weekly Results
- Created initial estimated Power Budget for major components
- Created more Fleshed Out Block Diagram
- Did initial Research on PyCubed Software Stack and F Prime Flight Software
- Started Designing the Drivers for Magnetic Torque Coils

Next week
- Select software stack - CircuitPython or F Prime
- Talk with GNC Team about dividing Software Work
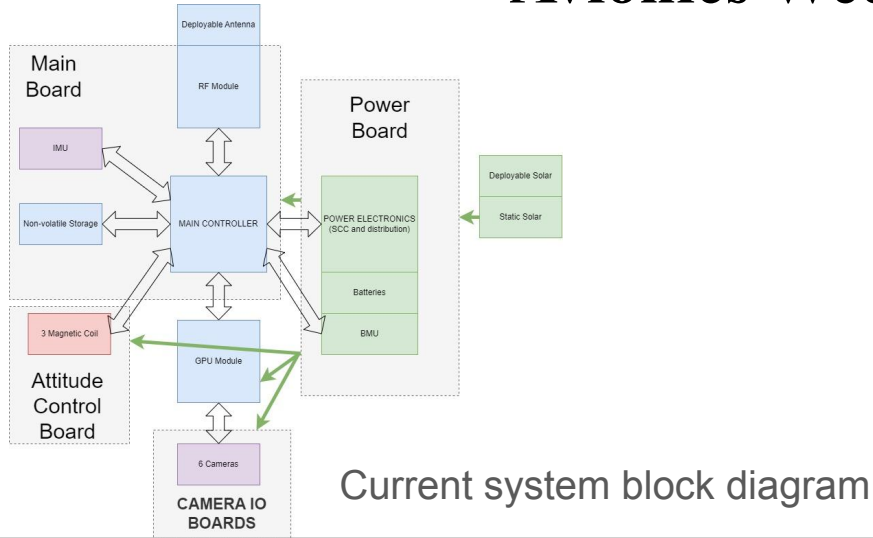- Build pycubed boards for initial integration testing.

Interfaces

Vision: Compute module(s?) and camera selection

GNC: Division of software work, torque coil specifications

Ops: Develop command and data list for transmission

Mech: None

Avionics Week 2 16/18-873F23

Current system block diagram

Blockers
- None

Requirements
- Camera and Processor specs from vision team
- IMU and Coil requirements from GNC team

Weekly Results
- Created block system level diagram
- Discussed with all other teams about primary requirements
- Updated requirements

Next week
- Get PyCube board running and run simple interface code with available sensors or other boards
- Solar estimation to determine whether we need deployable panels
- Power source and drain calculations with burst usage availability

Interfaces
Vision
- Camera and Processor Specs
- # of cameras and duty cycle

GNC
- Power consumption of magnetic torque coils
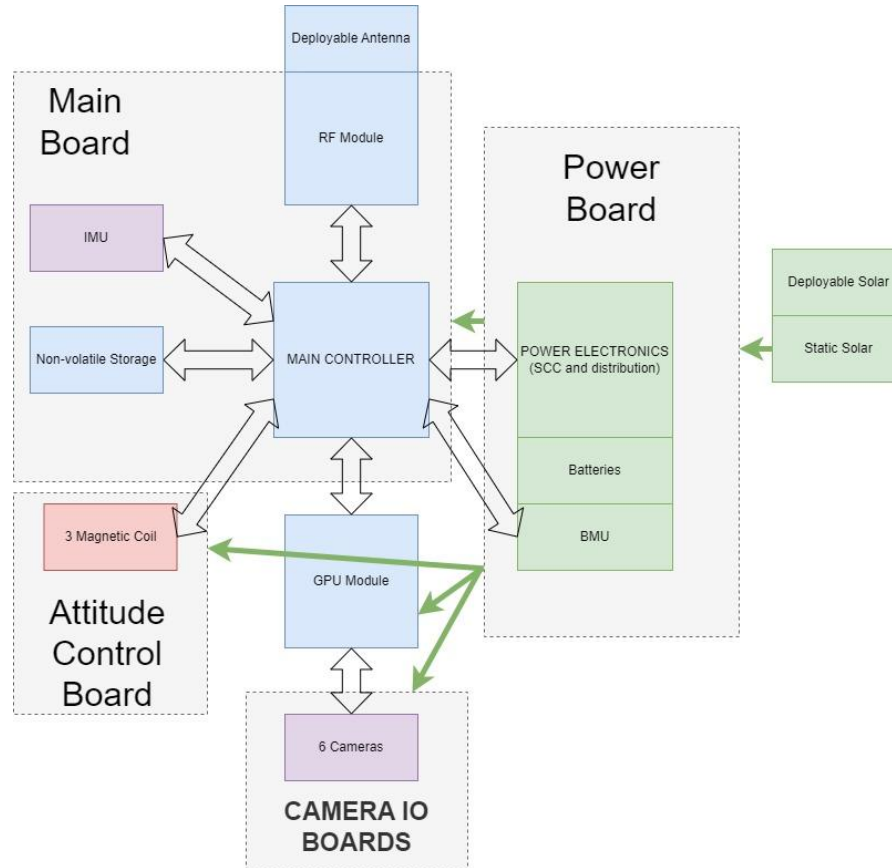- Orbit estimation for determining solar power, comm time

Ops
- Data input and output
- Detailed power consumption for RF Module

Mech
- Board dimensions and mounting options
- Deployable Switches

Hardware Block Diagram

Avionics Week X 16/18-873F23

Blockers

●

Weekly Results:

Next week:

Interfaces

Vision

GNC

Ops

Mech