Avionics Week 3 16/18-873S23
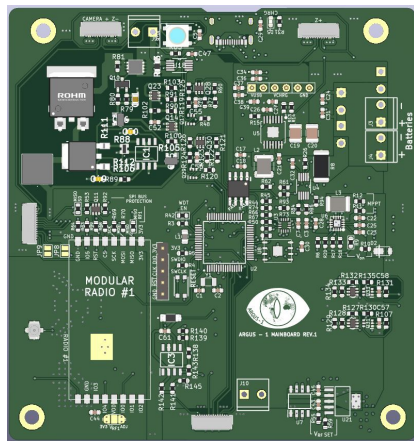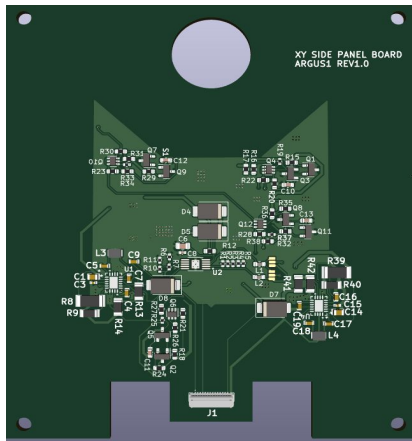

PyCubed

XY Torque

Blockers

- New camera interface selection (vision/gnc)
- Top board keepout for the radio antenna

Weekly Results:
- V1 PyCubed & XY torque boards ready to order
- V1 Camera board (Z torque)
- V1 Battery Board

Next week:
- Order completed boards (after class today)
- Setup flight software repo for CircuitPython & deploy
- CircuitPython driver development
- Integration test planning
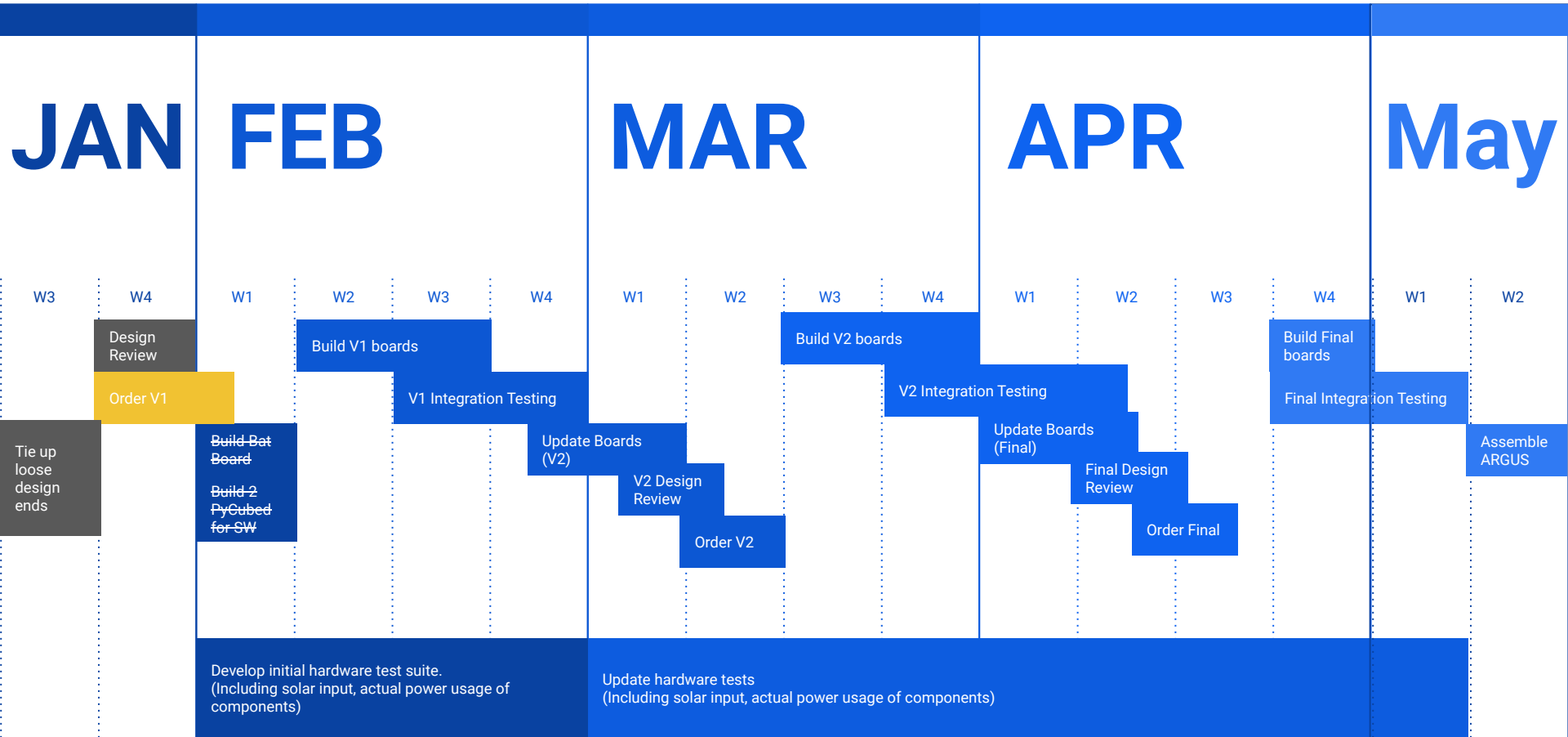- Finalize Designs V1 deployable, camera, z-radiator boards
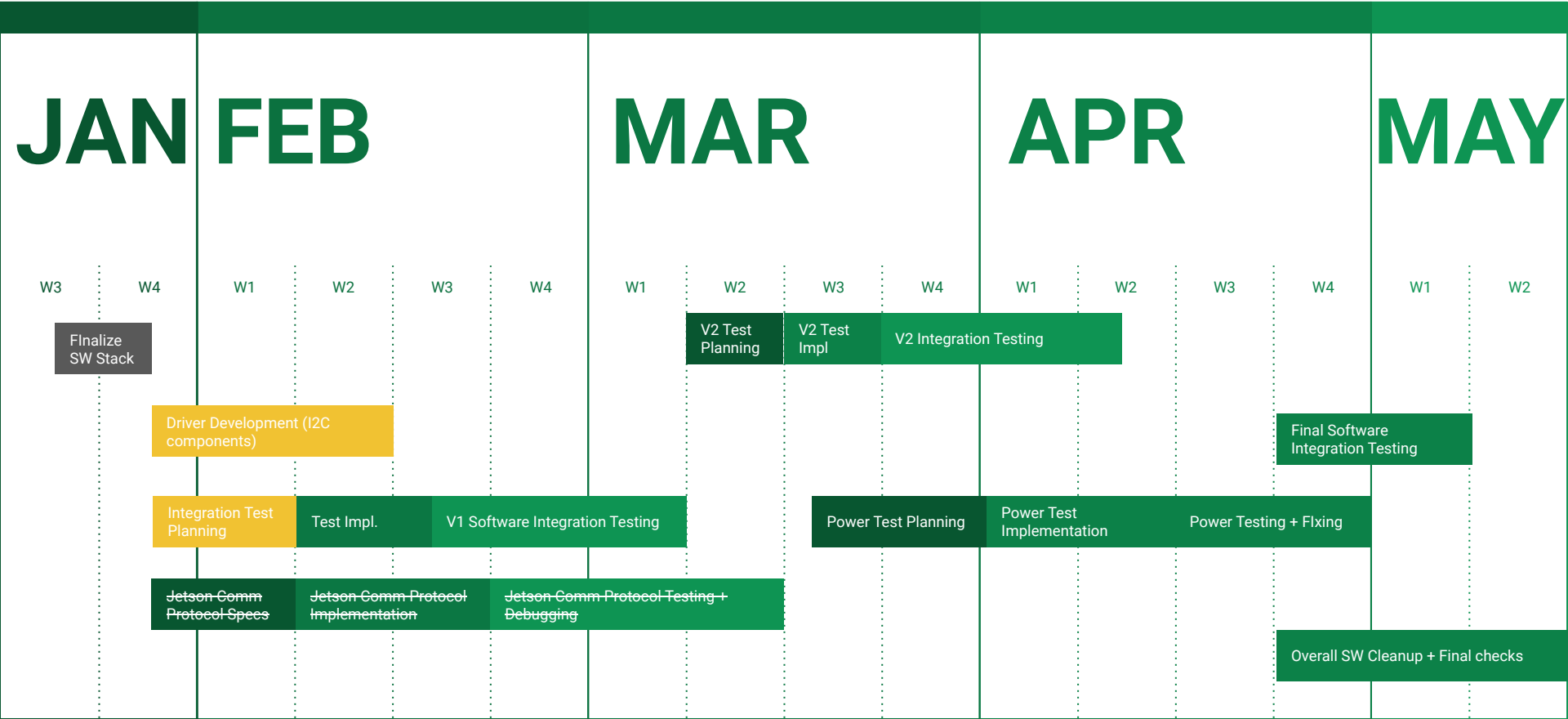
Interfaces

Vision/GNC - None

Ops - Discuss CircuitPython Integration

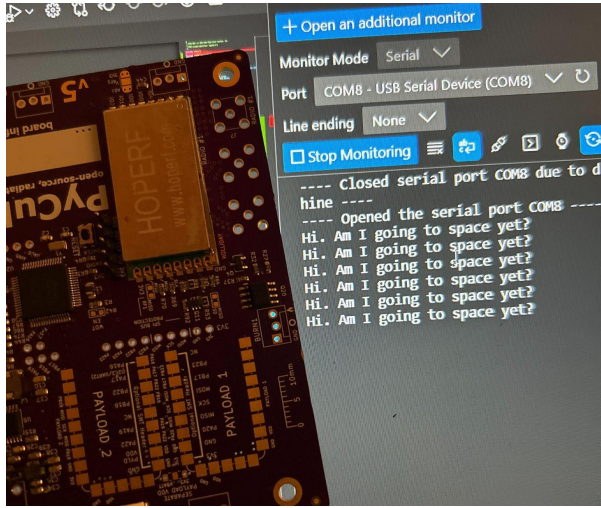Mech - Updated cutouts for deployables/z outers

Hardware Timeline

	JAN		FEB				MAR				APR				May	
W3	W4	W1		W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2

Design Review

Order V1

Tie up loose design ends

~~Build Bat Board~~

~~Build 2 PyCubed for SW~~

Build V1 boards

V1 Integration Testing

Update Boards (V2)

V2 Design Review

Order V2

Build V2 boards

V2 Integration Testing

Update Boards (Final)

Final Design Review

Order Final

Build Final boards

Final Integration Testing

Assemble ARGUS

Develop initial hardware test suite.
(Including solar input, actual power usage of components)

Update hardware tests
(Including solar input, actual power usage of components)

Avionics Week 11 16/18-873F23

Blockers

- None

Requirements

- Antenna (RFM, GPS) keepouts
- New camera keepouts out outer boards

Weekly Results

- Hello World with PyCubed/Zephyr
- Successful build with FPrime/Zephyr
- Hardware block diagram 2.0
- Initial power measurement for Jetson
  - 2 cores vs 4 cores in 7W => ~50% power savings on cores

Next week

- Build Fprime/Zephyr/PyCubed (total integration)
- Start driver development for FPrime
- Jetson power estimates
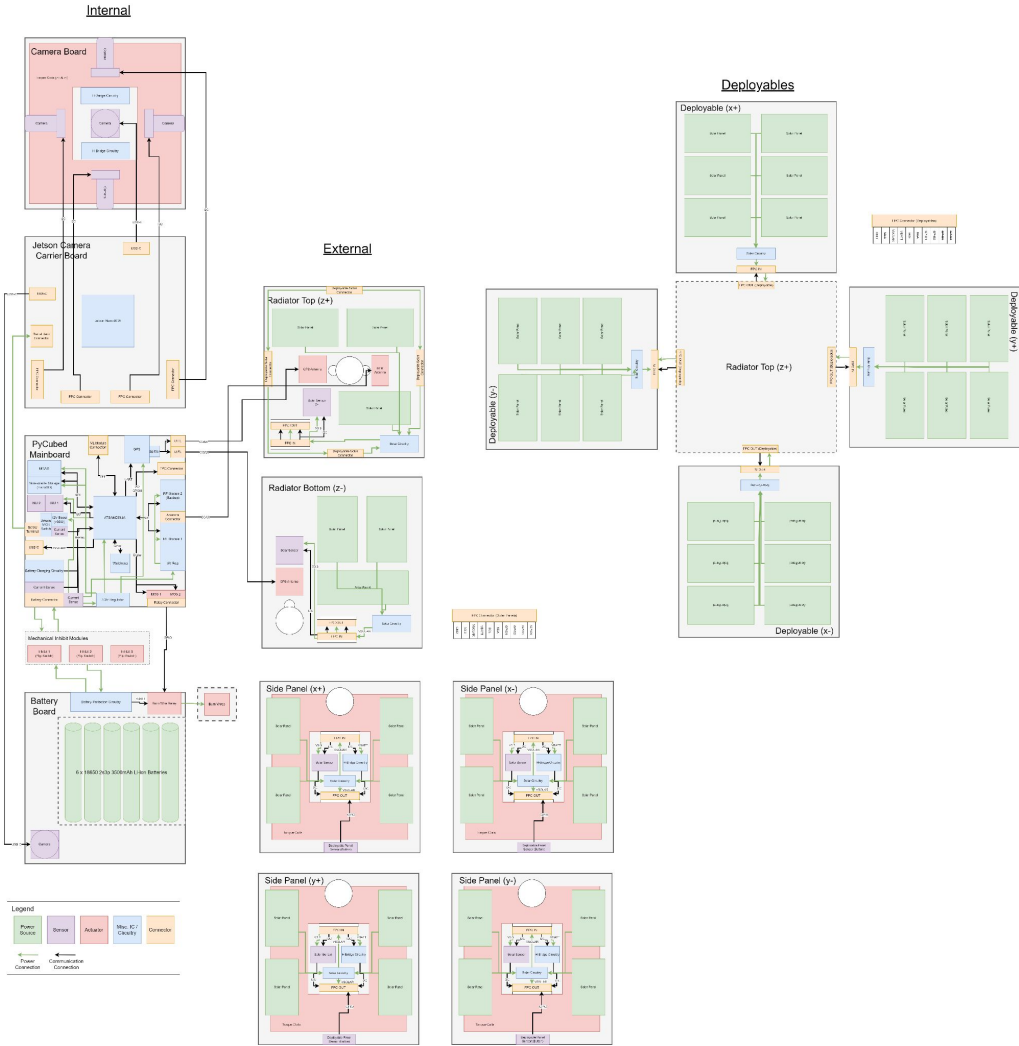- Hardware, hardware, hardware

Interfaces

Vision: Jetson power estimations
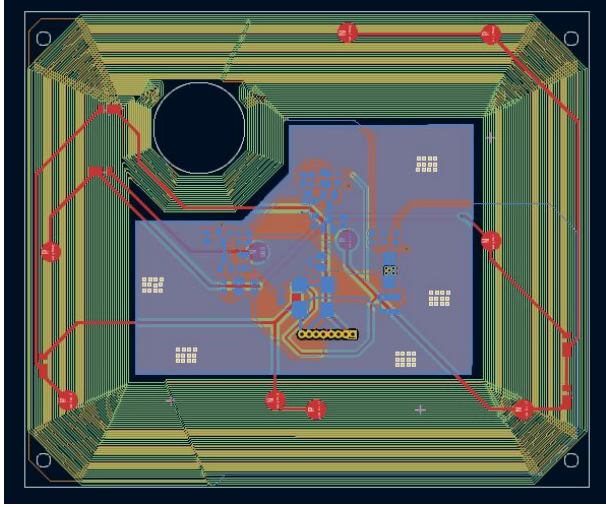**GNC**: Attitude workload for Jetson power estimate
Ops:
Mechanical: Cable management discussions

Diagram Link

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
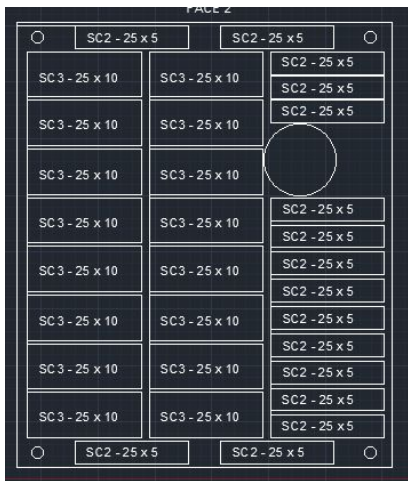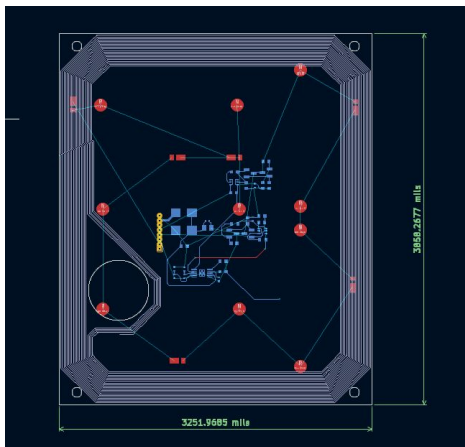- Build battery boards

Interfaces
Vision: Jetson power estimations

GNC: Attitude workload for Jetson power estimate

Ops: PyCubed RFM driver

Mech: RFM antenna positions (keepouts)

Avionics Week 9 16/18-873F23

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
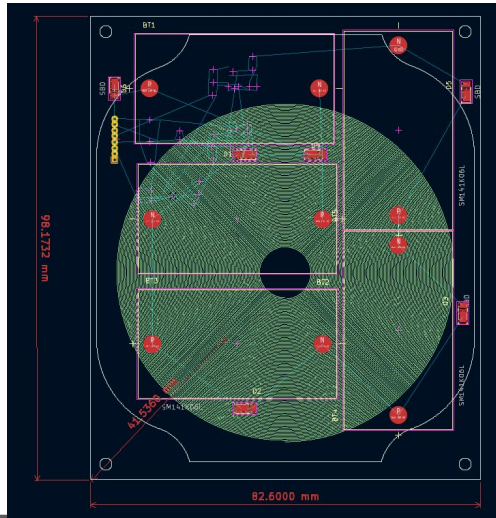- Driver development

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

👟

Add cover   Add comment

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

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
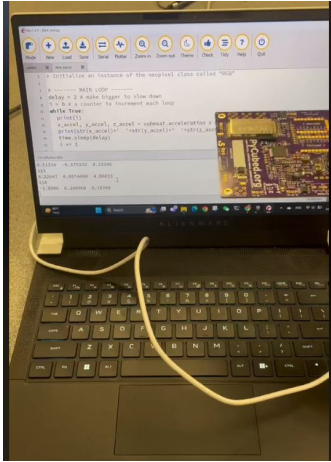- Develop and order torque coil boards

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.
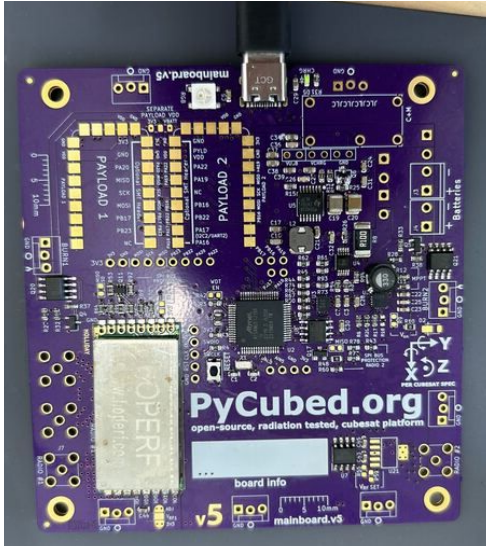- Start development of battery board.

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
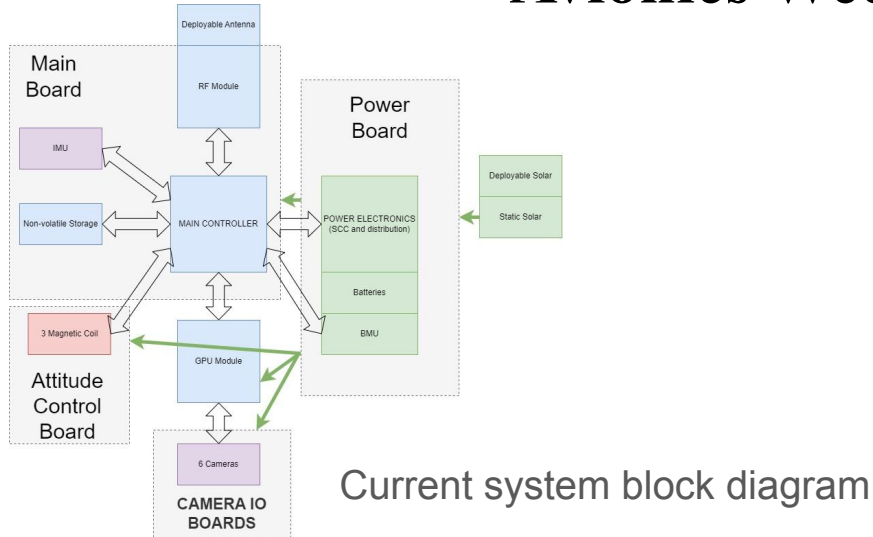- Build pycubed boards for initial integration testing.

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
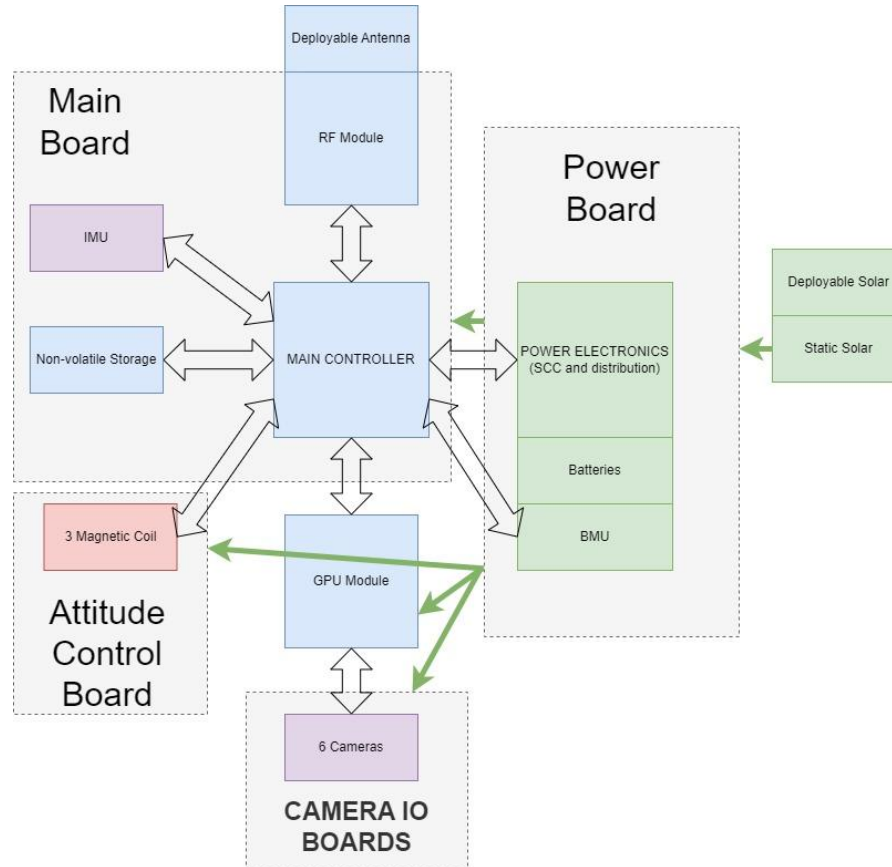- Orbit estimation for determining solar power, comm time

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