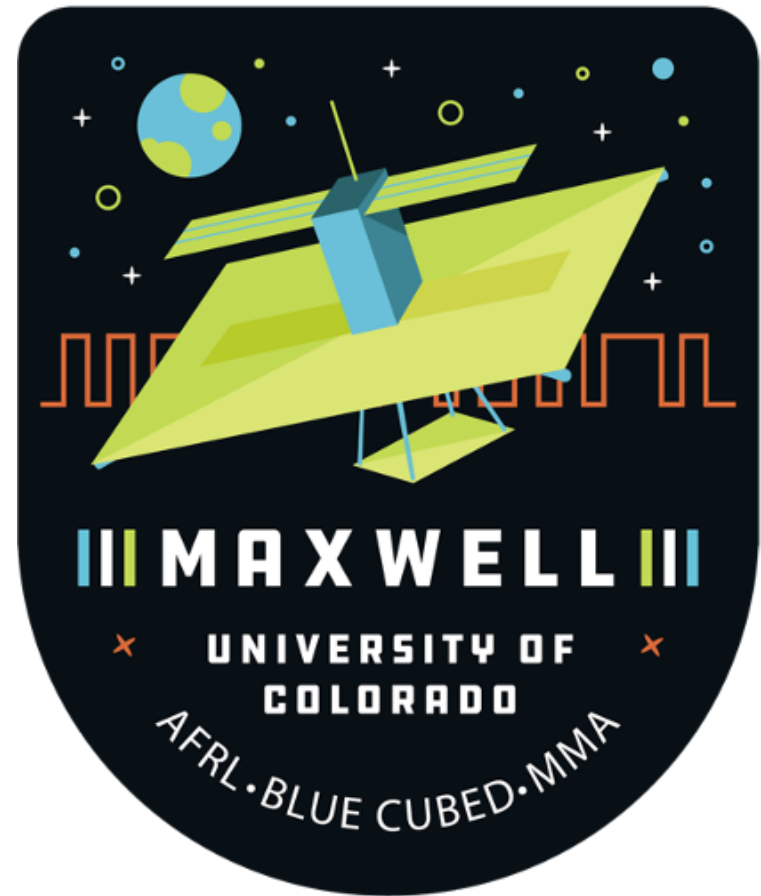


MAXWELL Mid Semester Presentation



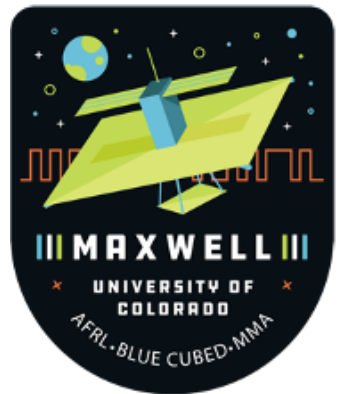
@maxwellcubesat



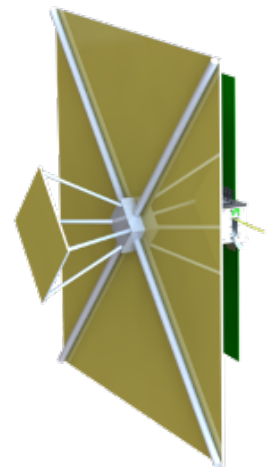
Smead Aerospace
UNIVERSITY OF COLORADO BOULDER

Spring 2023 Mid-Semester Review

- Mission Overview
- Team Organization
- Semester Goal
- Subsystem Updates
- Project Concerns

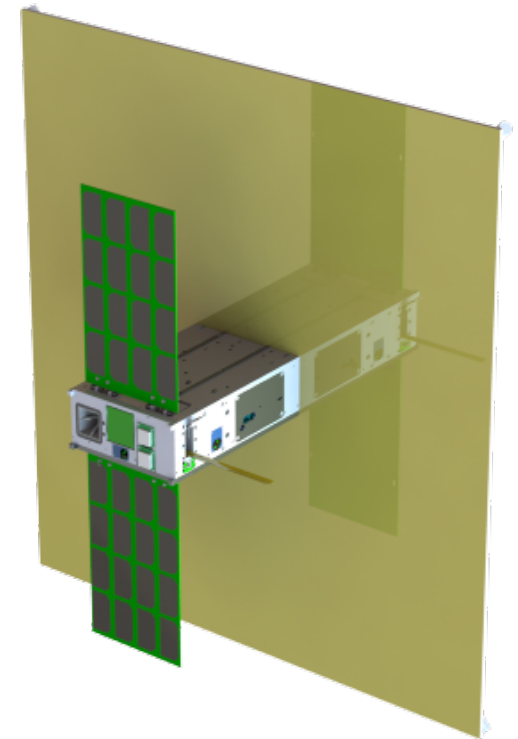


Mission Overview



Multiple Access X-band Wave Experiment Located in LEO

- ❑ 6U CubeSat designed, built, and tested here at CU
- ❑ Scheduled for completion in 2023
- ❑ **Mission level requirements:**
 - ❑ Test on-orbit CSAC Performance,
 - ❑ Demonstrate high-rate communications on a CubeSat using CDMA
 - ❑ Characterize the performance of the T-DAGHR antenna.
 - ❑ Demonstrate student-built ADCS system

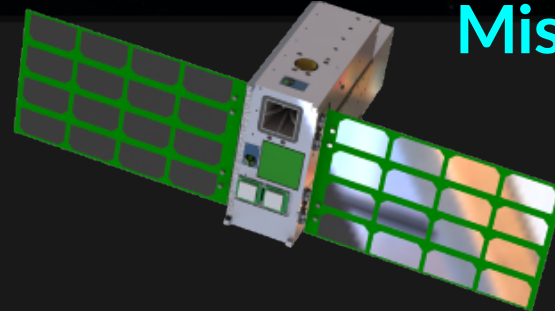


Mission CONOPS

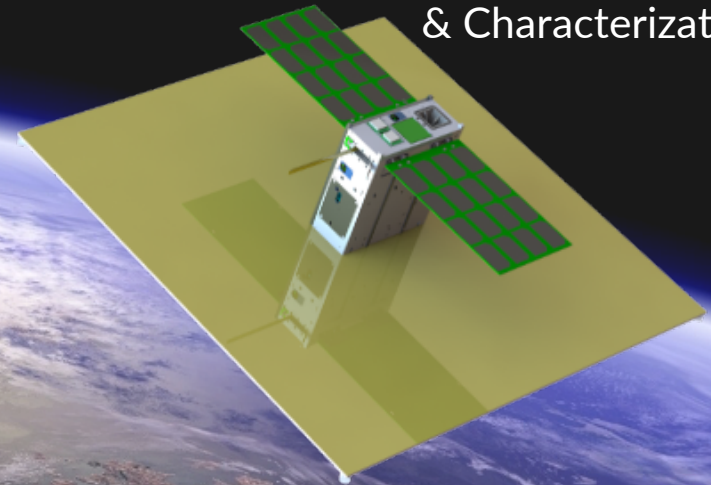
Phase 3: (MO1-4) Communications demonstration, telemetry downlink, and sun-point charging



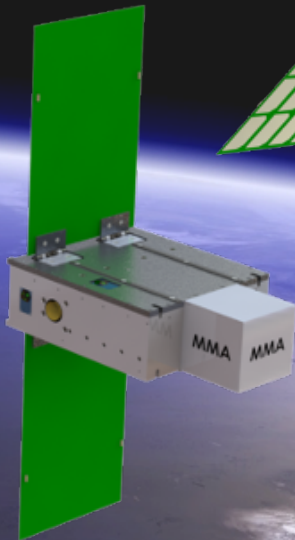
Phase 4: (MO-5) - CSAC Experiment



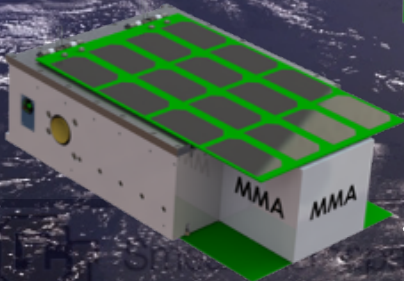
Phase 5: (MO-6) T-DaHGR Deployment & Characterization



Phase 2: Commissioning & Deployments of Solar Panels & UHF Antenna

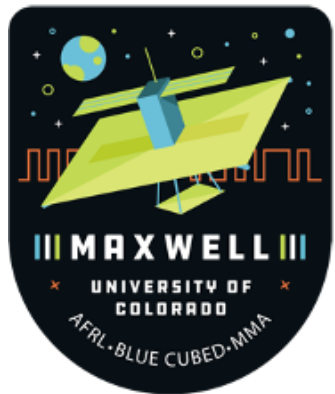


Phase 1: Ejection and LV Separation
45 min RF Silent and hazard timer

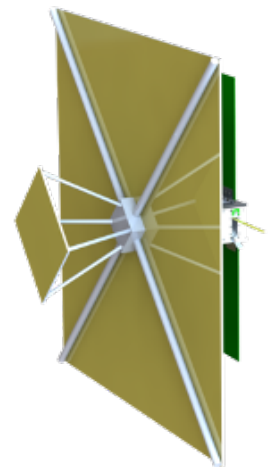


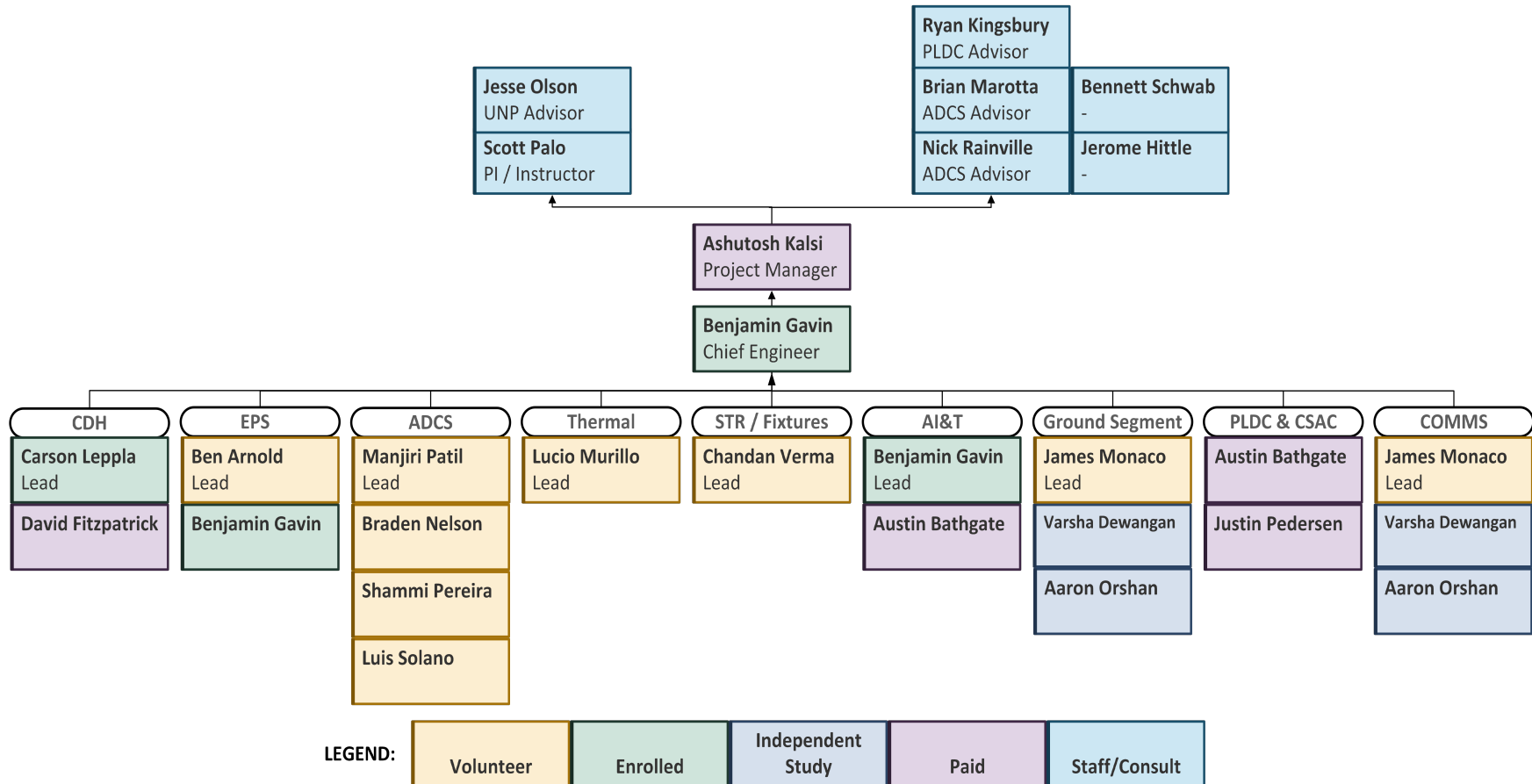
Phase 6: Deorbit, End of Mission





Team Organization

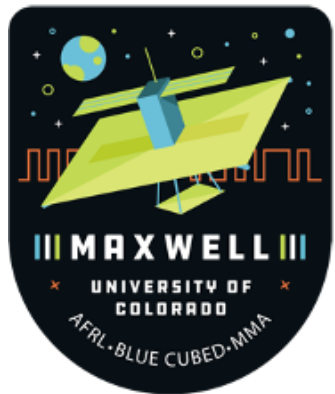






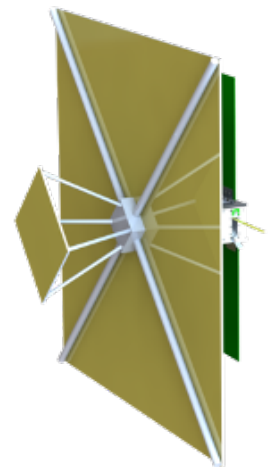
Ann and H.J. Smead
Aerospace Engineering Sciences
UNIVERSITY OF COLORADO BOULDER





Semester Goal

UNP Tests



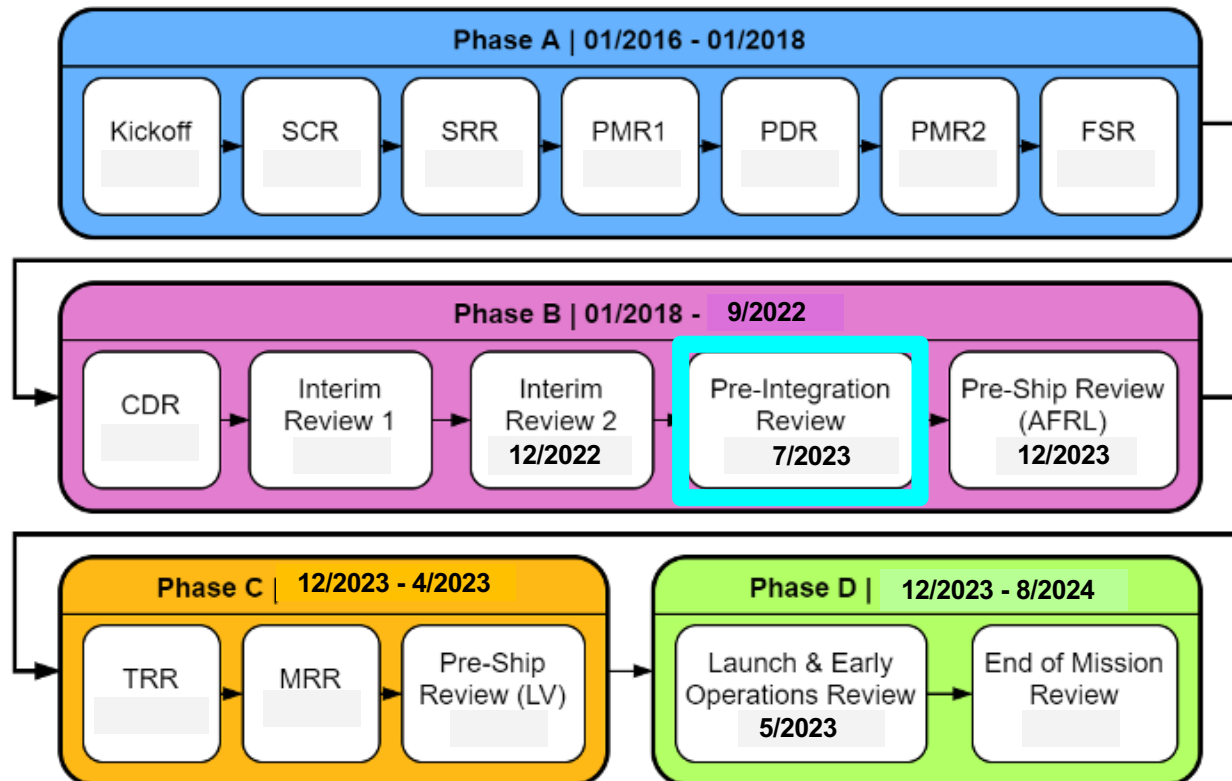
UNP - University Nanosatellite Program (AFRL)

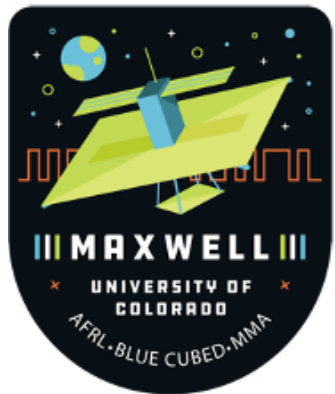
- ❑ **Day In The Life Test**
 - ❑ Demonstrate commissioning (separation & turn-on)
 - ❑ Demonstrate 24 hour operation sequence (all nominal modes & commands)
 - ❑ Capture end of life operations
- ❑ **Command Execution Test**
 - ❑ Send and check receipt/recognition of all satellite commands
 - ❑ Test must be conducted via RF transmission (no hardline)
- ❑ **Complete Charge Cycle Test**
 - ❑ Verify end to end power system
 - ❑ SOC, Solar Panels, Batteries, and Housekeeping Packet
- ❑ **Long Range Communications Test**
 - ❑ Demonstrate TT&C uplink and downlink with Lithium radio and LASP ground station
 - ❑ Long range open-air test using ground station
 - ❑ Verify antenna radiation patterns

- Subsystem Test Platforms
 - CDH, EPS, ADCS, PLDC

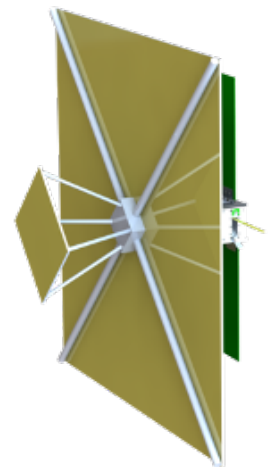
- FlatSat
 - Complete electrical model of the spacecraft

- Engineering Development Unit
 - Complete structural model of the spacecraft, partial electrical model for ADCS/COMM testing





Subsystem Updates

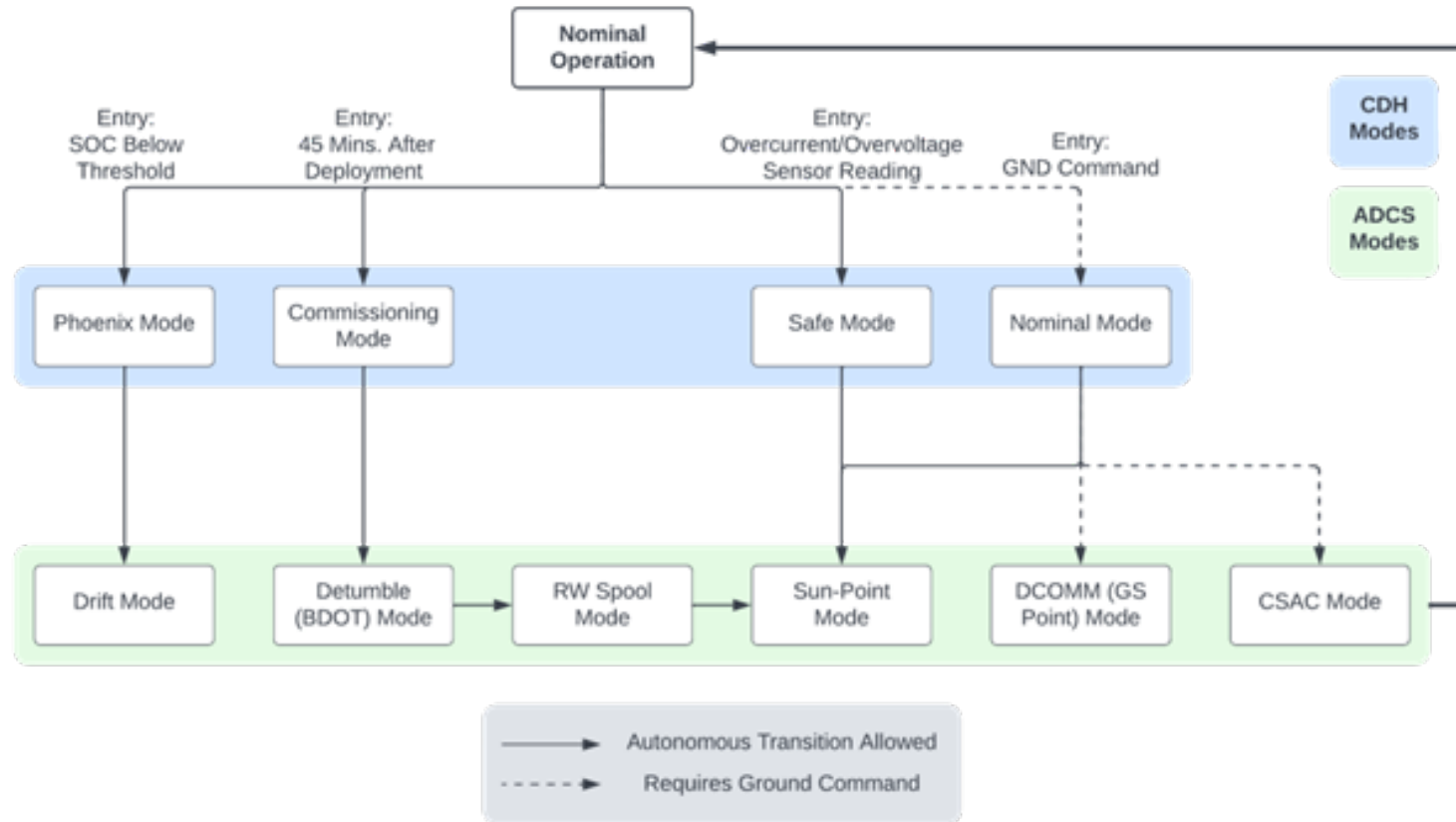


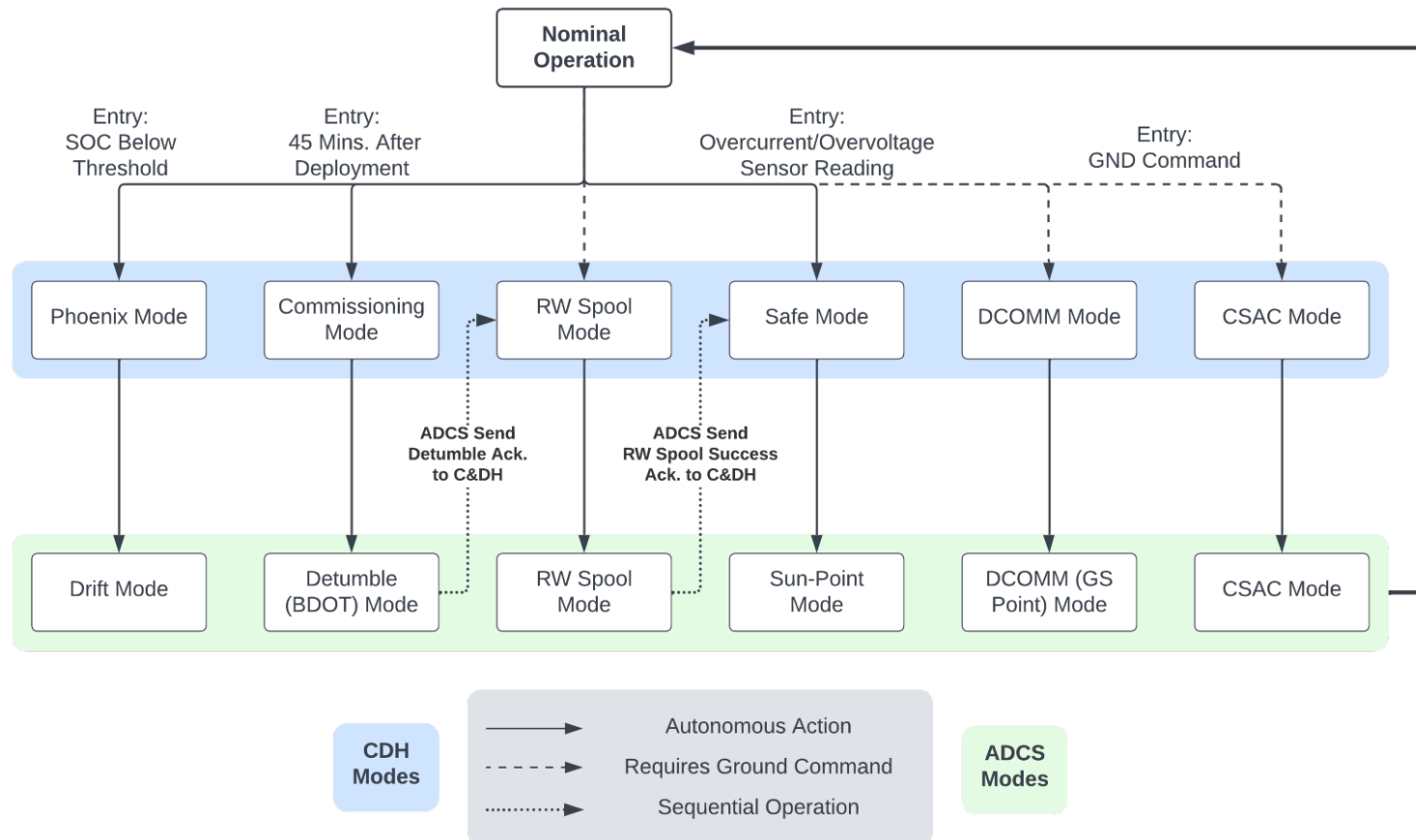
- ❑ Project Planning
 - Overall project plan is WIP
 - Sprint runs w/ Kanban will start after the CP is identified
 - Challenge: Lack of time w/ team members

- ❑ Communications
 - Internal collaboration SharePoint is ready; adoption pending
 - MAXWELL website update WIP

- ❑ Resource Management
 - Recruitment event this week!

- ❑ Training
 - Sub-system training plans to be developed





Test Objective: The purpose of this test is to verify that all possible commands to the satellite over RF are executed as expected. The CDH will demonstrate every command, including non-nominal, to ensure functionality on the fully integrated SC.

Phase	Description	Baseline	Completion
CET1	Verification of all baseline commands with Hydra configured in Hardline mode and only the CDH and BP ITL .	12/1/2021	11/26/2021
CET2	Identical to CET1 except with the inclusion of the EPS ITL to validate all EPS commands.	2/18/2022	4/16/2022
CET3	Identical to CET2 except with the inclusion of the ADCS and BB ITL to validate all ADCS commands.	10/31/2022	
CET4	Identical to CET3 except with the inclusion of the PLDC and ancillary hardware ITL to validate all PLDC commands.	11/28/2022	10/22/2022
CET5	Verification of all commands with Hydra configured in Radio mode and all the hardware used in CET4 as well as the UHF Li-2 radio ITL .		

❑ Fall 2022 ADCS testing

Command	Status	Additions
Req. ADCS HK Beacon	Working	None
Req. ADCS Error Status	Working	None
Change ADCS Mode	Working	Added new modes
Change ADCS Param.	Working	None
Req. Update CDH Time	Working	None
Req. ADCS Data Dump	Testing	None

- ❑ Flight Software
 - ❑ GPS and CSAC software is being reviewed
 - ❑ Basilisk simulation is being created for the ADCS software

- ❑ Hardware
 - ❑ ADCS board functional & acceptance testing underway
 - ❑ CSS functional testing underway.
 - ❑ GPS adapter functional test done.
 - ❑ GPS live sky test is scheduled.

- ❑ Flight Batteries
 - ❑ EDU battery testing completed
 - ❑ Ordering new cells for flight battery packs

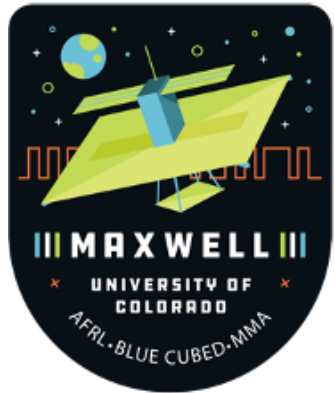
- ❑ EPS Boards
 - ❑ New rev of boards created to avoid flying white wires

Preparing for Simulated COMMs Testing

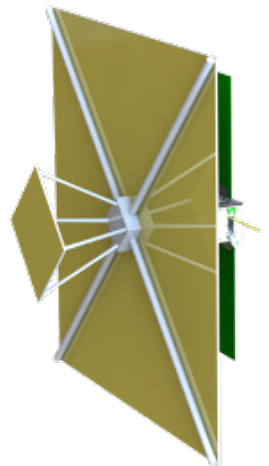
- ❑ Onboarded two new members for help testing and licensing
- ❑ Licensing:
 - ❑ Some progress on IARU/ODAR licensing, but hung up on acquiring ODAR software
 - ❑ UHF link budget being revised
- ❑ Much better understanding and documentation of UHF signal processing
 - ❑ Uplink bug blocking short packets to the Li-2 has re-emerged
 - ❑ GNU Radio Flowgraph documented

Completion of short/long range SCTs are still viable by end of term.

- ❑ SSO Orbital Case (stowed) results – all components w/in temp margins
- ❑ SSO Orbital Case results w/ MMA sail deployed pending
- ❑ Currently working on organization of thermal documents/code and creating an onboarding document for new team members



Project Concerns



ADCS

- PLDC hardware needed for CSAC interfacing.
- GPS - CSAC test has not been done yet.

CDH

- Only two team members - Lots of FSW testing needing to get done
- Legacy code - makes it hard to understand code structure and flow

EPS

- Acceptance testing required for new flight EPS boards
- Compatibility issues btwn new solar cells & solar panel boards

Comms

- Unsure of IARU will approve use of non-amateur bands for licensing
- Li-2 Radio still not receiving short packets
- Short and long Range Communications Test delayed due to unexpected problems with the over-wire testing

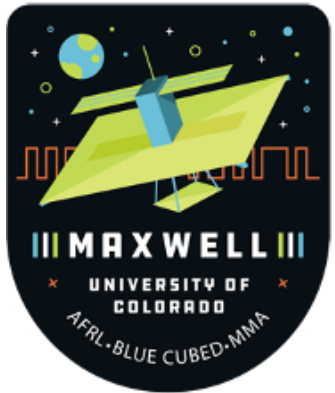
Structures

- Past team members no longer supporting

PLDC

- High turnover with software devs

III MAXWELL III



Thank You!

