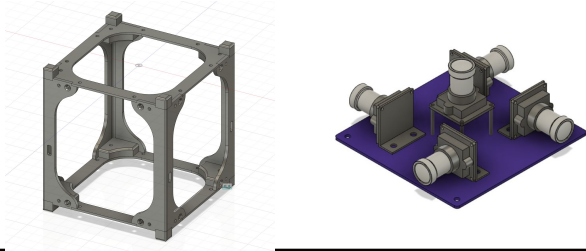


# Mechanical Quad Chart- 10/25/2023

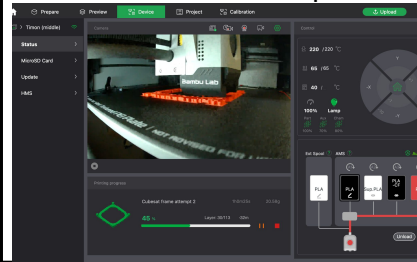
## Update/Milestones

- Updated structure based on TechSpark machining recommendations
- 3D print
- Thermal desktop workup continuing based on just chassis
- Multiple hinge designs considered for solar panels
  - Consulted former lab member on thoughts



## Team Blockers

- Endurosat chassis has not arrived
- Avionics
  - Updated board requirements?
  - Access ports location



## Next Week

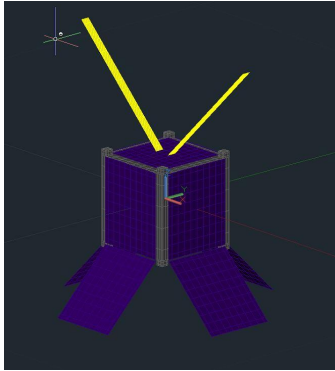
- Crash course on FEA
- EOW- Submit for machining at Tech Spark
- Parts order: PC104 rod selection, screws/fasteners
- Start ribbon cable design
- Update keep out zones for XY panels with new cameras
- Deployable solar panels
  - Attempt at hinge printing
  - construct design ideas
- Check for fit on solar panel deployment sides

## Cross team issues and interfaces

- Boards - continue to reference PC104 document on mechanical wiki
- **Continue thinking about internal components and materials so we can start formulating testing protocols more fully (thermal, etc.)**
- Outer boards will be thicker than previously thought to accommodate torque coils
- Any vibe test implications of epoxying limit switches to PCBs?

# Mechanical Quad Chart- 10/11/2023

## Update



## Team Blockers

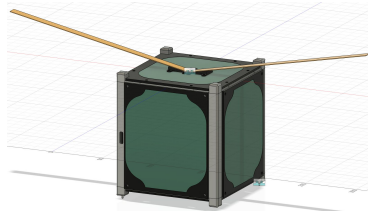
- Missing physical components- Endurosat and springs
- Solar panel surface area
  - To determine need for deployable solar panels
  - Surface area we can provide without deployables= approx. 70 cm<sup>2</sup> per side
- Need to know exact camera boards being used to rebuild interior board stack

## Milestones

- Updated CAD model for chassis
- Interior stack integrated to model
- Currently building thermal model
- DXF file for “keep out zones” on wiki
- Met with machine shop at TechSpark

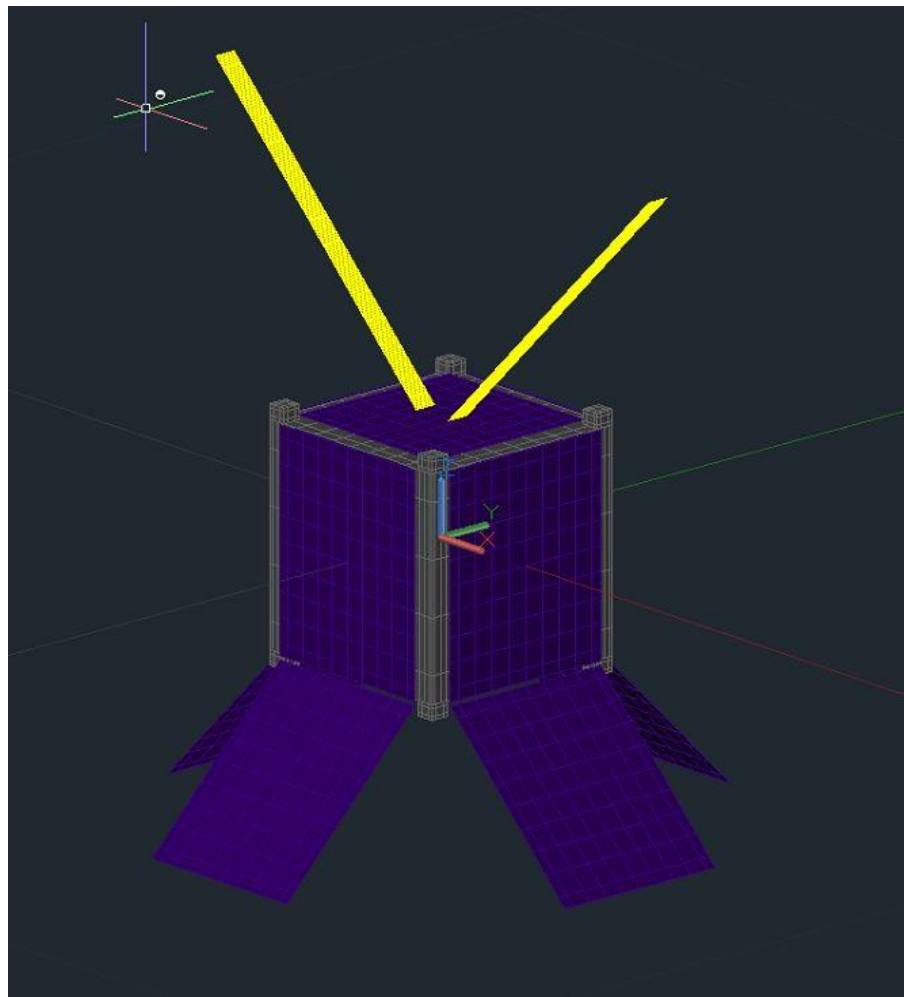
## Next week

- Play with endurosat structure if we get it
- Start machining our chassis design?



## Cross team issues and interfaces

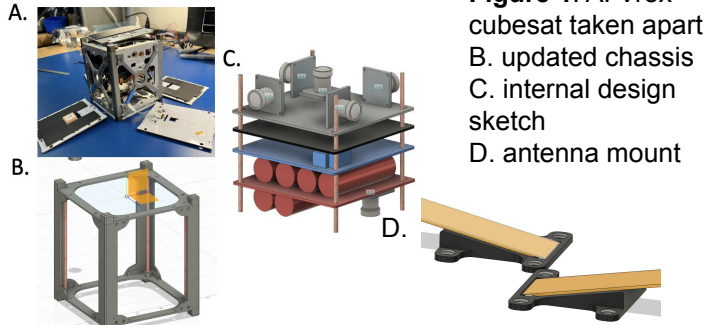
- Boards - continue to reference PC104 document on mechanical wiki
- Avionics-
  - number of access ports (charging, etc.) so we can work on structure adaptation for that
  - Updated final power budget
- **Continue thinking about internal components and materials so we can start formulating testing protocols more fully (thermal, etc.)**



# Mechanical Quad Chart- 10/4/2023

## Update

Took apart 1u cubesat in lab to better understand board infrastructure and connectivity



**Figure 1:** A. Vr3x cubesat taken apart  
B. updated chassis  
C. internal design sketch  
D. antenna mount

## Team Blockers

- Chassis hasn't arrived
- Springs haven't arrived
- Solar panel surface area
  - To determine need for deployable solar panels
- Not critical right now: thermal offloading capabilities of the chassis
  - Do we need an additional radiator?

## Milestones

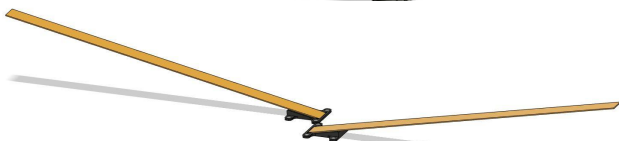
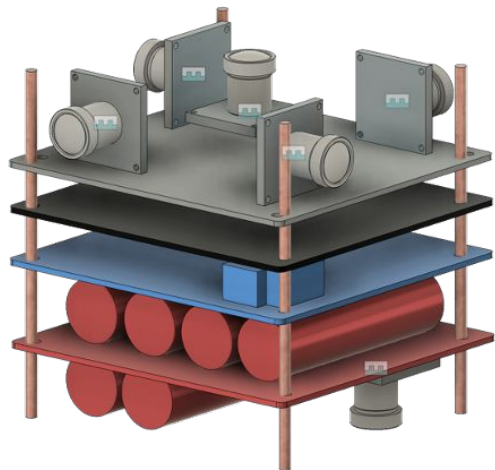
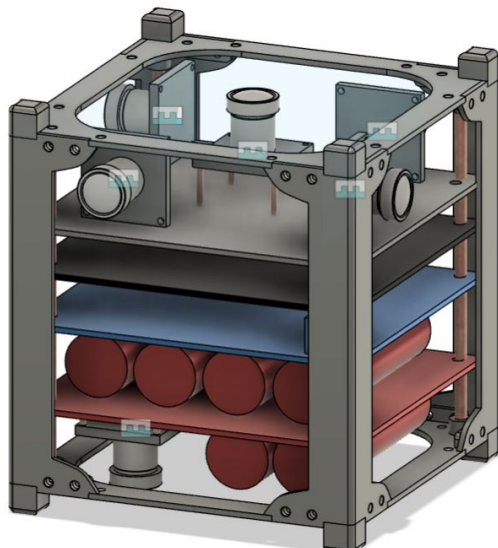
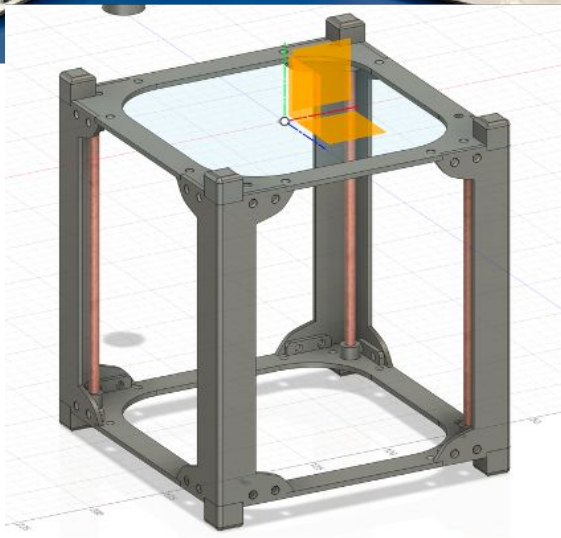
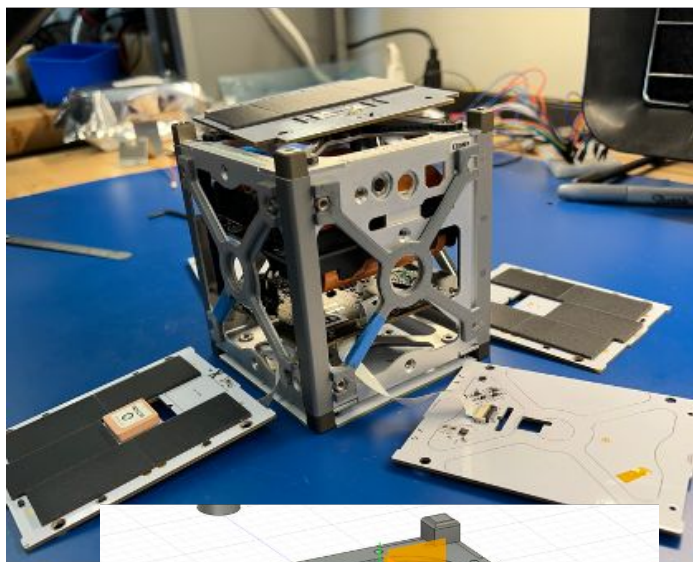
- Updated CAD model for chassis
- Z dimension/board heights determined
- Number of boards determined/more refined interior stack
- Antenna design

## Next week

- Continued manufacturability considerations:
  - Integrating switches/holes on chassis
  - How to take apart/build: ie top comes off
- Play with endurosat structure if we get it
- Start machining our chassis design?

## Cross team issues and interfaces

- Boards - use PC104 board dimensions
  - Will give "keep out" zones for passive components on pcbs due to frame
- Avionics- number of access ports (charging, etc.) so we can work on structure adaptation for that
  - Where will they be?
- **Starting thinking about internal components and materials so we can start formulating testing protocols (thermal, etc.)**
- **All sizes locked in by 10/6- try to avoid major component size changes after this date**





# Mechanical Quad Chart- 9/27/2023

## Update

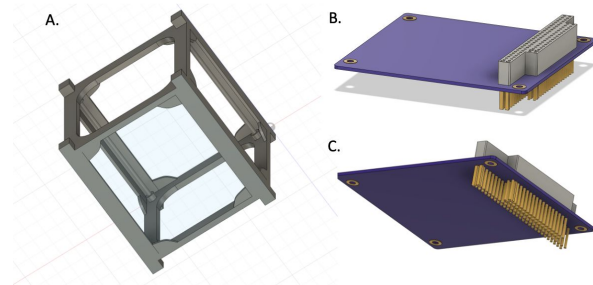


Figure 1: A. chassis structure B. top view of PCB C. bottom view of PCB

## Team Blockers

- Endurosat chassis purchase
  - Don't have arrival date
- Power budget
  - To determine solar panel surface area needed
  - Thermal offloading capabilities of the chassis
    - Do we need an additional radiator?
- Component sizes for each team to determine stack height for each board
  - Number of boards you need

## Milestones

- Cad model: chassis and PC104 start
- Placing orders for switches, springs, chassis
- We have a deployable solar panel idea if needed and would adjust structure accordingly

## Next week

- Integrating antenna design to structure
- Manufacturability:
  - Integrating switches/holes on chassis
  - How to take apart/build: ie top comes off
- Play with endurosat structure if we get it

## Cross team issues and interfaces

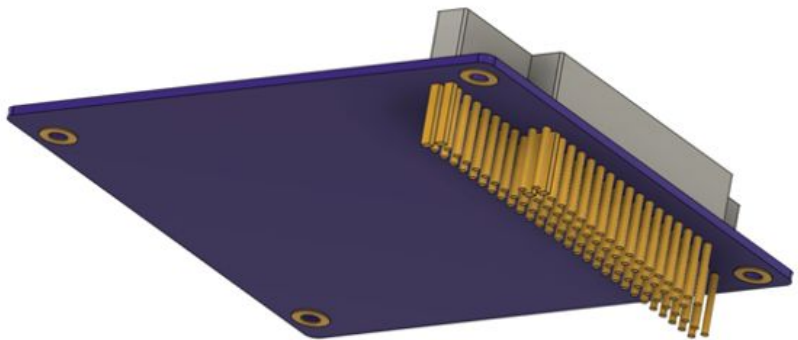
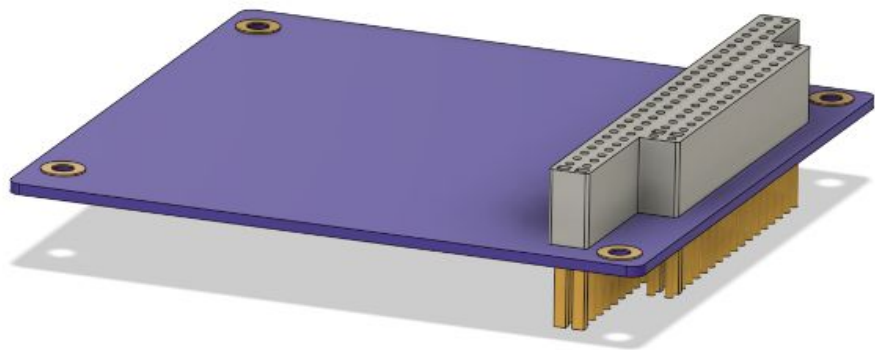
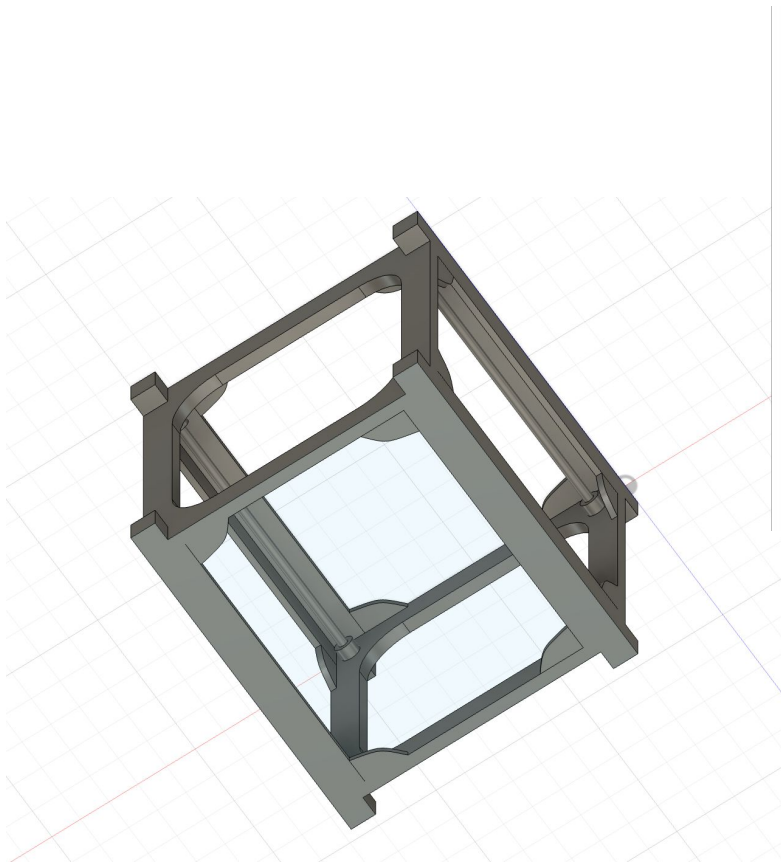
- Boards - use PC104 board dimensions and hole positions
  - Will post the dimensions on the mechanical wiki by end of week
- Camera dimensions - will need cutouts in some boards
- Avionics- number of access ports (charging, etc.) so we can work on structure adaptation for that
- **By 10/6, have all internal component sizes sent to us for inner cad model**
  - **Like batteries, cameras, tall board components, etc.**

# Mass budget estimate updated

## 1500g target (up to 2000g)

- Chassis- 120 g (Endurosat)
- Batteries- 282g if we use 6
- GPU/vision- 500g
- ~~Torque coil- 46g (probably 2 coils so 92g)~~
- Antenna design- 100g
- PCBs- 70g per board? (so 420g for all 6 potential boards, ~~then additional 70 for back panel?~~)
- Solar panels/outer panels- approx. 50g per side (around 300 total depending on size on each side)
- Ballast- ??g
- Deployable solar panels (4)- 176g

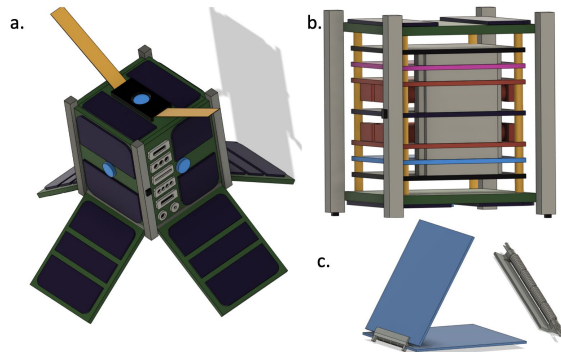
Total right now: 1878g





# Mechanical Quad Chart- 9/20/2023

## Update



**Figure 1:** a. Overall design with outside panels. b. Internal board stack. c. initial design for solar panel deployment (hinges)

## Team Blockers

### Endurosat

- Potential chassis design
- Requires CMU legal representative to start looking at CAD drawings
- Was sent the data sheet

### Other

- Power budget to determine final solar panel surface area

## Milestones

- Came up with initial deployable solar panel idea
- Refined initial CAD design
  - No magnetic torquer rod (embedded in outer panels)
  - Board connection and support with chassis
- No turn-style antenna
  - Thinking V shape

## Next week

- Finalize inner board design and maybe 3D print a model so everyone has dimensions and constraints
- Continue buy/build considerations for chassis

## Cross team issues and interfaces

### Vision-

- Will potentially having antenna in camera view be something you can work around?

**GNC-** updated size with solar panels (each deployed panel will be an additional 10cm with an additional 176g at the bottom)

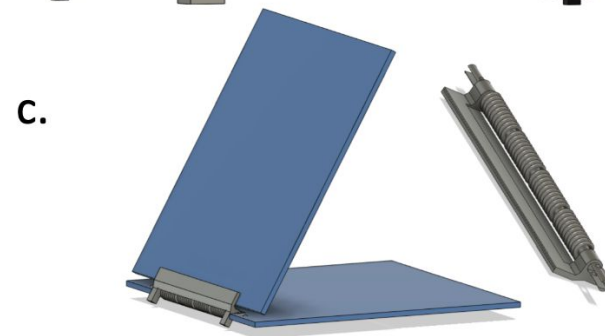
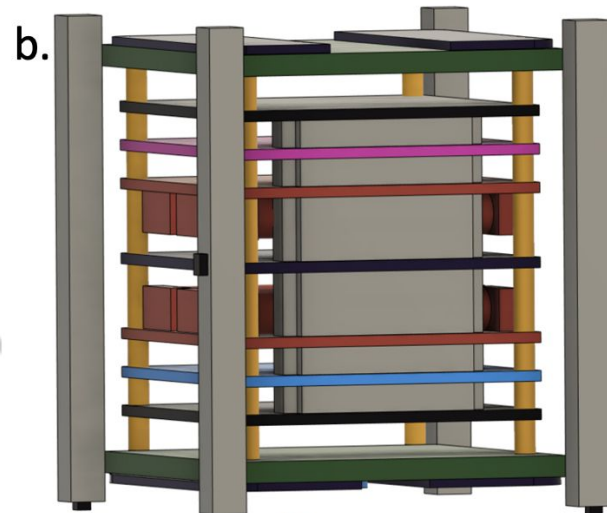
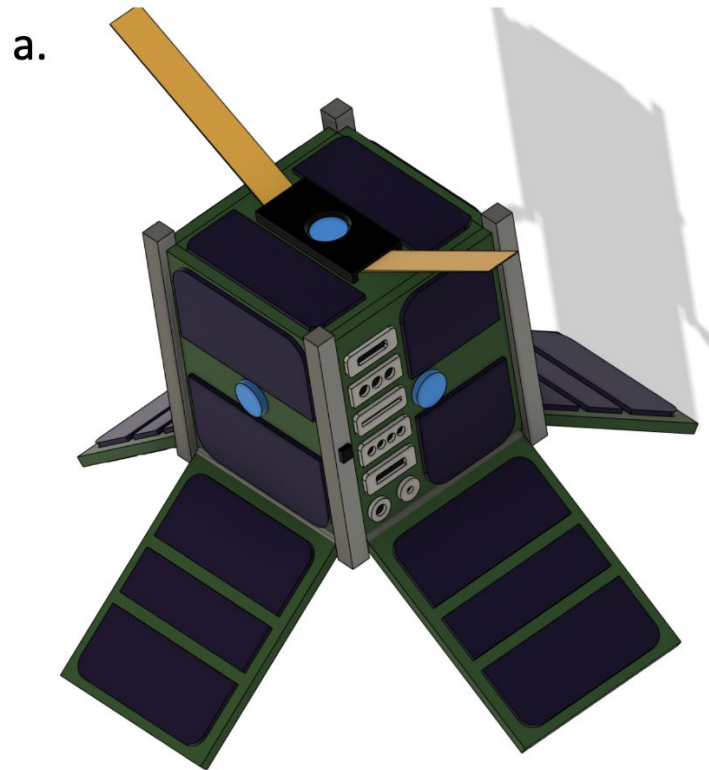
**Avionics-** power budget

**Coms/ops-** link budget

Main structure: 10 cells  
+ Deployable structure: 16 cells  
Total cells: 26 cells

2.4 W per cell x 26 cells= 62.4W  
X 29.5% efficiency

Total power generated= **18.408W**



# Mass budget estimate updated

## 1500g target (up to 2000g)

- Chassis- ideally less than 100 g
- Batteries- 282g if we use 6
- GPU/vision- 200g worst case
- Torque coil- 46g (probably 2 coils so 92g)
- Antenna design- 100g
- PCBs- 70g per board? (so 420g for all 6 potential boards, then additional 70 for back panel?)
- Solar panels/outer panels- approx. 50g per side (around 300 total depending on size on each side)
- Ballast- ??g
- Deployable solar panels (4)- 176g

**Total right now: 1740g**

# Mechanical Quad Chart- 9/13/2023

## Update

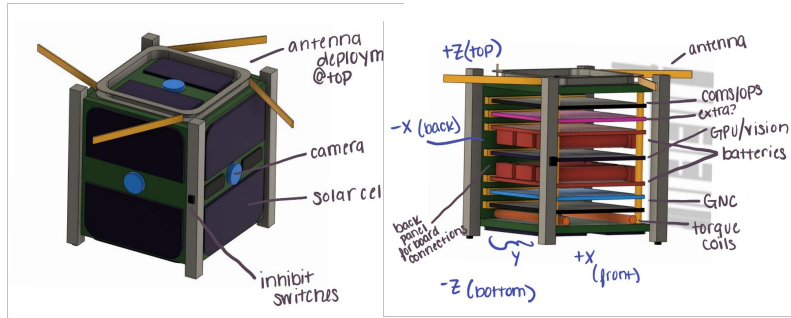


Fig.1- initial CubeSat Rev.1 sketch

## Team Blockers

Need link budget to get power budget to get solar panel size and design

We need to know when each team decides what physical components they want to use so we can finalize mass budget (ie work towards more than just an estimate)

Make sure to keep track of what materials you will be using (or if they can be coated with NASA-approved materials)- we are comprising a list

## Milestones

- interfacing with the other teams
- Revised Level 2 requirements
- Started visualizing first iteration model with initial stack ideas
- First idea for antenna

## This week

- Finalizing initial mass budget estimate as we collect more information from other teams
- Starting CAD models for chassis design
- Deciding how to organize the boards

## Cross team issues and interfaces

Figure out power and link budget to begin determining battery number and subsequent solar arrays (ASAP)\

Vision- camera size to determine placement location- next week?

GNC- sensor and actuator selection- early next week

Coms/Ops- working on antenna design first iteration

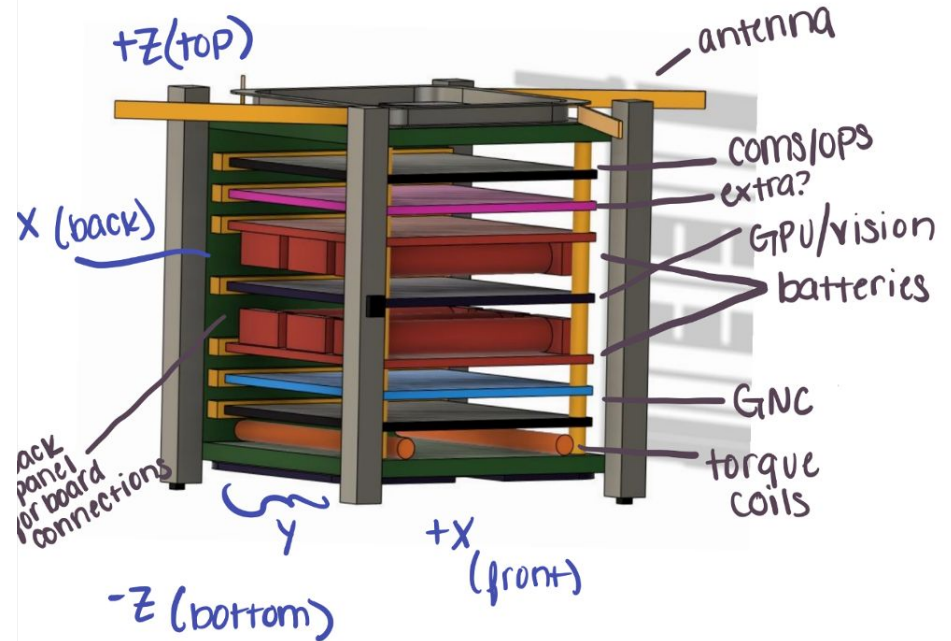
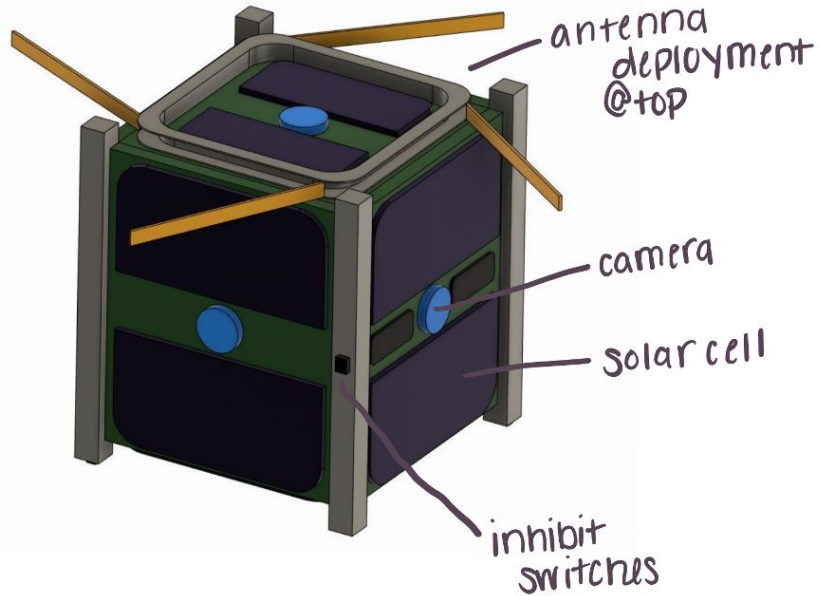
# Mass budget estimate (rough)

## 1500g target (up to 2000g)

- Chassis- ideally less than 100 g
- Batteries- 282g if we use 6
- GPU/vision- 200g worst case
- Torque coil- 46g (probably 2 coils so 92g)
- Antenna design- 100g
- PCBs- 70g per board? (so 420g for all 6 potential boards, then additional 70 for back panel?)
- Solar panels/outer panels- approx. 50g per side (around 300 total depending on size on each side)
- Ballast- ??g
- 

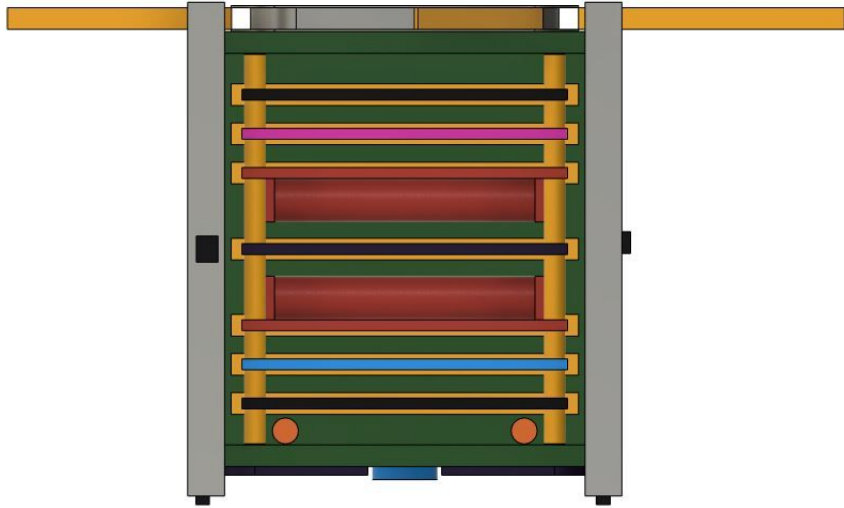
**Total right now: 1564g**

Close-up images if needed

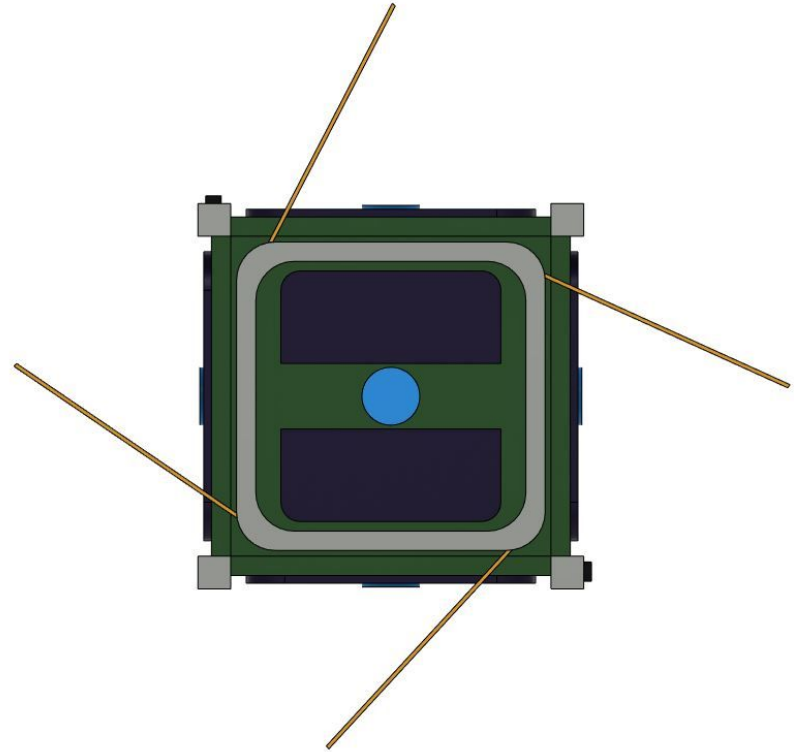




Close-up images if needed



Inside front



top