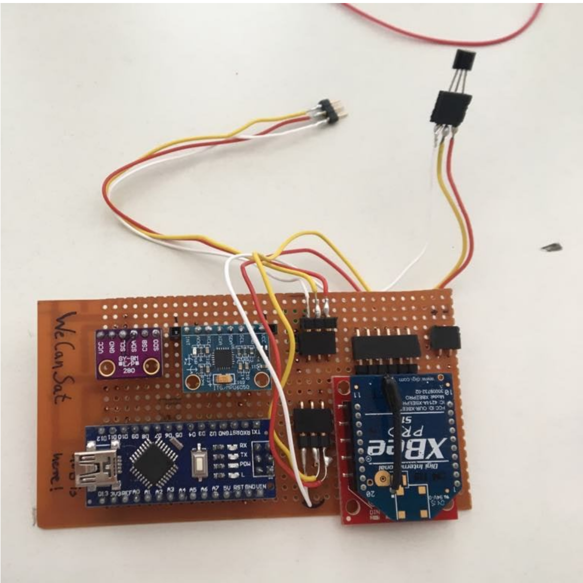
WeCanSat



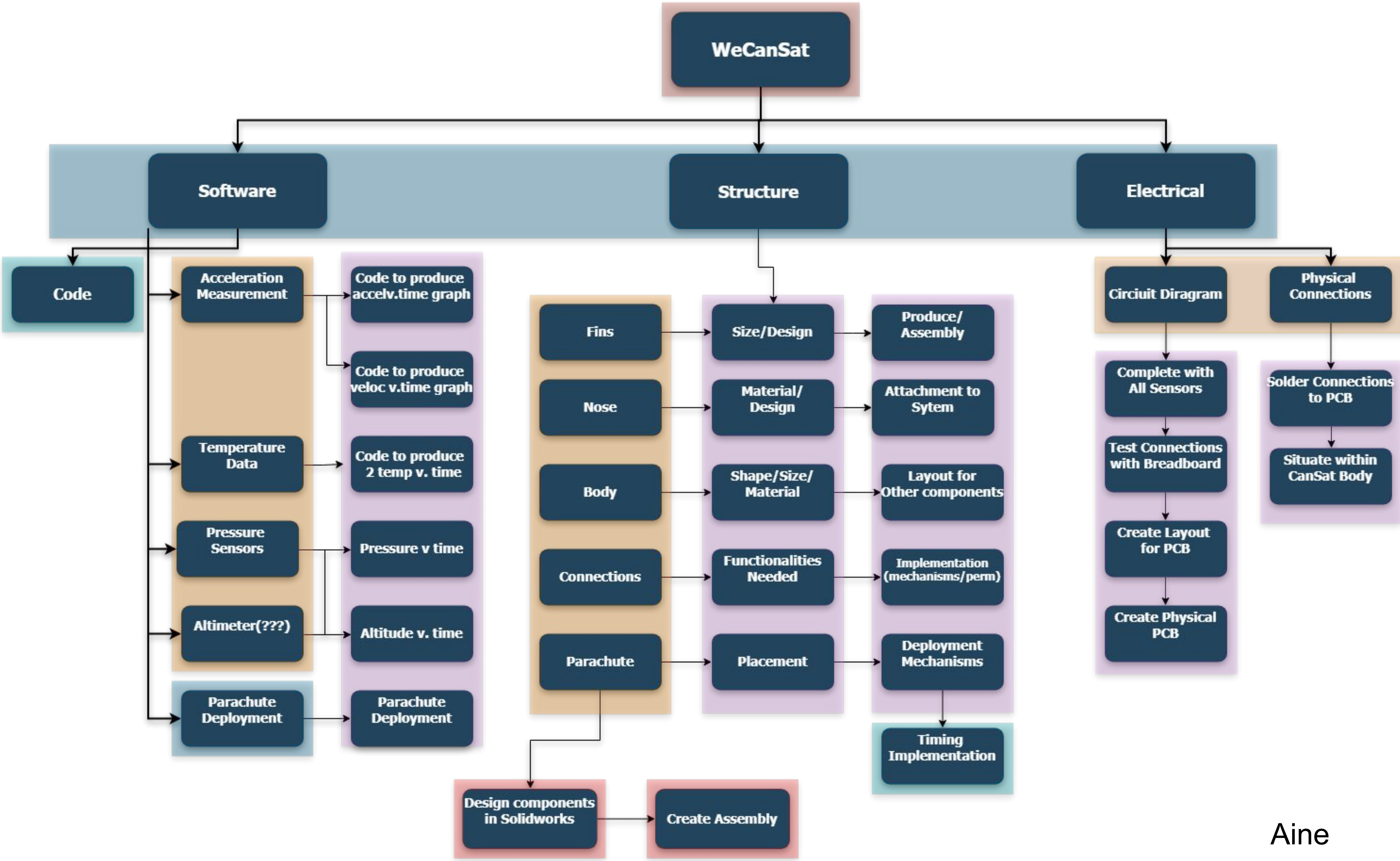
Aine
Alex
Arun
Chanhee
Joana
Seob
Yifei

Technische Universität Berlin

SUMMER UNIVERSITY

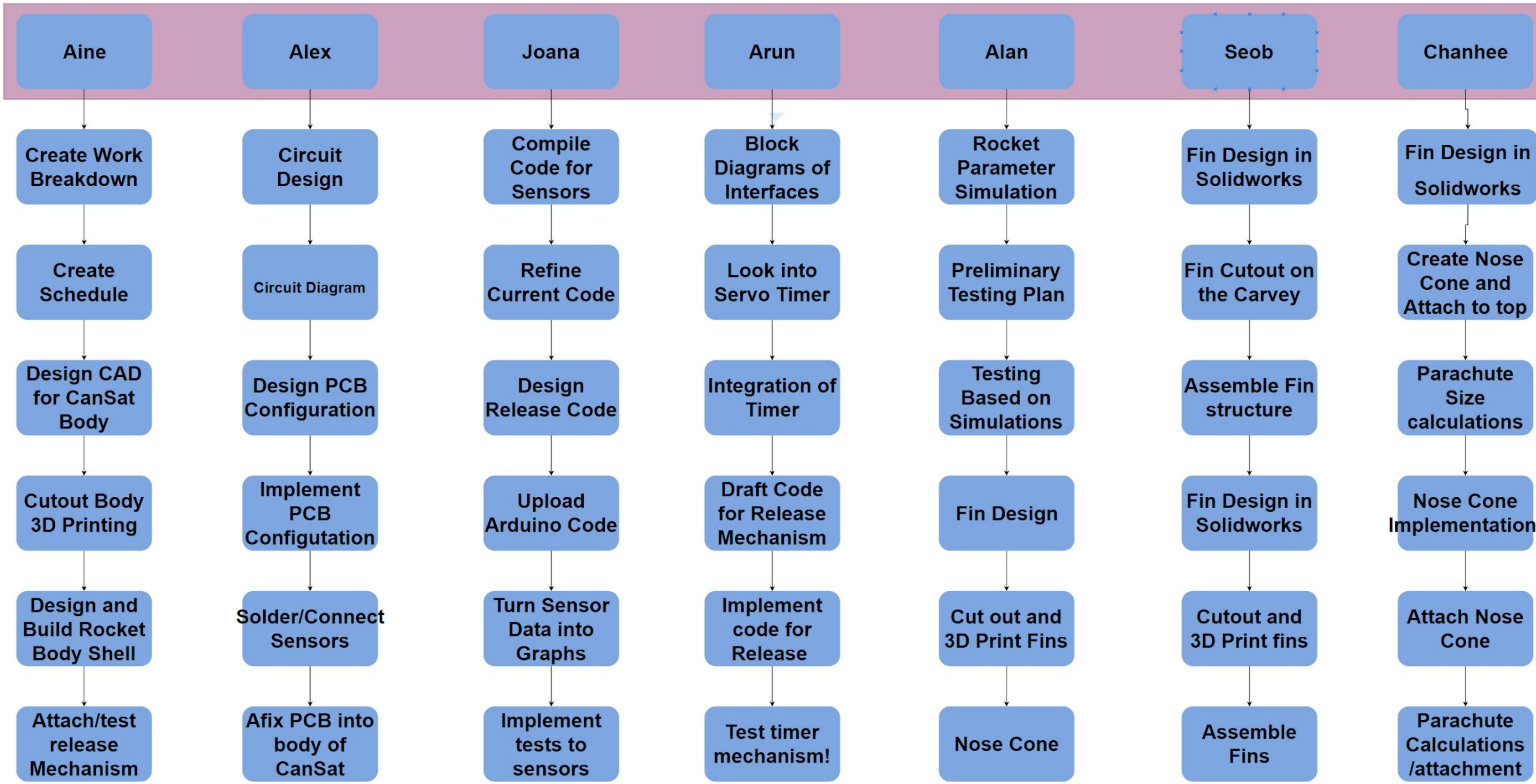
Planning Components

Detailed Project Components



Aine

Work Breakdowns



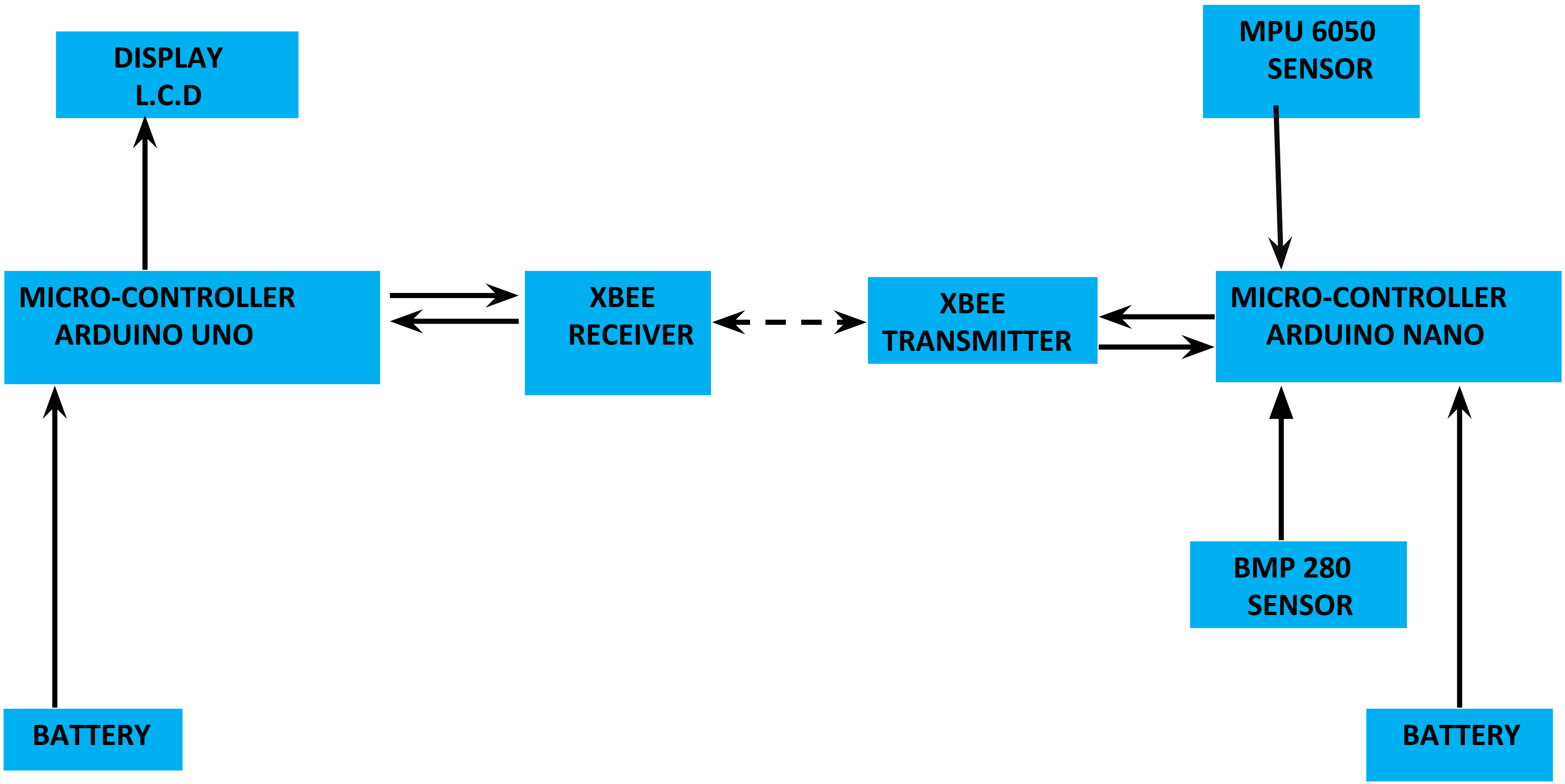
Aine

WeCanSat Schedule

Mon	Tues	Wed	Thurs	Fri/Sat/Sun	Mon	Tues	Wed	Thurs
- complete CAD of CanSat drawings - complete draft of PCB - get simulation DATA - confirm logistics of Servo Timer - Complete Presentation Slides -Assign presentation components	- learn about measurement reading for data processing ~ CDR Presentation Day ~	-integrate XBEE into codes to produce graphs - aquire servo timer and servo motor - make connections on PCB for arduino -design fins in solidworks -3D print body	- connect servo timer to servo motor - cut bottle door and attach servo timer - test servo timer mechanism -3D print body (if not done) -use carvey to cut out fins	** any details for demonstration if not complete**	-test sensors and ensure they produce accurate graphs - Fit PCB Components inside of body and secure -Assemble all!! ~ Critical Parts Demonstration ~	Final Testing and any Glitches!	~Final Project Review~	**~Launch Campaign!~**

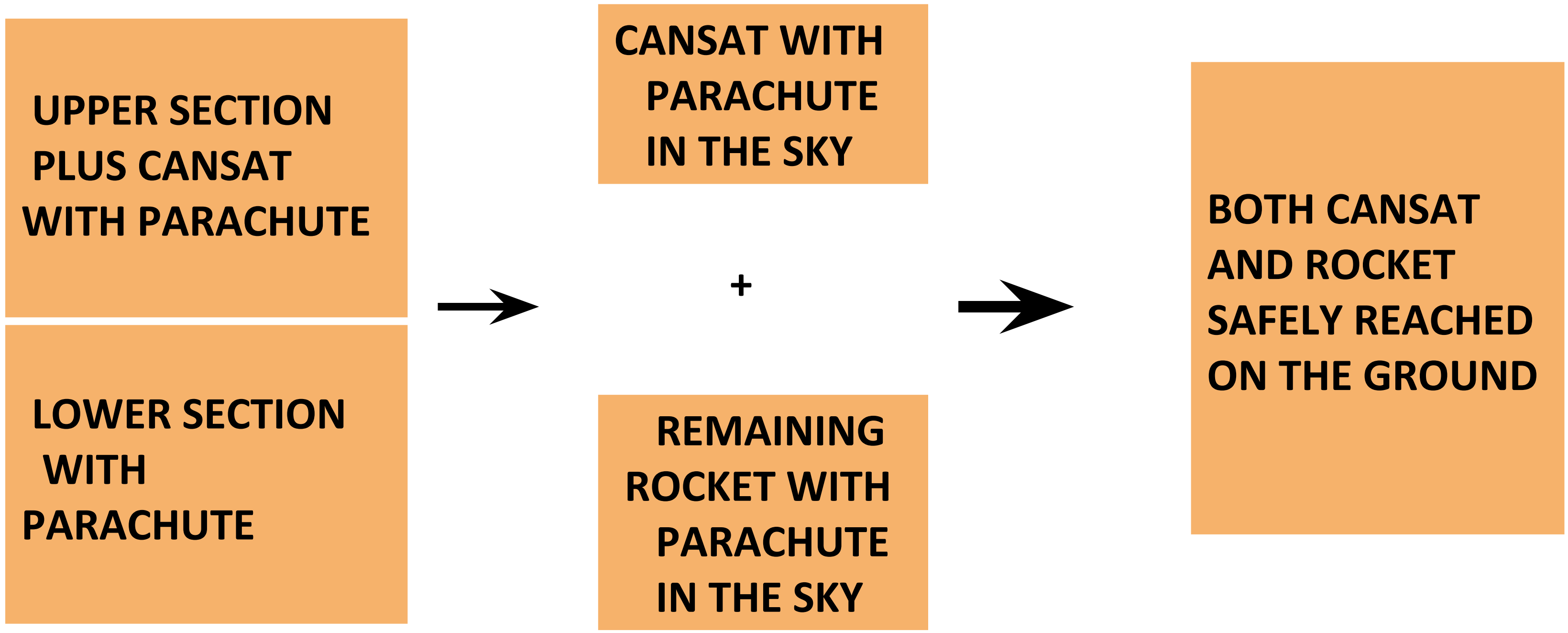
Aine

BLOCK DIAGRAM OF ELECTRONICS INTERFACES



Arun

BLOCK DIAGRAM OF ROCKET DEPLOYMENT



STAGE 1
INITIAL STAGE LAUNCHING WITH TRIGGERING METHOD

STAGE 2
SEPARATION OF CANSAT FROM ROCKET IN THE SKY

STAGE 3
COLLECTION OF ROCKET AND CANSAT ON THE GROUND

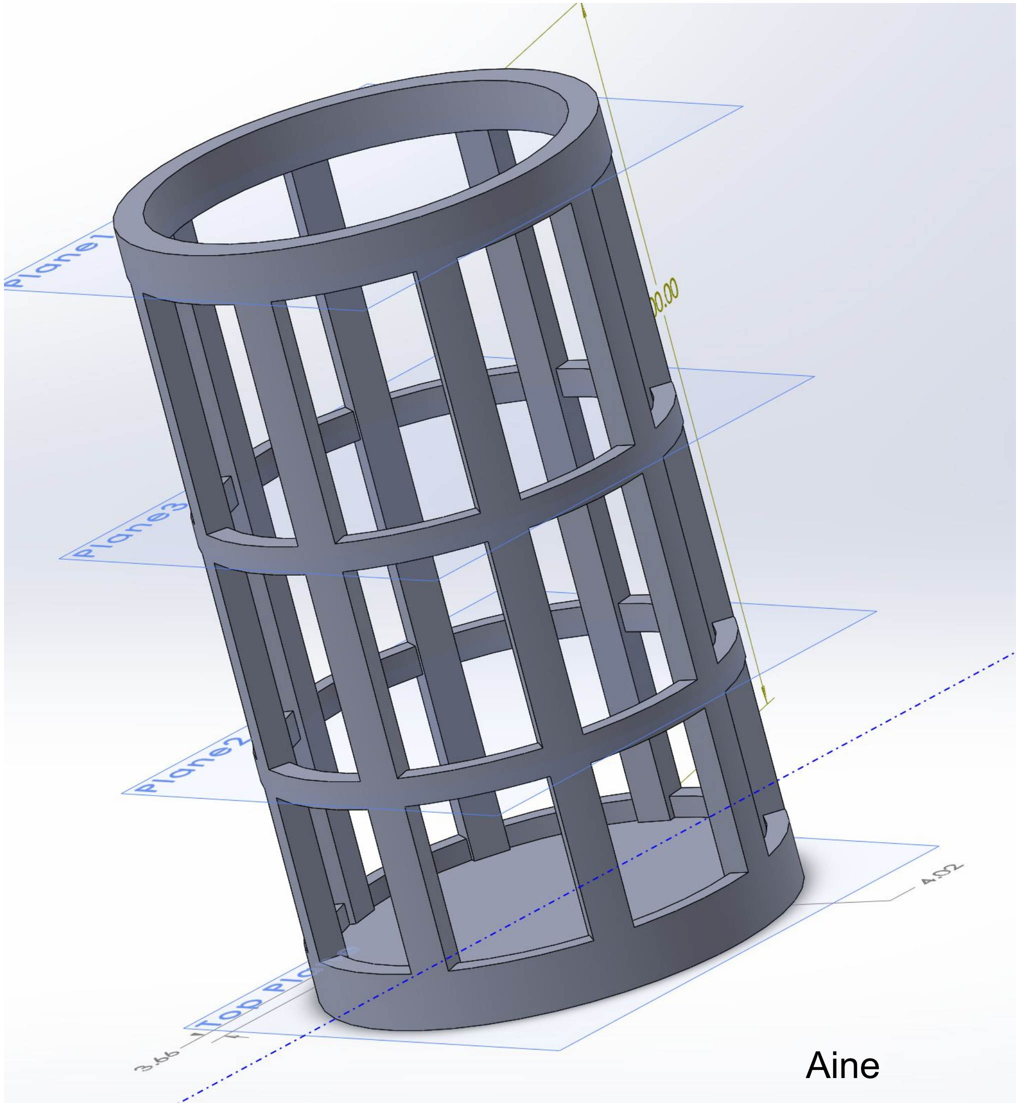
Arun

Technical Details

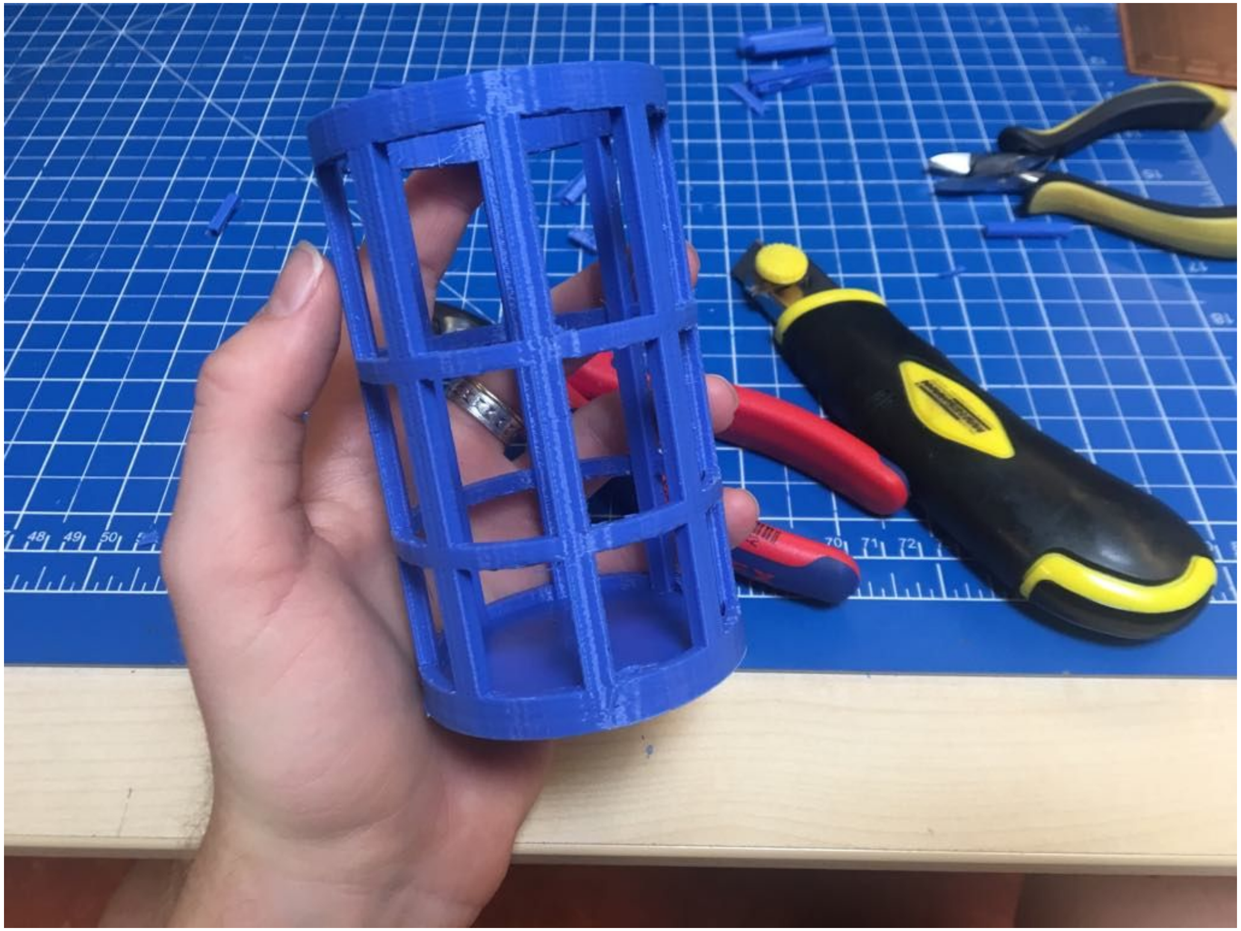
Body Casing - Design

CanSat Body Casing:-

- 3D printed
- Open Space allows for light weight
- Supporting rings for integrity of structure
- Spaces covered in tape for protection of internal components



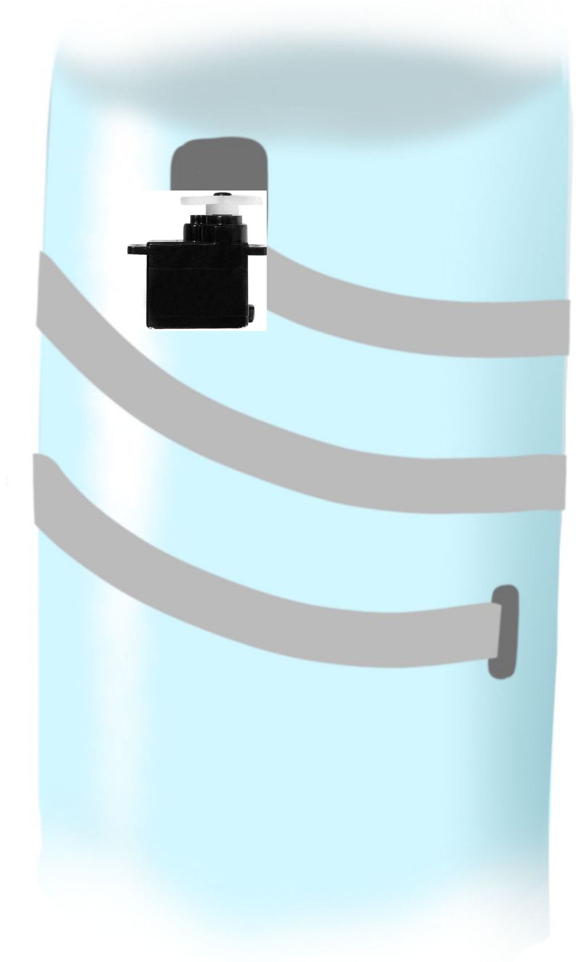
Body Casing - Result



Rocket Body - Construction

Ejection System - Design

- Servo motor attached to inner component.
- Rubber band attached to outside wrapped around and connected to servo
- Turn of servo releases rubber band, triggering release of spring loaded CanSat



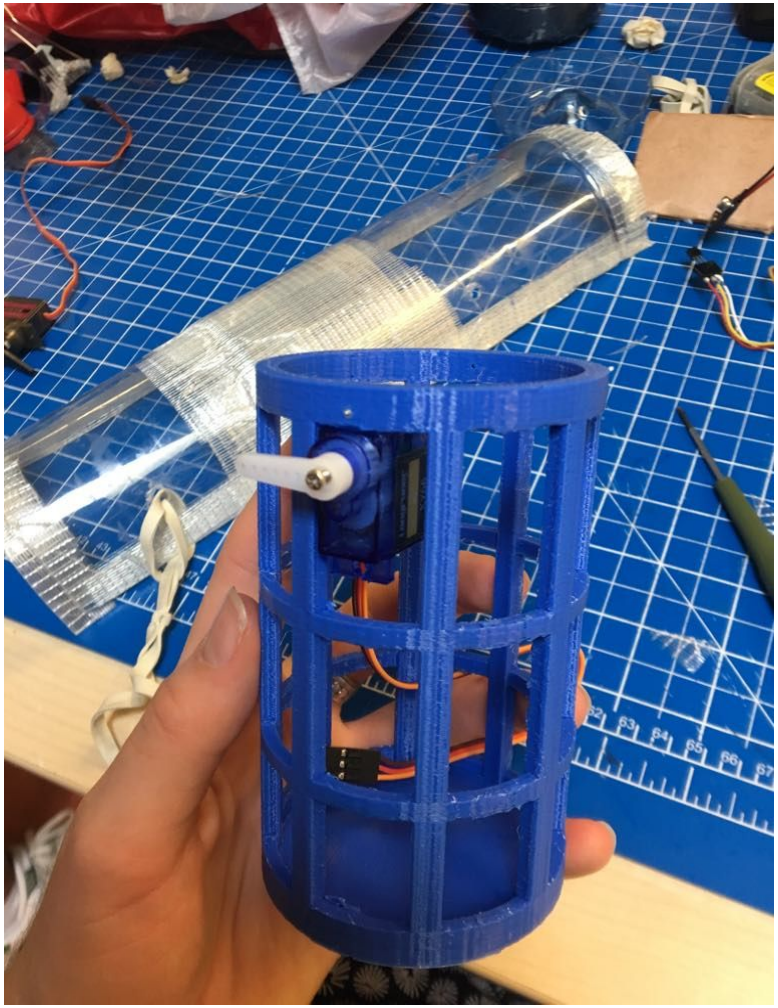
Aine

Ejection System - Result

- System starts after launch.

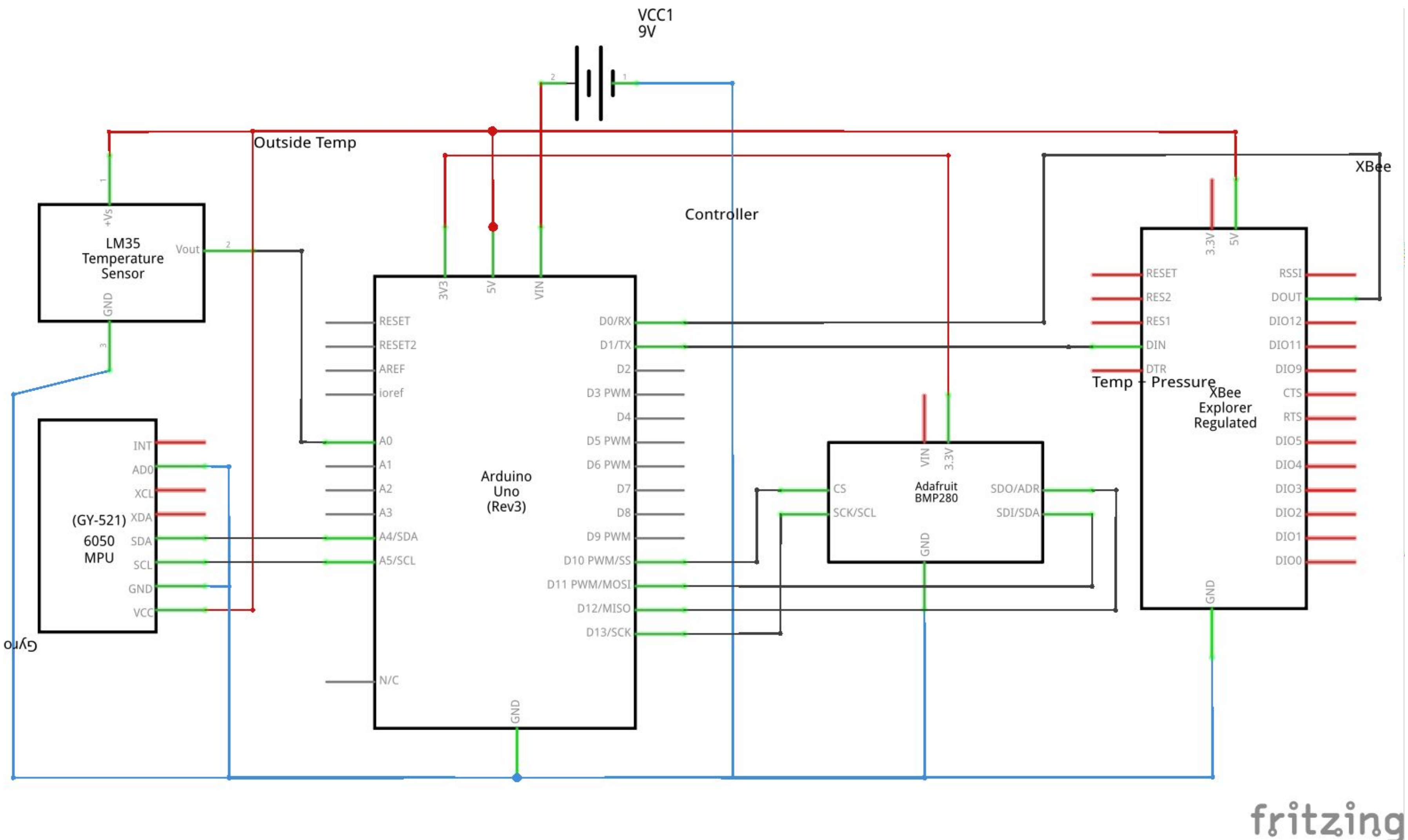
- For deployment of CanSat:-

➢ When the acceleration(ay) reached a value between -0.1 to 0.1 .
➢ Then servo gets start moving from position 1 to 2.
➢ And then rubber band lock is get off and CanSat is get released with parachute.



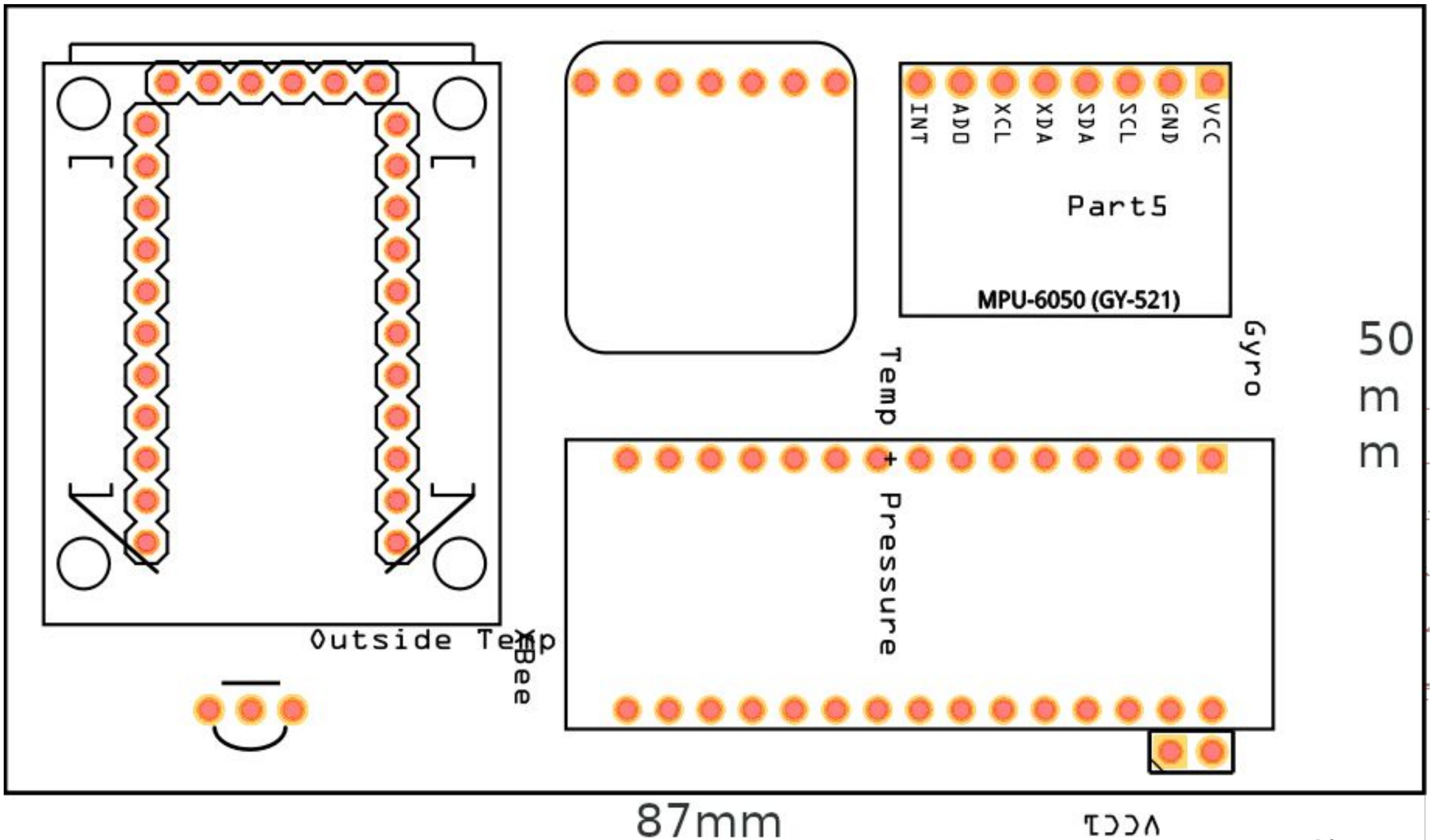
Arun

Circuit diagram



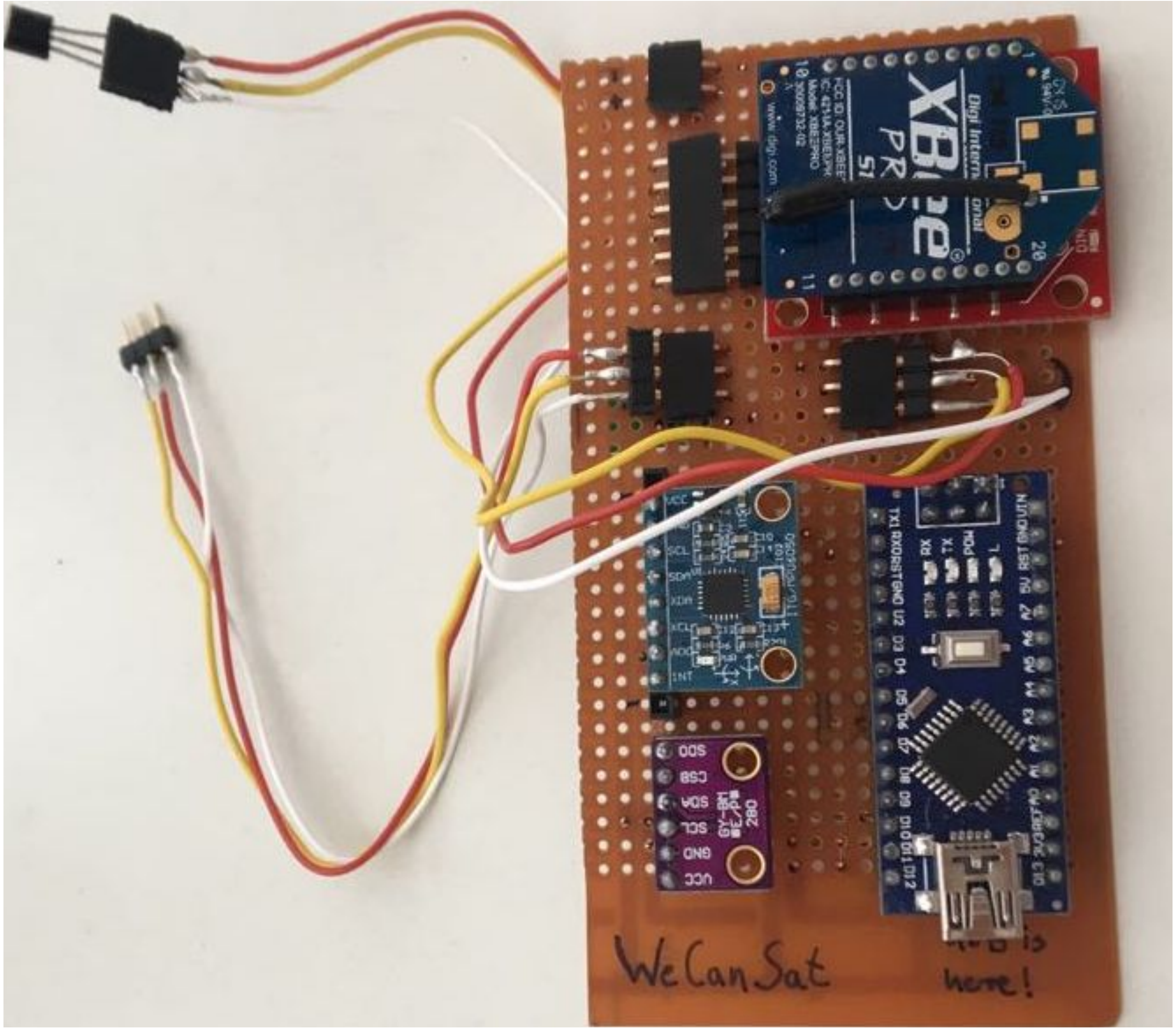
Alex

PCB Layout



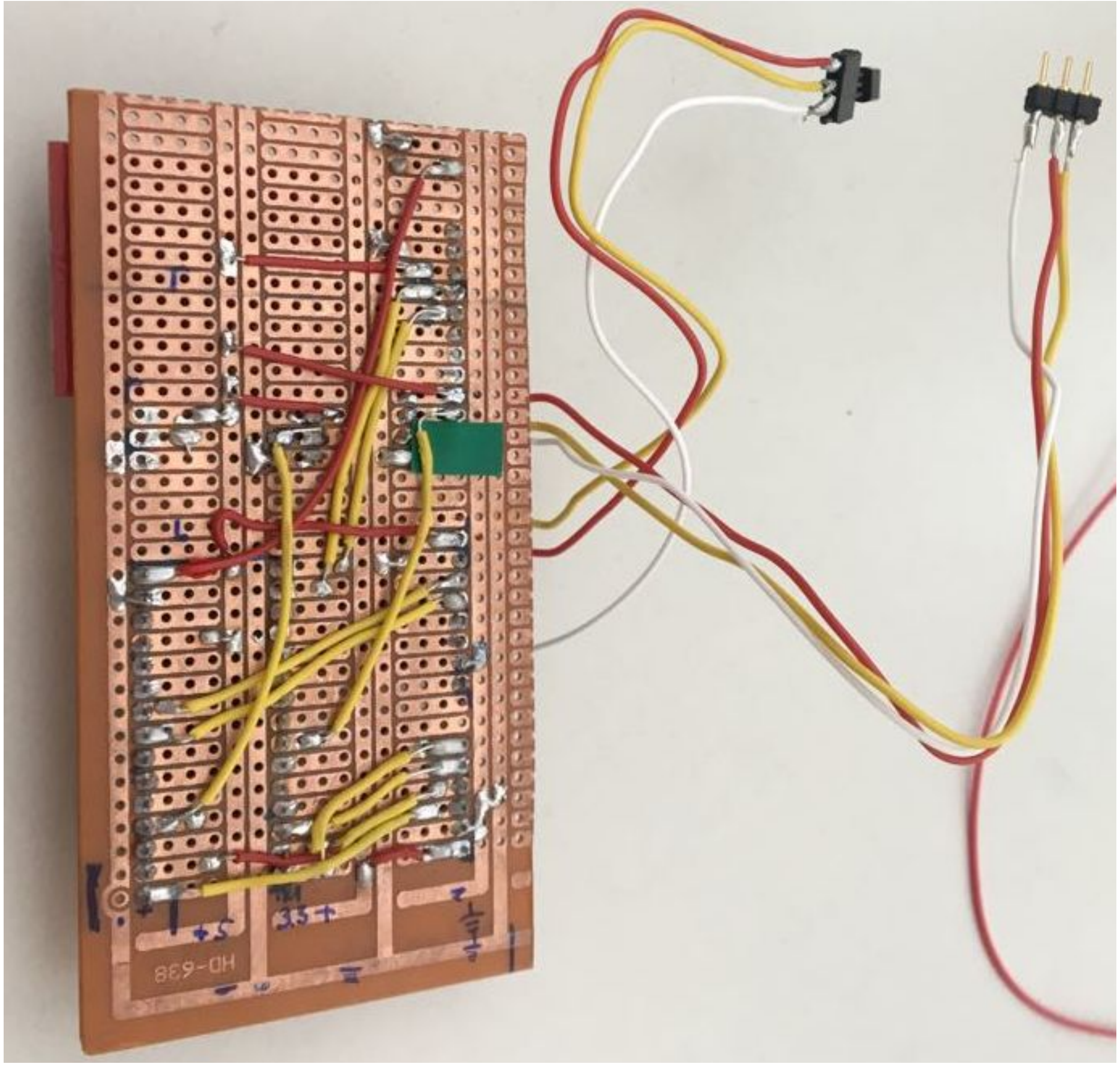
Alex

Actual PCB



Alex

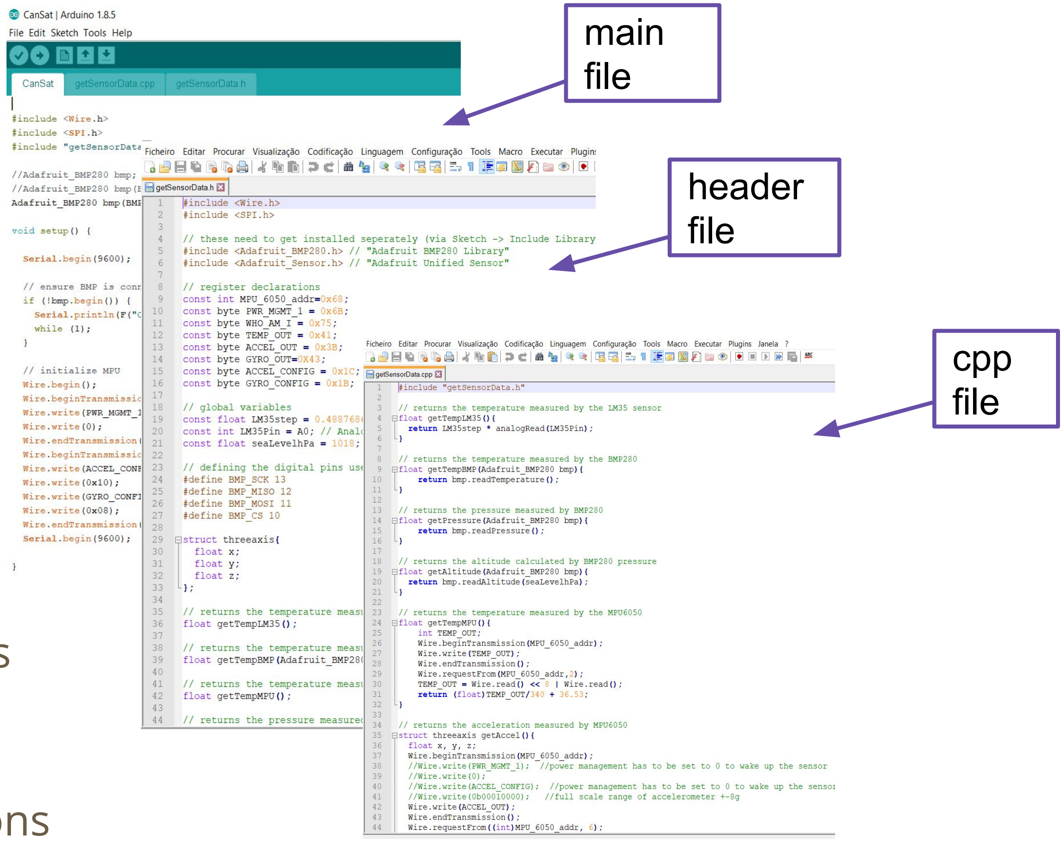
Actual PCB



Alex

Software Plan

- **main file**
  - initializations
  - calls functions
  - serial.print
- **header file**
  - declare libraries
  - declare functions
  - addresses
  - constants, pins, analog pins
- **cpp file**
  - development of the functions
  - libraries (less extensive code, Adafruit_Unified_Sensor, Adafruit_BMP280_Library)



Joana

XBee Communication

-doesn't need additional code

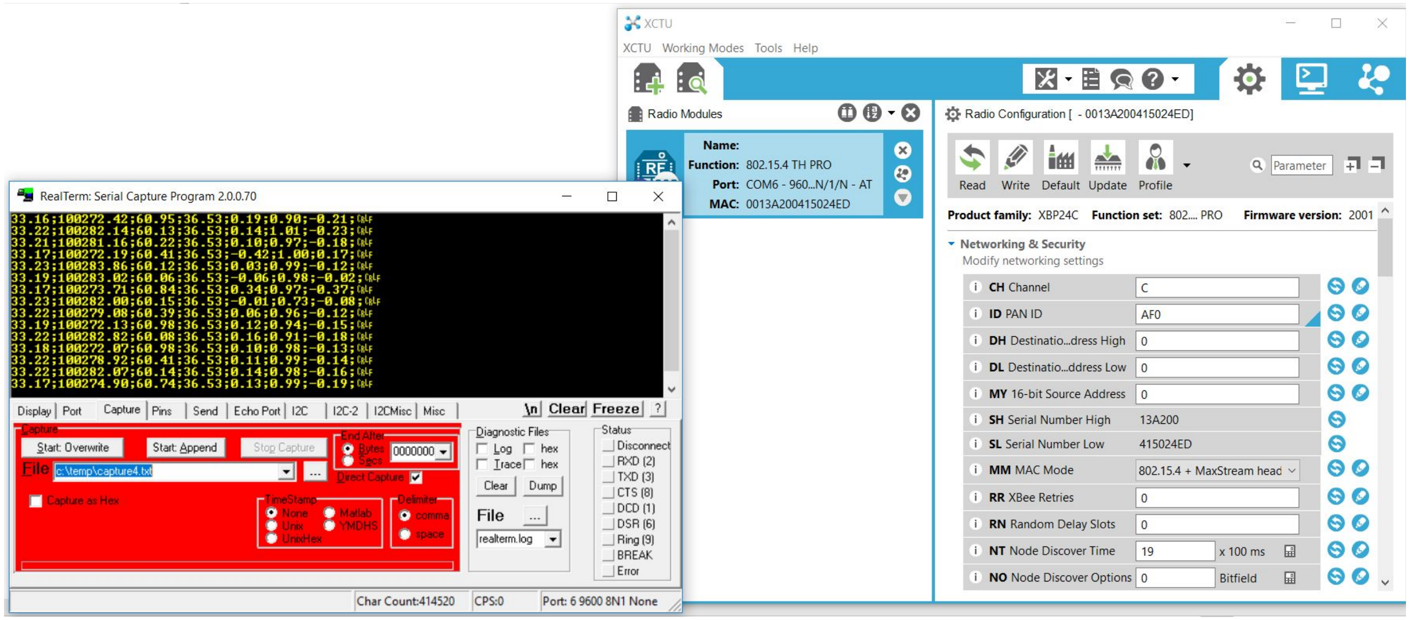
-Software

-XCTU

-Realterm

-Graphs

-Matlab



Graphs-lab experiment

When the altitude reaches its

peak the pressure reaches a

local minimum.

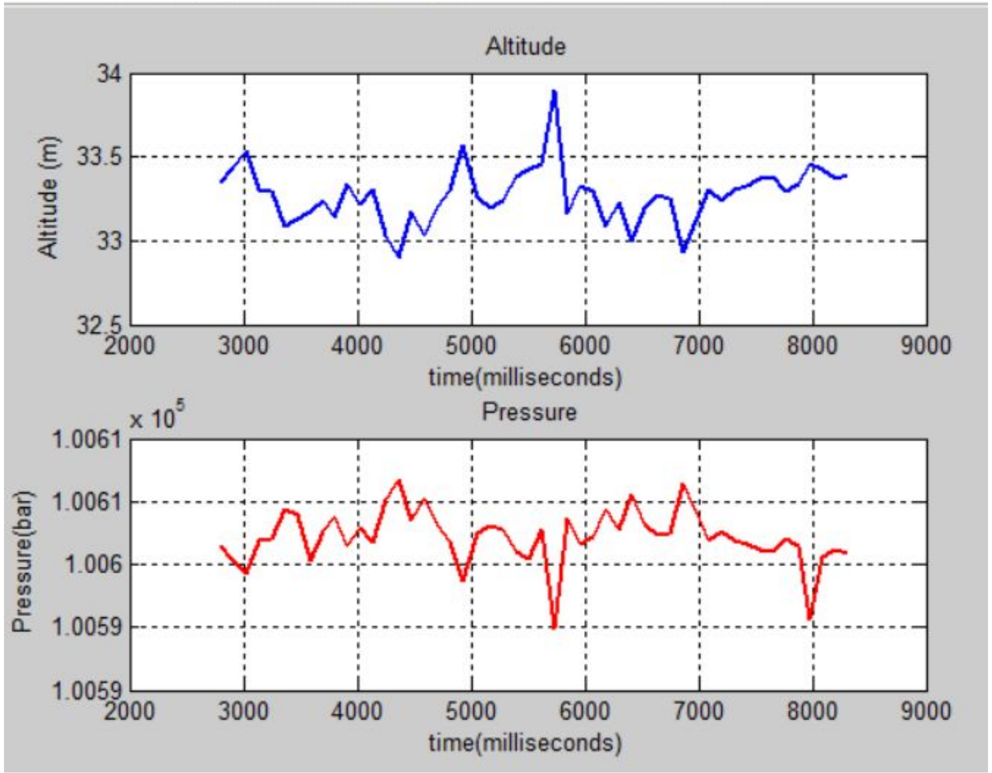
When the acceleration in the vertical

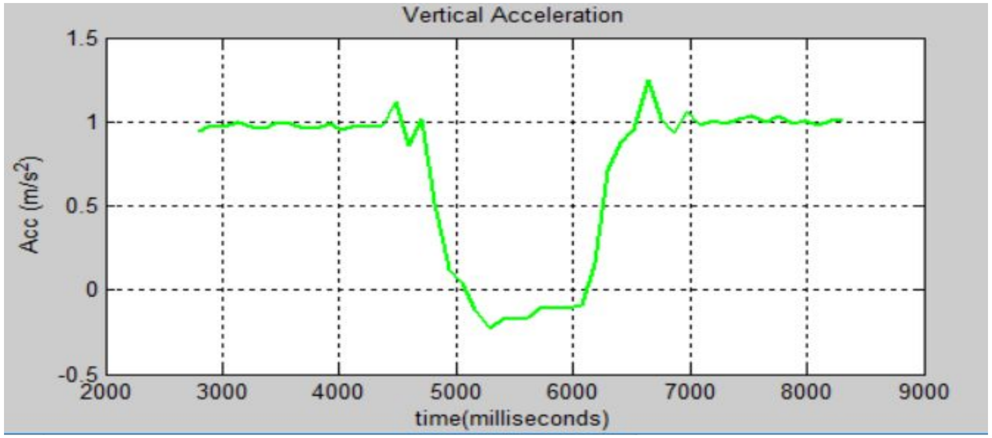
axis reaches a certain value

the servo motor changes its position

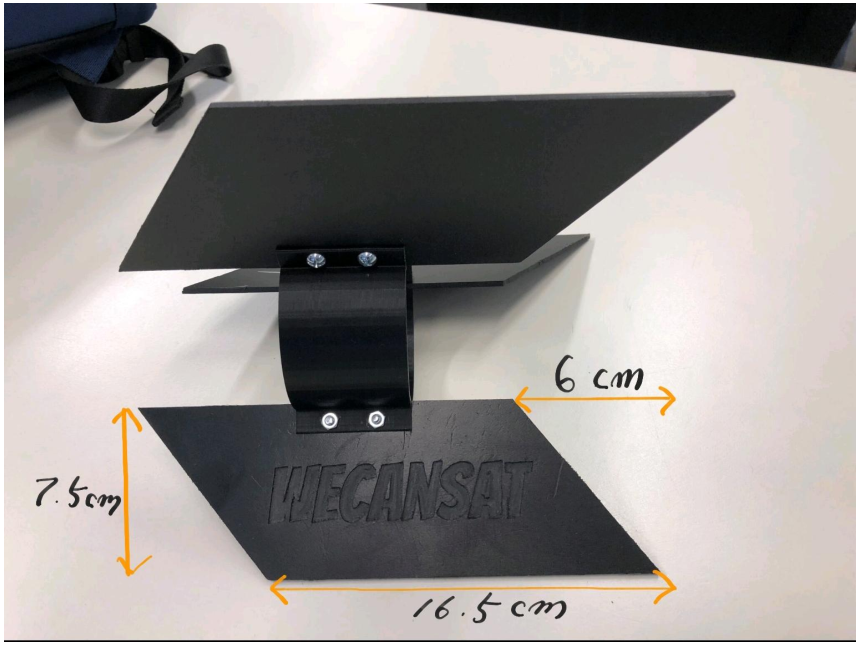
and the holding mechanism

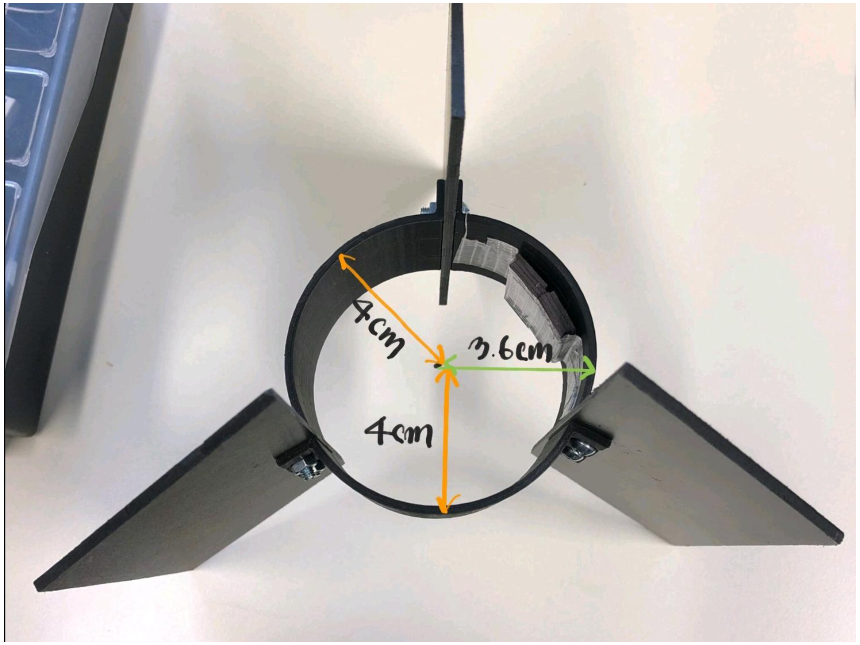
detaches.





Fins



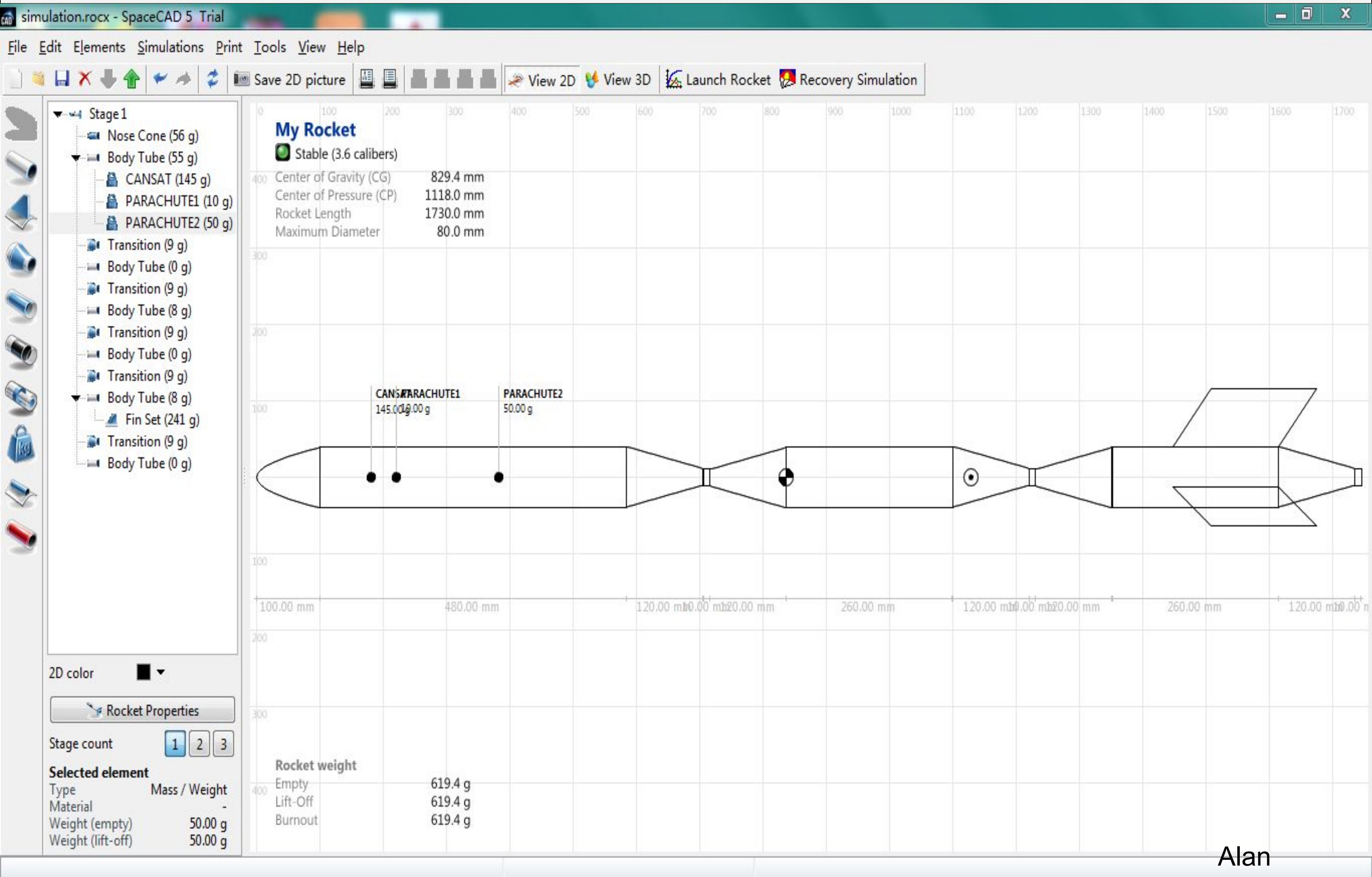


Chanhee

Nosecone

Seob

Simulation Result



Alan

Simulations of Rocket Parameters

LIMITATIONS

- Mass of CANSAT under 200g
- Size of CANSAT smaller than 66mm*115mm
- All pressure tanks shall pass a pressure test at 8bar before launch
- The pressure test chamber has a height of 1400mm
- The pressure at the launch pad will be limited to 10bar
- The propellant for the launcher shall be water

Alan

WEIGHT DISTRIBUTION:

COMPONENTS		WEIGHT(g)
cansat		145
booster		326
fins		116
parachute(rocket)		50
parachute(cansat)		10
body		265
total weight		912

Alan

Water Rocket Simulation Results

Simulation number 12604, for 141.23.151.29

Parameters

Bottle Volume	5600 cc
Diameter	80 mm
Water Fill	1900 cc
Launch Pressure	811 Kpa (118 PSI, 8.00 Bar)
Nozzle diameter	23.0 mm
Nozzle viscous losses	0.16
Dry mass	912.0 grams
Coefficient of drag	0.30
Initial Velocity	0.0 m/s
Launch Tube length	0.0 mm
Launch Tube diameter	23.0 mm

Alan

Results

Launch and thrust phase

Initial thrust 644.5N
Initial burn acceleration 219.4 m/s^2 (22.4G)
Average acceleration 299.5 m/s^2 (30.5G)

Burnout

Burnout after 137 milliseconds
Burnout Velocity 41.2 m/s (148.2 kmh, 92.1mph)
Burnout Altitude 2.3 metres (7.6 feet)
Burnout acceleration 324.8 (33.1G)
Drag force at burnout 0.9 newton (0.1kgf)
Deceleration due to drag 0.1G
Speed increase due to air pulse 7.0m/s

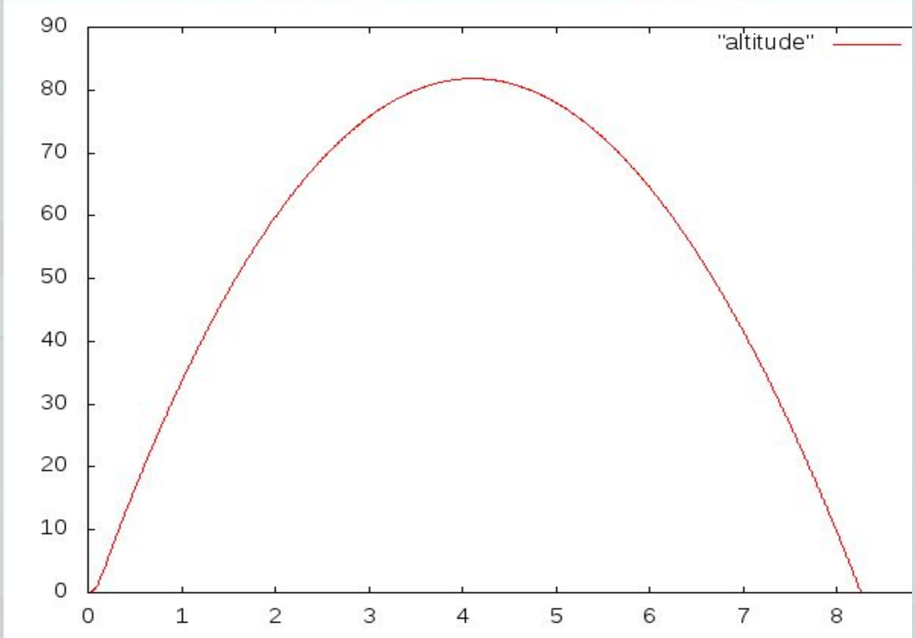
Coast

Drag-free coast 86.4 metres to apogee at 88.7 metres after 4.3 seconds

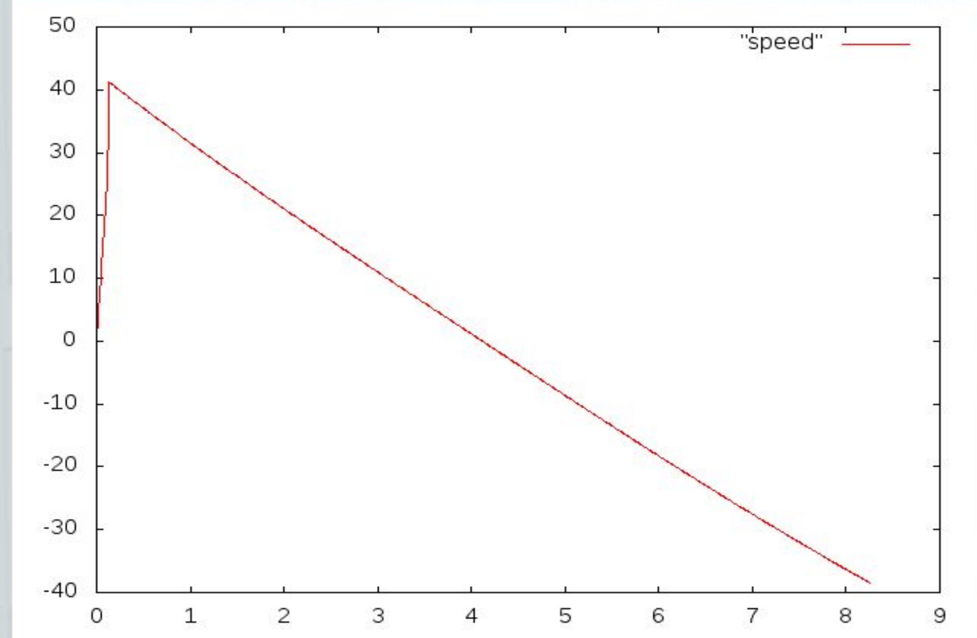
Actual apogee at **81.83** metres (268.5 feet) after 4.12 seconds

Alan

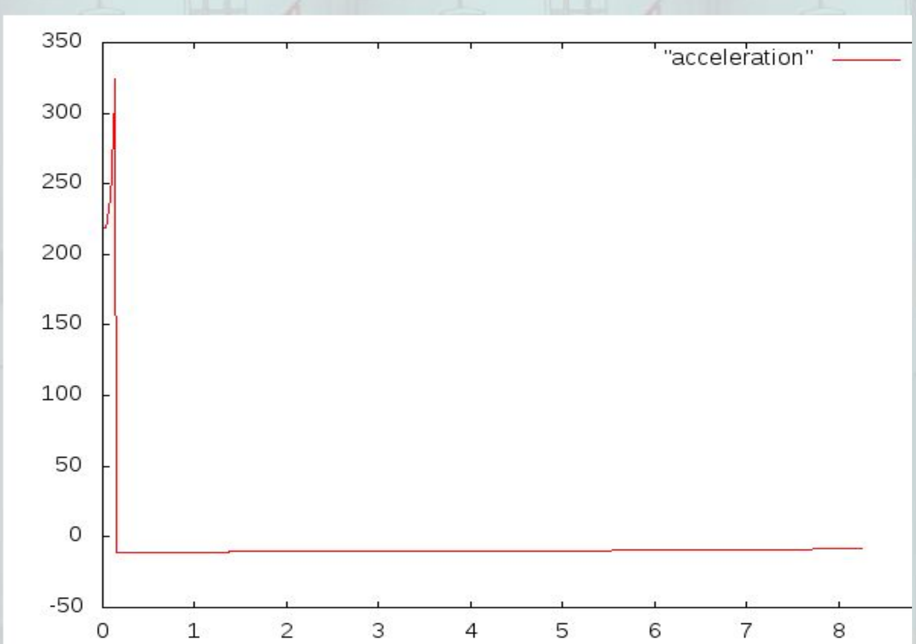
Altitude (Metres)



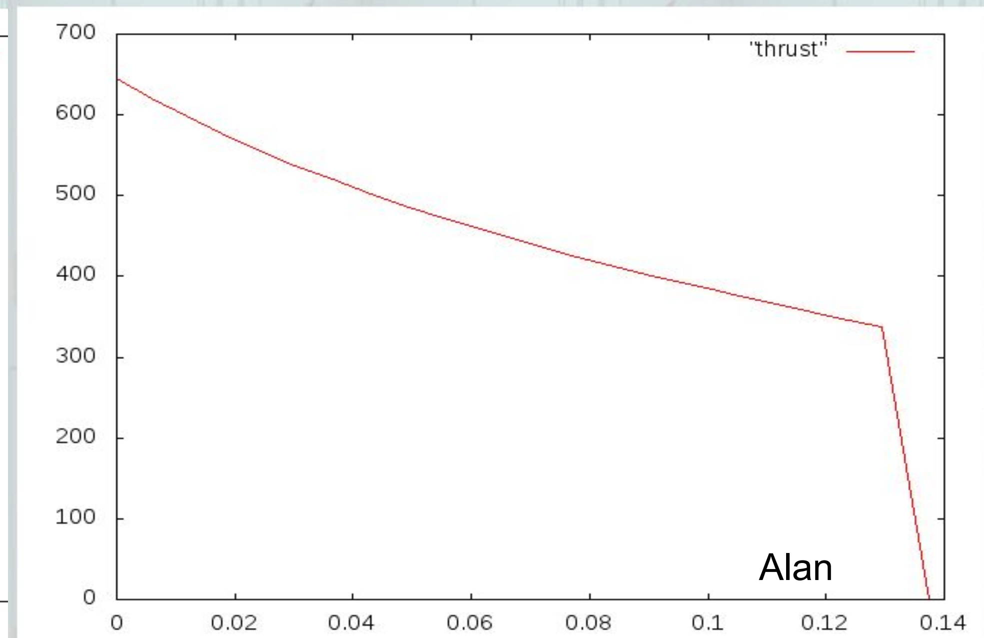
Speed (Metres/second)



Acceleration (Metres/second^2)



Thrust (N)



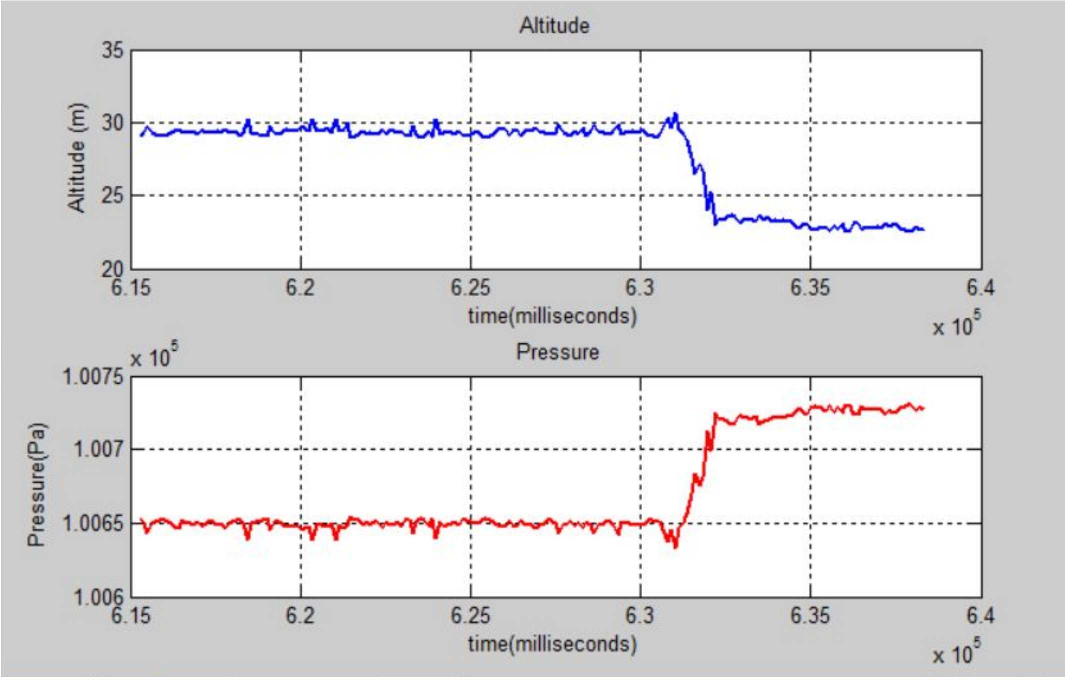
Results - Comment:

-Altitude

-the pressure goes up as the altitude decreases;

-in this experience, 29m to 23m;

-the altitude must decrease slower when the parachute opens.



Joana

Results - Comment:

-Acceleration

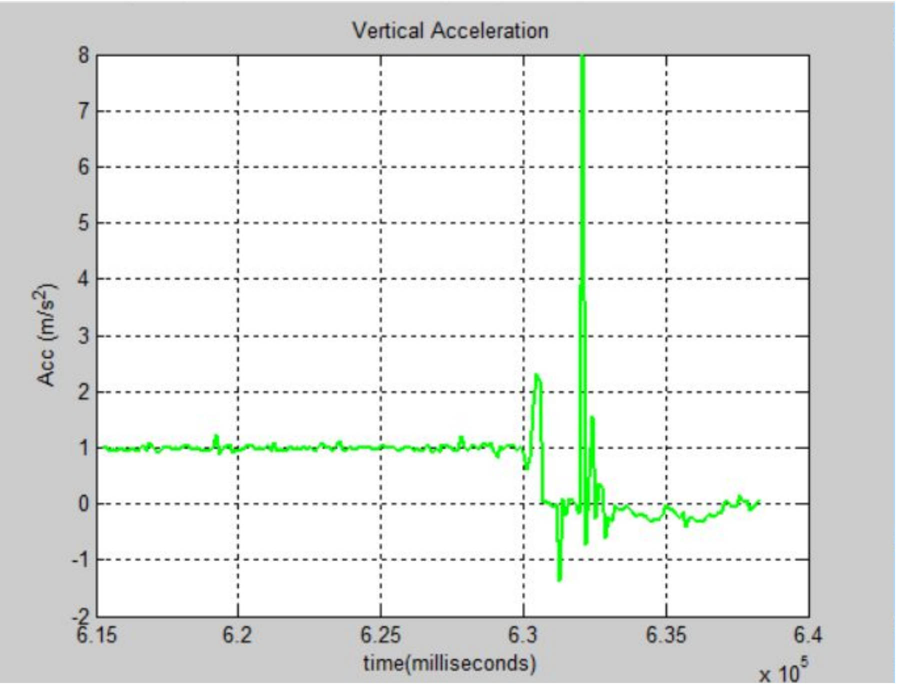
- peak;

- acceleration decreases;

- parachute (decrease slope);

- acceleration gets to zero (terminal velocity);

-oscillates around zero (until reaches the ground).

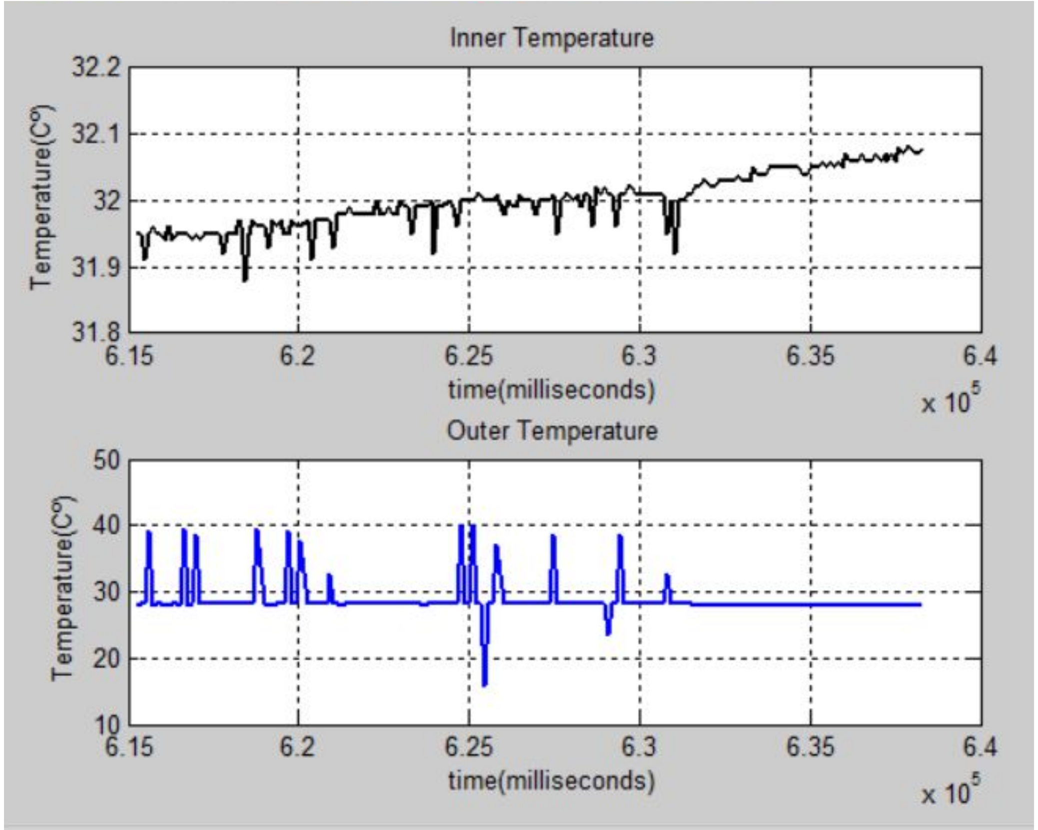


Results - Comment:

-Temperature

- the inner temperature did not changed much and it's arround 32ºC;

-the temperature outside maintains around 29ºC.



Joana

Testing our System

- Tested by throwing CanSat/ CanSat and rocket into the air
- Successful ejection 19/20 times
- 95% Success Rate
- 1 Fail due to human error

Aine

Testing our System

Aine

Pre-Launch Checklist

- Attach New Battery
- Confirm Connection between PCB and Servo
- Seal down Lid with Temp Sensor Connection

- Fold Parachutes
- Pack Parachutes and CanSat into Rocket

- Connect **upright** servo to rubberband door holder
- Launch!

Aine

WeCanSat

Thank you!