

# Critical Design Review

# AURORA

# Team Aurora



## Structure & Recovery:

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## Electronique :

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- Carlo Schmitt

# Buts et Objectifs :



- Apprendre à construire une fusée LVL1
- Transporter puis éjecter un cansat
- Atteindre une apogée entre 300-600 m  
→ tout en respectant les exigences obligatoires

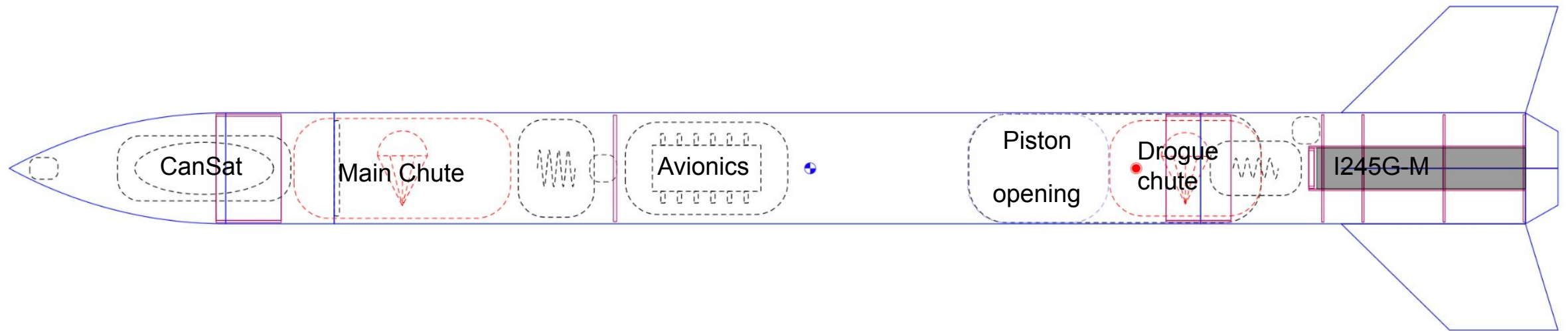
# Agenda



- Design Overview
- Bottom
- Side door (+ drogue shoot)
- Avionics
- Nosecone
  - CanSat
  - Main shoot
- Recovery

# Design Overview

## Rocket Design



Rocket

Stages: 1

Mass (with motor): 2484 g

Stability: 2.94 cal

CG: 74 cm

CP: 104 cm

# Design Overview



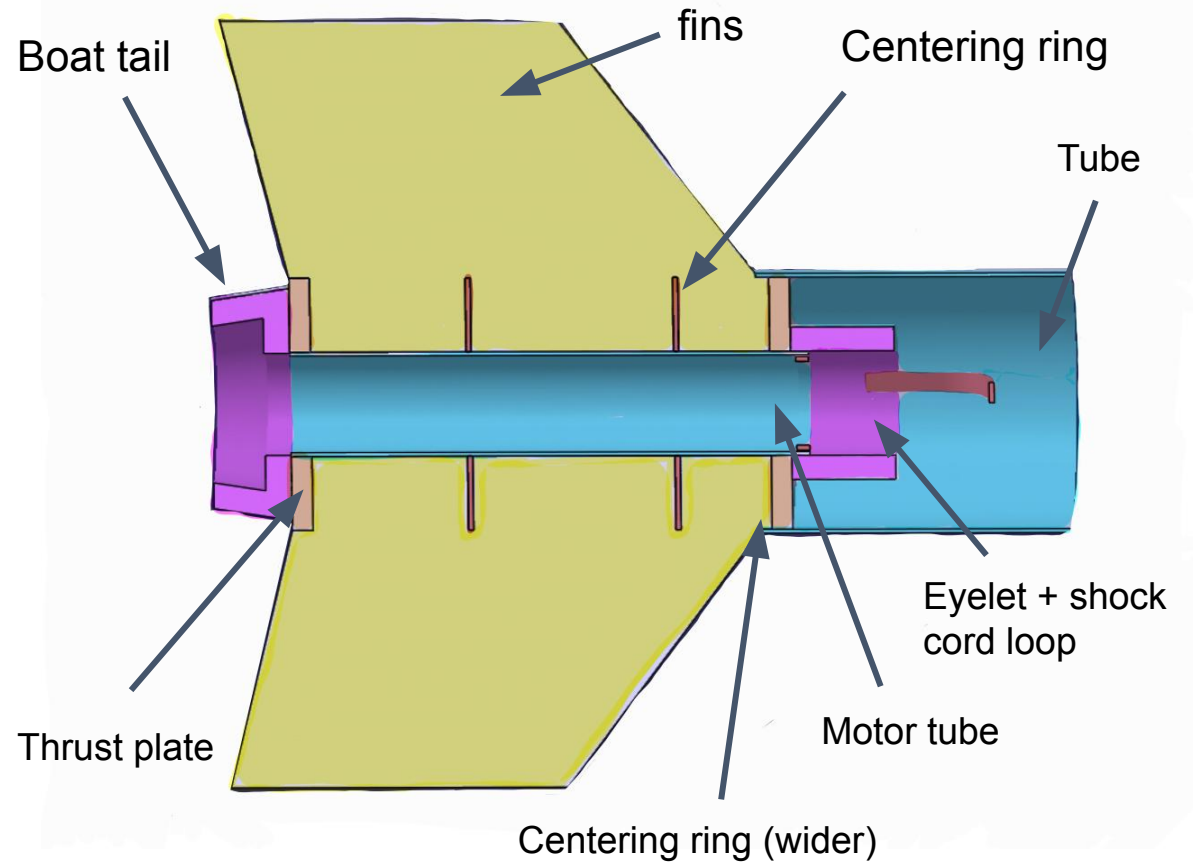
## I245G-0

Altitude	567 m
Flight Time	74.3 s
Time to Apogee	10.4 s
Optimum Delay	8.94 s
Velocity off Pad	23.5 m/s
Max Velocity	122 m/s
Velocity at Deployment	17.4 m/s
Landing Velocity	3.36 m/s

Motor	Avg Thrust	Burn Time	Max Thrust	Total Impulse	Thrust to Wt	Propellant Wt	Size
I245G	250 N	1.4 s	412 N	351 Ns	10.28:1	181 g	38/193 mm

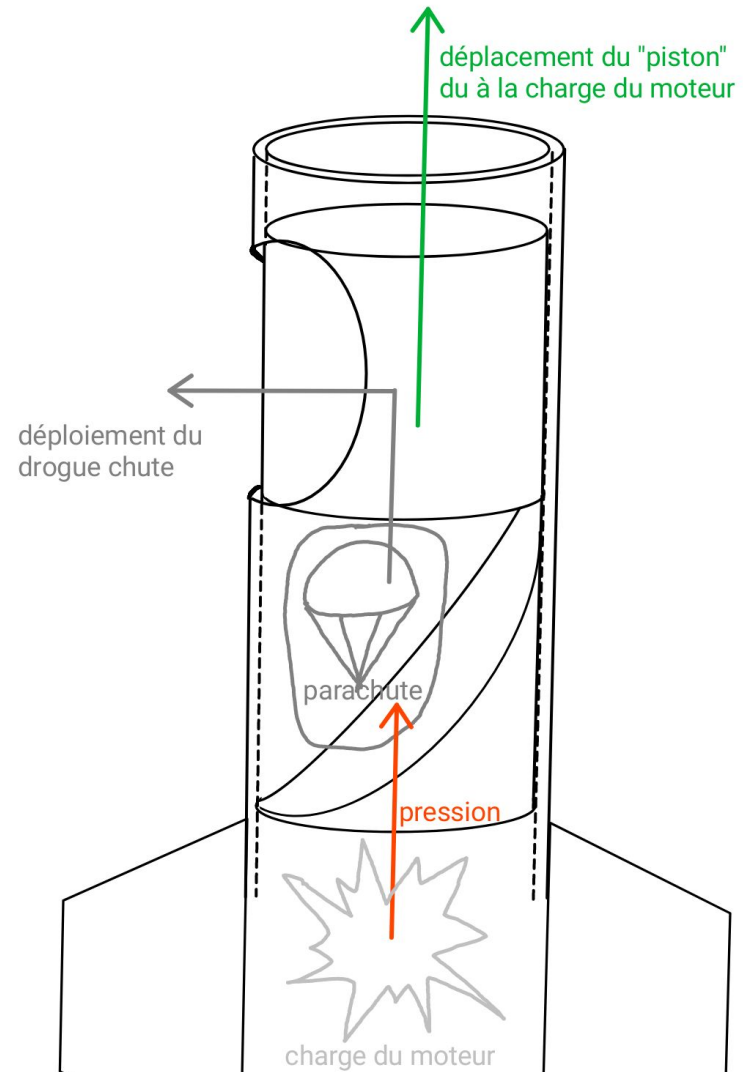
# Bottom

- 4 fins
- motor tube :  $\varnothing$  38 mm
- G-I impulse range



# Side Door

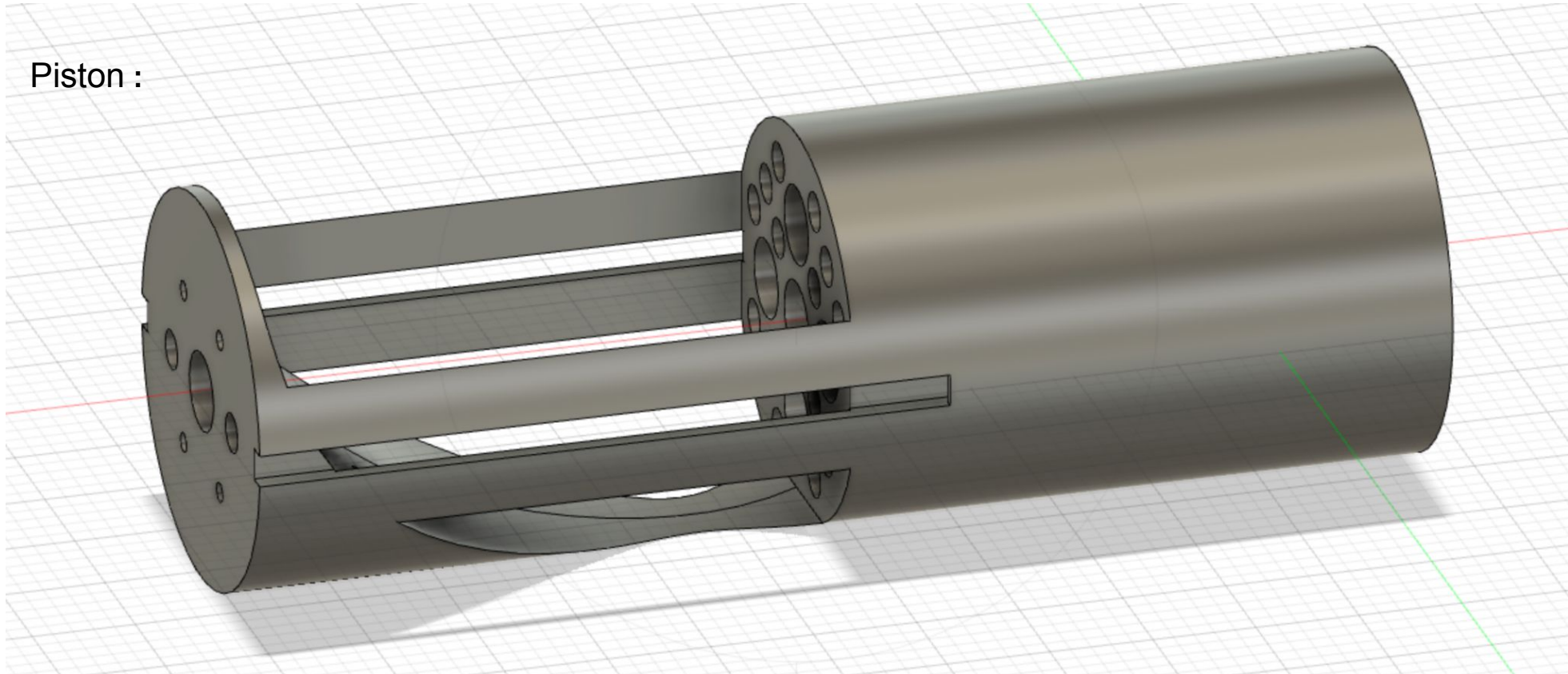
Concept/Idea:





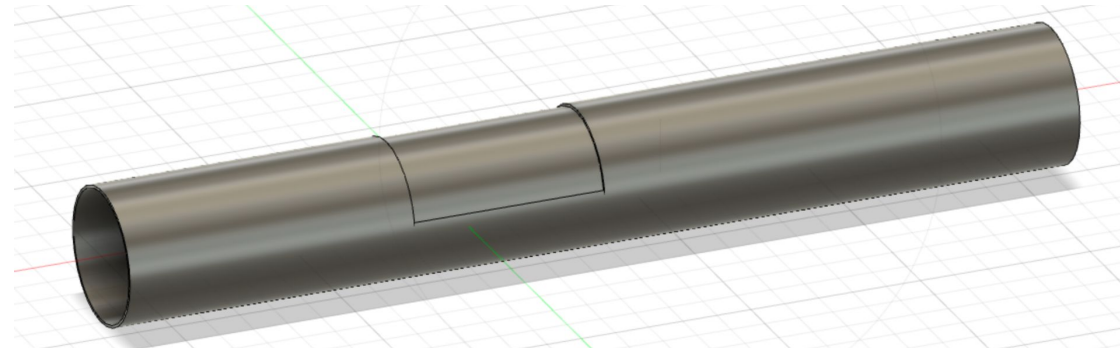
# Side Door

Piston :

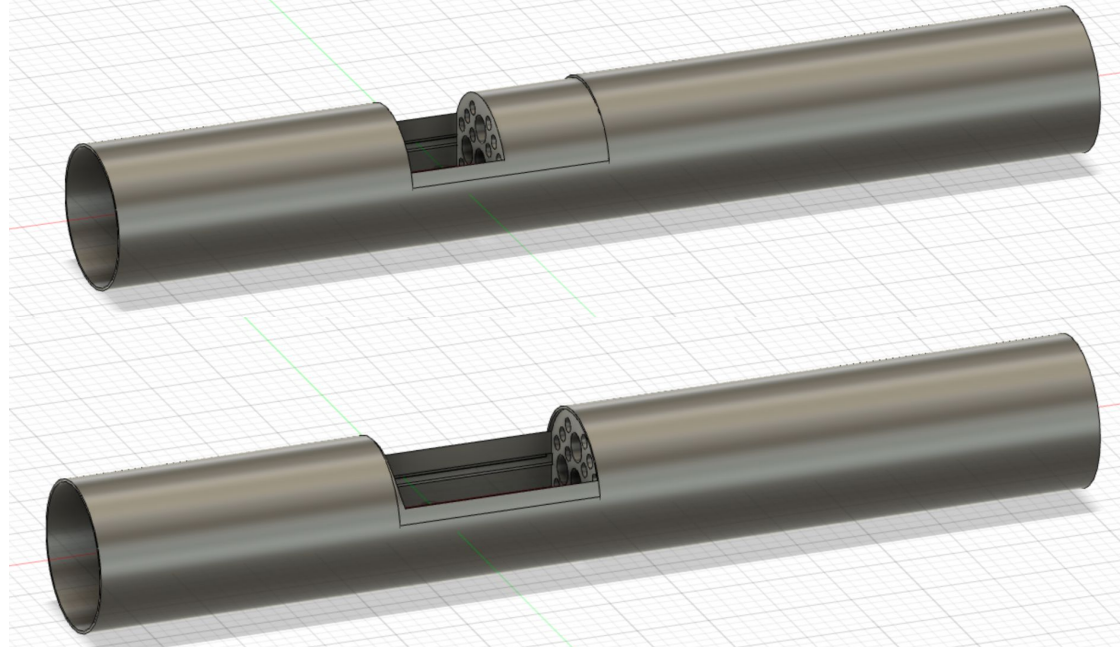


# Side Door

Ascent:



Apogee:

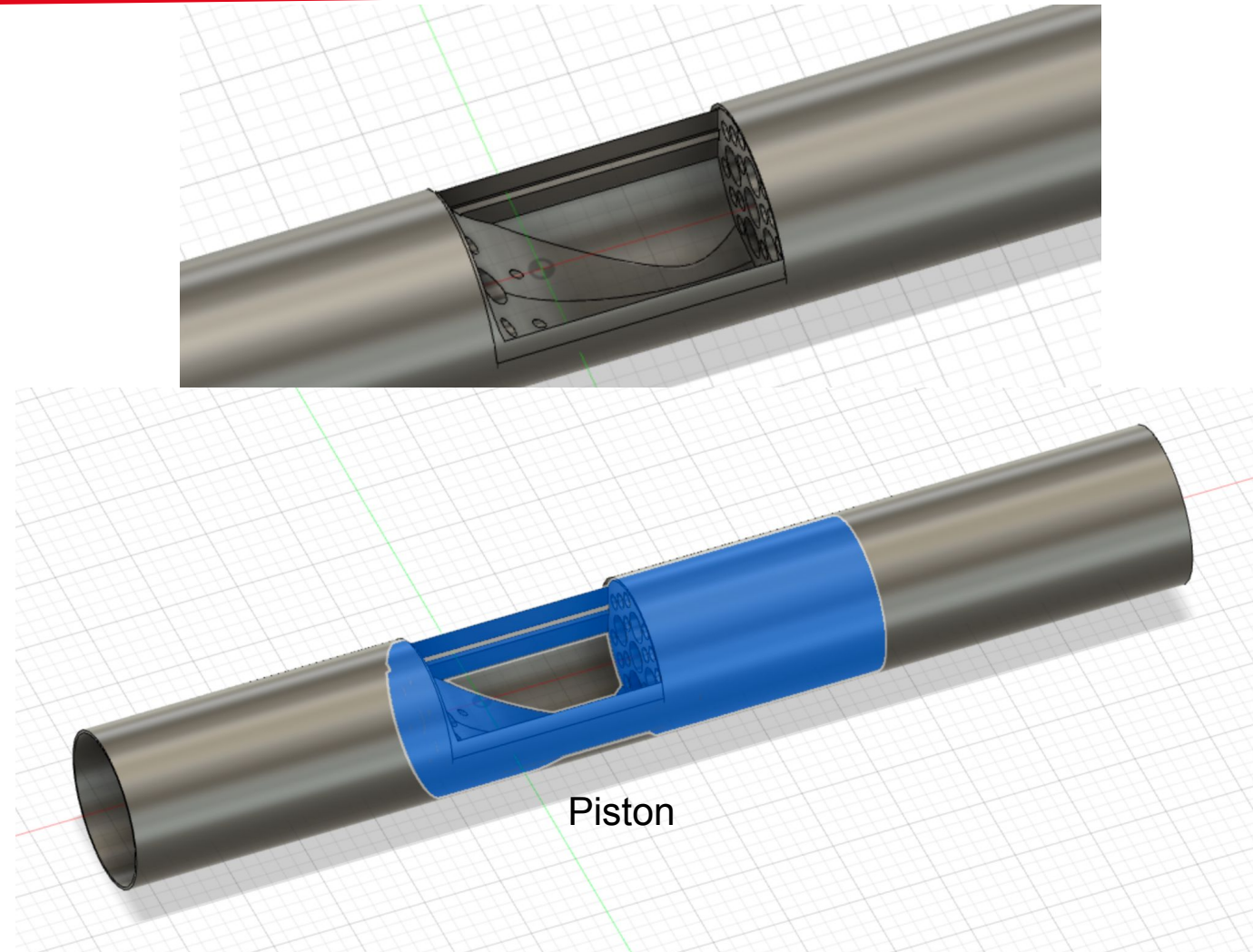


**Don't forget to lub the tube**

(to make sure the piston has a smooth way up)

the "stop" deploys and blocks the piston.

# Side Door



# Avionics - Objectives



- **Pyro** - Fire the e-matches to trigger recovery events
- **Data logging** - Data should be stored in a memory, that we can recover after flight
- **(Telemetry)** - Send back live data to the ground and display them

# Datapoints

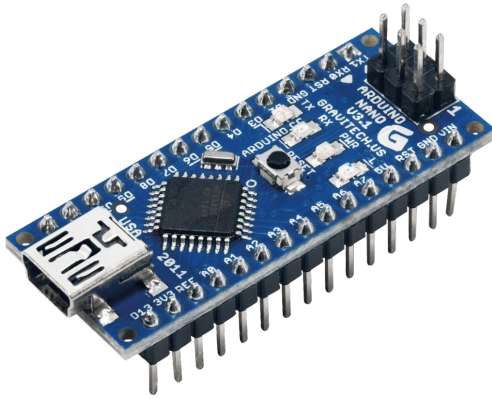


- Time
- Altitude
- Acceleration
- Velocity
- Orientation
- Pressure
- Temperature
- Video

# Components

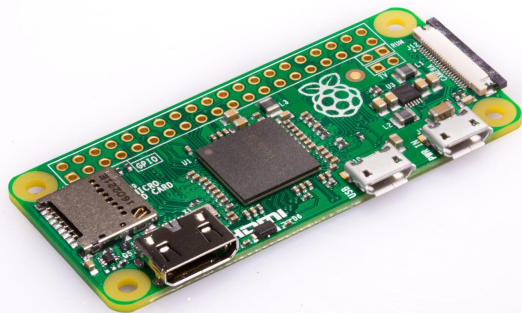
- Arduino Nano
- Raspberry Pi Zero
- MPU6050 (Acceleration & Gyroscope)
- BMP280 (Pressure and Temperature)
- Rpi camera module v2 (Video)
- SD-Card module
- Battery

# Microcontrollers



## Arduino Nano

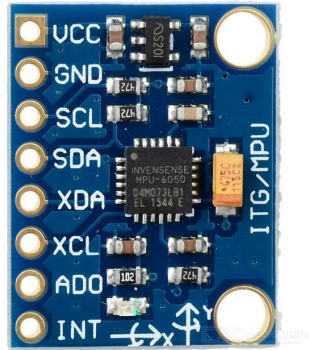
For triggering the recovery events and logging data from sensors



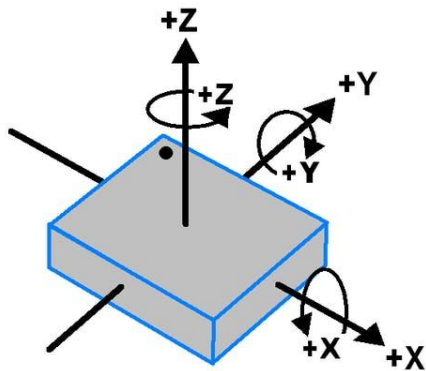
## Raspberry Pi Zero

For Handling the Camera and the Telemetry

# MPU6050



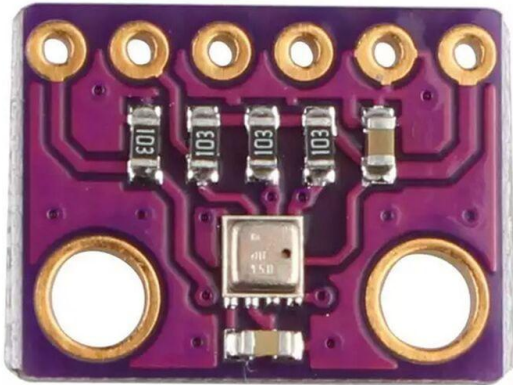
- 3-axis accelerometer
- 3-axis gyroscope
- Temperature



MPU-6050  
Orientation & Polarity of Rotation

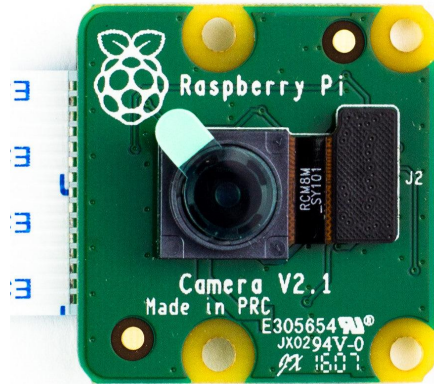


# BMP280

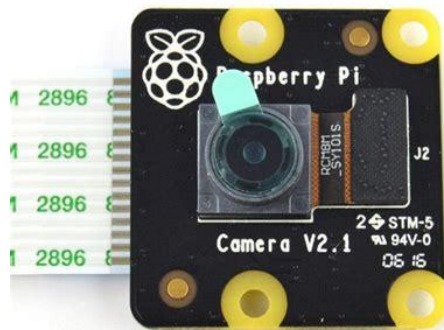


- Temperature
- Pressure

# Rpi camera module v2

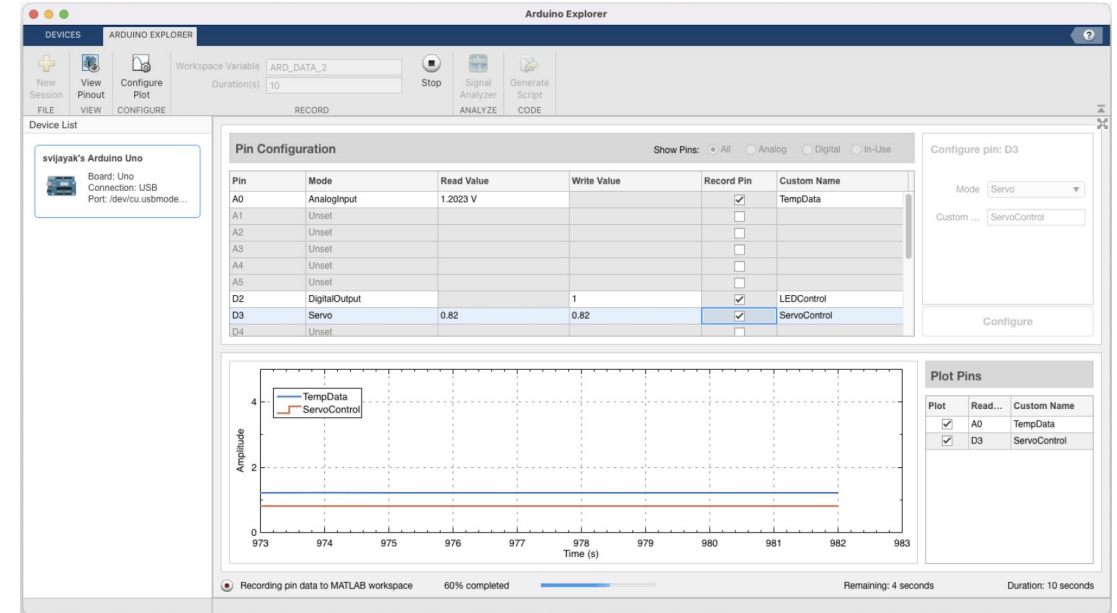


- Video
- Multiple viewing angles: Inside and outside



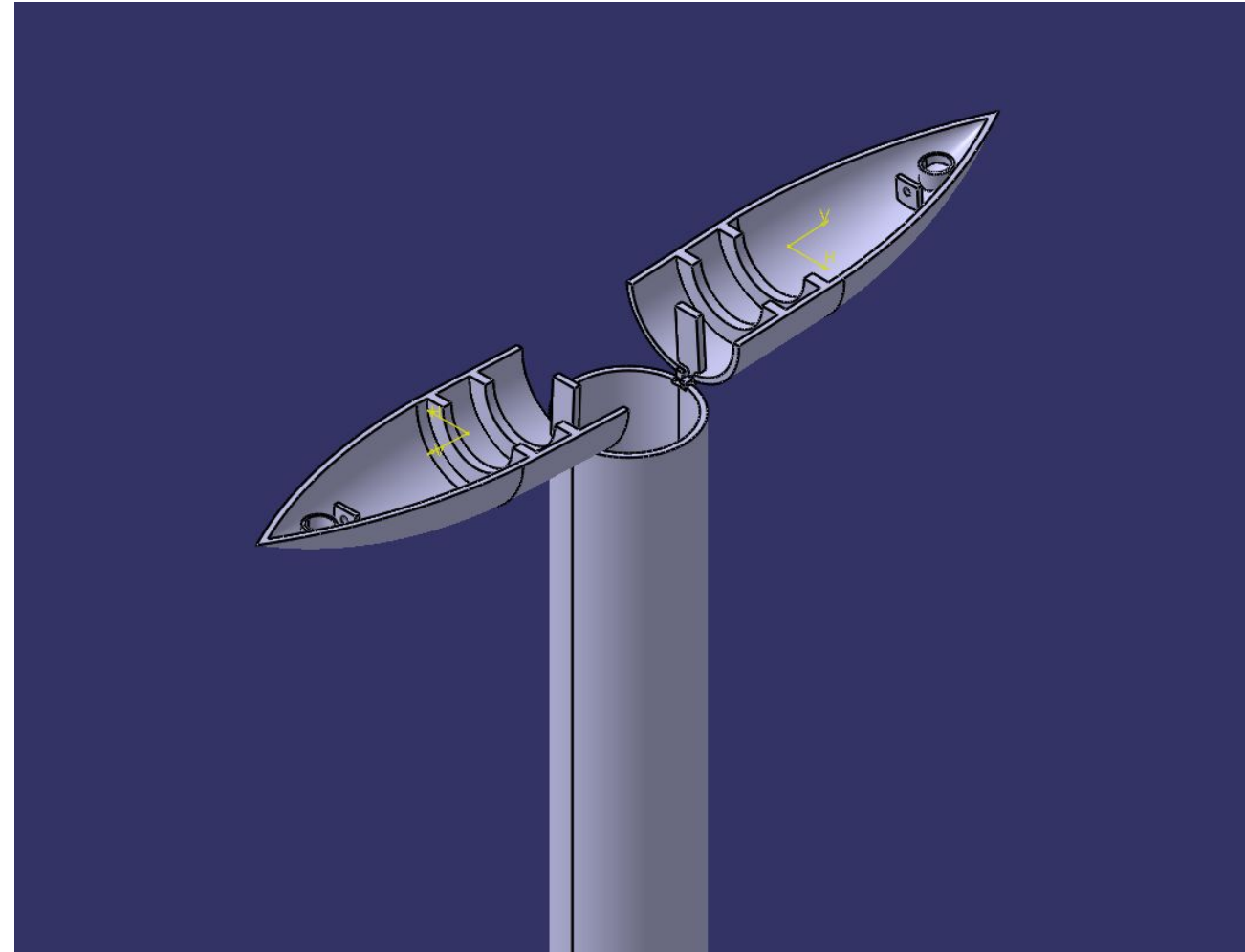
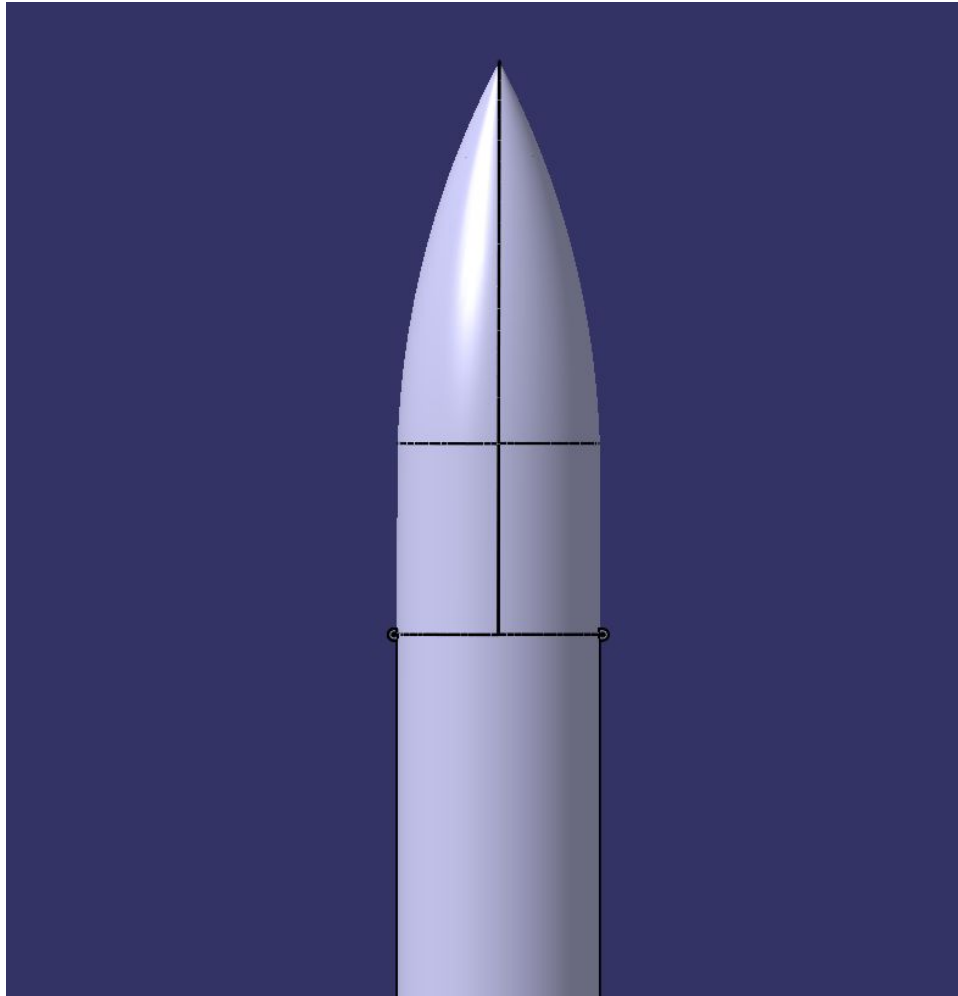
# Telemetry - general idea

- If we have time
- Rocket transmitting data to an arduino on the ground
- Arduino communicating with a computer
- Using Matlab to perform live plot



# Nosecone

“Jaws”: Système d’ouverture en mâchoire.



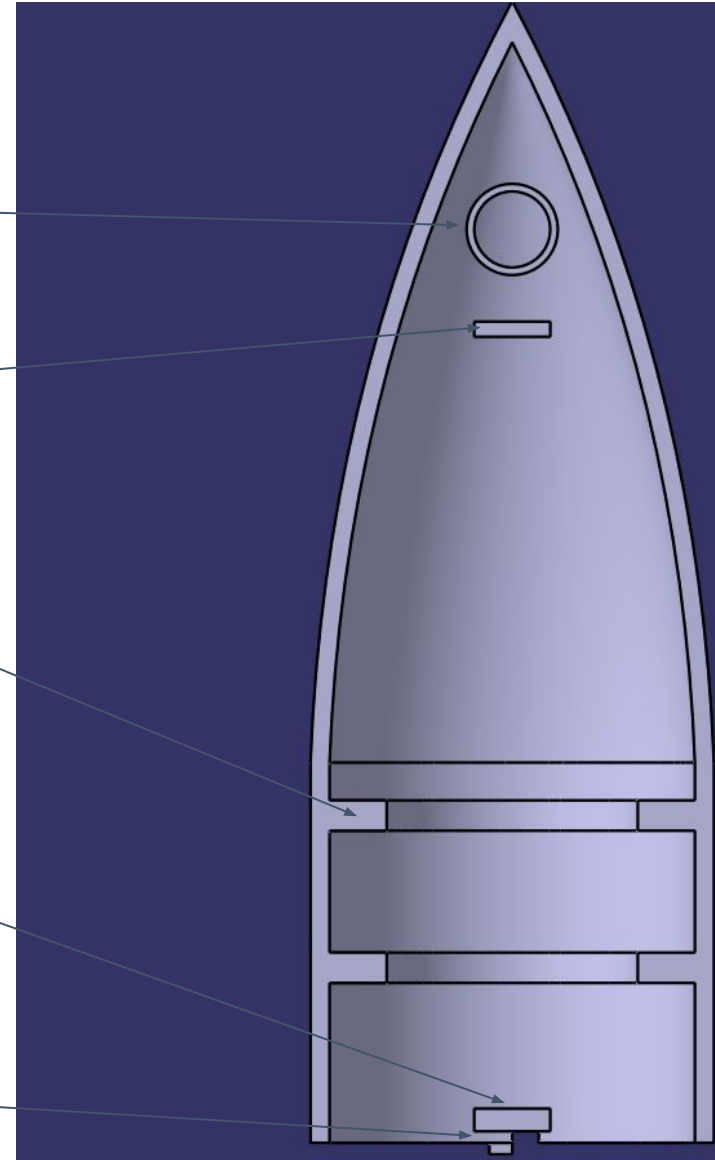
# Ouverture du Nosecone

- Point(s) d'attache
- Ressort préchargé
- Bras de support
- Ejection du CanSat à l'ouverture

# Fairings

Chaque fairing est composé de :

- Cylindre ressort
- Point d'attache
- 2 centering rings pour le CanSat
- Bras de support & expulsion
- Charnière



# Hermétisation du nœseau



- Système d'emboîtement
- Joint

# Recovery



Apogee : Drogue chute

150m : Main chute

Drogue chute : steal one at ERT, at least dia. **0.46m**

Main chute : if possible, make one ourselves

Following the parachute made for Bellalui II (Hemisphere type). dia : **1.5m** for a **4.7m/s** landing

*Problem : Worldwide shortage of parachute fabric...*