CanSat 2023
Post Flight Review (PFR)
Outline

#1085

Bamantara EEPISAT

Presentation Outline

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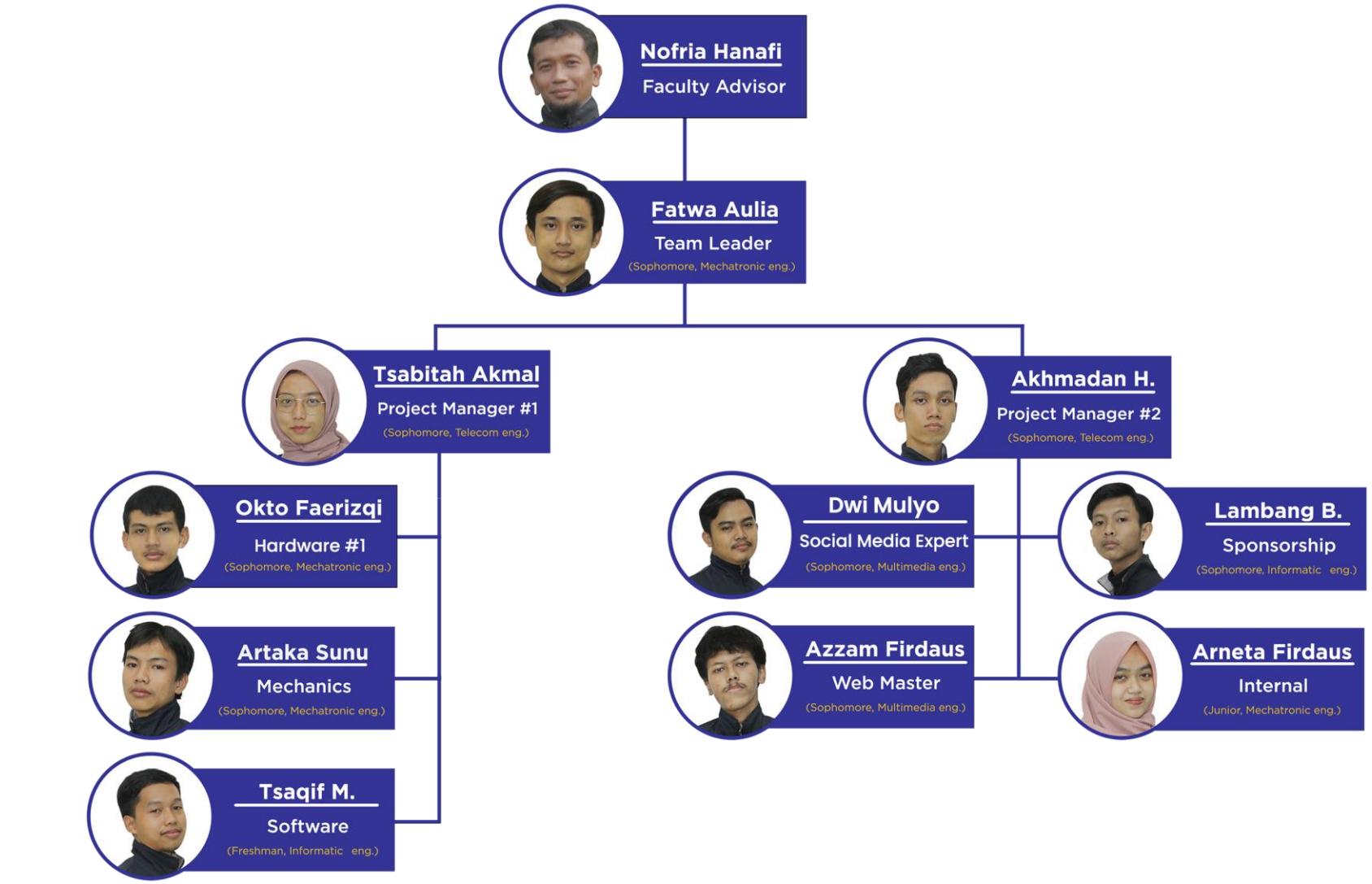
Team Organization



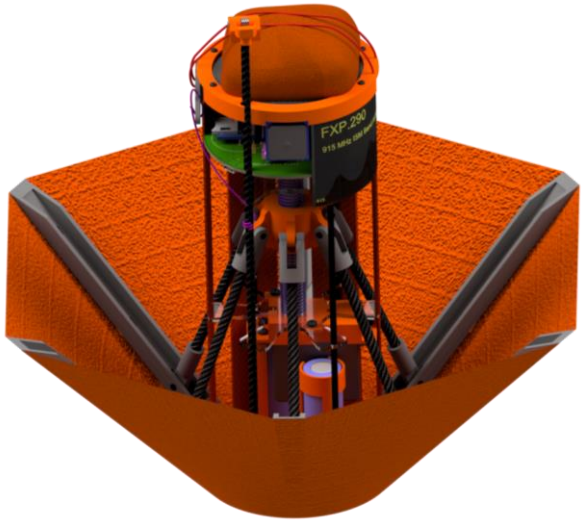
System Overview

Artaka Sunu Adhi Prasetya

Payload Design Description (1/2)

Payload Major Components

Payload 3D Design



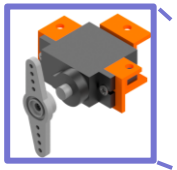
Actual Payload

Information

Payload will work after released from the container. DC motor and leadscrew mechanism are used to maintain the heat shield angle. The mass is focused at the bottom of the payload to keep stability and prevent from swaying.

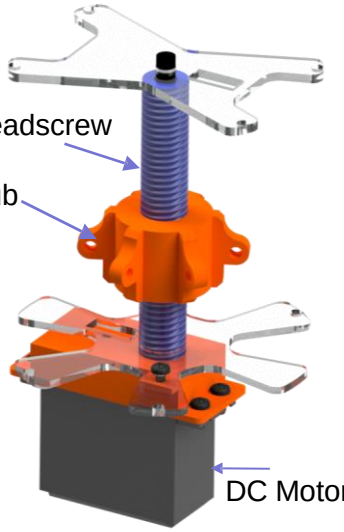
Payload Design Description (2/2)

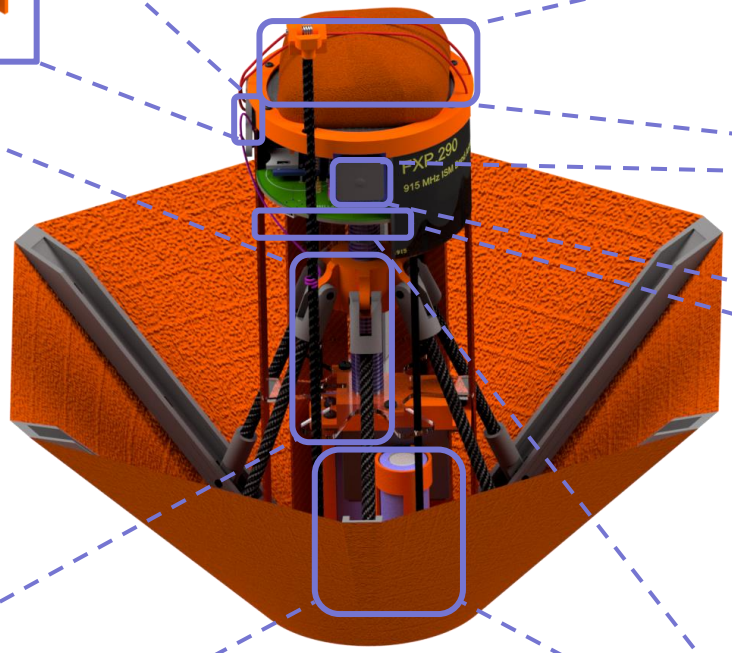
Payload Major Parts and Components



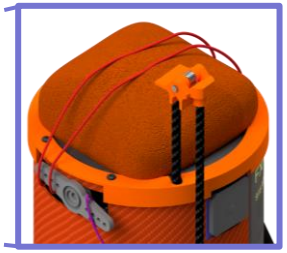
Servo Motor

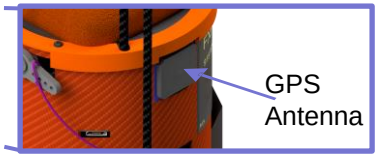
Leadscrew Mechanism

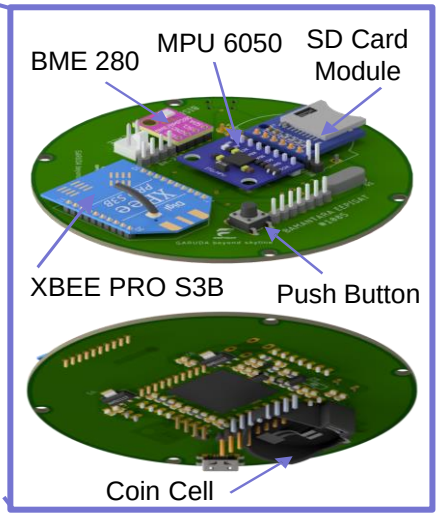




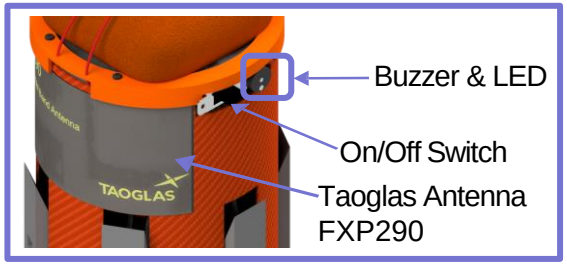
Rubbers Locking System

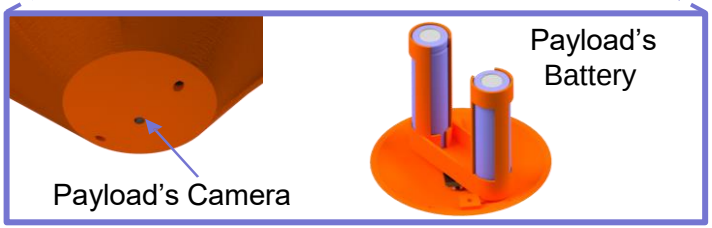






Electronic Components

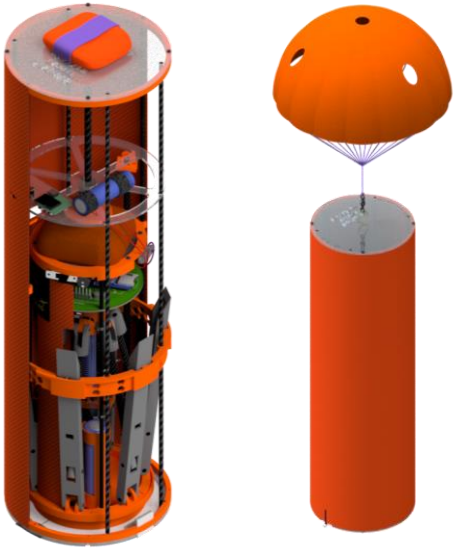




Container Design Description (1/2)

Container Major Components

Container 3D Design



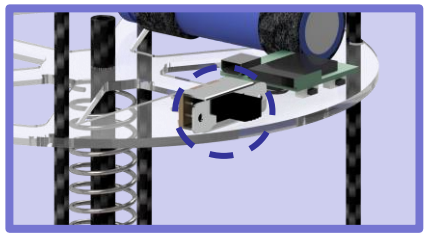
Actual Container

Information

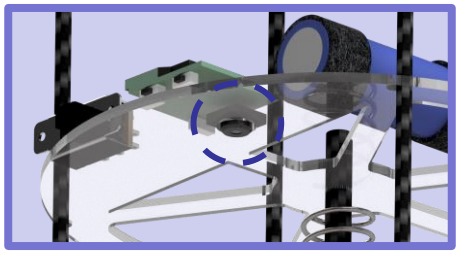
The descent control of the container is maintained by a parachute. The parachute has a spill hole and three side holes to improve stability and maintain nadir direction.

Container Design Description (2/2)

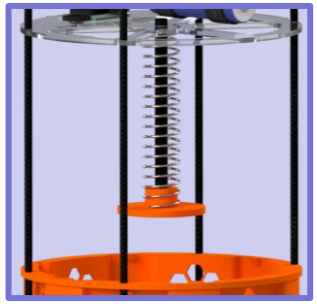
Container Major Parts and Components



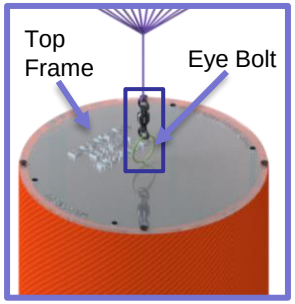
On/Off Switch



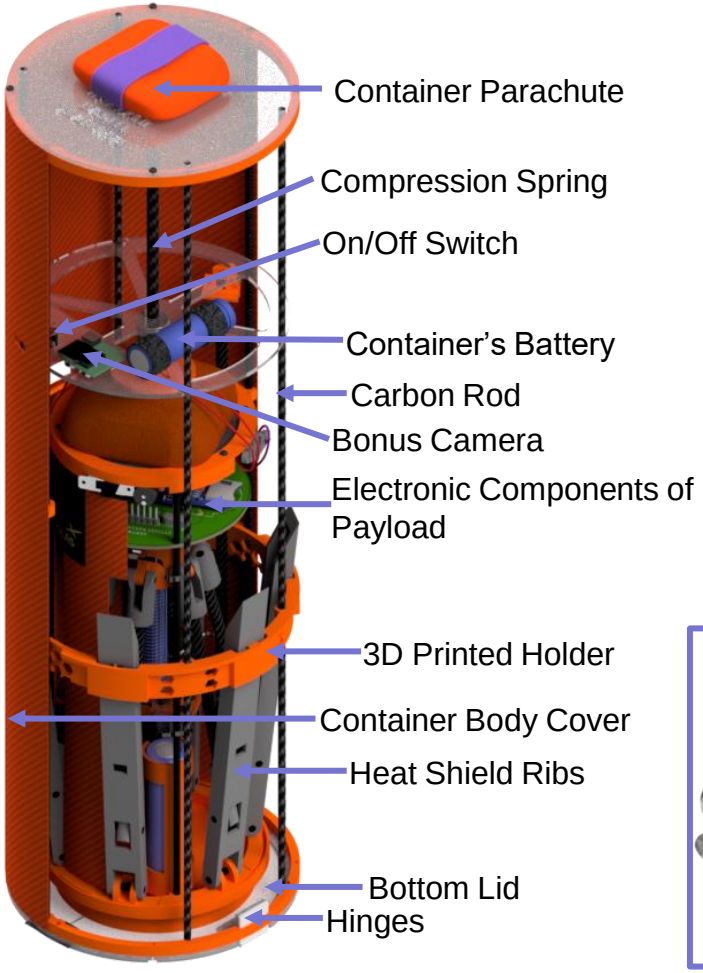
Bonus Camera

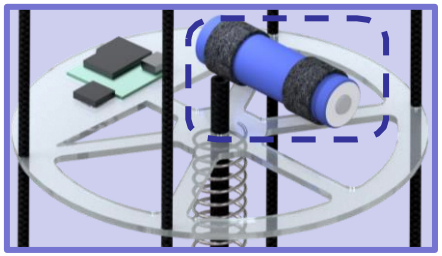


Compression Spring

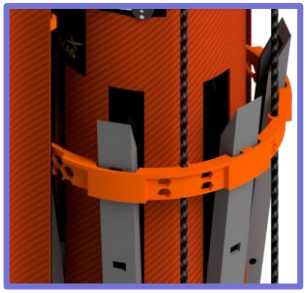


Attachment Point

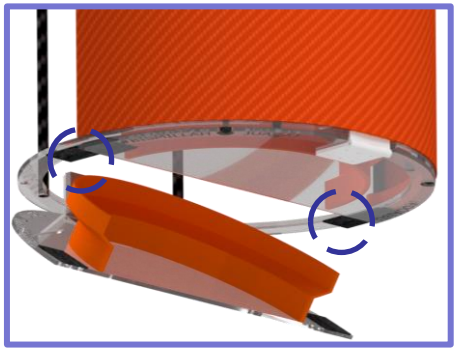




Container's Battery



3D Printed Holder



Velcro Locking System

Concept of Operations and Sequence of Events

Fatwa Aulia Al-Haq

Comparison of Planned and Actual CONOPS

CONOPS	Planned	Actual
Pre-Launch	• Arrive at the launch site • GCS and antenna setup • Sensor system calibration and communication with the GCS command • Final CanSat check completed • Activate and load CanSat into a rocket	• Arrive at the launch site ✓ • GCS and antenna setup ✓ • Sensor system calibration and communication with the GCS command ✓ • Final CanSat check completed ✓ • Activate and load CanSat into a rocket ✓
Launch	• CanSat in a rocket launch • CanSat is released from the rocket (670–725 m) • Container parachute deployment with a rate of 15 m/s • The video camera started to record the separation of the payload then the payload open a heat shield at 500 m with a rate of 20 m/s or less • Payload parachute deployment at 200 m with a rate of 5 m/s • Payload landed in the upright position and raised a flag 500 mm above the base of the payload. Therefore video camera stopped recording • Payload shall stop transmitting data to GCS	• CanSat in a rocket launch ✓ • CanSat is released from the rocket (670–725 m) ✓ • Container parachute deployment with an average rate of 19.6 m/s **(in tolerance)** ✓ • The video camera started to record the separation of the payload then the payload open a heat shield at 500 m with an average rate of 17.5 m/s **(less than 20 m/s)** ✓ • Payload parachute deployment at 200 m with an average rate of 9.1 m/s **(out of tolerance)** • **Payload raised flag then video camera stopped recording, but didn't in upright position** • Payload shall stop transmitting data to GCS ✓
Post-Launch	• CanSat recovery by location from last telemetry and buzzer • Inspection of CanSat damage • Take the SD Card from the payload • Analyze data received • PFR preparation	• CanSat recovery by location from last telemetry and buzzer ✓ • Inspection of CanSat damage ✓ • Take the SD Card from the payload ✓ • Analyze data received ✓ • PFR preparation ✓

Comparison of Planned and Actual SOE (1/2)

CONOPS	Planned	Actual
Arrival	• Team arrival at the launch site • GCS and antenna setup • Check for any damages that may occur during travel	• Team arrival at the launch site ✓ • GCS and antenna setup ✓ • Check for any damages that may occur during travel ✓
Pre-Launch	• Communication inspection • Mechanism inspection • Assembly of the container and payload • Check the CanSat dimension and weight	• Communication inspection ✓ • Mechanism inspection ✓ • Assembly of the container and payload ✓ • Check the CanSat dimension and weight ✓
Rocket Integration	• Final CanSat inspection completed before launch • Turn on the CanSat, integrate it into the rocket, and ensure communication with GCS	• Final CanSat inspection completed before launch ✓ • Turn on the CanSat, integrate it into the rocket, and ensure communication with GCS ✓

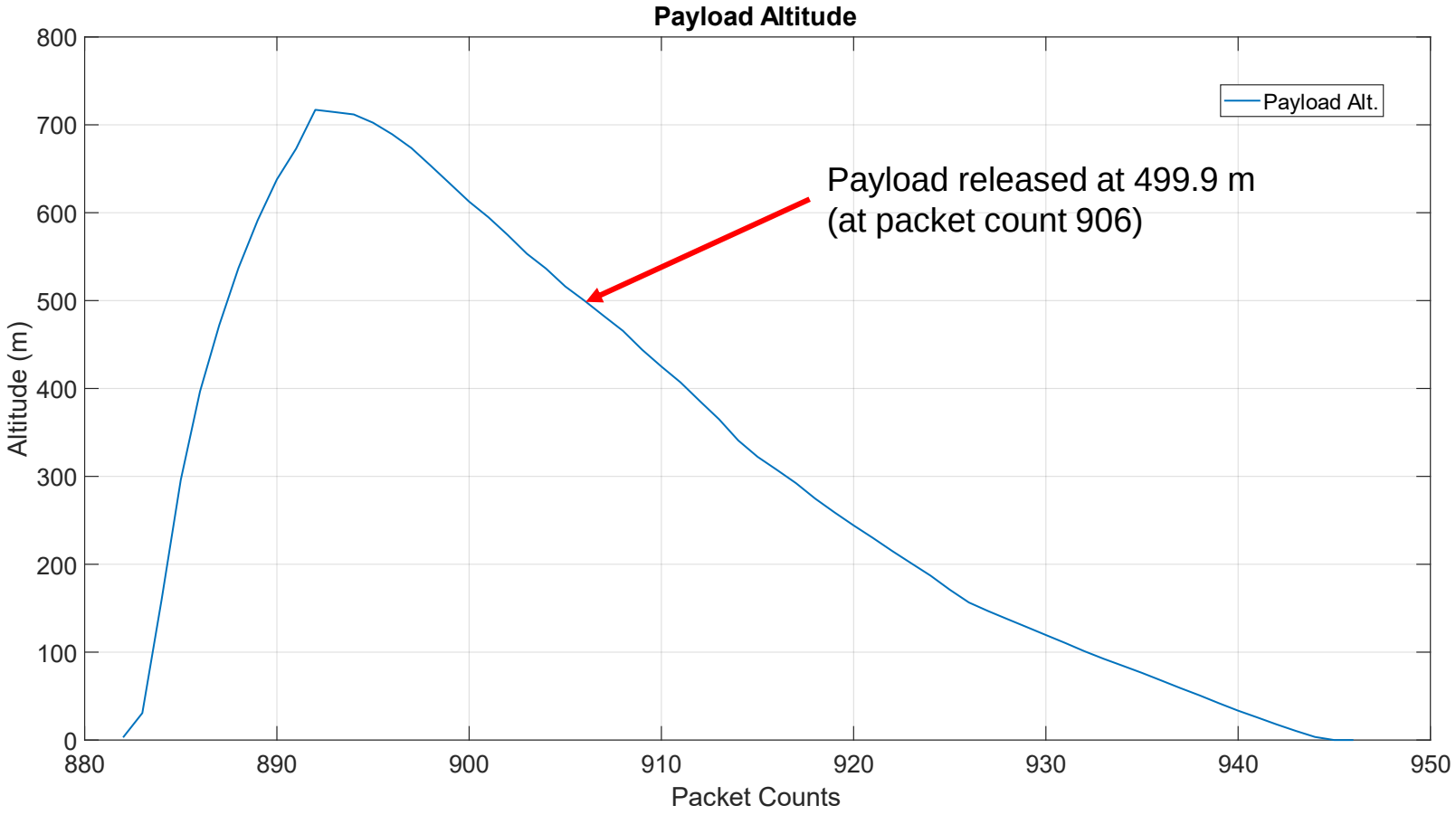
Comparison of Planned and Actual SOE (2/2)

CONOPS	Planned	Actual
Mission	• CanSat in a rocket launch • Flight monitoring • Display GCS to the judges and collect telemetry data during the mission • Recovery crew preparation	• CanSat in a rocket launch ✓ • Flight monitoring ✓ • Display GCS to the judges and collect telemetry data during the mission ✓ • Recovery crew preparation ✓
Recovery	• CanSat recovery by location from last telemetry and buzzer • Inspection of CanSat damage • Retrieve data from SD Card in the payload	• CanSat recovery by location from last telemetry and buzzer ✓ • Inspection of CanSat damage ✓ • Retrieve data from SD Card in the payload ✓
Post-Launch	• GCS data analysis and acquisition • Deliver SD card and telemetry data to judges for scoring • Evaluation team for launch day • PFR preparation	• GCS data analysis and acquisition ✓ • Deliver SD card and telemetry data to judges for scoring ✓ • Evaluation team for launch day ✓ • PFR preparation ✓

Flight Data Analysis

Achmad Bagus Okto Faerizqi

Payload Released at 500 Meters

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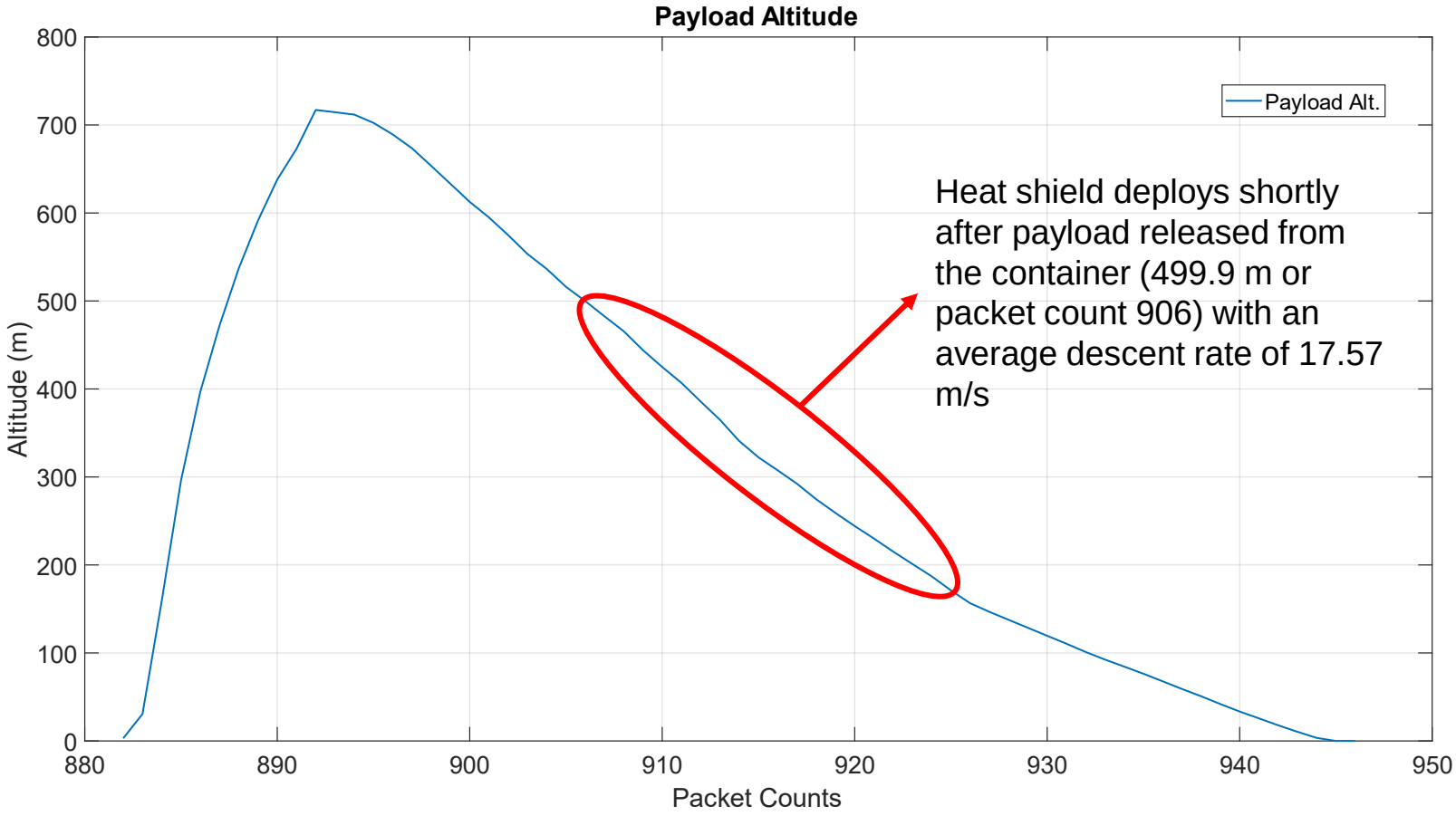
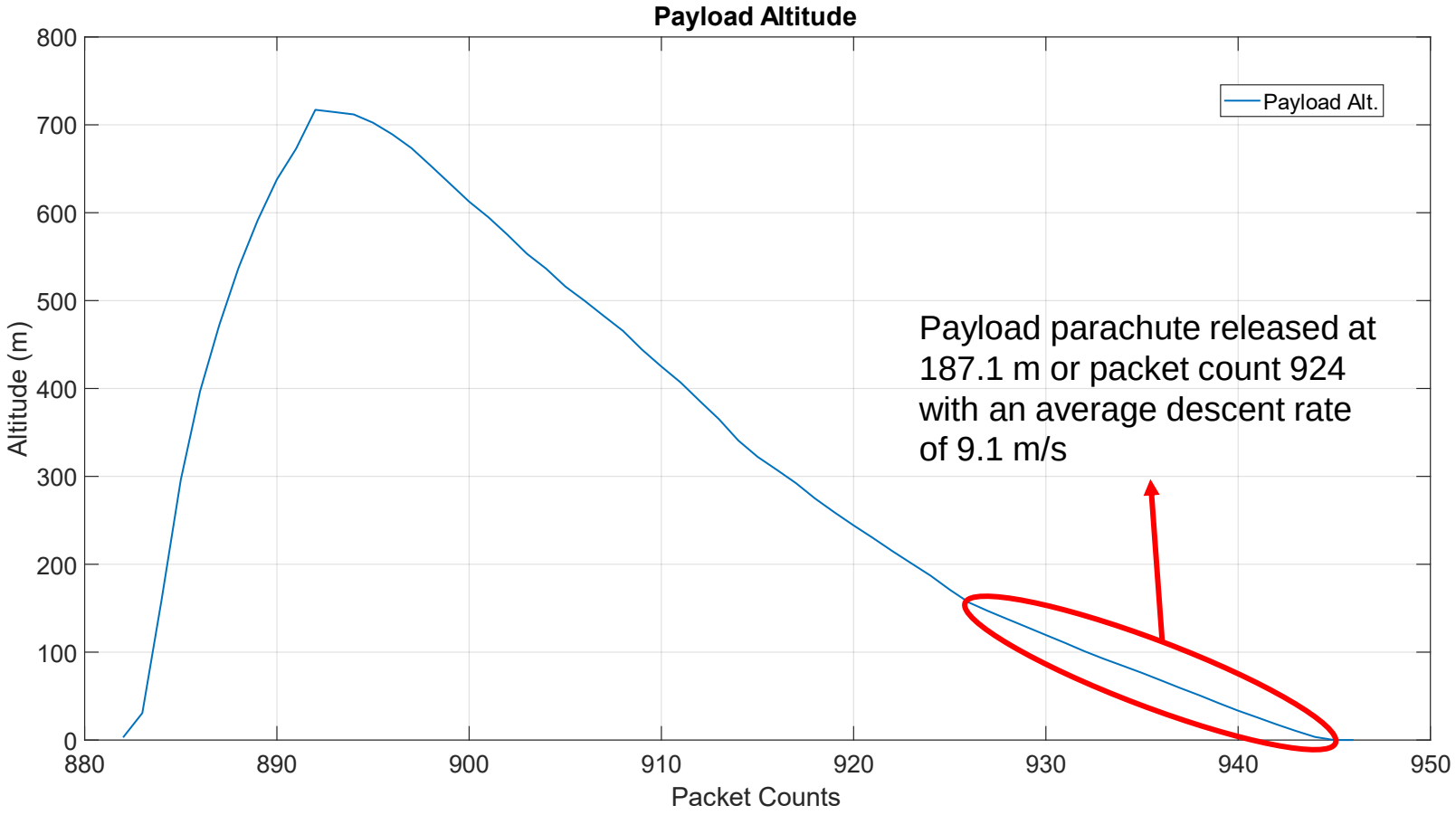
Heat Shield Deployed



Parachute Deployed at 200 Meters

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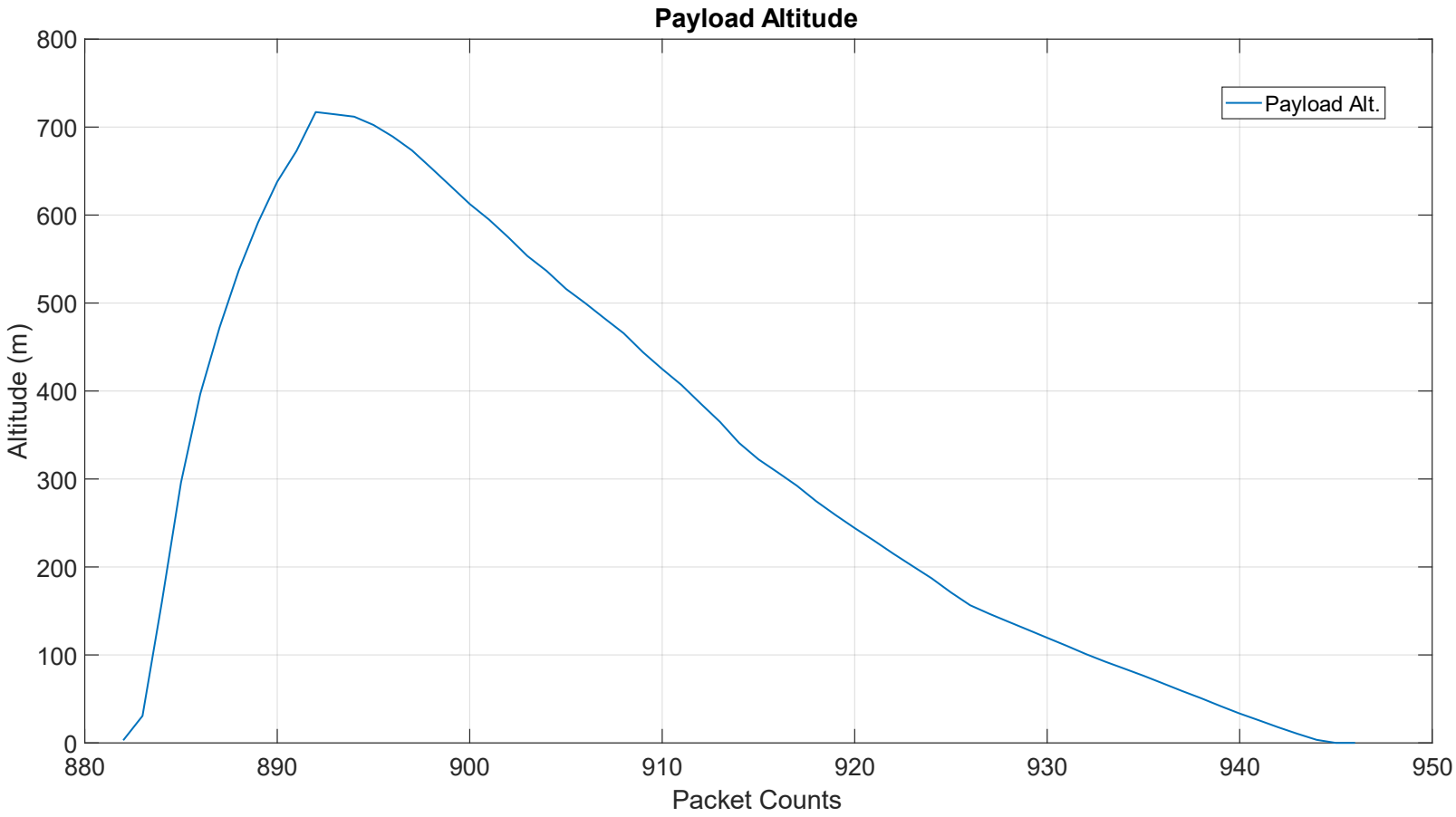
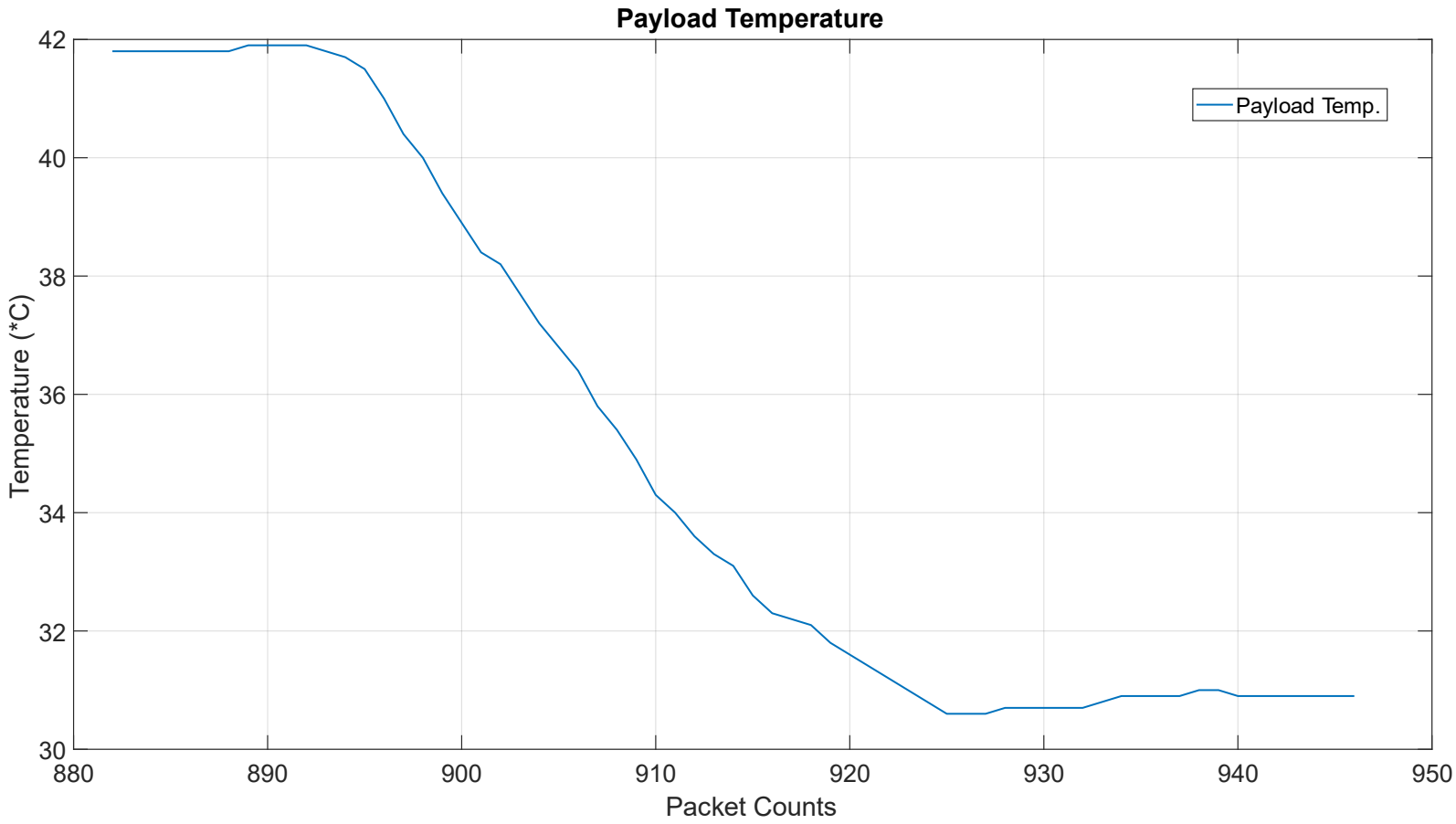
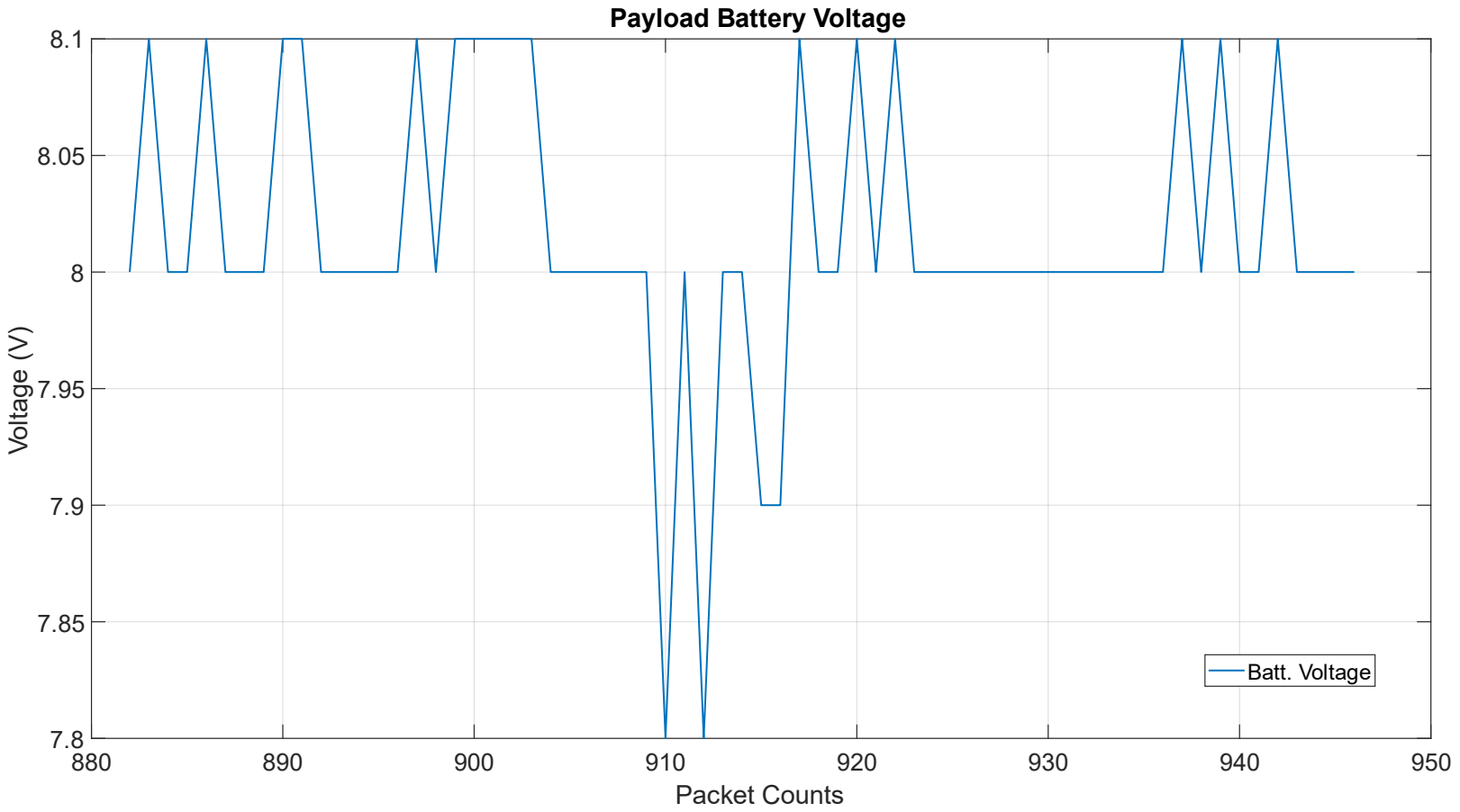
Payload Altitude Plot



Payload Temperature Sensor Plot



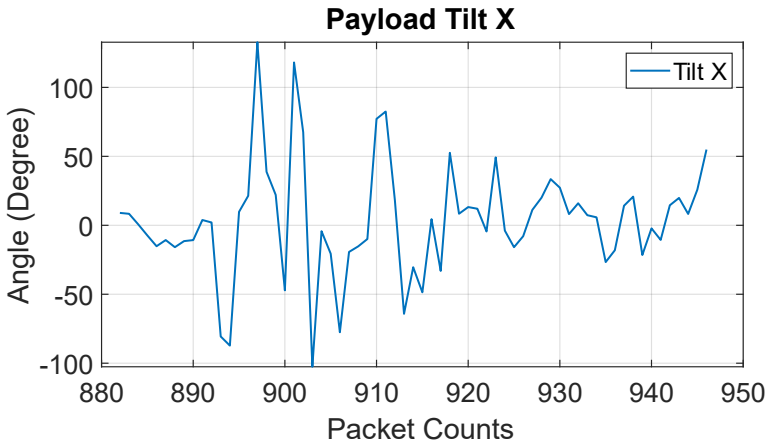
Payload Battery Voltage Plot

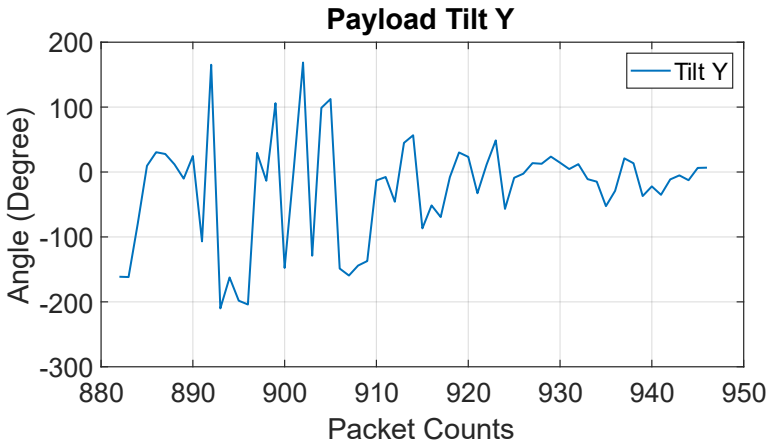


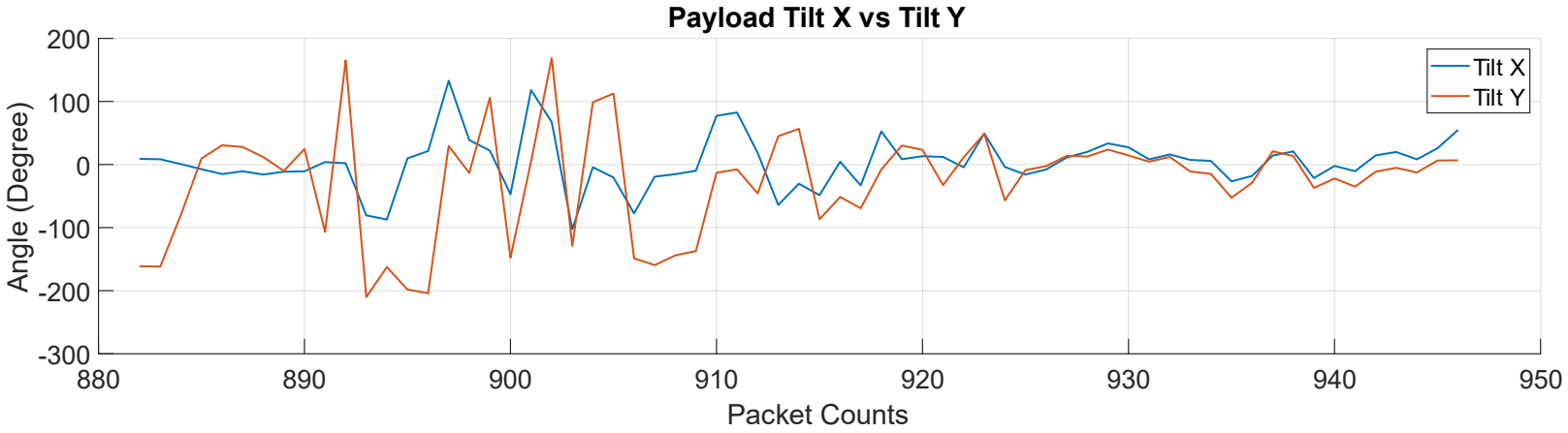
Information

The battery voltage had dropped when the heatshield was opening.

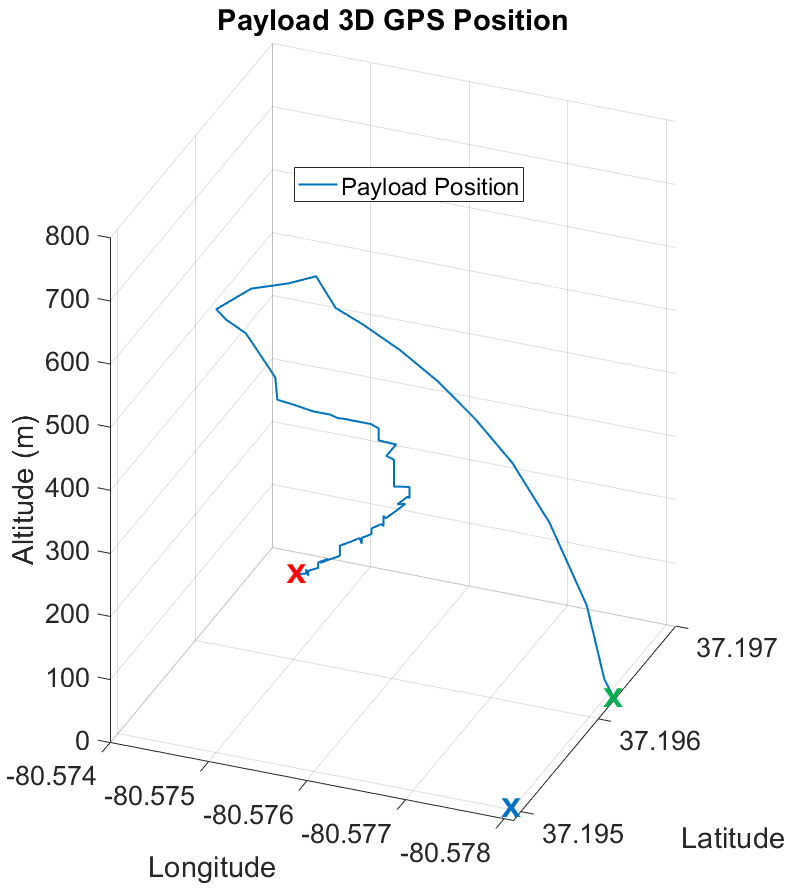
Tilt Sensor Data Plot

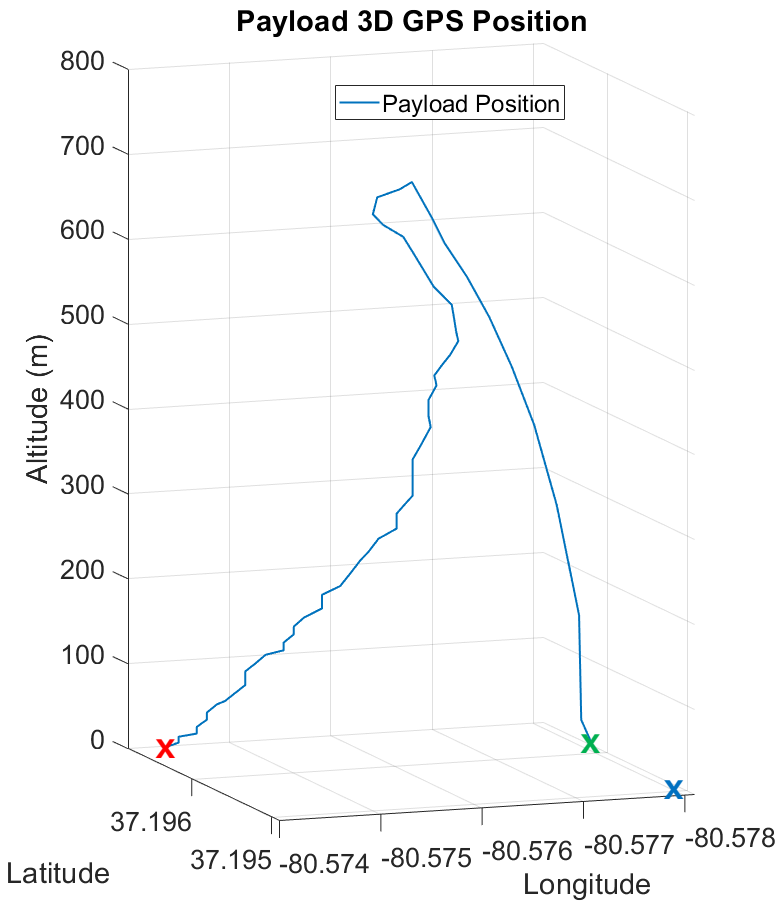






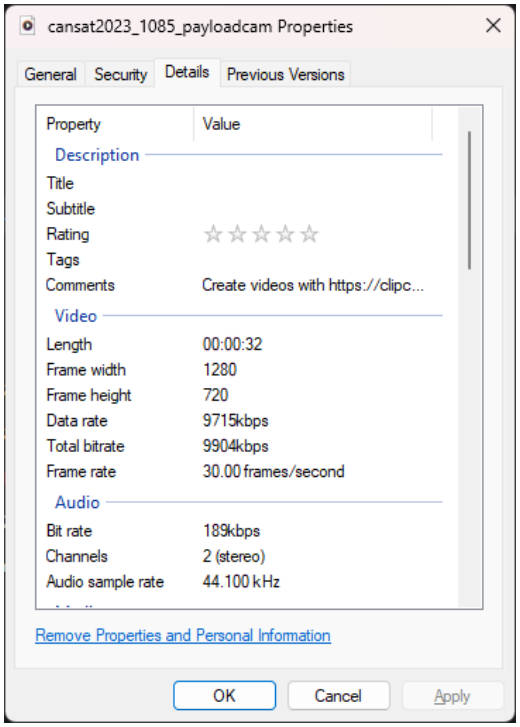
Payload GPS Position Plot



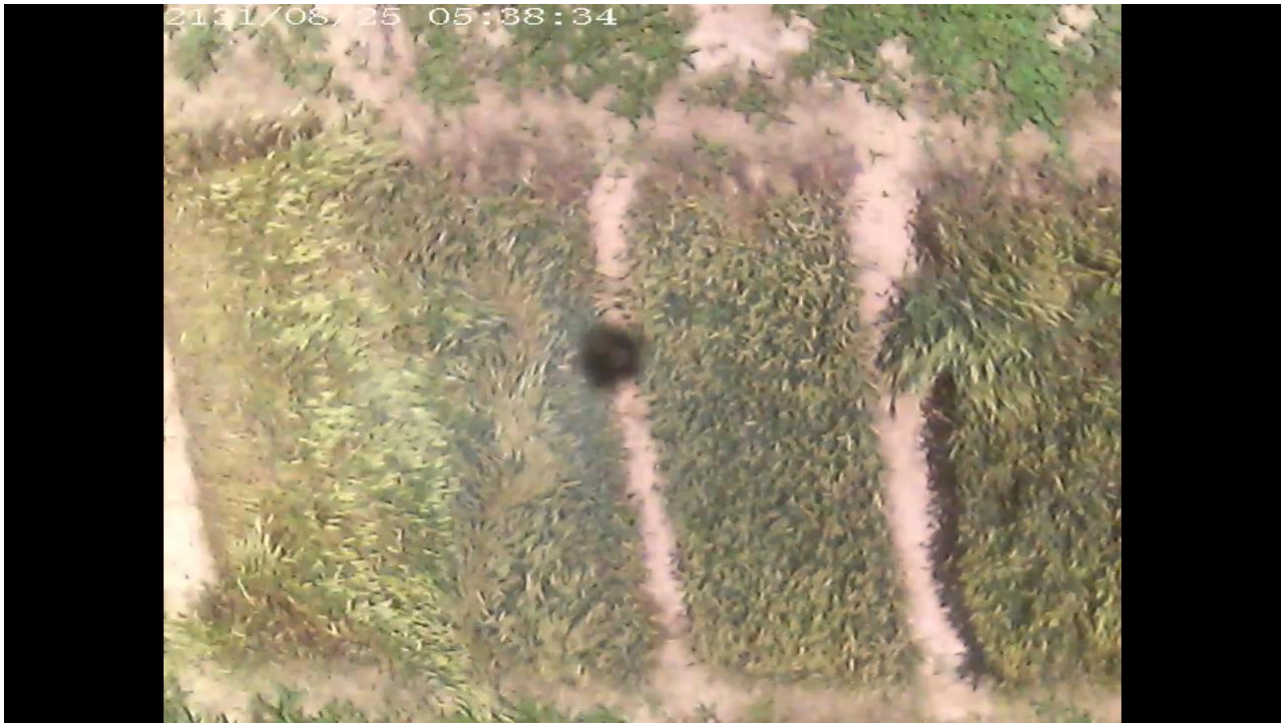


x : Launch pad
x : Landing
x : Control tent

Payload Camera Video



Video properties

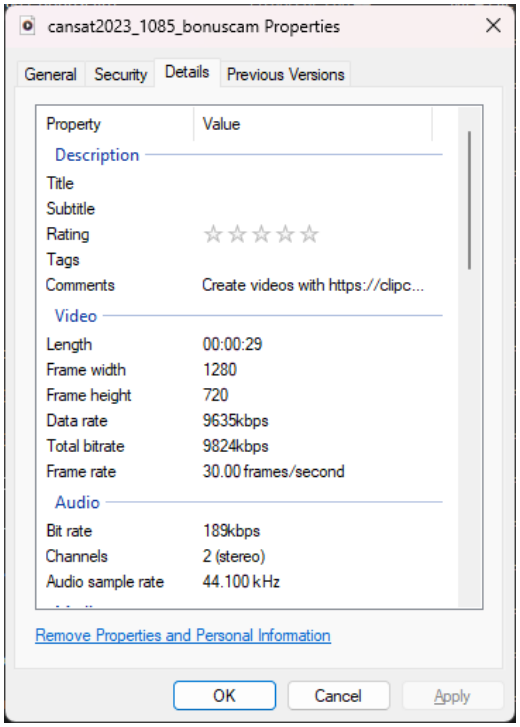


Video link: Click here

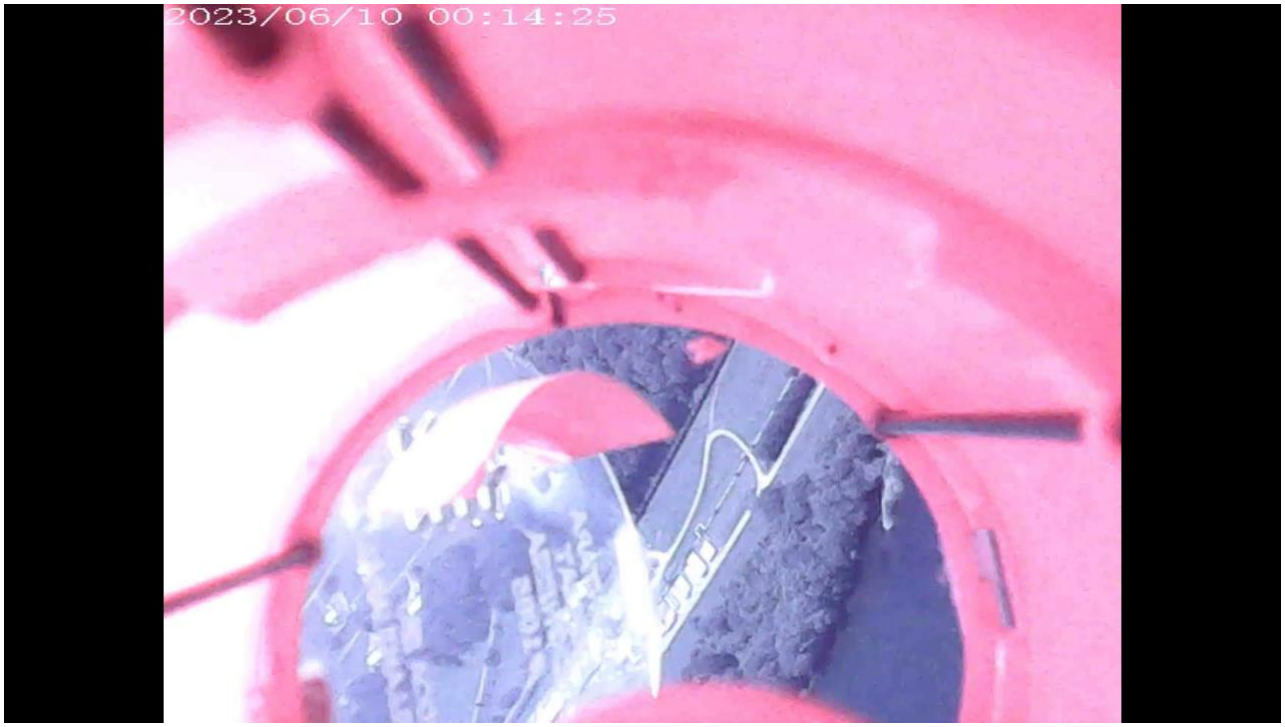
Information

The camera stopped recording shortly after LANDED state achieved. That state achieved while it is still descending because the elevation of landing area is lower than the launch pad. We didn't set the camera date and time.

Bonus Container Camera Video



Video properties



Video link: Click here

Information

Video shown in this slide is cutted to payload release moment only. The camera started recording before the CanSat turn in the rocket and stopped after the CanSat was recovered. The payload release wasn't seen because the release moment is very fast. We didn't set the camera date and time.

Failure Analysis

Muhammad Tsaqif Mukhayyar

Identification of Failures, Root Causes and Corrective Actions

Failures	Causes	Corrective Actions
Payload is unable to upright after landing	• Payload hit the crop before touchdown	• Change uprighting algorithm in Flight Software
Average of payload parachute descent rate doesn't meet the competition requirement (5 m/s)	• Our parachute need a lot of time to gradually slow the descent rate	• Correct the design for faster deccelaration
Several GPS data loss	• GPS cannot fully lock with satellites	• Add an antenna extension for the GPS

Lessons Learned

Fatwa Aulia Al-Haq

Discussions of What Worked and What Didn't

What Worked	What Didn't
Payload deployment	Payload is not in upright position
Payload aerobraking	Average of payload parachute descent rate doesn't meet requirement
Payload parachute deployment	Several GPS data loss
Uprighting mechanism	
Flag Deployment	
Payload and container camera	
No payload data loss	

Conclusions

Bamantara EEPISAT Are Ready to be The Winner of CanSat Competition 2023

- The main objective was succeed, except the upright position
- We observed that very important to think every possibilities to prevent the mission failure
- We should consider the effect of weather and field conditions
- We learned how to work on engineering project, adapting to a teamwork environment, implementing project and time management