Field Experiment and Safety Standards

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Please imagine you conduct the field test with your students in your country, and consider how to conduct the field test.

Field Experiment by Captive Balloon

Experimental setup

- Helium Balloon
- Carrier
- CanSat
- Reel
- Tether
- OPEN
- Ground Station
- 3m
Flight of CanSat

- The terminal velocity (or the velocity at the landing) should be sufficiently small for safety, e.g., less than 4m/sec.
- The experiment time is very short (typically 20-30 seconds)

Field Experiment by Captive Balloon

We will have the balloon experiment at Futawa field in 12th August.

Tips for Balloon Experiment

- Do you think the distance between the reels should be short or long? Why?

Tension

Aerodynamic force balances with tether tension

The balloon descends

The tether s lacks

L-mg
Tips for Balloon Experiment

How do you open the carrier?

Field Experiment by Captive Balloon

Experimental setup

Balloon
Carrier with remote-deployment system
Laptop (GS for carrier system)
Reel with stopper

Function of Balloon

- It holds the carrier.
- It keeps the carrier to a certain altitude with enough floatation.
- It is connected to the tethers, and can be connected to some anchor (weight such as water tank).
Field Experiment and Safety Standards

Experimental setup

Field Experiment by Captive Balloon

Function of Carrier

- It keeps the CanSat inside safely.
- It is connected to the balloon with enough strength.
- It opens the bottom door remotely by the uplink command, and also by the timer.
- It can measure the altitude and send the data to the ground station for the balloon system.

Function of Ground Station for Balloon System

- It can send the uplink command to the carrier.
- It can receive the telemetry (e.g. pressure data) from the carrier and store the data with time stamp.
- It can display the telemetry.

Example of Balloon Experiment Data
**Field Experiment by Captive Balloon**

**Example of Balloon Experiment Data**

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**Field Experiment by Model Rocket**

ARLISS

You can participate in ARLISS. UNISEC organize ARLISS with AEROPACK (American amateur rocket group).
Field Experiment by Model Rocket

Launch by Small Model Rocket

We will have the rocket experiment at Futawa field in 14th August

Example of Rocket Experiment Data

Field Experiment Movie
Example of Safety Standards

Safety Standards

You can determine the safety standards for balloon experiment and rocket experiment suitable for your experiment field and your country's law.

Balloon Experiment

- Probably no special safety regulation is necessary, but
  - The balloon cable (chain) should be hocked to some weight (e.g. water tank) during the break time between the flights.
  - We should take enough care for the chain and the carrier when we release the balloon.
  - Reel keeper should be two person.
  - The distance between the reels should be sufficiently long.

Rocket Experiment

- We should follow the domestic law (The engine includes black powder)
- We should set the restricted area around the launch point

Example of Safety area regulation

R100m  
R60m  
R20m

- r < 20m: None can enter
- r < 60m or 100m: No tent or visitor

Field Experiment by Kite Plane

- This is an optional experiment. You can use the kite lane in 12th August.
  - The kite plane costs relatively high.
  - But it is quite easy to conduct the experiment compared with other methods.
  - The kite plane is strong against the wind and the small rain.
  - The payload is 1 or 2kg, and the altitude is up to 1 or 2km in case of the below one.
**Preparation for Field Experiment**

To achieve the success without any trivial mistake

- It is quite important to check the work procedure at the rocket launch of your CanSat by conducting the balloon testing.
- You can improve the checklist (what to do) for the rocket launch of your CanSat.
- If you have enough time, you can make the experiment plan document for balloon testing. After the balloon testing, you will make very good experiment plan document for rocket launch.
  - Location, date, member and sharing roles, timeline, checklist for preparation, list of materials
  - Purpose, mission and evaluation method of success criteria
  - Sequence of the experiment, Checklist for work procedure (before flight, during the flight, after the flight)
  - Evaluation sheet