

Introduction

The 2019 mission will explore the use of auto-gyro descent control of a science payload when released from the launch vehicle. The CanSat shall consist of two parts, the science payload and the container to protect the science payload as it is deployed from the rocket.

The Cansat shall be launched to an altitude ranging 670 meters to 725 meters above the launch site and deployed near apogee (peak altitude). Orientation of deployment is not controlled and is most definitely violent. The CanSat container must protect the science payload from damage during the launch and deployment.

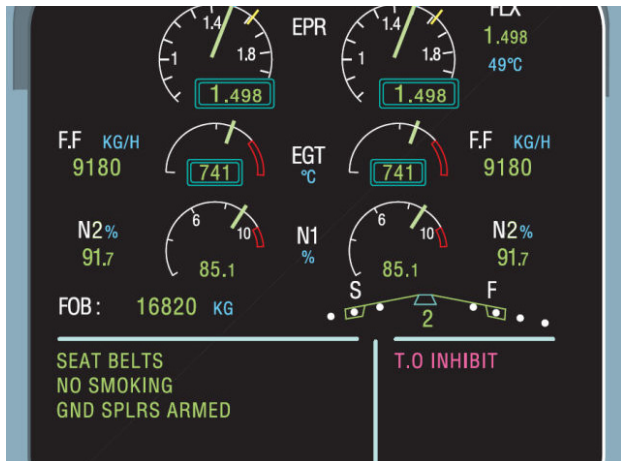
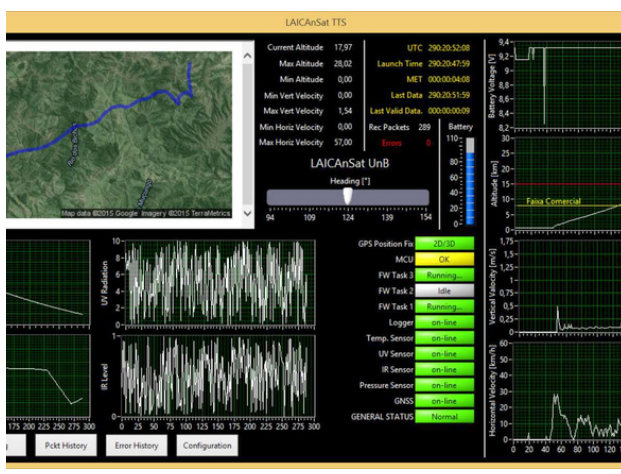
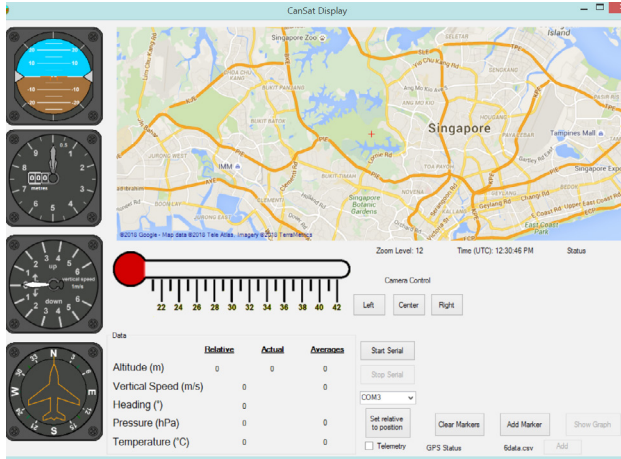
Once the CanSat is deployed from the rocket, the CanSat shall descend using a parachute at a descent rate of 20 m/s. At 450 meters, the container shall release science auto-gyro payload. The descent rate shall be 10 to 15 m/s. As the science payload descends under auto-gyro control, the payload shall transmit telemetry which shall include sensors to track altitude using air pressure, external temperature, battery voltage, GPS position, pitch and roll and auto-gyro blade spin rate. When the science payload lands, all telemetry transmission shall stop and a located audio beacon shall activate.

GROUND STATION INTERFACE

REQUIRED DISPLAY INFORMATION

- altitude by air pressure
- external temp
- battery voltage
- GPS position
- pitch and roll
- auto gyro-blade spin rate
- activated landing beacon

***EXISTING
INTERFACE
INSPIRATION***



RESEARCH

I tested 3 people, they all gave the same feedback and response for the most part. The 3 users were examined at separate times and were not able to see the screen or hear the testing while the others were in progress.

- All 3 people were able to identify the altitude at the 10sec mark.
- All 3 people were able to identify the phase at the 15sec mark (Person one took about 2 seconds longer to find it).
- All 3 people were able to identify the pitch at the 25sec mark.
- All 3 people were able to identify the battery voltage at the 25 sec mark (Person one took a second longer due to him trying to find the battery percentage as opposed to the voltage).
- All 3 people were able to identify the altitude and whether it was ascending or descending at the 30 sec mark.
- All 3 people found the current temp at the 40sec mark
- All 3 people were able to identify the current pitch and roll at the 45 sec mark.
- All 3 people were able to identify the current spin rate at the 50sec mark.
- All 3 people were able to identify the current altitude at the 55sec mark.
- All 3 people were able to identify the descent rate at the 60sec mark
- All 3 people were able to accurately pin point when the rocket landed at the 72sec mark

Person one looked at the Digital data, as well as person two. Person three used the digital readouts but noted that she was watching the analog readouts for things such as "descent rate", "Prop Spin Rate", "Pitch", and "Roll" because she is used to looking at the analog dials on the dashboard of her car.

Person one noted that it was difficult to identify which phase the rocket was at when I asked at the 15sec mark but found it soon after. Person one also struggled to find the battery level at first because he was looking for the percentage, which we don't have. Persons two and three did not have any difficulty finding any of the information or cards on screen.

Persons one, two, and three all noted that they were focused most on the altitude of the rocket because it had the largest range of motion, the most vibrant color, was most centrally located on the screen, and was the "most important" to look at.

All in all, the three people tested said that they liked the interface and that it was easy to navigate. Person one noted that "if I had the chance to look at it for a minute before the test to familiarize myself with where everything was on screen, it would have been very easy to know where to look to find whatever I was looking for."

The Tran

Dashboard Testing Report

3/6/19

I have given to 5 of my coworkers and friends my interface to testing. They love how the interface turned out and very excited to see how it works.

1. **Interviewees:** 5 people. They come from different background and programs/positions and only 2 guys understand how the rockets launch. Others don't have a lot of experiences about this but very interested in it.

2. **Post Test Interview:**

- I did ask them about how the interfaces look like and tried to explain how it works and show them where is altitude, pitch, roll, temp, ...
- ½ of the interviewees focused on the digital readouts.
- Trouble finding: one with decent rate, one with altitude (need to see phase number), one guy said it's everything ☹
- Readout focused the most: Altitude, Timer, All

3. **Overall**

- 4 out of 5 people asked about "PAUSE" button because everything was too fast and they couldn't see the number to write it down.
- The average time for one testing was 10 minutes because they have to start again many times.
- The testing numbers were similar from everyone.

4. **Reflection**

- I should get one of the people from mechanical or engineering programs to test but I think time doesn't like me at all
- I think the design came out nice and people like it ☺)

Pablo

Intro

Thank for taking the time to help me test this interface. What I plan to show you is a dashboard for a launch device. It will monitor a rocket launch while recording different types of data. For this test I will start the simulation of the launch and will ask you to point and identify some items and also report certain readouts. I will be recording and timing this activity.

Testing

10sec - What is the current altitude of the rocket? 150

15sec - At what phase is the rocket during launch? 1

25sec - Point at the pitch of the rocket. What is the current battery charge? 3 12v

30sec - What is the current altitude of the rocket? Is it ascending or descending? 690 v

40sec - What the current temp? 21

45sec - What is the current pitch and roll? 8 -14

50sec - What is the current spin rate of the rocket? 9 33

55sec - What is the current altitude? 240

60sec - What is the descent rate? 15

65sec - The rocket is currently descending. Tell me the time the rocket lands? 72

Post Test Interview

Did you look at the digital readouts or analog readouts.

Digital

Was there anything you had trouble finding?

Descent rate

What readout were you focused on the most?

Timer

THANKS!
SEYMOR :)

It would be easier to follow the rocket phase if it was moving and changing color.

To ram

Intro

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Testing

- 10sec - What is the current altitude of the rocket? 156-
- 15sec - At what phase is the rocket during launch? 3, 85%
Blue, steady, middle
- 25sec - Point at the pitch of the rocket. What is the current battery charge? 3, 85%
- 30sec - What is the current altitude of the rocket? Is it ascending or descending? 686
- 40sec - What the current temp? 21
- 45sec - What is the current pitch and roll? 8, -14
- 50sec - What is the current spin rate of the rocket? 15
- 55sec - What is the current altitude? 256
- 60sec - What is the descent rate? 933
- 65sec - The rocket is currently descending. Tell me the time the rocket lands? 72Sec

Post Test Interview

Did you look at the digital readouts or analog readouts.

Both but digital gives more accurate number so checked analog and then reconfirmed digital

Was there anything you had trouble finding?

No.

What readout were you focused on the most?

Timer

THANKS!
SEYMOR

Intro

Thank for taking the time to help me test this interface. What I plan to show you is a dashboard for a launch device. It will monitor a rocket launch while recording different types of data. For this test I will start the simulation of the launch and will ask you to point and identify some items and also report certain readouts. I will be recording and timing this activity.

Testing

10sec - What is the current altitude of the rocket?

150

15sec - At what phase is the rocket during launch?

2nd phase?

25sec - Point at the pitch of the rocket. What is the current battery charge?

3? 60%?

30sec - What is the current altitude of the rocket? Is it ascending or descending?

Descending

40sec - What the current temp?

21°C

45sec - What is the current pitch and roll?

8° -14°

50sec - What is the current spin rate of the rocket?

933RPM

55sec - What is the current altitude?

230

60sec - What is the descent rate?

15M/S

65sec - The rocket is currently descending. Tell me the time the rocket lands?

72 seconds

Post Test Interview

Did you look at the digital readouts or analog readouts.

Analog mostly

Was there anything you had trouble finding?

Altitude, not labeled " Rocket Phase number? Is it bar to right of Altitude bar

What readout were you focused on the most?

Altitude, although I was looking all over the place trying to answer these questions

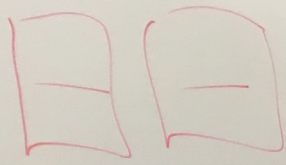
THANKS!

SEYMOR

😊

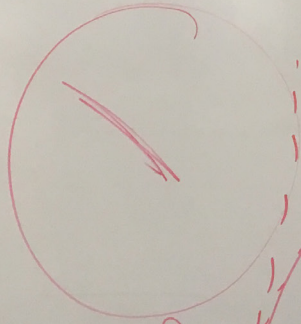
- Pitch and Roll maybe have "0"
- Symbol I.E. 90°
- Percentage for battery readout

ITERATION
/
IDEATION



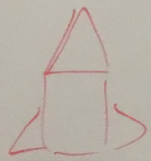
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AIT

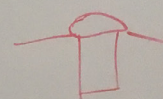
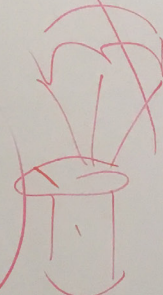
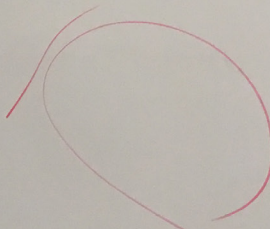
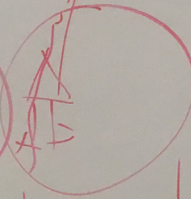
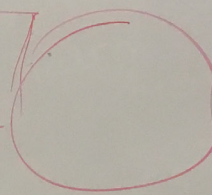
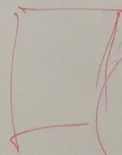


BAR

Prepare Sol
Stage 1 Deploy



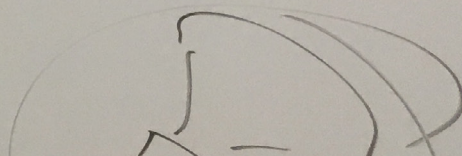
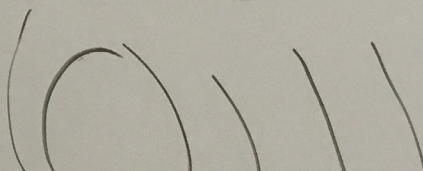
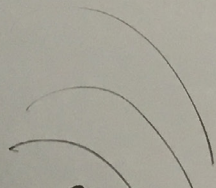
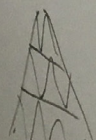
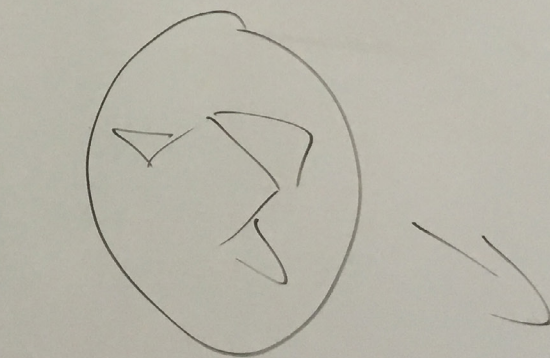
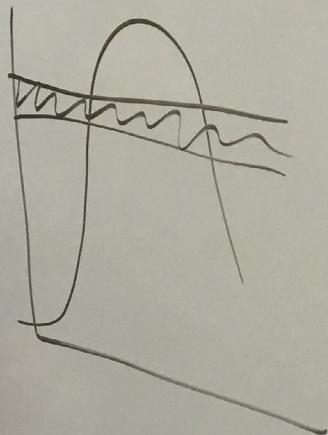
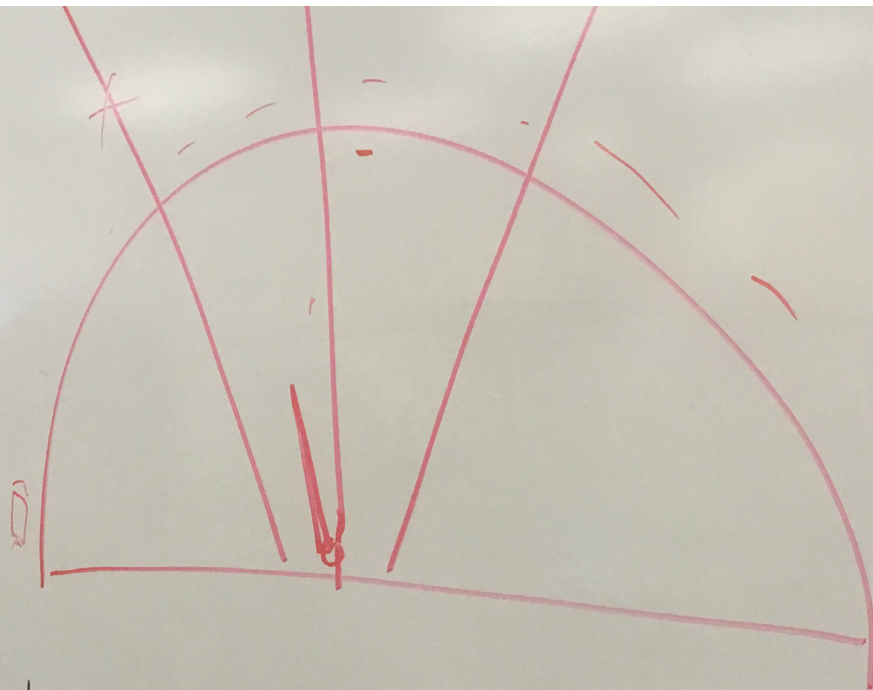
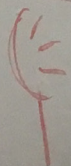
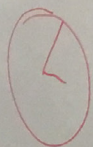
ICOMs



21v

30°C

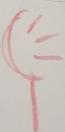
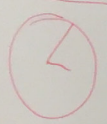
Times



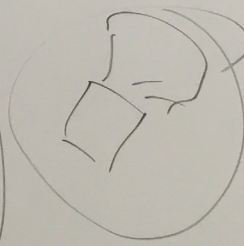
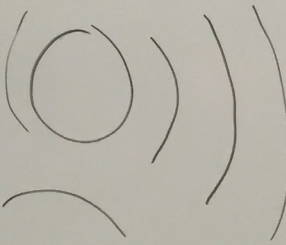
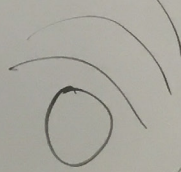
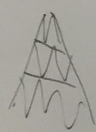
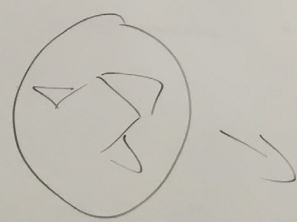
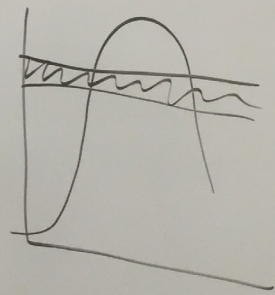
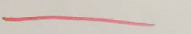
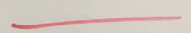
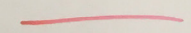
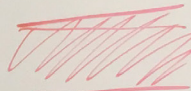
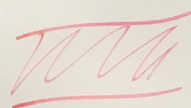
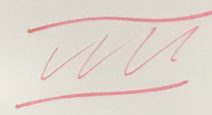
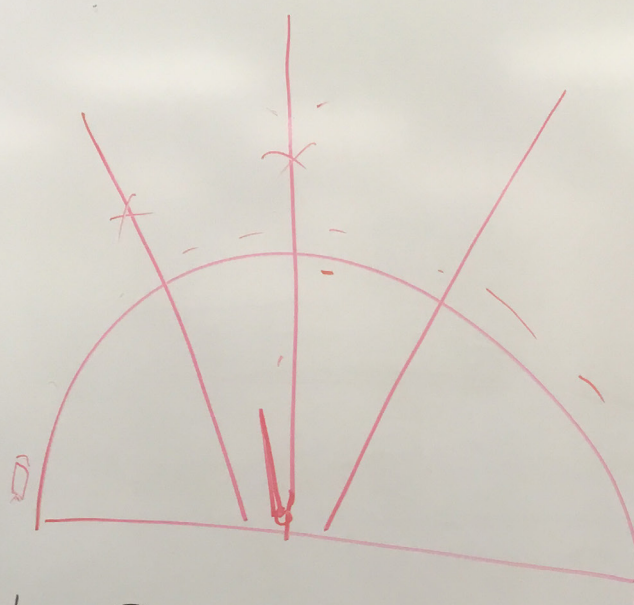
21v

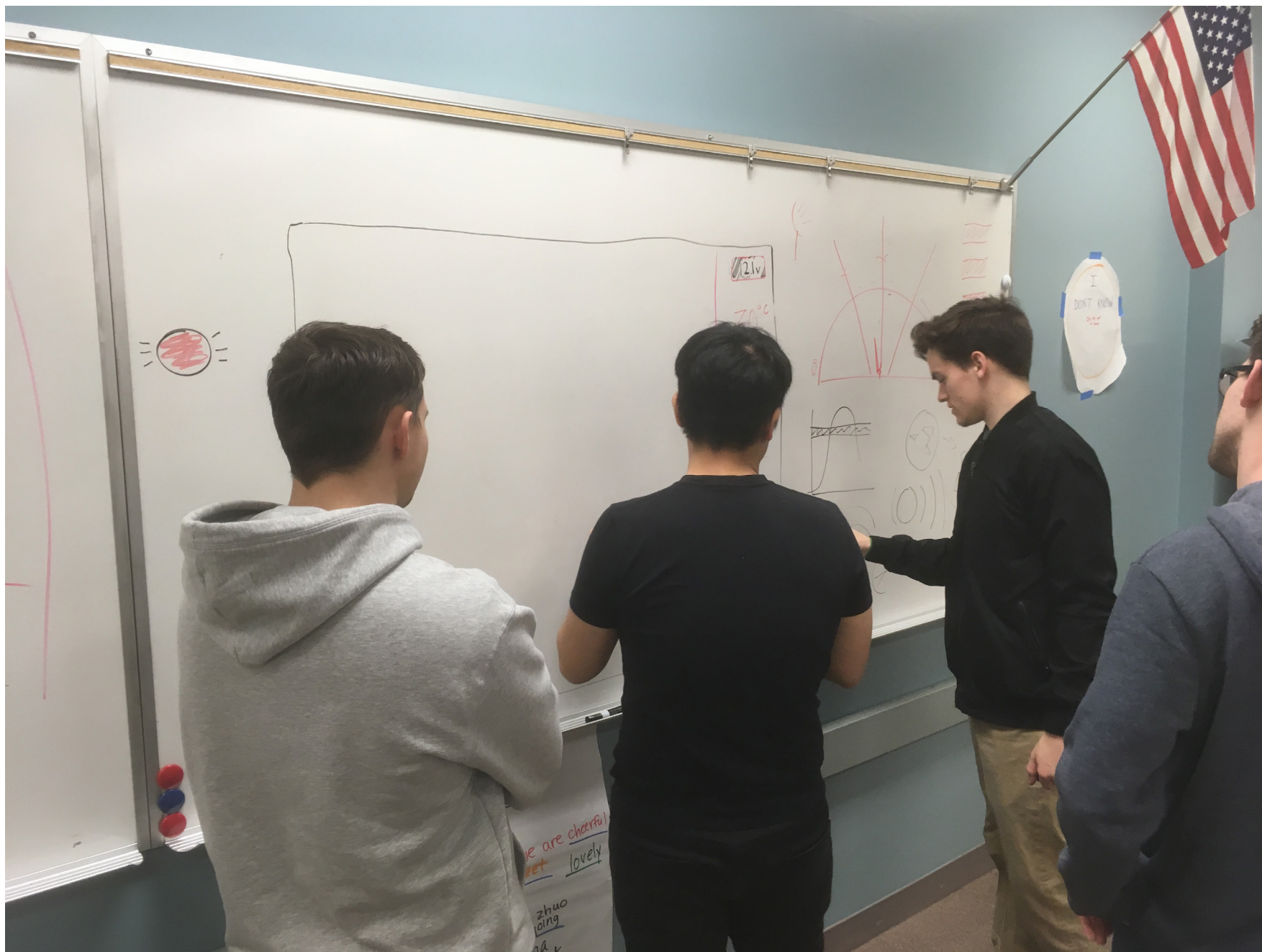
30°C

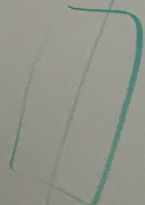
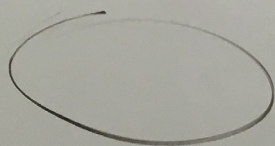
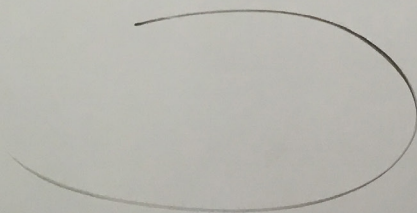
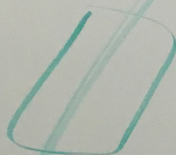
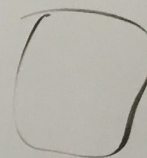
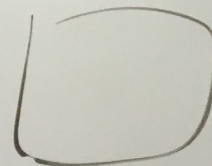
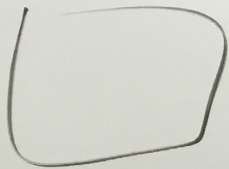
Timer



Click Here
When Done



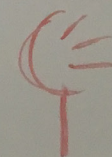
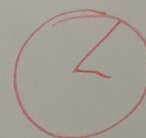




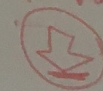
12.1v

30°C

Timer



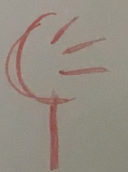
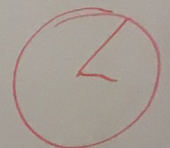
Click Here
When Done



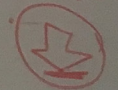
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30°

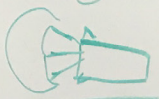
Timer



Click Here
When Done



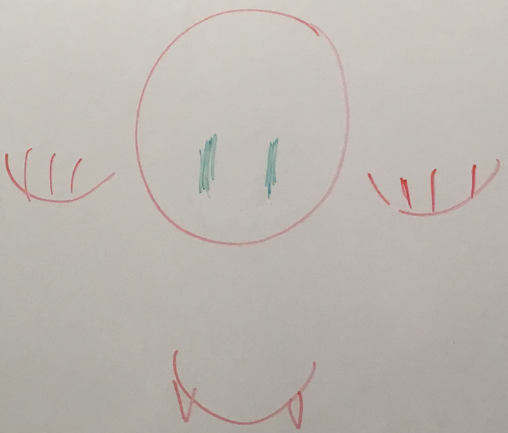
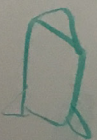
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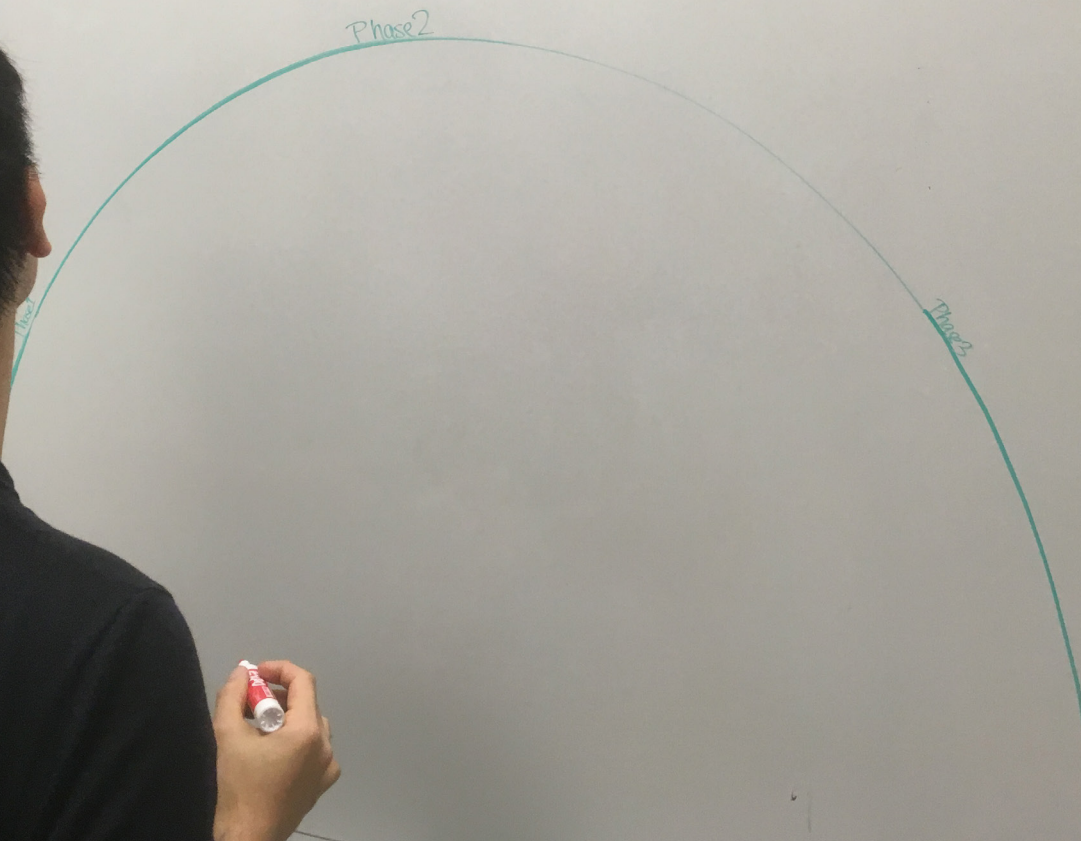
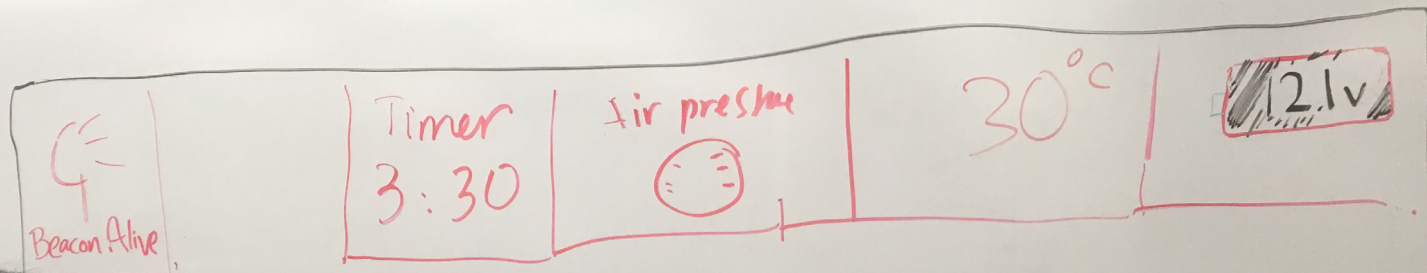


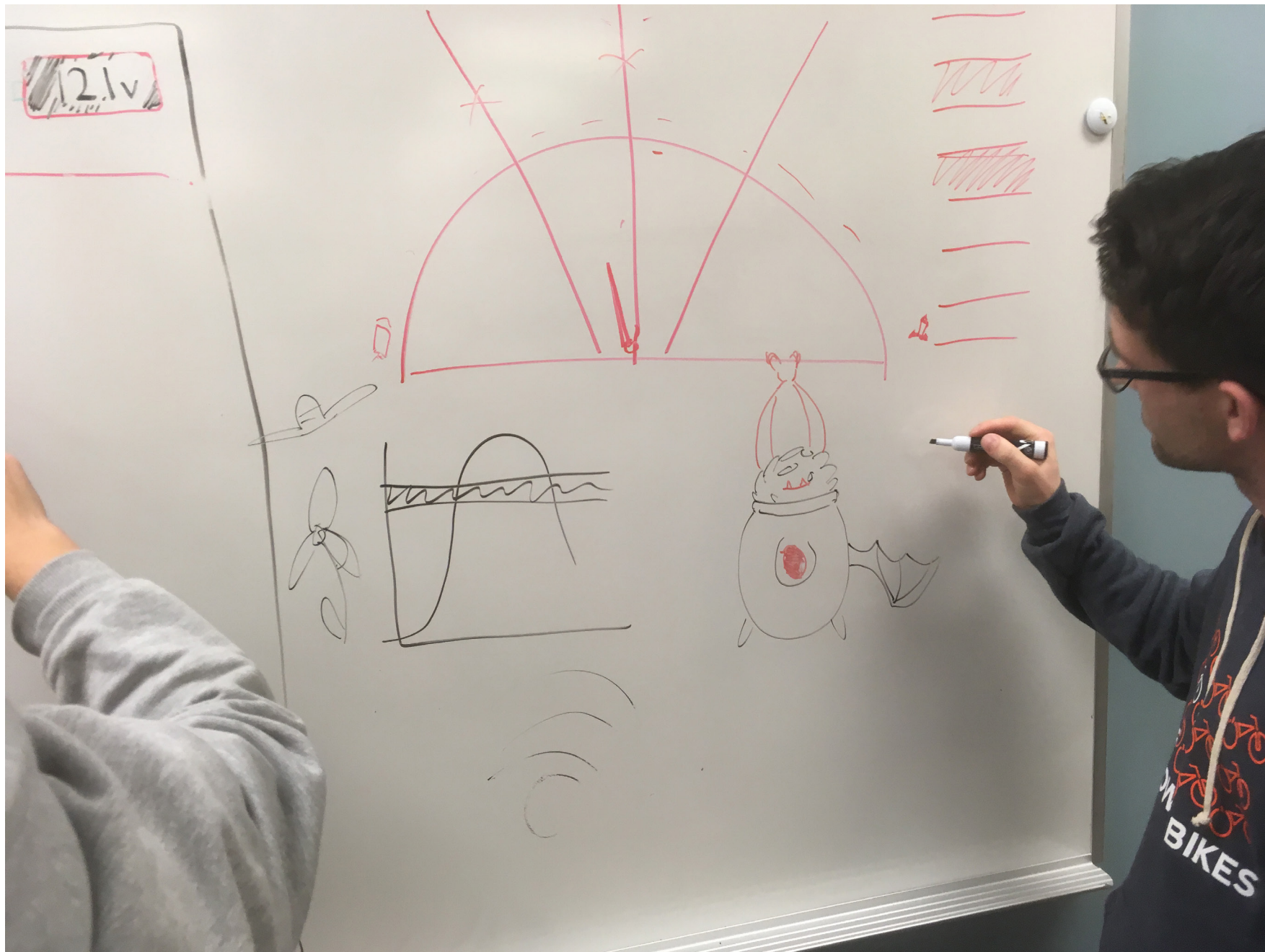
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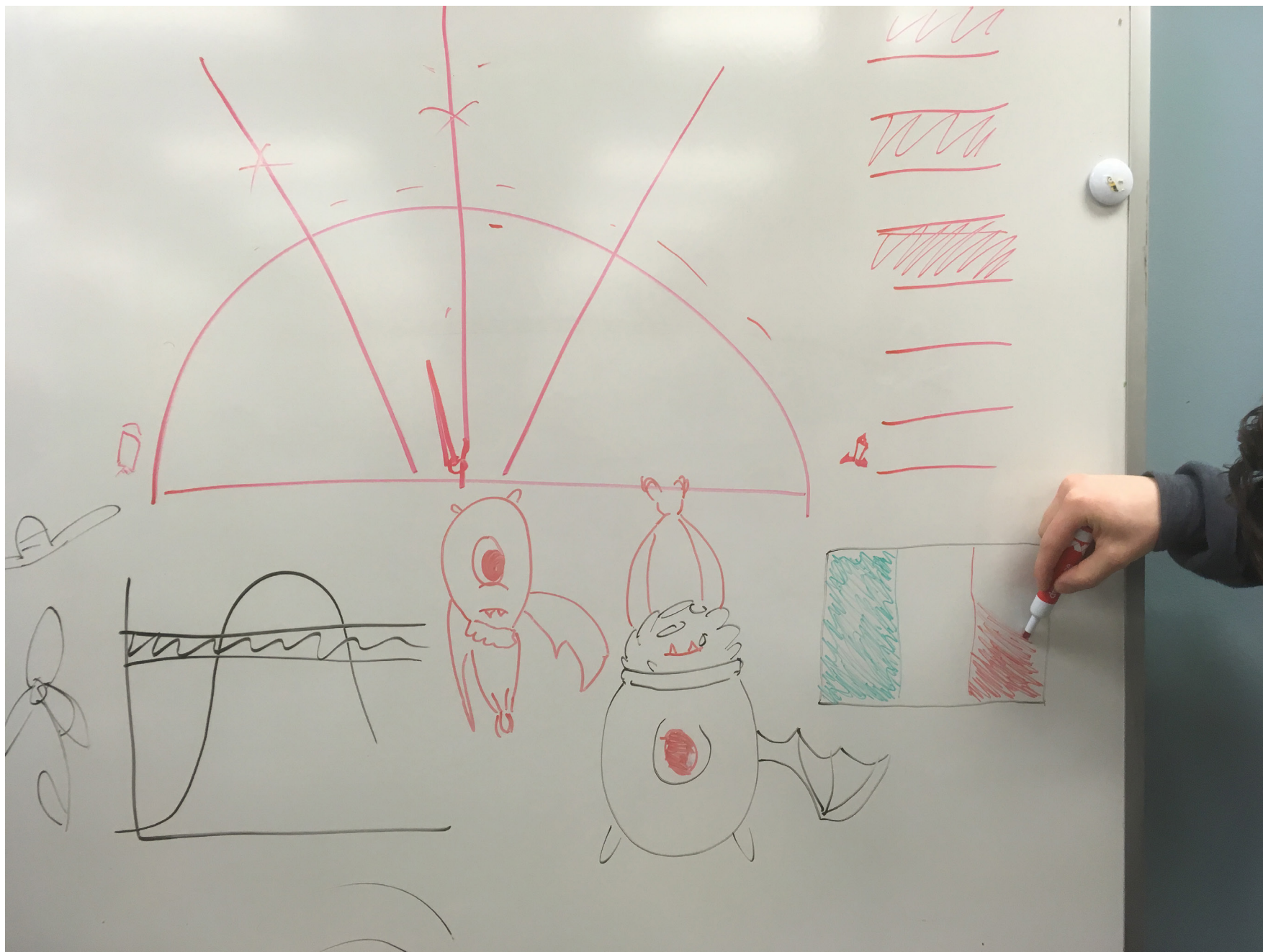


Stage 1



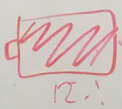






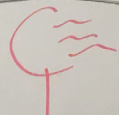
TIMER
3:30

30°

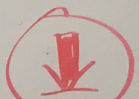


42

Air Pressure

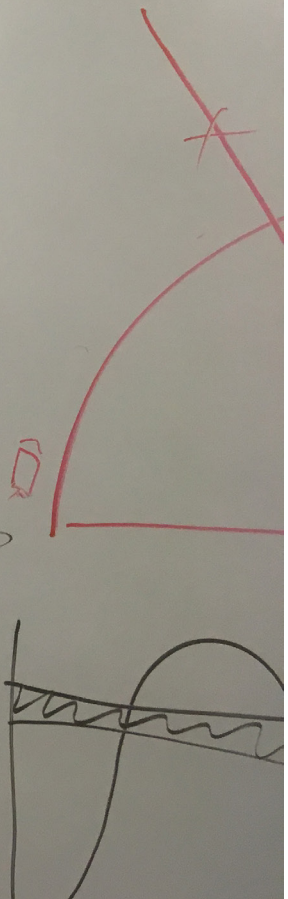
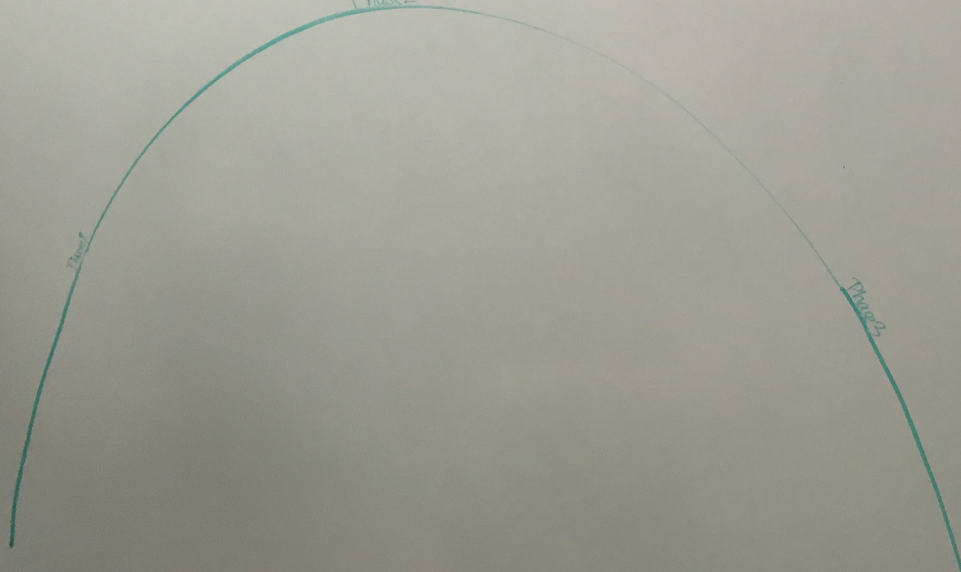


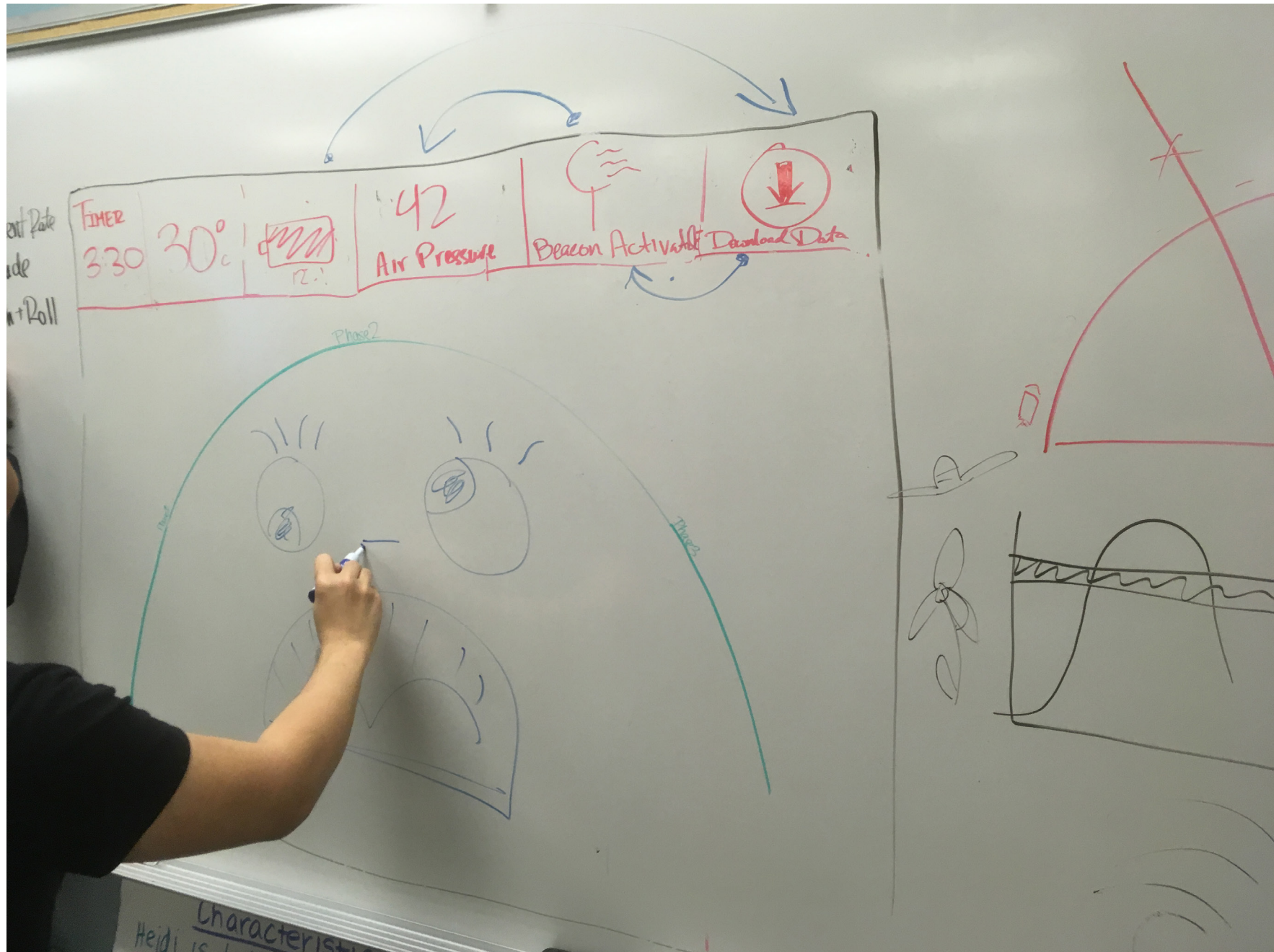
Beacon Activation



Download Data

Phase 2

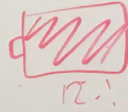




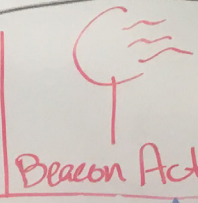
• Descent Rate
• Altitude
• Pitch+Roll

TIMER
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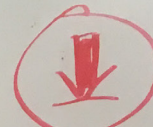
30°



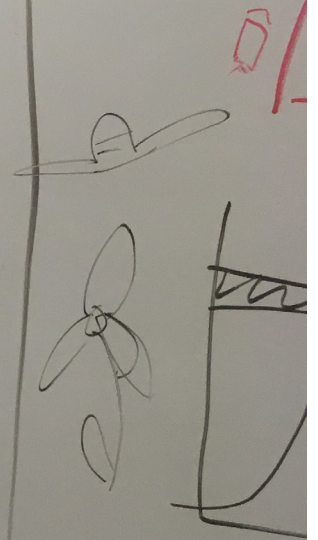
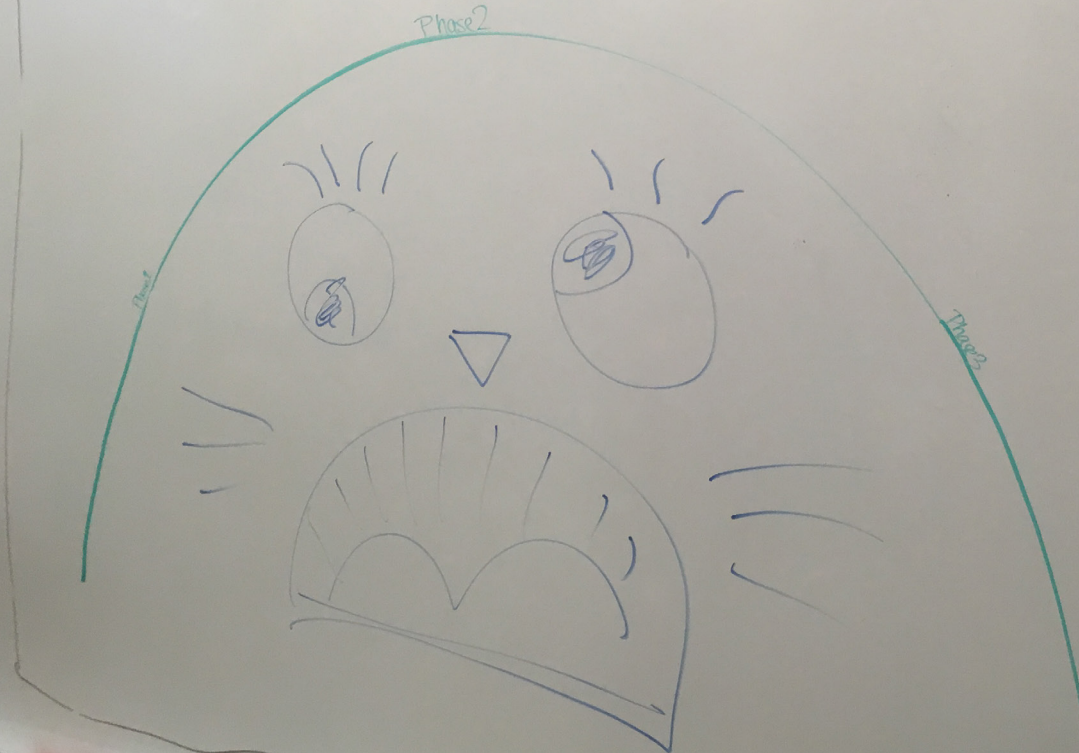
42
Air Pressure



Beacon Activated

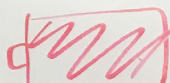
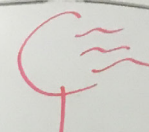
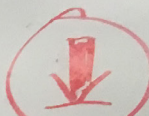


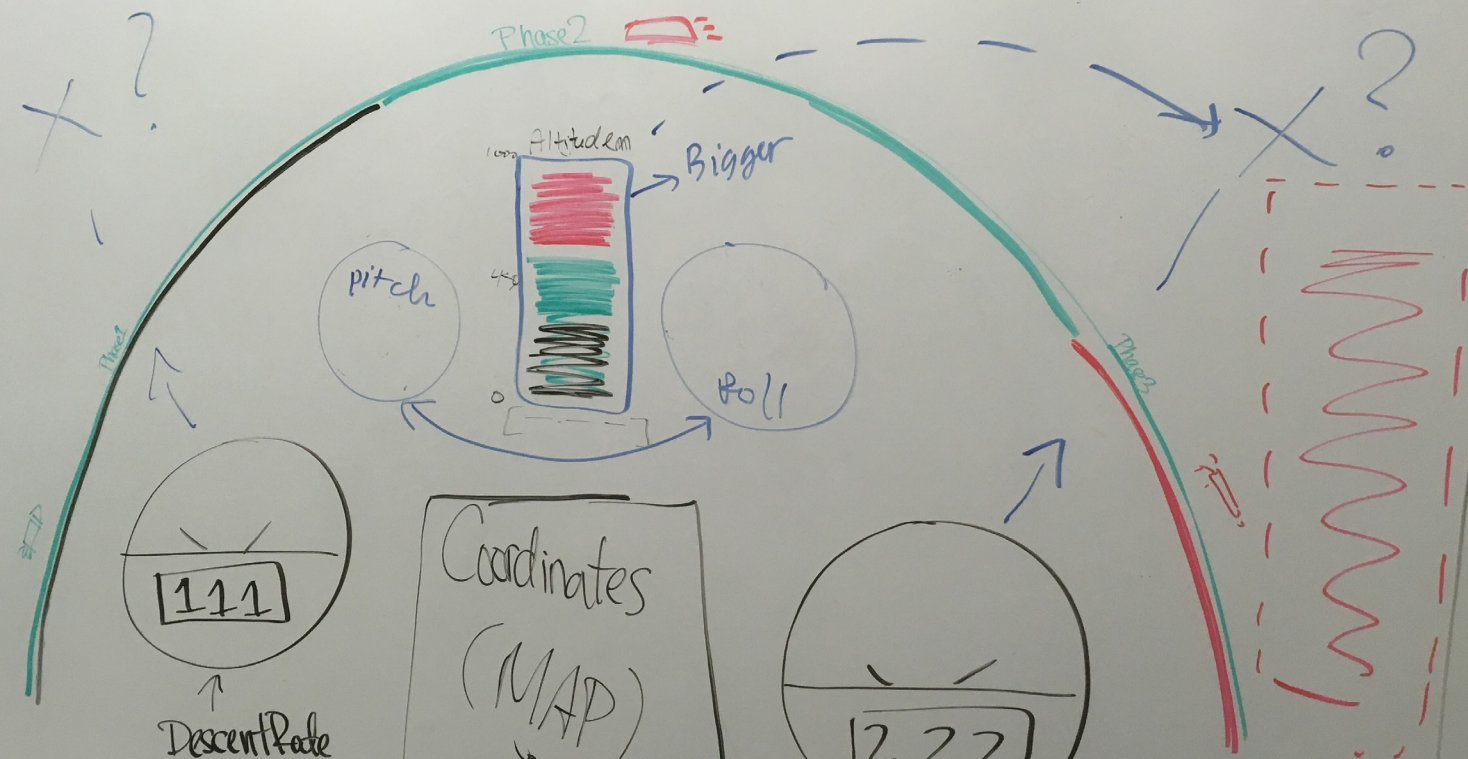
Download Data



Rate

Roll

TIMER 3:30	30°	 12.1	42 Air Pressure	 Beacon Activated	 Download Data
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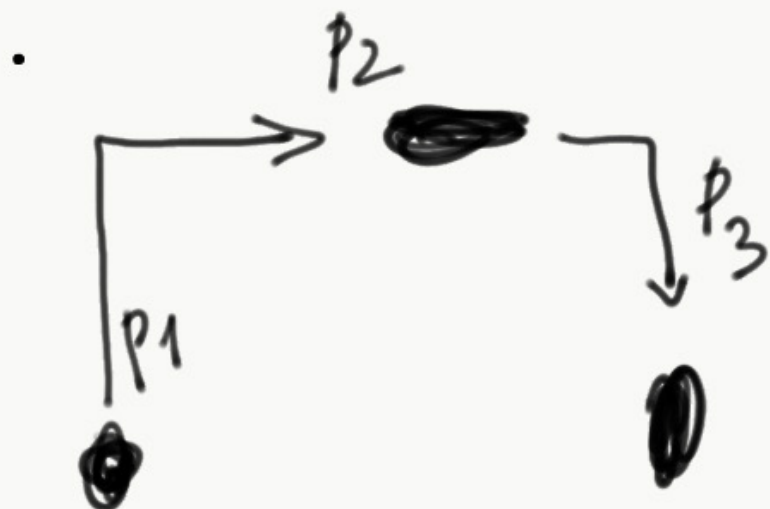
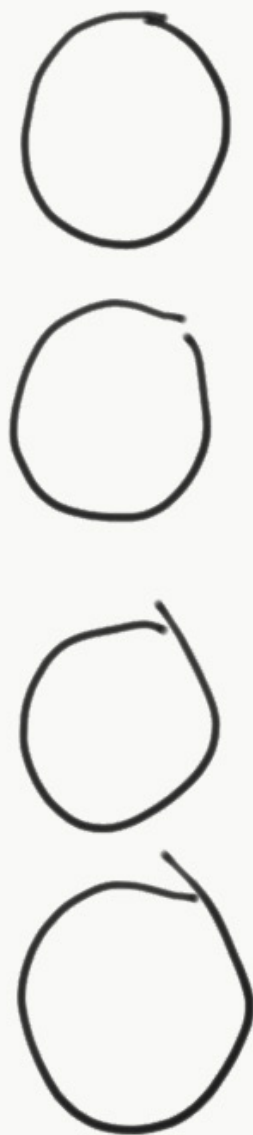
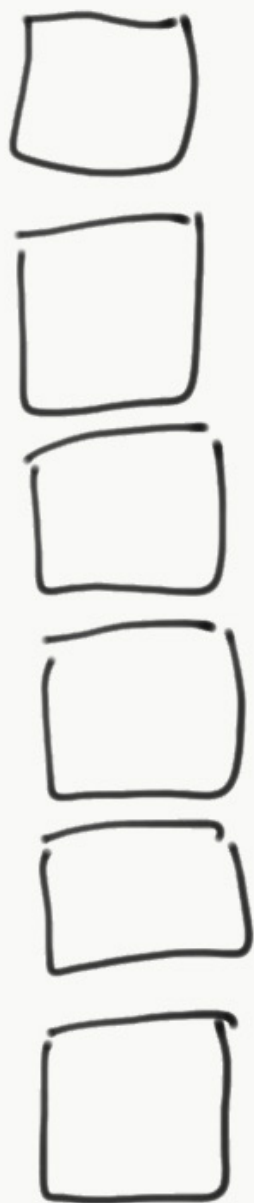
111
↑
Descent Rate

Coordinates
(MAP)

222
Propeller Spin Rate

Characteristics

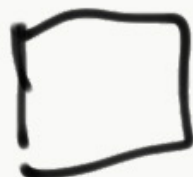
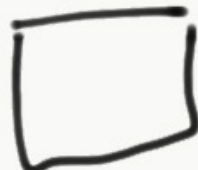
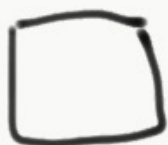
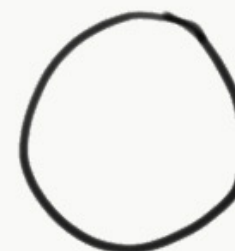
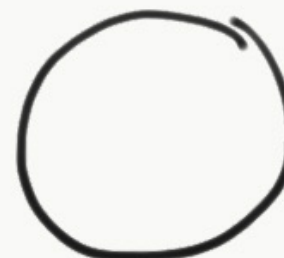




9

10

map



Bar



