Team Asteria

Project Echo

Exploring the Electromagnetic Spectrum

Spring 2015
Mission Overview

Expectations:
The intensity and quantity of UV rays, especially UVc rays, will increase as altitude increases. Collection of various radio waves from atmospheric and deep space phenomena.

Objective:
Collect data on UV rays–especially UVc–as the balloon rises. Gather and identify radio emissions from the Sun, Earth’s atmosphere and other sources in the 200-1000 kHz range.

Why:
Electromagnetic waves are cast by high-energy events in space; observing these frequencies can reveal origins of space occurrences, expanding the scope of the observable universe.
Mission Inspiration
Initially, half the team was interested in collecting UV data while the other half wanted to “listen” to space. Realizing both would observe solar phenomena, and weight not being an issue, the experiments were combined.
Design

- Use Arduino-compatible UV sensors and antennae to record electromagnetic emissions
- Observe variations in electromagnetic emission data as altitude changes
- Cover UV and 200-1000 kHz frequencies
FBD

**THERMAL**
- Power 3.9V Batteries
- Switch
- Heater
- LED Indicator

**CAMERA**
- Power 2 Lithium Ion Batteries
- Switch
- Camera
- LED Indicator
- 2G SD Card

**SCIENCE**
- Power
- Switch
- Arduino SCI
- LED Indicator
- 2G SD Card
- 6 UV Ray Sensors
- 3 Radio Wave Receivers

**CORE**
- Power
- Switch
- Arduino CORE
- LED Indicator
- 2G SD Card

**KEY**
- POWER
- SWITCH
- ARDUINO
- LED INDICATOR
- MEMORY
- SENSOR
- MISC COMPONENT

**Sensors**
- Temperature Sensor Interior
- Temperature Sensor Exterior
- Pressure Sensor
- Humidity Sensor
- Accelerometer
## Management (Brief Cost)

<table>
<thead>
<tr>
<th>Product</th>
<th>Weight</th>
<th>Cost</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV Light sensors</td>
<td>4.2g total</td>
<td>$6.50 x6</td>
<td>$39.00</td>
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<tr>
<td>Radio Antenna</td>
<td>500 g</td>
<td>$115.00</td>
<td>$154.00</td>
</tr>
<tr>
<td>Arduino Uno</td>
<td>50 g total</td>
<td>$0</td>
<td>$154.00</td>
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<tr>
<td>Camera</td>
<td>150 g</td>
<td>$0</td>
<td>$154.00</td>
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<tr>
<td>Heater</td>
<td>100 g</td>
<td>$0</td>
<td>$154.00</td>
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<tr>
<td>Batteries</td>
<td>15.36 g</td>
<td>$15 (12</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>batteries)</td>
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<tr>
<td>Totals:</td>
<td>820.56 g</td>
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<td>$169.00</td>
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Management

Pre Launch
-Proposals due
  FEBRUARY 9th
-In-class Arduino work
  FEBRUARY 5th, 10th, and 12th
-Begin building as soon as we receive the “ATP” from Chris
  FEBRUARY 13th
-Have structural testing (whip, drop, cold...etc) done
  FEBRUARY 27th

- Preliminary Design Review
  MARCH 3rd
- Aim to have it done before
  Spring Break (additional alterations can be made if necessary after this)
- In-class Mission Simulation Test
  MARCH 31st
- Final BalloonSat Weigh-In and Turn In
  APRIL 10th

Launch
APRIL 11th

Team Meetings:
Wednesdays at 5-7pm
Sundays at 2-4 pm (additional time if necessary)

Post Launch
Post launch presentation
  April 16th
ITLL Design Expo
  April 25th
Final Presentation
  April 28th
Conclusions

Through the resultant data, we hope to understand more about UV and solar radio rays. Besides being useful in terms of understanding, it is also an interesting and fun project.