Flight Date: 4/8/2016

I. Results

**UV Sensor**

The UV sensor is a breakout sensor (ML8511). In the presence of 365nm light, the sensor will react and change the voltage input. The units of UV light were measured in mW/cm$^2$. To convert voltage outputs to units (mW/cm$^2$) we determined an equation based on given voltages and known values of UV light. Those voltages given from Sparkfun were estimated and plotted (possible significant amount of error because readings were derived from a graph and were estimated) in order to determine an equation that could output any voltage in units of mW/cm$^2$.

In general the UV increased as altitude increased, and as the altitude decreased the UV also decreased. Over time the graph increases and then has a maximum which correlates with a maximum in altitude.

These findings support the hypothesis that with greater altitude there are fewer particles of atmosphere that would absorb UV light. Therefore at a higher altitude more UV light is present because the UV is not being absorbed by particles of atmosphere because there are fewer particles present at higher altitude.

These results are inconclusive however because there are many sources of error as we measured UV. For purposes of interpreting data, we have multiplied the UV readings by 2000.

![UV Sensor Graph](image-url)
In our launch review, we predicted that the external temperature would increase directly with altitude and decrease with altitude on the way down. We didn’t take the normal rise in temperature as the time went from 7 AM to 10:30 AM with the natural warming of the environment. As the graph below shows, there were pockets where the temperature did not directly follow the rise and fall of altitude. We attribute this variation to the different atmospheres. In the stratosphere, from around 40,000 ft to 180,000 ft, there is contained the ozone, which absorbs radiation from UV light from the sun. This causes an actual rise in temperature as there is a rise in altitude. Our graph of time versus altitude and temperature actually shows where the payload enters the stratosphere. For purposes of interpreting the graph we have multiplied the temperature readings by 1000.
Methane

Disregarding the initial readings on the methane sensor, it looks like it has a relatively constant reading around 1250 parts per million of methane. However, it looks like when the balloon burst and started to come back down to earth, the velocity moving down created a vacuum from the speed at which it was falling. Due to Bernoulli’s Principle, anything will move toward a lower pressure, where a higher velocity is present. For purposes of interpretation, the methane was multiplied by 10, so the graph actually shows parts per 100,000.

![Altitude and Methane vs Time](image)

Internal Temperature

Results inconclusive. The sensor did not work because of what looks like circuitry error.

GoPro

Dead Battery

Lesson Learned

1. Day of flight checklist including making sure all sensors are working as needed and everything is charged properly.
2. Make sure everything is charged day of flight, or night before depending on charging time, i.e GoPro.
3. Placement of UV should be on top of payload rather than on the side. Having it on the side caused our readings to shift from low to high, likely due to spin of payload.
4. For beginners, as we are, create code to output voltage readings of sensors rather than specific readings for sensors.
5. Include an altitude sensor as a high priority to save time and frustration on the back end when compiling data.
6. Our time stamp was each second, but to make a more manageable size of data, we would recommend having readings every 5-10 seconds.
7. Wait to solder until the entire circuitry is configured. Use breadboards to test all sensors prior to building one large system.
8. Ask the Space Grant mentors, especially Bernadette, about common solutions to issues faced by all teams. They have been doing this for a while and can point you in the right direction. If you are stumped, use them as a resource.

9. Suggestion for applying more time to project. Our team met many times beyond what was scheduled, which was only once per week for two hours.

10. Develop a learning plan for circuitry and coding, which was our 2 bottlenecks for completing the project as originally designed.