First Flight Data Analysis

Demonstration of concept

Western Aerostat Fliers | 6/21/2015

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Our goal for the first flight was to safely launch and land the payload and collect basic data pertaining to radar signal strength, altitude, battery voltage, and weather conditions. We wanted to see the relationships of radar signal strength as a function of distance and atmospheric conditions.

Pre-Flight

Each sub-team was able to efficiently set up their own equipment necessary to perform experiment and collect data. We used over 100 ft. of extension cords to power laptop chargers and the power supply used for the radar gun. We performed ground testing of the platform to ensure data transmission and began laying out the aerostat for inflation. Once the payload had been tested and the aerostat unpackaged, we began inflation. Unfortunately, the tank of helium we received was empty and we were forced to exchange it. We filled the aerostat to approximately neutral buoyancy to allow us to connect the payload platform and tether.

Flight

10:22 AM: Using the winch powered spool (WPS), we deployed the aerostat to 24.6 yards.

10:44 AM: Irregular signals from MPB and EPS to AX base require aerostat to be brought down for troubleshooting. Signals should have been smooth DC values but were noisy instead. Upon looking at signals with the oscilloscope, we noticed 60 Hz noise present everywhere on payload circuitry. This could have been a result of poor power supplied to the oscilloscope due to the long extension cords and multiple instruments plugged into the power strip. In the future, a generator would be desirable to reduce line loss in the extension cords.

11:21-11:51 AM: Testing resumes.

Time	Distance (yards)	MPB Voltage
11:25	44.4	Yes
11:32	55.5	Yes
11:35	58.5	Yes
11:40	76.5*	Yes
11:44	101*	Yes
11:50	125*	Yes
11:51	135*	Yes

*Radar gun positioned directly below payload.

Orientation of radar horn is crucial to voltage produced. Aperture of horn should be facing directly toward radar gun. Gimbal system may be developed to ensure horn orientation.

12:04 AM: Aerostat retrieved and deflated.

Post Flight Analysis

The data from the Aim XTRA was not as consistent as we had anticipated. We later found that the Arduino was wired incorrectly. EPS team plans to solder Arduino shield and outputs to prevent a similar problem in the future.

The radar signal strength was used from a radar unit that we had not fully tested but were forced to use due to a board damage during soldering. A replacement board has been ordered and will be fully retested.

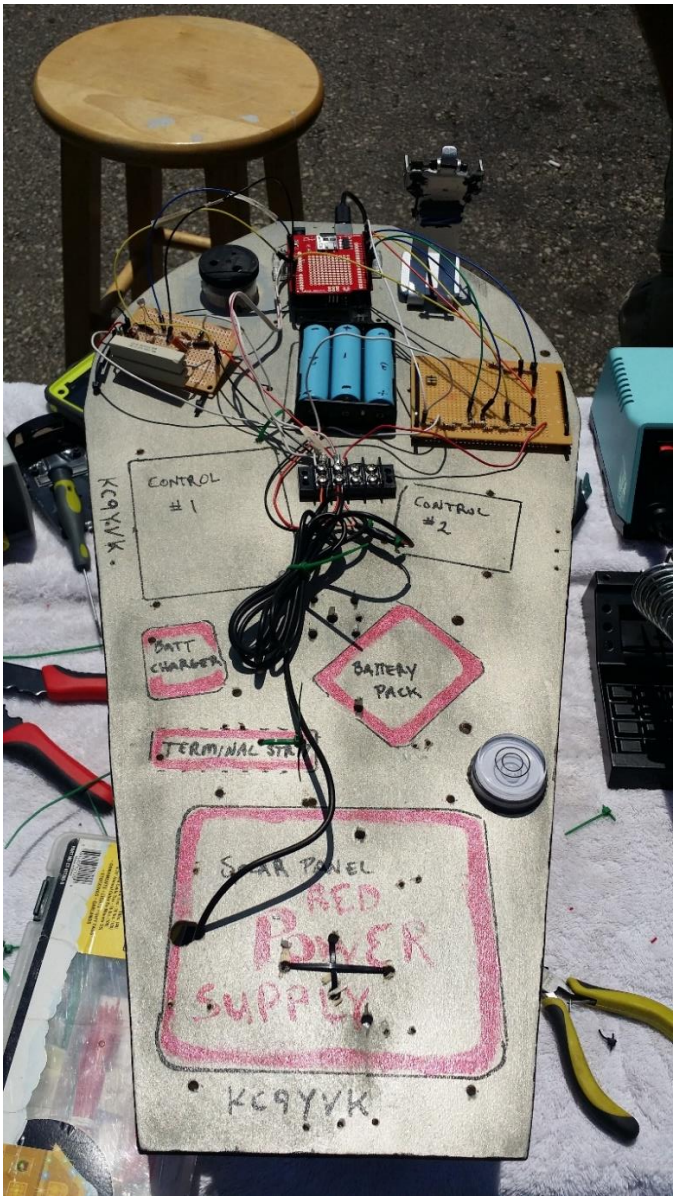
We need to figure out a way to uniformly keep time for experiment conditions and AX data logging. We have discussed having one time keeper, using a stop watch, or trying to decipher the GPS time that the AX uses. Further discussion on this matter is required.

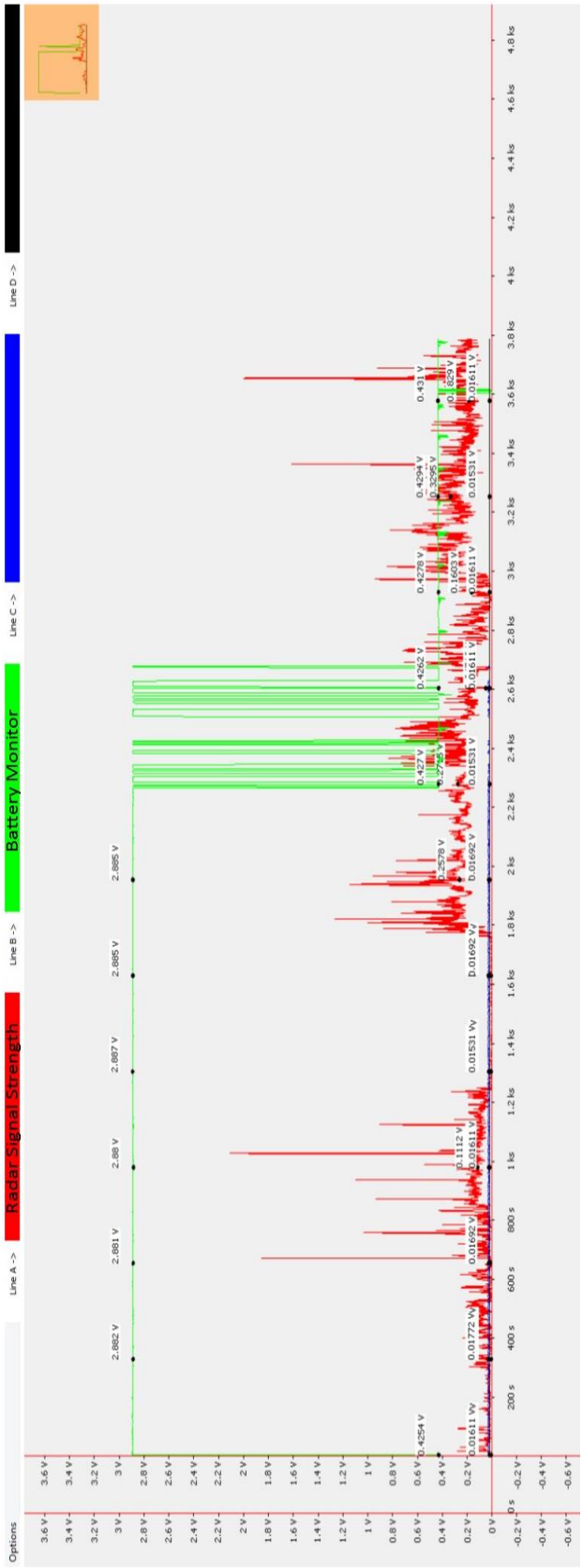
Uniform experiment procedures need to be developed. Once the aerostat was airborne, we did not have a clear direction for our experiment. An experiment procedure will be written and followed for the next flight.

Radar gun needs dedicated power supply because the power source we were using was unreliable. It was difficult to tell if the radar gun was getting the full 12Vdc it required. We will use a car battery in the future to provide a consistent voltage.

We received an empty tank of helium from our supplier. Much time was wasted trying to figure out if the tank was empty or if we were not filling it correctly, as well as the time to retrieve the new tank. We will have to get the helium very close to the launch date and require our supplier to show us the gauge pressure on the tank.

WPS worked effectively, mounting onto a trailer would make transportation easier and eliminate need for salt ags as counter weights. Could also use the trailer to transport other necessary equipment to launch site to reduce carrying items by hand. We will strive to have the WPS mounted to the trailer by the next flight.





Data Analysis

To the left is the data collected from the AX. This shows the EPS and MPB voltages as a function of time.

As mentioned earlier, the data was not what we expected. Both the EPS and MPB data should be very close to a DC voltage. Further development and testing is required to obtain useable data.

In the future, we would like to be able to show the MPB voltage as a function of time as well as altitude.

Next Steps

We will be addressing all of the items highlighted in green in the preceding report as well as work on some additional projects leading to our next launch.

We would like to develop a gimbal system for the horn of the radar detector. This would allow us to position the aperture in perfect orientation to the radar gun. We have discussed several ideas including using 2 GPS antennas coupled with a math function to determine the angle between the platform and the spool, where we would have the radar gun. Significant testing will be required, however, if we can use this to maximize efficiency, we will have greater power transfer.

We would also like to build a custom payload platform. During our first flight, we used Dan Hawk's prototype, which provided a good starting point, however, there is much wasted space. We will also focus on cleaning up all the wiring to give a more professional appearance.

Development of a fractal antenna is still on hold until we can produce consistent and repeatable data collection from the MPB.

To address these goals, we have team workshops every 2 weeks, and leader meetings on the intervening weeks. Each LSI also has team workshops to accomplish individual goals.

Our next flight is tentatively planned for July 25th, 2015, however, if we lack measurable progress to test a new concept, that date will be delayed.