HASP Monthly Status Report - April 2014

Balloons over Volcanoes Team

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1 Synopsis

- Constructed and tested power system
- Submitted preliminary Payload Specification and Integration Plan
- Purchased supplies for acoustic array
- Set up data transfer from ground array for use in predicting acoustic signals during the flight
- Examined trends in wind noise with altitude

2 Activity Summary

This month's activities consisted of constructing the data logger and microphone array power circuit (Figure 1). While the 30V-12V DC step down is currently being shipped, the team was able to build the 12 V portion of the circuit. We tested the current draw of the system by running the Data Cube data logger at its most power intensive setting (high accuracy, continuous GPS acquisition, and maximum sample rate) and connecting all three microphones. The current remained near 31 mA, deviating less than 5 mA throughout the half hour long test.

We also created and submitted a preliminary Payload Specification and Integration Plan. This process consisted of developing a power circuit diagram, creating a 3D model of the payload mounted on the interface plate, measuring the current draw, and weighing all the components we had on hand (and estimating weights for those we did not have yet). Measurements made during the development of this report indicated that the shielded signal cable will bring the payload above the maximum allowed weight, so we will switch to unshielded cable or shorten the array.

Kyle Jones of Sandia National Laboratories has received clearance to release data collected on that institution's ground acoustic array near Socorro, New Mexico. He will transfer these data to us at the end of April, and team member Tierney Larson will begin analyzing the data when she arrives at UNC in early May.

We investigated wind noise levels recorded on a video camera that flew to 24 km above North Carolina as part of a high altitude photography project (Figure 2). Wind noise decreases significantly with altitude during the ascent, and appears to depend on the product of ascent rate and density (Figure 3). This is expected if the bulk of the wind noise is from stagnation pressure variations. Extreme variations in horizontal wind speed (up to 100 mph) did not affect sound levels. This is encouraging, as it suggests that wind noise should be very low during the float phase of the HASP flight.

3 Issues Encountered

The weight of the shielded signal cable we had planned to use for the acoustic array is unacceptably high. We will investigate signal transmission through unshielded cable. Using unshielded cable will allow us to preserve the planned network aperture; otherwise we will have to shorten the array.

4 Milestones Achieved

We are excited to have developed the power circuit, submitted the preliminary PSIP, and organized the ground array data transfer.

5 Team

The student team consists of Daniel C. Bowman (University of North Carolina at Chapel Hill), Jacob F. Anderson (Boise State University), Aaron Curtis (New Mexico Tech), and Tierney Larson (Yale University). Jonathan M. Lees (UNC Chapel Hill) serves as Faculty Advisor. Paul Norman and Kyle Jones are outside advisors.

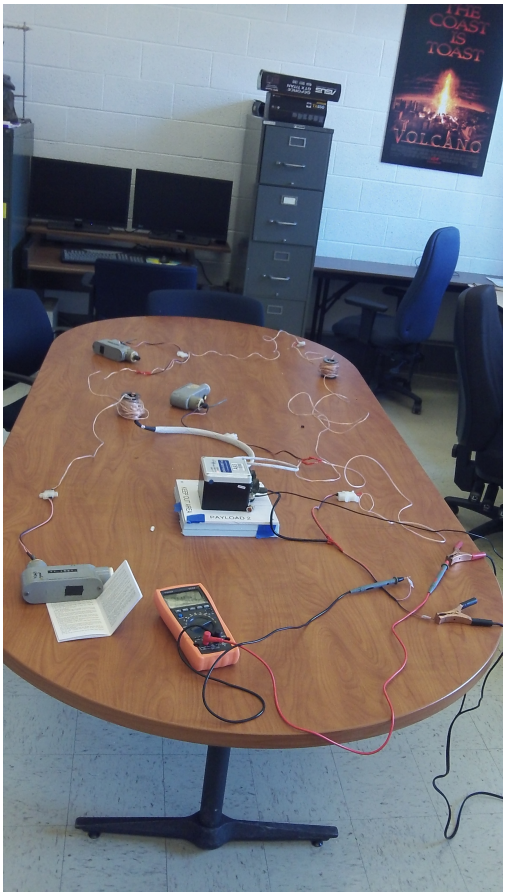

Figure 1: Testing the current draw of the microphones and Data Cube logger. The Data Cube is resting on the payload interface plate.

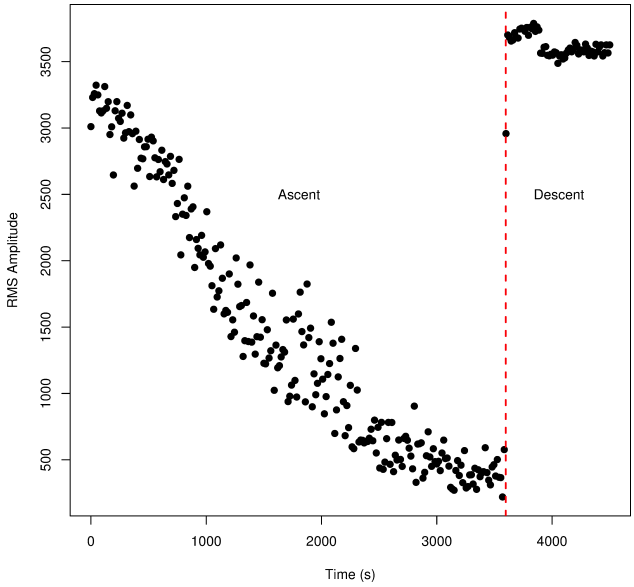

Figure 2: Root mean square (RMS) amplitudes of sound levels recorded on a video camera during a high altitude balloon flight to 24 km above sea level. RMS amplitudes were calculated over a 15 second window.

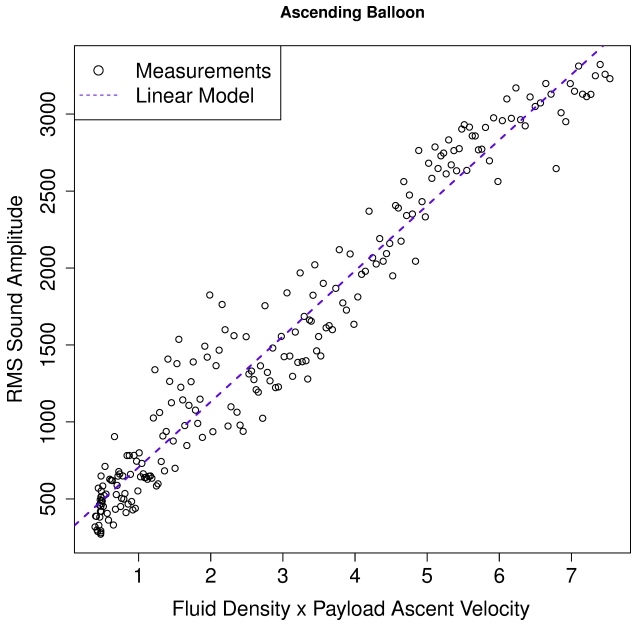

Figure 3: Wind noise recorded on video camera versus the product of ascent rate and atmospheric density.