

# **Elijah Payload Team Interim Report**

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## *Speed of Sound Experiment*

**Goal of the Project:** To experimentally measure the speed of sound relative to altitude.

**Methodology:** A tone generator and two microphones will be rigged in a straight line onto a rigid dowel. A recording device will record the noise from the tone generator in stereo. With the mics at a fixed distance apart and the experimentally determined lag time between mics, the speed of sound can be determined through analysis of the recording.

**Materials Acquired:**

- Digital Voice Recorder (44100 Hz sampling rate, SD card included)
- Two Noise Cancelling External Mics
- Stereo Plug
- Two Mono Jacks
- Shielded Four-Conductor Wire
- Tone Generator
- Software for MP3 Analysis

**Progress to Date:** All the required materials have been ordered and received; everything is in order. The mics have been wired and soldered with the stereo plug and the mono jacks. They successfully record in stereo onto the DVR in MP3 format. Software has been obtained for MP3 trimming; lengths of track can be clipped and individually analyzed in relation to altitude. A program has been downloaded and integrated allowing MATLAB to analyze MP3 recordings, and tests of the system thus far have been promising, with visible wavelengths and lag times in generated plots of the data.

**Work to be Done:** Data analysis is the main focus at the time. Averaging algorithms are being looked into for manipulating the data into an easier format to analyze. Once more insight into how the data is to be examined is obtained, important final decisions will be made, including tone volume, tone frequency, and the distance between the mics. All that will then remain is to construct the optimized experimental design (with insulation and a possible heating system) and to run the experiment.

## *Time Experiment*

**Goal of the Project:** To experimentally measure a time difference with altitude and to record the effects on digital and analog watches.

**Methodology:** Five watches and a camcorder will be rigged across from each other in a rigid base. There are two analog watches, one low end and a high end, and three digital ones, one cheap, middle and high end models. The camcorder will record the watches the whole flight. In addition, there will be another five exact watches on the ground at all times. This will enable us to determine any changes in time due to the conditions of the flight.

**Materials Acquired:**

- Two high-end and Two middle-end analog watches (same model Timex)
- Two high-end and Two-middle end digital watches (same model Timex)
- One cheap Wal-mart model digital watch
- Panasonic Camcorder
- External power supply for camcorder
- 16GB SD memory card
- Macro filter lens for camcorder

**Progress to Date:** All the required materials have been ordered and received; everything is going well. The stand for the watches has been made and the watches have been put in place. Also, the wristbands of the watches have been removed and fitted with Velcro wristband. The camcorder base is nearly complete and the distance is set so the watches can be recorded properly.

**Work to be Done:** The external power supply for the camcorder needs to be wired and placed in the container with the rest of the experiment equipment. Some further testing of the camcorder and power supply recording the watches still needs to be done. Also, we may need to add a light source inside the container so the watches are recorded properly by the camcorder.

### *Watermelon and Coffee Experiment*

**Goal of the Project:** To experimentally measure effects near space conditions on watermelon seeds.

**Methodology:** Two bottles containing watermelon seeds will be sent up with the payload. One container will be insulated from the cosmic radiation and part of the extreme weather and the other one will be left out so it can be affected by the extreme conditions. Also, three control samples will stay on the ground. All the samples will be planted and grown using the same equipment and a strict set of control standards. This will enable us to

measure any differences between the seeds that go up and the ground ones. Also, this is the case for the coffee beans experiment. Two samples will be sent on the payload and control samples on the ground. The coffee samples will be grounded using a different coffee grinder for each sample to avoid contamination. The samples will be brewed and served to the public to see if there are any differences in the samples.

- Materials Acquired:**
- Miracle Grow mixture
  - Watermelon seeds
  - Grow Light
  - Container to grow the seeds
  - Four coffee grinders
  - Generic coffee beans
  - Bottle containers

**Progress to Date:** All the required materials have been ordered and received; everything is in order. The container holder is already designed and built. It will hold the four samples, two of watermelon and two of coffee. One sample of each will be insulated and the others will not be. The containers have been tested for pressure and if they block UV radiation or not. The grow light and growing container are set. Hopefully, the seeds and coffee will be sent up this coming weekend of July 18<sup>th</sup>.

**Work to be Done:** The ground seed samples have to be planted and their growth progress monitored and recorded. After the first launch, the space samples will be grown and monitored for any mutations, growth rate, etc. As for the coffee, the samples will be ground up each with a separate grinder and tested for any changes in flavor, color, etc.

Overall, the project is interesting and exciting, and is moving along nicely. All of us cannot wait for the launches and see the results for our experiments.