Mission Overview

- Spaced Out shall track humidity, temperature, acceleration and pressure using sensors to record data and find correlations between energy produced and external variables.
- Spaced Out shall measure electrical energy produced using a KERS.
- Spaced Out shall determine if the energy measured is sufficient to provide functionality to background electrical components.
- Spaced Out’s BalloonSat shall be reusable.
- A camera shall record video of the flight until it runs out of battery.
Design: Concept of Operations

Mission followed CONOPS diagram to a tee and every function of the BalloonSat functioned correctly through the sequences of the diagram.
Results and Analysis (The Journey)
Results and Analysis

Before

After
(Survived!)
Results and Analysis
Results and Analysis

Voltage/G force vs Time

Time (min)

-4 -3 -2 -1 0 1 2 3 4 5 6

XG (g) ZG (g) Voltage1 Voltage2
Results and Analysis

Sensor Data vs Time

Time (min)

0 4 8 12 15 19 23 27 31 35 39 42 46 50 54 58 62 66 70 73 77 80 85 89 93 97 100 104 108 112 116 120 124 128 131 135 139 143

Temp1 (F)  Temp2 (F)  RH (%)  Pres (psi)  XG (g)  ZG (g)
Results and Analysis

Instantaneous Voltage vs Time

- Voltage (volts)
- Time (min)

Graph showing the comparison of Voltage1 and Voltage2 over time.
Results and Analysis

All data Recorded vs Time

- Temp1 (F)
- Temp2 (F)
- RH (%)
- Pres (psi)
- XG (g)
- ZG (g)
- Voltage1
- Voltage2

Time (min)
Failure Analysis

What Failed? Why?
- The camera stopped recording after 44 minutes 31 seconds when it was expected to work at least about 70 minutes.
- On impact, Arduino 1 shut off so all the sensors stopped reading data; Arduino 2 (connected to the KERS) was still running on impact.

How do we know?
- The light on the camera was no longer blinking once recovered and when the SD card was analyzed from the camera, only 44 minutes 31 seconds of video were taken.
- When the BalloonSat was recovered, the orange light was off meaning it was no longer reading data; the data recovered from the SD card showed a cut off on impact landing as well.

What tests do we plan to perform to verify failure?
- For the camera we plan to do another life test to see if it would last 70 minutes under normal conditions to see if the battery is in good condition still. If everything is normal, another cold test will be simulated to see what temperature the camera shuts off at.
- We plan to do another impact test with all systems running to see if we can simulate the conditions where the systems shut off on the real flight; this will determine if it was an impact failure or possibly a connection failure.
What’s Your Plan?

• From here, we will need to conduct further to see why some areas of our mission failed.
• In order to do this, we will need to simulate the conditions experienced during flight.
• We will need more dry ice to simulate extreme cold temperature to determine when the camera fails.
• We will also need to a high balcony to simulate impact tests while systems are running.
• We will need to consult Tim May to help read data.
• We will compare this new data to our flight data.
• We expect this whole process to take about a week.