

# ASU ASCEND 2016-2017



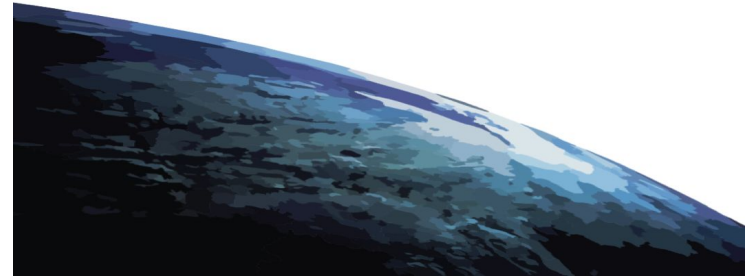
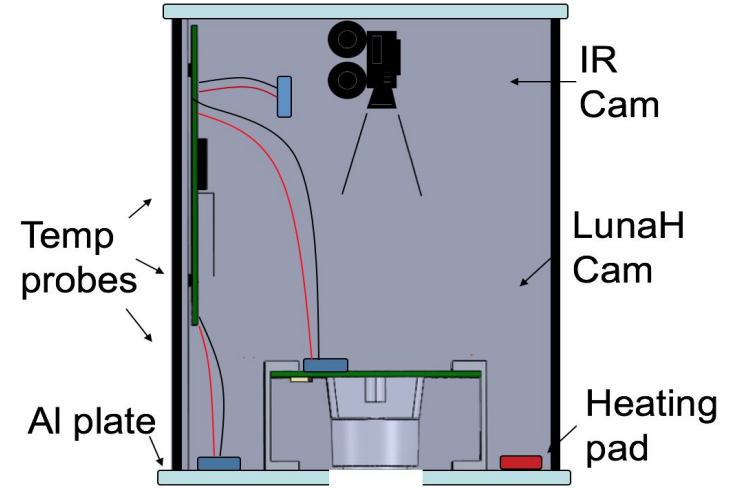
# Experiment 1

- Goal
  - Perform a thermodynamic analysis of an electronic device to examine how heat flows through a circuit in space-like conditions.
  - Seek to find components that may become too hot or too cold in a vacuum environment.
- Motivation
  - A LunaH-map camera will be used so a thermodynamic analysis is extremely helpful in their testing phase

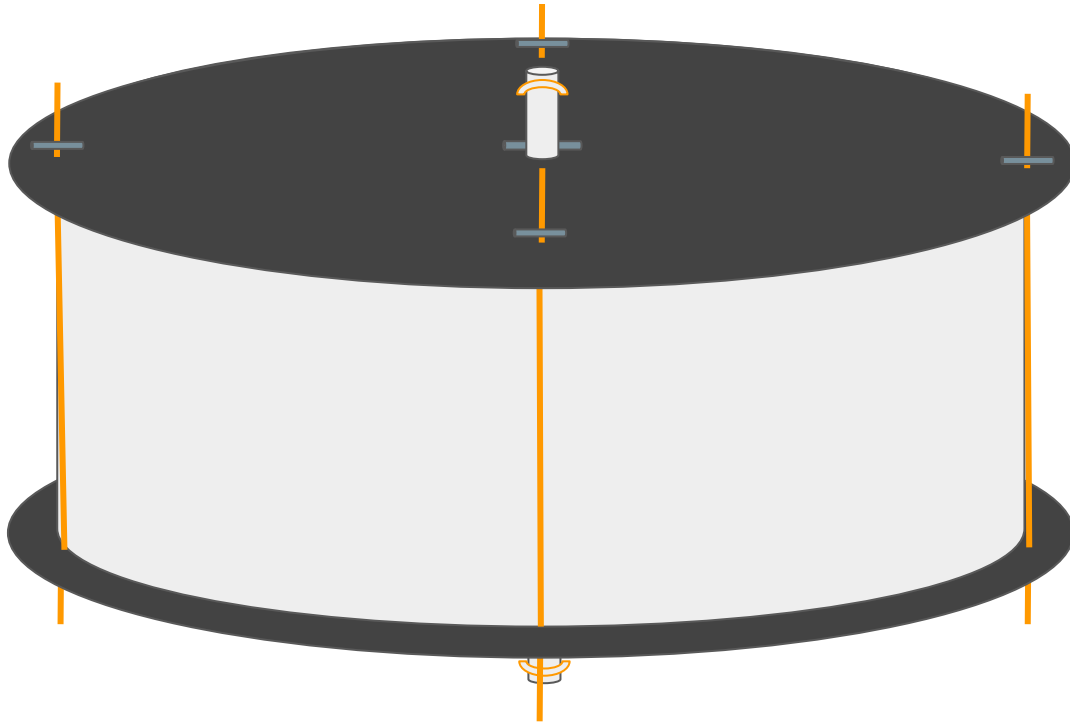


# What does this require?

- Much stronger and safer payload since we are flying Lunah-map components that need to be recovered.
  - Safer payload design
  - Heating element to prevent camera freezeout
- Electronic components to measure heat flow v. altitude which is accomplished through
  - Temperature probes
  - IR camera
  - barometer

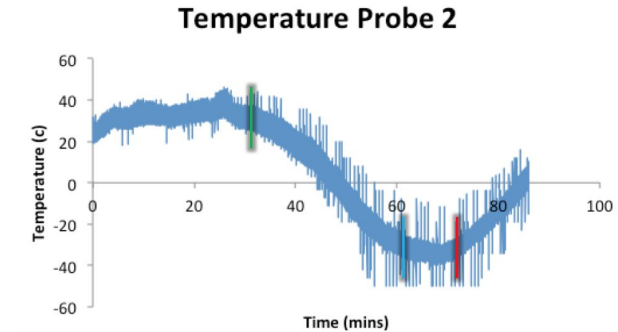
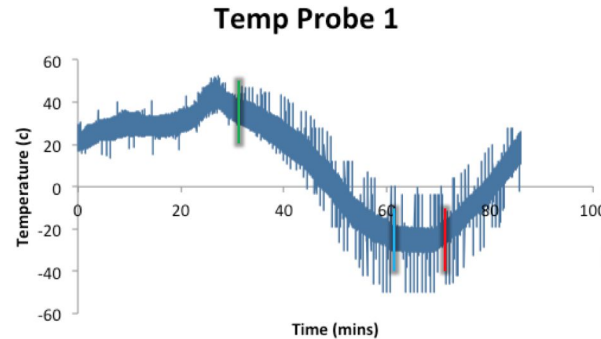
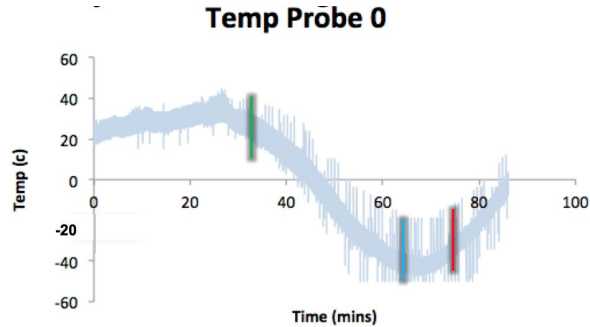


# Payload Design



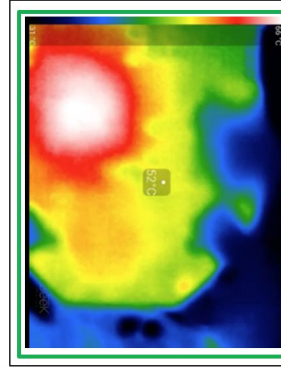
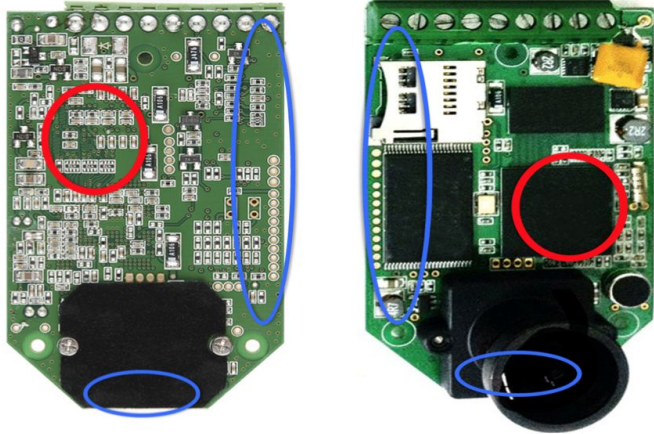
- Al top and bottom plates
- Carbon fiber cylinder self-wrapped central frame
- Al rods wrapped between carbon fiber layers
  - Rods puncture Al plates to prevent rotation
  - Plates secured down with pins on Al rods

# Results: Temperature Probes

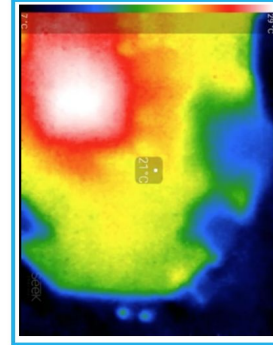


- Temp probe locations
  - 0: Bottom Al plate
  - 1: Camera board metal mount
  - 2: Ambient air
- No Significant temperature differences
  - Shows that heat wasn't dissipating from the hot board effectively

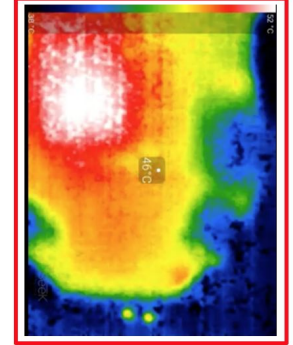
# Conclusions



0 min/ground lvl  
standard temp



29 min/13,000 m  
coldest point



40 min/19,000 m  
last data pt.

- Lunah Cam picture showing overheating regions (red) and possible freeze-out regions (blue)
- Camera boards were found to pose overheating problems in space-like conditions due to the inability to convectively dissipate heat.
  - To prevent electronic failure the use of thermally conductive tape is advised

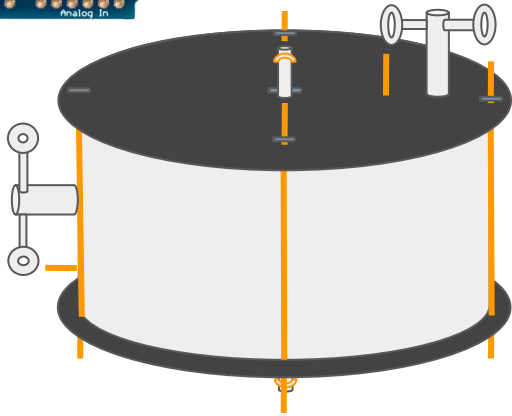
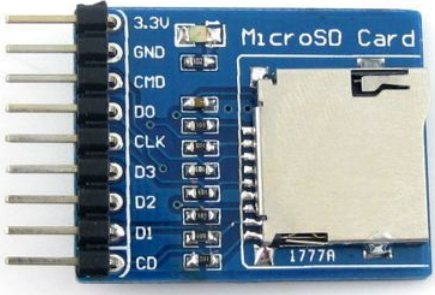
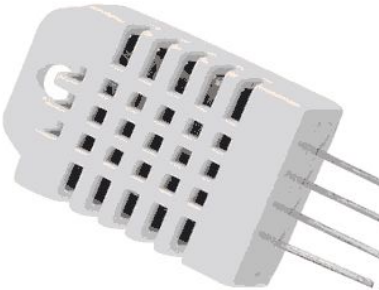
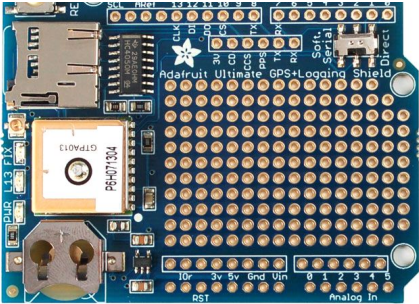
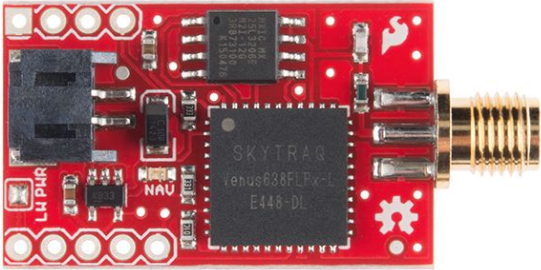
# Experiment 2

- Motivation
  - To assist the Eclipse team by completing the science payload to allow them to spend additional time on other tasks.
- Research Goal
  - To test fluctuations in atmospheric conditions during a solar eclipse due to sudden surface cooling.
  - We Seek to measure
    - Wind speed/direction
    - Humidity
    - Earth's surface temperature
    - Atmospheric temperature



# Methods

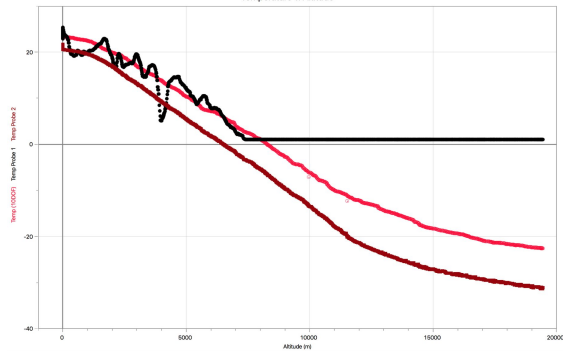
- Use a number of atmospheric monitoring sensors operated through arduino micro-controllers



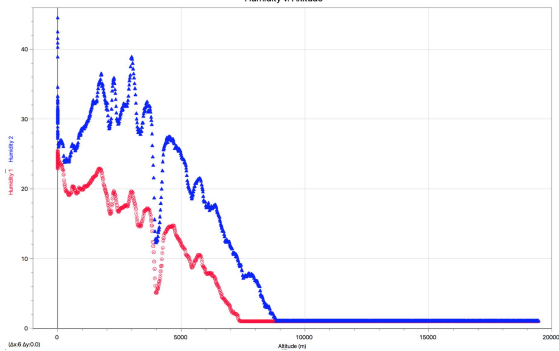


# Results

Temperature v. Altitude



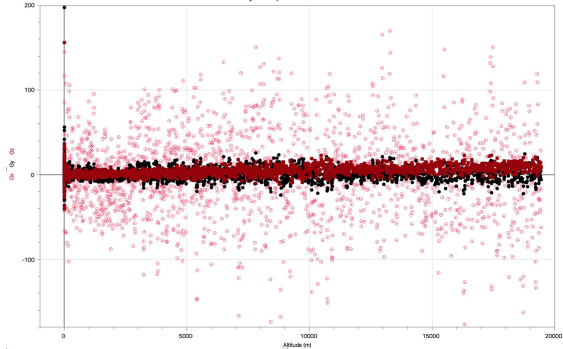
Humidity v. Altitude



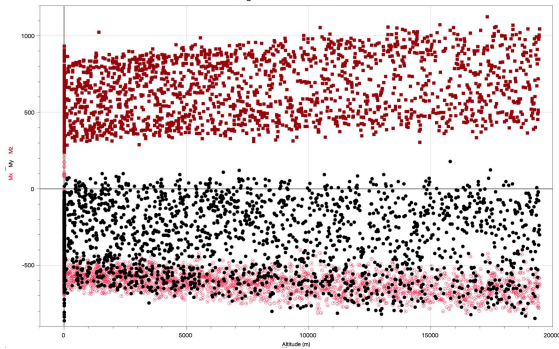
Wind Speed v. Altitude



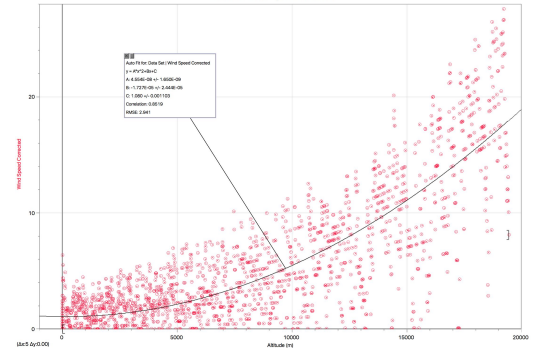
Gyroscope v. Altitude



Magnetometer v. Altitude



Corrected Wind Speed v. Altitude



# Thank You For Your Time

Are there any questions?

Additionally I would like to thank my advisor Tom Sharp, my ASU ASCEND team, The Arizona Space Grant group, Desiree Crawl, Jack Crabtree and the entire ANSR group.

