Mission Overview

– **Primary Objectives**
  - Measure speed of sound as it changes with altitude
  - Measure infrared and ultraviolet waves as they change with altitude
  - Capture video of flight
    - 1 minute of video every 5 minutes
  - Pico ITX Operation

– **Secondary Objectives**
  - Temperature
  - Pressure
  - Acceleration
– We expect to see that temperature is the only factor in the speed of sound as the payload gains altitude
  • since the change in pressure and the change in air density are equal and opposite factors of the speed of sound their effects will not be noticed

– Factors for Speed of Sound
  • Temperature
    – As temperature increases speed of sound increases
      » This is due to the increased activity (energy) of the air particles being disturbed as temperature rises
  • Pressure
    – As pressure increases speed of sound decreases
      » This is due to the decreased activity of air particles as pressure increases
  • Air Density
    – As air density increases speed of sound increases
      » This is due to the increased difficulty to accelerate particles as the density of the medium is increased
• Measure intensity of specific wavelengths
  – We expect to record a varied amount of Infrared and Ultraviolet waves relative to the amount of atmosphere through which they pass
  – Relative brightness levels (intensity)
    » black and white
  – Scattering
Video Capturing

• Use Pico ITX board to capture as much video as the power and memory will allow
  • Video may help explain any odd data recorded
  • Integrating camera to Pico ITX is a current challenge
  • Entertainment
• Subsystem Requirements

- Power
  - 12V
- No need to control temperature or pressure as we are measuring quantities relative to these factors

- What subsystems do you have: power, C&DH, thermal, etc.
- What requirements do you have for each subsystem.
- What requirements do each subsystem impose on each other.
  - You should have quantifiable requirements in this section.
    - Power subsystem shall supply 2W to…
    - Power subsystem shall remain at or above 72 F at all times during the flight.
- Which requirements are design drivers?
Test Plans

• Vacuum Bell Jar
  – This will simulate a low pressure environment and test our components in these conditions

• Power
  – We will run circuits to test the amount of power needed and for how long

• Filters
  – Resolution of camera
  – Filter effectiveness
Parts List

• Speed of Sound
  – Jameco 134105
    – Jameco is a SRF (sonic range finder) distributor and 134105 is their part number
    – [Data Sheet](#)
  – Tubing for sonic range finding
    – Possibly PVC, aluminum
  – End piece for effective sonic reflection
    – Possibly Arduino
Parts List

• Infrared and Ultraviolet Measurement
  – Webcam
  – Filters
  – Possibly Arduino
Parts List

• Video Capturing
  – Webcam
  – Pico ITX
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• Conclusions

– Issues and Concerns
  • Power
    – may be an issue for running cameras
    – essential to our success
  • A swinging payload might make it hard to analyze data from cameras with the infrared/ultraviolet filters

– Closing remarks
  • Thank you for the opportunity to do this project!