

**THE PRESSURE, HUMIDITY,
AND TEMPERATURE -
TESTS AND CAMERA
OBSERVATIONS (PHAT-TACO)
STUDENT-BUILT BALLOON
PAYLOAD**

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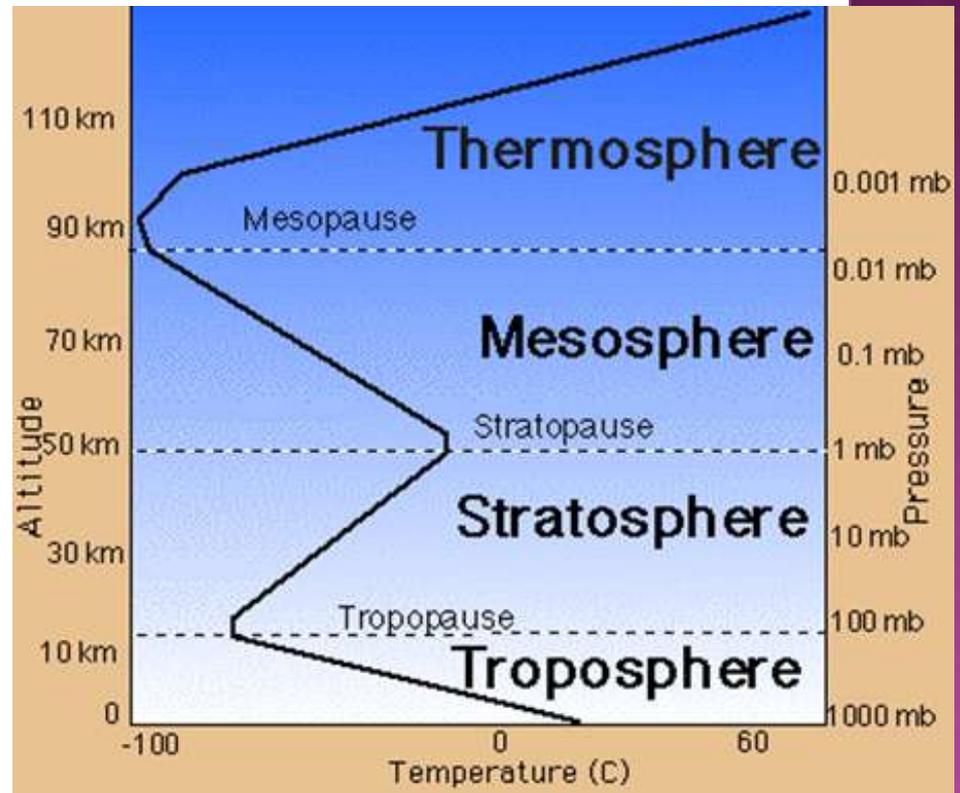
Louisiana State University

MISSION GOAL

- To study the layers of the atmosphere using an instrumented sounding balloon flown in East Texas during May and to analyze the balloon and the environment surrounding the payload in order to study the relationship between the temperature and humidity profiles acquired during flight.

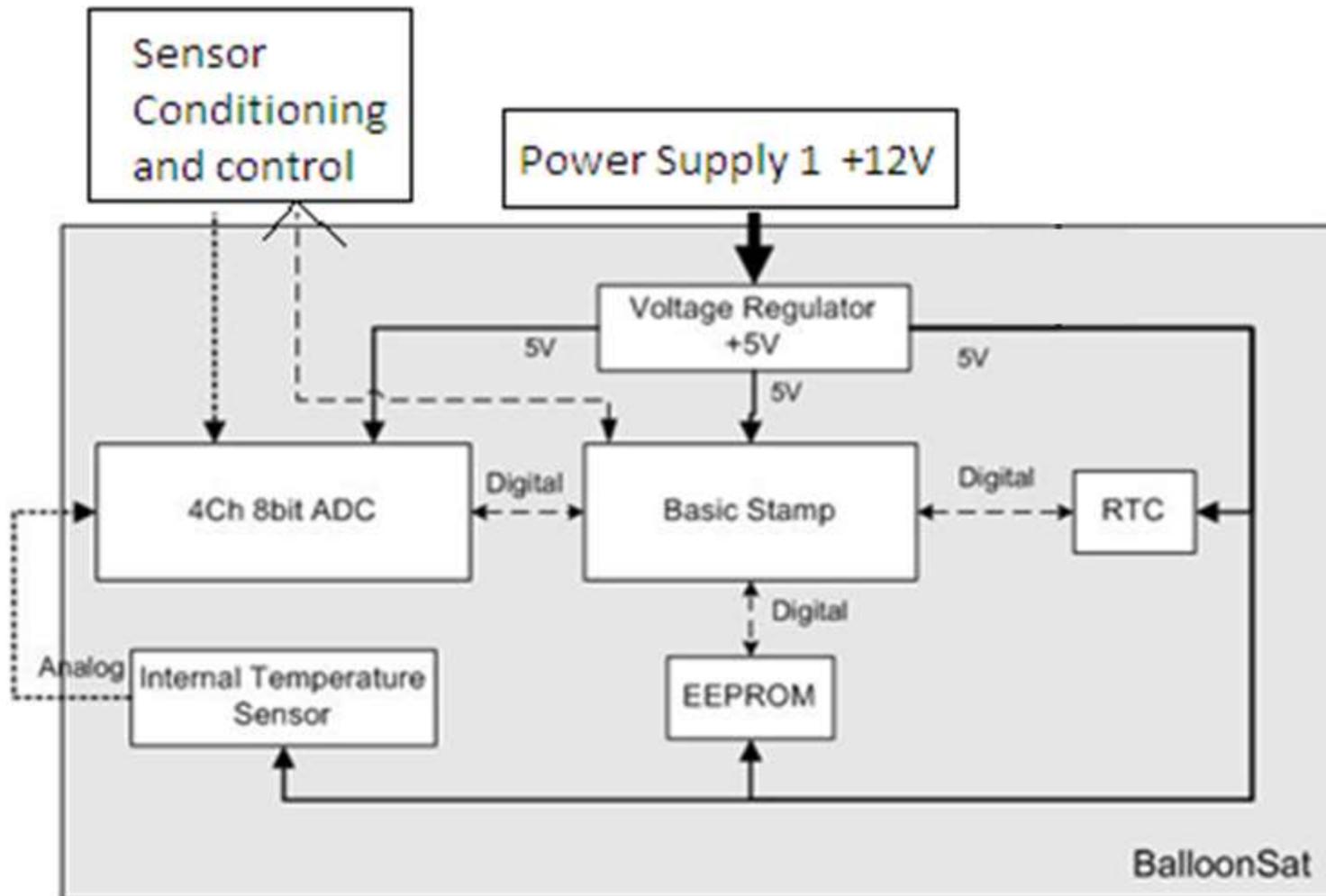
SCIENCE BACKGROUND

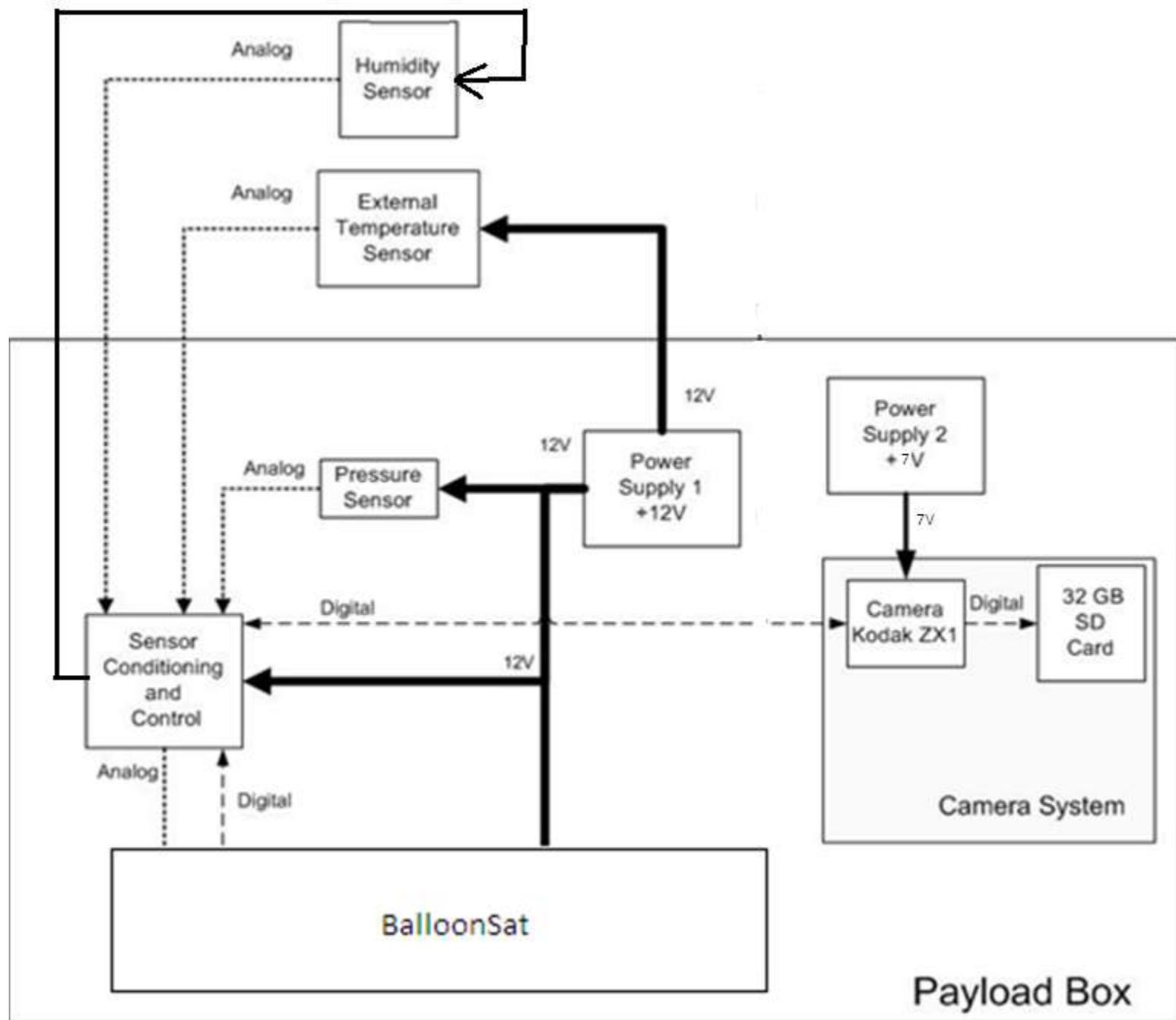
- ⦿ Troposphere
 - Clouds
- ⦿ Stratosphere
 - Less humidity & lower pressure than the Troposphere
- ⦿ Balloon Radius



<http://www.wyckoffschools.org/eisenhower/teachers/chen/atmosphere/earthatmosphere.htm>

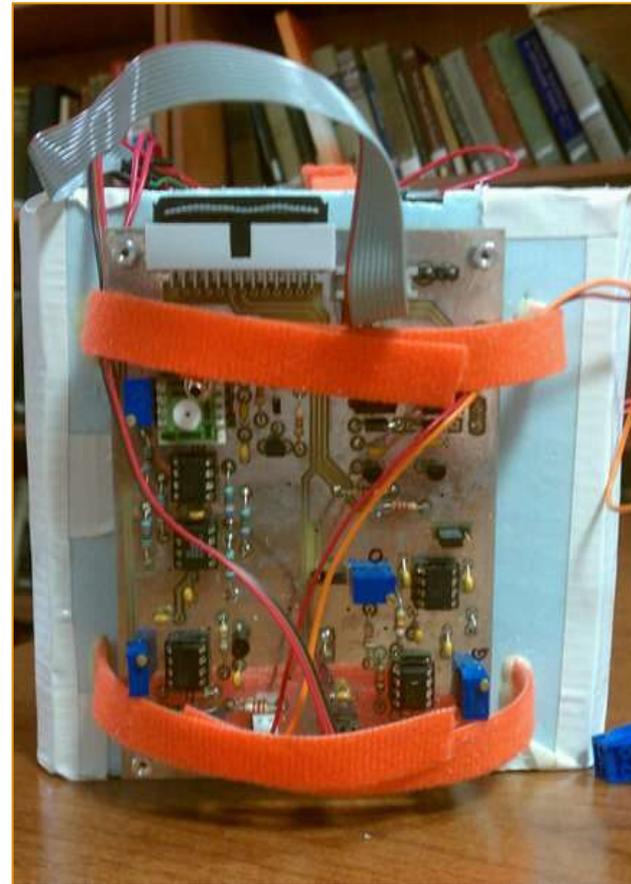
SYSTEM DESIGN





SENSORS AND POWER

- Temperature
 - Internal: built into BalloonSat
 - External: 1N457 (small signal p-n junction diode)
- Pressure
 - Model 1230
- Humidity
 - HIH-4000
- Camera
- 2 power sources



SOFTWARE

⦿ Pre-flight

- Set the real time clock
- Cleared memory locations
- Set the first two memory locations

⦿ In-flight

- Took atmospheric readings
- Ensured that the camera recorded video
- Restarted the video once every ten minutes

THERMAL DESIGN

- ◉ Temperature Range: - 80°C to 30°C
- ◉ Component Range: - 12°C to 60°C
- ◉ Construction Material: Insulating foam with a low thermal conductivity
- ◉ Heat produced by electronics
- ◉ Lowest temperature: 15.8°C



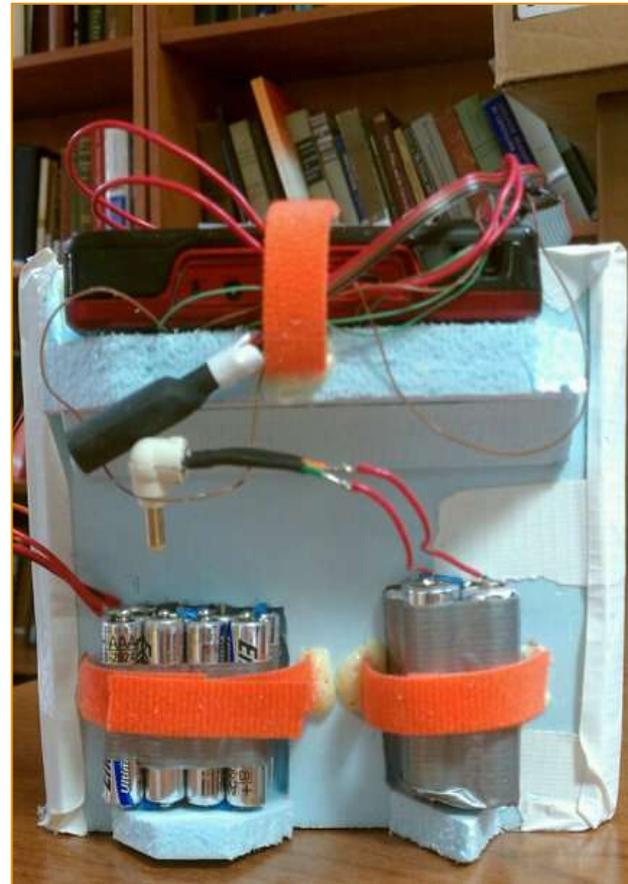
FABRICATION AND INTEGRATION

○ Fabrication

- Payload box
- Electronics
- Software

○ Integration

- Electronics to BalloonSat
- Software to EEPROM
- Complete electronic-software integration
- Integrate full system to box



TESTING AND CALIBRATION

⦿ Temperature

- Various temperature environments
- Multimeter for calibration

⦿ Pressure

- Vacuum chamber
- Chamber readout for calibration

⦿ Humidity

- Saturated, salt reduced and outside humidities
- Hobo humidity sensor for calibration

PRE-LAUNCH

- Run Pre-flight software
- Load In-flight software
- String up balloon



LAUNCH

Flew out of Columbia Scientific Ballooning Facility
in Palestine, TX at 6:54 am.

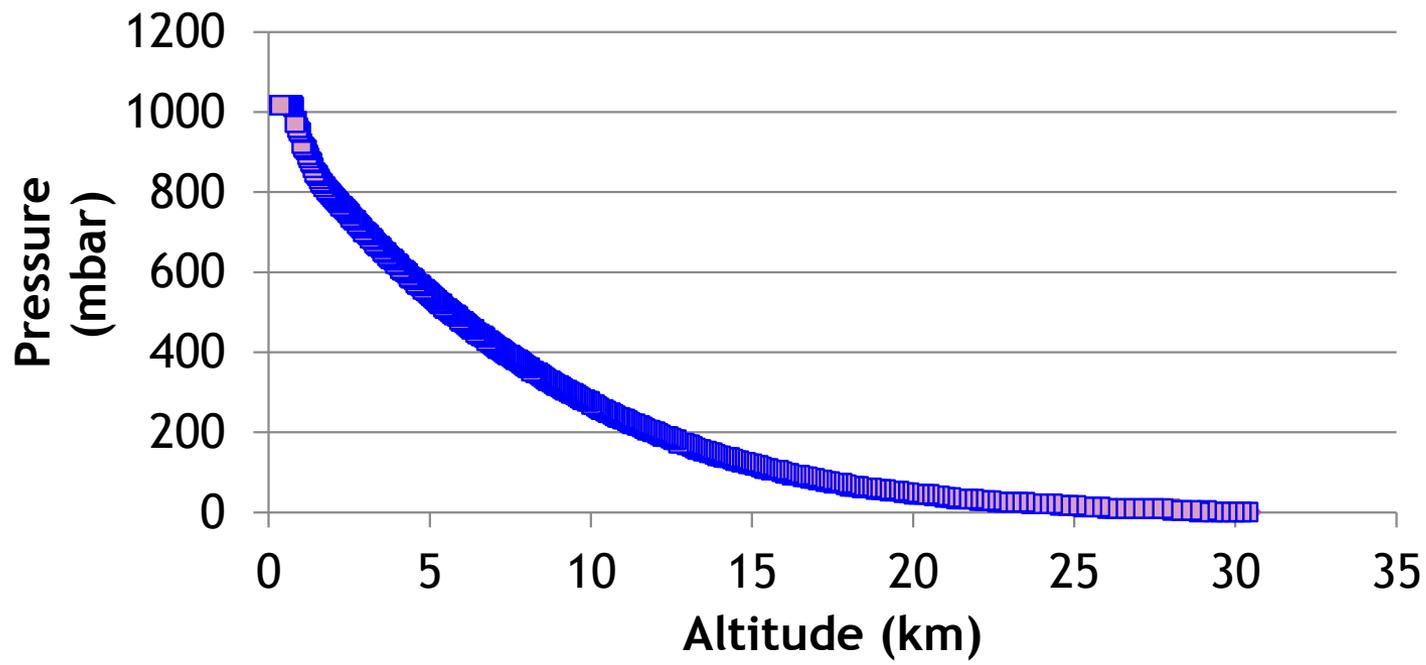
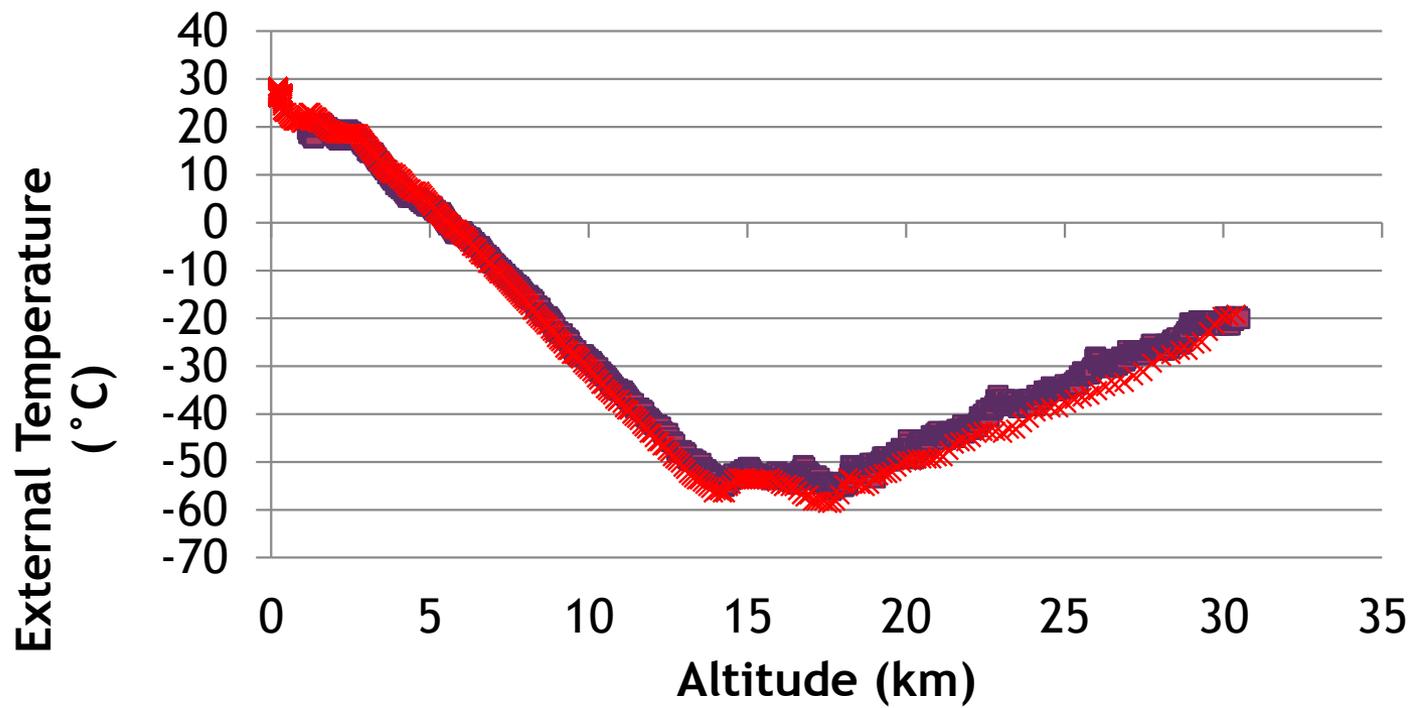


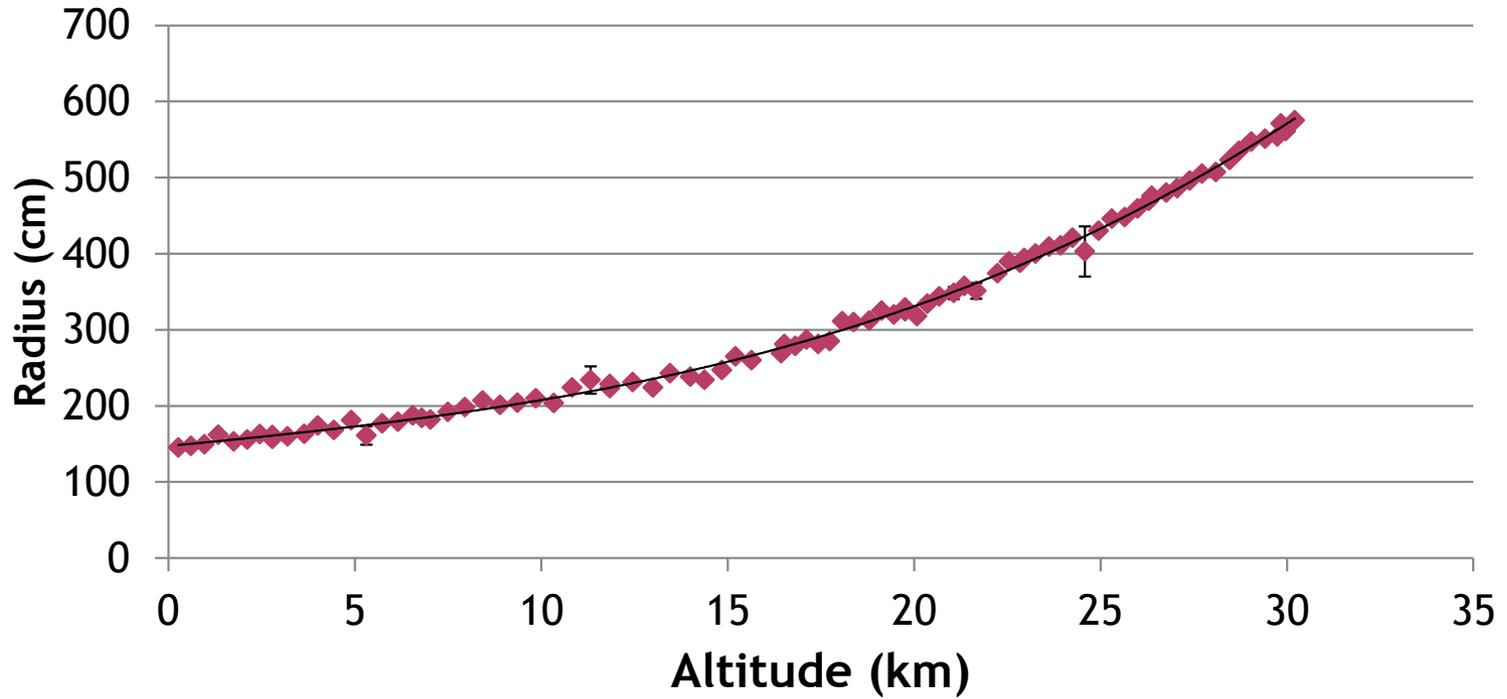
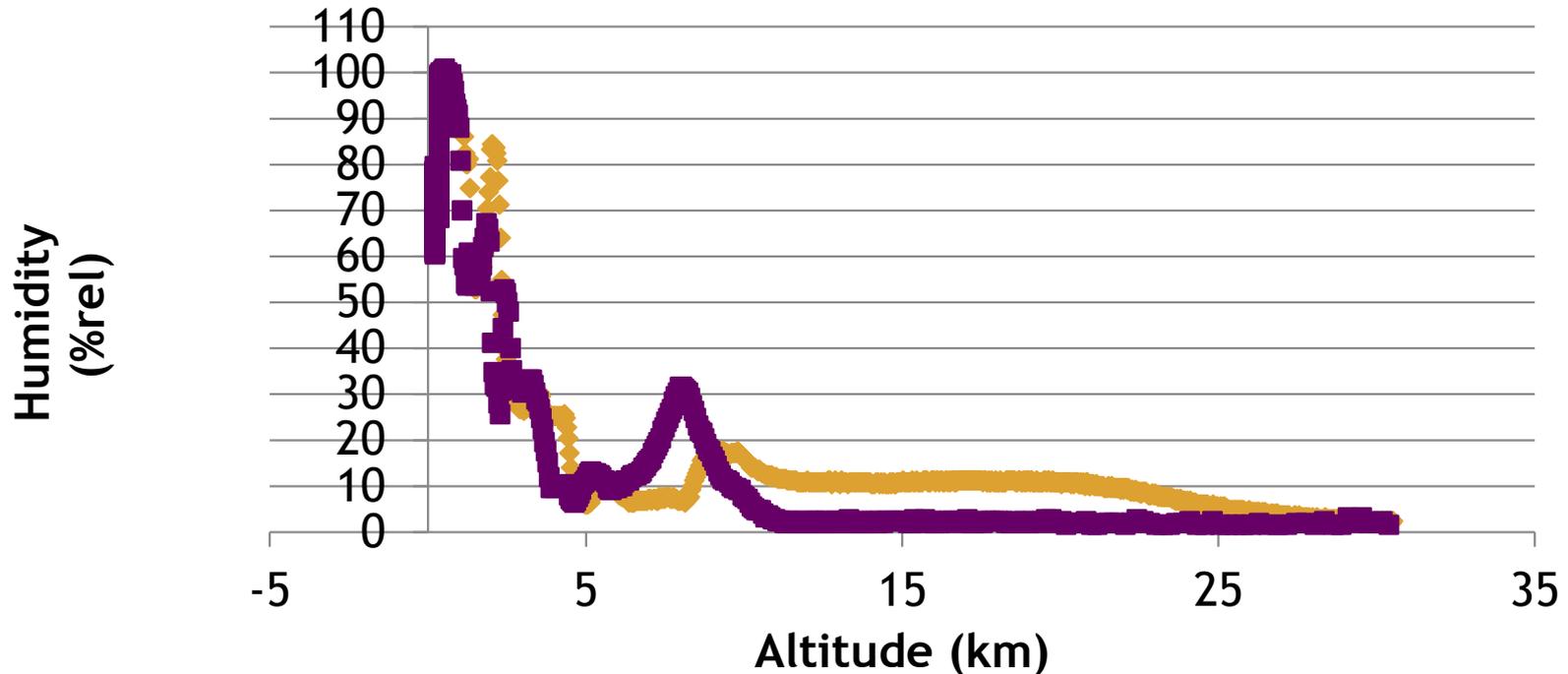
RECOVERY

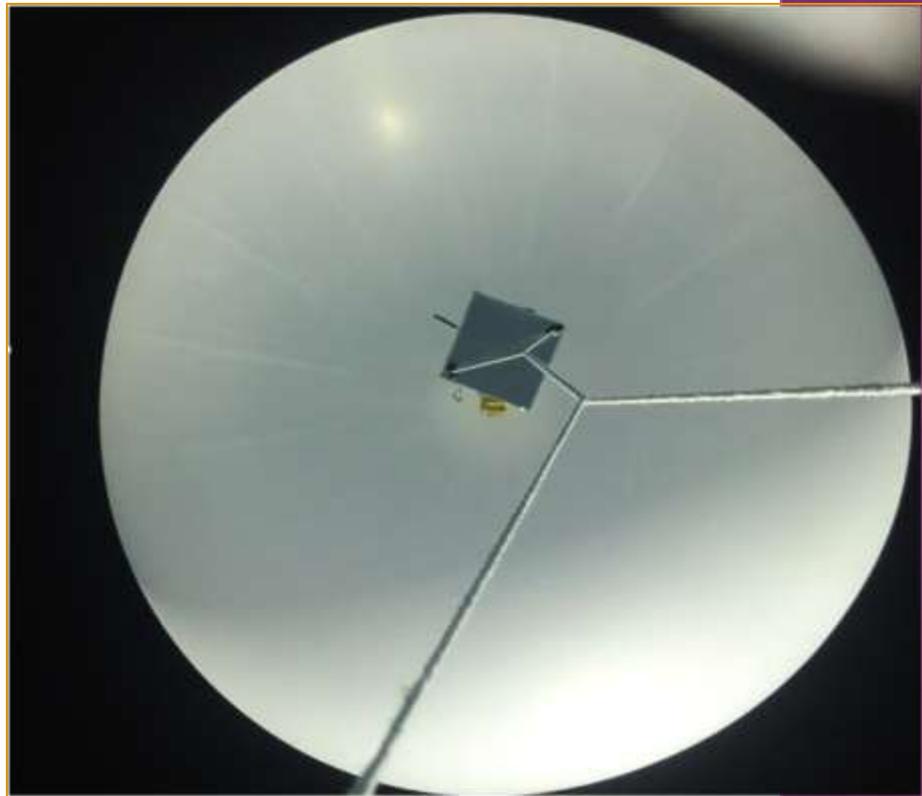
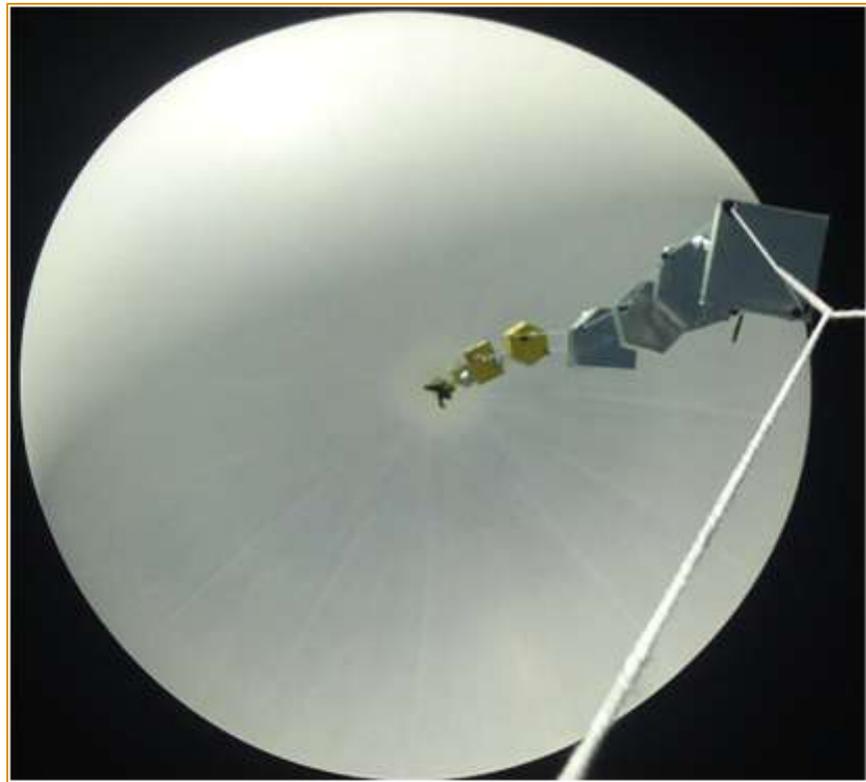
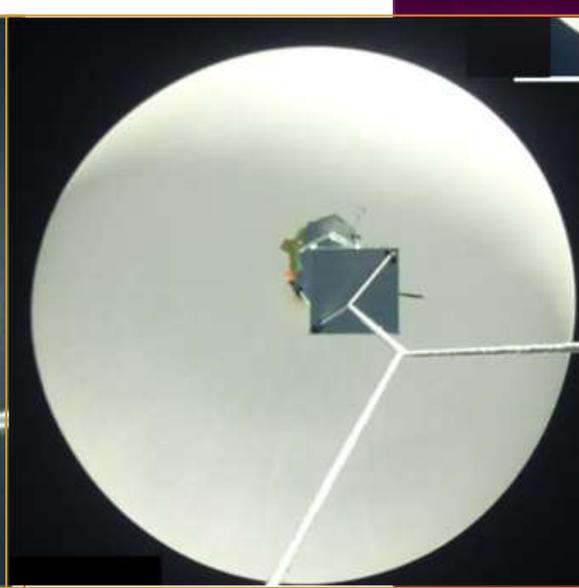
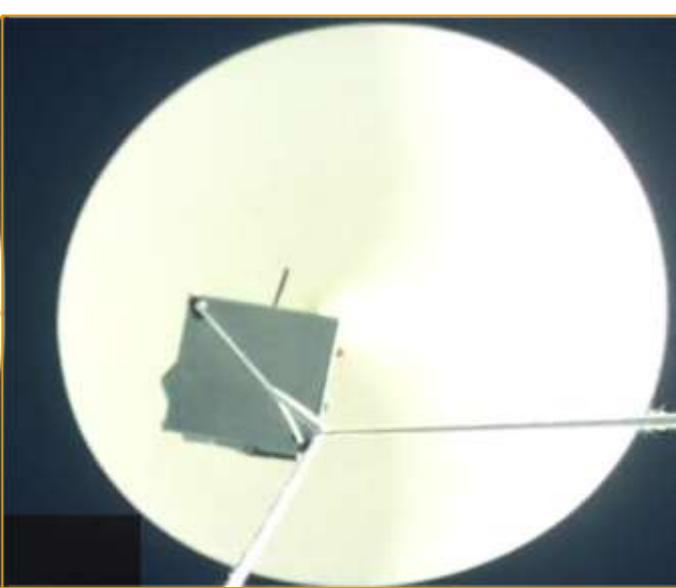
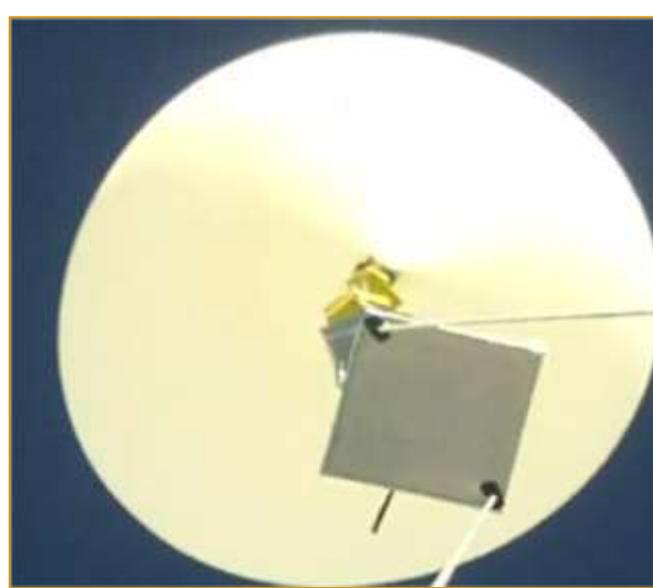


RESULTS

- ⦿ Term232 imported data to plain text
- ⦿ Excel converted ADC counts to data points
- ⦿ Balloon radius “fitting” program
- ⦿ Clouds
 - Ascent
 - ⦿ 1.02 to 1.14 km (3363 to 3763 feet)
 - ⦿ 1.18 to 1.23 km (3863 to 4043 feet)
 - Descent
 - ⦿ 0.86 to 0.66 km (2837 to 2150 feet)







CONCLUSIONS

- ◉ Introduced the concepts, skills and processes inherent in the aerospace industry
- ◉ Measured and recorded temperature, pressure, humidity and video from three minutes after launch through recovery
- ◉ Correlated with the payload's passage through clouds with spikes in humidity
- ◉ Temperature and pressure values generally followed the expected trends
- ◉ Provided the opportunity to increase knowledge and comprehension of the atmosphere
- ◉ Completed and documented a hands-on project that resulted in achieving the mission goal

ACKNOWLEDGMENTS

Team Philosohook thanks Brad Ellison, Jim Giammanco, Michael Stewart and Jenny Hay for all their support. We also thank the staff at the Columbia Scientific Balloon Facility for assistance with the balloon flight. This work was supported by LaSPACE under NASA Space Grant award NNX10AI40H.