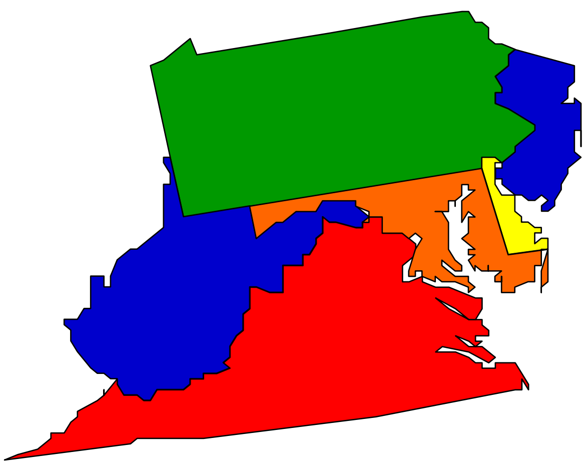
Maryland Space Grant Consortium

Program Highlights



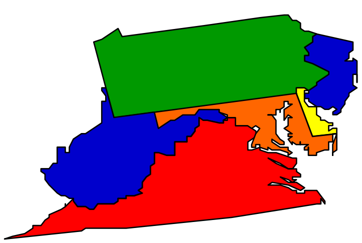
Mid-Atlantic Regional Meeting

2014 September 25

Dr. Terry Teays, Assistant Director

Maryland Space Grant Consortium

Fellowships, Scholarships, & Internships



Mid-Atlantic Regional Meeting

2014 September 25

Dr. Terry Teays, Assistant Director

MDSGC Observatory

2013 Scholarship Luncheon

- Question: How did participation in these programs impact your education and life?

It allowed me peace of mind, knowing that the money was helping pay for college so that I didn't have to work while going to school. Also the group activities that were part of the grant allowed me to interact with other students in my same situation, make friends, connect with people in the field, and talking with the group about what I wanted to do with my career helped me decide that I wanted to go on to graduate school and get my PhD.

National Council of Space Grant Directors - Science Mission Directorate Working Group

- Success with Chandra and OSIRIS-Rex
- Failure with HST and NAI

OSIRIS-Rex Intern, Tiffany Hawley

Balloon Payload Program

The Most Likely Landing Place for a Balloon Payload in Maryland – A Tree

Weather Balloon Payload

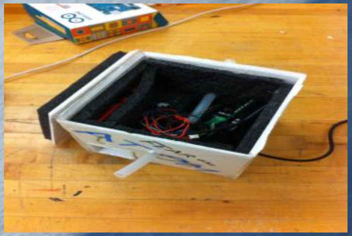
Hailey Palensky
Sage Muffley
John Bachkosky
Adam Stambouli
Bruno Livio

Dr. Mary Bowden
Faculty Advisor, Space Systems Labs

Frank Cianciarulo & Kristy Weber
Upperclassmen Assistants

Summary

Our payload was designed to measure pressure, temperature and humidity over the course of a balloon flight. We designed and constructed a sounding box that held measuring sensors and was built to maximize the efficiency of each one, given its purposes. We collected the data from the sensors after our payload's flight and analyzed this data using specific data processing software. The experimental results were consistent to what was expected. The temperature sensor outside of the box correlated with the temperature at the humidity sensor, which was different than the temperature inside the box. These results proved that the sounding equipment designed was successful in its goal.

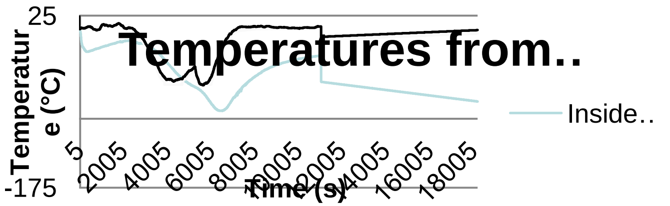


Hypothesis/Objectives

Our goal of this project was to construct a sounding box out of ordinary materials, such as foamboard and duct tape, that would allow accurate temperature and humidity readings from various sensors installed inside and outside of the box. We aimed to attain this accuracy by allowing ambient air to flow within the apparatus.

Methodology

First, we established a design and determined what sensors we would need in order to measure air pressure, humidity and temperature. We then constructed a sounding box out of foamboard so that the humidity sensor would be exposed to the outside airflow while the rest of the electronics remained safe within the box. The temperature sensor was also hanging outside of the box via a hole that we had cut out. Inside the box, we also placed a Canon PowerShot ELPH 300 HS camera that had been preprogrammed using CHDK software to automatically take pictures every ten seconds. Along with the camera was a PCB board attached to an Arduino that was coded to run all of the sensors. In order to successfully secure all sensors within the box, we packed the box with Styrofoam squares. At this point, our box was ready for launch. In the early morning of November 16, we drove to Warfordsburg PA and began to set up for takeoff. We blew up a balloon with two tanks of helium and attached our payload via string. Once all of the other payloads were also ready for launch, we let go of the balloon. We began to track it with the help of a GPS system. Periodically we received packages notifying us of the location and height of our payload, which peaked at 78,000 feet, until we arrived at the final destination in Reisterstown, MD. Once we retreived our payload, we read the data from the Arduino using.Then used this data to analyze and construct line graphs of air pressure, temperature, and humidity.



Conclusion

Our objective was completed as we constructed a sounding box that effectively optimized temperature, pressure and humidity readings and wistood the flight 's extreme conditions. The results of the sensors proved to be accurate with our hypothesis as the outside temperature sensor read parallel with thetemperature at the humidity sensor in the tube with the airflow. Without the construction of the airflow tube, the pressure and humidity readings would have generated incorrect data. The box was carefully constructed and planned out as a team, which was evident as our results proved to be accurate.

A special thanks to Maryland Space Grant Consortium for providing funding for this project!

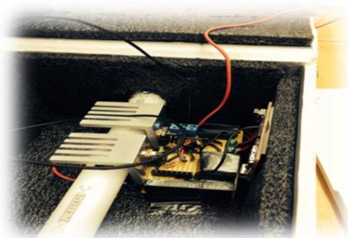
Team "Bad Attitude"

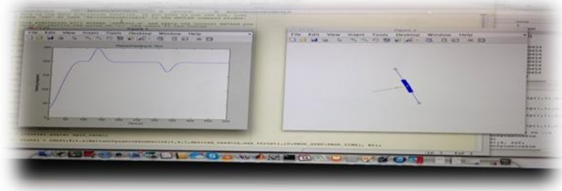
Near Space Spin Stabilization

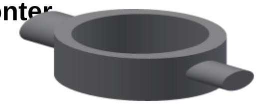
Camden Miller, Forrest Ridenhour, Matthew Juliano, Justin Coe, Zach Plotkin, Mike Lucci, Edward Carney, Kurt Gonter, Dr. Bowden

Description

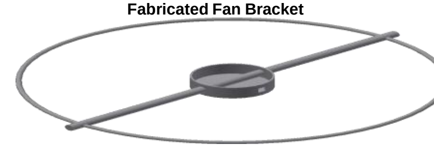
In previous launches, payloads attached to weather balloons were uncontrolled and unstable. We attempted to stabilize through the use of active and passive control.





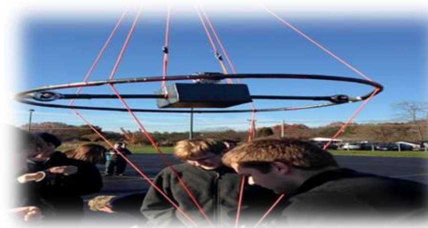


Fabricated Fan Bracket



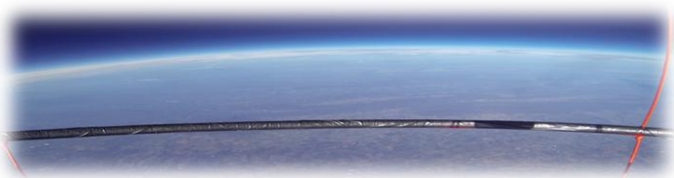
Passive Control

- Large ring on horizontal axis to increase moment of inertia about the vertical axis
- Swivels isolating the payload from the spin above and below
- Weight placed at a substantial distance below the payload in order to increase the moment of inertia about the payload's azimuthal plane



Active Control

- Gyroscope, Accelerometer, and Magnetometer were used to detect spin of the payload
- Program detects and attempts to counteract spin using small fans



Methodology

Our project was conceived, designed, built and tested over the course of 6 weeks in preparation for the final launch. After conception and design of the payload, we proceeded to construct the housing, assemble the electronics, 3D print the fan brackets, program the Arduino using a proportional-integral-derivative controller with heavy focus on the derivative term, and test the final system.

Hypothesis and Testing

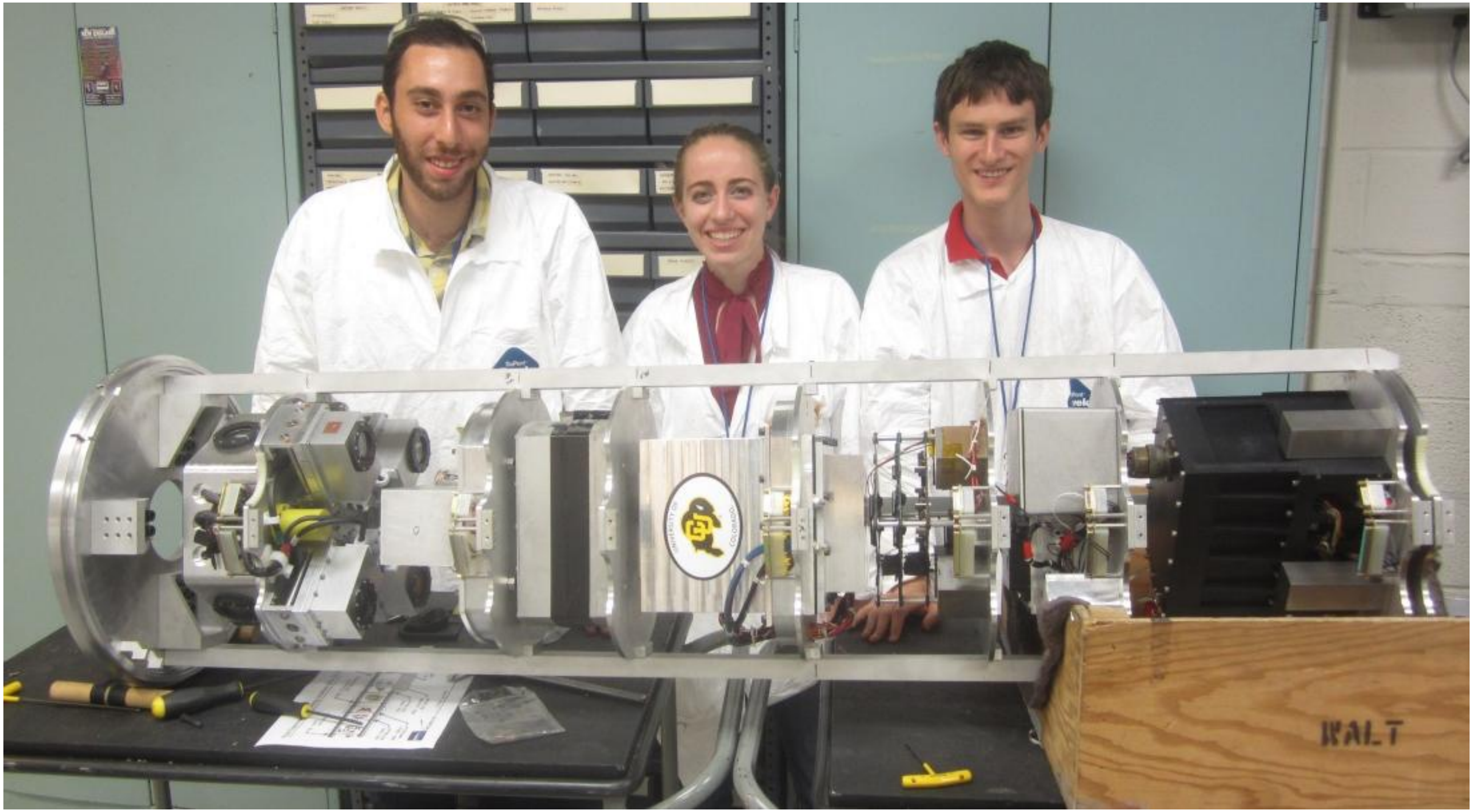
During testing, the low friction swivels properly isolated our payload, allowing it to spin freely without affecting the rest of the system. The active control systems worked well to stop the spin, typically stopping minor disturbances before reaching half of a rotation. Because of our tests, we suspected that the payload would perform well in lower altitudes, but at higher altitudes the fans would be less efficient due to the lower density.

Conclusion

During the flight, the payload reduced the spin greatly. As the payload reached the middle portion of the flight, stability was at a maximum due to the even airflow. As expected, upon reaching higher altitudes of approximately 70-80 thousand feet, the payload gradually became less stable. In the descent phase, while being lowered by parachute, the payload began spinning out of control. In conclusion, the data shows our control method was effective for a significant portion of the flight.

Funded by Maryland Space Grant Consortium

Hopkinauts



A Revised, Rated and Dated Inventory of Very Large Candidate Impact Basins on Mars

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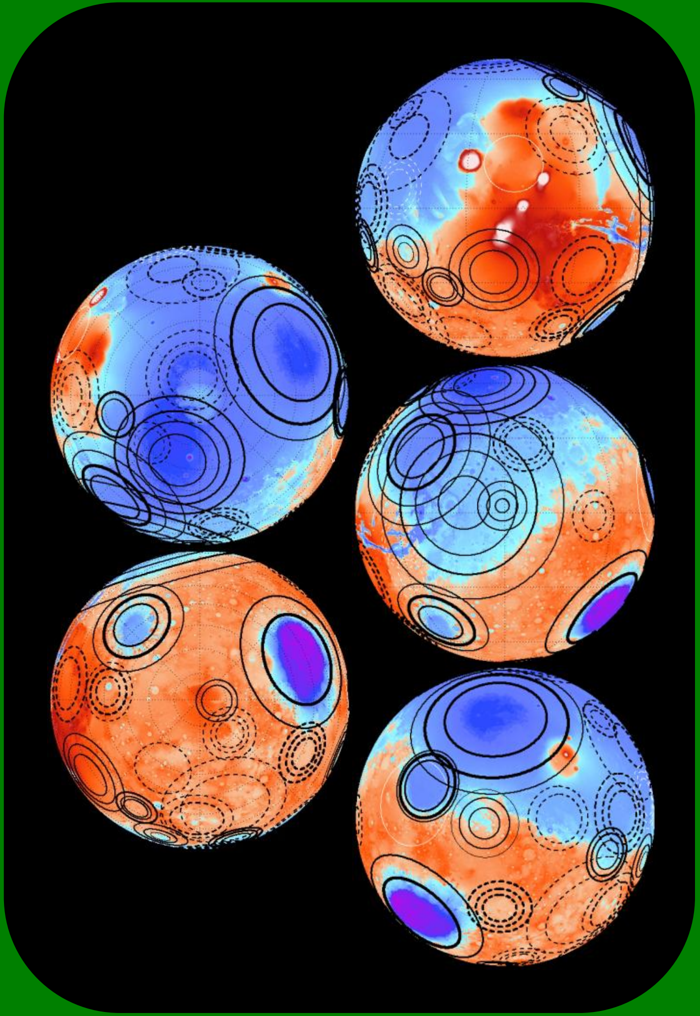

SEMAA STEM Extravaganza 2014

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