DROPS OF JUPITER

Quick-Look Post Launch Review

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Mission Overview

Launch a BalloonSat to an altitude of 30 km to determine if a magnetic field is an effective way to shield harmful cosmic radiation.

• Hypothesis:
  If we create a magnetic field around a Geiger-Muller tube and compare the radiation levels to an unshielded G-M tube, then the measured radiation of the shielded G-M tube will be less than the measured radiation in the unshielded G-M tube.

• Mission Objectives:
  • Explore magnetic fields as a possible radiation insulator
  • Determine if cosmic radiation can be shielded using a magnetic field
Concept of Operations

Flight:
- Heater Keeps all parts warm throughout flight.
- Camera starts taking pictures every 10 seconds
- Arduino 1 Collects data from 4 environmental sensors (internal temperature, humidity, pressure, and accelerometer) and the control geiger kit and stores it on the first SD Shield
- Arduino 2 Collects Data from the External Temperature sensor and the test geiger kit and stores it on the second SD Shield

Pre Flight:
- Use aluminum tape and hot glue to close balloon-sat.
- Turn on all switches
- All LEDs turn on

Post Flight:
- Track and recover via GPS.
- Turn off all switches.
- Open project and collect SD cards.
- Analyze data on laptops and draw conclusions.
- Check functionality for next flight.
All parts of the conops mission plan were followed. As a whole the flight went exceptionally well and all systems (except the camera) lasted the entire duration of the flight despite our limited amount of batteries. All sensors worked the entire flight and minus some calibration issues we believe the data we collected to be accurate. Data was collected correctly and was easily analyzed using Excel. We expect limited fixes to be made in order to prepare our project for another launch.
Results And Analysis

Included:

● Accurate Geiger data correspondent to expected Geiger data

● Stills from flight video and failed flight pictures (Light Sensor blocked)

● Environmental Data
- Internal Temp (Celsius): Blue
- Humidity (%): Orange
- Pressure (psi): Grey
- Geiger 1 (cpm) Unshielded: Blue
- Geiger 2 (cpm) Shielded: Orange
- Acceleration
  - Blue: X-axis
  - Orange: Z-axis

- Temperature
  - External: Shield 2

Burst
Failure Analysis

• Pictures: All oversaturated
  - Problem: Light sensor was covered
  - Solution: Cut out a larger camera hole for the light sensor to work
  - Re-test for future launch: Run camera with new hole, face sun and get new pictures

• Acceleration data: Incorrect values (3 & 4 Gs)
  - Problem: Incorrect calibration
  - Solution: Re-calibrate correctly
  - Re-test for future launch: Whip test, ensure acceptable data

• Magnets: Displaced during flight
  - Problem: Not secured well, allowed for shifting during flight
  - Solution: Fly entire 3D printed part
  - Re-test: Whip test with 3D part

Proper Orientation
Post Launch Plan

• Run a mission simulation with all components set up how they were during launch
  • Radiation source will be used to test the Geigers and see if the shielded geiger collects less radiation than the unshielded

• Must figure out better way to shield geiger from radiation
  • **If not, original hypothesis is proved wrong and magnets do not shield radiation (in this setup)**

• Test can be done in one day after data analysis