727 Test Equipment Data Package

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ISS On Orbit Camera

2.Introduction

The Senior Engineering Design Students at BJHSC, performed an experiment which included the design of an on orbit camera. The experiment was flown as part of the High School Students United with NASA to Create Hardware (HUNCH) program. The purpose of the project is to downlink imagery needed onboard the ISS (International Space Station) for use in sustaining engineering, failure investigation, and real time flight support. The experiment will test if the flying spherical camera will be able to fly and be controlled in a zero gravity environment. The engineering students will observe the effect of a zero gravity environment on the transmissions of signals and basic operations of the camera.

3.Abstract

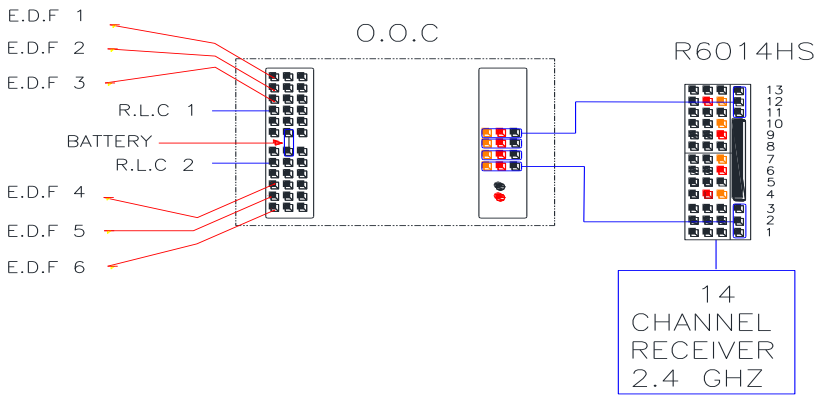
The experiment will test if the flying spherical camera will be able to fly and be controlled in a zero gravity environment. The engineering students will observe the effects of a zero gravity environment on the transmissions of signals and basic operations.

4. Statement of the research program.

History of the problem. (include, perhaps, past attempts at solutions)

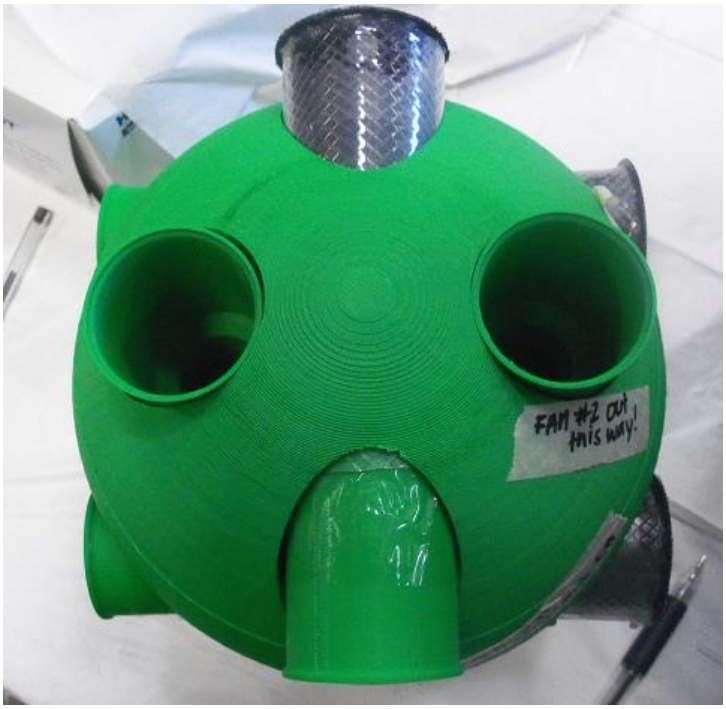
The first problem we had with our ISS spherical camera was the research and the MSDS of all the equipment we were going to use. Another problem we had with the camera was trying to fit and balance all of the equipment inside of the shell.

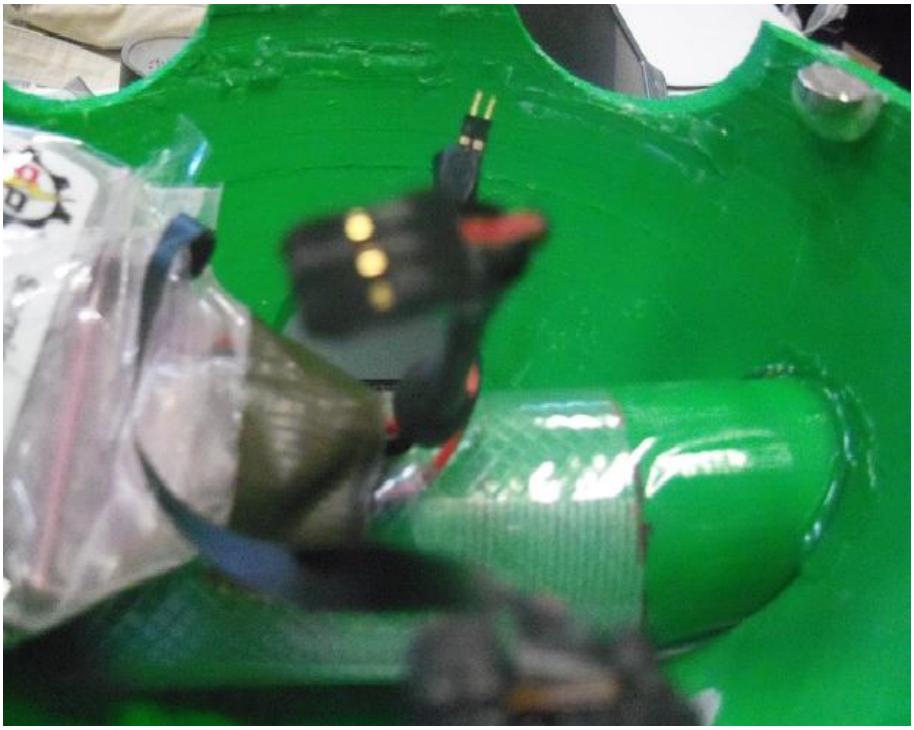
B) Work sources. (tables, graphs, pictures, etc)



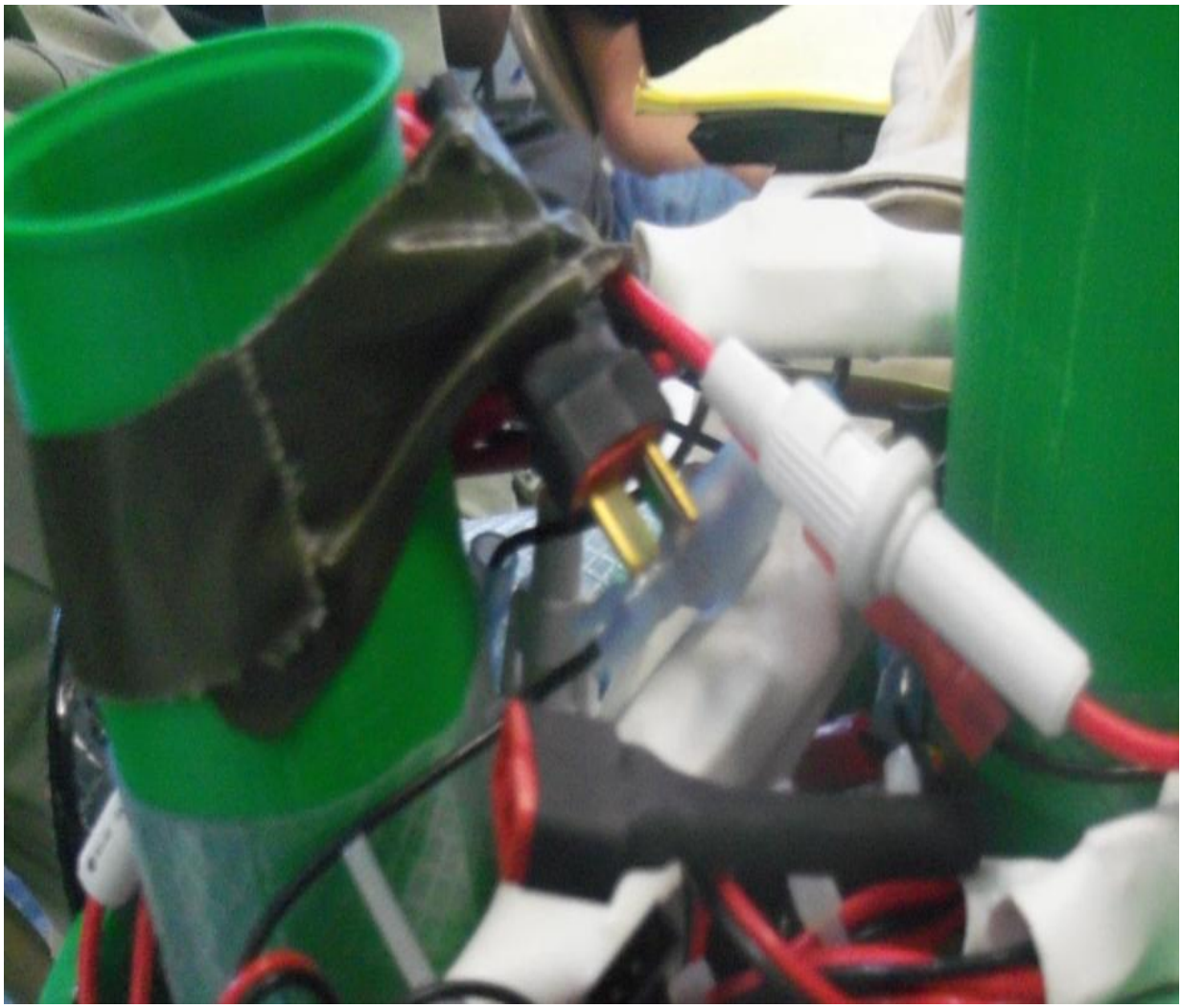
LEGEND : EDF= ELECTRIC DUCTED FAN
RLC= ROBOT LOGIC CONTROL

Free Flying Spherical Camera.

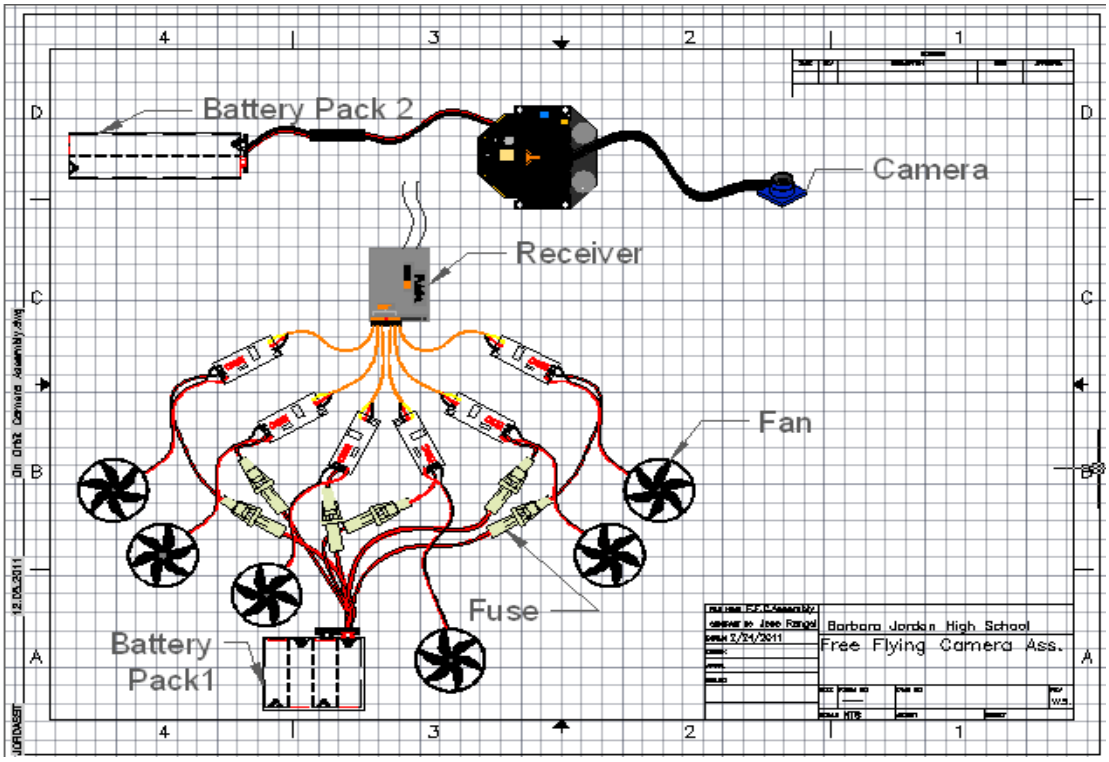


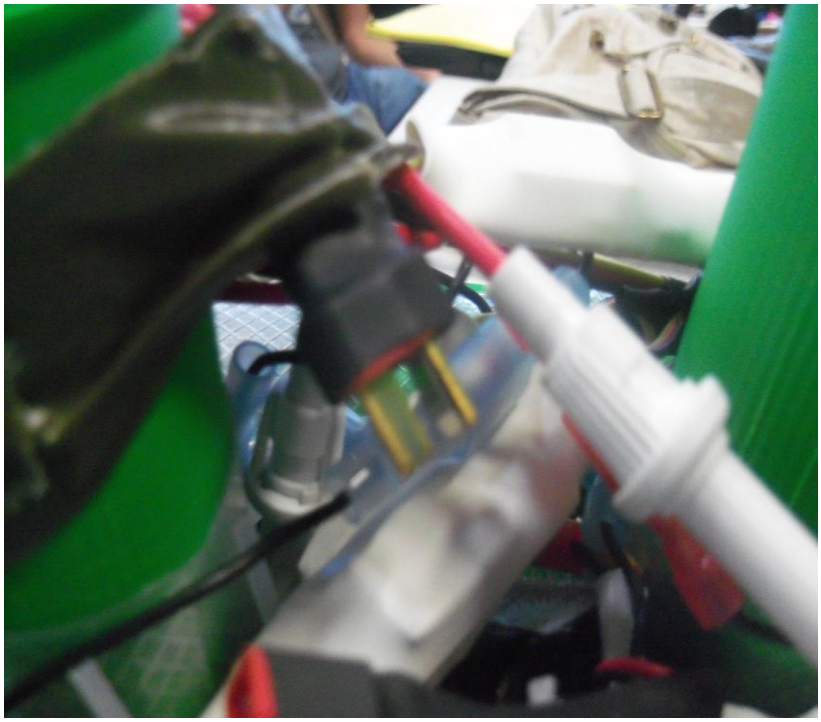


The inside of the Free Flying Spherical Camera.



Electrical Component Assembly.



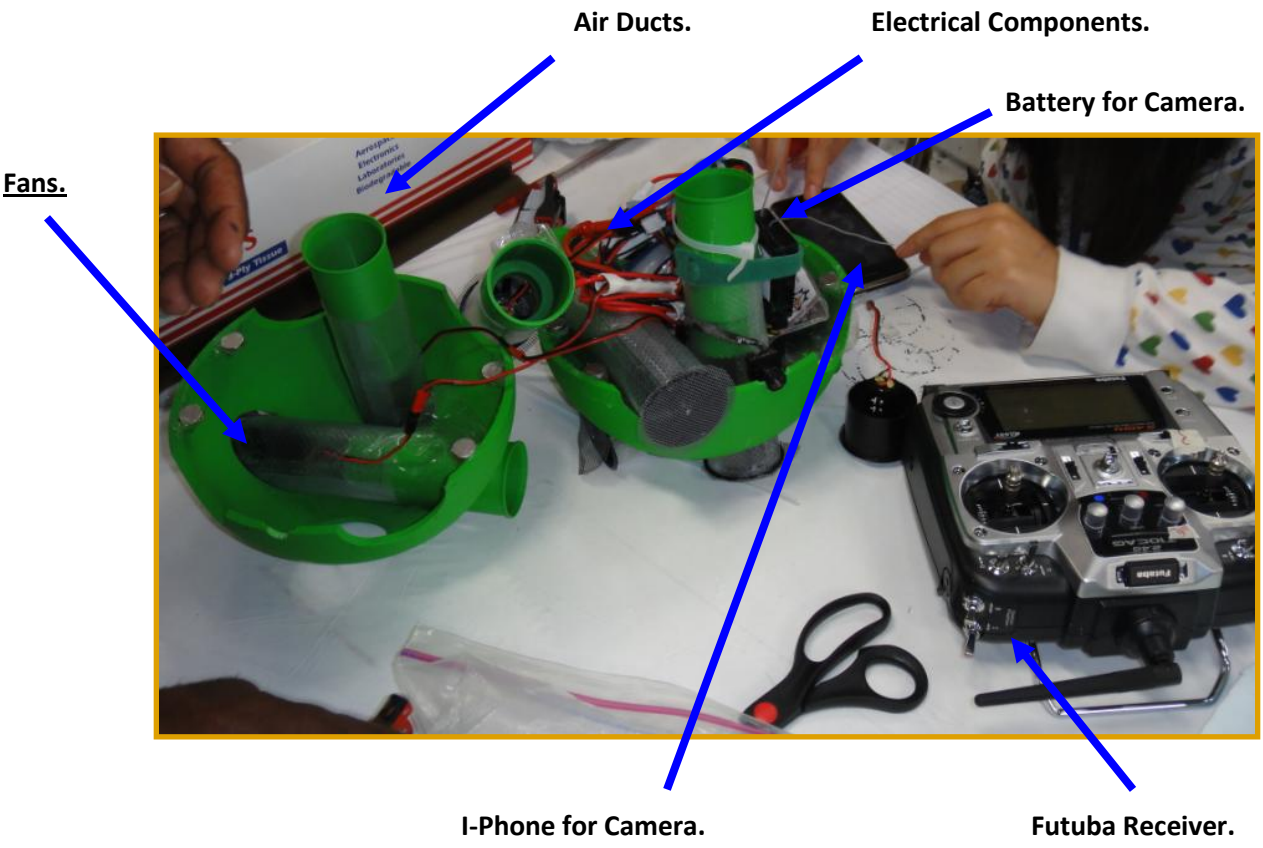


5. Method

a) How did the research begin?

The research began when we were introduced to the project and the main expectations were presented. Afterwards, we had to research all of the materials and equipment we were going to use in the development of the Spherical Camera.

b) Describe your experiment set up



c) What were your hypothesis?

Our hypothesis was about whether a free flying spherical camera would be easily controlled in a zero gravity environment. However, believed that its controllability will be more difficult in the zero gravity environment than on earth, because of the variation of the environmental or atmospheric conditions.

d) What research did you do to prior to the flight?

Basically, we researched the six degrees of freedom. We also researched flying aircrafts like helicopters and airplanes and how they worked, the type of material they used and how they affected the aircrafts. We also researched the type of engines and how they worked. We also researched the control systems and radio signals, transmission and controls.

e) What tests did you do to prepare?

- Outer Shell Test.
- Programming/Mixing Signals.
- Wiring/Hardware test(Fans)

f) What were the results in 1g? Did you prove or disprove your hypothesis?

On the 1g trials, the spherical camera was able to be controlled the fans and the camera worked.

6. Results:

a) What were the results in 1g? Did you prove or disprove your hypothesis?

On the 1g trials, the spherical camera was able to be controlled the fans and the camera worked.

b) What were the results in 0g? Did you prove or disprove your hypothesis?

On 0g trials, the fans and the electrical output worked. The roll, pith and yaw also worked. The camera didn't work due to the fact that Wi-Fi was needed.

c) What were the results in hyper-g? Did you prove or disprove your hypothesis?

On hyper-g trials, the fans and the electrical output worked. The roll, pith and yaw also worked. The camera didn't work due to the fact that Wi-Fi was needed.

7. Discussion:

What were the challenges?

We had many challenges throughout the entire process of the spherical camera. Two challenges we had to face with the spherical camera were the mixing and programming of the Futaba controller. Another challenge we had to face was the placing and fitting all the equipment inside of the limited space of the Spherical Camera shell.

What were your successes?

Just like we had our challenges we also had some successes. One success we had was that we actually passed TRR (Test Readiness Review). Another success we had was that we were able to have all the equipment ready and in place by the day of the flight.

8. Conclusion:

a) What did you learn?

Lessons learned were a thoughtful comprehension of the 6 Degrees of Freedom, how difficult it is to manage something on a 0g environment, and how the environment can affect the project and its functions.

b) Now that you have tested your experiment… What would change if you were to re-test the experiment again?

The first change we would make on our Spherical camera would be to balance the whole shell/body.
Another change that we would make to the Spherical Camera would be to expand the size of the shell. We would also change the number of fans.

c) How would the research you conducted contribute to NASA's goal of heading back to the moon, on to Mars and beyond?

The research we gathered with the ISS Spherical camera contributed to NASA's goal by provided a tool that could be use to check dangerous problem areas without putting the life of an astronaut in danger. Costly unexpected maintenance problem could be early detected, without an astronaut being interrupted if working on another project etc.

d) Looking back at your proposal you listed outreach items your team would complete prior to and after completing the RG research. What outreach did your team complete?

We were able to bring next year's students to the Science Symposium on May 13 so that they could learn more about our project. Some of the seniors working on this project, who will be living near Barbara Jordan next year will become important mentors to next year's HUNCH team.

9. Bibliography: include all sources- websites, books, etc.

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10. Acknowledgements.

The Senior Engineering Design Students at BJHSC would like to thank the HUNCH Program and NASA for giving us this great opportunity to design the Spherical Camera