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Engineering part of Payload box in High Altitude Balloon Experiment.

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Introduction

High-altitude balloons have long been used for experimental access to both the lower and upper atmosphere, including the troposphere and stratosphere (McKaig et al., 2019). Space is the region of Earth's atmosphere that lies between 40 to 150 km above sea level, surrounding the mesosphere, stratosphere, and the lower thermosphere (McKaig et al, 2019). . Our team expected the balloon will ascend to somewhere between 80,000 ft to 120,000 ft At this altitude, the payload box will be exposed to temperatures down to negative sixty Celsius degree. There is a surge of interest in flying balloons to the edge of near space in recent years, largely for recreational and educational purposes due to the major reduction in costs of all the involved components (Margarita el al., 2013). On this poster, I am describing the design and the engineering part of the payload box with Pocket lab device in High Altitude Balloon Experiment.

Methods

The most important thing in High altitude balloon experiment is maximizing the effectiveness of the equipment, so the team should think about what exactly the payload should do is a good way to breduce unneeded components and weight. The team could build a circuit with a pressure sensor, electronic thermometer, humidity sensor,, and a microcontroller to send up into the atmosphere. However, the team used the pocket lab device to collect the data. The team made total two payload ox to collect the data from the pocket lab.

The design of the 1st Payload box

1. The team uses the source of purple Styrofoam to make the payload box.
2. The team uses a heat gun and glue gun to make a payload box.
3. The team cut out the Styrofoam to make 65 cm length and 50 cm height payload box (figure 1) .
4. The team puts a camera, extra battery, pocket lab device, and lab quest sensors.
5. The team surrounds a silver tape to support the payload box.
6. The team finally connects the payload boxes, radar reflector, parachute, and balloon using white rope.

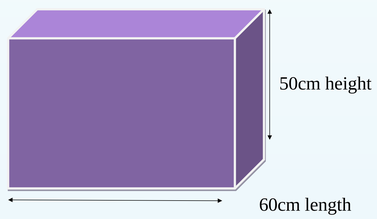

Figure 1: The design of the 1st payload box.

The design of the 2nd Payload box

1. The team uses the source of purple Styrofoam to make the payload box.
2. The team does not use a heat gun and glue gun to make a payload box.
3. The team cut out the Styrofoam to make 8 cm length and 15 cm height payload box (figure 2).
4. The team only puts the pocket lab device and extra battery.
5. The team surrounds a silver tape to support the payload box.
6. The team finally connects the payload boxes, radar reflector, parachute, and balloon using white rope.

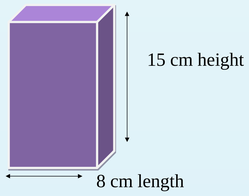

Figure 2: The design of the 2nd payload box.

Results

For the first flight

- After the flights, the team realizes that they make the payload box to big for the pocket lab device. So that the device does not record the appropriate data. However, the team can collect the data from Labquest device.

For the second flight

- The team made a right size for a payload box, but the team did not collect the data from the device(figure 3).

Figure 3: A picture of the 2nd flight.

Discussions

The pocket lab is an all-in-one science lab for investigating climate change and air pollution in your environment. PocketLabr can measure, carbon dioxide, ozone, particulate matter (PM1, PM2.5, PM10), temperature, humidity, barometric pressure, and light. To collect these data using the Pocket lab device, the Pocket lab device sensor should be well exposed to air and light. However, the team did not make a hole in the payload on the first flight. Therefore, the device did not expose to air and light in the payload. Also, the team made the payload too big to fit the Pocket lab device, so the device did not stay in one place in the payload. For the second flight, the team made a payload smaller than the first flight's to fit only the pocket lab device and extra battery.

Furthermore, the team made little holes using cross driver to make the air and light go through the payload. However, one of the teammates made a mistake when he handling the Pocket lab device, so the team did not receive the data from the device.

The sensor locates in upper left of the device.

Figure 3: A picture of Pocket Lab device

Conclusions

To make a successful flight next time. The teams have to make improvements.

For the 1st flight

- The team needs to make the payload small to fit only the pocket lab device and iPhone.
- The team should make a hole in the payload so that the pocket lab device can collect the accurate data.
- The team needs to locate the pocket lab payload under the parachute (figure 4). To maximize the exposure of air and light to the Pocket lab sensor. \

For the 2nd flight

- The device should be fixed with tape in the payload.
- Teammates should contact PocketLab to learn how to handle the device.

References

Margarita ,S., Akshata, N., Sreejith A.G, Mathew J., Sarpotdar, M., & Murthy J.,(2013).An Overview of High- Altitude Balloon Experiments at the Indian Institute of Astrophysics. *Advances in Space Research , 120*(3), 600-609. DOI: 10.1016/j.enpol.2018.05.052.