The Unit

BF-D

Period 3

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Design Brief

Our experiment is about the pressure in the atmosphere vs. the change in altitude. Our goal for this project is to measure and analyze the change in pressure as you go higher in our atmosphere. We plan to accomplish this by putting a barometer to a hot air balloon and measuring the pressure as the balloon goes up. Some problems will be how are go to sample the atmosphere at different pressures. We must also consider the weight restrictions on our project. Getting the data from the balloon will also create a problem for us. Our goal for this project is to measure and analyze the change in pressure as you go higher in our atmosphere.

Product Design Specifications

Major issues

1. Time elapsed between pressure readings = The time it takes for our equipment to sample pressure at a specific altitude will decide how long we have to maintain a particular height to gather an accurate reading. Since our team has concluded to take readings per every 100 km, we must test the accuracy of our equipment so that we can correctly time these readings.

2. Leakage within equipment = A leak in our contraption can cause a serious problem in collecting data (air samples can be lost, affecting the accuracy of readings). Thus, we need to keep our materials air-tight, so that such a possibility does not become a reality.

Minor issues

1. Air capacity = the air capacity of the balloon determines how much air it can hold and how resistant it is to popping

2. Expense of the materials = expensive materials will deter the builders from following through on the construction of their design

3. Flexibility = the flexibility of the your materials determines how easy it is to work with them.

4. Permeability = the equipment for the experiment needs to be almost impermeable so that holes aren't formed in it, creating leaks

5. Weight = the weight of the equipment must fall between the limits of what the balloon can handle and easily lift off the ground

6. Mass = the mass of all the instruments and materials determines how much space the finished contraption will take-up

7.Reliability = the reliability of the balloon as well as that of the measuring instruments is crucial to the accuracy of the recorded data and the overall success of the experiment

8. Safety = the procedure of the experiment must be completely safe, insuring the well-being of property and people

9. Testing = a valuable method of testing our experiment must be devised in order to rate the efficiency of and improve our design

10. Maintenance = all the instruments and materials must be somewhat easy to fix and take care of, so that they can be operated without trouble

11. Storage = all the needed accessories for the experiment must be stored appropriately so that they are not damaged

Alternative Design #1 Expectations and Specifications

Expectations

This design is workable, but has several loop-holes that make it less efficient than other supposed models. For example, the balloon hooked-up to the jar adds an additional transfer of readings, throwing off the accuracy of the measurements. Such a factor can significantly weigh-down the experiment and keep it from being successful. Also, the connection between the balloon and the jar (a rubber-band) is not extremely reliable and could break ,off allowing unwanted air into the jar, This would result in a total experimental collapse. For these reasons and more, our team is labeling this particular design as a back-up or alternative way of accomplishing the goals stated in our thesis statement.

Specifications

Materials

1 qt. jar attached to an inverted one-way valve
Balloon connected (with rubber band) to tube, leading to jar
Barometer, lab pro, and calculator

Procedure

1. The jar is sent upward with helium balloon
2. The high-pressure air (originally in the jar due to the jar's primary position at ground level) will escape into the lower pressure air as altitude increases
3. The balloon connected to the jar will then adjust to this pressure alteration by changing its fluctuation
4. Every time the contraption reaches 100m higher than its preceding height we will bring it down and check the pressure inside the balloon using the barometer

Alternative Design #2 Expectations and Specifications

Expectations

This design will allow air to flow out of the jar at high altitudes, but will not allow air back in due to the blockage of the ping-pong ball. Such a contraption will sample air pressure at the proposed heights without reading the pressure at the lower levels of the atmosphere as it travels down from those points. However, this design has some problems that cannot be overlooked if a successful experiment is to be completed. For example, the ping-pong ball can sometimes malfunction, making the design less air tight. This road-block can cause the failure of the experiment.

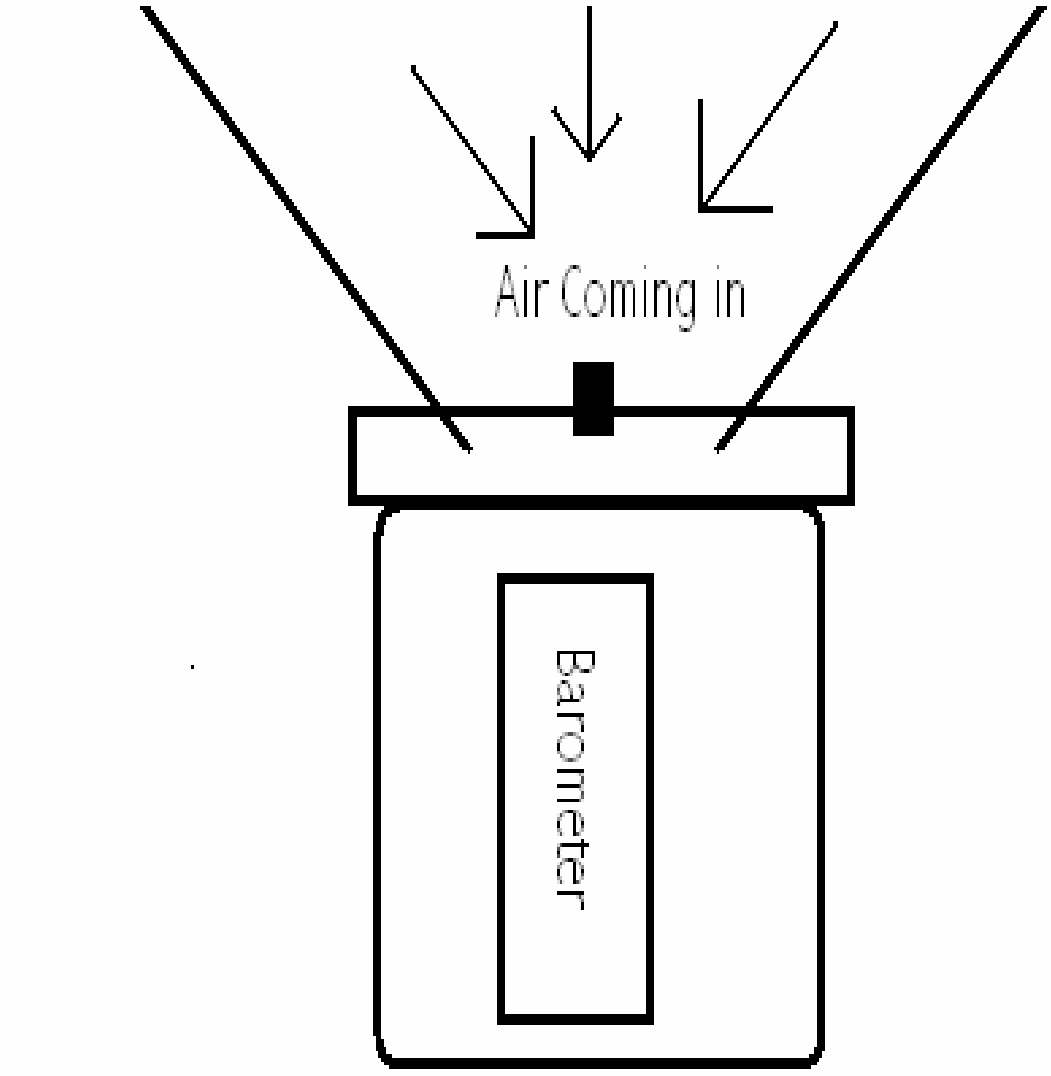
Specifications

Materials:

- 2 empty water bottles
- scissors
- ping pong ball
- hot glue gun

Procedure

We take two water bottles of the same kind and cut them in half. Then we will place a ping pong ball on the inside of these two cups. Then we will glue them together and make them air tight. Once we complete these steps, we will send the contraption up to sample the air pressure at high altitudes.


Air Coming in
Barometer

Selected Design Expectations and Specifications

Expectations

This design contains many beneficial qualities, making it the forerunner in the race to find a successful solution to the team's thesis statement. The theory it incorporates is fairly simple in nature and uses clear steps to get the job done. This will most likely result in an accurate gathering of readings and overall, a successful experiment. Our team currently believes that this design is the best way to find pressure in high altitudes and, thus, it has been labeled as the selected module.

Specifications

Materials

1 qt. jar attached to an inverted one-way valve
Barometer, lab pro, and calculator

Procedure

1. Jar is sent upward with helium balloon
2. High pressure air (originally in the jar due to the jar's primary position at ground level) will escape into lower pressure air as altitude increases
3. Air inside jar will conform to air outside
4. Every time the contraption reaches 100m higher than its preceding altitude, we will bring it down and measure the pressure inside the jar using a barometer

Hypothesis and Instruments Concerning Selected Design

Hypothesis

Our team believes that as the jar travels farther upwards into the atmosphere we will receive readings of lower pressure. This is concluded because more air rests on the instruments at lower altitudes than at higher altitudes, thus reducing the pressure.

This hypothesis was confirmed to be correct by the experiment conducted on April 16 in which we received data that corresponded with our conjecture (we discovered that as less air is placed upon the space inside the jar, the pressure decreases).

Instrument Characteristics

Note: All the conclusions drawn about the following pieces of equipment are based on the data received during our experiment on April 16.

One-way valve: It has definent need for improvement: is somewhat unreliable

Laptop: It has problems working with the LoggerPro program, but is quite efficient despite this.

Barometer: no problems; functioned perfectly

LabPro: no problems: functioned perfectly