Chute For the Stars

[The Effect of Parachute Shape on Fall Time]

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Abstract

This experiment tested the effect of a parachute's shape on its airtime. Three different shaped parachutes were placed into a bottle rocket and put to the test. One was a triangle, one was a rectangle, and one was a circle. It has been hypothesized that if the parachute shape is circular, then it will have a longer fall time. The average fall time of each parachute shape tested, and demonstrates that the Circular Parachute had the longest fall time. The circular parachute had the longest fall time because when the parachute caught air, the air was trapped with no way out. With rectangles and triangles, the air particles can escape the parachute via the corners and edges. During the testing portion of this experiment, there were a couple of errors. For example, during trial 1 of the circle group, the parachute did not fully deploy. This may have made the rocket have less fall time. Another error was in trial 1 of the triangle group. The rocket hit a tree. By hitting a tree, it took a little longer for the rocket to land on the ground. Also, during trial 3 of the triangle group, the rocket hit another tree. This slowed the fall time of the rocket as well. If further studies were to be conducted, many other variables could be tested. For example, more shapes could be tested, different parachute sizes could be tested, and even different parachute materials could be tested. More trials for each independent variable could be tried.

Introduction

This experiment tested the effect of a parachute's shape on its fall time. Three different shaped parachutes were placed into a bottle rocket and put to the test. One was a triangle, one was a rectangle, and one was a circle. It has been hypothesized that if the parachute shape is circular, then it will have a longer fall time. For each trial of each parachute, a two-liter bottle rocket filled with one cup of water was launched. The rocket was timed from right at its peak

point until it landed on the ground. The parachutes all had the same surface area and all were made out of the same type of trash bag. The parachutes were made based on a tutorial made by Howcast. The experiment's parachutes followed some parts of the tutorial by using a trash bag for the silk of the parachute and thread for the strings. When this experiment was being planned, it was debated whether or not to have a control. If the experiment had a control, each level of the independent variable, or each shape of parachutes, would be compared to a rocket launched with no parachute. Instead, each shape of parachute was compared to one another in order to determine which shape is best.

Materials

- 2 two-liter bottles
- Cardboard
- String
- Multiple pairs of scissors
- Bottle rocket launcher
- Duct tape
- Water
- Measuring cup
- Timer
- Trash bag
- Ruler
- Safety goggles
- Bottle launcher

Procedure

1. Cut 15 cm off of the top of one two-liter bottle and set it aside.
2. Cut the cardboard into 4 fins for the bottle rocket 10 cm 10 cm and 14 cm long.
3. Attach the cardboard fins to four sides of the 2-liter bottle using 20 cm of duct tape.
4. Create the parachutes out of trash bags cut it into a circle, rectangle, and triangle. The area of each shape should be 961.625 cm^2.
5. Cut three pieces of string into 60 cm.
6. Cut four holes across from each other on the parachute 2 cm from the edge.
7. Tie the string onto the parachute through the holes.
8. Tape the parachute using 4cm of duct tape to the top of the bottle rocket. Make sure to cut a small hole into the middle of the tape and tie the string to the tape as well.
9. Fold the parachute into a square.
10. Before testing, make sure to wear safety goggles.
11. Put one cup of water in the 2-liter bottle rocket.
12. Cover the parachute with the top of the other 2-liter bottle.
13. Step back before launching.
14. Launch the bottle rocket using 10 pumps of air pressure.
15. When the rocket reaches its peak point, press the start button on the timer.
16. When the rocket hits the ground, press the stop button.
17. Repeat steps 4-9 three times for every different shaped parachute you use.
18. Record the data on a raw data sheet and add it to the table once the trials have finished.

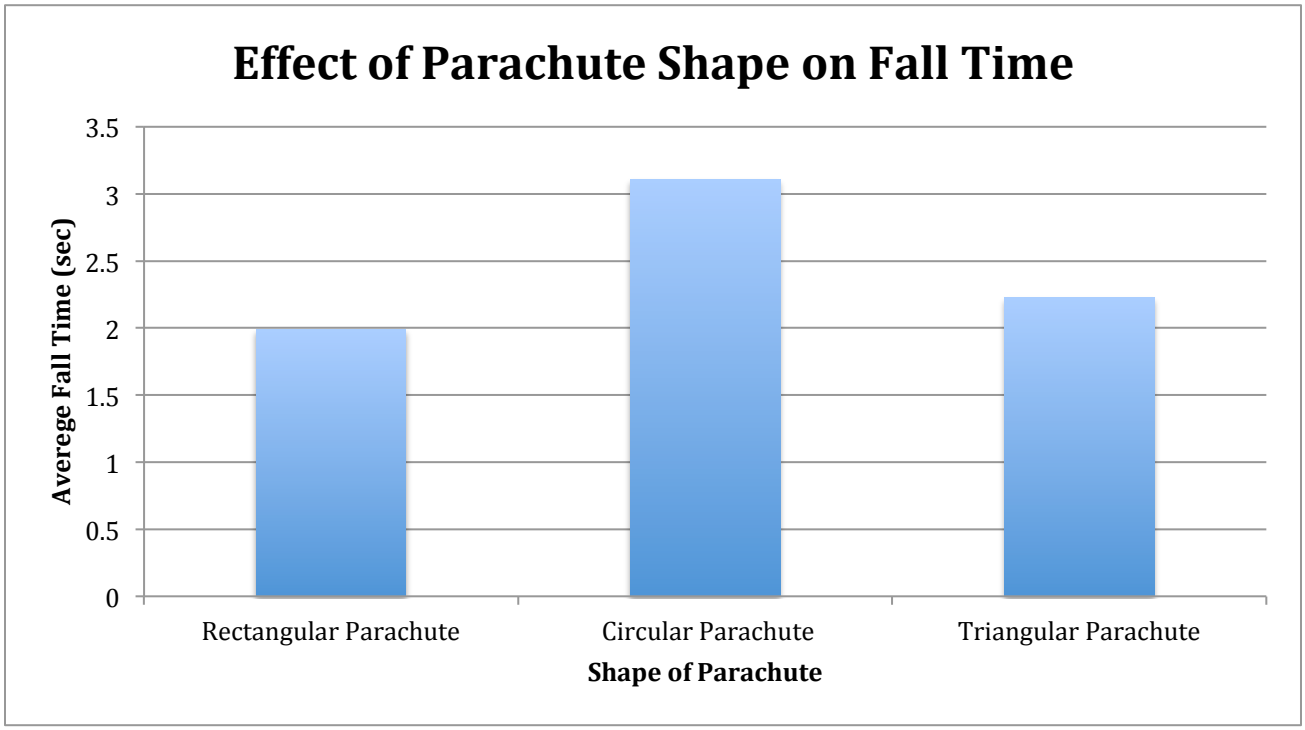
Results

Amount of Fall Time in Seconds

Shape of Parachute	Rectangle	Circle	Triangle
Trial 1	2.03 seconds	2.13 seconds	1.89 seconds
Trial 2	1.89 seconds	5.55 seconds	1.45 seconds
Trial 3	2.06 seconds	1.66 seconds	3.34 seconds
Average	1.99 seconds	3.11 seconds	2.23 seconds

There were three trials for each shape of parachute. The numbers are how much time the rocket took (in seconds) to hit the ground from its peak point. The last row is the average fall time for each parachute shape.

Analysis



The question tested was, "Does the shape of a parachute effect its fall time." This graph shows the average fall time of each parachute shape tested, and demonstrates that the circular parachute had the longest fall time. The circular parachute had the longest fall time because when the parachute caught air, the air was trapped with no way out. With the rectangle and triangle parachute, the air particles can escape the parachute via the corners and edges. However, with a circular parachute, there are no corners for the air to escape from. This proves the hypothesis, "If the parachute shape is circular, then it will have a longer fall time," correct.

The first level of the independent variable is the rectangular parachute. The graph shows that after three trials, it has an average of 1.99 seconds. The second level of the independent variable is the circular parachute. It has an average of 3.11 seconds. The third level of the

independent variable is the triangular parachute, which has an average of 2.23 seconds. This data shows that the circular parachute's average of 3.11 seconds is the longest fall time.

During the testing portion of this experiment, there were a couple of errors. For example, during trial one of the circle group, the parachute did not fully deploy. Another error was in trial 1 of the triangle group. The rocket hit a tree. Also, during trial three of the triangle group, the rocket hit another tree. All of these sources of error slowed the fall time of the rocket.

Conclusion

The data shows that the hypothesis, "If the parachute shape is circular, then it will have a longer fall time," proved correct, because the circle group has the greatest average fall time. If further studies were to be conducted, many other variables could be tested. For example, more shapes could be tested, different parachute sizes could be tested, and even different parachute materials could be tested. More trials for each independent variable could be tried. However, this experiment proves that a circle parachute does in fact effect a rocket's fall time the greatest.

Bibliography

H. (2013, May 26). How to Make a Parachute | Science Projects. Retrieved September 24, 2018, from https://www.youtube.com/watch?v=QFooUXyN-pA