

HOW DO THE FEATURES OF A GLIDER AFFECT ITS AERODYNAMICS?

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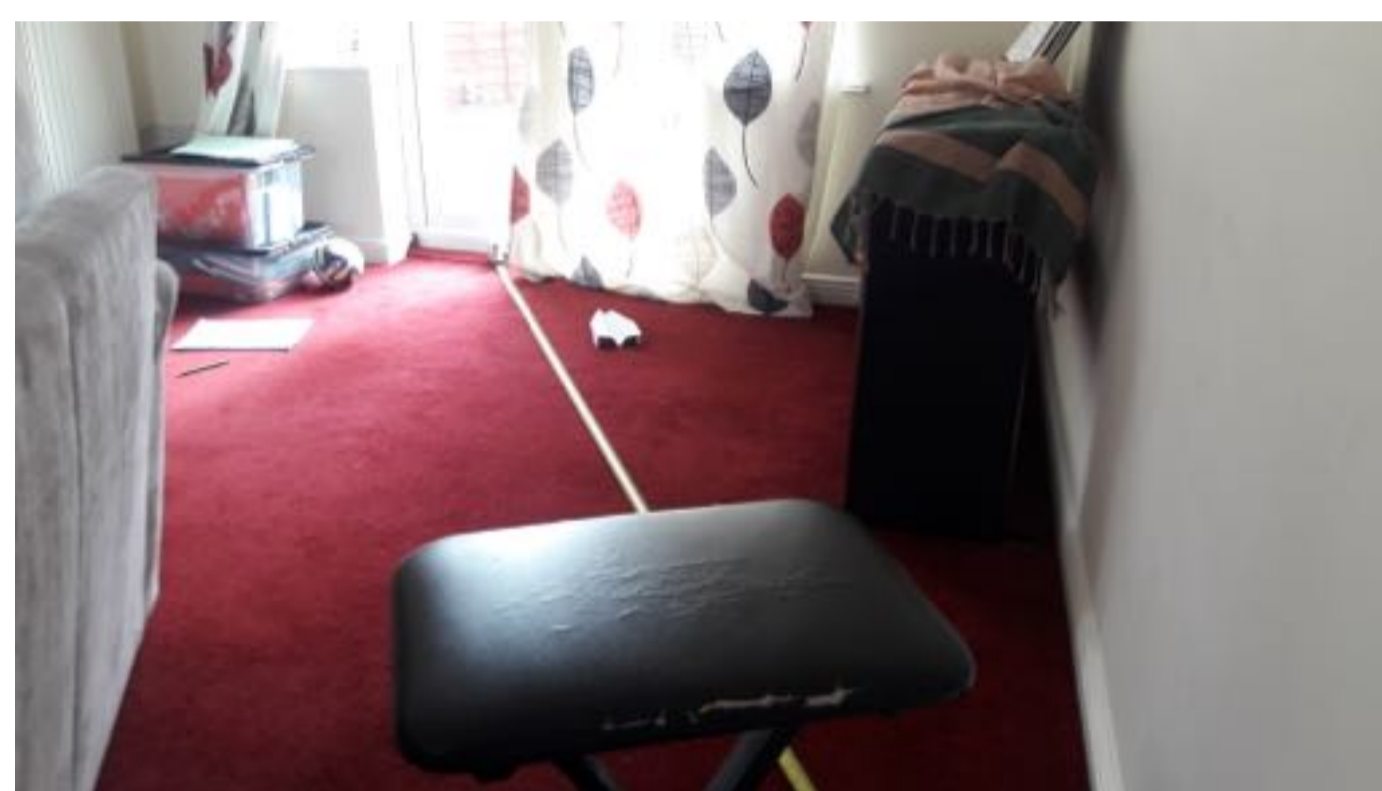
1. Introduction

Aerospace is a fast-growing industry with the improvement of technology for space travel and the industrialization of aircraft which has greatly improved international travel.

I decided to investigate the basic aerodynamics of gliders (paper planes) by planning and conducting mini experiments focusing on the relationship of a plane's features. With this, I hoped to get a basic understanding of aerodynamics.



2. Method + Experiment information



Method

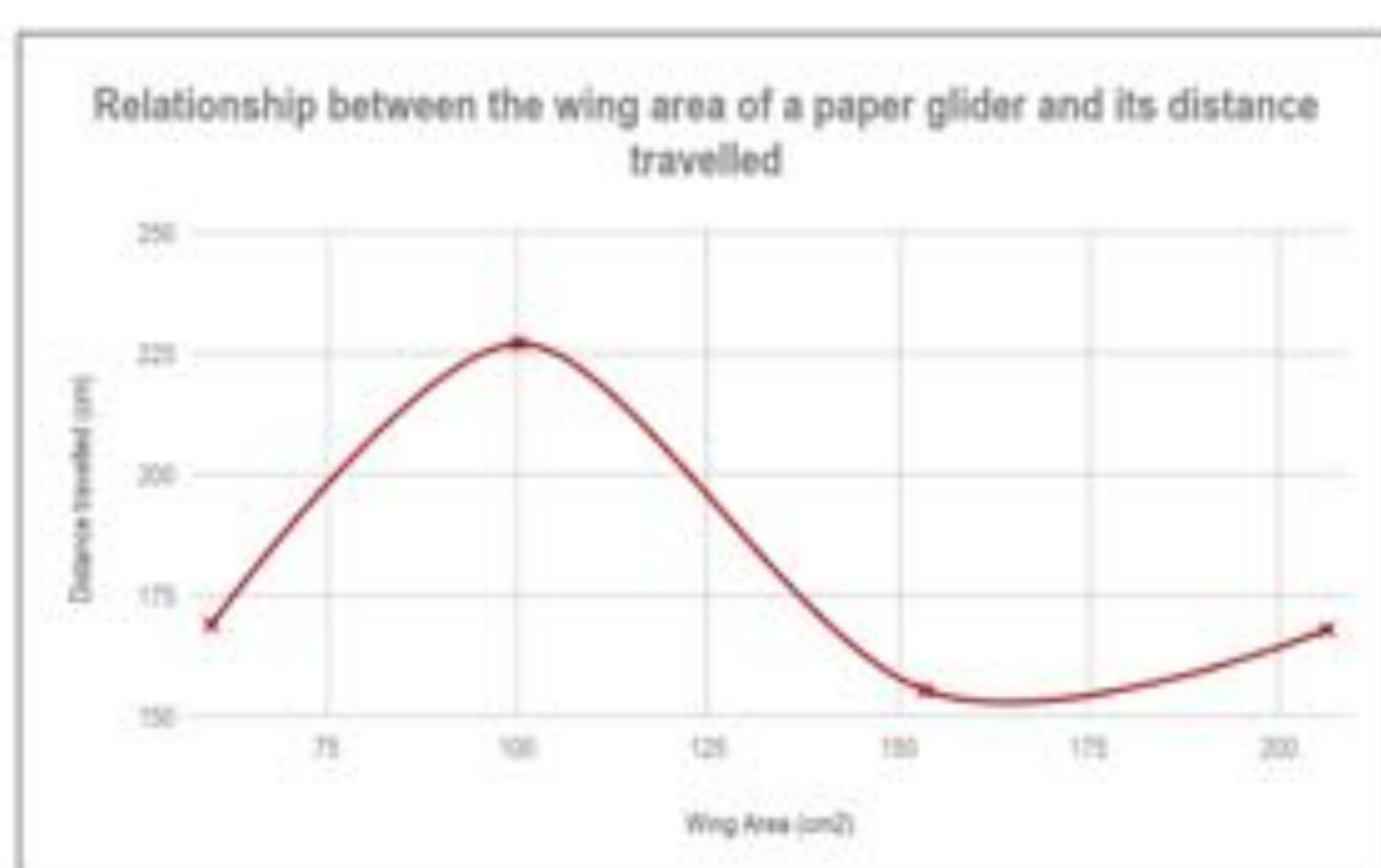
1. Unravel a measuring tape down a long corridor. Make sure it's straight and not bent.
2. At the start of the tape, place something with height (e.g a stool) for the glider to launch from.
3. Place the glider at the starting point and launch it.
4. When the glider reaches rest, use the tape measure to see how far it has traveled. Record the results in a table.
5. Repeat steps 3-4 with gliders of different wing sizes, and record the distances traveled in the table. Plot a graph to compare the investigated variables.
6. Use the graph to evaluate the results and reach a conclusion.

Modifications + Notes

For my experiment, I wanted to investigate the relationship between a glider's wing area and its distance traveled. I did this experiment indoors to prevent the results from being affected by the wind. I also made some modifications to the method. One change was that I used just one glider and marked out folding lines to make different wing areas. Some advantages were that I had a constant paper composition, design and mass. However, a disadvantage was that the creases of the many folding lines on the wings would result in increased drag from reduced uniformity of air passing through the wings.

I also had problems with the launching method. Originally, I had planned on using a hairdryer to shoot the glider, but it was hard to get the glider to free-stand and the hairdryer also wasn't powerful enough. I also tried using a slingshot method using a rubber band but the paper of the glider kept getting bent by the band, and I found it hard to actually get the glider to launch with this method. I had to resort to using my hand, and tried to keep the angle of attack and the power used to throw it the same throughout.

Results + Evaluation + Conclusion



Evaluation

I predicted that the distance traveled by a glider would be proportional to its wing area. This turned out to be true when I did some research and found the equation for lift ($Lift = Constant * Wing\ area$).

However my results showed that my glider actually traveled the furthest when it had a wing area of 100.2cm^2 which was the second smallest wing size used in the experiment.

A very likely explanation for this would be my launching method, which was throwing the glider by hand, meaning that there would be an inconsistency with the power used to throw it and its angle of attack. There would be other factors that would have affected the results, such as the shape of the wings.

Conclusion

In conclusion, even though my experiment did not provide me with accurate results, I still managed to gain experience in the planning and conducting aspects of the project. I also managed to get a basic understanding of aerodynamics from research in booklets and online information.

As well as that, I was originally planning on doing two more of these kinds of experiments however due to timing issues, I was not able to start them. I only ended up doing one experiment. Despite this, I felt that I learned some useful and worthwhile things in this project.

Wing-span (cm)	Wing area (cm²)	Throw 1 (cm)	Throw 2 (cm)	Throw 3 (cm)	Throw 4 (cm)	Throw 5 (cm)	Throw 6 (cm)	Throw 7 (cm)	Mean (cm)
6.3	59.9	167	159	182	179	179	160	156	168.9
9.5	100.2	272	209	234	245	236	192	201	227.0
12.8	153.6	151	176	164	134	169	141	152	155.3
15.0	206.3	135	130	180	208	169	160	193	167.9