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SCIENCE LAB: PAPER AIRPLANES

Problem: How does adding paper clips to paper airplanes affect the flying and distance time of it?

Research:

- Paper airplanes with long nose and vertical rudders give good stability.
- Paper airplanes with pointier noses are able to resist more wind.
- Paper airplanes do not float in air they are sucked into it.
- Mass can change the distance flown.
- Mass can also change the flying time, or the time flown in air.
- Lift and weight balance it out until it looses control.
- Airplane wings are created to give a lift.
- Airplanes do not float on air.
- "Bernoulli's Principle is a relation discovered by the 18th-century Swiss scientist and mathematician Daniel Bernoulli. He discovered that the faster a fluid (such as air) moves, the lower is the pressure that it exerts."
- Three forces are needed for a glider to move: drag, lift, and weight.
- "Drag is the resistance of motion between a solid object and a fluid (liquid or gas)."
- The way one throws a paper airplane is called thrust.
- The shape of the wings really matters, as it changes the entire distance and flying time.
- If a paper airplane has curved wings, it allows for a more upward lift because air moves more quickly over them
- If a paper airplane has bigger wings, there will be a longer flight.
- If a paper airplane has smaller wings, there will be a shorter, but speedier flight.

Hypothesis: I believe that the paper airplane that does not have any paper clips will have the highest flying time.
Independent Variable: Amount of paper clips on each paper airplane (the mass for each paper airplane)
Dependent Variable: Flying Time for each paper airplane

Materials:

- Three pieces of paper
- Three (fairly large) paper clips
- Timer/Stopwatch
- Three paper airplanes (made from the 3 sheets of paper)
- A partner or helper to time while the other person is throwing the paper airplanes

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Procedure:

1. First, take your three sheets of paper and make them into paper airplanes; all the three should be of the same kind of paper airplane (tutorials can be found online, at Google or Youtube).
2. After creating the paper airplanes, take one paper airplane and take one paper clip; using the paper clip, place it onto either of the airplane's wings.
3. Then, take another airplane and the remaining two paper clips. Place one paper clip on each wing.
4. Now, you should have a paper airplane with no paper clips, one paper airplane with one paper clip, and one paper airplane with two paper clips.
5. At this time, take out your timer. Take the paper airplane with no clips and when the timer says go, without too much force, throw the paper airplane. As soon as it reaches the ground, have your timer stop and record this data.
6. Repeat step 5 for each different paper airplane 5 times. Record your data.

Data Table:

Trials (seconds in air; flying time)	**Trial One**	**Trial Two**	**Trial Three**	**Trial Four**	**Trial Five**	**Average (seconds per airplane)**
Paper Airplane One: No Paper Clips	2.58	2.28	2.33	2.97	2.41	2.514
Paper Airplane Two: One Paper Clip	2.36	1.98	2.50	2.39	2.42	2.33
Paper Airplane Three: Two Paper Clips	2.14	1.91	2.34	2.19	2.16	2.148

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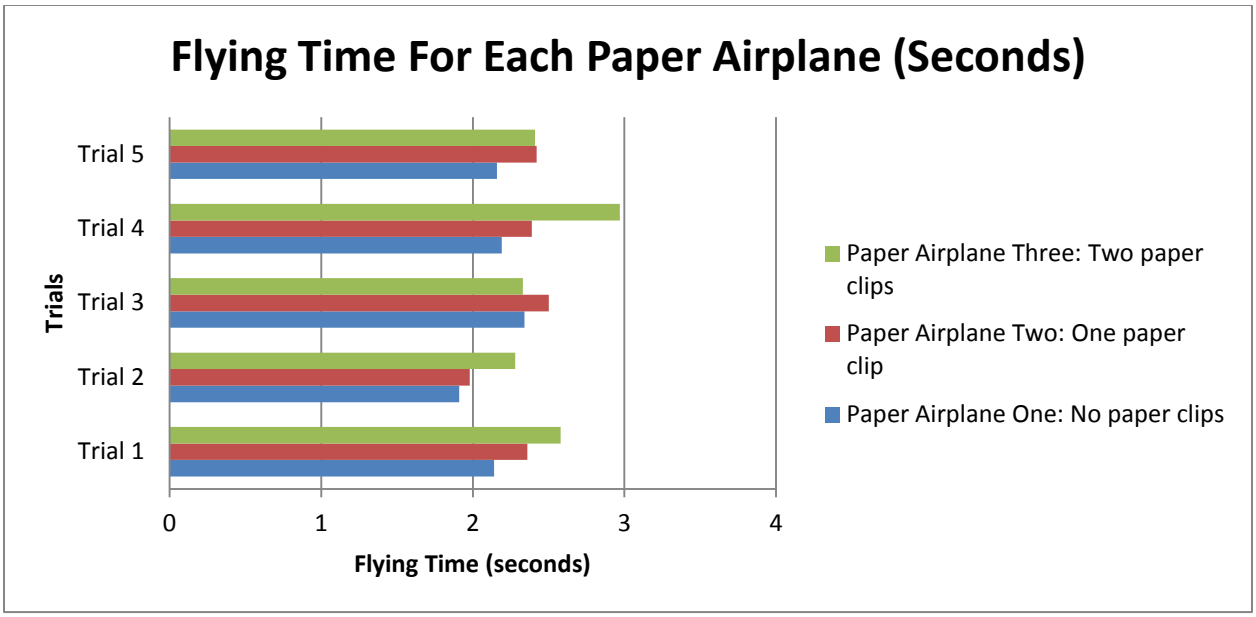
Graph:



Analysis:

In the graph, it shows the five trials of each paper airplane. Four out of the five times, paper airplane number one, the one without any paper clips, had the highest flying time. But for trial number three, paper airplane number two, the one with one paper clip, had a slightly higher flying time than paper airplane number one. This could have been because of uncontrollable factors, such as the thrust.

Conclusion:

Claim: The paper airplane with the least (zero) paper clips will have the highest flying time.
Evidence: In the experiment, I held five trials for each paper airplane, and calculated the averages at the end. For paper airplane number one, the one without any paper clips, the average time it flew in air was 2.148 seconds. Next, for paper airplane number two, which had one paper clip, had an average flying time of 2.33 seconds. Finally, for paper airplane number three, which had two paper clips, had an average of 2.514 seconds of flying time.
Reasoning: My claim was paper airplane number one, which held no paper clips, would have the highest flying time; this was proven true in the experiment. According to research I did, mass does not only change the distance flown, but also mass changes the flying time of an object (paper airplane) in air. This was proven in my lab because when adding paper clips to the paper airplane, I was changing the mass; so the paper airplane with no paper clips (number one), had the lowest mass. However, there were also uncontrollable variables that shaped the outcome of my project. For example, the thrust, or the way one throws a paper airplane. If I applied more force at different times, it would have changed the outcome; for instance, in Trial

3, paper airplane two had a longer flying time. This could have been because of the amount of force I applied while throwing paper airplane number two. Unfortunately, this is something we cannot control, therefore it is deemed as uncontrollable. Also, from my research, I understood that larger wings create a longer flight, while smaller wings create a shorter, speedier flight. Since I was making my airplane by watching tutorials, I did not pay attention to the size of the wings. However, after making the airplanes, I realized my wings were smaller in size than a normal paper airplane's wings. Though all three airplanes had small-sized wings, this affected my results. All in all, from this experiment, I learned that the mass of a paper airplane effects both distance and flying time. Objects (paper airplanes in this scenario) with more mass, as added with paper clips, will fly less distance, as opposed to objects with less mass; objects with less mass will fly longer distances and have a longer flying time.

Citations:

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