Science Fair Logbook

Name: Jace & Nathan

Testable Question

How does _____ affect _____?

What is the effect of _____ on _____?

Which _____ is/does/makes/etc _____?

How does the design of the wing of an airplane affect how long the airplane stays in the air?

What aspect of the plane's design will you change?

We will change the wing design of each airplane to see which design will stay in the air for the longest time

Topic:

Write about the topic you chose. Why did you choose this topic? What do you hope to find out?

How Does Changing The Design Of An Airplane Affect How Long It Stays In The Air?

We chose this topic because we found the topic of flight interesting and wanted to learn more about it. We hope that we can learn what the best wing design is for time in the air because this can help airplane engineers design planes that can make less stops so it can be a more direct flight.

Background Information

What questions/information do you need to find out about your topic? What is some important vocabulary?

What are the aspects of an airplane that makes it fly?

There are 4 forces that a airplane requires to fly. They are ***gravity, thrust, drag,& lift.*** When you throw the airplane that gives it ***thrust.*** Then the air that comes against it is ***drag***. The air coming up from under the wings is ***lift.*** Finally, the gravity that comes from the Earth is ergo, ***gravity.*** All these force together is what makes a airplane fly. Even Bernoulli's principle will tell you the exact same stuff. So with all these forces, gravity, thrust, drag, and lift this is what make the common airplanes fly.

Sources of Information

Note all sources used - websites, books, experts, etc. (*Google is not a website, follow links to find the page information.) Add slides as needed.

Title	Author	Information (web link, publisher, etc)	Year
DIY Space: How to Do a Science Fair Project - Step 3	**NASAJPL Edu**	https://www.youtube.com/watch?v=mjhyUM4JmJo&t=8s	2015
THE SCIENCE OF FLYING	nasa.gov	https://chandra.si.edu/make/images/paper_airplanes.pdf	Accessed on 12/18/2024

Variables

Manipulated / Dependent Variable

ONE thing that you will test/change:
We will change the design of the wing on the airplane.

Responding / Independent Variable

The thing I think will change or be affected: We think that the time it stays in the air will be affected.

How will you measure it? :
We will use a timer to measure our results.

Variables

Controlled Variables

Things we have to be very careful to keep the same every time we test so that they do not affect the results/outcome of the experiment:

- The body shape of the airplane
- The kind of popsicle sticks we use
- Where we test the airplanes
- The day we test the airplanes
- The stopwatch we use
- The kind of paper we use
- Finally the size paper we use

Hypothesis

Your prediction, or what you think will happen:

If _____ then _____ because _____.
(I do/change this…) (I think this will happen) (Why?)
*use info from your research or background knowledge to help explain)

If the four forces (Gravity, Thrust, Drag, and Lift) work together proper we believe airplane number four will stay in the air the longest. We think this because the wing shape is rectangular so the air might flow around it better. Especially because the other designs are way more wavy so the flow of air might not be as smooth.

Materials

What materials will you use for your experiment? Be specific about amounts whenever possible.

- Paper
- Popsicle sticks
- Tape
- Stopwatch

Procedure

List the step-by-step procedure you will follow to conduct your experiment. Be as specific as possible and include exact measurements, quantities, times, etc.

1. Make 5 different designs
2. Test each design 4 times
3. Use a stopwatch to time each design
4. Take pictures while testing
5. Evaluate results in log book
6. Then, write conclusion

Experiment: Trial 1

Date:

Data: (measurements)

Test 1	1.47 seconds
Test 2	1.67 seconds
Test 3	1.59 seconds
Test 4	1.73 seconds

Observations:/Notes
While testing the airplanes we realized that it went in loops a lot. Also, they all went to the ground pretty fast. The average for this trial is 1.615 seconds.

Experiment: Trial 1

Photos:

Experiment: Trial 2

Date:

Data: (measurements)

Test 1	1.99 seconds
Test 2	1.59 seconds
Test 3	1.66 seconds
Test 4	1.06 seconds

Observations/Notes:
On this trial the times were pretty close together in general. It was pretty interesting how the planes flew in the air. Also, it flew in a kind of graceful way. Overall, it was a very interesting test. This trial had the average time of 1.575.

Experiment: Trial 2

Photos:

Experiment: Trial 3

Date:

Data: (measurements)

Test 1	1.67
Test 2	1.59
Test 3	2.99
Test 4	1.60

Observations/Notes: On this trial, the paper airplane was able to get 3 times that were very similar to each other. And one time that had an astonishing 2.99 seconds, the highest time of any test. This trial also has the highest average yet of 1.9625.

Experiment: Trial 3

Photos:

Experiment: Trial 4

Date:

Data: (measurements)

Test 1	1.73
Test 2	1.07
Test 3	1.21
Test 4	1.40

Observations/Notes:
This trial had a lot of spin and curve while it flew. This one had the max distance. The wing design was a big triangle. It had some low times. The average time was 1.3525.

Experiment: Trial 4

Photos:

Results: Chart

Put your data together into a chart.
Example: (you can change the chart)

	Test 1	Test 2	Test 3	Test 4
Trial 1	1.47 seconds	1.67 seconds	1.59 seconds	1.73 seconds
Trial 2	1.99 seconds	1.59 seconds	1.66 seconds	1.06 seconds
Trial 3	1.67 seconds	1.59 seconds	2.99 seconds	1.60 seconds
Trial 4	1.73 seconds	1.07 seconds	1.21 seconds	1.40 seconds

Results: Analyze

Look at your data and observations. Look for patterns and trends. Explain what happened in your experiment and what you found out:

We noticed that the planes flew in loops a lot. They all stayed between one and two seconds except on trial three where one test lasted 2.99. Every time the planes landed in a nosedive. We found out that trial three had the bes time out of the other trials. Also, the planes often didn't go very far, some even came back. In addition, the way the planes flew were all a bit different from each other because of the wing shape.

Results: Graph

Graph your data for a visual display of your results.

Use Google Sheets or another website and copy the graph onto this slide, or draw by hand and upload a photo.
Ask your Science Fair teachers for help if you need it!

Conclusion

My question was: How Does Changing The Design Of The Wing An Airplane Affect How Long It Stays In The Air?

The answer to my question is:
That trial number three was the best wing design. Number three probably had the best flow of air allowing it to fly longer.

My hypothesis was <u>incorrect</u> because:
Because my hypothesis was that number four would fly the longest because of its narrow wing design. However when we tested it, number three ended up staying in the air the longest.

Applications

In what ways are your findings useful?
Who could benefit from your results and how?

We think our findings are useful because when engineers make airplanes this can help them find an efficient way to design a wing that can stay in the air longer for more direct flights. Also, this can make people's lives efficient especially those who travel a lot for work so if they have connecting flights they don't have to worry too much about their flights being delayed.

Sources of Error

Do you think your results were reliable? Were there any other factors or conditions that could have affected the results of your experiment in unexpected ways?
What could have affected your results, that would need to be controlled differently if you were to repeat the experiment?

One problem was when I was building the models the wings were very flimsy so I had to reinforce the wings with packing tape. Also, you had to put only one layer of tape or else it would become too thick. In addition, you would have to carefully cut around the paper if the tape became too thick. The strength of our paper could have affected how long the airplane stays in the air.

Extensions

If you were to conduct this experiment again, what would you do differently?

CONGRATULATIONS!!

You have completed your experiment!

Make sure that you enter information from this logbook into the CYSF Digital platform.

You are now ready to create your trifold display and practice your presentation.