SCIENCE FAIR PROJECT LOG BOOK

Timetable

Dec 19	Brainstorming ideas for my project
Dec 27	Project Planning, start background Research
Dec 28	Continue research
Dec 29	Finalize question, hypothesis & variables
Dec 30	Gather materials & build shapes
Jan 2	Completed the trails 1-4,
Jan 4	Calculate averages & organize data Analyze results
Jan 6	Conclusions and final formatting

On December 19, 2025, I started working on the bigger picture of my project

First, I brainstormed different ideas that interested me like Gravity, magnets, plant growth and hydraulics. I discussed some of these ideas with my parents, and short-listed Gravity as more feasible.

I realized I am most curious about gravity and falling objects. I have always wondered why some shapes float slowly to the ground but some fell very fast. That made me think about air resistance. After discussing with my parents, I decided on my topic: **How does shape and surface area affect air resistance and fall speed?**

I created a simple schedule for the next 10 days, so I can complete everything step by step. I felt excited about this topic because it connects to real life, like parachutes and skydiving.

On December 27, 2025 I started my background research.

I knew that gravity was the force that pulls objects toward the Earth. I learned that air resistance was another force that pushes against objects as they move through air. I saw a few educational videos on YouTube, which explained the effects of air resistance and gravity on falling objects. When something falls, gravity pulls it downward while air resistance pushes upward.

I read about **Isaac Newton** and his laws of motion. His third law states that *for every action there is an equal and opposite reaction*. That means when an object moves down, the air

pushes up against it. I also learned that objects speed up as they fall, until air resistance becomes strong enough to slow them down.

On December 28, 2025, I continued my research

I learned about terminal velocity. Terminal velocity occurs when the force of gravity pulling down becomes equal to the force of air resistance pushing up. When this happens, the object stops accelerating and falls at a constant speed.

I also read about Galileo Galilei. Long ago, people believed that heavier objects fall faster than lighter ones because of Aristotle's theory. Galileo proved this wrong by dropping 2 balls with different weights from the Leaning Tower of Pisa. Both objects hit the ground at the same time. That experiment was very interesting and changed science forever.

On December 29, 2025 I wrote my testable question clearly in my notebook: How does shape and surface area affect air resistance and fall speed?

I wrote my hypothesis. I predicted that the larger shape would fall the slowest, because it has the largest surface area and will experience the most air resistance.

I also predicted the smaller shape would fall faster because it has smaller surface area and the least air resistance.

On December 30, 2025 I started to gather my materials.

I created a couple of shapes with A4 white papers. Many shapes were similar in dimensions and surface area/size, so I picked only 3 significantly different shapes.

I also gathered other materials that I would need like clear tape, a digital stopwatch and a measuring tape. I measured the drop height from the tip of my finger on a stretched hand to the floor, which was 192 cm. I carefully made three shapes:

- A crumpled ball by tightly squeezing one paper.
- A cone by rolling the paper into a cone shape and taping it.
- A parachute by keeping the paper wide and open to create maximum surface area.

I tried to keep the weight as similar as possible, although I had to use small pieces of tape.

I also identified my variables:

- Independent variable: Shape of the object
- Dependent variable: Time it takes to reach the ground
- Controlled variables: Same paper, same height (192 cm), same room, same person dropping

On January 2, 2026, I did my trials.

Trial 1:

I dropped each shape from same height - 192 cm and used the stopwatch to measure how long it took to hit the ground.

The Results:
Crumpled ball – 79 milliseconds
Cone – 81 milliseconds
Parachute – 1.38 seconds

The parachute clearly fell much slower than the other two. It floated down gently while the crumpled ball dropped straight down quickly. I noticed it was hard to stop the stopwatch exactly at the right moment.

I also did Trial 2 to make my results more accurate.

The Results:
Crumpled ball – 69 milliseconds
Cone – 94 milliseconds
Parachute – 1.66 seconds

The parachute again took the longest time. I noticed the cone sometimes moved slightly sideways as it fell. I think air movement in the room may have affected it. I tried to stand still and not create air flow.

I decide to complete the Trial 3 as well.

Results:
Crumpled ball – 73 milliseconds
Cone – 88 milliseconds
Parachute – 1.79 seconds

The parachute took even longer this time. It moved slowly and sometimes tilted as it fell. The crumpled ball dropped quickly and straight down again. I am starting to see a clear pattern.

I completed my data collection with Trial 4.

Results:
Crumpled ball – 76 milliseconds
Cone – 74 milliseconds
Parachute – 1.76 seconds

Now I have four trials for each shape. I felt confident that I have enough data to calculate averages.

On January 4, 2026, I calculated the averages for each shape.

Crumpled ball average = 74 milliseconds
Cone average = 84 milliseconds
Parachute average = 1.64 seconds

The parachute clearly had the highest average time. This shows that surface area plays a big role in slowing down falling objects.

On January 5, 2026 I analyzed my results carefully.

The crumpled ball had the smallest surface area and fell the fastest. The cone had a medium surface area and fell at a medium speed. The parachute had the largest surface area and fell the slowest. This proves that larger surface area increases air resistance. Air resistance slows down the falling object by pushing upward against gravity.

I also wrote down possible sources of error:

- My reaction time when stopping the stopwatch
- Small air movements in the room
- Slight weight differences due to tape, that I used.

On January 6, 2026 I wrote my final conclusion and finished everything else for my project.

My hypothesis was correct. Shape and surface area do affect air resistance and fall speed. The parachute shape took the longest time to reach the ground, and the crumpled ball reached the fastest.

If I were to improve this project, I would:

- Use glue instead of tape
- Use a more accurate timing device
- Drop the objects from a greater height
- Increase the number of trials

I learned a lot about gravity, air resistance, and how to conduct a fair experiment. This project helped me understand how engineers design parachutes for safety. I am proud of my work and excited to present it.

Application

Engineers can use this information to design parachutes. Parachutes are used by many people. They are used by the army, astronauts returning from space, skydivers, and paragliders. This information tells engineers that the more surface area an object has, the greater time it stays in the air. Using this information, engineers can design parachute that slow down the fall of a

person even more than parachutes do today. Parachutes should have the most surface area they can and the shape should be as flat as possible.

Sources Of Error

- On some of the trials, I stopped the Stopwatch a few Milliseconds after the shape had touched the ground. It would be more accurate if I had reacted sooner.
- I used tape which might have increased the weight by a few milligrams.
- Also, since I used tape, it might have increased the fall speed since the surface of the tape is smoother than the surface of the paper.

Future project

If I were to do this project again, I would do some things differently.

- I would use a actual stopwatch rather than the one on my watch.
- I would make more shapes to experiment with.
- I would also drop them from a larger height.
- Also, I would use glue rather than tape to get more accurate results.

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References

Air resistance. (2021, December 16). Primary Science Online. https://primaryscienceonline.org.uk/glossary-of-terms/air-resistance/

Debunked. (2023, June 3). Do heavy objects actually fall faster than light objects? DEBUNKED [Video]. YouTube. https://www.youtube.com/watch?v=ZgqJ5wQF944

Free fall and air resistance. (n.d.). https://www.physicsclassroom.com/class/newtlaws/Lesson-3/Free-Fall-and-Air-Resistance

How does air resistance impact a falling object? | TutorChase. (n.d.). https://www.tutorchase.com/answers/ib/physics/how-does-air-resistance-impact-a-falling-object

Manocha Academy. (2023, October 28). Motion under Gravity | Free fall [Video]. YouTube. https://www.youtube.com/watch?v=6mFGzESlmxI

NASA Glenn Research Center. (2024, July 18). Falling Object with Air Resistance | Glenn Research Center | NASA. Glenn Research Center | NASA. https://www1.grc.nasa.gov/beginners-guide-to-aeronautics/falling-object-with-air-resistance/

Parachutes: Does size matter? (2025, September 25). Science Buddies. https://www.sciencebuddies.org/science-fair-projects/project-ideas/Aero_p017/aerodynamics-hydrodynamics/parachutes-does-size-matter

Phantastic Physics. (2025, April 22). Do heavier objects fall faster? (Gravity & Air Resistance Experiment) [Video]. YouTube. https://www.youtube.com/watch?v=Vn5EK9pwEws