

An Investigation of factors affecting the flight of a paper spinner

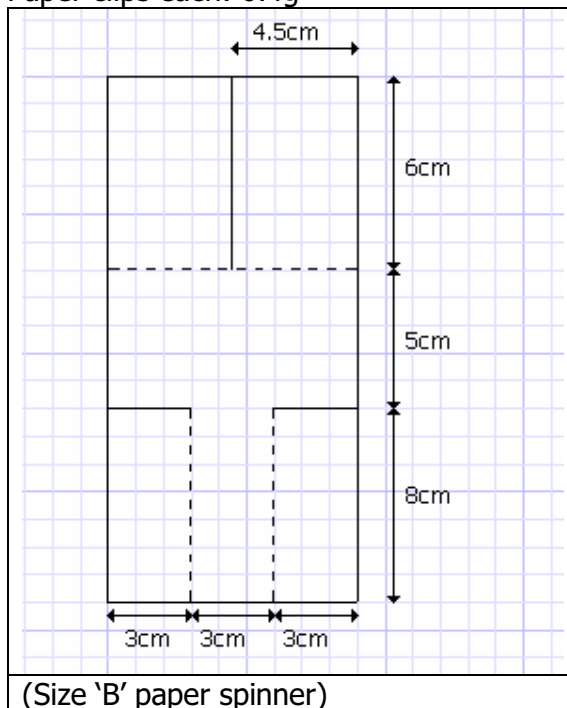
Introduction

When a paper spinner is dropped, it spins. The direction, clockwise or anticlockwise, depends on which way the wings are folded. It happens because the air lifts the spinner, as air resistance opposes its movement. It's done the same way on an aeroplane. The plane moves on the runway and speeds up so much that the wings 'slice' through the air. Air pressure is high underneath, but low above, so the plane is lifted up. The way the plane is lifted up depends on how the shutters are positioned.

The spinner will drop at the start, but when the air resistance force is great enough, the air resistance will push the wings, which eventually makes it spin.

The spinner: 1.4g

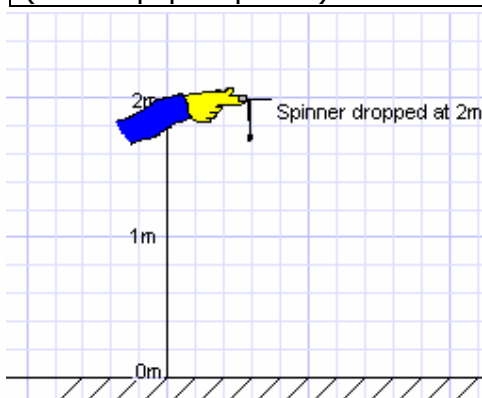
Paper clips each: 0.4g



Plan

I will investigate whether weight affects the time it takes a spinner to fall down. I think that the heavier it is, the quicker it falls down. Paper clips will be used for weight and weight and time will be recorded.

I think gravity will pull down the heavier ones faster. Gravity is a force pulling things down. The air resistance will probably be stronger on the lighter ones, so they will probably take more time to fall.

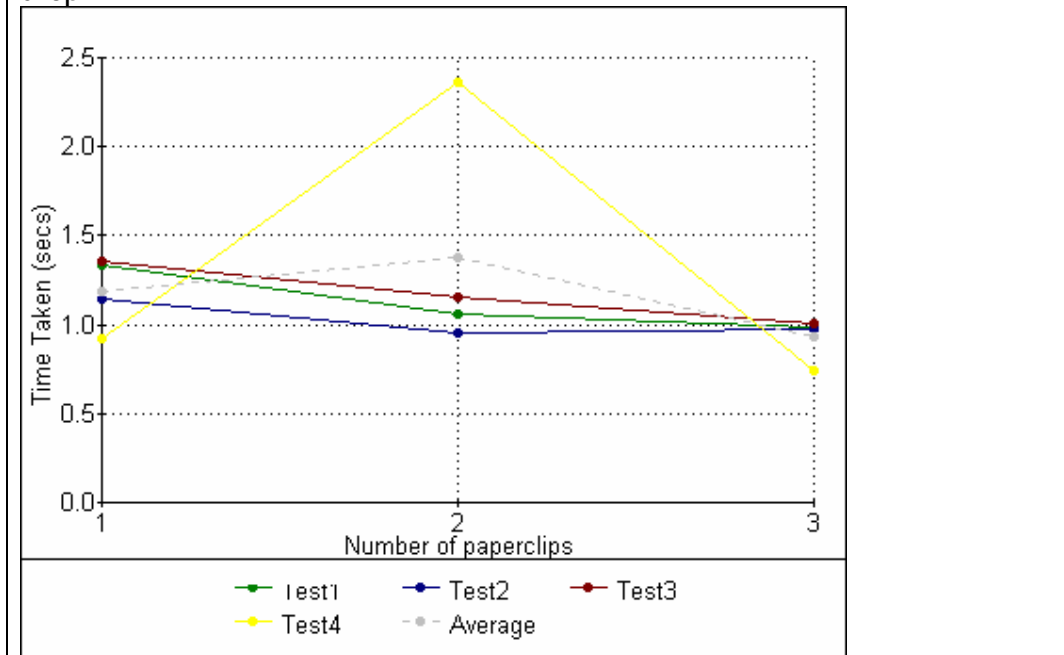


The test will be kept fair by using the same type of paper clips for same size weights and the same paper spinner will be used for all the tests. The spinner (from wings) will be dropped at a measured height of 2 metres, which should just give me a good result and allow enough time for it to spin rather than fall all the way.

Results

	Number of paper clips		
	1	2	3
Test1	1.34	1.06	0.98
Test2	1.14	0.95	0.97
Test3	1.36	1.15	1.01
Test4	0.92	2.36	0.74
Average	1.19	1.38	0.93

A graph to show whether weight affects the time it takes for a paper clip to drop



Conclusion

The graph seems to show that when more paper clips are used, the more quickly the spinner will fall to the ground. However, only tests 1, 2 and 3 show this. Test 4 has an odd result, an anomalous result and is probably human error. The stop clock may not have been reset so that it started at zero, but instead carried on from where it left off. The average roughly

follows 1, 2 and 3 but the result for two paperclips is high because of test 4's two paperclips.

The gravity must have pulled on the spinners so they fell. The lighter ones taking more time to follow because of air resistance pushing it up. The heavier ones fell faster because gravity's pull was stronger than the air resistance's push.

Some of the prediction seems to match the results... it was test 4 which was probably done wrong.

Evaluation

The results don't really support the conclusion because of test 4.

The anomalous result in test 4 was probably because the stop clock had not been set back to zero, so it was probably continued from the last result. Not rushing things may have identified this mistake.

The stop clock timed results weren't exactly accurate as the time the button is pushed may not be exactly the moment it first leaves your hand. The same is for when it lands – you can't push the button at the very same moment when it touches the ground. It relies on your reaction speed

The results aren't reliable, but more tests and greater differences in the weight might have shown more clearly whether weight affects the time it takes for a paper spinner to fall to the ground. More tests would give a better average and greater differences in weight would clearly show any changes in the time it takes for the spinner to fall.