Physics IA

How does the surface area of a parachute impact on its dropping time?

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Materials:

(1)Plastic bags

(2)Scissors

(3)String

(4)A rubber.

(5)30cm rulers

Process:

(1) Cut the plastic bags into triangles with different surface area. The width remains the same , but the length changes (30~10).

(2) Use a pen to pole four holes on each corner of the triangles, and tie the string on the hole.(The string should remain the same length)

(3) Tie a rubber on the other end of the four strings.

(4) Pick the rock to a certain height above the ground, and start the timer as the parachute is dropped. Stop the timmer as the parachute lands.

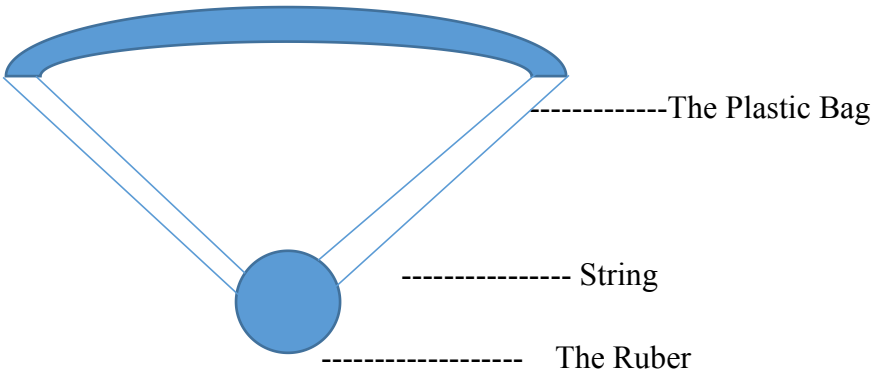
(5) Repeat step (2) to (4) for different size of triangles.

Objective:

To test the relationship between the surface area of the parachute and the speed of dropping.

Hypothesis:

The parachute with larger surface area will have a lower speed due to the higher air resistance.



Variables:

Variables	Types of ariables	Control method
The surface area	Independent	Cut the plastic bads into different sizes of rectangles. While the width remains at 8 cm, the length varies from 30 cm to 10 cm.
The time of dropping	Dependents	Depend on the surface area of the parachute.
The length of the string	Control	All cut into 18 cm.
Dropping distance	Control	All drop from 223cm above the ground
Material of parachute	Control	All made of the same plastic bag.
Environmental impacts	Control	Do the lab in the same space.

Result:

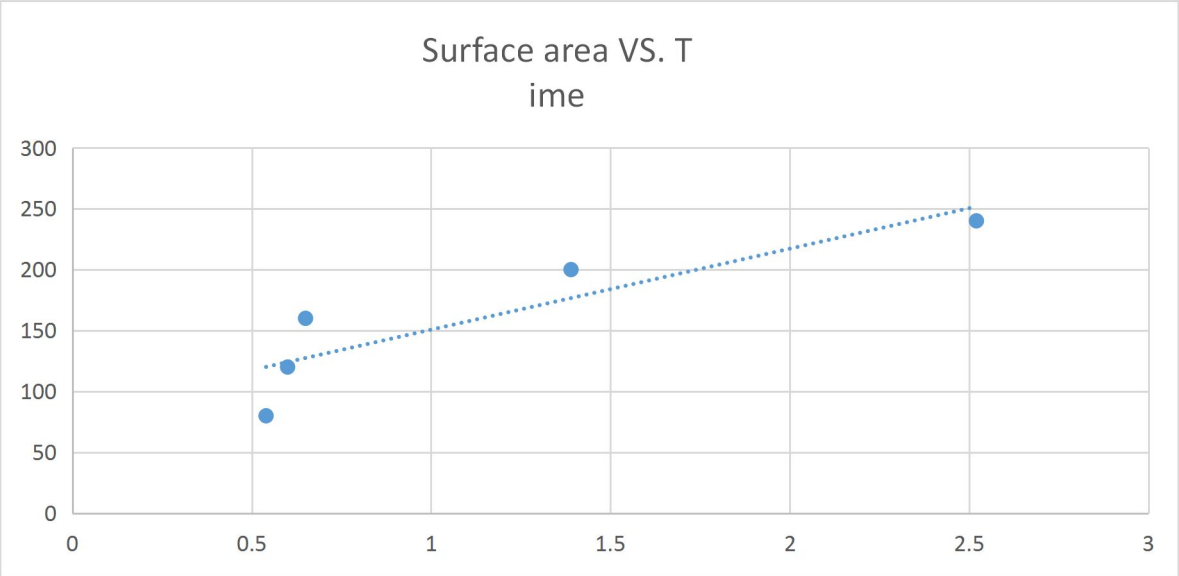
Parachute	Surface Area(cm^2)	Time 1(s)	Time 2(s)	Time 3(s)	Average time(s)
1	240=8*30	1.83	2.58	3.14	2.52
2	200=8*25	1.34	2.18	0.64	1.39
3	160=8*20	0.63	0.63	0.68	0.65
4	120=8*15	0.68	0.58	0.53	0.6

5	80=8*10	0. 48	0. 55	0. 6	0. 54

As the table above shows, as the surface area of the parachute increases, the time of the parachute drops deceases. Thus, the speed of the parachute dropping decreases as the surface area increases.

To expore the relationship between the surface area and the speed of dropping, I make a graph to analyize the data.

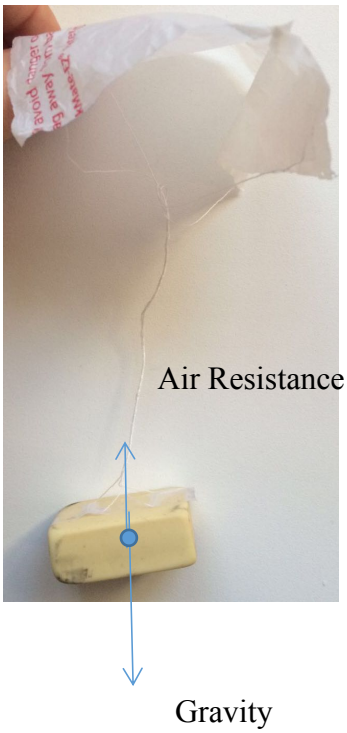
Graph:



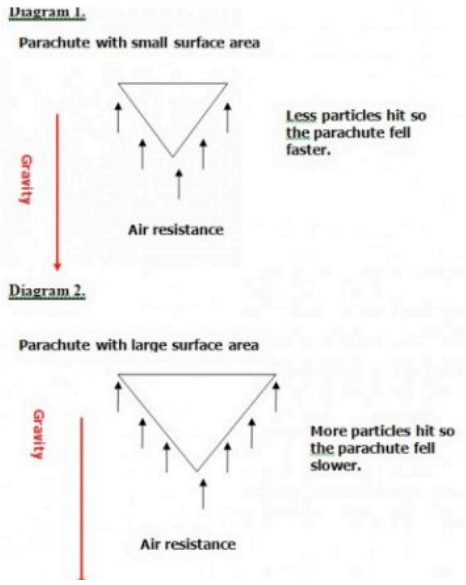
Conclusion:

As the data and graph above shows, as the surface area of the parachute increases, the dropping time increases and the dropping speed decreases. Therefore, my hypothesis is true.

Since the weight of the rubber and the parachute remains the same (the parachute is made of plastic bags, so the weight doesn't change a lot when the size is changed, and thus it can be ignored), the prachute with larger surface area has a greater air resistance.



This is a force diagram for the parachute.



(From GCSE Physics)

This diagram shows that with a larger surface area, the parachute has a larger air resistance while the gravity remains the same. Therefore, the parchute with larger surface area has less net force downwards than the one with smaller surface area.

In conclusion, the surface area of the parachute has an impact on the dropping speed, and that is when the surface area of the parachute increases, the dropping speed of the parachute decreases. The reason behind that is mostly because of air resistance. The larger surface area has a larger air resistance, and the larger air resistance drags the parachute more than the one with less surface area.

Bibliography

Al-Naemi, Maryam, 10C, and Mr. Hennard. Lab Report: The Impact a Parachutes Surface Area Has (n.d.): n. pag. Web.

BBC News. BBC, n.d. Web. 22 Feb. 2016. <http://www.bbc.co.uk/schools/gcsebitesize/science/add_gateway_pre_2011/forces/fallingrev1.shtml>.