Parachutes Affect On Rockets

M1-1 PHYSICS

Testable Question

- What effect does the surface area of a model rocket's recovery parachute have on the rate in which the rocket descends?

Rationale

- I want to test this question because for many years I have been greatly interested in rockets and aerospace engineering. Last year, my project was also on rockets and how a change in design affects an attribute of the rocket's performance.

Abstract

When I started the project I researched the topic and got my plan down. Later I built the rockets and came to some complications with the production. When I launched the rockets and analyzed the data they came out to the hypothesis I made in the beginning; The rocket with the larger parachute would have a longer descent time.

Hypothesis

If I change the surface area of a rocket's parachute then the parachute with the largest surface area will slow the rocket's descent speed because the more surface area an object has while falling from an altitude, the more drag, air resistance.

Materials

My materials for my project included:

- 3 estate hi-flier rockets ($22.50 each)
- 60 A8-3 model rocket engines (3 estate A8-3 bulk packs from Eletronixs Express, $57.08 each)
- Flash launch set (1 for $35.49)
- 1 9v battery
- 1 stop watch

Procedures

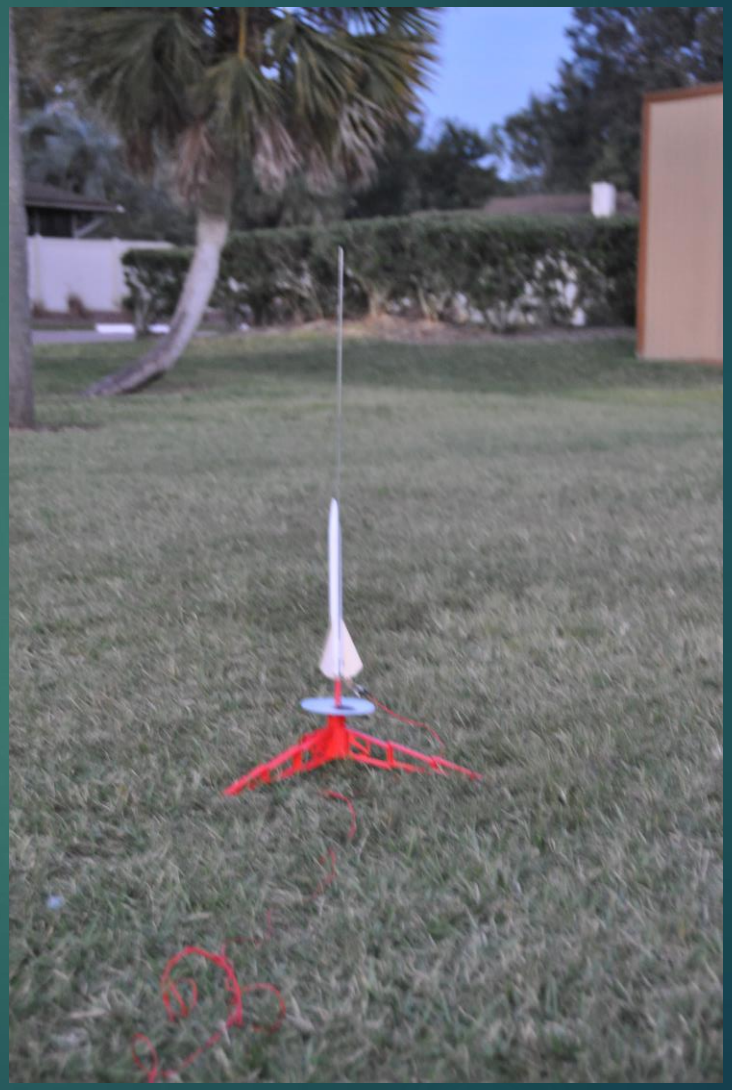
- 1. Complete rockets as instructed on rocket build instructions
- 2. Create 3 parachutes with one 100 sq. cm, one 300 sq. cm, and one of the supplied parachutes (approximately 200 sq. cm) as a median surface area to compare the results to
- 3. Set up launch equipment for the launch
- 4. Launch rockets
- 5. Once rockets have deployed the recovery system, time the descent and record data.
- Perform steps 3, 4, and 5, 20 times for each of the 3 test rockets.
- 6. Find the descent rate by using the formula r = d/t with the distance set at 100 ft due to the engines cut deployment timing

Variables

Variables:

- Independent- the surface area of a rocket's recovery parachute.
- Dependent- the rate of descent
- Constant- rocket type and engine model

Pictures



Results (Graph)

** Some wind conditions varied at times*

Rocket type	1 sec.	2 sec.	3 sec.	4 sec.	5 sec.	6 sec.	7 sec.	8 sec.	9 Sec.	10 Sec.
small	7.73	7.6	7.69	8	8.02	7.74	7.5	7.01	*tree	7.68
medium	8.38	8.4	8.56	8.71	7.89	8.16	9.06	8.75	8.50	8.94
large	9.5	10.51	9.34	9.78	9.97	10.23	10.13	9.96	9.79	10.26
small	7.81	7.62	7.34	7.65	7.76	7.98	8.01	6.86	7.42	7.32
medium	8.43	*tree	9.21	8.45	8.64	8.36	8.95	8.68	8.7	9.04
large	9.23	9.69	9.09	9.68	9.46	9.86	9.67	9.77	10.21	10.07

Results

Through the analyzing of my data, I found that the rocket with a parachute had longer descent times making it have more drag to the others. I did have some natural elements pop up but those situation a little affect on the end result.

Conclusion

My hypothesis was supported because the rocket with the largest parachute surface area had the longest descent times.

Sites Noted

- http://www.spaceanswers.com/space-exploration/what-is-rocket-fuel-made-of/ by Jonathan O'Callaghan, 8 October 2012
- http://www.grc.nasa.gov/WWW/K-12/TRC/Rockets/history_of_rockets.html Editor: Tom Benson, Last Updated: Jun 12 2014
- http://medical-dictionary.thefreedictionary.com/Drag+(physics) Drag definition from Dictionary of Sport and Exercise Science and Medicine by Churchill Livingstone © 2008 Elsevier Limited
- http://www.grc.nasa.gov/WWW/K-12/airplane/drag1.html NASA children's explanation for drag, Editor: Nancy Hall, Last Updated: May 05 2015
- http://faculty.dwc.edu/sadraey/Chapter%203.%20Drag%20Force%20and%20its%20Coefficient.pdf Aircraft performance analysis written by VDM Verlag Dr. Müller, 2009