CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
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Project Number
J0122

Project Title
Can I Make Rocket Fins More Efficient?

Abstract

Objectives/Goals
Phase 1 - Would differently shaped fins affect rocket performance?
Phase 2 - Methodology improvements to validate results and improve upon standard rocket kit fins.
With surprising results from Phase 1, I need to retest my project with more launches, more apogee accuracy, and better fin precision.

Methods/Materials
Phase 1 - For my project, I measured rocket apogee as my metric for fin efficiency.
I built 24 rockets to account for duplicates, lost, and damaged rockets. I cut and shaped seven fin shapes from balsa wood, including a replica of the Estes kit cardboard trapezoid-shaped fin.
Using different fin materials (balsa vs. the rocket kit cardboard), I would need to create Baseline data as well as Control data for my project.
Standing 30 and 60 meters north and south of the launch site, my measurers observed the apogee tangent angle. I launched each shape twice, then averaged measurements for apogee.
Phase 2 - During Phase 1 I observed interesting trends, but I feel that I require more data points (launches) per fin type, more precise altitude measurements, and more precisely shaped fins.
I am now testing using rocket kits that carry a small altimeter. I will require more powerful motors to generate the speed and altitude to differentiate between fin types.

Results
Phase 1 - My results disproved my hypothesis that an S-shaped fin would be most efficient
The half circle balsa fin went highest of my test fins, only 1% less than the Estes cardboard fin, but far above all other test fins including my Control trapezoid balsa fin.
Though my calculations were accurate, my Santa Cruz County judges advised me to develop a more precise apogee methodology.
Phase 2 - Phase 2 rocket building is in process so no results yet.

Conclusions/Discussion
In Phase 1, my Control trapezoid balsa fin launched lowest of all fins. This leads me to believe that all fin shapes would improve if I use Estes-thickness cardboard.
However, my goal is to improve upon the standard kit fins.
Can I create a fin shape that is better than a standard kit shape or do I improve upon the standard Estes kit fin by creating an airfoil cross-section on my balsa fins?

Summary Statement
I suspect that the standard shape rocket fin that comes with rocket kits might not be the most effective; my preliminary results indicate that a half-circle fin shape could be very efficient, as measured by apogee.

Help Received
My Science teacher helped refine my scientific methods and my Math teacher introduced me to trigonometry so that I could use tangent angles for my apogee calculations.