CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
J0131

Project Title
Model Rocketry: The Correlation between Increased Weight and Decreased Altitude

Abstract

Objectives/Goals
The goal of my experiment was to determine if there is a correlation between increased rocket weight and decreased rocket altitude. I think that after my experiment I will be able to predict how high the rocket will go if I put on a certain amount of weight. I predict that there will be a linear correlation between increased rocket weight and decreased rocket altitude.

Methods/Materials
I launched a 16" long, 1" diameter, 1.6-ounce Estes model rocket seven times at a 90 degree angle; weighted with lead shot in the nose cone at 20-gram intervals, starting at zero and going up to 140 grams using an Estes B6-4 engine. Prior to launch, I set up a 200-meter baseline with a standard tape measure for altitude calculation. I used an Apogee Altitude Tracker and Apogee Altitude Calculator to determine the altitude of each launch. Each launch was completed using the same launch procedures and on the same day with the same temperature and wind conditions.

Results
The initial test showed a height of 180 meters. Each altitude after that was reduced in correlation to the added weight by approximately 40 meters per launch, until flight 4 when it was thereafter reduced by 23 meters per launch. The rocket was damaged on the seventh launch due to the weight did not give the parachute enough time to release.

Conclusions/Discussion
I conclude that there is a nearly linear correlation between increased rocket weight and decreased rocket altitude. The data were not able to conclude the correlation was as linear as I predicted due to possible human error in measuring the angle of flight and limited number of data points. I planned to verify the results using the same rocket and different engines; however, that was not possible due to the damage the rocket received on the launch with 120 grams added. These data suggest that using this correlation I can apply it to any rocket engine, given the zero-weight altitude.

The linear correlation can be related to real-world applications by applying how weight would affect rockets (manned and unmanned) and satellites. The correlation could ensure that too much weight was not added.

Summary Statement
My project was designed to determine if there was or was not a linear correlation between increased model weight and decreased model rocket altitude.

Help Received
Mom helped purchase materials, friend Ryan took photos, Dad surpervised launches and reviewed my data.