CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

J1803

Project Title

The Effect of Mass and Revolutions on a Slingatron Projectile's Velocity

Abstract

Objectives/Goals

The goal of this project was to determine whether the mass and revolutions of a slingatron affect the velocity of the projectile being launched. A slingatron is a mechanical hypervelocity mass accelerator that is an efficient method to launch payloads such as building materials into space. Space is mankind's next step to explore natural resources, but the cost of rockets is high so developing more efficient methods of space exploration is important.

Methods/Materials

A slingatron was constructed with the help of an HSU equipment technician using a Bobcad system to program a Bridgeport milling machine that cut two acrylic models (one with 4 revolutions, one with 1 revolution) in a spiral pattern to test how revolutions affect velocity. A small battery powered motor was used to drive an acrylic arm that pushed the projectile through the revolutions. The velocity of a plastic sphere (.4992 g) and then also of a metal sphere (2.88 g) projectile were measured as they exited the slingatron using a light sensitive speed reader. Both mass of the projectile and number of revolutions were considered.

Results

The 4 revolution spiral with a plastic projectile had the greatest velocity with an average of 53.55 m/sec. The 1 revolution spiral with a plastic projectile had the slowest velocity with an average of 40.08 m/sec. The heavier metal sphere also had a higher velocity with the multiple revolutions than single revolution, but was slower in comparison with the plastic. The results show that the amount of revolutions and projectile mass do affect velocity. The number of revolutions did increase the velocity for both projectiles, but the lower mass projectile had a greater increase.

Conclusions/Discussion

The model slingatron can help us understand how to build a slingatron that could actually launch payloads into space. A formula that represents revolutions, mass, and the velocity needed to exit earth#s atmosphere could be applied to a real life scenario. Payloads of materials needed to build satellites, space stations, fuel, water, etc. that would allow a broad exploration of space without the costly expense of constant rocket launches. Currently, private companies are attempting to build a large slingatron. If this technology is perfected, it could be used in interplanetary space exploration.

Summary Statement

I built a slingatron to investigate how a projectile#s mass and slingatron#s revolutions affected velocity in order to model how large scale slingatron#s could create the needed acceleration for optimum velocity to exit the Earth#s atmosphe

Help Received

I received guidance from Marty Reed, Equipment Technician at Humboldt State University, who assisted in the development of my project idea and taught me to use specialized equipment, which is one of the reasons my results are accurate.