CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Jared A. Lyon

Project Number

J0115

Project Title

The Effect of Parachute Canopy Shape and Apex Venting on Parachute Performance

Abstract

Objectives/Goals

The objective of my experiment is to determine which parachute canopy shape (Triangular, Square, Star, or Circular) will perform best, and whether adding an apex vent to the canopy will improve parachute performance regardless of the canopy shape.

Methods/Materials

Eight parachutes of identical total canopy surface area and weight were constructed (1 of each shape with and without apex vents). I used direct measurement of expired time from parachute release to payload landing to compare parachute performance utilizing a stopwatch. Poor parachute deployments due to partial opening, wind, or excessive oscillation were noted and the best eight of twelve drops for each design were averaged to compare performance. Longer flight times were equated to better performance, and shorter flight times were equated to lower performance, due to the goal of landing at the lowest speed being preferable.

Results

My results indicate that the non-vented parachutes finished in order from longest to shortest flight time as follows: Circle, square, triangle, and star. The best performing (circular) parachute performed approximately 30% better than the worst performing (star-shaped) parachute. When I added canopy apex vents, the vented parachutes finished in the identical order as the non-vented versions, but each vented shapes# flight time increased approximately 6% over the non-vented version. This clearly demonstrated that venting did improve parachute performance regardless of canopy shape.

Conclusions/Discussion

My hypothesis was proven correct; the vented circular parachute performed the best by having the greatest flight time, demonstrating that it generated the most aerodynamic drag and best stability during flight. My experiment results matched well with my background research information. Specifically, that parachute shape is a key factor because it defines how efficiently a parachute will generate aerodynamic drag. This is due to the canopy shape determining the effective area exposed to airflow, and that area being directly proportional to the amount of drag. Also, my experiment demonstrated that venting is an effective way to increase drag. An apex vent is a hole in the canopy that allows turbulent trapped air escape from its center, which improves airflow by decreasing turbulence and improving parachute stability. This improved stability also increases the parachute aerodynamic drag force.

Summary Statement

My experiment is to determine which parachute canopy shape will perform best, and whether adding an apex vent to the canopy will improve parachute performance regardless of its shape.

Help Received

My Father dropped the parachutes from 5 meters off the ground (from our roof) while I timed the drops. He also helped proofread my display board.