

**Greater San Diego Science and Engineering Fair
2018 PROJECT SUMMARY**

Name: Blake T. Scurry

Grade: 8

School: Marshall Middle School

Teacher: E.Gillum

Project Title: A Unique Spin on Aerodynamics

Airfoil augmented with semi-auto rotating leading edge cylinder

Abstract

Objectives/Goals

Determine if an airfoil with a semi-auto rotating leading edge can efficiently increase lift.

Hypothesis

An airfoil augmented with a semi-auto rotating leading-edge cylinder can be designed, then lift will be increased by approximately 25% when compared to a conventional airfoil.

Methods/Materials

A low speed wind tunnel built of cardboard, wood, Plexiglas, and portable fan for wind generation. An apparatus was created to hold a rotating cylinder and airfoil suspended on a scale. The cylinders and airfoils are made from 3D printing. The data was collected utilizing weight, RPM, and wind speed measurements. Dry ice was used for flow visualization.

Results

The data from multiple test runs of both a stand-alone cylinder and an airfoil augmented with a leading-edge rotating cylinder resulted in a 7% increase in lift.

Conclusion/Discussion

The test results of 7% increase in lift varied from the predicted 25% increase in lift by approximately 70%. This discrepancy is primarily related to the inability to meet target RPM speeds due to instability.

Summary Statement

The addition of a semi auto-rotating leading-edge cylinder to an airfoil does increase lift. However, design tolerances and rotation speeds are critical to optimized performance.

Help Received

Help was received from a neighbor who is an aerospace engineer as well as from my father.