



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Austin Lam	Project Number 38556
Project Title Effect of Non-Tip Wing Structure on Performance of Aircrafts	
Abstract Objectives/Goals The objective of this study is to determine the efficiency of a closed-wing design in lieu of the modern wingtip design to eliminating drag caused by wingtip vortices. Methods/Materials Initial prototypes used cardboard, tape, and wood skewers for proof of concept. Data collection involved using force sensors, for which an apparatus was built in order to suspend the airfoil in a 23cm deep wind tunnel at varying wind speeds. Results Five trials of 20 seconds for each of the two wing designs produce a graph that indicates the average lift to drag values of each wing. The traditional wing has a higher lift to drag ratio than the closed wing does, but is only observed at lower wind speeds. Conclusions/Discussion The data supports my hypothesis, but improvements are to be made to make further claims. Continued experimentation should include a larger wind tunnel which allows for smoke testing to see traveling wake as well as for larger airfoils which minimize surface inconsistencies by scale. As of today, limitations of using the closed wing include it not being all of the following: cheap, light, structurally sound.	
Summary Statement I created different airfoil designs to be tested for efficiency in minimizing wing-tip drag	
Help Received My research class teacher and an undergraduate mentor helped me to create an airfoil, to find the best way to collect valid data, and to convey my scientific findings in a public manner.	