



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Sebastian J. Figueroa	Project Number 34744
Project Title The Effect of Bird Formation on Flight Efficiency	
Objectives/Goals The purpose of this study was to find whether a V-formation increases the flight efficiency of birds by taking advantage of wing-tip vortices, and if so, what variation of a V-formation is the most efficient; as a side note, testing was completed to see if it would be more beneficial for birds to fly in a straight line. Abstract Methods/Materials To begin, a wind tunnel and two model birds were constructed. The first bird was the independent variable, while the second, stationary bird was the dependent variable: using a lever system, its drag was measured by an electronic scale. The experiment involved taking an average reading from the scale for thirty seconds of fan operation with the first bird in a fixed position. This bird was moved around each of the positions on a baseplate. Materials included a large fan, electronic scale, and two poster boards, as well as the scale model birds, lever system, and testing baseplate, which are all constructed of Legos. Results On the baseplate, a grid system was used; the columns were 16.25 inches and the rows were 14.375 inches apart (all results and measurements to scale). The column directly in front of the second, stationary bird resulted in the most efficient formation, while the most beneficial position called for the first bird's beak to be 46.25 inches in front of the second's. However, the second column, 16.25 inches to the right, also had benefits while still retaining a V-formation. The most productive position using a V-formation was 71.875 inches in front and 14.375 inches to the right of the stationary bird. Conclusions/Discussion Therefore, it is of greater benefit for birds to fly in a straight line formation. However, a V-formation will still maintain productivity if the birds hold a tightly packed formation. Perhaps, on a larger model, there would be different results, ones where wing-tip vortices (an important aspect in flight efficiency) might have a larger effect. To expand on this project, different size birds could be tested, and perhaps the experiment could be expanded to encompass the aerodynamics of cars and bicycles. These ideas could be applied to a variety of modern day topics and greatly benefit the area of aerodynamics.	
Summary Statement The goal of this experiment was to determine the most efficient flight formation for birds.	
Help Received Mother helped me edit report; father helped construct posterboard.	