



CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

Name(s) Trevor J. Fobel	Project Number S0207
Project Title Flying Steady: A Comparison of Flying Wing Aircraft vs. Conventional Aircraft	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Each year, aircraft become faster and more efficient at their tasks. However, demand for both civilian and military aircraft has been dominated by conventional aircraft. This project was designed to examine and compare a model of a conventional aircraft to a comparable model of potential replacements, flying wings, in an experiment that allowed visual observation of the drag produced by each type of aircraft in simulated flight.</p> <p>Methods/Materials The project began by constructing the outer shell of the low-speed wind tunnel from a large appliance box. The fan assembly consisted of two parts: a box-fan in conjunction with homemade cardboard braces secured to the original bottom-end of the appliance box. The second part of the assembly consisted of a honeycomb grid designed to equalize airflow emitted by the fan constructed of cardboard tubes 11 cm in length and 4 cm in diameter connected to each other with crafts glue and encased in a cardboard frame 50cm x 50cm. A small view port 61cm x 46cm was cut into the outer shell and overlaid with a clear plastic poster cover and secured with masking tape. Utilized models were mounted on a cardboard shaft 20cm in height and 4 cm in diameter. The top end of the tube was cut to an angle of 15 degrees to give the models an ideal angle-of-attack, giving the models maximum lift. To examine and visualize the drag produced by each model, a grid and tuft assembly consisting of a metal wire-screen and thin plastic streamers cut to approximately 6 cm and attached with double-stick tape. Upon completion of all necessary assemblies, both models were subjected to a drag test, with the fan outputting a maximum airspeed of 8km/hr and data was recorded.</p> <p>Results Both models were tested in the tunnel. In the experiments, the flying wing produced a consistent wake that resulted in a linear pattern of disturbance in the streamers, indicating a low-drag profile. The conventional aircraft model produced a wake that resulted in an erratic pattern of disturbance in streamers positioned toward the edges of grid, but a more stable pattern directly behind the tail section.</p> <p>Conclusions/Discussion The data supports the observation that flying wings produce a more stable wake, indicating a design that most efficiently moves through the air. This experiment supports the statement that in the future, flying wings could be favored over conventional aircraft for their superior design qualities.</p>	
Summary Statement This project is about comparing the aerodynamic drag of a flying wing aircraft and a conventional aircraft.	
Help Received Father helped acquire materials and assisted in assembly of wind tunnel; Mother helped in gathering photos and data presentation, in addition to acquiring some research material	