



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Vishnu Murali	Project Number J0116
Project Title Jet Engines: Manipulating Airflow within a Turbofan Jet Engine in Order to Maximize Output Thrust	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project investigates how changing the order, size, and angle of turbofan jet engine's blades manipulates the air flow to maximize output thrust. This work arose out of my desire to maximize the power and efficiency of the turbofan jet engine in a simple way.</p> <p>Methods/Materials A model jet engine was constructed from galvanized hot dip steel, steel tubes, threaded rod, ball bearings, hex-nuts and aviation snips. 6 different blades were cut out to form the 5 engine configurations (the control, oversized initial blade, oversized ending blade, oversized initial blade with extra 10 degrees greater end compressor, control with extra 10 degrees end compressor). Those 6 blades were measured using a compass and cut out of galvanized steel using aviation snips. The angles of each blade were measured using a protractor. The motor mounted on the nose of the engine was turned on and a weighing machine was placed behind the engine to measure the output thrust. The motor was set at 8 different speeds, 4 low and 4 high RPMs. For each RPM, the output thrust measured by the weighing machine, was recorded in grams and then converted to Newton. This was repeated 4 times for each of the different configurations.</p> <p>Results In this experiment, 2 results were found since different engine configurations performed better at different RPM. The Big Fan with Extra compressor was the best at high RPM averaging out 0.069678 Newton of thrust at 20,000 RPM. The Big Back blade excelled at the lower RPM since it averaged out at 0.002646 Newton of thrust at 900 RPM.</p> <p>Conclusions/Discussion This experiment proves that manipulating the order, size, and angle in a turbofan jet engine can maximize its thrust production. This experiment also points out that no jet engine can be made such that it can provide maximum thrust at all RPM. This research backs up my hypothesis that high bypass engines will perform better. Engines with big blades or high bypass generally did better.</p>	
Summary Statement This homemade engine model demonstrates that manipulating the size, angle, and order of turbofan jet engines blades can maximize the output thrust.	
Help Received I would like to thank my science teachers Mrs. Shah and Mr. Okimura for their helpful discussions, and advice on this project. I would like to thank my mom for her brutal criticism throughout the science fair process, and my dad for going to homedepot on short notices to purchase the necessary supplies.	