CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
James D. Fagan

Project Number
J0109

Project Title
A Study of Aerodynamic Variables on Ducted and Non-Ducted Propulsion Fans

Abstract

Objectives/Goals
My primary objective was to determine if ducted or non-ducted propulsion fans of the same size and propeller velocity would create more thrust and whether various inlet configurations could improve their performance.

Methods/Materials
Ducted and non - ducted propulsion fans with various inlet configurations were mounted atop scales. Measurements were taken before and after applying power. The difference was recorded as net thrust. Air velocities were measured at intake and exhaust to determine thrust in Newton's (theoretically, by means of the thrust formula).
Material used:
Four fan motors (6.3cm dia.),
Three kitchen scales,
Transmitter/Reciever,
Motor speed control,
12 volt power supply,
Various inlet rings.

Results
I found that impellers are more efficient in generating thrust than propellers, and that different inlet configurations can significantly improve thrust generation on a propeller design.

Conclusions/Discussion
Greater thrust generation in an enclosed duct can be explained by reduction of "propeller tip vortices". I was surprised to find that increasing thrust in my static tests was easily achievable by manipulation of inlet designs with principles I learned in my wind tunnel.

Summary Statement
The purpose of my project is to look for propulsion variables that can eventually be applied to my martian drone aircraft design.

Help Received
My dad supervised my use of power tools. Kevin Brooks was the person I bought my motors from, he explained to me how they needed to be set up and operated by remote control, due to being brushless motors.