CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

Mohammed Khan

Project Number

38665

Project Title

Miracle of Flight: Design of Split Scimitar and Blended Winglets Using Computational Flow Dynamics

Abstract

Objectives/Goals

In my project, I designed the split scimitar winglet, blended winglet, and the wing with no winglet using Autodesk Inventor, AutoCAD software, at different cant angles of directly proportional to various angles of attack. Using the measurements from AutoCAD, I performed computational flow dynamics (CFD) with Auto Foam software to calculate the Lift Coefficient, Drag Coefficient, and the Lift-to-Drag ratio. The purpose was to determine which design can increase in better fuel efficiency and better aircraft performance.

Methods/Materials

My designs were made using an Autodesk AutoCAD software program using my measurements and dimensions. The measurements of these designs were fed into autofoam CFD Software using the Navier Stokes equations to calculate pressure, momentum, Drag coefficient, Lift coefficient, and lift-to-drag ratio.

Results

The thirty degree blended winglet has the most Lift and Drag at various angles of attack. But if you put into a lift to drag ratio, the split scimitar winglet has the most lift to drag ratio. The split scimitar winglet is the most fuel efficient at 4-degree angle of attack.

Conclusions/Discussion

Finally, I concluded that the split scimitar winglet which is the 90-degree winglet is the most fuel efficient. This means that this design can reduce the most wingtip vortices and drag. I also concluded that the wingtip vortices increase with an increase of an angle of attack. The split scimitar winglet increased by 2% lift than the blended winglet. This means that it can save 5 million gallons of fuel within its design.

Summary Statement

My project is a experimental design of split scimitar and blended winglets at different cant angles using computational flow dynamics.

Help Received

I designed autocad design and computational flow dynamics myself. I was trained on autodesk and computational flow dynamics by my teacher Mr. Charles Pascal