The Stability of an Aircraft Wing with Varied Winglets

Warfa, Osman (School: Burnsville High School)

This experiment was conducted to determine the stability of an aircraft wing with varied angles of winglets. Winglets give aircraft a performance improvement between five and seven percent by reducing the powerful vortices that curl out behind the wingtip as the aircraft slices through the air. A winglet with a cant (angle of winglet to wing) of 30 degrees will have the highest Lift to Drag Ratio because it won't create as much drag. A model wing and winglet for each iteration of angle is drawn up in Autodesk Inventor and was saved as an STL to work with Makerbot Print which is the software that talks directly to the 3D printers also made by Makerbot. This wing was placed into a wind tunnel with the trailing edge facing back towards the outlet of the tunnel. Each winglet was tested five times in a wind tunnel at 80 km/hr. Results refuted the hypothesis and the null is accepted. The 70 degree winglet had the lowest Lift to Drag Ratio because this angle compared to others was just wide enough to reduce wingtip vortices by effectively disrupting the airflow over the wingtip, yet also narrow enough as to not cause unnecessary drag in performing its task.

Awards Won: