A Wing of the Future: Part III

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Aircraft are convenient and fast, but not very fuel efficient. Being a significant mode of transportation means large volumes of fuel are consumed and huge emissions result. In 2015, US airlines consumed 16,729,600,000 gallons of jet fuel, producing an estimated 176,497,280 tons of CO2. For every 1% reduction in fuel consumption, there can be over 1.7 million tons of CO2 saved annually. A novel wing design was developed that blows a jet of air from a flush vent across the upper surface of the wing. This design was modeled in computational fluid dynamics software and is shown to improve energy efficiency by 42.4% over the standard NACA-2415 airfoil in cruise angles of attack. Depending on the airframe it is installed on, overall efficiency improvement will vary. In addition to efficiency gains, this wing design also improves the performance envelope. Super-circulation induced from the vent gives the capability to significantly increase the lift being produced and increases the operational angle of attack range. This design improves the safety of aircraft by reducing the speed and runway length required for takeoff or landing and vastly improves stall performance. In addition to commercial aviation, many applications are possible for this technology. An automated system could be used on training aircraft to turn the system on if a stall is detected too close to the ground, preventing a possible crash. This technology could also be used to improve wind turbine performance, reduce hull or propeller friction in maritime applications, and reduce drag on semi-trucks.

Awards Won:

Fourth Award of $500