Airfoils

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Modern airfoils, based on 1930-40s designs, have reached their limit of efficiency. Can airfoils modeled after living things produce more lift? The purpose of this experiment was to determine if nature-based airfoils were more efficient that common aviation airfoils. Research revealed albatross and dragonflies have two of the most efficient wings. The experimenter hypothesized albatross or dragonfly airfoils would be more efficient than common airfoils. The independent variables were the Clark Y, Laminar flow, albatross wing, dragonfly wing, and dolphin caudal fin airfoils. The dependent variable was the lift to drag ratio. The experimenter controlled for angle of attack, materials, airflow and airspeed. Two sets of wings were made of each airfoil and tested in an air tunnel measuring lift and drag with the airfoil at 0° angle of attack. Each pair was tested five times, collecting lift and drag data. The albatross airfoil produced the most lift with an average lift to drag ration (L/D) of 3.161 (standard deviation {SD} of 0.315). Dragonfly L/D was 2.55, SD 0.439, followed in order by Clark Y L/D 2.433, SD 0.185; Laminar flow L/D 2.385, SD 0.617; and dolphin caudal fin L/D 2.35, SD 0.695. The experimental hypothesis was supported as the albatross and dragonfly airfoils produced more L/D than standard aircraft wings. Airfoils based on nature could be the next great improvements in aircraft wing efficiency. The research could be extended to evaluate the airfoils at different angles of attack, airspeeds, and sizes.

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