Blown Away: A Study of the Flight Characteristics of Conventional and Canard Wing Configurations

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The wing configuration of an airplane affects the airplane's flight characteristics. The purpose of the experiment was to compare the lift, drag, efficiency, and stall characteristics of a canard configuration to a conventional configuration airplane. Because the horizontal stabilizer is in front of the main wing, the canard configuration can potentially increase lift, maintain drag, improve efficiency, and provide safer stall characteristics. A wind tunnel was used to simulate the flight characteristics of a Boeing 737 in conventional and canard configurations. The lift, drag, efficiency, and stall characteristics were determined by using lift and drag values at eleven different angles of attack from -25 degrees to 25 degrees. Lift and drag coefficients were calculated using the lift and drag formulas. Stall speed was calculated using the stall speed formula based on each configuration's maximum lift coefficient. Efficiency was determined using the lift to drag ratio. The canard configuration created 5.8% more lift and 8.6% more drag. The canard configuration had a 2.7% lower stall speed. The canard configuration demonstrated better stall characteristics, because it maintains lift further after its stall and has a lower stall speed. The efficiency was not statistically different between the configurations. Based on similarities in the data, the canard configuration will fly. The lift coefficient on an actual, full-size Boeing 737 is 0.600; the calculated lift coefficient from the model used in the simulation was 0.570. Therefore, the data from the simulation could be used to predict the flight characteristics of a full-size, canard configuration Boeing 737.

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