

Aerodynamic Investigation of Baseline-IV Bird-Inspired BWB Aircraft Design: Improvements over Baseline-III BWB

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Abstract : The study on BWB UV begins in UiTM since 2005 and three designs have been studied and published. The latest designs are Baseline-III and inspired by birds that have features and aerodynamics behaviour of cruising birds without flapping capability. The aircraft featuring planform and configuration are similar to the bird. Baseline-III has major flaws particularly in its low lift-to-drag ratio, stability and issues regarding limited controllability. New design known as Baseline-IV replaces straight, swept wing to delta wing and have a broader tail compares to the Baseline-III's. The objective of the study is to investigate aerodynamics of Baseline-IV bird-inspired BWB aircraft. This will be achieved by theoretical calculation and wind tunnel experiments. The result shows that both theoretical and wind tunnel experiments of Baseline-IV graph of CL and CD versus alpha are quite similar to each other in term of pattern of graph slopes and values. Baseline-IV has higher lift coefficient values at wide range of angle of attack compares to Baseline-III. Baseline-IV also has higher maximum lift coefficient, higher maximum lift-to-drag and lower parasite drag. It has stable pitch moment versus lift slope but negative moment at zero lift for zero angle-of-attack tail setting. At high angle of attack, Baseline-IV does not have stability reversal as shown in Baseline-III. Baseline-IV is proven to have improvements over Baseline-III in terms of lift, lift-to-drag ratio and pitch moment stability at high angle-of-attack.

Keywords : blended wing-body, bird-inspired blended wing-body, aerodynamic, stability

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