

Aerodynamic Optimization of Oblique Biplane by Using Supercritical Airfoil

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Abstract : Introduction: This study verified the potential applications of two Oblique Wing configurations that were initiated by the Germans Aerodynamicists during the WWII. Due to the end of the war, this project was not completed and in this research is targeting the revival of German Oblique biplane configuration. The research draws upon the use of two Oblique wings mounted on the top and bottom of the fuselage through a single pivot. The wings are capable of sweeping at different angles ranging from 0° at takeoff to 60° at cruising Altitude. The top wing, right half, behaves like a forward swept wing and the left half, behaves like a backward swept wing. Vice Versa applies to the lower wing. This opposite deflection of the top and lower wing cancel out the rotary moment created by each wing and the aircraft remains stable. Problem to better understand or solve: The purpose of this research is to investigate the potential of achieving improved aerodynamic performance and efficiency of flight at a wide range of sweep angles. This will help examine the most accurate value for the sweep angle at which the aircraft will possess both stability and better aerodynamics. Explaining the methods used: The Aircraft configuration is designed using Solidworks after which a series of Aerodynamic prediction are conducted, both in the subsonic and the supersonic flow regime. Computations are carried on Ansys Fluent. The results are then compared to theoretical and flight data of different Supersonic fighter aircraft of the same category (AD-1) and with the Wind tunnel testing model at subsonic speed. Results: At zero sweep angle, the aircraft has an excellent lift coefficient value with almost double that found for fighter jets. In acquiring of supersonic speed the sweep angle is increased to maximum 60 degrees depending on the mission profile. General findings: Oblique biplane can be the future fighter jet aircraft because of its high value performance in terms of aerodynamics, cost, structural design and weight.

Keywords : biplane, oblique wing, sweep angle, supercritical airfoil

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