Aerospace Engineering Thesis Defense

Assessing Flight Performance of a Supersonic Airliner with Swing Wing Capabilities using Energy Maneuverability Theory

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Abstract

The objective of this study is to estimate the variation of flight performance of a variable sweep wing geometry on the reverse engineered Boeing 2707-100 SST, when compared against the traditional delta wing approach used on supersonic airliner. The reason for this lies beneath the fact that supersonic orientations of wings doesn't seem to work well for subsonic conditions, and subsonic wings are inefficient for supersonic flight. This would likely mean that flying long haul subsonic with supersonic wing geometry is inefficient compared to regular aircraft, but more importantly requires high takeoff/landing speeds and even long runways to bring the aircraft to hold. One might be able to get around this problem - partially - by adding thrust either by using afterburners, or by using variable geometry wings. To assess the flight performance, the research work done in this report focuses on implementing the latter solution to the abovementioned problem by using the aerodynamic performance parameters such as Coefficient of Lift, Coefficient of Drag along with its components specific to every test Mach number and altitude, along with the propulsion performance parameters such as thrust and thrust specific fuel consumption at different iterations of power settings of engine, flight Mach number and altitude in a propulsion database file to estimate flight performance using flight missions and energy-maneuverability theory approach. The flight performance was studied at several sweep angles of the aircraft to estimate the best possible sweep orientation based on the requirement of mission and an optimal flight mission was developed for an aircraft with swing wing capabilities.

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