

Aerospace Engineering Thesis Defense

The Effects of Static Aeroelastic Properties on Aircraft Performance and Shockwave Formation

School for Engineering of Matter, Transport and Energy

Benjamin Webb

Advisor: Dr. Timothy Takahashi

Abstract

As the push to develop ever more efficient aircraft increases, the use of lightweight composite materials to meet this push has increased. Traditional aircraft structural component sizing has revolved around the tensile yield strength of materials. Since composite materials excel in tensile strength, these traditional sizing tools provide overly optimistic weight reduction predictions. Furthermore, composite materials are generally weak under compression and shear. Thus, proper structural sizing yields heavier-than-expected designs.

Nevertheless, a wing using thin, lightweight composites in the primary load-bearing components significantly impacts its static aeroelastic properties. These thin structures have a decreased flexural rigidity, making them more susceptible to bending. The bending of swept wings decreases the design wing twist and dihedral angle, potentially impacting the aerodynamic performance and the lateral stability and control, respectively. This work aims to determine what, if any, are the effects of excessive static aeroelastic properties on the aerodynamic performance of an aircraft. Does the perceived gain in the theoretical reduction in structural weight outweigh the potential reduction in aerodynamic performance.



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Zoom Link: <https://asu.zoom.us/j/81178269788>