

Aerospace Engineering Thesis Defense

Attainable Moment Sets - Approaches to Understanding
Trim Capability in Conceptual Design

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Abstract

This thesis addresses the issue of assessing longitudinal and lateral-directional trim capability during the conceptual design process. Modern high-performance aircraft are likely to feature complex flight control systems where the control system may independently command every control surface to develop necessary moments. However, to prove stability and controllability on such an aircraft requires a near-final set of control laws. This requirement is onerous at the conceptual design level, where engineering methods need to facilitate rapid, multidisciplinary design optimization trades. This work considers the differences in Attainable Moment Sets across a wide variety of airframes using a simplified “pre-mix” approach to controls as well as a model where the control systems have independent command authority over each control surface. This work indicates that the “independent-single-panel” model offers modest improvements in attainable moments over a “pre-mix” strategy. This suggests that a “pre-mix” approach used to assess basic combined trim problems will not lead to an overly conservative final design.

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Zoom Link: <https://asu.zoom.us/j/8166481262>