

AEROELASTIC CHALLENGES IN THE AIRCRAFT DESIGN PROCESS

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Abstract. One of the most important constraints within the design process of flexible aircraft is to avoid aeroelastic instability for all combination of speed and altitude encompassed by the flight envelope. This constraint affects the structural design as well as the aerodynamic design both impacting the calculated aircraft performance. It is therefore of significant importance to understand the aeroelastic behavior of the concept during all design phases and avoid major changes in the detailed design phase which bring along inherent costs. This holds both for the design of next generation aircraft concepts, for example strut-braced wings with increased wing's slenderness, as well as new designed conventional aircraft components. The latter is often a major challenge for tier one and two suppliers that do not have the overview of the total aircraft system which is needed to understand the aeroelastic behavior. Their component optimization process affects the aeroelastic behavior of the entire aircraft system and is therefore critical when included in the overall design. This paper provides an overview of the work done at the Netherlands Aerospace Centre in various design phases of the aircraft going from conceptual design using methodologies for fast aeroelastic modelling to detailed design incorporating correction factors used from higher fidelity tools.

Keywords. Aeroelasticity, Aircraft Design, Flutter, Loads