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Title

A multidisciplinary modeling system for aircraft structural components

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Abstract

Tier 1 suppliers like GKN Fokker need to have the ability to rapidly respond to new customer requests for aircraft component trade studies and exploit product optimization opportunities [1]. New market opportunities such as electrical, hydrogen and Urban Air Mobility (UAM) platforms have recently increased the need for a rapid and agile product development process. To support this GKN Fokker is working towards a high level of multidisciplinary design and analysis automation and the application of Multidisciplinary Design Optimization (MDO) and Design Space Exploration (DSE) techniques. In [2] the Knowledge Based Engineering (KBE) application *MoveableGenerator* was introduced: an application for defining and analyzing aircraft moveable structures. This paper presents advancements that have been made since that publication and introduces the larger framework that application is part of: the Multidisciplinary Modelers (MDM) package.

MDM is a Python based package built using the Parapy KBE platform [3] that enables the construction of executable central product models for wing-like structures such as the *MoveableGenerator*, *FlapGenerator* and *WingboxGenerator*. These generator applications are constructed using generic software building blocks or primitives such as the Spar, Rib, SkinPanel and Joint classes. Disciplinary models (e.g. cost, mass, FEM) are linked at both the main application level and the primitive level [2]. Some of the main extensions presented in the full paper are the setup of the flap and wingbox generators, integration of stress analysis methods, addition of features such as joints, holes, panel breakers, a mesh model and an interface to the Abaqus FEM solver.

MDM applications are currently being used to generate input for aircraft trade studies at GKN Fokker and in research programs: in the AGILE4.0 project in a distributed workflow to generate flap designs [4], coupled to a requirements framework [5] and in the DEFAINE project to automatically generate moveable designs [6]. The approach to perform architecture optimization on a moveable is presented in [7]. Next steps include the development of a fuselage generator model [8], a tip-to-tip wingbox model and integration in an architecture optimization framework.

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