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CAD-Centric Aircraft Design

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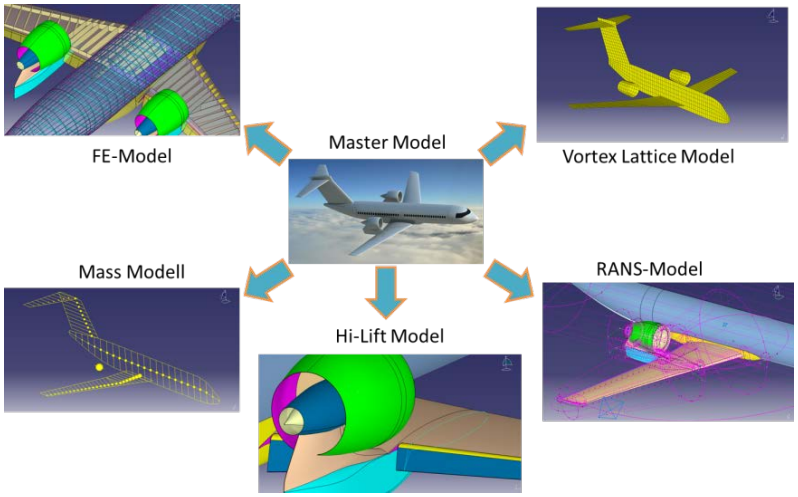
High-end parametric Computer Aided Design systems have become a cornerstone in today's aircraft design and high fidelity simulation and optimization chains rely more and more on the input from a CAD system. For high fidelity CFD simulations based on solving the RANS equations a watertight fluid volume, which encloses a detailed geometry, i.e. the aircraft, is required while for lower fidelity CFD calculations solely planforms have to be provided.
In parallel to the classical approach of starting a new design with a rough geometry description using lower fidelity simulations, a new trend in aircraft industry towards high fidelity simulations in early design phases can be observed. For those mixed-fidelity design approaches a central geometry model, which contains the necessary geometrical input for all relevant simulations, has become an important issue.
In the present approach at first the master model concept from CAE has been adopted and secondly extra CAD-models, which were derived from the master model geometry and which are associated with the master model are used to support simulation chains of different fidelity levels and different disciplines with the necessary geometry input.



The final paper will address several aspects from the modelling of parametric aircraft CAD models and their transition to simulation via additional context models. These context models are created with the CAD system and contain surfaces to define a far-field for CFD or ribs for CSM or curves to serve as block-edges in a structured grid generator. There are also simulation tools in use, which have their own geometry generator and which rely on point distributions in wing- or fuselage cross-sections in a certain format. Finally, to link these tools to a CAD-centric design optimization process specific macros have been developed.