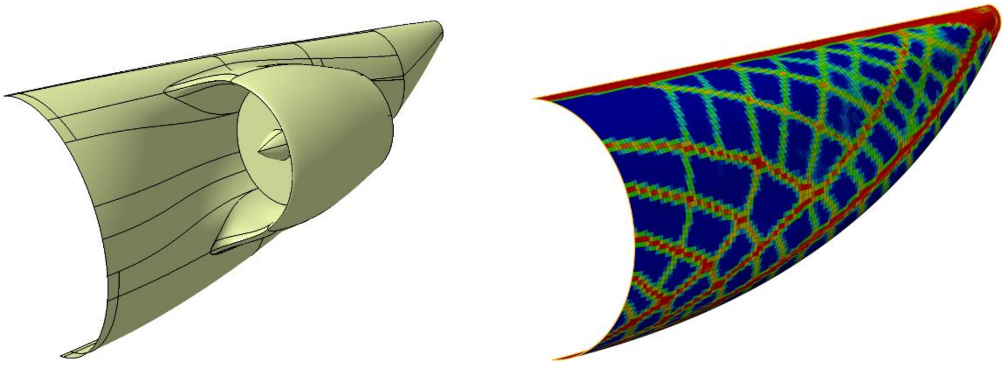
# Thesis (Bachelor / Research Project / Master)



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| **Themenbereich** | **Structural topology optimisation for highly integrated engines at the rear fuselage** |
| **fachliche Schwerpunkte** | FEM, structural optimisation, design automation |
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| **Voraussetzungen** | FEM fundamentals are helpful<br>Basic programming skills (for example Python) are helpful<br>Independent way of working |

With the major goal of climate-neutral flying, we are exploring potentials and synergies through highly integrated aircraft development. One approach is the integration of the engines into the rear fuselage to enable boundary layer ingestion and potentially also reduce structural weight (top left image). In this context, the influence of the engine position on the structural weight is investigated.

The aim of this thesis is to determine the optimal design of stiffeners on the fuselage skin using structural topology optimisation methods. A popular algorithm that can be used is the Solid Isotropic Material with Penalisation (SIMP) method (top right image). The design of the stiffeners should be automatically optimised for different engine positions, materials and load cases (manoeuvres and thermal loads), taking into account buckling and/or manufacturing constraints. Altair OptiStruct can be used for this purpose.

Summary of the steps involved:

- Literature research and comparison of methods for topology optimisation of stiffened skin panels
- Execution of topology optimisation of the rear fuselage for different engine positions, materials, load cases considering buckling and/or manufacturing constraints (for example with Altair OptiStruct)
- Investigation of the automation possibilities of the design process
- Analysis of the influence of the engine position on the structural weight