High-Fidelity Static Aeroelastic Simulation of Wing Using a Coupled CFD–FEM Solver

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Abstract. Designing modern flexible wings requires an integrated approach to optimizing aerodynamic shape and structure. However, models optimised using low-fidelity solvers often cannot be directly transferred into a high-fidelity framework due to differences in model geometry, aerodynamic and structural solvers and coupling mechanisms. This discrepancy leads to unreliable optimisation of complex structures, particularly for unconventional wing configurations. This paper presents software for static aeroelastic calculations of FEM wing models using aerodynamic loads input provided by CFD solver. The numerical models were implemented in ANSYS Mechanical and ANSYS Fluent. The research model is a transonic fibreglass wing designed for wind-tunnel testing of aeroelastic response. Validation of the aeroelastic solver was performed by numerical comparison of the resulting FSI loads with aerodynamic loads generated by the deformed wing from the last FSI iteration.