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VALIDATION OF FINITE-ELEMENT MODEL OF MALE UAV COMPOSITE WING WITH EXPERIMENTAL STATIC BENDING TEST

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Abstract. *With the increasing use of finite element (FE) analyses in the aerospace field to ensure structural safety, it is mandatory to have active validation practices to increase the reliability of the computational model simulations. This works presents a comparative study between experimental data obtained from a static bending test of a 12-meter span UAV composite wing with numerical simulations from a high-fidelity FE model using a commercially available FE analysis software. The wing failure indices and displacement contours were extracted from the simulations and compared against the measured deformation of the wing in the experimental test for five load cases. Several differences were found, including the wing failure for the last load condition, which highlight not only the importance of continuous validation procedures of the computational model but also the use of safety factors during the different structural design stages. In particular, a simulation-only approach should be avoided and adequate safety factors used when sizing critical aircraft components such as the wing. Some suggestions are emphasized to further improve upon the presented FE model, including the use of non-linear analysis, adequate mechanical material characterization, closer-to-reality geometry taking into account manufacturing, and load and displacement boundary conditions application. Ultimately, this work provides guidelines on how to improve the reliability of FE analysis and highlights the differences that can be found between simulations and reality.*