

PRACTICAL PROBLEMS OF NUMERICAL OPTIMIZATION IN AEROSPACE SCIENCES

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Abstract: Design processes of aircrafts are well established today and described by numerous positions in literature. This well understood and safe path leads to aircraft designs, which become very similar. It is harder then ever to achieve competitive construction. This is why numerical optimization is becoming standard tool during the design process. Although, optimization procedures are becoming more mature, in the industry practice still fairly simple examples of optimization are present. The more complicated is the task to solve the harder it is to implement automated optimization procedures. The paper presents practical examples of optimization in aerospace sciences. Encountered problems during the optimization are presented, solutions of the problems are shown and resulting consequences are discussed.

Practical numerical optimization in aerospace is most often multidisciplinary. Combining few scientific disciplines Fig. 1 is always demanding and computationally expensive. Designers and optimization code developers, where the author of the article has experience [1, 2], always seek for the way to speedup the computations. Generally there are few possible ways for improvement: more efficient optimization algorithms (mathematical operations), faster analysis of the objective function by the simulation programs and reduction of number of the objective function analysis to reach the optimum. In the process of improving the computational efficiency one can forget about the quality of the obtained optimum. This can have significant implications on the final designed product.

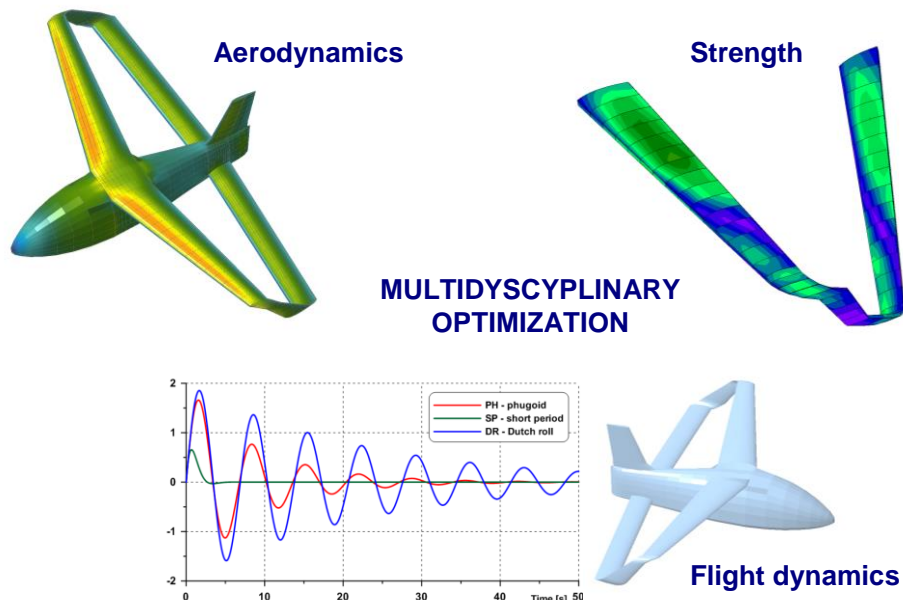


Fig.1 Example of combining many scientific disciplines in optimization.

References:

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- [2] Goetzendorf-Grabowski T. Mieloszyk J., Mieszalski D. "MADO – SOFTWARE PACKAGE FOR HIGH ORDER MULTIDISCIPLINARY AIRCRAFT DESIGN AND OPTIMIZATION" Proceedings of 28th International Congress of the Aeronautical Sciences, Melbourne, 2012