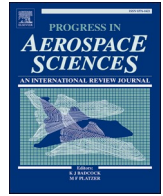


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Enhancing optimization capabilities using the AGILE collaborative MDO framework with application to wing and nacelle design

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ABSTRACT

This paper presents methodological investigations performed in research activities in the field of Multi-disciplinary Design and Optimization (MDO) for overall aircraft design in the EU funded research project AGILE (2015–2018). In the AGILE project a team of 19 industrial, research and academic partners from Europe, Canada and Russia are working together to develop the next generation of MDO environment that targets significant reductions in aircraft development costs and time to market, leading to cheaper and greener aircraft. The paper introduces the AGILE project structure and describes the achievements of the 1st year that led to a reference distributed MDO system. A focus is then made on different novel optimization techniques studied during the 2nd year, all aiming at easing the optimization of complex workflows that are characterized by a high number of discipline interdependencies and a large number of design variables in the context of multi-level processes and multi-partner collaborative engineering projects. Three optimization strategies are introduced and validated for a conventional aircraft. First, a multi-objective technique based on Nash Games and Genetic Algorithm is used on a wing design problem. Then a zoom is made on the nacelle design where a surrogate-based optimizer is used to solve a mono-objective problem. Finally a robust approach is adopted to study the effects of uncertainty in parameters on the nacelle design process. These new capabilities have been integrated in the AGILE collaborative framework that in the future will be used to study and optimize novel unconventional aircraft configurations.

1. Introduction

OVER the past century, the aircraft design and development process

has evolved from pioneering - one or few people building a simple and small aircraft in a shed - into a highly complex but well-established engineering process. Today, aircraft are highly advanced technological and competitive products that are developed by multidisciplinary teams

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