# Optimization in industrial contexts in a nutshell !

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**Mots-clefs :** Engineering, optimization, applications

As it is very well known, modeling and simulation (M & S) activities support more and more decision-making processes in the industrial domain. In the aeronautical sector, real test campaigns are scarce, and thus it is key to optimize the main performances by advanced numerical methods all along the design cycle. This is of course not only a matter of advanced algorithmic resolution nor access to a big High Performance Computing capability. The daily difficulties lie in the precise modeling of an optimization or a set of optimization problems, the knowledge gap between optimization experts and field engineers, the complexity of industrial organisations that decouple the different ingredients of an optimization problem and the practical difficulties to get access to models and data in a common interoperable environment. In parallel, concepts such as "robustness", "complex systems", "system engineering", "collaborative environment", "maturity of data", "fidelity of models" are used by engineers to describe their working environment.

We will first describe the main challenges associated to the engineering activities around optimization all along the design cycle of a complex system. This will be illustrated by the results obtained during the recent years in different areas: topological optimization, multi disciplinary optimization, robust optimization, mixed-integer programming. Then, based on these results, we will draw some perspectives over coming challenges in aeronautics.