

Rotorcraft Performance and Environmental Impact Evaluation by Multidisciplinary Modelling

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Abstract : Rotorcraft provides invaluable services thanks to their Vertical Take-Off and Landing (VTOL), hover and low speed capabilities. Yet their use is still often limited by their cost and environmental impact, especially noise and energy consumption. One of the main brakes to the expansion of the use of rotorcraft for urban missions is the environmental impact. The first main concern for the population is the noise. In order to develop the transversal competency to assess the rotorcraft environmental footprint, a collaboration has been launched between six research departments within ONERA. The progress in terms of models and methods are capitalized into the numerical workshop C.R.E.A.T.I.O.N. "Concepts of Rotorcraft Enhanced Assessment Through Integrated Optimization Network". A typical mission for which the environmental impact issue is of great relevance has been defined. The first milestone is to perform the pre-sizing of a reference helicopter for this mission. In a second milestone, an alternate rotorcraft concept has been defined: a tandem rotorcraft with optional propulsion. The key design trends are given for the pre-sizing of this rotorcraft aiming at a significant reduction of the global environmental impact while still giving equivalent flight performance and safety with respect to the reference helicopter. The models and methods have been improved for catching sooner and more globally, the relative variations on the environmental impact when changing the rotorcraft architecture, the pre-design variables and the operation parameters.

Keywords : environmental impact, flight performance, helicopter, multi objectives multidisciplinary optimization, rotorcraft

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