# Flow control at trailing edge of wings and profiles: an overview of the AFLoNext project

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## Abstract

This paper will present the main results of the aerodynamic design and analysis for flow control applied to trailing edge of wings and profiles, conducted in the framework of the European project AFLoNext. Numerical simulations, parametric investigations and optimisations are performed on 2D and 3D test cases. High-speed and low-speed conditions are considered, in order to investigate a transonic and a high-lift configuration. Trailing edge devices (TED) such as fluidic Gurney flaps or micro-jets for circulation control are used for assessing the possibility of delaying the buffet onset or increasing the maximum achievable lift, thus extending the flight envelope of an aircraft.

The partners involved in the project focussed on the numerical assessment of the flow-control devices and their effect on a reference configuration. The numerical simulation is a central part of this collaborative project, and is used to understand both the flow-field inside a control device and the impact on the total aerodynamic field in each considered case. Parametric investigation is used to assess the effect of the control-device location on the global system, while optimisation is applied in order to assist the design of the actuator and define its geometric characteristics. Part of the work was also dedicated to numerical simulations with the goal of assisting wind-tunnel tests that will be performed in other work packages of the same project.

The full-length paper will proceed as follows: first, a numerical benchmark is presented, where the partners evaluated the performance of their code by comparing RANS results on cases with and without flow control against an existing experimental database. The benchmark includes a 2D profile with TED and a half wing-body configuration equipped with a 3D slot acting as a fluidic Gurney flap on the outer part of the wing. Figure 1 presents a comparison between the results of all partners, showing on the left hand side the pressure distribution on the 2D profile. On the right hand side, a section of the 3D model is presented, with the Mach number iso-contour showing the flow field on the wing. The effect of the TED is clearly visible.

Secondly, the paper will present the results of the parametric investigation performed to evaluate the impact of TED position, orientation and momentum on the aerofoil forces. Concerning the

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