SYSTEM NOISE ASSESSMENT OF AN AIRCRAFT WITH COANDA FLAPS

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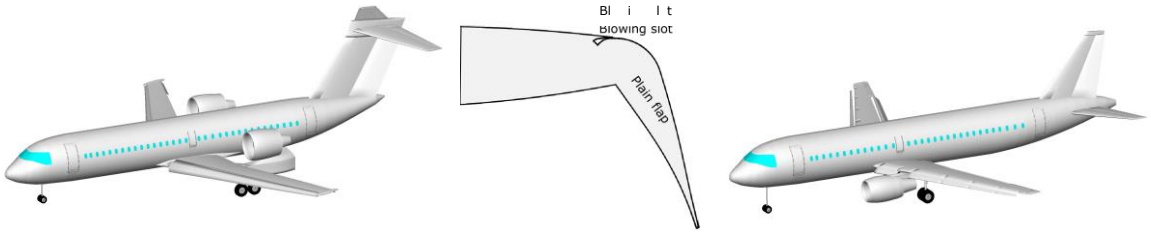
An up-to-date 100-seat passenger aircraft of the Collaborative Research Centre *SFB 88o* is the REF3, see Fig. 1 (a). This aircraft features a new active high-lift system, which is comprised of a droop-nose and a so-called Coanda flap. The Coanda flap is a plain flap which provides very high deflection angles. To prevent flow separation, a very thin jet is ejected in front of the curvature.

Compared to a conventional aircraft, the new aircraft offers noise reduction at the source, primarily due to the removal of the noisy slat. Furthermore, the active high-lift system offers increased lift coefficients, enabling reduced landing and take-off speeds. Due to the lower speeds, the airframe noise is reduced, which is particularly important during approach when the engine is at low thrust levels. Furthermore, the landing and take-off runway is decreased. This benefits the noise during take-off, as the aircraft can start to climb earlier. The high lift coefficients of the active system also offer new low-noise trajectories. Further noise reduction can be expected due to an advantageous engine location, offering engine noise shielding to the front.

This publication focuses on the qualitative noise reduction potentials of the REF3 during approach when compared to a conventional aircraft KON1V1, see Fig. 1 (b). As individually designed low-noise trajectories are not yet available, both aircraft are compared on a Continuous Descent Approach where the final segment is a 3°glidepath. In a first step, the aircraft are compared with the same landing speed. Next, the *REF3* is evaluated with reduced landing speed, making use of its high lift coefficients. The aerodynamics are provided by the preliminary aircraft design and optimization tool PrADO.



(a) REF3 (b) Coanda Flap (c) KON1V1

Figure 1: *SFB88o* aircraft

The overall aircraft noise on the ground is predicted using DLR's aircraft noise prediction tool PANAM. This tool is comprised of several parametric noise source models for the major noise sources, i.e. engine, leading-edge device, trailing-edge device, control surfaces and landing gear. The noise of REF3's droop-nose can be predicted using research results from literature. A model for the Coanda flap, however, does not exist. In order to evaluate the qualitative noise reduction potentials it is shown that the Coanda flap noise can be estimated with the conventional Fowler flap noise source model. The required input for PANAM can also be provided by PrADO.

The results show that significant airframe noise reduction may be achieved close to the airport. However, for a standard glidepath of 3°, the reduction in airframe noise is eliminated by the engine noise as the drag increases significantly when the Coanda flap is deflected.