

Abstract – presentation slides withdrawn

CROR Installation Effects on Noise

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The Contra-Rotating Open Rotors (CROR) are being studied intensively by Airbus, engine manufacturers and the research community as they could represent a solution to decrease the fuel consumption of medium range aircrafts of about 10% compared to turbofan engines of the same generation. This is attractive versus operating cost (especially if oil price increases) and environmental considerations. However this propulsion system is potentially noisy and a special care of acoustic design and integration has to be taken to meet future community noise requirements, ensure acceptable cabin noise and mitigate en-route noise risks.

The aeronautic community consequently investigates the CROR noise to understand the physics of its generation, and the possibilities to reduce it. A large influence on noise is due to the so called installation effects. These are of both kinds, the aerodynamic installation effects (modification of the aerodynamics of the CROR by the aircraft body) and the acoustic installation effects (noise reflection and refraction on the aircraft). They differ between the aircraft pusher (CROR at rear fuselage) and puller (CROR in front of wings) configurations. For the pusher configuration, the fuselage and the pylon wake can modify the CROR aerodynamics and noise generation. The presentation will show how these effects are reduced, especially using pylon boundary layer blowing. For the puller configuration, the wing upwash modifies the CROR inflow and consequently the noise. The directions of rotation of the CROR on the left and right hand sides of the aircraft influence also the noise emission and the various possibilities will be compared.

The presentation will give an overview of known CROR-installation-effects on noise and assess some of them using numerical simulations or wind tunnel tests. The road-map as seen by Airbus towards the aeroacoustic design of a CROR powered aircraft for an entry into service in 2025 will be shown.