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ACOUSTIC ASSESSMENT OF TWIN-ENGINED TURBOPROP LAYOUTS

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Turboprop aircraft are fuel efficient on short and medium range flights but their noise emissions are higher than future aviation targets and standards. The flow solver HMB3 is employed to analyse the near sound field of a full-scale twin-engined turboprop to assess the quietest installation layout. Co-rotating and counter-rotating configurations are considered, as well as propeller synchrophasing. The eight-bladed IMPACTA propeller is used for this research, and cruise operating conditions are assumed. Overall sound pressure levels on the fuselage exterior surface are evaluated directly from the CFD solution. Cabin noise is estimated through experimentally-obtained transfer functions.

The employed method showed marked differences among the various installation options, capturing the complex acoustic field generated by the propellers and underlying the need of simulating the whole airframe for accurate predictions.
Synchrophasing on a co-rotating propellers aircraft appears to be acoustically beneficial, especially regarding the interior sound. However, the noise reduction provided by a counter-rotating layout with inboard-down rotational direction is larger. The inboard-up rotational direction shows louder noise levels because of inflow conditions and the occurrence of constructive acoustic interferences between the sound-waves of the two propellers and those generated by the airframe.

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