AERO-ACOUSTIC EXPERIMENTAL IDENTIFICATION OF FEEDBACK MECHANISMS DUE TO HVAC COMPONENTS

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ABSTRACT

The Heating Ventilation and Air Conditioning (HVAC) system of a car has to provide air flow to ensure the passengers comfort regarding the temperature inside the vehicle cabin without damaging the acoustic environment. The acoustic sources are mainly produced by the blower and by the interaction between a low Mach number flow and the elements located in a duct. A research program CEVAS was conducted under the leadership of Valeo to develop a tool to design low noise car HVAC. The acoustic laboratory of the University of Technology of Compiègne (UTC) was in charge of the experimental and theoretical characterization of the aeroacoustics sources. With the experimental 2N-ports method, measurements of the scattering matrix and of the aero-acoustic power spectrum of the aero-acoustic sources are performed. The existence of fluid-resonant feedback mechanisms responsible for high level tones radiated sound power are identified and discussed for a butterfly flap and two diaphragms in tandem, the latter representing the association of HVAC elements.