



Identifiant de la contribution : 281

Type : non spécifié

JISFA4#2 - Overview of Onera acoustic active control activities in helicopter cabin

mercredi 12 juillet 2023 14:20 (20)

Within a helicopter cabin, passengers are in close proximity to disturbing sources that contribute to interior noise: main and tail rotors, engines, main gearbox and aerodynamic turbulence. These sources generate bending vibrations of the entire tail boom, induced vibrations in the cabin at blade passing frequencies, transient vibrations of rotor blades and structure borne noise induced by gear meshing within gearboxes. Conventional passive systems, as trim panels or passive anti-resonance isolation systems, are still the main way to control the cabin noise. Nevertheless, (semi-)active control techniques have been the subject of numerous studies for decades, especially to improve the performance of passive concepts in low frequencies. Unfortunately, many turned out to be unreliable or completely inapplicable because problems of robustness, time convergence of algorithms, but also a difficult identification of optimal locations for actuators and sensors or a high added mass and electrical power. The objectives of this paper is to describe in details the research projects in active noise control carried out at Onera since the 1990s, i.e. from numerical modeling and laboratory tests to flight tests in helicopter cabin. This overview will feed into the reflection on the renewal of active vibro-acoustic control within different laboratories.

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Classification par session : JISFA 4 / Passive and Active Control of Aeronautical Noise