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Journal of Research and Development

ISSN: 2311-3278

Perspective

Development of Air Craft Engines to Reduce Acoustic Noise in Engine

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DESCRIPTION

In the last few decades, air travel has expanded rapidly tremendously. The inconvenience of jet noise, especially near airports, is rapidly increasing as global air traffic continues to expand. As a result of the resulting environmental concern, aircraft noise reduction has become a challenge. The minimisation of aircraft noise has progressed steadily in two directions: aero-engine noise and airframe noise.

Since the introduction of the turbofan engine in the 1970s, and the use of high bypass ducts and serrated nozzles, the main source of aircraft noise has gradually shifted from the engines to the airframe during the landing phase, when the engines are operating at low power and the high-lift devices and landing gears are fully deployed.

Types of air craft engines

- Turboprop Engine
- Turbojet Engine
- Turboshaft Engine
- Turbofan Engine
- Ramjet Engine

Aircraft noise technologies

- Even at departure, jet noise is a secondary noise source for current large aircraft, Single Aisle and Twin Aisle, with fan noise dominating. The noise from the jet may still dominate at departure for smaller aircraft, such as business jets and small regional jets, as it does for many older aircraft.
- Jet noise has been minimized by decreasing jet velocity to maximize fuel burn, but because jet noise is now a secondary source of noise, additional fuel burn improvements will not result in significant noise reductions.
- At arrival, airframe noise, primarily from the landing gear, is the most prominent noise source for modern large aircraft. Potential airframe noise reductions are highly dependent on aircraft type, design, and operational characteristics, and their implementation will be constrained by a number of factors.
- As engines become larger in proportion to aircraft, resulting in a reduced fan pressure ratio, it becomes increasingly vital for the engine and the aircraft to be developed as a single unit. The aircraft's optimization should include acoustic design as well as fuel-burn and emissions-minimization design.
- Acoustic wall treatment is a vital technology for minimizing fan noise, and liners in the inlet and bypass ducts provide crucial attenuation. Work on optimizing liner performance continues, but maintaining current levels of liner attenuation will be difficult given the incentives to lower nacelle length and make the intake and bypass ducts shorter in ratio to diameter for fuel burn reasons.

The possible additional benefits of acoustic design optimization will need to be properly evaluated, as the scope for noise technology reductions of the typical tube and wing structure, particularly in big aircraft, now appears to be restricted. Novel configurations, or even some highly sophisticated tube and wing combinations, may present new potential for noise reduction, but they will also present significant things of a different sort that must also be addressed.

Technologies used

The airframe noise carried on by airflow through the landing gear during approach was addressed by the Landing Gear Noise Reduction technology feature. The NASA-tested experimental landing gear has front fairings that are porous, or made up of lots of tiny holes that partially let air flow through them while also deflecting some of the wind surrounding the landing gear.

CONCLUSION

In an effort to reduce aviation noise, NASA has tested three novel noise-canceling technologies on a number of Acoustic Research Measurement (ARM) flights. NASA effectively decreased airframe noise by more than 70% by combining three technologies: adaptive compliant trailing edge flexible wing flap, landing gear noise reduction, and landing gear cavity treatments. Not the engines, but the wind rushing through the aircraft's structure when it lands causes airframe noise. For communities that live close to airports, the noise reduction technology will aid.

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Received: 25-Feb-2022, Manuscript No. JRD-22-18070; **Editor assigned:** 02-Mar-2022, PreQC No. JRD-22-18070(PQ); **Reviewed:** 16-Mar-2022, QC No. JRD-22-18070; **Revised:** 23-Mar-2022, Manuscript No. JRD-22-18070(R); **Published:** 30-Mar-2022, DOI: 10.35248/2311-3278.22.10.183.

Citation: Smetankinac N (2022) Development of Air Craft Engines to Reduce Acoustic Noise in Engine. J Res Development. 10:183.