NASA's Aeroacoustic Tools and Methods for Analysis of Aircraft Noise

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Abstract

Aircraft community noise is a significant concern due to continued growth in air traffic, increasingly stringent environmental goals, and operational limitations imposed by airport authorities. The ability to quantify aircraft noise at the source and ultimately at observers is required to develop low noise aircraft designs and flight procedures. Predicting noise at the source, accounting for scattering and propagation through the atmosphere to the observer, and assessing the perception and impact on a community requires physics-based aeroacoustics tools. Along with the analyses for aero-performance, weights and fuel burn, these tools can provide the acoustic component for aircraft MDAO (Multidisciplinary Design Analysis and Optimization). Over the last decade significant progress has been made in advancing the aeroacoustic tools such that acoustic analyses can now be performed during the design process. One major and enabling advance has been the development of the system noise framework known as Aircraft NOise Prediction Program2 (ANOPP2).

ANOPP2 is NASA's aeroacoustic toolset and is designed to facilitate the combination of acoustic approaches of varying fidelity for the analysis of noise from conventional and unconventional aircraft. The toolset includes a framework that integrates noise prediction and propagation methods into a unified system for use within general aircraft analysis software. This includes acoustic analyses, signal processing and interfaces that allow for the assessment of perception of noise on a community. ANOPP2's capability to incorporate medium fidelity shielding predictions and wind tunnel experiments into a design environment is presented. An assessment of noise from a conventional and Hybrid Wing Body (HWB) aircraft using medium fidelity scattering methods combined with noise measurements from a model-scale HWB recently placed in NASA's 14x22 wind tunnel are presented. The results are in the form of community noise metrics and auralizations.

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