GARTEUR GROUP FOR AERONAUTICAL RESEARCH AND TECHNOLOGY IN EUROPE

FRANCE GERMANY ITALY THE NETHERLANDS SPAIN SWEDEN UNITED KINGDOM

AD/AG-50: Effect of open jet shear layers on aeroacoustic wind tunnel measurements

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The Background

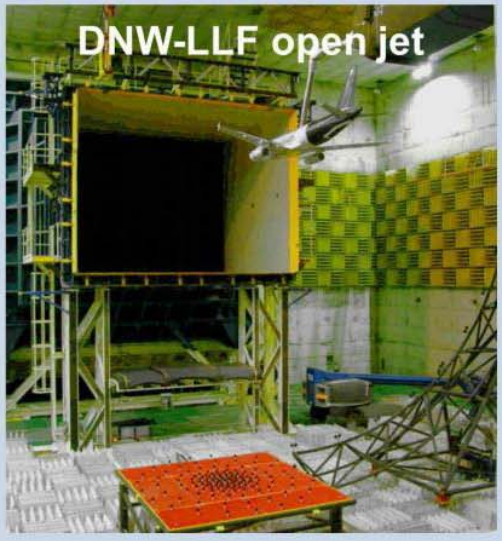
Aeroacoustic wind tunnel tests are typically conducted in open jets
Sound propagates through shear layer

Shear layer causes refraction, spectral broadening and coherence loss
These effects complicate interpretation of test results (e.g. identification of open rotor tones)

Shear layer effects depend on frequency, wind speed, and source position

Currently most groups only correct for shear layer refraction, using ray-acoustics approximation

Challenge
Understand shear layer effects and develop correction methods or reduction concepts



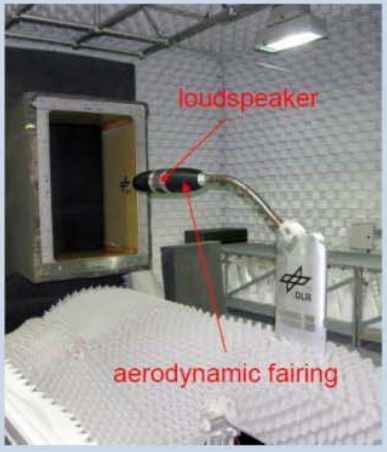
The Programme

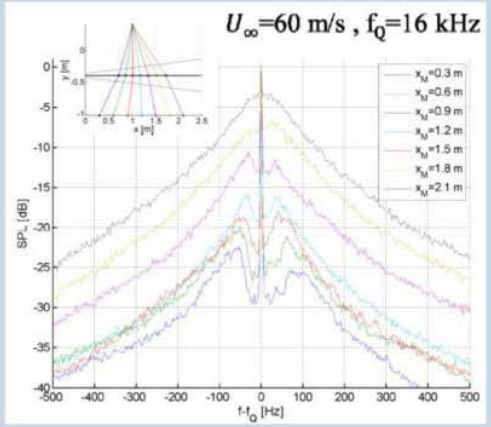
Objectives of AD/AG-50
- To improve the understanding of shear layer effects;
- To quantify the magnitude of shear layer effects, including the dependence on different parameters;
- To develop procedures to correct for shear layer effects;
- To investigate the possibilities to reduce shear layer effects.

Approach
- Experiments with calibration sources in different wind tunnels
- Benchmark computations using existing correction methods
- Advanced computations to improve understanding

Partners
Airbus, CIRA, DLR, NLR, ONERA, University of Southampton

Project duration: 1 January 2010 – 30 April 2013



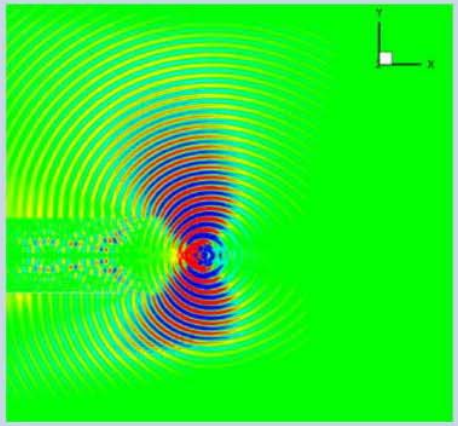


The Outcomes

Wind tunnel experiments
- Quantification of spectral broadening as a function of wind speed, frequency and source position
- Better understanding of mechanisms through turbulence measurements
- Methods to retrieve correct acoustic energy of tones measured outside shear layer

Computations
- Existing analytical correction methods were benchmarked
- Advanced numerical methods were developed and compared to benchmark cases
- CAA calculations including spectral broadening
- Comparison to experiments

AD/AG-50 improved the quality of aeroacoustic wind tunnel testing



AIRBUS CIRA DLR NLR ONERA UNIVERSITY OF Southampton Institute of Sound and Vibration Research