Actran™ AeroAcoustics
Simulation Tool for Complex Flows Noise

Key Features
- All Actran Acoustics features (see dedicated flyer)
- Hybrid aero-acoustic approach: CFD followed by acoustic radiation
- Direct interface to most leading CFD codes using native CFD file formats, or through Ensight™ Gold format
- Lighthill analogy and Möhring analogy for retrieving aeroacoustic sources from CFD results
- Conservative integration technology for source mapping from CFD mesh to acoustic mesh
- Fan noise prediction based on transient CFD solution or less costly CFD solutions such as MRF & NLH
- Compatible with other Actran modules for aero-vibro-acoustic simulations
- Direct and iterative solvers for reduced CPU times
- Available platforms: Windows 32 & 64 bits, Linux and most Unix platforms
- Integration in Actran VI

Product Overview

Predicting the noise generated by complex flows

Actran AeroAcoustics is a finite element based acoustic solver for predicting the noise generated by turbulent flows. Actran AeroAcoustics retrieves aerodynamic noise sources from flow simulations performed with most of current CFD codes such as Fluent™, Star-CD™, StarCCM+™, Powerflow™, OpenFOAM, etc. The complete simulation procedure involves three steps:

1. A flow simulation is performed by the CFD code. The CFD solution (velocity, density and pressure fields) is stored in its own native format or in the Ensight™ Gold format.

2. Actran AeroAcoustics computes the aero-acoustic noise sources from the CFD results produced in step 1. This involves translating the CFD results from the time to the frequency domain and mapping them from the CFD mesh to the acoustic mesh.

3. The radiated acoustic field is then computed. This produces a wide set of relevant results: acoustic pressure, velocity or intensity maps, frequency response functions of various local (e.g. pressure) or global (e.g. power) quantities.

This multi-step strategy offers several advantages: (1) Each part of the work can be done independently by different engineers, departments or even companies with different responsibilities or skills. (2) A single CFD simulation can feed different acoustic simulations (e.g. with different acoustic treatments). (3) The acoustic mesh does not need to be refined where the aerodynamic structures are small (for instance in the boundary layers). (4) Actran AeroAcoustics can be combined with Actran VibroAcoustics in order to address aero-vibro-acoustic challenges.

On top of the state-of-the-art modeling process, various utilities assure the accuracy of the analysis: integration mapping technique to conserve all necessary CFD information, source filter to avoid spurious sources due to CFD domain truncation, etc.

For fan noise applications, Actran aero-acoustics can rely on CFD inputs from transient compressible analyses (for broadband noise prediction), or from much less expensive MRF or NLH analyses (for tonal noise prediction).
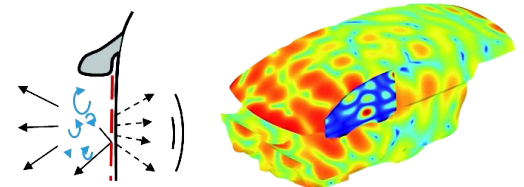
Actran AeroAcoustics offers high performance solvers and parallel processing features and is fully integrated in Actran VI.

Car side window noise
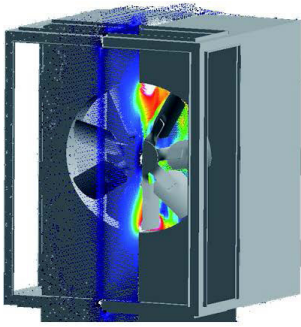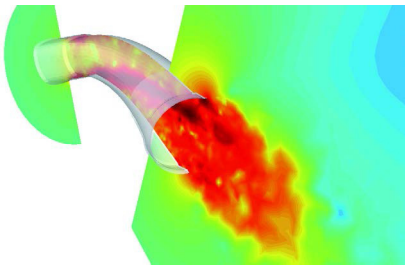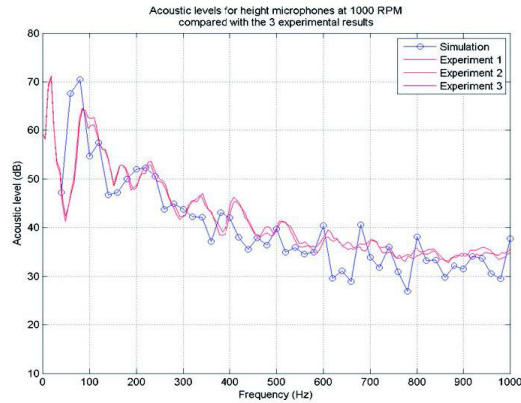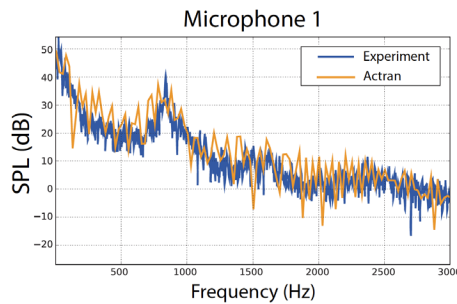Model courtesy of Volkswagen

Target Applications
- Air conditioning modules, HVAC
- Airframe noise: landing gear, trailing edge
- Air distribution systems
- Fan noise
- Vehicle side window noise (requiring Actran VibroAcoustics)

MSC Software

Acoustic levels for height microphones at 1000 RPM compared with the 3 experimental results

Fan noise application.Correlation between Actran AeroAcoustics predictions and measurements.
Model & results courtesy of John Deere

Sound pressure level of air conditioning duct. Correlation between Actran AeroAcoustics predictions and measurements.
Model & results courtesy of Visteon

Computational process overview

Actran Software Suite

Actran is a complete acoustic, vibro-acoustic and aero-acoustic CAE software suite. Empowered by the technologies of finite/infinite element methods (FE/IFE), as well as the Discontinuous Galerkin Method (DGM), Actran provides a rich library of materials, elements, boundary conditions, solution schemes and solvers. Actran is a high accuracy, high performance and high productivity modeling tool suiting the needs of the most demanding engineers, researchers, teachers and students for solving the most challenging acoustic problems.

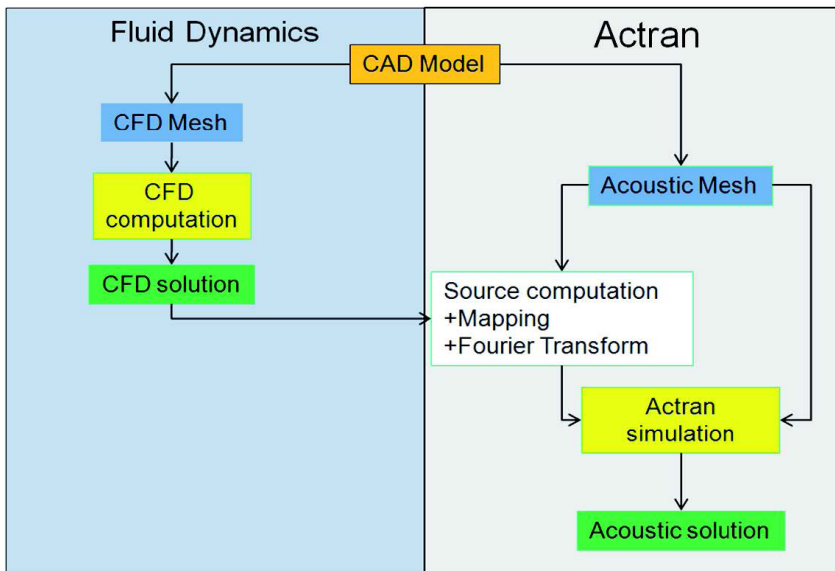## Free Field Technologies (FFT)

Free Field Technologies is focused on three main areas:

- Developing Actran software for acoustic, aero-acoustic and vibro-acoustic simulation;
- Providing technical services, support, training and delivering acoustic engineering projects;
- Researching innovative technologies and methods of acoustic analysis in order to remain the leader in acoustic modeling.

Free Field Technologies has more than 250 customers around the world active in the Automotive, Aerospace, Shipbuilding, Electronic and Heavy Equipment industries as well as in the Educational and Research sectors.

FFT is a wholly owned subsidiary of MSC Software Corporation.

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