

Actran TM

The leading solution for turbomachinery noise prediction



Product overview

A powerful acoustic CAE tool for turbomachinery noise prediction

Actran TM is the reference CAE tool for analyzing the sound radiated by turbomachines and for optimizing the related acoustic treatments. Actran TM is used extensively by many leading aerospace companies that rely on the tools' accuracy, ease-of-use and performance for reaching their strategic acoustic design goals.

Actran TM contains all advanced modeling features required for turbo machinery noise analysis. To capture the important convection and refraction effects, the sound waves propagate on top of a non-uniform background mean flow which can be calculated by Actran or imported from a CFD simulation. The influence of the boundary layer on the performance of acoustic liners is accounted for thanks to the Myers boundary condition.

The acoustic source is defined in terms of incident acoustic duct modes and their amplitude can be defined in a variety of ways (e.g. normalized amplitude, intensity, equal distribution of energy on all propagating modes). Duct modal amplitudes can be also computed from CFD unsteady results thanks to the iTM utility which enables the translation of CFD pressure and / or velocity fields into duct modes filtering spurious data. Ducts of irregular shapes can be modeled too using numerical duct modes.

Both full 3D, semi 3D, 3D angular sector and 2D axisymmetric and 2D models can be defined.

One of the challenges of acoustic CAE is to handle large models associated to high wave number and to large geometrical size and complexity. Actran TM meets this challenge thanks to its efficient solver technology that includes advanced parallel processing. In addition Actran TM includes efficient multiple loads handling. This enables to compute acoustic responses for several independent acoustic duct mode excitations in a single computation.

Actran TM is used not only for optimal aircraft engine nacelle liner design but also on inlet and outlet liners designs for helicopter turbines, environmental control systems (ECS) or auxiliary power unit (APU). Actran TM is also used for non aerospace applications like computer cooling system noise and more.

Key features

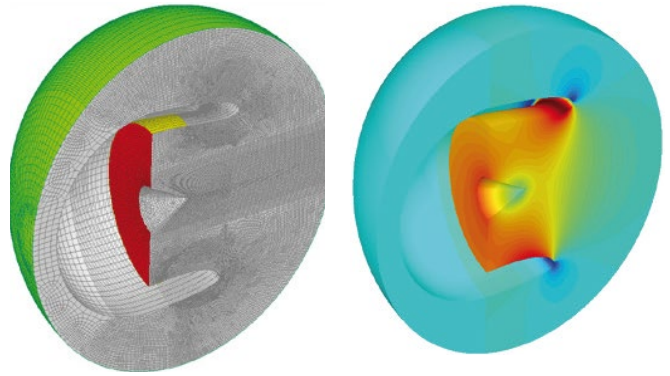
- All Actran Acoustics features (see dedicated flyer)
- Acoustic propagation and radiation in a non-uniform mean flow
- Accurate modeling of liners including the effects of the boundary layer (Myers-Eversman formulation)
- Infinite elements and (A)PML for unbounded domains
- Excitation defined by incident acoustic duct modes with possibility to account for swirl in flow
- Harmonic analysis
- 2D axisymmetric and 3D angular sector, semi 3D and full
- Complete finite element library (tria, quad, tet, hex, penta, pyra, all in linear and quadratic forms)
- Direct solvers for improved efficiency
- Streamlined interface with leading CFD tools, including Cradle CFD, Fluent™, STAR-CCM+™ and Powerflow™ for importing mean flow
- Integrated flow solver for calculating background mean flows
- Duct modal amplitudes computed from CFD unsteady results
- Integration in Actran VI

Actran DGM complements Actran TM in order to solve problems involving complex shear layers, temperature gradients occurring at the engine exhaust and is able to solve larger computational problems at high frequencies (see Actran DGM product sheet).

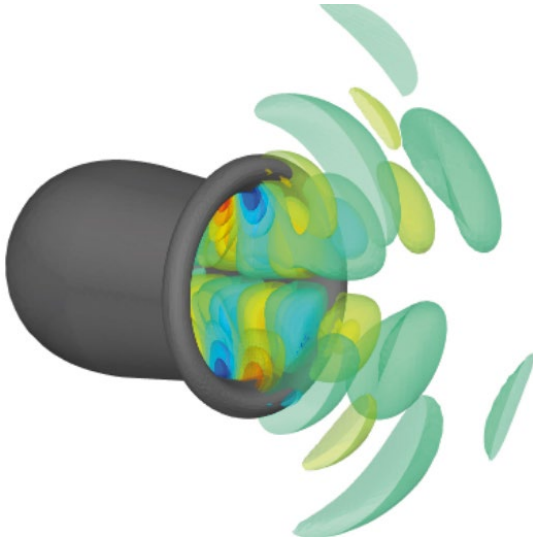


Target applications

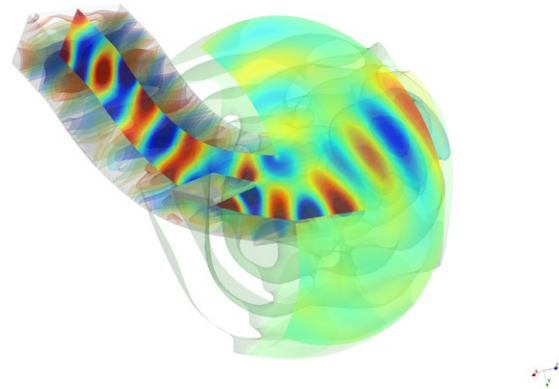
- Target applications
- Aircraft engine noise, including nacelle design and liners optimization
- Ducted cooling systems (electronic devices)
- Blower systems (air conditioning modules)
- Helicopter and rotorcraft engine noise



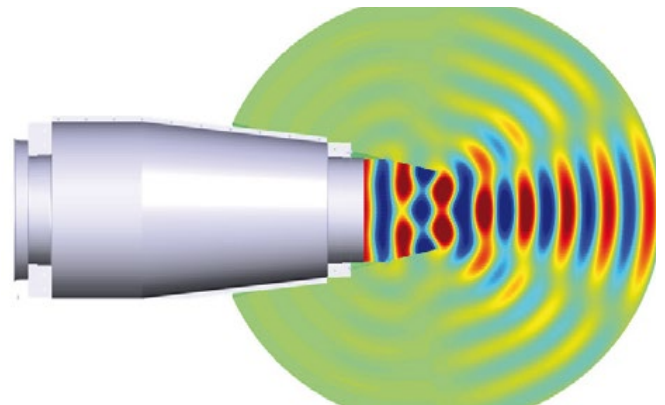
Mesh of a half nacelle model (left) and the associated computed flow magnitude (right) Model courtesy of Airbus



Nacelle duct mode propagation. Model courtesy of Alenia Aermacchi



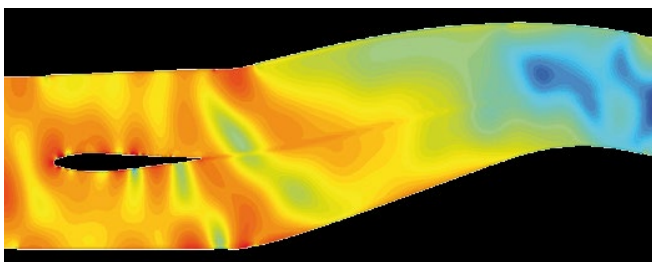
Sound propagation through an APU unit Model courtesy of Airbus



Visualization of the sound directivity generated by an APU exhaust Model courtesy of Airbus

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. the Educational and Research sectors. FFT is a wholly owned subsidiary of MSC Software Corporation.



Influence of a splitter within a bypass duct Model courtesy of Airbus



Acoustic modes propagation from engine nacelles



Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Free Field Technologies (FFT), part of Hexagon's Manufacturing Intelligence division, enables manufacturers to design and optimise products with powerful acoustic, vibro-acoustic and aero-acoustic modelling software and solutions. Learn more at fft.be. Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter.

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