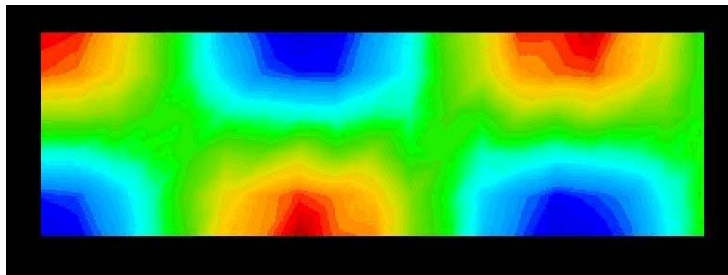


Acoustic-Flow Coupling

Acoustic module



fluidyn-CAF has been specially developed to calculate the acoustic modes in internal flow systems. The acoustic resonance modes may significantly affect coupling with other physical phenomena (vibrations, flows, heat exchanges).

fluidyn-CAF can simultaneously model fluid and acoustic flows. The flow calculations are run under the same conditions as with the software **fluidyn-NS**. Speed and temperature can also be taken into account during the Eigen mode calculations. **fluidyn-CAF** can also propagate acoustic waves in non-homogenous medium.

fluidyn-CAF can also perform vibratory calculations of structures if required.

fluidyn-CAF helps to determine the acoustic eigen modes in internal flow systems. The coupling of **fluidyn-CAF** with other softwares developed by Transoft (flow calculations, structural behaviours, and chemical reactions) helps to predict and solve acoustic resonance problems in these systems.

MODEL SETUP

fluidyn-CAF consists of a pre-processor, solver and post-processor. The solution progress can be monitored manually in case of complex problems. The graphical user interface is completely menu-driven, user-friendly and easy to use. Detailed on-line help is available to rapidly create different simulation conditions.



The development of **fluidyn-CAF** is mainly based on the following criteria :

- **User – friendly features**
Appropriate and specific numerical schemes developed for acoustic calculations
- **Software Modules Integrated**
Integrated graphic functions
Simultaneous access to pre-processor, post-processor and solver with the help of an interactive menu. For example: Results of different scenarios can be compared on the same screen and results of the studies can be determined interactively.
Modularity
To save computational time, a modular structure independent of the solver batch version is available. **fluidyn-CAF** can run on a wide range of platforms including DOS, WINDOWS and UNIX.

GEOMETRY AND MESH GENERATION

The user should first define the computational domain and its characteristics with the help of the GUI and the integrated mesh generator automatically generates the mesh. This helps the user to mesh complex geometries. The same mesh can be used for both fluid and acoustic flows. **fluidyn-CAF** can also import and mesh GIS and DXF files.

NUMERICAL FEATURES

fluidyn-CAF solves the Helmholtz equation using the Finite Elements method. The 2D or 3D finite element model can be reduced by using a succession of acoustic barriers for far field simulation. In cases where large variations of flow parameters are considered (pressure, density, temperature), the Helmholtz equation is accordingly modified. The equation is solved iteratively. The equations are discretized to give a solution in eigen values. A method known as ‘sub-space’ is used to solve the system. In the cases, where the flow speed should be considered, the resulting dissymmetric equations are solved iteratively. The solver uses either the available RAM memory or the hard disk memory if necessary.

USER INTERFACE

The pre-processor consists of the following modules:

- Meshing a geometric entity and its characteristics
- Automatic mesh generator
- Input of physical parameters such as flow velocity, sound velocity, temperature, pressure, density etc.
- View options to help in data input

The post-processor has a multiple viewport facility (upto 30 viewports)

- Mesh plots
- Contour plots of entities, such as acoustic pressure level and velocities
- Section plots to study parametric variation along user-defined planes



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