



# A FLAIR for SIMULATION

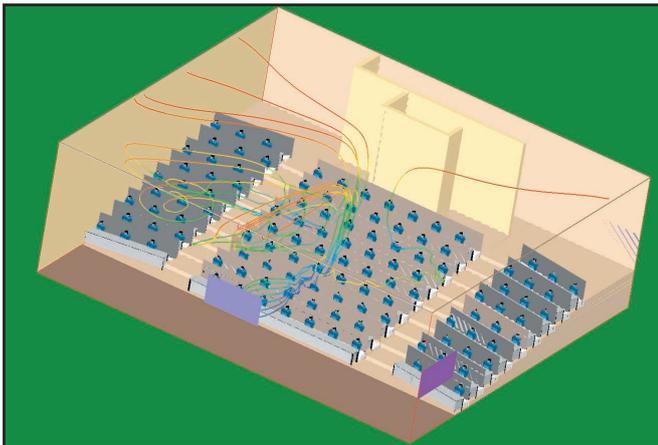
The air-flow design tool for HVAC comfort, economy and safety.



## FLAIR

FLAIR is designed for architects, design engineers and safety officers concerned with the performance of air-flow systems for the built environment. The software is self-contained for both model set-up and the analysis of results.

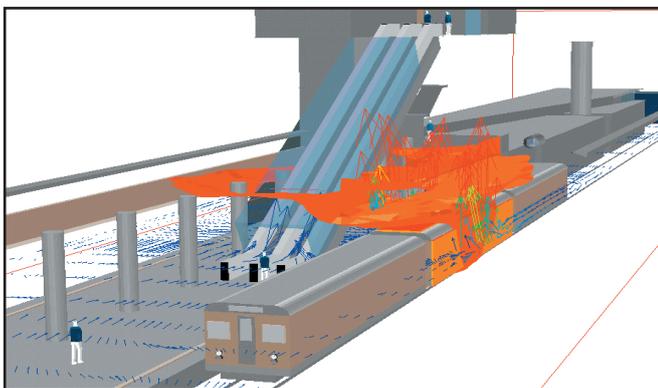
FLAIR enables the user to visualise, evaluate and refine air-flow patterns on a micro- as well as a macro-scale.



*Airflow in a theatre*

### FLAIR applications include:-

- Clean rooms
- Operating theatres
- Sports arenas
- Car parks
- Road and rail tunnels
- Industrial environments
- Residential developments
- Fire safety scenarios
- Pollution control

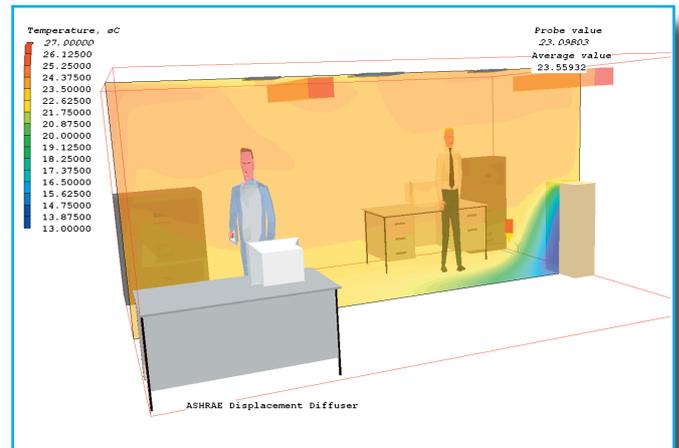


*Fire spread in a train station  
courtesy of LM FlowConsult & M+N Zander*

## A FLAIR for Comfort

With FLAIR you can quickly and inexpensively analyse your design options to:-

- **detect** and avoid uncomfortable air speeds, whether caused by draughts, buoyant motion of air or forced ventilation.
- **predict** the temperature in rooms and other enclosures to avoid hot or cold areas and assess the effectiveness of air conditioning equipment.
- **track** humidity and the motion of dust and other contaminants.
- **follow** dynamic effects as the “intelligent building” responds to the external environment and varying conditions of use.

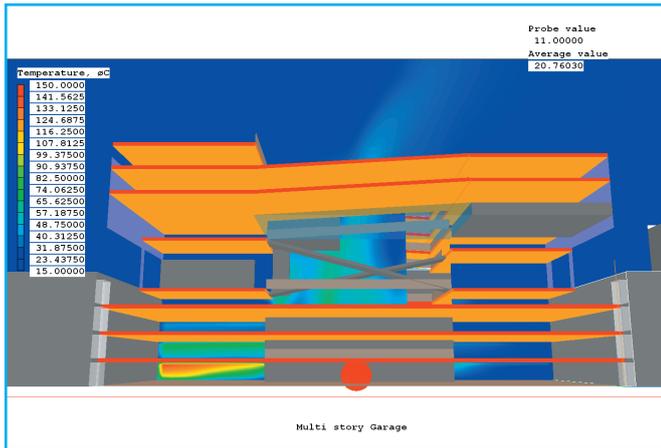


*Variation of Temperature in an office*

Comfort for each occupant lies in achieving a proper balance of four elements: temperature, air flow, humidity and radiation. FLAIR’s “comfort-zone” calculation (ISO 7730) gets the balance right and also provides an index of air quality by providing information on changes-of-air. FLAIR can also help avoid “sick-building syndrome” and other HVAC problems which have haunted modern buildings.

## A FLAIR for Safety

FLAIR can be used to simulate the spread of smoke in buildings and other enclosed spaces. This helps in the design of safe ventilation, smoke-suppression systems and the establishment of personnel-evacuation strategies. Fire officers can use FLAIR to answer “what-if?” questions to allow danger scenarios to be anticipated and thereby avoided.



*Click To Run Animation  
Car park fire simulation  
courtesy of Van Hooft Adviesburo BV*

For industrial plants, clean rooms, hospitals and food factories, FLAIR can be used as a building design tool and as a means of establishing settings for HVAC systems to maintain a contamination-free environment. Processes involving noxious, toxic and radioactive contamination of air can also be handled in a dynamic way.

## A FLAIR for Economy

FLAIR can help designers reduce the capital cost of HVAC systems by avoiding over sizing. Building services operators can use the results of simulations as a guide to HVAC settings that will provide a comfortable environment.

The dynamics of building warm-up and cool-down can be simulated and therefore show the variation in comfort and air quality through the working day.

## Using FLAIR

### Design before you build

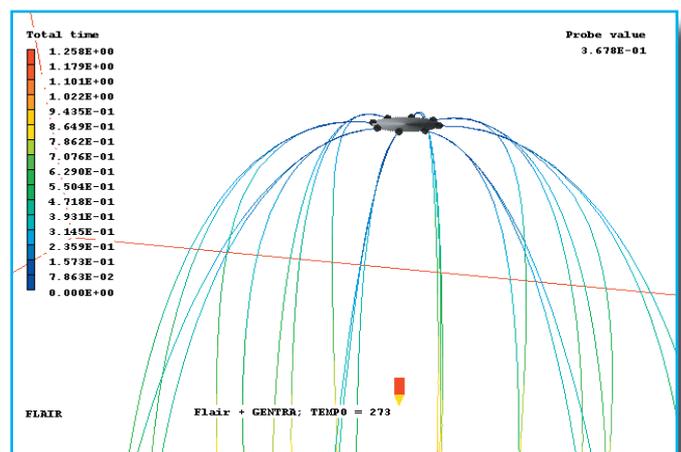
By simulating the environment in advance of building or refurbishment work FLAIR can identify the performance of design decisions before significant costs are committed.

### Easy design changes

With FLAIR the effects of design variations such as the re-positioning of HVAC equipment and structural elements can be quickly checked.

### Complete set of data

FLAIR predicts velocities, pressures, temperatures and smoke concentrations everywhere in the domain being simulated and not just where measuring devices are located. In addition quantities relating to interior comfort are calculated.



*Spray Head*

## Why FLAIR?

### Designed for building-services

The FLAIR user-interface has been specifically tailored for use by architects, HVAC engineers and fire officers. It requires no previous knowledge of the advanced CFD tools on which FLAIR is based.

### Flexible and powerful geometry handling

Accurate representation and easy handling of geometry is a key feature of FLAIR. Three coordinate systems (Cartesian, cylindrical polar and general curvilinear) are available to represent rooms and enclosed spaces of any shape.

### Steady-state and transient analysis

FLAIR can perform both steady state and transient simulations. The steady-state analysis provides the flow pattern under constant (with regard to time) conditions. The transient analysis allows the study of time-varying processes such as room heat-up or the spread of smoke. It can be used to examine the effect of time-varying phenomena such as temperature-controlled fans, start-up from cold or equipment failures.

## FLAIR Features

### Library - materials

FLAIR has a built-in reference library of building materials. It contains the latest materials as used in the building industry today. Compiled by CIBSE all reference data corresponds to the latest building regulations. The library can be customised to include user specific material properties.

### Library - airflow

A wide range of standard diffusers, fans and spray-head objects are included to help speed up model build. The objects are based on the test data from ASHREA report RP-1009.

### Turbulence

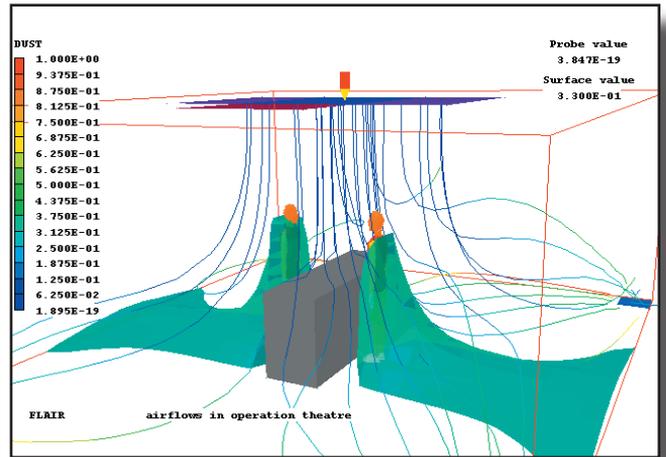
FLAIR has a built-in version of the k-e turbulence model that simulates the range of turbulence flows present in enclosed spaces.

### Natural, forced or mixed convection

FLAIR is able to model the thermal stratification associated with natural and mixed convection problems.

### Conjugate heat-transfer

When required, FLAIR can compute simultaneously the temperature distribution in the air and solids. Thermal links between both are automatically set-up within the model.



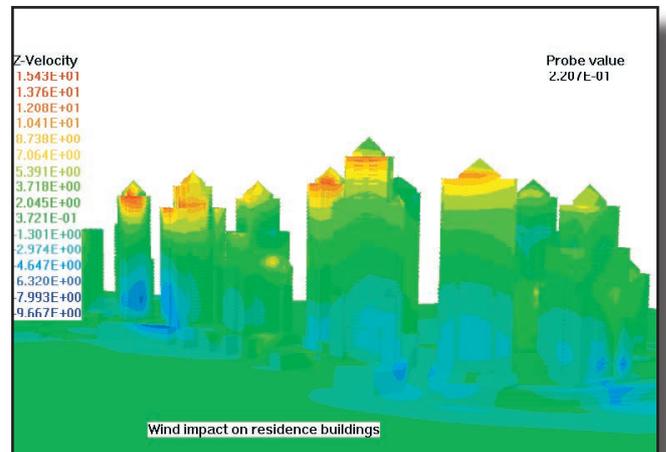
Flow of contaminants in an operating theatre

## System Requirements

FLAIR can be run on any standard PC running Windows. The software is CPU and RAM intensive, so the more power that is available, the faster it will perform. Consider a 1GHz system with 512Mb RAM as a minimum requirement.

FLAIR is able to accept designs created using a wide range of CAD software as both STL (3D object-based solid models) and dxf-file formats are catered for. Alternatively a 3D-modeling package such as Shapemaker or AC3D can be supplied by CHAM.

For further information contact CHAM on  
020 8947 7651  
or  
e-mail Sales@CHAM.co.uk



Flow around buildings