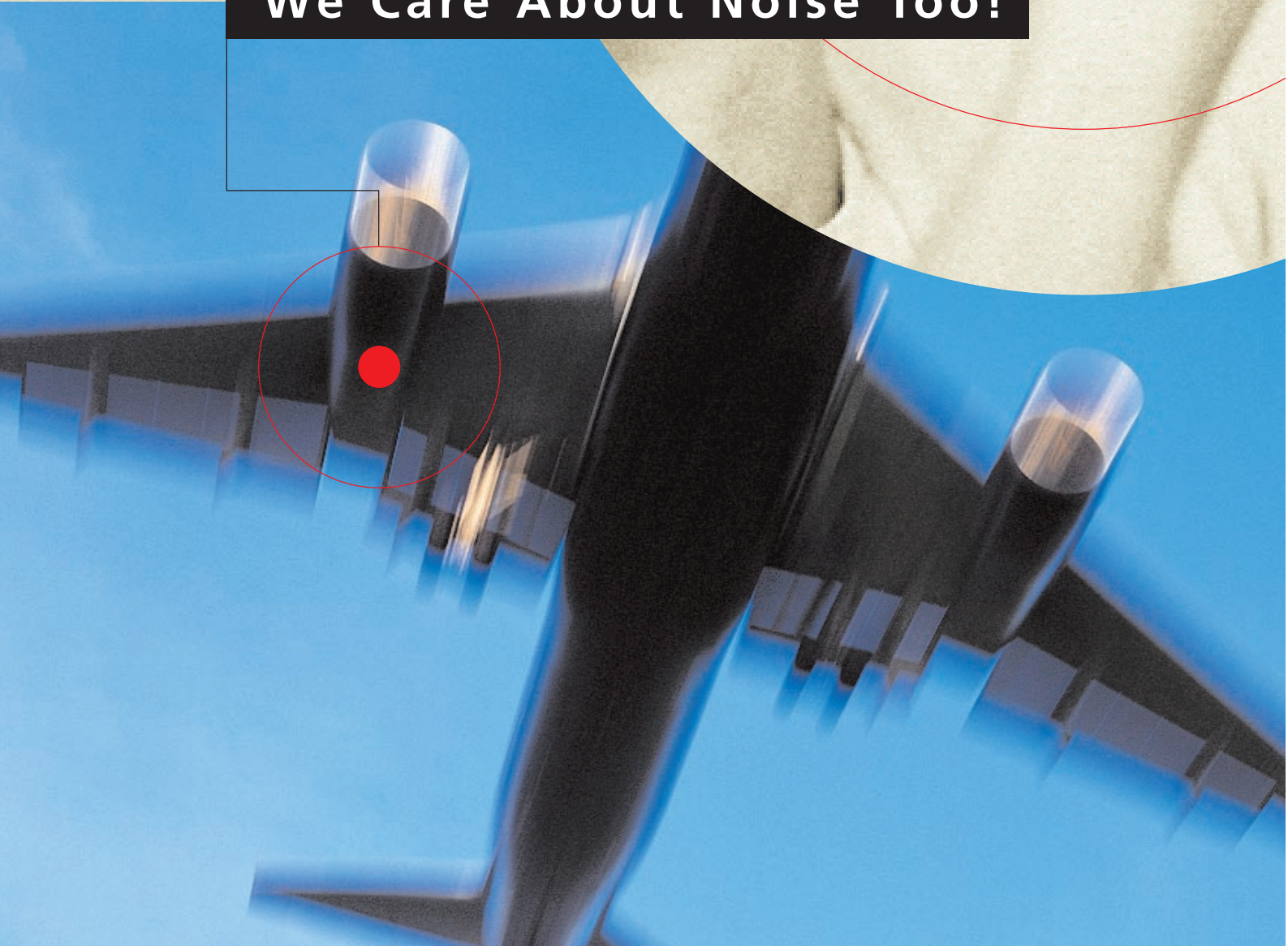


**We Care About Noise Too!**



**AIRPORT NOISE MONITORING**

# Keeping the Peace



Living close to an airport can't be much fun. Constant noise from takeoffs, landings and thrust reversals is not only a blight on the community but also one of the fastest growing environmental problems, and a major public concern.

Public demands for quieter airports have brought about strict legislation that has made airport noise monitoring compulsory in many countries. Indeed, growing environmental concerns constitute one of the most serious obstacles to capacity expansion of airports. By taking the step of measuring airport noise you can:

- Enforce legislation
- Minimise the noise impact caused by aircraft in both the present and the future
- Maintain safe and efficient aircraft operations
- Deal effectively with noise complaints
- Improve the environmental image of your airport
- Predict and optimise air traffic

In short, you'll be meeting the needs of both your business and the community.

*Taipei Sungsan Airport, TAIWAN*



*Taipei Sungsan Airport's first Brüel & Kjær system was installed in 1990. Their current system includes 14 Noise Monitoring Terminals.*



## ACOUSTIC KNOW-HOW AT THE READY

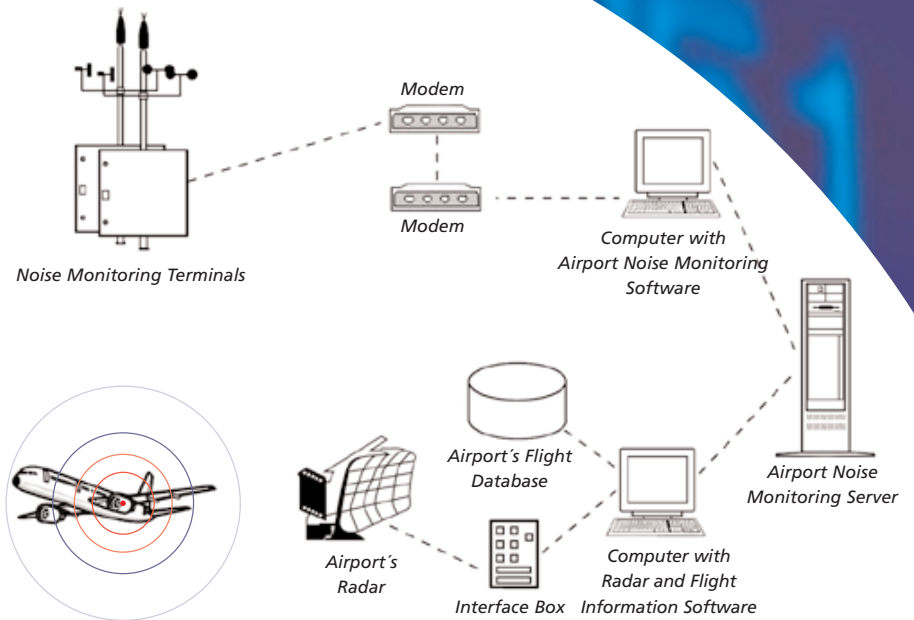
With over 50 years experience in the world of sound and vibration, the Brüel & Kjær name has become synonymous with innovative solutions, acoustic know-how, high precision and top quality. Our goal is to develop, manufacture, market and service unique solutions to our customers worldwide. To achieve this, over 100 engineers are dedicated to research and development alone. This large pool of expertise ensures that there are always resources available and ready to work on the perfect solution for your airport.

## VAST KNOWLEDGE

Our vast experience producing sound and vibration equipment, and over 30 years of working in the airport noise monitoring field ensures that our products perform precise, reliable and accurate measurements. This saves you time and money by enabling you to gather evidence and handle complaints quickly, optimise your air traffic and create an environmentally friendly image. So, you can rest assured that your money is well spent.

## CLOSE AT HAND

Brüel & Kjær is an international company with more than 90 sales offices or sales agents around the world. All the service and support you need is on your doorstep, in your native language and in your own time zone so there's no waiting around for calibration and repair.



## The Airport Noise Monitoring System

The typical Brüel & Kjær Airport Noise Monitoring System (ANM) is not only suitable for airport noise monitoring but also perfect for all kinds of outdoor, permanent and temporary environmental noise measurements, from city and industrial noise to train noise. It includes a number of noise monitoring terminals (NMTs) placed strategically around the airport, a central computer system and a number of workstations.

The NMT consists of a noise level analyzer, a weatherproof microphone, a system controller and a power supply, all mounted in a weatherproof cabinet with a climatic unit that maintains the internal temperature within the working range of the equipment. Correlated noise monitoring – where noise events are correlated with flight tracking data as well as weather and demographic data – can be used as an integral part of comprehensive environmental moni-

ring policy for creating a more environmentally aware, “greener” airport environment.

Copenhagen Airport, DENMARK



*Copenhagen Airport's Brüel & Kjær Airport Noise and Flight Tracking System was installed in 1997, has a radar interface, and includes 11 Noise Monitoring Terminals. Their first Brüel & Kjær System was installed in 1980.*

# Hard-working Hardware

## ALL-ROUND ANALYZER

The Noise Level Analyzer analyses data from a weatherproof microphone, and the analysed data is logged in the System Controller. The Noise Level Analyzer is a Type 1 analyzer and has a dynamic range of 110 dB.

The following parameters are stored:

- Hourly reports: statistical information for every complete hour, including Distribution, LN-values, Total  $L_{eq}$ , Background  $L_{eq}$ , Noise Event  $L_{eq}$ .
- Noise events: detects noise events from any user-defined trigger levels and durations, and stores the information in the database. For each event the following information is stored at 1/2 or 1 second intervals:
  - $L_{eq}$  and SPL values
  - 1/3-octave spectrum, PNL and PNLT values
  - Sound file

Furthermore, PNdB (Perceived Noise Level) and EPNdB (Effective Perceived Noise Level) of all the events according to the ICAO Annex 16 are also calculated and stored in the database.



System Controller



Noise Level Analyzer

Power Supply

*Orlando International Airport's Brüel & Kjær Noise Monitoring and Flight Tracking System, with its 4 Noise Monitoring Terminals and radar interface, was installed in 1997.*

## WEATHERPROOF MICROPHONE IN A CLASS OF ITS OWN

The weatherproof microphone is suitable for unattended measurements. Its omnidirectionality ensures that noise from all directions is detected without any undesirable reflections from its casing affecting the noise measurements being undertaken. The microphone is based on a unique patented probe tube system. It can be used in the most humid and corrosive atmospheres as the casing is made completely of stainless steel and it has built-in protection system against humidity.



Orlando International Airport, USA

## RELIABLE DATA WITH THE MINIMUM OF FUSS

The system automatically checks the calibration of the equipment 4 times a day using an acoustical signal and the patented Charge Injection Calibration (CIC) check. CIC ensures that the entire measurement chain is tested.

# Find the Culprit

Brüel & Kjær's Airport Noise Monitoring Systems are totally open and expandable and can be tailored exclusively towards your particular needs and budget. The Windows®-based, flexible structure means that you can start with a basic system and add and expand as your needs grow. Whether you need a single noise monitoring terminal, a portable solution or a complete, integrated modular system with up to a 100 noise monitoring terminals, we can deliver, install and commission the whole easy-to-use package.

## SOFTWARE THAT GOES INTO DETAIL

The NMT, together with the Noise Monitoring and Flight Tracking software packages, enables airports to fulfil local noise and flight regulations and handle complaints from the public. The Geographic Information System (GIS), a standard feature of the Flight Tracking software, contains geographic and factual information, but also a visual interface of the data and a map showing the exact flight tracks. Brüel & Kjær's Airport Noise Monitoring System provides an option to have the prediction software "INM Link" which enables the airport to export data into a noise model like the INM (Integrated Noise Model) developed by the FAA to predict future noise impact around the airport.

## NOISE MONITORING

Unattended airport noise monitoring enables you to ensure that noise limits are kept without the need for expensive consultants to perform noise measurements. A main feature of the system is its sound recording option. You can listen to the recorded noise events at your

leisure and discover whether the actual noise offender was indeed a plane or merely a passing motorbike! The sound recordings can be used as verification of aircraft noise and as proof against airlines providing quick, detailed and accurate information concerning the noise level. **Figure 1**

## FLIGHT TRACKING

Adding Flight Tracking Software enables the Airport Noise Monitoring System to correlate aircraft movements with the recorded noise events, providing data on track violations and singling out offending aircraft and airlines. Flight and noise data can either be viewed "live" in real-time or as playback where historical flight tracks are replayed. **Figure 2**

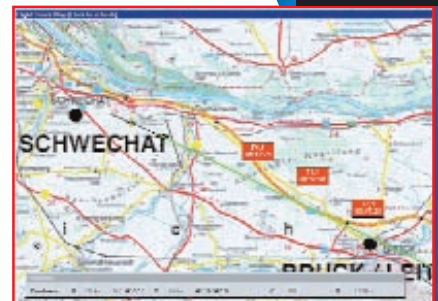
A flexible filter function enables you to pick out an individual aircraft or a group of aircraft so that you can see the flight track and detailed information concerning it. You can also, for example, pick out all aircraft from a specific airline, all departures or arrivals using a specific runway. You can then make an analysis based on the data you have selected. **Figure 3**

The level of detail on your GIS maps is up to you. The selected tracks are shown in either 2 or 3 dimensions providing you with a very user-friendly layout on the screen. A coloured indicator shows the altitude of the aircraft and you can add gates and corridors. You can also check whether aircraft follow the allotted arrival and departure routes. Information about roads, buildings, etc., can be added as layers to the GIS maps, as can noise outlines and contours. **Figure 4**

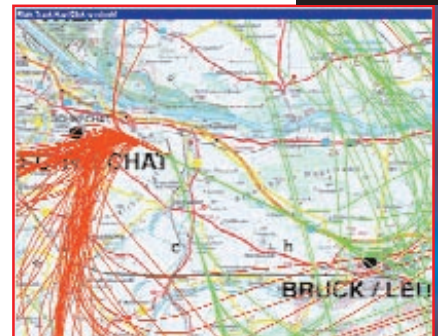
**Figure 1**



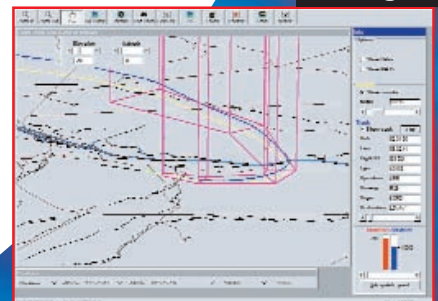
**Figure 2**



**Figure 3**



**Figure 4**





# Optimise and Predict



## COMPLAINTS HANDLING

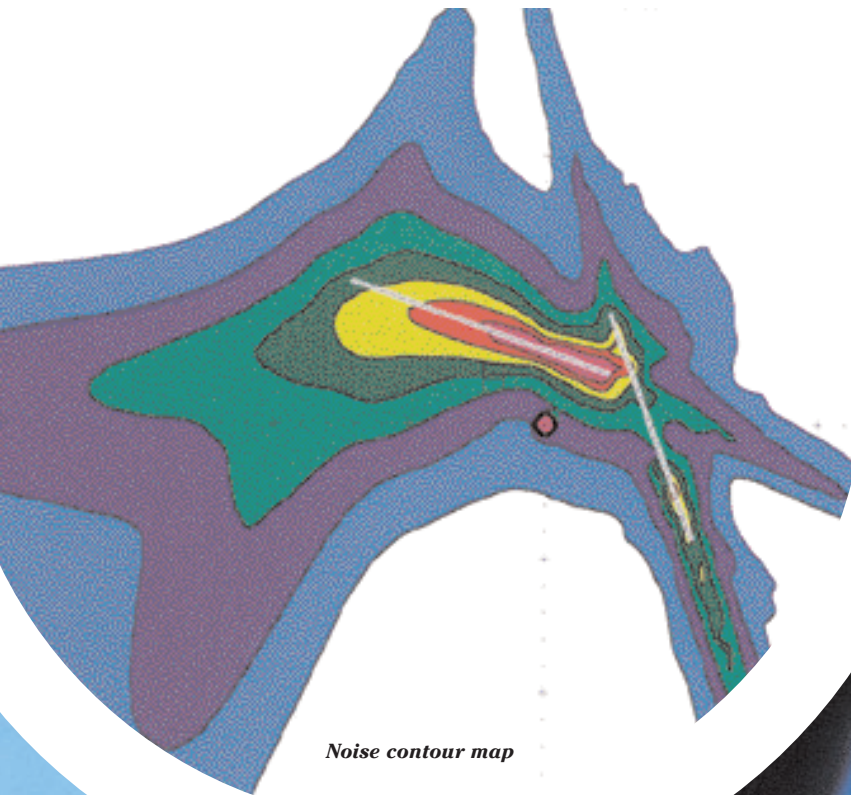
A specially developed database for the investigation of complaints from citizens ensures quick reporting and overview. The database stores the complainant's call and examines the possibility of there being a pattern to the complaints. The database also enables the generation of standard reports. As a result, it is possible to respond quickly and provide the complainant with accurate documentation concerning the noise level at the exact time of the complaint together with information on the guilty airline. The Complaints Handling module makes it easy to store all complaints from neighbours and make statistics and reports.

## REPORTING AS YOU LIKE IT!

Data can be exported into other Windows programs and predefined templates make the task of creating different kinds of reports easy including hourly, daily, monthly, NMT status, weather data, calibration, short, noise event, and runway statistics. The Reporting module allows you to customise at will.

## PREDICT AND OPTIMISE AIR TRAFFIC

The Integrated Noise Model (INM) is used to predict the noise impact around the airport when, for example, plans to add a new runway are made. The Brüel & Kjær INM Link program is a quick shortcut to integrating flight traffic into the model, cutting out the time-consuming process of keying in all the information needed to generate a realistic noise contour map.



Noise contour map



Stuttgart Airport, GERMANY

*Brüel & Kjær's Airport Noise and Flight Tracking System was installed in Stuttgart Airport in 1998. The system has radar interface and includes 8 permanent Noise Monitoring Terminals and one portable Terminal.*

**Brüel & Kjær**

*Brüel & Kjær has  
been in the business  
of Airport Noise  
Monitoring for a long  
time – over 30 years  
– and our complete  
noise monitoring solu-  
tions have been up  
and running at over  
200 airports around  
the world.*

*Brüel & Kjær's Airport Noise Monitoring and Flight Tracking System was installed in Tunis Carthage Airport in 1999. The system includes 6 Noise Monitoring Terminals and runs on solar energy.*

Tunis Carthage Airport, TUNISIA



## Where Do You Go From Here?

### INTERNET

Check out the Airport section on our homepage [www.bksv.com](http://www.bksv.com) for the latest news, testimonials, product information and a virtual demo tour.

### CONTACT US

If you have any queries regarding airport noise monitoring, please contact our Airport Competence Centre, Nærum, Denmark or your local sales representative.

### LITERATURE

Brüel & Kjær offers a comprehensive range of high quality literature that includes User Manuals, Product Data Sheets, Brochures, Application Notes, Bulletins, Brüel & Kjær Magazine, etc.