# Airport Noise
## Le bruit des aéroports

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Over the years of commercial aviation, there have been huge reductions in the noise created by individual aircraft. Consequently, despite increases in traffic, the number of people affected by noise has fallen at many airports worldwide. At London Heathrow, for example, there were 590 ,000 people living inside a 57dB (A) noise zone in 1988, created by about 350 ,000 operations. By 2001, although traffic had risen to about 440 ,000 movements, only 250 ,000 people were living in a 57dB (A ) area.

Unfortunately, community appreciation across the world has been less than dramatic. Because the reductions have been implemented gradually over a long time frame, the public have not really noticed the progress. The fact that fleets are quieter now is lost on them, especially as they look up and see more and more aircraft in their skies.

After 9September- the 11th, inevitably, the number of operations around the world fell suddenly and older aircraft were quickly phased out. There was, therefore, a further rapid reduction in noise impact. The result of these gains is that levels of community expectations were reset and have now risen to be higher and more demanding than ever before.
The key areas for reducing noise impact in the future are in the evolution of operations procedures, such as BAA's use of continuous descent approaches, and in land use planning, preventing encroachment. Dramatic reduction of the noise at source through changing fleets, such as the mandatory phasing out of Chapter 3 aircraft, is unlikely. All the straightforward improvements in noise reduction at source have already been completed. Further fleet transition will offer only modest gains.

Communities are becoming increasingly demanding of a more open and thorough disclosure of facts about aviation noise. The old methods of communication will no longer work. Airports need to focus more on how the community reacts to noise impact and on setting realistic expectations. For example, in the past, the benefits of fleet transition have often been oversold, leaving people feeling they have been misled. There needs to be clear, friendly explanation to the public of how airspace will be used and how operations will vary through the year. Airports need to talk in a language that the public understands, not in technical terms.

Open collaborative communication with the public is the key to the continued success of airport noise management strategies. Airports that grasp this fact will continue to grow. The alternative is to risk expansion plans being blocked by a distrustful community.

### Noise Management Program

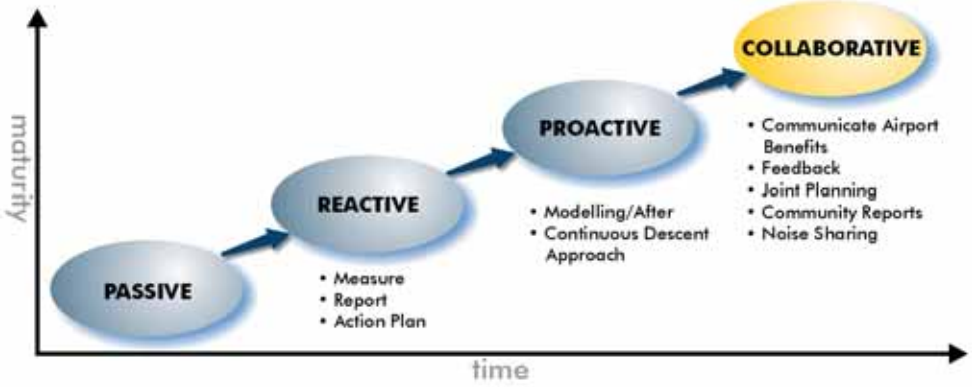


**Fig. 1 : The noise program maturity scale**

No two airport noise programs are alike. The specific reasons for establishing a program and the tactics used by a noise office are rarely the same. There are a number of reasons for this, including community involvement, finances, fleet operator cooperation, legal regulations, management support and technology, yet there is an observable and common progression of noise programs among all airports. Knowing this progression can help plan a strategy and develop tactics to get the most out of a noise program investment.

The noise program maturity scale (see Fig. 1) shows the progression from no program to a fully mature, collaborative program. In the early stages, airports are largely unresponsive to public complaint. This stage usually lasts until a trigger, such as a desire for expansion, results in establishing a noise program. The reactive approach in Stage 2 is purely responsive to requirements placed by external groups, whether community or government, or by management.

A noise monitoring system may be installed and communications with the community and fleet operators about noise begin, although the interaction can often be negative because of the complexity of airport noise issues. Community resistance typically builds and complaints can grow significantly. This happens because of awareness, and has little to do with whether noise levels are increasing or not.

At Stage 3, airports begin to realise noise issues can be actively managed through better communication with concerned parties. Airports invest in people and technology resources to better communicate programs and positions in a positive way. Monitoring data become more accessible, perhaps through web pages, and community groups such as roundtables are organised. Airports now start to build trust as they engage the community and fleet operators. Most of the airport noise offices Lochard works with are in this stage. In the final, ideal stage, airports and the other parties are working collaboratively on all parts of the noise management agenda. Here the dialogue is based on information sharing and trust building. Data independence, community based reporting, and self-serve information analysis are all part of the airport's environment management strategy. A position of trust is formed, and all parties begin working towards a goal of balancing the airport's economic growth with the environmental impact of aircraft operations. Knowing where your airport's noise program is on the maturity scale can help you plan for the future.

## Lochard Technology

ANOMS (Airport Noise and Operations Monitoring System)

ANOMS is a world-leading noise and flight track monitoring system, renowned for its ease of use, reliability, flexibility, integrity and service. ANOMS collects data in real-time or batch data collection from the necessary interfaces for best practice environment management at airports, ie. flight tracks (radar), flight plan information, noise and weather data. The information is distributed to a data warehouse at Lochard or at another suitable location through the Internet or the Airport's Local Area Network (LAN).

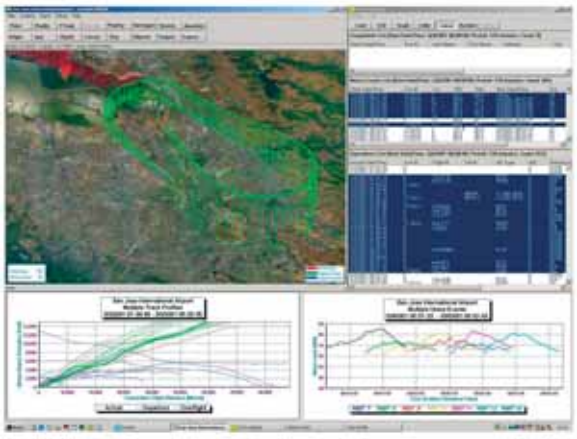

**Fig. 2 : Visualisation of the airport noise and operations monitoring systems (ANOMS)**

ANOMS data and tools are used to monitor compliance, operations efficiency and many other important factors in maintaining and developing noise abatement strategies.

ANOMS operates within the Microsoft Windows environment to deliver advanced functionality enabling operators to efficiently and accurately analyse and produce information on the following key areas:

- Aircraft that exceed noise thresholds
- Aircraft that fly off track
- Aircraft that cause complaints
- General noise climate and the contribution from Aircraft
- Ad hoc analysis in response to specific queries
- Standard reporting obligations

### GEMS (Global Environment Monitoring System)

For airports with advanced environment management programs Lochard's GEMS is a valuable strategic tool. To help the airport reduce environment impact and gain community confidence GEMS will:

- Accurately measure noise disturbance
- Pinpoint noise offenders
- Determine that aircraft are following the correct noise abatement procedures
- Illustrate the mix of quiet versus noisy aircraft
- Model the influence of new operations on the noise distribution; and
- Provide full reporting functions.

With data collected automatically and the powerful combination of functions, GEMS is designed for comprehensive environment management.
GEMS operates in the powerful and reliable UNIX environment for industrial strength monitoring.

### Noise Monitoring Terminals (NMTs)

The Lochard Environment Monitoring Unit (EMU) is a precision, digital noise measurement instrument, developed specifically for outdoor noise monitoring. The EMU does not

compromise on any aspects of its design. Innovative digital signal processing technology represents significant advances over older style, analog based noise monitors, particularly in areas of accuracy, stability and flexibility. Lochard is committed to providing quality instrumentation that complies with internationally recognised standards.

The EMU is mounted on a mast fixed in the ground. A secondary enclosure houses a modem, batteries and charger that continues powering the monitor in the event of a power failure.

The portable EMU is mounted on a robust outdoor tripod. A waterproof box houses a power supply and battery backup.

Additional battery packs may be located external to the box. As the portable units are functionally and electrically identical to the fixed units they can act as a short term replacement for a permanent unit, eliminating the need for holding spare parts.

**Fig. 3 and 4 : Presentation of the noise monitoring terminal (microphone and the portable unit)**

As the EMU is an Environment Monitoring Unit, and not simply a noise monitoring terminal, it offers additional metrics of humidity, wind speed and direction, rainfall, pressure and/or solar radiation.

## WebReplay

Lochard's WebReplay is a web-based noise and operations display system. The interface gives residents easy access from their home computers to straightforward information about the airport noise environment and flight operations. This improves noise office efficiency and fosters a community relationship based on trust and disclosure.

Community members are able to select data based on the


**Fig. 5 : The Webreplay**

date then zoom into their local area, view noise events at noise monitors and view flight paths relative to their street. WebReplay is compatible with all Lochard noise and flight track systems. This solution can be fully hosted and maintained by Lochard.

## iView

Lochard's iView is a powerful tool for displaying aircraft operations and noise in easily understood ways. iView is a 3D visualisation tool, enabling users to view actual radar tracks, from GEMS or ANOMS, over high definition satellite images

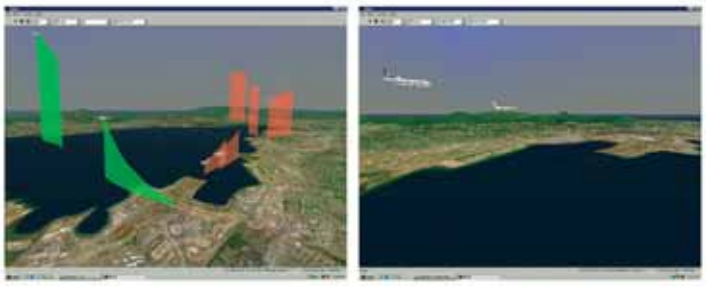

**Fig. 6 : Differents visualisations of aircfrats operations by iView**

with terrain and building elevation data.
iView provides views of aircraft operations from various perspectives (fixed, follow and track modes) to build detailed understanding of airspace usage.
iView displays in either real-time or replay mode, with powerful display options including time and speed control, and display of ground tracks.
iView supports large display formats, including hemispherical projections, and is well suited to visitor's centres or demonstrations.

## SkyTraK

SkyTrak is Lochard's own Mode S passive terminal area radar, combining international enroute tracking and national weather coverage to provide the total picture of aircraft operations -

from take-off to touchdown. SkyTrak's live situational displays for inbound aircraft provide operations teams the information they need to optimise resources as delays and diversions unfold. SkyTrak's positive live identification of operators and airframes recovers lost landing fees faster. Community web displays, better noise monitoring data, more accurate FIDS and instant emergency response displays are some of the benefits of SkyTrak.

### Lochard Scenario Builder (LSB)

Modelling enables comprehensive noise contour analysis of the impact of existing operating scenarios and future scenarios using real flight track data from the system.
LSB enables the user to develop and record a set of rules for data extraction, correction and aggregation from GEMS or ANOMS, to be automatically applied to other scenarios at any time. The output from LSB is returned to ANOMS or GEMS where it can be displayed and utilised.
LSB can also include an air quality emission inventory module to determine annual emissions for aircraft operations at the airport.Flight movement charts

The integration of the Flight Movement Charts (FMC) package for use with LSB is a powerful addition to any Lochard solution. The package enables extended reporting options to assess aircraft noise and operations for presentation to the public, specifically:

- Flight Path Movement Charts
- Respite Charts
- Number of Event Charts

Flight path movements are used to indicate where aircraft fly, and the number of overflights that occur in given periods.
Respite charts allow the display of statistics indicating the amount of time a flight path does not have an overflight, or a break in flights.
The number of events chart is used to display event contours on a map, indicating aircraft noise events louder than a specified level.

## The case of Nice Cote D'Azur airport

Lochard delivered a GEMS at Aeroport Nice Cote D'Azur in December 1999. GEMS is a state-of-the-art, modular system, tailored to each individual airport's needs through selection of appropriate features and specific system interfaces.

The Nice GEMS configuration is a comprehensive system designed to provide an automated solution to the monitoring and management of the airport's noise impact on the surrounding community.

Through unattended collection, correlation and analysis of noise and flight information, GEMS measures the airport's noise impact and positively identifies its source. GEMS analyses each flight operation, determining compliance with noise regulations and guidelines.

Powerful analysis and reporting tools enable the user to perform detailed analysis of the data to meet a multitude of requests; from senior airport managers through to the general public.

GEMS is built on industry proven UNIX-based data acquisition and management technology to ensure maximum stability and reliability. GEMS' user functionality is delivered on standard Pentium PCs enabling users to work in a familiar Windows desktop, running reports and creating spreadsheets in Microsoft Access and Excel. The user terminals operate on Microsoft NT.

As GEMS is a modular system it is capable of future expansion, ranging from adding users or additional noise monitoring terminals, through to integrating sophisticated air and water quality monitoring systems.

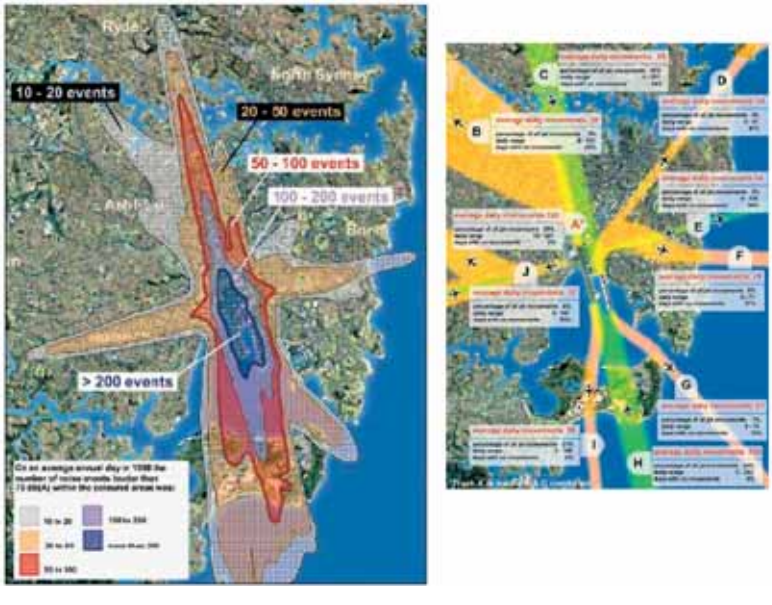


**Fig. 7 and 8 : Examples fo Number of Event Chart and Flight Path Movement Chart**

### System Overview

***Architecture***

The GEMS server performs all automatic data collection, data storage and data processing functions. The server uses the UNIX operating system for maximum power and robustness. The server is equipped with sufficient memory, disk storage and processing power for two full users and two remote display terminals as well as more than 40% spare capacity for future expansion. There is sufficient storage to retain data online for a period of at least 12 months. The system also has functionality for data back-up and archiving.
Noise information is recorded from permanent outdoor Environment Monitoring Units (EMUs). These units monitor the overall noise as well as identifying noise due to aircraft and reporting on it separately. The EMUs communicate with the GEMS server via digital cellular phones

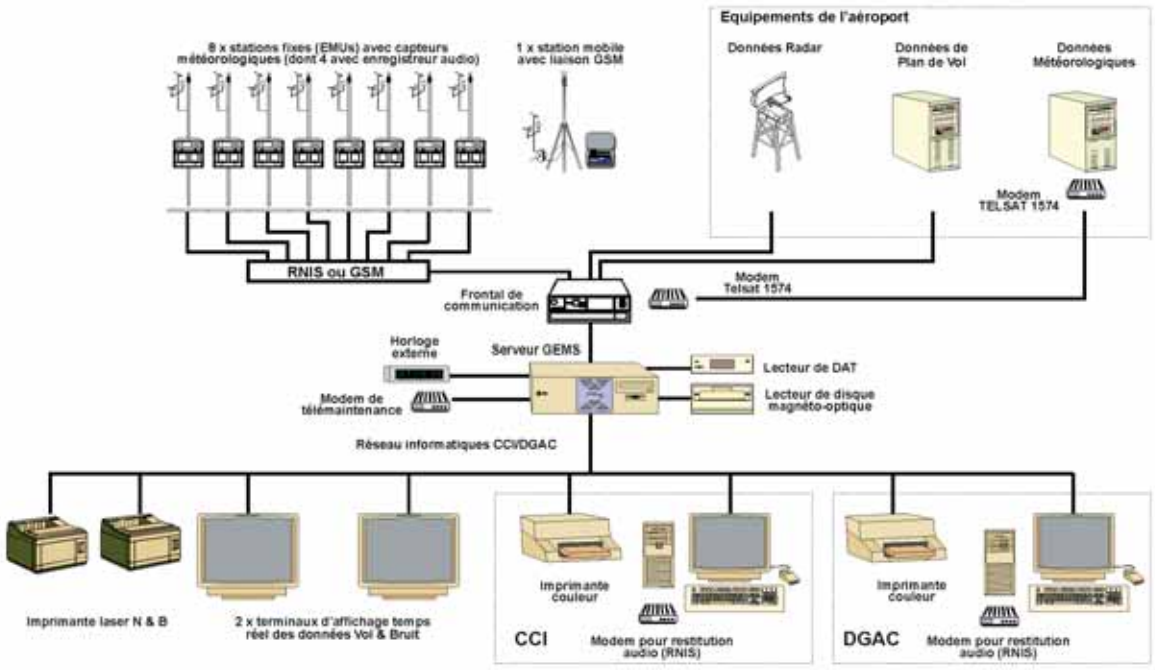


**Fig. 9 : Nice GEMS Architecture**

(GSM) or the public telephone network (ISDN or standard telephone lines). A portable Environment Monitoring Unit is also used, communicating with the GEMS server via GSM digital mobile telephone. Each EMU is additionally equipped to monitor wind speed and wind direction locally at each monitoring point. Some of the fixed EMUs located in the city are equipped with sound recording equipment to record noise events and enable audio replay at user terminals.

Flight plan data is read from the files transferred to GEMS and flight track information is gathered from the radar system. Flight plans and tracks are linked in real time, or as plans become available and used to provide a positive identification of the aircraft that caused a particular noise event.

The system as originally installed has already been expanded to include operations and noise measurement at nearby Cannes Airport. Additional noise monitors were installed in November 2002 to measure the noise level and a high speed data link enables an operator at Cannes airport to use the system to manage noise abatement locally at Cannes airport.

Lochard is working with the airports and ACNUSA to provide other solutions such as the Web replay for the display of flight tracks in the community.

**Fig. 10 : Picture of the Nice Côte d'Aur airport system System Expansion**