

**EUROCONTROL**  
Experimental Centre

**Ken Hume**  
**Helen Morley**  
**Callum Thomas**

**A Review of Complaints and Social  
Surveys at Manchester Airport**

**Attitudes To Aircraft Annoyance Around Airports  
(5A)**

**EEC/SEE/2003/004**



**Review of Complaints and Social Surveys at Manchester Airport  
Attitudes To Aircraft Annoyance Around Airports (5A)**

Ken Hume, Helen Morley & Callum Thomas  
Manchester Metropolitan University, UK;

**EEC/SEE/2003/004**

© European Organisation for the Safety of Air Navigation EUROCONTROL November 2003

This document is published by EUROCONTROL in the interest of the exchange of information. It may be copied in whole or in part providing that the copyright notice and disclaimer are included.

The information contained in this document may not be modified without prior written permission from EUROCONTROL. EUROCONTROL makes no warranty, either implied or express, for the information contained in this document, neither

## REPORT DOCUMENTATION PAGE

<b>Reference:</b> EEC Note No. <b>EEC/SEE/2003/004</b>		<b>Security Classification:</b> Unclassified				
<b>Originator:</b> Centre for Aviation, Transport and the Environment (CATE)		<b>Originator (Corporate Author) Name/Location:</b> Manchester Metropolitan University Oxford Road Manchester UK				
<b>Sponsor:</b> Society Environment & Economy Research Area		<b>Sponsor (Contract Authority) Name/Location:</b> EUROCONTROL Research Centre Centre de Bois des Bordes B.P.15 91222 BRETIGNY SUR ORGE CEDEX France Telephone: +33 1 69 88 75 00				
<b>TITLE:</b> Review of Complaints and Social Surveys at Manchester Airport						
<b>Authors :</b> Ken Hume, Helen Morley Callum Thomas	<b>Date</b> 11/03	<b>Pages</b> 70	<b>Figures</b> 17	<b>Tables</b> 1	<b>Appendix</b> 1	<b>References</b> 40
<b>EATMP Task Specification -</b>	<b>Project</b> 5A		<b>Task No. Sponsor</b> SEE-D-BD		<b>Period</b> 2003	
<b>Distribution Statement:</b> (a) Controlled by: EUROCONTROL Project Manager (b) Special Limitations: None (c) Copy to NTIS: <del>YES</del> / NO						
<b>Descriptors (keywords):</b> Airport – complaints – 5A – aircraft annoyance – Manchester – complainers – serial complainers – aircraft noise - overflight						
<b>Abstract:</b> <p>The aim of this work was to track the levels of noise disturbance due to aircraft as indicated by complaints and surveys to help gauge the usefulness of complaints as a measure of community tolerance. It is a tacit assumption that you do not get complaints without annoyance and the two fields are considered very close and overlapping.</p> <p>Detailed investigation of complaint data at Manchester Airport for both 1998 and 2000 showed a distinct sub-group of serial-complainers, with 40% of complaints accounted for by 3 individuals at Manchester in 1998 and 2000. The results showed however that the serial-complainers did not influence the pattern of results substantially.</p> <p>Social surveys were particularly concerned with night flights and found sleep disturbance and high levels of annoyance due to aircraft noise which was positively related to noise level above 65 dB(A) outdoors. In general there was good agreement between the social surveys that have been carried out around Manchester Airport.</p>						



# Table of Contents

<b>REPORT DOCUMENTATION PAGE</b> .....	<b>III</b>
<b>TABLE OF CONTENTS</b> .....	<b>V</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>9</b>
<b>BACKGROUND AND AIMS</b> .....	<b>13</b>
<b>STRUCTURE OF THE REPORT</b> .....	<b>15</b>
<b>HISTORICAL DEVELOPMENT OF MANCHESTER AIRPORT</b> .....	<b>17</b>
<b>ENVIRONMENTAL MANAGEMENT AT MANCHESTER AIRPORT</b> .....	<b>19</b>
Consultations with stakeholders.....	20
<b>COMPLAINTS AND ANNOYANCE – A BRIEF LITERATURE REVIEW</b> .....	<b>21</b>
Residence type and sound insulation .....	21
Education .....	21
Income and Occupation .....	22
Age.....	22
Sex .....	22
Social Status.....	22
Personality .....	22
Negative affectivity.....	23
Fear of an aircraft crash .....	23
Situational factors .....	23
Behaviour at the time of disturbance.....	23
Utility of the noise source .....	24
Media coverage and heightened community awareness to noise .....	24
Cross-cultural differences.....	24
<b>COMPLAINTS AT MANCHESTER AIRPORT</b> .....	<b>27</b>
Flight and noise information - MANTIS .....	27
Complaint information.....	27
Complaints information provided to the 2 <sup>nd</sup> runway inquiry (1995).....	28
Average peak noise level of departing aircraft (1971-1993): .....	28
Percentage movements made by Chapter 2 aircraft: .....	29

Noise level of different types of departing aircraft and the number of complaints received per 1000 movements:.....	30
<b>SUMMARY OF RECENT COMPLAINT ANALYSIS .....</b>	<b>31</b>
The pattern of complaints over the last 20 years at Manchester Airport.....	31
Detailed studies of complaints at MA .....	31
Aircraft noise level .....	32
Time of Day .....	34
Specific noise complaints (per 1,000 movements) for each hour of the day .....	36
Day of the Week.....	36
Hourly distribution for weekdays and weekend .....	37
Months of the Year .....	38
The influence of serial-complainers on complaint profiles .....	39
Serial-complainers and Time of Day (1998 and 2000) .....	40
Serial complainers and Day of the Week (1998 and 2000).....	41
Serial complainers and Month (1998 and 2000).....	42
<b>COMPARISON OF COMPLAINTS AT MANCHESTER, LYON AND BUCHAREST</b>	<b>45</b>
Complaints at Lyon-Saint Exupery Airport .....	45
Complaints at Bucharest-Otopeni International Airport.....	46
<b>SOCIAL SURVEYS AND REPORTS BASED AROUND MANCHESTER AIRPORT .....</b>	<b>47</b>
EUROCONTROL (2003) .....	52
<b>COMPARISON OF PREVIOUS SOCIAL SURVEYS AND COMPLAINT PROFILES AT VARIOUS SITES AROUND MANCHESTER AIRPORT .....</b>	<b>55</b>
<b>CONCLUSIONS AND FUTURE WORK.....</b>	<b>59</b>
FUTURE WORK.....	60
<b>REFERENCES .....</b>	<b>63</b>
<b>APPENDIX.....</b>	<b>67</b>
Knutsford and Mobberley: .....	67
Vale Royal: .....	67

---

Congleton: .....	68
Marthall/Marton: .....	68
Cheadle Hulme: .....	68
Hale Barns: .....	68
Wythenshawe: .....	68



This report was produced as part of a project aimed at understanding attitudes to aircraft noise annoyance around airports and in parallel with other work 'Valuing Aircraft Noise Nuisance' which included a social survey. The main work was carried out in communities around Manchester, Lyon and Bucharest airports in 2002.

This report assesses the levels of disturbance around Manchester Airport (MA) by a consideration of two main sources of information: recent complaint analysis (1998 & 2000) and previously collected social survey data. More specifically the aim of the work was to track the levels of noise disturbance due to aircraft as indicated by complaints and surveys to help gauge the usefulness of complaints as a measure of community tolerance.

MA has undergone considerable expansion and development in the last 20 years. It is now a major international airport, the third busiest in the UK. In parallel with the increased growth of MA there has been a growing realisation of the environmental consequences that such sustained development could have on the local environment. It was this that led MA to appreciate the need to widen their corporate approach to environmental control and community relations and embrace the concept of sustainable aviation.

The changes at MA had been implemented through its Environment Department, which aimed to ensure that the growth of MA was accomplished with environmental responsibility. The Department advised on aircraft noise, air quality, energy, wastes, water pollution and community relations. There is consultation with Airport stakeholders predominantly through the Manchester Airport Consultative Committee, which operates through a number of sub-committees.

There is a limited scientific literature base concerned with complaints but there is a considerable literature about annoyance due to transport noise. It is a tacit assumption that you do not get complaints without annoyance and the two fields are considered very close and overlapping. The literature was reviewed and included the following factors:

- Residence type and sound insulation
- Age, Sex, Education, Income, Occupation, Social Status, Personality, Fear of crash, Culture and Sensitivity of the Recipient
- Behaviour at the time of disturbance
- Utility of the noise source
- Media coverage and community awareness
- Noise level, background noise and aircraft operations

Recent studies mainly at Manchester have shown that complaint propensity was affected by:

- Media coverage of airport development plans/inquiries, at both Manchester and Lyon, increased the level of complaint
- Aircraft noise was the main source of complaint, by far
- Location particularly the distance from the airport and the proximity of noise footprints and flight-paths
- The noise level of the aircraft
- The time of day of the ATM, with most sensitive times in the late evening and the first half of the night
- The day of the week, with the weekend, particularly Sundays, showing the least tolerance to noisy aircraft

- The months of the year, with peak complaint during the summer particularly July/August and least in November

Detailed investigation of complaint data at Manchester Airport for both 1998 and 2000 showed a distinct sub-group of serial-complainers. The vast majority of residents who complain do so only once, but the most extreme serial-complainer complained about 624 flights in 2000. Serial-complainers have the potential to bias the complaint data, therefore the data was reanalysed with two groups: 'serial' and 'normal' complainers. The results showed that the serial-complainers did not influence the pattern of results substantially. However, there was a difference in the circadian pattern where serial-complainers complained more in the late evening and early night, while complaints from 'normal' complainers were more even across the night.

- Serial-complainers were operating at the airport, with 40% of complaints accounted for by 3 individuals at Manchester in 1998 and 2000. However, the serial-complainers complaint profile did not differ markedly from the normal complainers. Never the less, this indicates the need to identify and report the number of complainants as well as the number of complaints
- There were numerous additional factors that govern complaint behaviour eg. socio-economic status, sound insulation of the home, utility of the noise source
- There was an agreement between the areas around Manchester airport which showed high level of annoyance and had high levels of complaint about aircraft noise but this was influenced by socio-economic status
- Also, there was a clear demonstration of a link between annoyance and complaint propensity with participants in the recent attitudinal survey having the same order (Lyon, Manchester and Bucharest) in the relative numbers of complainants and individuals expressing 'very or extremely annoyed with aircraft noise'

The early social surveys were particularly concerned with night flights and found sleep disturbance and high levels of annoyance due to aircraft noise which was positively related to noise level above 65 dB(A) outdoors. In general there was good agreement between the social surveys that have been carried out around MA:

- Aircraft noise was, by far, the greatest cause of environmental disturbance in the communities living near to the airport, particularly at night
- Other negative aspects of living near to an Airport were – air pollution, house price reduction, fear of crashes, unwanted development and increased road traffic
- There was a clear relationship between the distance from the airport, noise footprint and flight paths and the reported affect on the community
- There were considerable individual differences in subjective disturbance which 'cut across' very different communities and the perceived problem of aircraft noise was not confined to higher socio-economic groups who tended to complain more
- Most of the problems were concentrated in the high noise areas
- In the areas of high aircraft noise disturbance, road traffic noise seemed to be tolerated much more than areas of relatively low aircraft noise

- The main reported affects of aircraft noise was interference with communication (particularly in the evenings), general annoyance and sleep disturbance
- In those individuals suffering sleep disturbance, it was a relatively common event. However, in general, other domestic issues affected sleep more
- Night flights by noisy aircraft, which were perceived as being off track, were a major source of complaint
- It was considered by the majority of residents that the advantages (ease of travel and economic benefits) of airports outweighed the disadvantages, even in the most noise disturbed communities – this was determined largely by the individual's perceived utility of the airport
- Quality of life was not largely determined by aircraft noise but this was a consistent source of dissatisfaction
- For most individuals there is little evidence of direct health effects but many believed such a link could exist
- Negative affectivity plays an important part in how individuals view aircraft noise

In 2001 a second runway was opened at MA which resulted in a substantial increase in complaints - from about 3,000 in 2000 to 9,000 in 2001. Further work has been outlined which compares 2001 complaints levels with earlier years (1998 & 2000) for:

- Noise level, Temporal variables, Aircraft type, Mode of operation, Community type and population density, Preliminary modelling work.

This work will provide valuable insights into how the local communities surrounding airports respond and adapt to a major change in the operating pattern of the airport.

In addition to the work outlined above and as a result of the work covered in this report there are three areas of research that are suggested for future work:

1. Development of a generic complaint handling system
2. Complainants v Non Complainants survey
3. Assessment of human factors (disturbance/tolerance) to different models of land use management and intermodality in the development of aviation in Europe.



## Background and Aims

This report forms part of a main study that in essence, was designed to better understand noise annoyance and the value placed on aircraft noise nuisance in communities surrounding airports in different parts of Europe. Noise annoyance is a complex issue that is not solely dependent on noise level but a host of other non-auditory variables including personal, social, economic and cultural factors. Therefore, the factors that determine attitude to noise disturbance will most likely vary in different communities across Europe. Communities surrounding three airports (Manchester, Lyon & Bucharest) were studied in the main project, but this report is concerned primarily with Manchester Airport (MA). MA is the largest and most developed, particularly with regards to complaint handling, of the three and has been the focus of a relatively large amount of previous community and environmental research.

In the 1990's there was a growing realization across Europe that environmental factors associated with aviation would place a major restriction on airport capacity and sustainability. The main environmental issue that potentially detracts from the quality of life in communities close to major airports is aircraft noise. One of the main indexes for continuously monitoring the level of tolerance and or dissatisfaction in communities is by developing and maintaining an efficient and transparent complaints procedure.

The main work of this report is an exploration of the pattern of complaints from communities located near to Manchester Airport over the last 20 years. During this period MA has undergone considerable growth and expansion, including the building of two terminals and a second runway, which have been associated with planning and legal procedures that have generated a lot of attention in the local media. In parallel with these developments there have been

- (a) the development of sophisticated complaints handling procedures and systems for noise monitoring and aircraft flight tracking and
- (b) a number of social surveys and reports designed to determine the effect of the Airport's growth and operations on the local communities.

The main aims of this project are to investigate how the nature and volume of complaints from local residents have varied over the period of considerable growth of MA and how the community perception of MA has changed as indicated by social surveys. Some limited comparable complaint information is available for Lyon Airport but there is no available information for Bucharest.

This work should provide valuable information and insights about the validity of using complaints as an index of the level of disturbance and tolerance in local communities to airport growth and operations. It will also provide valuable background information to help understand the results of the main study.

It is accepted that complainants are not always totally representative of the total population and do not reflect the full extent of aircraft noise annoyance. However, prevalence does reflect the distribution of aircraft noise annoyance in noise polluted areas and provides a continuous source of feedback of the tolerance of local communities.



## Structure of the Report

This report is the result of a trawl of the available data in reports and studies based on Manchester Airport and in particular the Airport's effects on the surrounding communities as indicated by complaints and social surveys.

The report tracks the historical development of MA (Section 3.0) to its present position as the third largest airport in the UK after Heathrow and Gatwick. MA has an excellent track-record of environmental management, which has helped it avoid 'designation'<sup>1</sup> by the UK Government, and a summary of the developments of the environmental management programme has been included (Section 4.0). This infrastructure at MA helps to explain the way complaints are received, processed and acted upon. A brief literature review of complaints and annoyance generated by transportation noise has been included (Section 5.0).

In parallel with the development of the environmental management programme there have been considerable technological developments and operational improvements that have enabled the Airport to link individual complaints to specific aircraft movements. It is essential for the equitable application of a penalty system for aircraft that breach threshold noise limits that a monitoring system is in operation that is able to track and identify noisy aircraft. The outlines of these systems have been explained (Section 6.0).

Results from very recent detailed investigations of the 1998 and 2000 complaint data of the nature and temporal patterns (hourly, weekly, monthly, yearly) of complaints have been included with some attempts to control for the contribution of serial complainers (Section 7.0). Some comparisons of complaint profiles at Lyon are included and compared with MA (Section 8.0).

A review of social surveys carried out around MA has been provided (Section 9.0) and brought together with the complaint data for specific communities where available (Section 10.0). Conclusions and suggestions for future work is outlined in a final section (11.0).

---

<sup>1</sup> 'Designated' airports are under the direct control of the Government in terms of their operating envelope.



# Historical Development of Manchester Airport

Manchester Airport is located to the south west of the Greater Manchester conurbation, which has a population of approximately 2.5 million people. Aircraft approach the airport over Greater Manchester and depart towards the southwest over the Cheshire countryside.

The airport was opened in 1938 and in the following year handled 7,600 air traffic movements. Today Manchester Airport is the third largest airport in the UK, one of the busiest in Europe and is now firmly established as one of the world's top international airports. In 2001 over 19 million passengers passed through the Airport, carried on over 181,000-passenger air transport movements of which over 70% were scheduled services. The cargo throughput in 2001 was over 112,000 tonnes, 30% of which was carried in dedicated freighters and 70% in the holds of passenger aircraft.

After the Second World War, during which the airport was closed, there followed a period of traffic and infrastructure growth beginning with the construction of a new terminal in 1949. In 1951 the airport began 24 hour operations and in 1953 inter-continental services to North America. In 1962 a new terminal was opened. It following the introduction of wide-bodied aircraft operations a decade later that the airport began a period of rapid and sustained growth.

By 1978 over 15,000 people were employed on and off site by nearly 100 companies directly associated with the operation of the Airport. Fifteen airlines flew scheduled services to 37 destinations with an additional 17 airlines operating regular inclusive tour and charter flights. Two years later BA began a regular shuttle service between Manchester and London. This growth was also accompanied by expansion of the existing terminal facilities.

In 1986 Manchester Airport was established as a public liability company (plc) with shares owned by the local authorities of the Greater Manchester area. The same year saw further passenger terminal expansion and the opening of a cargo centre (which soon after was handling 45,000 tonnes of freight a year). By 1988 passenger numbers had reached 8.7 million and cargo almost 70,000 tonnes. A new domestic terminal was opened and in the following year new hangars were constructed to enable development of aircraft maintenance services at the airport. All these developments led to Manchester becoming the fastest growing major international airport in Europe during the 1980s.

The first phase of the £265 million Terminal 2 was opened in 1993 followed by an £18 million airport rail terminal, which carried 1.5 million passengers in its first 18 months. Further Terminal expansion occurred during the mid 1990's along with the construction of new hotel facilities and other airport infrastructure such as office blocks. By the year 2000, passenger numbers had increased to 18.4 million and traffic to 178,500 ATMs.

Following granting of planning approval in 1996, a second runway costing £172 million was constructed and brought into operation in February 2001. In the more recent past, a major inter-modal transport terminal has been constructed, additional office facilities provided and other buildings and infrastructure modernized.

Current forecasts (DfT 2002) indicate that Manchester Airport will grow to approximately 40 million passengers and 300,000 ATMs per year by 2015 increasing to 60-65 million passengers and approximately 370,000 movements by 2030.



# Environmental Management at Manchester Airport

The strong and sustained growth of Manchester Airport, particularly over the past 20 years, brought with it significant social and economic benefit to the North of England. However both the ongoing development of new infrastructure and the associated growth in passengers, cargo, air and road traffic has had an increasing impact upon the environment and the lives of local residents. The increasing media attention being paid to airport developments and in particular the public inquiries associated with Terminal 2 and the second runway further heightened community awareness of, and stimulated debate about the airports current and planned growth in operations.

The Airport Company anticipated growing environmental pressure and the need for more extensive management of such issues when it undertook a review of its environmental management programme during the mid 1980's. A social survey undertaken in 1988 revealed that aircraft noise remained the single most important concern of people living close to the airport (MA 1989); this despite the fact that the Airport had employed a noise officer for over 20 years and introduced its first noise monitoring system in 1972. It also indicated that local residents, whilst accepting that some disturbance was inevitable, did object to what was considered avoidable. There was a belief that whatever good words the Airport spoke in public, when it came to conflict between the needs of the community and the needs of the airports service partners, commercial interests would always come first. In addition, a significant proportion observed that having seen such rapid airport growth in the recent past, they had genuine fears about future traffic growth and how this would affect their quality of life.

The results of the airports review were published in the 1989 document 'Towards a Better Environment' (MA 1989). It considered not only noise impacts but all issues associated with the airports operation and growth. The continuing general increase in public awareness of, and concern for environmental protection further stimulated momentum in this field and in 1992 an Environment Department was established. At the same time the Company set up a Community Relations Unit to specifically identify and address issues of concern to local residents. The Airport Company also acknowledged community concerns about the future by developing a comprehensive set of targets and guarantees the would effectively deliver a commitment that as future growth proceeded, increasing attention would be paid to environmental issues so as to ensure that the 'quality of life' of local residents would be protected. In addition to developing a comprehensive environmental management programme, described in its 'Environment Plan' (MA 1993), the Company invested in new monitoring systems particularly to support the noise control strategy.

Further significant developments included a move towards greater transparency of management systems, greater public consultation and participation in the development of the noise control programme and more public reporting of performance against target. These developments were publicised locally which again heightened awareness of environmental issues amongst local residents.

The recent public consultation undertaken by the UK Department for Transport into the Future of Aviation (DfT 2002) has again raised community interest and concern about future growth.

As a result of an appreciation of environmental issues and a proactive stance by senior managers, MA has been at the forefront of environmental action:

- First aircraft track monitoring system in the UK
- First airport to introduce financial penalties for poor track-keeping
- First airport in UK to install continuous air quality monitoring

- First airport in UK to install a major Heat and Power station (CHP)

There have been a number of occasions in the last 20 years when action groups have called for the 'designation' of MA to bring it under the same central government regulatory controls as the London airports, but because of its excellent track record of environmental management and policies, these attempts were unsuccessful.

### Consultations with stakeholders

MA realised that there was a need to develop a dialogue with the community in order to maintain an awareness of the issues of concern to local residents. This came about, partly as a result of social surveys (see Section 9.0).

The **Manchester Airport Consultative Committee (MACC)** was set up in 1969 as a formal interface between MA and its neighbours. It is composed of representatives from local authorities, amenity and user groups. MACC holds quarterly meetings in public and MA provides it with reports on a variety of issues of local interest including:

- Environmental monitoring, particularly noise and track monitoring
- Analysis of community complaints
- Development proposals
- Progress on environmental management initiatives
- Night flying proposals
- Traffic and passenger throughput data

A **Technical Sub-Committee** of MACC examines individual issues in considerable detail and meets in private enabling it to discuss commercially sensitive issues and matters of security.

As an initiative to conduct some of the work of the **Community Relations** office within the community, a series of meetings and clinics in key areas in the surrounding towns and villages are now held.

An **Aircraft Monitoring Group** functions as a conduit to introduce community concerns and wishes directly into the noise control programme, to guide MA on the priority of the different issues and to monitor and report progress to MACC. This group, made up of representatives from MA, NATS and members of MACC, meets on a 6 weekly basis and reports back to MACC.

The **Pilot Technical Working Group** comprises pilots from the major airlines operating at MA representing a wide range of aircraft types. This group allows the practical experience of pilots and aircraft operations to be utilised to guide noise control policies.

The **Environmental Health Officer Consultative Group** comprises representatives from MA and EHOs from local authorities and meets on a six weekly basis. The main role of the group is to act as a means of communication at senior officer level between MA and Local Authorities. This allows consultation on various aspects of MA's environmental strategy and how it might impinge on the health of various groups.

# Complaints and Annoyance – A Brief Literature Review

Complaint may be loosely defined as spontaneous expression of dissatisfaction and it is generally assumed that complaint behaviour results from annoyance. Other descriptions suggest complaint is an outcome of an individual's decision that can be modelled as a discrete choice problem; either the individual does or does not complain. This can be a formal act eg. contacting the Airport or informal eg. expressing verbal concern to a neighbour. Complaining can also be regarded as an aspect of coping behaviour as a result of e.g. annoyance or other perceived adverse health effects of noise (van Wiechen et al, 2002). Levy-Leboyer et al (1987) describe expressed annoyance as a social behaviour, which is frequently stimulated by the media or the existence of an active group. There is a limited scientific literature based on complaint data but most work in this area is related to annoyance estimates gained from social surveys.

## Residence type and sound insulation

Van Wiechen et al (2002) recently reported on complaint profiles at Schipol Airport. In order to compare prevalence of complaints from areas of different noise exposure, the home location of complainants and the annual average noise levels were compared using GIS. A positive relationship was found with complaints increasing from 50 to 62 dB(A)(Lden) but above this level complaint prevalence drops back. This seems to be a consequence of the substantial rise in the percentage of homes with double-glazing which increases from 24% to 90% above 60 dB(A). In addition, comparison of complainers with non-complainers in a questionnaire survey showed that complainers report more:

- Noise annoyance
- Sleep disturbance
- Health concerns
- Fear of aircraft crashes

However, it is well known that individual and community reaction to aircraft and environmental noise are not fully explained by acoustical variables and there has been an inability of acoustic variables on their own to satisfactorily predict self-reported annoyance (Fidell, 1999) nor account for complaint patterns.

The personal variables affecting predisposition to complain that are most often discussed in the noise annoyance and complaint literature include the following:

## Education

Persons who are better educated are more prone to express their feelings in the form of complaints (van Weichen et al, 2002; Borsky, 1979). Other reports suggest that better educated people seem to experience more noise annoyance than the less educated, and they are more active in their action to improve their environment (Anon, 1980; Miedema & Vos, 1999).

## Income and Occupation

'We would expect generally lower income levels and less expensive housing in the airport vicinity' (Fiedler & Fiedler, 1975). Residents with a higher income are more likely to complain (Anon, 1980; Miedema & Vos, 1999). Occupational status is also seen as a factor in complaint propensity. Anon (1980) and Miedema & Vos (1999) found that higher occupational status increases the tendency to complain.

## Age

Conflicting results are described in the literature concerning the relationships between age, noise annoyance and complaint. Anon (1980) found that old people are generally less affected by road traffic noise and are generally less active while the younger ones are more active complainers. Opposing this view, van Wiechen et al (2002) reported that persons who are older are more prone to express their feelings in the form of complaints. Younger and older people are less likely to complain than middle aged individuals (Miedema & Vos, 1999)

## Sex

'There is no significant difference in the annoyance response of the male and female. Nevertheless, it seems that the male respondents tend to be more active in taking action to improve the environment' (Anon, 1980). Apart from the previous statement all literature states that there is no effect on noise annoyance or response to it caused by or due to gender (Levy-Leboyer, 1987; Miedema and Vos, 1999; van Wiechen et al 2002).

## Social Status

Anon (1980) reported that people living in an upper middle class area complain more to the newspapers and government than those in a lower class area. Van Wiechen et al (2002) agreed with this statement.

## Personality

Personal sensitivity to noise is an important factor. Surveys on noise annoyance reviewed by Schultz (1978) reveal that for the same noise exposure some people were nearly oblivious to the noise, some experienced various amounts of annoyance and some were extremely disturbed. An individual's attitude towards the noise, source of the noise or the neighbourhood in general, appears to affect whether or not they express annoyance and the amount of annoyance (Schultz, 1978). It has even been suggested that noise exposure itself is one of the least important determinants of people's propensity for noise annoyance, that one can more accurately predict whether an individual will be annoyed by noise from a study of their personal traits (fear, hostility etc.) rather than by measurement of the noise to which they are exposed.

An interesting suggestion mentioned in some literature is that there is a super-sensitive portion (about 20%) of the population who are always annoyed and who may complain of the noise even though they are exposed to very low noise levels; and that there is an “imperturbable” proportion (about 25%) of the population who do not appear to be disturbed, no matter how much noise they are exposed to (Schultz, 1978; Stockbridge & Lee, 1973).

### Negative affectivity

There are some indications in the literature (Diamond et al 2000) that ‘negative affectivity’ (tendency to be sensitive to negative features of the environment and to be biased towards reporting negative outcomes) determines how individuals view environmental stressors such as aircraft noise. There is a similar suggestion that there is a psychological element of **neuroticism** deciding whether a person evaluates sound as noise or not. Belojevic (1997) found that: headache, nervousness, fatigue and the feeling of depression were more frequently found in the noisy area. It was indicated that these people might have a high level of neuroticism as this predisposes to the long-term negative psychological effects of environmental noise.

### Fear of an aircraft crash

An important factor in expressed annoyance and increased noise sensitivity to aircraft noise is fear of an aircraft crash (Ollerhead, 1996; Alexandre, 1973; Levy-Leboyer et al, 1987; Stockbridge & Lee, 1973; van Wiechen et al, 2002; Miedema & Vos, 1999; Reijneveld, 1994).

### Situational factors

The evaluation of noise differs depending upon what situation of the evaluator e.g. looking forward to going on holiday and hearing aircraft noise would be evaluated differently than if concentrating on important work which is disturbed by noise.

### Behaviour at the time of disturbance

Aircraft noise causes intense annoyance by distracting people, intruding upon their privacy and interfering with work, with relaxation, with voice communication (particularly TV and radio reception) and, at night, with sleep (Ollerhead, 1996; Stockbridge & Lee, 1973; Fiedler & Fiedler, 1975). The literature concludes that sleep disturbance is an important determinant of complaint behaviour (van Wiechen et al, 2002; Guski, 1977).

A person subjected to aircraft (or other) noise is more likely to complain if they feel that the noise could be reduced, but those in authority do nothing about it. In the literature this term is given the name 'misfeasance' (Job, 1988; Levy-Leboyer, 1987; Borsky, 1979).

### Utility of the noise source

Another variable affecting attitude towards noise is the utility of the noise source, that is, a respondent's personal interest in the process that causes noise is believed to influence his assessment of the noise annoyance. Alexandre (1973), surveying people who live close to an airport, observed the highest annoyance among those who fear plane accidents, while the less annoyed either worked at the airport or had one of their close relatives working there. In contrast, Fields (1992,1993) concluded that variables including use of the noise source and dependency on the source do not have an (important) effect on annoyance. Gjestland et al (1995) studied people in a community who had jobs either directly at the airport studied (military personnel and airline company employees) or had jobs that depend upon the presence of the airport and the military base. The response given by military personnel and people with jobs directly related to the airport was compared with the response from people with non-airport related jobs. Perversely, contrary to what could be expected, the respondents in the first group (airport related) were slightly more annoyed than the others. However, the difference was not significant.

### Media coverage and heightened community awareness to noise

This may contribute to annoyance and complaint. Levy-Leboyer et al (1987) state that expressed annoyance is a social behaviour, stimulated by the media or the existence of an active group. The number of complaints grows each time the newspaper or television agencies give information about environmental problems and issues (Guski, 1977).

### Cross-cultural differences

Sato et al (2002) investigated cross-cultural differences in the community response to road traffic noise via social surveys conducted in Gothenburg (Sweden) and Kumamoto and Sapporo (Japan), using the same questionnaire and noise measurement method. The questionnaire comprised 40 questions relating to environmental, housing and personal factors. The key questions concerned annoyance caused by road traffic noise.

There were no systematic differences between community responses from Sapporo and Kumamoto, which have the same culture. The results showed that sound insulation did not have a significant effect on annoyance responses. It was considered that differences were probably related to differences in customs between the two countries, such as spending time outdoors in gardens or on balconies particularly in Gothenburg.

It was found that people living in detached houses were more annoyed by house vibration caused by road traffic than people living in apartment houses in both countries. People living in detached houses in Gothenburg were more annoyed by the same road traffic noise than

people living in Japanese cities. There were no systematic differences among the three cities with regard to activity disturbances indoors, but a significant disturbance to activities and resting/relaxing in gardens or on balconies was found in Gothenburg.

Ertoren & Smith (1998) carried out a cross-cultural study on the effects of noise on 100 Turkish and British volunteers using an 'adaptive cost' paradigm in which the negative effects of noise on performance can be masked by compensatory effort. The only major differences between the cultures were found at baseline which was suggested to reflect the different familiarities with the types of performance assessments used. Another suggestion to explain the lack of cultural differences was the lack of intensity and type of noise used.



# Complaints at Manchester Airport

## Flight and noise information - MANTIS

Manchester Airport operates a computerised Aircraft Noise and Track Information System (MANTIS). The MANTIS system records the movements of all aircraft up to a 30km radius and a height of 12,000ft. MANTIS has links to thirteen remote noise monitors situated at strategic locations in the local community surrounding the airport that can be used to describe the local noise climate or the noise made by individual aircraft movements. Noise readings on MANTIS are given as a maximum long-term average noise level  $LA_{eq}$  ( $LA_{max}$ ), the maximum value of continuous steady sound during an aircraft flyover.

The readings from these monitors are used to assess the outdoor noise levels on departure and arrival and routinely used to determine whether the aircraft is operating within the noise limits for that particular time of day and impose penalties upon aircraft which exceed locally agreed limits. Other monitors record the noise on the airfield and in nearby densely populated areas. In this way, every individual aircraft movement can be associated with the noise generated in the community surrounding the Airport. All aircraft movements (arrivals and departures) with associated information; flight number, aircraft type, airline, route, runway, time and date, were logged onto this system.

## Complaint information

The Airport has a **Community Relations Department** that deals with complaints via surface mail, e-mail, a dedicated phone line during office hours and an answer-phone at other times.

The complaints data had been processed by the Community Relations Department and initially logged and coded for a variety of factors, e.g. time and nature of the complaint, and further processed with the addition of flight and noise data onto the MANTIS system by the Environment Office. The current authors then carried out further specific analysis.

Methods of collection include via telephone, answerphone, letter and e-mail, the most frequent method being via the telephone. Complaints about specific aircraft are logged and then linked to a specific flight causing annoyance. MANTIS then establishes a protocol linking corresponding flight data and noise level produced to specific complaints generated, within the database.

The main types of complaints received by MA are:

- Noise
- Aircraft off track or too low
- Road traffic
- Air pollution
- Fear of accident
- Reduced amenity e.g. loss of green space

However, the problem of noise is by far the greatest and the 'off-track' and 'too low' complaints are usually associated with noise.

It is generally accepted that aircraft noise can affect individuals in four main ways:

- interference with auditory communication
- distraction and loss of concentration (cognition)
- general annoyance
- sleep disturbance

**Complaints per Movement:** In order to gain a clearer picture of noise disturbance due to aircraft movements for different years, months, days and times of day there was a need to control for the large variation in the number of movements. This was achieved by calculating a common metric of the number of complaints per unit movements (usually 1,000 movements). The complaints per movement represents a sensitivity scale as when the number of complaints per movement is high, it represents a high level of annoyance as each movement is generating a large number of complaints.

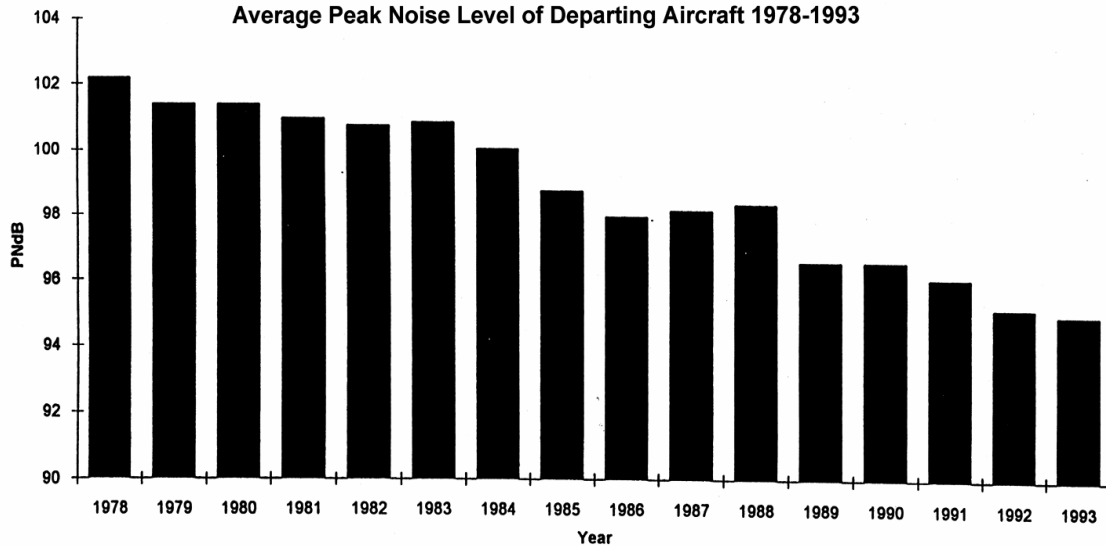
### Complaints information provided to the 2<sup>nd</sup> runway inquiry (1995)

The MA Second Runway Inquiry involved Manchester Airport providing an analysis of some complaint data. The essential findings relevant to this project are outlined below and more details are provided in Appendix 1.

### Average peak noise level of departing aircraft (1971-1993):

Changes in aircraft type and improvements to operational procedures resulted in a significant drop in noise levels made by departing aircraft operating out of Manchester over the period 1978 - 1993. This is illustrated in figure 1 (MA897.4). The average peak noise level made by departing aircraft declined from approximately 106PNdB in 1971 to 95 PNdB in 1993

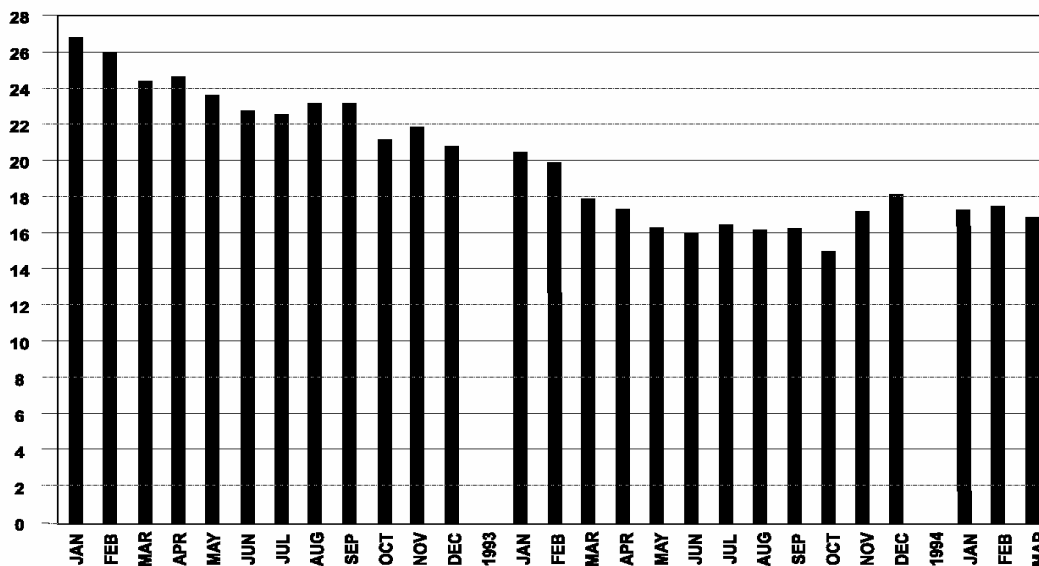
**Figure 1**  
Average Peak Noise Level of Departing Aircraft 1978-1993



**Percentage of movements made by Chapter 2 aircraft:**

In the early nineties there was a rapid decline in the percentage of older and noisier Chapter 2 aircraft operating out of Manchester, see figure 2 (MA897.5).

**Figure 2**  
Percentage Movements made by Chapter II Aircraft  
Jan 1992 - Mar 1994

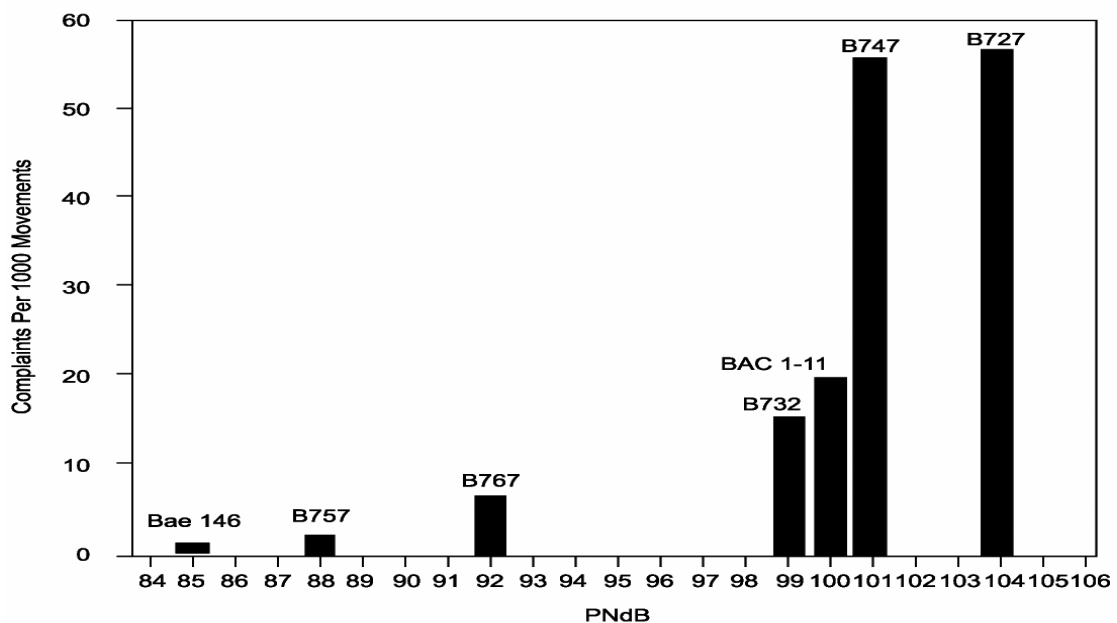


Over 65% of noise complaints in 1993 related to operations by Chapter 2 aircraft despite the fact that they comprised only about 17% of movements in that year. Chapter 2 aircraft ceased to operate from April 2002. However, in recognition of the disturbance they caused, the Airport developed a strategy which encouraged the phasing-out of Chapter 2 aircraft ahead of legislation.

### Noise level of different types of departing aircraft and the number of complaints received per 1000 movements:

Complaints from local residents have indicated the types of aircraft that are of greater concern. These are principally large slow climbing aircraft such as jumbos (Boeing 747s) which create most noise (MA897.2). There is limited data on the noise level associated with different types of aircraft operating at MA but some has been produced (figure 3) which shows the noise level of departing aircraft and number of complaints received per 1,000 movements.

**Figure 3 The relationship between the noise level of departing aircraft and the number of complaints received per 1000 Movements**

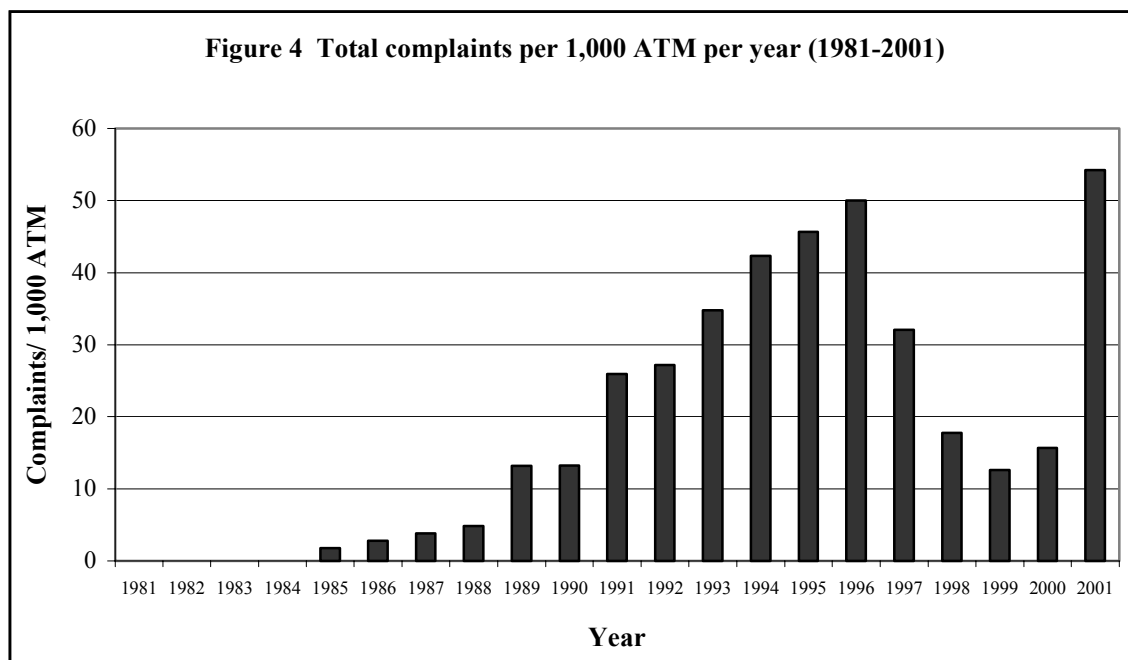


# Summary of Recent Complaint Analysis

## The pattern of complaints over the last 20 years at Manchester Airport

The trend over the past 20 years in total complaint numbers and total air traffic movements (ATM) is shown in Figure 4. The airport has kept complaint data since 1985. Complaint numbers are clearly lower before 1989 due to a difference in complaint recording procedures. Before 1989 when complaint letters were received listing more than one specific complaint regarding aircraft noise events, they were logged only as one complaint. Beginning in 1989 this procedure was revised to include a recording of every single complaint within a letter, hence the misleading apparent rise in complaints. Air traffic movements show a steady increase over the 20-year period, mirroring the global increase in aviation.

The second decade on the graph shows some interesting patterns of complaint that do not follow the air traffic movement numbers. This dissociation can be explained by the planning and development of the second runway. The planning application for runway 2 was sought in 1993, corresponding to a slight rise in complaints. The Public Inquiry for the new runway was carried out from 1994 to 1996, giving rise to a year on year increase in complaints. This trend is possibly due to a steady increase in public awareness of the plan for a new runway which was widely reported in the local media. Following the approval of the new runway, complaints were reduced from 1997 to 2000. Then in February 2001 the new runway began operations, leading to a new noise climate in areas along the departure routes associated with the new runway. This changed pattern of disturbance produced the largest value of complaints per 1,000 flights seen at Manchester Airport (figure4).



## Detailed studies of complaints at MA

Three recent studies comparing complaints and associated flight data have been carried out at MMU. The first study analysed data from 1998 (& part of 1999). The

findings were presented at a Meeting (Scan-UK, 2001) and published (Hume et al 2003). This study addressed a series of questions:

- What aspect of airport operations do people complain about?
- Are complaints directly dependent on noise levels?
- How do temporal factors eg. time-of-day, day of the week, month of the year, affect the propensity to complain about aircraft operations?

The second study asked questions about :

- How do serial -complainers influence the complaint data (Inter-noise, 2002 & Hume et al 2002)

A third series of investigations:

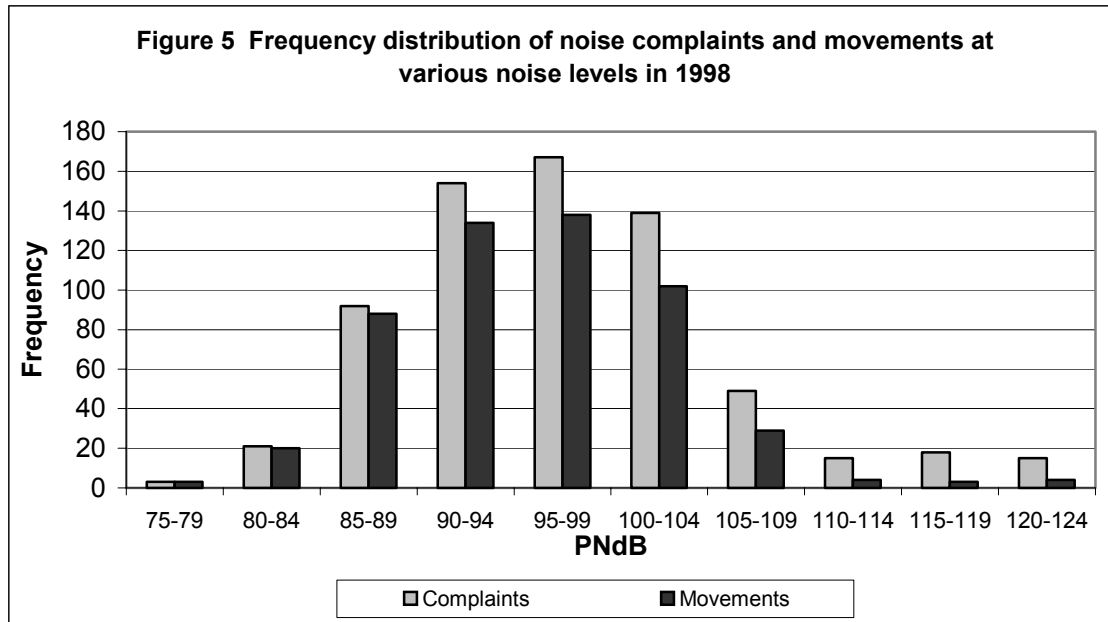
- Compared the results of 1998 with 2000 (Forum Acusticum 2002) for temporal aspects of complaints and the influence of serial complainers.
- Investigated the influence of socio-economic factors on complaints and is currently in progress (ICBEN 2003).

It should be stressed that for these specific complaints about aircraft noise events, the time of day of the event was logged and not the time when the complaint was registered. The complaint data were noise complaints that were directly compared to recorded movements from the Airport's monitoring system MANTIS.

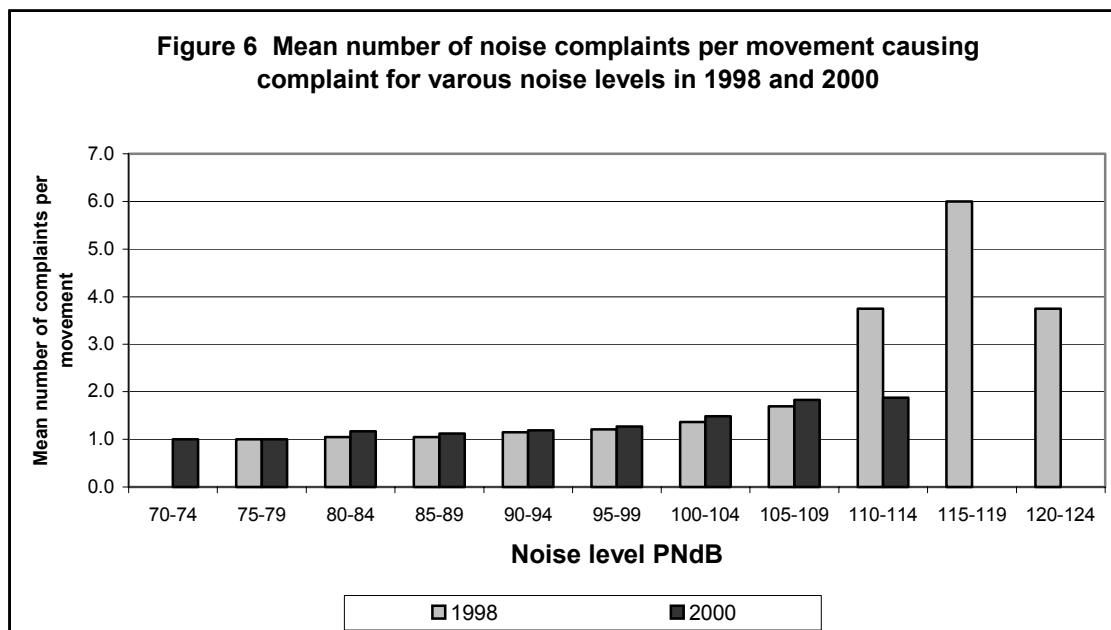
The main findings of these studies are provided below.

### Aircraft noise level

Considering only movements where complaints were received, Figure 5 shows the distribution of aircraft movements and corresponding complaint data for various noise levels in 1998. The frequency of the various noise levels and complaints produced by the aircraft movements approximates to a normal distribution with a slight skew to the right. There was a large volume of complaints around 96.6 PNdB as a large number of aircraft generate this noise level.



As the noise level increased so did the number of complaints per movement. This can be more readily observed if the mean number of noise complaints is plotted against the rising noise level (figure 6, data for 1998 & 2000). The mean complaints per movement were calculated by dividing the number of complaints by the number of movements causing complaint at that noise level. The higher the noise level the more complaints were generated.



Analysis of flights that generated complaints revealed a threshold of 70-79 PNdB with a steady rise to about 1.9 complaints at 105-109 PNdB in 198 and 2000. In 1998 there were higher

noise levels associated with much more complaint. This was due to Concorde flying out of Manchester in 1998 but not 2000.

Recently, van Wiechen et al (2002) reported on complaints at Schipol Airport. The home location of complainants and the annual average noise levels were compared using a GIS in order to compare prevalence of complaints from areas of different noise exposure. Their results demonstrated a positive relation between aircraft noise exposure and the prevalence of complaints, with complaints increasing progressively from 50 to 62 dB(A)(Lden) but above this level complaint prevalence dropped back. This lack of a relationship at the noisiest sites seems to be a consequence of the substantial rise in the percentage of homes with double-glazing which increases from 24% to 90% above 60 dB(A).

The results demonstrated a clear positive relationship between noise level and complaints. This relationship demonstrates that complaints are not simply random expressions of annoyance with all ATM rather individuals detect louder ANE and report them. This is predictable as at higher noise levels more individuals in the noisiest areas would reach their 'threshold of coping' with the nuisance and feel the need to complain. As with all potential stressors, there are large individual differences in response to noise and the personal threshold for being annoyed enough to complain to the airport would vary considerably (Job, 1996). Complaining can be considered as part of a coping mechanism to a stress situation, which provides an index of tolerance or annoyance. Social surveys (Hume & Thomas, 1993; Diamond et al, 2000) indicate that many individuals cope or 'put-up-with' the disturbance rather than complain, because they assume that their complaint would not change significantly the airport's operations.

However, it is well known that individual and community reaction to aircraft and environmental noise are not fully explained by acoustical variables and there has been an inability of acoustic variables on their own to satisfactorily predict self-reported annoyance (Fidell, 1999) and account for complaints.

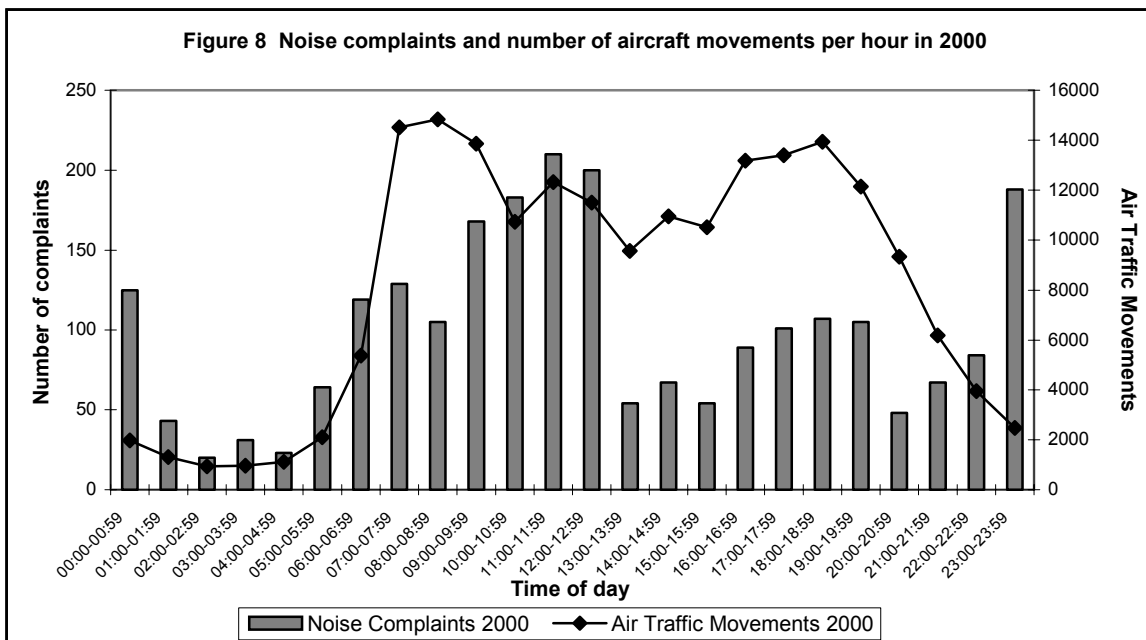
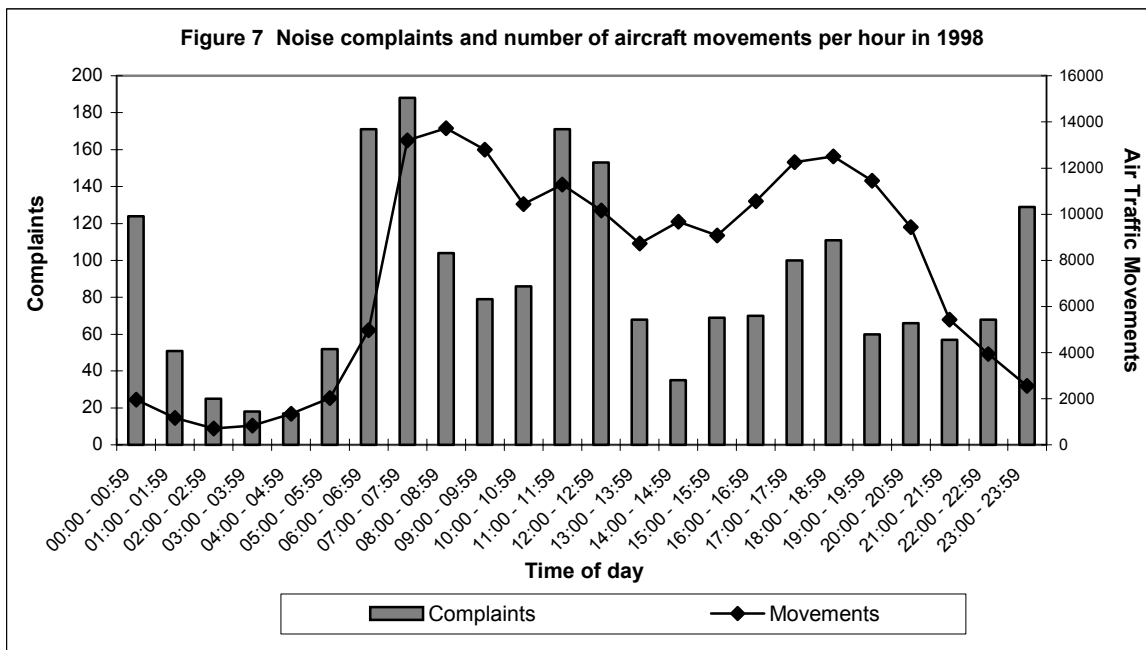
### Time of Day

The number of aircraft movements per hour and the number of complaints per hour reveals a complex relationship over the 24-hour day (figure 7 & 8). The 24h patterns of complaints and ATM's were not similar. The number of aircraft movements at Manchester Airport remains low at night (2300-0600hrs) due to the 'Night Noise Policy'<sup>2</sup> and the 'Noise Penalty Scheme'<sup>3</sup>, which restrict the type and number of aircraft and the noise levels of departing aircraft.

---

<sup>2</sup> Manchester Airport in common with many other airports operates a 'Night Noise Policy', which restricts the types and numbers of aircraft that can take-off and land between 2300 and 0700hrs. Chapter 2 (noisier) aircraft are only allowed to land after 0630hrs.

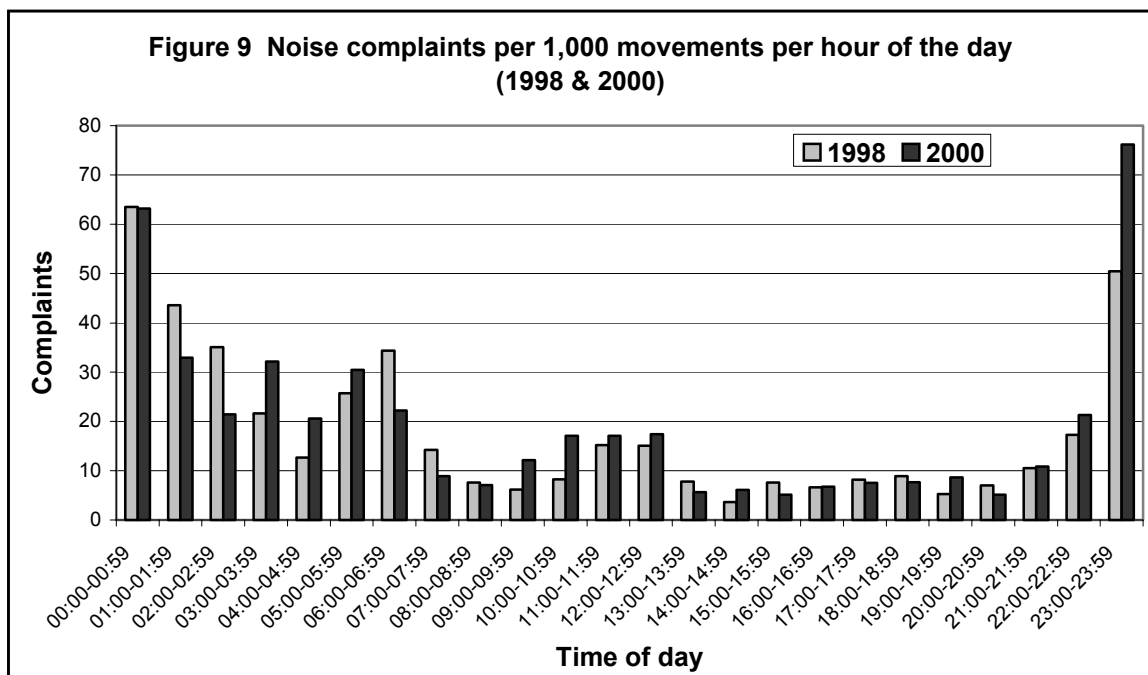
<sup>3</sup> In addition, the airport operates a 'Noise Penalty Scheme' the limits of which are lower at night (100PNdB = 87dBA) than in the day (105PNdB = 92 dBA) to encourage airlines to operate quieter aircraft and pilots to fly more quietly, particularly at night.



Following the night restrictions, the flight frequency rapidly rises between 0600hrs and 0900hrs with the departure of many European business flights and arrival of transatlantic flights. There is a similar peak in aircraft movements between 17.00hrs and 19.59hrs, which coincides with the return of many of the European business flights. On the other hand, the complaint pattern does not follow this pattern.

### Specific noise complaints (per 1,000 movements) for each hour of the day

In an attempt to clarify the situation and to provide an index of the sensitivity or tolerance of the residents for a fixed ATM value, the complaints per 1,000 ATMs was derived. A very distinct pattern emerged when the distribution of complaints to specific ANE over the 24hrs in terms of complaints per 1,000 movements was analysed (figure 9). A significant nighttime sensitivity was revealed which showed that the mean complaints per movement were considerably greater than the rest of the day.



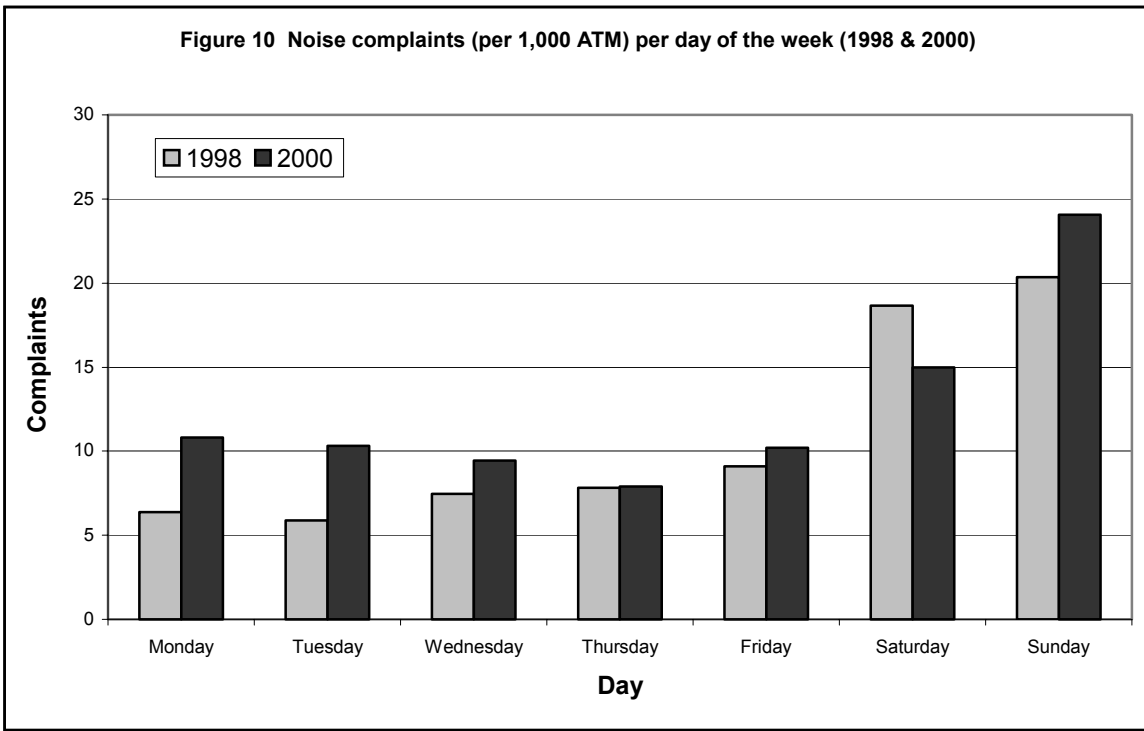
There appears a very distinctive pattern of complaints over the 24hr period, with high levels in the late evening and over the night, and a second peak in the early morning with a minor peak at midday. This clear circadian variation in propensity to complaining should not be too surprising as it has been clearly established that most physiological, psychological and behavioural variables express circadian variability as a result of internal clocks and entrainment to the prevailing time cues (Moore Ede et al, 1982). In addition, subjective experience indicates that sleep disturbance or delay due to environmental noise is generally considered to be both very annoying and to act against one's right for a 'good night's sleep'.

In addition, there is the possibility that fewer aircraft at night cause accentuation of aircraft noise disturbance, as there is less background noise and less habituation compared to the daytime with more frequent flights.

### Day of the Week

The daily pattern of flights over the working week shows a steady level with a fall on Friday and Saturday to low levels at the weekend. On the other hand, the number of noise complaints rises steadily from a minimum on Monday to a maximum on Saturday/Sunday. The picture for

days of the week in terms of complaints per 1,000 ATMs (figure 10) shows a distinct weekend effect, particularly Sundays, with increased complaints despite fewer ATM's.

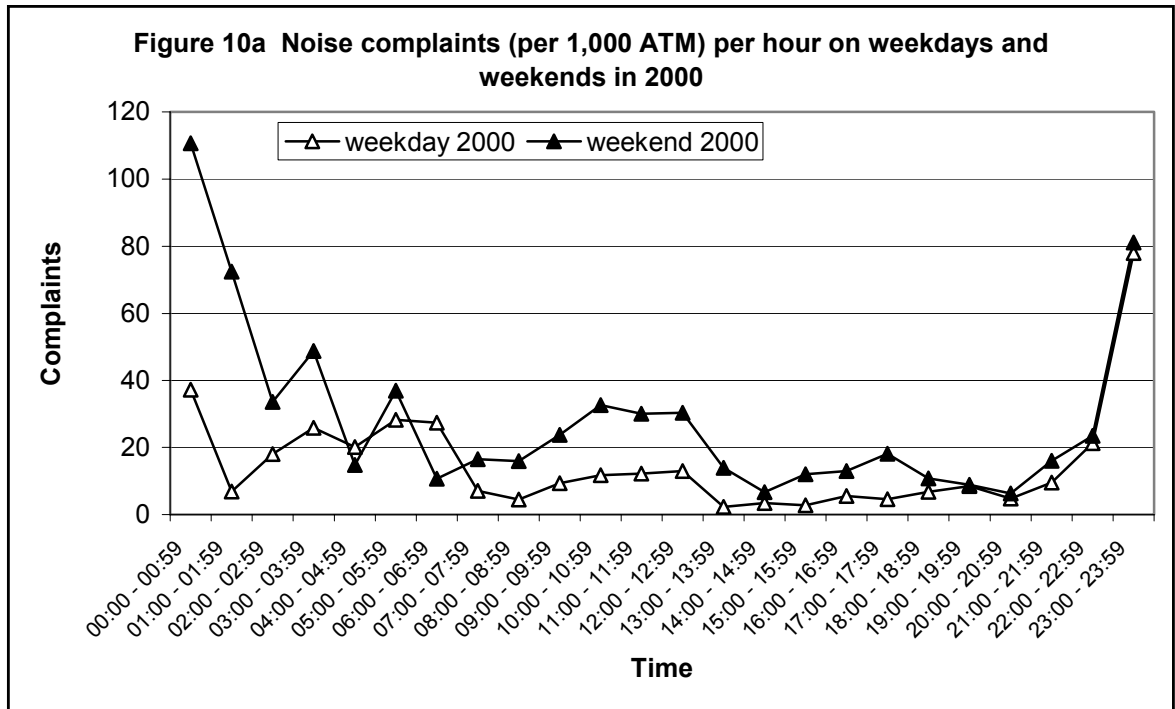


Possible explanations for the elevated weekend levels are: (a) the residents of the local community are spending more time at home and are therefore subjected to more aircraft noise; (b) the weekend is most likely perceived as having greater intrinsic value for rest and relaxation, important factor in ones quality of life and therefore a greater source of annoyance.

### Hourly distribution for weekdays and weekend

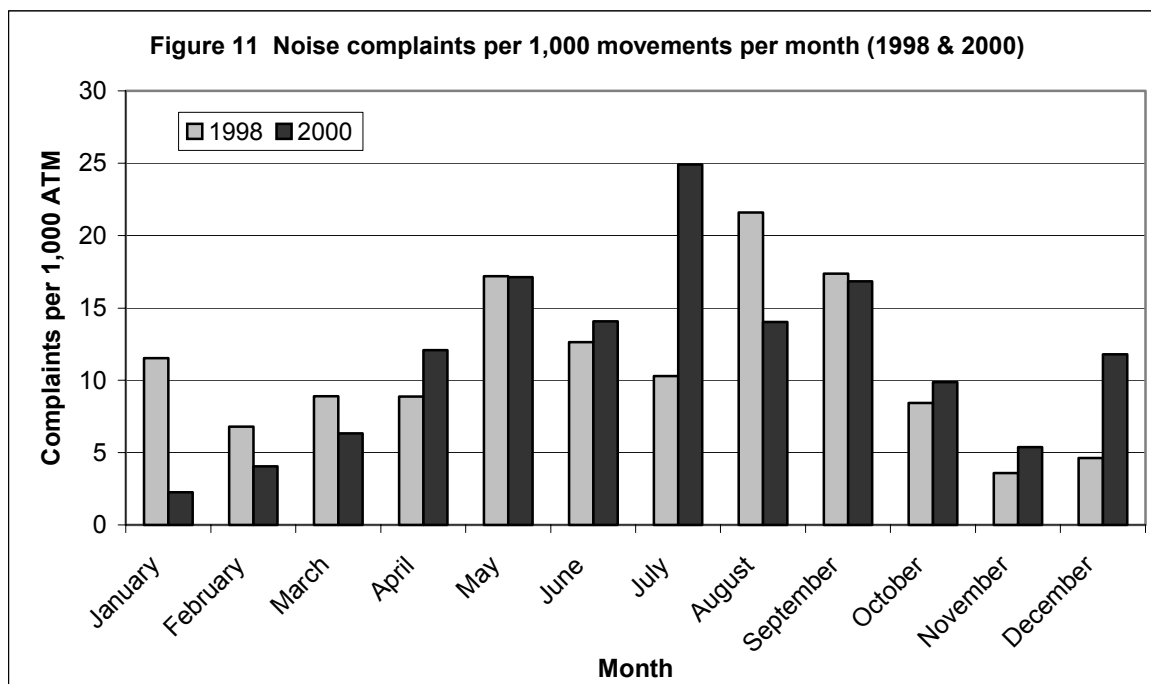
The increased complaints at the weekend compared to the weekdays were most likely due to two related factors. More people would be at home during the daytime at weekends, particularly Sundays (the day of rest), and experiencing aircraft noise. Also, people would have a greater expectation of obtaining rest and relaxation with reduced tolerance at the irritation and annoyance caused by aircraft noise. Graph 10a showing the hourly pattern of complaints (per 1,000 ATM) for weekdays and the weekend (data only available for 2000) reveals increased complaints during the daytime at weekends, a consistent sharp rise for weekdays and weekends in complaints after 23.00 which peaks for weekdays but increases further at weekends with generally higher levels in the first half of the night. Therefore, weekends show more complaints during the daytime and the first half of the night when compared to weekdays

with a consistent rise in complaints at the time that many people are attempting to sleep between 23.00 and midnight.



### Months of the Year

The monthly pattern of ATMs and complaints reflects the typical annual holiday cycle with a high season from May to September followed by a low season. The pattern of noise complaints follows this but with two peaks, one at the start of the high season (May), one during the main holiday period (July/August) and a smaller peak around Xmas. The complaints per 1,000 ATMs shows a similar pattern (Figure 11).



The rise in complaints in May is likely to be due to the increase in flights at the start of the peak summer season, following the relatively quiet winter season. The complaint rate habituates over June and July before another rise in August, which is most likely due to more time at home with the windows open and in the garden, therefore more time to 'suffer' from ANE and complain.

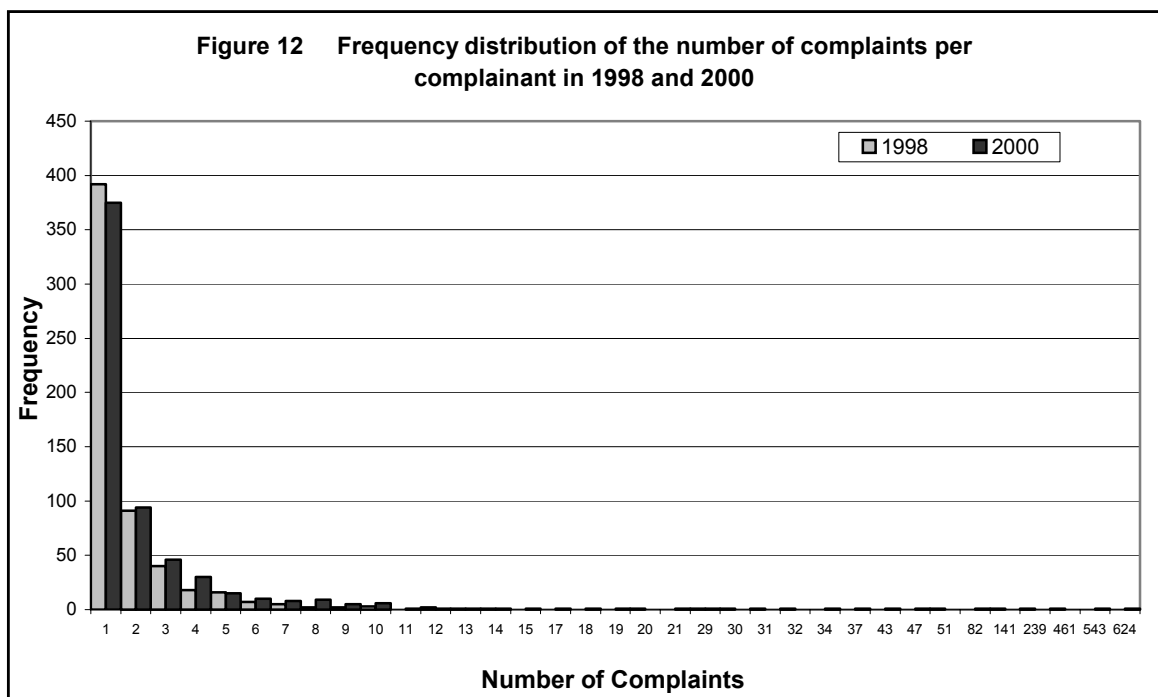
### The influence of serial-complainers on complaint profiles

Complaining is one of a spectrum of responses open to residents concerned about the effects of airport operations. Complaining is probably the most frequent and immediate form of opposition to airport operations as it is the easiest way to express concern. More sophisticated opposition occurs less frequently (e.g. organising an opposition group) as the cost in time to the complainant is much greater (Gillen and Levesque, 1994).

It is sometimes difficult to accurately assess solely from complaints whether airport operations are genuinely causing widespread disturbance to the silent majority in a particular community i.e. complainants are the 'tip of an iceberg', or whether the complaints are emanating from an unrepresentative small group of serial complainers with strong political views and motivation.

However, it is evident from data at Manchester Airport that there are also different levels of complaining. Most people complain just once or a few times, while in extreme cases individuals lodge hundreds of complaints. These 'serial-complainers' are worthy of more detailed investigations to find possible reasons for their repeated complaining and to investigate their social and psychological attributes. However, initially it is important to determine how much bias they introduce into the data.

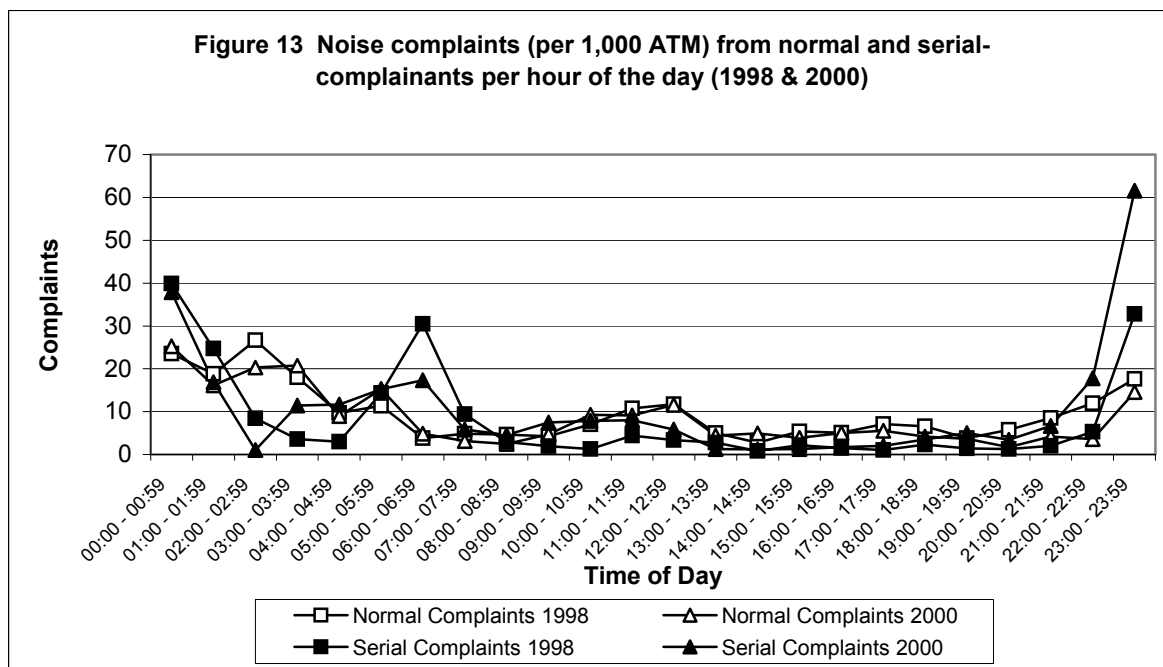
Figure 12 compares the frequency distributions of the number of complaints in 1998 and 2000. This figure demonstrates how complaints by a core of individuals could potentially bias the complaints profile. There was a very similar pattern for both 1998 and 2000 with a clear exponential decrease where most individuals complained once, to individual complainers who complained about a dozen times. At the end of the distribution were three individuals who complained about the noise levels on 141, 239 and 461 occasions in 1998 and 82, 543 and 624 times in 2000. These three individuals accounted for 41% and 45% of specific complaints in 1998 and 2000 and were classed as serial-complainers.



Complainants lodging more than 50 complaints in a year were arbitrarily designated as 'serial-complainers' and compared with complainants complaining less than 50 times in a year ('normal-complainers') in terms of temporal patterns i.e. for time of day, day of the week and month.

### Serial-complainers and Time of Day (1998 and 2000)

Figure 13 shows noise complaints (per 1,000 ATM) from normal and serial complainers per hour of the day in 1998 and 2000



In both 1998 and 2000 serial-complainants data produced a similar picture: noise annoyance was greater in the early and later parts of the night period, falling away in the mid-night period. Normal-complainants, however, are annoyed consistently throughout the night. This fact would indicate that serial-complainants are annoyed with aircraft noise before they go to sleep, but then tend to sleep throughout the night. Once awake, the serial-complainants continue to complain. Conversely, normal-complainants are annoyed by flights throughout the night and are woken, or prevented from sleeping more often. This could be described as an acute annoyance, whereas the serial-complainant could be described as being chronically annoyed by airport operations, regardless of time of day.

### Serial complainants and Day of the Week (1998 and 2000)

Figure 14 shows noise complaints (per 1,000 ATM) for normal and serial-complainants per day of the week in 1998 and 2000.

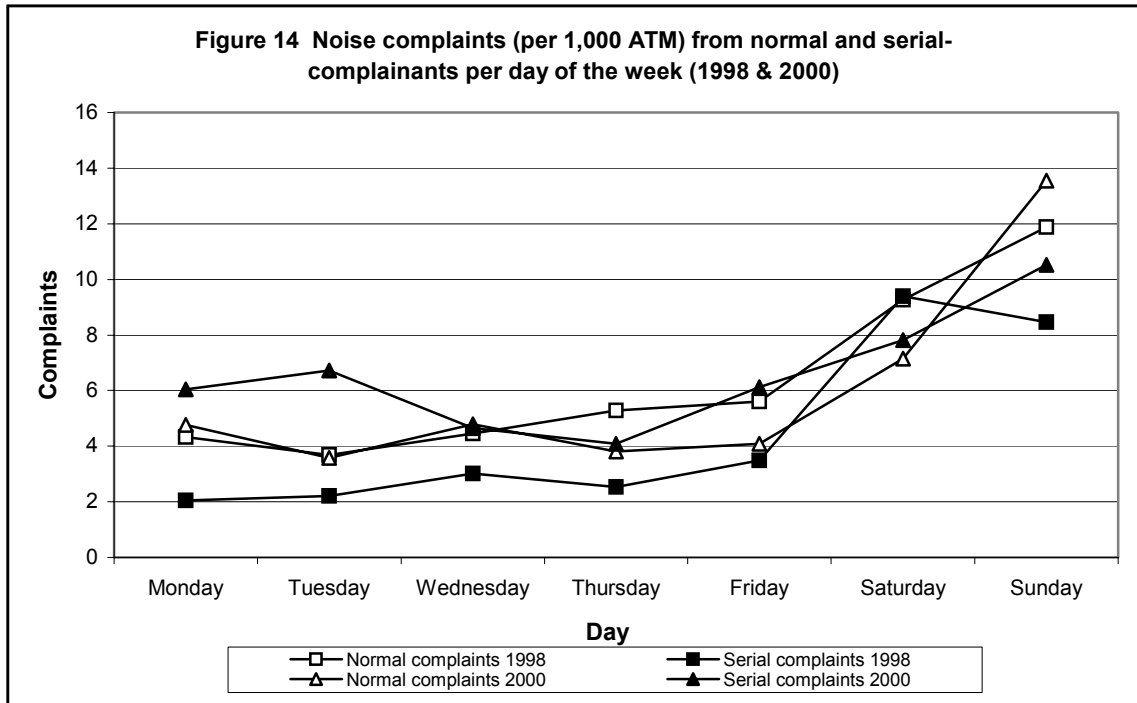
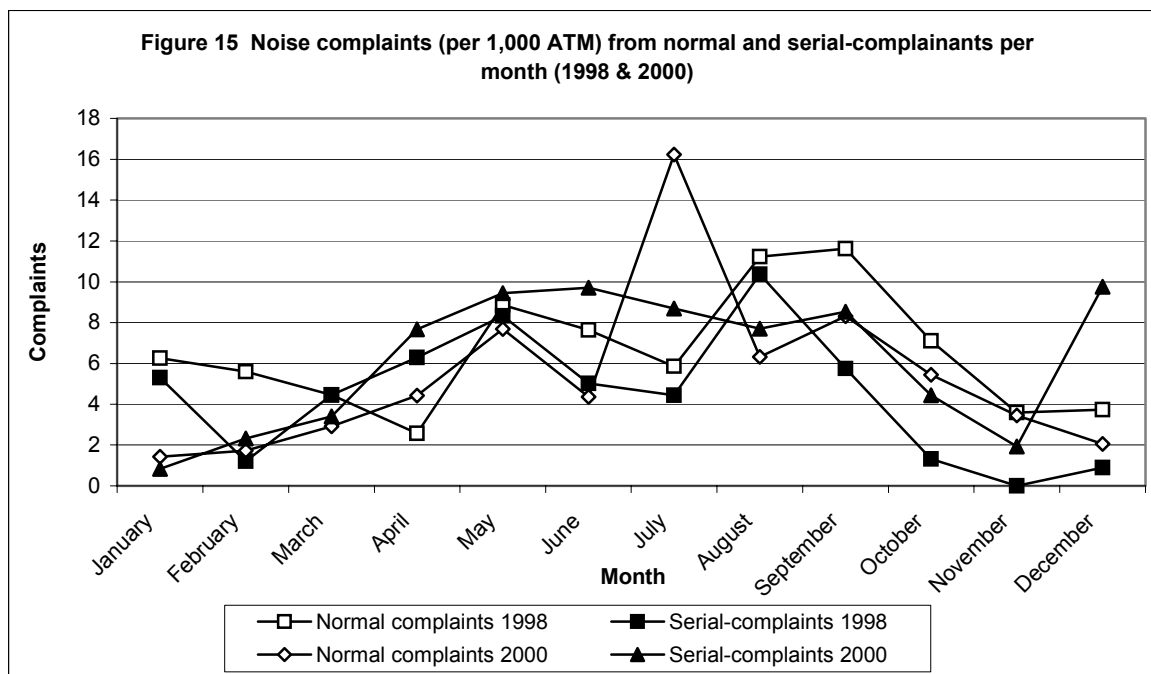


Figure 14 illustrates that a similar pattern was seen in 1998 and 2000, with relatively constant annoyance levels from Monday to Friday for both normal and serial-complainers, whereas on Saturday both complainant types exhibited an increased annoyance. Normal-complainers were more sensitive on Sunday, while serial-complainers were similarly annoyed on Saturday and Sunday.

### Serial complainers and Month (1998 and 2000)

Figure 15 shows noise complaints (per 1,000 ATM) from normal and serial-complainers per month in 1998 and 2000. In 1998 and 2000 the patterns of complaint propensity with month revealed general similarities with some slight differences apparent in July of 2000 for normal-complainers and December in 2000 for serial-complainers.



Overall there appears to be little bias introduced by serial-complainants but need to be aware of their existence and airport's should always provide data on the number of complainants in addition to the number of complaints.

This study has found that serial-complainants do not substantially change the complaint picture with regards to temporal patterns, except at nighttimes when interesting differences exist.

Research showed that these serial complainants were male, tend to live in wealthy areas in relatively expensive housing, were well educated and articulate. It is important to note also that data from the two separate years, 1998 and 2000, show similar results indicating a consistency of findings. It would be interesting to see if other airports report similar complaint patterns.



# Comparison of Complaints at Manchester, Lyon and Bucharest

## Complaints at Lyon-Saint Exupery Airport

Lyon-Saint Exupery Airport is located to the east of Lyon in a rural, generally low population-density area of central France. The Airport operates two runways with a north/south orientation. It handled about six million passengers and 130,000 ATM in 2001, making it the fourth largest airport in France. There were about 8 complaints per 1,000 ATM in 2001 (compared with about 55/1,000 ATM at Manchester). The Airport has a direct link to the rail intercity network TGV. It is a developing airport with plans and approval to build two more runways.

In general the Airport, which has increased considerably in the last decade, is surrounded by small towns and villages that offer inexpensive housing in an attractive and frequently tranquil rural location. There is little difference between these communities in terms of amenities, social structure and affluence except Pusignan, the nearest town, which has more amenities and is more of a shopping centre than the other communities.

There are plans for two new runways that were outlined in 1996 with a subsequent rise in complaints from 315 (from 108 complainants) in 1996 to 2,025 (from 494 complainants) in 1997. This resulted in the creation of active opposition to the development in the form of the ACENAS group.

There are some similarities with Manchester in terms of recent developments and complaint profiles but set at an earlier stage of evolution, particularly with regard its community initiatives. For example, there is currently no night fly restriction policy. In January 2001 a permanent noise (7 measurement points around the Airport) and track monitoring system became operational.

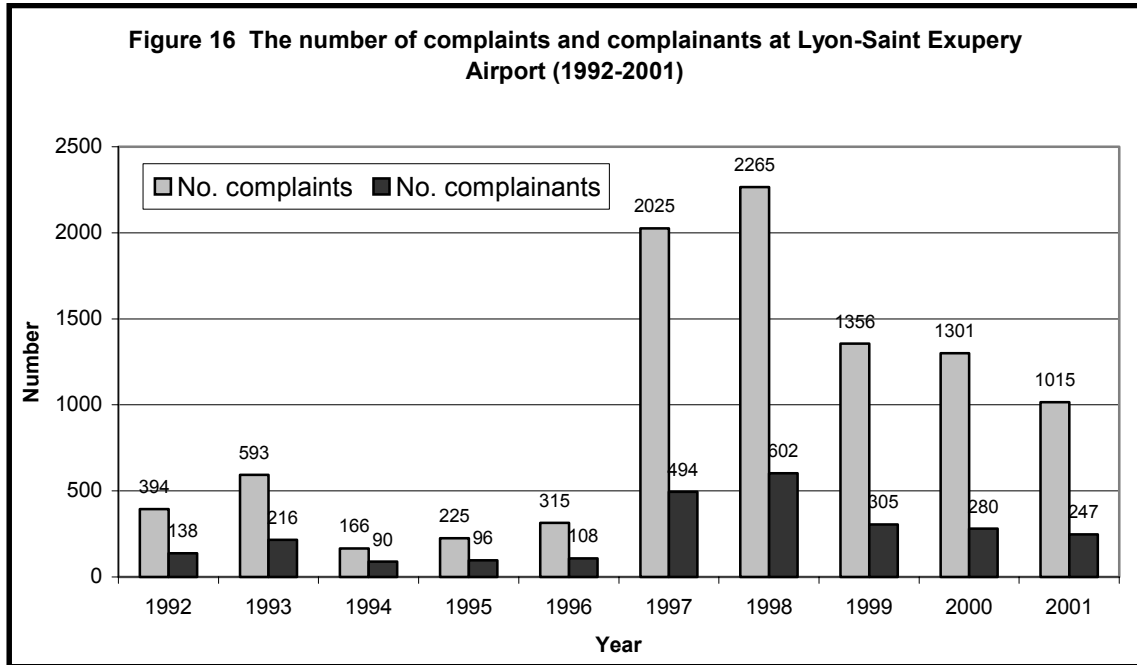
Since 1998 a 'Mediator', Environment Advisory Committee and an Information Office have handled local residents' complaints. This system has enhanced transparency and communication between the Airport and its neighbours and helped reduce complaints.

Complainants frequently mention the disturbance of tranquillity and health damage by aircraft noise. Residents under the major streams of air traffic (used to being over flown) complain about the noise or flying too low. Residents outside the air corridors and less use to seeing planes complain about being off-track. Disturbed tranquillity complaints are relatively high from areas where there are plans for new air corridors associated with new runways – means of expressing opposition to development plans – creation of active organized opposition groups ACENAS led to increase in complaints).

The data<sup>4</sup> in Figure 16 shows the evolution of the number of complaints and complainants at Lyon-Saint Exupery Airport from 1992 to 2001

---

<sup>4</sup> Information obtained from "Complaints management at Lyon-Saint Exupery Airport, France" presented at Forum Acusticum in Savilla 2002 by N'Dogbia Yombo



The considerable rise in complaints in 1997/1998 following the plans to build more runway capacity followed by the general decline probably due to a feeling of a 'fait accompli' in the communities. This pattern closely mirrors the situation at Manchester during and after the second runway inquiry.

### Complaints at Bucharest-Otopeni International Airport

As far as the authors can establish there are no procedures nor systematic records maintained of complaints to the Airport. Complaining about the operation of state controlled institutions has a very different recent history in Romania to that experienced in Western Europe and most residents would not find such behaviour as reasonable action. Some complaints are made about the Airport's operations but these are usually to environmental health and medical agencies, which are not necessarily directly relayed to the Airport authorities.

# Social Surveys and Reports Based around Manchester Airport

Most of the surveys carried out at MA and funded by the UK Government over the last 20 years have been concerned with sleep disturbance and comparing the situation at the London Airports with Manchester. On the other hand, Manchester Airport has tended to fund social studies that aimed at understanding what were the major issues concerning residents, how the Airport was perceived and carried out in order to gauge the level of support for potential developments.

**Dickinson (1974)** carried out a postal survey of 1,000 residents of Cheadle and Gatley, communities approximately 3 miles from the Airport along the main approach flight-path. He found that about 60% of the residents who replied (79% returns) were at least moderately annoyed or disturbed by aircraft noise. About half reported that aircraft noise disturbed their rest, relaxation and sleep while 27% reported that aircraft noise had prevented them from getting to sleep.

**In 1982 a Manchester Night Noise Study** investigated the relationship between sleep disturbance and aircraft noise using postal questionnaires (51% returns) and recording aircraft noise levels at six locations (Brinnington, Cheadle, Heald Green North, Heald Green South & Knutsford) around MA. This study closely resembled an earlier exercise carried out around Heathrow and Gatwick. In the conclusion of the Manchester study the authors considered that there was no clear evidence that the general situations at the London airports and Manchester were markedly different but the level of sleep disturbance from all causes was found to be 5-10% greater for communities around MA compared with London.

The London Airports Study had concluded:

- Sleep disturbance occurs frequently irrespective of aircraft exposure
- Night time Leq is the measure of aircraft noise exposure which best correlates with sleep disturbance
- Total sleep disturbance shows a statistically significant increase for Leq values of 65dB(A) outdoors, but little association with noise exposure below that level
- The disturbance attributed by respondents to aircraft noise increases more substantially as Leq increases
- The proportion of people expressing difficulty in getting to sleep increases steadily with greater exposure to aircraft noise (Leq) between 22.00 and 24.00.

**MIL & MMU in 1989** conducted a social survey in 9 local communities funded by MA (Hume & Thomas, 1993) to:

- Explore their perception of MA by local communities
- Determine the major issues concerning the community
- Establish how the quality of life is affected by aircraft noise

The study consisted of two phases; a telephone survey of 900 residents and a qualitative study employing five discussion groups of 8-10 residents in each.

The telephone survey involved 100 randomly chosen households from 9 areas in May 1989, using a computer-assisted telephone interviewing system. The areas surveyed were:

- Mobberley

- Heald Green (North)
- Heald Green (South)
- Woodhouse Park
- Knutsford
- Stockport (Brinnington)
- Alderley Edge
- Altrincham (Timperley)
- Bolton (Heaton)

Eight areas with some noise complaint history were surveyed plus a control area (Bolton) which receives the benefits of MA but has none of the environment problems. The number of refusals or other reasons e.g. inability to speak English, was 35% of the initial contacts. The interviews were carried out between 18.00 and 21.30 and lasted about 15 minutes. Interviews were conducted with a male or female over 18 with the condition that in any one area equal numbers of the sexes were interviewed.

The aim of the interview, as indicated to the respondents, was simply stated as ...”carrying out an environmental survey amongst residents in a number of communities in the Manchester area”.

During this period there was a total of 15,097 air movements during the month of May and on average; 154, 155, 117 & 62 air movements during the morning, afternoon, evening and night respectively. Also during the period of the survey the weather was generally fine and warm.

For the focus groups the participants were selected after initial screening to ensure that they did experience disturbance at home by aircraft noise. Participants were adult and equally divided between sexes and over and under 35 years. They were recruited from

- Mobberley
- Heald Green (North)
- Heald Green (South)
- Woodhouse Park
- Stockport (Brinnington)

All individuals were from social class ABC1 except Woodhouse Park who were from C2DE.

The main conclusions of the study were:

- Aircraft noise was, by far, the greatest cause of environmental disturbance in the communities living near to the airport, it's associated noise footprint and flight paths.
- There was a clear relationship between the distance from the airport, noise footprint and flight paths and the reported affect on the community

- There were considerable individual differences in subjective disturbance which 'cut across' very different communities and the perceived problem of aircraft noise was not confined to higher socio-economic groups
- In the areas of high aircraft noise disturbance, road traffic noise seems to be tolerated much more than areas of relatively low aircraft noise
- The main reported affect of aircraft noise was interference with communication particularly in the evenings followed by general annoyance and sleep disturbance
- In those individuals suffering sleep disturbance, it was a relatively common event
- Night flights by noisy aircraft, which are perceived as being off track, were a major source of complaint. It was considered that publishing a policy on night flights which showed they were being reduced and eventually eliminated within a prescribed time period would help the situation considerably
- It was considered by the vast majority that the advantages of MA outweighed the disadvantages, even in the most noise disturbed communities
- Nevertheless MA was not considered to be doing enough to minimize the environmental disturbance to the local communities – 'profit before concern'
- Many respondents felt that MA cannot be trusted to put its own house in order, the commercial and economic pressures are too great
- Communications could be greatly improved between MA and the local communities

**The UK Field Study (Ollerhead et al 1992)** was one of the largest studies carried out anywhere in the world specifically looking at the effect of aircraft noise on sleep in communities near to airports. Areas close to the major UK airports (Heathrow, Gatwick, Manchester and Stansted) were studied. As part of this study a social survey by interview was carried out (in 1991) at two sites at each of the four Airports with 200 residents at each site (1636 in total) taking part. The primary purpose of the social survey was to provide a pool of potential subjects. However, the opportunity was taken to collect data on the general perceptions of aircraft noise and its affects. The average interview was 25 minutes. The sites at Manchester were Edgeley and Heald Green.

The results revealed that of the 1636 residents interviewed:

71% were very much annoyed by aircraft noise

83% were very much annoyed by aircraft noise at night

80% had been awakened at night by aircraft noise

An observation emphasized in this report was the reactions at the two Manchester sites, which were the reverse of what would have been expected from their relative outdoor noise exposures. Residents in Heald Green reported less disturbance and annoyance than those in Edgeley, despite night time aircraft noise exposure at Heald Green being the highest of all the sites studied and considerably more than Edegeley. However, this result could possibly be explained by:

- Heald Green is in the grant area for sound insulation with 92% having either secondary or double-glazing. Edgeley is not in the grant area and only 15% have some form of sound insulation
- Heald Green residents tended to have lived in the area longer than those in Edgeley with nearly 75 % having lived in Heald Green for at least 5 years compared with only 50 % of Edgeley residents.

**MORI (1993)** conducted a survey into the attitudes towards MA generally and its expansion specifically in November/December 1993, with 1,643 full and 6,665 short (focused solely on expansion plans) face to face at home interviews at 415 sampling points throughout Greater Manchester, Stockport and Cheshire. Some of the questions were also asked in the spring of 1992. Data was weighted by constituency and by sex, age and working status to match the known population profile.

The results showed:

- Experience of MA was high with about three quarters of all residents having used it at some time
- Local councils were named spontaneously as owners of MA by about one third of residents (rising to a half in Stockport)
- The message that the income helped subsidise Council Tax bills was understood by 50% in Stockport and 40% in Manchester and less in Cheshire
- The majority of residents supported expansion mainly because 70% thought it would be good for the local economy.

In terms of the image of MA:

- 80% viewed MA as being efficiently run
- 75% considered MA provided a good quality service
- 50% thought MA was less strong on environmental protection than on efficiency of service, but it did try to limit environmental damage
- >50% agree that MA is run for the benefit of the local economy
- Disagreement expressed by 30% of Stockport residents on the extent to which MA takes the views of local people into account.

**Perceptions of aircraft noise, sleep and health (Diamond et al 2000).** This was a large pilot study carried out in late 1999 and early 2000 studying Heathrow, Gatwick, Manchester, East Midlands and Coventry.

The aims of the study were to:

- Explore public perceptions of aircraft noise at night around UK airports, the relationships between various indicators of disturbance and a number of modifying factors
- Examine the relationships between health, noise sensitivity, noise-disturbed sleep, personality and perceptions of aircraft noise at night
- Investigate the use of alternative collection strategies for collecting data on public perceptions to aircraft noise.

The research involved:

- Focus groups (8-11 participants, recruited by telephone, discussions lasted 1-1.5h) in areas around Heathrow and Manchester airports
- In Manchester the groups were recruited from Heald Green and Brinnington (Stockport)
- Secondary analysis of previous survey (random 500 sample) data collected in Bristol considering aircraft noise at night
- An interview survey in areas around Heathrow, Gatwick, Manchester (Heald Green & Edgeley), East Midlands and Stansted airports
- A postal survey in areas around Heathrow, Manchester (Cheadle & Hyde), East Midlands and Coventry airports.

At each airport two sites were chosen for each survey in areas of relatively high and low noise levels at night. The fieldwork produced a total of 1500 interviews and 700 completed postal questionnaires. The postal response rate was considered, by the authors, as acceptable, despite being extremely low in some areas (about 20% in Manchester) and not considered fully representative of the target population.

The results showed that in almost all cases there were very few instances of disturbance in the lower noise areas so the results correspond to high noise areas. The main findings were:

- There was broad agreement between the postal and interview results
- A reasonably high percentage of residents were highly disturbed by aircraft noise at night (30% at Heathrow and East Midlands; 20% at Manchester, Coventry and Gatwick)
- At Heathrow, Manchester and Gatwick the percentages very much disturbed during the day were similar to that at night. However, at East Midlands and Coventry the percentages were higher during the night than the day.
- At East Midlands and Coventry respondents reported that the noise levels had become much worse in the previous three years, which accords with actual developments at these airports
- There was relatively little disturbance due to night-time aircraft noise at the lower noise sites
- Between 10-20% of respondents reported often being prevented from going to sleep at night and similar percentages reported being woken up in the morning. However, at Heathrow the percentage was markedly higher (30%) for disturbance in the morning
- Very few people reported that health was extremely affected by aircraft noise at night, but 30-60% at each site perceived their health to be 'somewhat' affected
- Respondents who reported long term or recent physical or mental problems, or stress in their job or in life generally, were more likely to report that their health was affected by aircraft noise at night
- High proportions of residents at all airports were worried about various aspects of flying eg. 60% at Coventry believe planes fly lower than necessary

- Few people believed that the airline industry was concerned to protect the local environment
- The earlier Bristol data and the present surveys showed that perceptions of an association between night-time AN exposure and health could be accounted for by 'negative affectivity' (tendency to be sensitive to negative features of the environment and to be biased towards reporting negative outcomes) but the association between noise disturbed sleep and health was independent of it. However, it is not possible to infer causality i.e. it is unresolved whether noise disturbed sleep leads to a decline in health or whether ill-health makes one more sensitive to noise disturbing sleep.

With regards to the present report there are some additional pertinent observations:

- In Manchester the sites surveyed by interview were the same as those used in the UK Field Study (1992) and a similar result was found at the higher noise site (Heald Green) where lower than expected percentages of annoyed residents were found. This was considered to be due to the combination of adaptation, sound attenuation measures (double glazing) together with alternative attractions of the area, which meant that residents accepted aircraft noise as part of the environment and as a consequence were less likely to express high levels of annoyance.
- The health affect of aircraft noise at night was considered 'very much' or 'extreme' by about 10% of interviewees but 30-60% thought health was affected somewhat. The results showed that many people believed that other people's health and quality of life was affected by aircraft noise but they were not similarly affected.

### EUROCONTROL (2003)

A social survey – 'Attitudes to Aircraft Annoyance around Airports' - has been carried out as part of a project entitled 'Valuing Aircraft Noise Nuisance' (EEC 5A) under the auspices of Eurocontrol (Paris). The project has been published in two reports: The Focus Group Report (EEC/Env/2002/009) Heaver et al 2002, and Attitudes towards and values of aircraft annoyance and noise nuisance (EEC/SEE/2003/002) Bristow et al 2003. This report is part of the same project.

The research was conducted around three European Airports (Manchester, Lyon & Bucharest (Otopeni)) and used focus groups, attitudinal survey and stated preference techniques to explore the annoyance and perceived value of noise disturbance due to aircraft noise

**The Focus Group Report (Heaver 2002)** was based on five focus groups of residents at each of the three Airports. The main aim was to identify their attitudes to the environmental aspects of living near airports particularly aircraft noise.

The negative aspects of living near airports and responsible for deterioration in the quality of life identified were:

- Aircraft noise at specific times
- Air pollution
- Reduction in house prices

- Fear of crashes
- Loss of greenbelt/unwanted development
- Increased road traffic

There were differences in the ranking and tolerance of these issues depending on the country. However, the relative annoyance caused by different noise levels and the types of activities most affected by noise were similar.

There were large differences in the perceived value of living close to an airport, mainly dependant on its utility. At Lyon the hostility to the negative environmental effects was much greater than at the other Airports because the residents perceive little benefit from the Airport. Bucharest residents view the airport as an important opportunity for economic development and have more basic needs (eg. health care and education) to worry about aircraft noise and other negative aspects. Many people around Manchester Airport use it for travel, already live in a generally noisy urban setting and recognize the benefit it bestows to the local economy. The report points out implications for the development of future airport sites:

- More opposition from rural sites with lower ambient noise
- Less opposition where the local economy will be seen to benefit directly and with good demand for air travel from the local population

An **attitudinal survey** (Bristow et al 2003) was carried out in hall-tests with small groups (10-20) during 2002 from sites, around the Airports, which varied in their aircraft noise exposure. A total of 647 residents took part with at least 200 from each country.

The results from each country were broadly similar with the main differences due to the operational characteristics of the airports eg. limited air traffic at Bucharest, and the prevailing socio-economic conditions. Quality of life was not largely determined by aircraft noise but was indicated as a consistent source of dissatisfaction. Aircraft noise was considered to be the noisiest and annoying environmental noise in Lyon and Manchester while barking dogs was the main external noise problem in Bucharest.

Aircraft noise was considered to interfere most with ongoing activities at Manchester and Lyon while traffic noise was the most troublesome noise at Bucharest. There was a clear positive relationship between aircraft size, and one assumes the associated noise level, and the degree of annoyance at Manchester and Bucharest. However, this was not so apparent at Lyon, where there were limited large aircraft operating.

The residents were aware of the benefits of living near an airport, such as ease of travel at Manchester and Lyon and economic development with associated jobs at Bucharest. There were only minor instances of health deterioration and building damage due to aircraft.

Respondents in Lyon were most likely to have complained about aircraft noise (40% of the survey groups) while very few (2.5%) had complained in Bucharest, with Manchester intermediate (17%). However, the low value at Bucharest may be a result of limited experience and mechanisms for complaining about the operations of institutions and large organizations in Eastern Europe compared with Western Europe. There was the same ranking of airports in the numbers of respondents who were very or extremely annoyed with aircraft noise. The high level of annoyance and complaint from residents in Lyon seems to be linked to the expectations of a peaceful and quiet existence at home in the countryside.

There were clear temporal factors affecting annoyance caused by aircraft noise. Noise was least tolerated in the evenings, at night and at the weekend, when residents were more likely to be at home relaxing or sleeping.

Levels of annoyance were influenced by:

- Distance from the airport – nearer more prevalent annoyance
- Area type – more affluent more indications of a problem
- Double glazing – presence reduces problem
- Duration of residency – longer more habituation to the noise
- Time spent at home – longer more of a noise problem
- Personal perceptions of noise climate –
- Noise sensitivity – more sensitive suffer more

# Comparison of Previous Social Surveys and Complaint Profiles at Various Sites around Manchester Airport

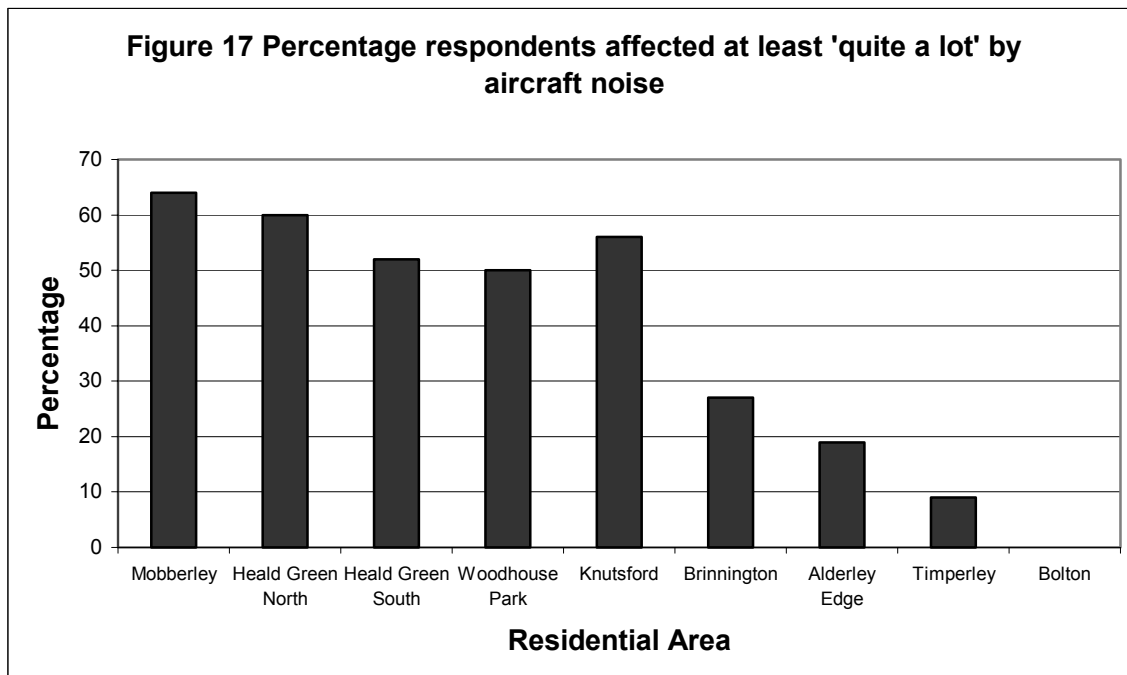
One of the aims of this report was to investigate the relationship between complaint rates and annoyance levels, as indicated by previous social surveys. This aim was only partially realized, because of:

- the lack of detailed and well documented complaint data prior to 1989 which took till the mid/end 90's to become fully documented and archived
- some of the social surveys were not adequately precise about the home location of their respondents
- the lack of specific questions in the social surveys about complaint behaviour.
- Difficulty in obtaining original raw data from reports to reprocess

However, some relevant and useful observations and comments are possible.

At the time of the Dickinson (1974) and the Manchester Night Noise Study (1982) there were no recoverable records kept or published concerning complaints to the Airport about its operations. However, there were clear indications that the main driver for these studies was the growing concern about noise disturbance, particularly at night, in communities surrounding Manchester and other major airports.

One of the aims of the MIL & MMU (1989) study was to investigate how distance from the Airport moderated the affect of aircraft noise on quality of life. The graph (Figure 17) shows the percentage of respondents affected at least quite a lot by aircraft noise compared with the distance of their community from the airport/noise footprint and is typical of the results showing the relative concerns obtained.



The four areas nearest the Airport and noise footprint showed consistently high levels of affectivity. Knutsford, which is some distance from the Airport but down the main take-off corridor, shows similarly high values but thereafter there is a fall with distance from the

Airport/noise footprint till Heaton near Bolton, which was included as a control area with no aircraft noise but all the benefits of the Airport, is unaffected by aircraft noise.

In 1989, at the time of the MIL & MMU study, the complaints procedures and reporting systems were being developed into a reliable system so there is some data for various residential areas. The complaint data available (Tunstall-Pedoe et al 1996) indicates that Mobberley & Knutsford recorded 328 complaints while Woodhouse Park had only 38 out of 1331 complaints in total. The one key difference between Woodhouse Park and Mobberley & Knutsford noted in that survey was its much lower socio-economic status (C2DE and ABC1 respectively). Therefore despite being affected to a similar extent as indicated by the survey data the residents from the lower socio-economic status were far more reluctant to complain spontaneously to the Airport about aircraft noise. Therefore, this suggests that the complaint data does not reflect an accurate relative index of annoyance in such situations where large socio-economic differences exist.

Two sites around Manchester (Edgeley and Heald Green) were included in the UK Field Study (Ollerhead et al 1992). Residents in Heald Green reported less disturbance and annoyance than those in Edgeley despite nighttime aircraft noise exposure being the highest of all the sites studied and considerably more than Edgeley. However, the authors considered that this result could possibly be explained by:

- Heald Green was in the grant area for sound insulation with 92% having either secondary or double-glazing. Edgeley was not in the grant area and only 15% have some form of sound insulation
- Heald Green residents tended to have lived in the area longer than those in Edgeley with nearly 75 % having lived in Heald Green for at least 5 years compared with only 50 % of Edgeley residents.
- Heald Green residents displayed a high level of compliance whereby although they did not like aircraft noise many had grown to accept it as part of the environment which they considered had other alternative attractions

This survey result is not supported by the complaints record, which shows consistently higher levels of complaints from Heald Green than from the Edgeley area. The relative complaint profiles for these two areas are close to what one would predict given their relative distance from the Airport. However, Heald Green compared to most other high noise areas, does not show as high complaint levels as might be expected.

Diamond et al (2000) used Edgeley & Heald Green as the Manchester sites for their questionnaire survey and included questions on what direct action, such as formal complaining, respondents had made. The results showed, as would be predicted, consistently more affect of aircraft noise in the higher noise area Heald Green compared with Edgeley. This agrees with the complaint pattern for these two locations with 10 complaints from 5 complainants in Edgeley compared with 123 complaints from 53 complainants in Heald Green out of a total of 2870 from 576 in 2000.

In terms of action taken to try to alleviate the problem, many in the high noise area had their homes insulated against noise (eg. 60% at Heathrow; 50% at Heald Green, Manchester). However, relatively few had taken action eg considered moving, signing petitions, written letters of complaint or demonstrated. About 20% had signed a petition at Manchester and East

Midlands and rather less elsewhere. Complaining by letter was much less prevalent with less than 20% at all sites. 40-50% of respondents at the noisier sites reported that they had waited for the situation to improve itself, because it was felt, by the participants in the qualitative exercise, that they had little influence over the activities of a large airport. To back this up, about 40% of people believed that airport authorities were not responsive to complaints. A similar result to that found in 1989 by Hume & Thomas.

This clearly indicates that complaints reflect only the 'tip of the iceberg' of dissatisfaction with airport operations and when complaints are made they should be treated seriously with 60% of residents considering airports to be responsive to complaints.



## Conclusions and Future Work

Complaints provide a relatively rapid feedback and a continuous measure of the level of tolerance of local communities to airports operations and allow local patterns of particular concern to be identified. It is particularly useful to record complaints over time in order to be able to identify issues and react to changes in the pattern of complaints. However, although complainants may only represent a very small percentage of the total numbers of residents disturbed by aircraft operations, they are important as they represent the first stage in potential active opposition to airport operations.

Recent studies at Manchester have shown that complaint propensity was affected by:

- Media coverage of airport development plans at both Manchester and Lyon
- Aircraft noise was the main source of complaint by far
- Location particularly the distance from the airport and the proximity of noise footprints and flight-paths
- The noise level of the aircraft
- The time of day of the ATM, with most sensitive times in the late evening and through the night
- The day of the week, with the weekend, particularly Sundays, showing the least tolerance to noisy aircraft
- The months of the year, with peak complaint during the summer particularly July/August and least in November
- Number of serial-complainers operating at the airport, with 40% of complaints accounted for by 3 individuals at Manchester in 1998 and 2000. However, the serial-complainers complaint profile did not differ markedly from the normal complainers. Never the less, this indicates the need to identify and report the number of complainants as well as the number of complaints
- There are numerous additional factors that govern complaint behaviour eg. socio-economic status, sound insulation of the home, utility of the noise source
- There was an agreement between the areas around Manchester airport, which showed high level of annoyance and had high levels of complaint about aircraft noise. However, residents in areas with low socio-economic status are less likely to complain than more affluent areas while survey data indicates that they are similarly annoyed with aircraft noise

The early social surveys were particularly concerned with night flights and found sleep disturbance and high levels of annoyance due to aircraft noise which was positively related noise level above 65 dB(A) outdoors. In general there was good agreement between the social surveys:

- Aircraft noise was, by far, the greatest cause of environmental disturbance in the communities living near to the airport, particularly at night
- There was a clear relationship between the distance from the airport, noise footprint and flight paths and the reported affect on the community
- There were considerable individual differences in subjective disturbance which 'cut across' very different communities and the perceived problem of aircraft noise was not confined to higher socio-economic groups who tended to complain more
- Most of the problems are concentrated in the high noise areas

- In the areas of high aircraft noise disturbance, road traffic noise seems to be tolerated much more than areas of relatively low aircraft noise
- The main reported affects of aircraft noise was interference with communication (particularly in the evenings) followed by general annoyance and sleep disturbance
- In those individuals suffering sleep disturbance, it was a relatively common event. However, in general, other domestic issues affected sleep more.
- Night flights by noisy aircraft, which were perceived as being off track, were a major source of complaint.
- It was considered by the majority of residents that the advantages of MA outweighed the disadvantages, even in the most noise disturbed communities
- For most individuals there is little evidence of direct health effects but many believe such a link could exist
- Negative affectivity plays an important part in how individuals view aircraft noise

## FUTURE WORK

In 2001 a second runway was opened at MA that resulted in a substantial increase in complaints - from about 3,000 in 1998 and 2000 to 9,000 in 2001. Further work has been outlined below which compares 2001 complaints levels with earlier years (1998 & 2000) for:

1. **Noise level** v complaint level for 2001
2. **Temporal variables** (hour of the day, day, weekend, month & year)
3. **Aircraft type** (make and/or categories eg. chapters)
4. **Mode of operation** - Departure (take-offs) v arrivals (landings)
5. **Community type and population density** - Eastward v westward take-offs ie. R'way 06 (Eastward over main south Manchester conurbation – this mode of operation occurs 20% of the time) v R'way 24 (Westward – 80% - over more commuter and rural setting with more upper socio-economic communities)
6. **Preliminary modelling work** – suggestions for a research strategy to investigating the viability of using complaints to generate “tolerance contours”. This could be based on complaints per 1,000 air movements per 1,000 individuals potentially affected with identification of the numerous modifying and moderating factors that need to be incorporated into such models. This could also include an appraisal of which available noise metric best fits and predicts the complaint patterns.

This work will provide interesting comparisons with the work in this report and valuable insights into how the local communities surrounding airports respond and adapt to a major change in the operating pattern of the airport.

In addition to the work outlined above and as a result of the work covered in this report there are three areas of research that are suggested for future projects:

1. **Generic complaint handling system** – best practice guidelines – preliminary work has been undertaken on this project as part of a report commissioned by the Northern

Ireland Office for ways of dealing with aircraft noise in Northern Ireland. However, there is a clear need to survey and review how complaints are currently being collected and used across Europe before a common systematic system is suggested.

2. **Complainants v Non Complainants survey** – human factors affecting complaint and tolerance within communities – complainants are matched with non-complainants in the same locale (ie. experience the same noise environment but do not complain) and are questioned on a number of human dimensions to create a clearer profile of what makes some people complain while others do not.
3. Assessment of human factors (disturbance/tolerance) to different models of land use management and intermodality in the development of aviation in Europe.



- Alexandre, A (1973) Decision criteria based on spatio-temporal comparison of surveys on aircraft noise. Proceedings of the international congress on Noise as a Public Health Problem. (Dubrovnik, Yugoslavia, 13-18 May 1973) 619-626.
- Anon. (1980) Responses to road traffic noise: a socio-economic approach. *Journal of Sound and Vibration*. 68(1), 147-152.
- Belojevic, G; Jakovljevic, B; Aleksic, O.(1997) Subjective reactions to traffic noise with regard to some personality traits. *Environment International*. 23(2) 221-226.
- Borsky, P.N. (1979) Sociopsychological factors affecting the human response to noise. *Otolaryngol. Clin. N. Amer.* 12 (3) 521-535.
- Bristow, A. et al (2003) EEC-5A Project: Attitudes towards and values of aircraft annoyance and noise nuisance. July 2003.
- DfT (2002) The Future Development of Air Transport in the United Kingdom: North of England Department for Transport, London.
- Diamond, I et al (2000) Perceptions of Aircraft Noise, Sleep and Health. Report to the CAA (UK).
- Dickinson (1974) Sleep disturbance at Cheadle and Gatley due to aircraft noise. Report for Stockport CC.
- Fidell, S (1999) Assessment of the effectiveness of aircraft noise regulation. *Noise and Health*. 3: 17-25.
- Fidell, S; Horonjeff, R; Mills, J; Baldwin, S; Teffteller, S; Pearsons, K. (1985) Aircraft noise annoyance at three joint air carrier and general aviation airports. *Journal of the Acoustical Society of America*. 77(3) 1054-1068.
- Fiedler, FE and Fiedler, J. (1975) Port noise complaints: verbal and behavioural reactions to airport-related noise. *Journal of Applied Psychology*. 60(4), 498-506.
- Fields, JM (1992) Impact of ambient noise on noise annoyance: an assessment of the evidence. *Proceedings of Internoise 1992*. 1011-1016.
- Fields, JM (1993) Effect of personal and situational variables on noise annoyance in residential areas. *Journal of the Acoustical Society of America*. 93: 2753-63.
- Gillen, DW, Levesque, T.J. (1994) A socio-economic assessment of complaints about airport noise. *Transportation planning and technology*. 18:45-55.
- Gjestland, T., Liasjo, K. H., Granoien, I. L. N. (1995) Community response to noise from short-term military aircraft exercise. *Journal of Sound and Vibration*. 182(2): 221-228.
- Guski, R. (1977) An analysis of spontaneous noise complaints. *Environmental research*. 13: 229-236.
- Heaver C (2002) EEC-5A Project: Attitudes to aircraft annoyance around airports. Focus Group Report. November 2002.
- Hume KI (1998) A field study of age and gender differences in habitual sleep. *J Sleep Res*. 7, 85-94.
- Hume, K; Terranova, D; Thomas, C. (2002) Complaints and Annoyance Caused by Aircraft Operations: Temporal Patterns and Individual Bias. *Noise and Health*. 4 (15): 45-55.

- Hume, K; Gregg, M; Thomas, C; Terranova, D. (2003) Complaints caused by aircraft operations: an assessment of noise level and time of day. *J Air Transport Management*. 9: 153-160.
- Hume, KI & Thomas, CS (1993) Sleep disturbance due to aircraft noise at a rapidly expanding airport (Manchester Airport). *Noise as a Public Health Problem*. Vallet, M (ed). 2 :563-567.
- Job, RFS. (1988) Over-reaction to changes in noise exposure: the possible effect of attitude. *Journal of Sound and Vibration*. 126: 550-552.
- Job, RFS (1996) The influence of subjective reactions to noise on health effects of noise. *Environment International*. 22 (1) 93-104.
- Levy-Leboyer, C; Moser, G (1987) Individual differences in noise annoyance: four explanations. *Developments in toxicology and environmental science*. 15, 293-299.
- MA (1989) *Towards a Better Environment*, Manchester Airport, Manchester.
- MA (1993) *The Environment Plan*, Manchester Airport, Manchester.
- Manchester Airport PLC (Thomas), (1994) Second Runway Inquiry Document (MA896.6) Appendix 6, The 1989 corporate environmental policy document 'Towards a Better Environment'.
- Manchester Airport PLC (Thomas), (1994) Second Runway Inquiry Document (MA897) Figures Approach to Environmental Matters.
- Manchester Airport PLC (Thomas), (1994) Second Runway Inquiry Document (MA895) Proof of Evidence approach to environmental matters.
- Manchester Night Noise Study (1982) SCPR publications.
- Miedema, H and Vos, H. (1999) Demographic and attitudinal factors that modify annoyance from transportation noise. *Journal of the Acoustical Society of America*. 105(6) 3336-3343.
- MIL & MMU (1988/89) Manchester Airport Noise Evaluation – Report on a community research study.
- Moore-Ede, M; Sulzman, F & Fuller, C (1982) *The clocks that time us*. Harvard, Cambridge (USA).
- MORI (1993) Report commissioned by Manchester airport plc. Attitudes towards the expansion of Manchester Airport.
- Ollerhead JB, Jones CJ, Cadoux RE et al (1992) Report of a field study of aircraft noise and sleep disturbance. UK Department of Transport, HMSO, London.
- Ollerhead JB (1996) Aircraft Noise – effects. Prepared for the Airports and the Environment short course, Loughborough University.
- Reijneveld, SA. (1994) The impact of the Amsterdam Aircraft Disaster on reported annoyance by aircraft noise and on psychiatric disorders. *International Journal of Epidemiology*. 23 (2) 333-340.

- Rohrmann, B; Finke, H; Guski, R. (1980) Analysis of reactions to different environmental noise sources in residential areas (an urban noise study). Noise as a Public Health Problem conference pp548-555.
- Schultz, TJ (1978) Synthesis of social surveys on noise annoyance. Journal of the Acoustical Society of America. 64 (2) 377-405.
- Stockbridge, HCW; Lee, M. (1973) The psychosocial consequences of aircraft noise. Applied Ergonomics. 4.1:44-45
- Sato, T., Yano, T., Bjorkman, M., Rylander, R. (2002) Comparison of community response to road traffic noise in Japan and Sweden – part 1: outline of surveys and dose-response relationships. Journal of Sound and Vibration. 250(1): 161-167
- Tunstall-Pedoe, N; Raper, DW; Ho Iden, J (Eds.) (1996) Airport and the Environment – liabilities and social responsibilities. Thomas Telford, London.
- van Wiechen, C; Franssen, E; de Jong, R; Lebret, E.(2001) Aircraft noise exposure from Schiphol airport: a relation with complainants. Noise and Health, 5 (17), 23-34.
- Weinstein, ND. (1980) Individual differences in critical tendencies and noise annoyance. Journal of Sound and Vibration. 68(2), 241-248
- Yombo, N'Dogbia (2002) “Complaints management at Lyon-Saint Exupery Airport, France” presented at Forum Acusticum, Savilla



Complaint information provided to the 2<sup>nd</sup> runway inquiry (1995) - Geographical distribution of complainants relative to airport departure routes. The number of complaints received from some key areas for 1989-1993 is provided below:

Key Areas	Number of complaints (1989 – 1993)				
	1989	1990	1991	1992	1993
Knutsford and Mobberley	328	434	735	1164	1065
Vale Royal	814	543	173	104	27
Congleton	4	122	387	15	6
Marthall/Marton	10	12	13	482	972
Cheadle Hulme	96	248	441	557	921
Hale Barns/Hale	41	59	135	85	270
Wythenshawe	38	19	12	29	21
<b>TOTAL</b>	<b>1331</b>	<b>1437</b>	<b>1896</b>	<b>2436</b>	<b>3282</b>

This list is not comprehensive, key areas have been chosen simply to illustrate causes of variation in complaints from different localities as explained below. This shows how complaint activity from an area can be governed by real and proposed changes in aircraft movement patterns and the actions of serial complainers.

### Knutsford and Mobberley:

Following public discussion and the announcement of proposals to build a second runway at Manchester Airport there was a progressive increase in the complaints about noise from people living in the areas that would be affected by the proposals, such as Knutsford and Mobberley.

### Vale Royal:

A sudden but short-lived increase in complaints from Vale Royal (primarily Northwich, Hartford and Sandiway) related to a change to the flight path of aircraft in that area which took place in 1989 and a belief amongst residents that complaints would result in another realignment of the departure route. Changes in operational procedures and a reduction in movements made by the oldest Chapter 2 aircraft may have resulted in the subsequent decline, although many people were also aware of the airport's efforts to resolve their concerns. A change in departure route towards the southwest was finally achieved in April 1994 following a period of extensive consultation. Following this complaints gave way to a small number of calls and a single letter of thanks from the area.

### Congleton:

In 1990/91, again after a change in the design of a preferred noise route (in the Congleton area) a sudden increase in complaints occurred following the announcement that the company was consulting over a possible further change.

### Marthall/Marton:

The increase in complaints from the Marthall/Marton area in 1992 resulted from public debate over how wide the preferred noise route was in that area and where aircraft could be expected to fly. Individuals living in two houses just outside the published departure route continually called the airport to complain about 'off track' aircraft.

### Cheadle Hulme:

The change in complaint numbers from Cheadle Hulme resulted almost exclusively from the efforts of members of one household who complained (in particular when the airport is operating on runway 06) of aircraft being too noisy or off track.

### Hale Barns:

Complaints from Hale Barns relate primarily from ground noise and in recent years (1994) have increased mainly through the action of a single individual.

### Wythenshawe:

The number of complaints received from the Wythenshawe area is perhaps less than might be expected from such a large community. It may reflect proximity to the flight path or the fact that the area is only affected by landing traffic. Alternatively it may reflect a different attitude amongst residents as to the value of the airport's operation or a belief that there is no point in complaining.



For more information about the  
EEC Society, Environment & Economy Business Area  
please contact:

Ted Elliff  
Society, Environment & Economy Business Area Manager,  
EUROCONTROL R&D Centre  
Centre de Bois des Bordes, BP15  
91222 BRETIGNY SUR ORGE CEDEX  
France

Tel: +33 1 69 88 73 36

Fax: +33 1 69 88 72 11

E-Mail: [Ted.Elliff@eurocontrol.int](mailto:Ted.Elliff@eurocontrol.int)