

# Guidance Material for Selecting and Providing Aircraft Noise Information



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#### Foreword



In March 2000, the Department of Transport and Regional Services (DOTARS) released a Discussion Paper titled *Expanding Ways to Describe and Assess Aircraft Noise*. This document was produced following extensive discussions with community representatives on finding new ways to describe aircraft noise.

The release of the Discussion Paper generated significant interest, both in Australia and overseas, in 'new' aircraft noise information concepts. The feedback on the paper revealed that many people now believe that the conventional ways of describing aircraft noise have significant limitations and that we need to move on to using aircraft noise descriptors that are less technical and more transparent to the non-expert. Clearly, improving the ways in which aircraft noise is described has benefits for all parties involved in aircraft noise issues.

This guidance material constitutes one of the formal responses to the feedback on the DOTARS Discussion Paper. Another important outcome from the Discussion Paper has been the development by DOTARS of a software package, the Transparent Noise Information Package (TNIP), designed to enable non-experts to rapidly produce the 'new' descriptors using standard personal computers.

Aircraft noise descriptors are used in a number of applications. These include the underpinning of aircraft noise assessments in Environmental Impact Statements (EISs), communicating with members of the public on specific aircraft noise issues and the reporting of routine environmental monitoring at airports. As these issues fall across the responsibilities of both the Commonwealth transport and environment portfolios, this guidance material has been prepared jointly by DOTARS and Environment Australia.

When considering the use of this guidance material it is important that the context of the airport in question be taken into account. The magnitude of aircraft noise issues varies widely from airport to airport depending on variables such as the type of aircraft, including military or civilian, the number and times of operations and whether flight paths go over residential, or other noise sensitive, land. This document puts forward a number of aircraft noise information options and it is intended that these be selected and applied in a manner that meets the needs of the circumstances pertaining at the time.

Given the dynamic nature of aircraft noise information, and its rapid evolution as technical capabilities expand, it is envisaged that this guidance material will be reviewed after five years to ensure that it captures new concepts as they emerge.

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#### 1 Purpose

This guidance material is principally directed at airport operators, acoustic consultants and aviation and environmental authorities/agencies.

#### 1.1 Providing the information

The broad aim of this document is to provide guidance for persons who prepare and provide aircraft noise information for use by non-experts, such as members of the public and decision-makers. For airports and aviation authorities this guidance has day-to-day application in the provision of information to the public and in routine environmental monitoring/reporting. It is also intended to be of assistance to acoustic consultants and aviation and environmental authorities in carrying out aircraft noise investigations and in preparing formal assessment reports such as Environmental Impact Statements (EISs).<sup>1</sup>

It is common for state and local government agencies to receive queries about aircraft noise from members of the public. In responding to these queries, these agencies generally act as secondary providers of aircraft noise information by passing on information produced by or for an airport. Until recently these agencies have typically only had access to land use planning contours and have used these as a source of aircraft noise information irrespective of the nature of the questions asked. It is intended that this guidance material will facilitate improved practices by assisting these agencies to provide the most appropriate aircraft noise advice.

In addition to assisting the providers of information, this document will assist recipients of aircraft noise information by drawing their attention to the types of aircraft noise information now available.

It is hoped that this document will generate further ideas on new ways to describe aircraft noise. This guidance material is designed to broaden thinking; it is not intended to be prescriptive.

#### 1.2 Application of the information

The ultimate aim of this document is to achieve better aircraft noise outcomes for Australian airports.

The purpose of this document is not to give guidance on the selection or implementation of specific aircraft noise management measures at airports. The intention is to facilitate a situation, through the presentation of a meaningful picture of the noise, which allows all parties with an interest in an airport to speak the same language and to hold open discussions on aircraft noise management strategies.

<sup>1</sup> For the purposes of this publication the term Environmental Impact Statement (EIS) refers to the generic environmental assessment process of a project rather than an EIS as defined in various pieces of legislation.

In the end, it remains the responsibility of the relevant bodies and organisations – airports, airspace management authorities, government transport and land use planning agencies and aircraft operators – to use the information and to work with local communities to implement strategies and plans which deliver acceptable aircraft noise outcomes.

#### 2 The importance of aircraft noise information

There are a range of reasons why it is important that information on aircraft noise exposure is gathered and/or generated and is released in a form that describes the noise in a way that is both 'accurate' and comprehensible to the reader. It is important to recognise that 'accurate' in this context means much more than pure technical accuracy. In the context of this document it means accurate in the sense that the information gives a 'picture' of the noise exposure patterns around an airport which the user believes gives a portrayal of what is actually happening.

The following are key reasons why airports and aviation authorities need to allocate resources to generating and disseminating aircraft noise information.

#### > Good environmental management practice

Environmental monitoring and reporting underpin responsible environmental management. It is now generally accepted that the pollution levels generated by any significant activity in society should be monitored and be published so that the public can be aware of the potential adverse effects which may be generated by that activity. Aircraft noise pollution is a significant unwanted by-product of aviation activities at many airports. As such, there is an onus on the aviation industry to monitor and report on these activities.

It is important that the results of environmental monitoring are archived so that long-term trends in pollution levels can be checked and published. For example, the information is vital for the preparation of accurate and comprehensive 'State of the Environment' reports. On a more detailed level, the information can demonstrate the changing nature of aircraft noise exposure around an airport – the gains in terms of significantly quieter aircraft; the losses in terms of increasing numbers of aircraft movements.

The gathering of this information is also essential so that when there is a proposal which will significantly change aircraft noise exposure patterns at an airport – for example, the construction of a new runway – well-established baseline data is available to permit an effective assessment of the impacts of the proposed project.

#### > The responsibility to meaningfully respond to complaints

There is an onus on the aviation industry to be open and to be able to provide meaningful responses to legitimate questions raised by members of the public. If an airport is to effectively respond to complaints made by the public it is fundamental that ways of describing aircraft noise be used which the non-expert can easily understand and have confidence in.

In particular, the issue for many complainants is non-compliance with specific rules and regulations. Trust between the parties is dependent on all the parties being aware of the rules, knowing adherence to them is checked and being able to fully understand what is stated in compliance monitoring reports.

#### > Disclosure - avoidance of false expectations

Experience has shown that the most aggrieved members of the public are often those whose expectations about the aircraft noise environment in the vicinity of their home have not been met. Even relatively low levels of aircraft noise have the potential

to be highly annoying to a person given information which has generated an expectation of there being no aircraft noise at their home. This potential is heightened if expectations have been created by 'official' aircraft noise information published by or for an airport.

Similarly, it is not uncommon for a person moving into a new area adjacent to flight paths to have not given any consideration to aircraft noise. They then become very surprised when they hear aircraft noise. These people often have an implicit, rather than explicit, expectation about aircraft noise. In these circumstances the question often

is "why wasn't I told?" The annoyance outcome can be essentially the same in both cases.

It is fundamental that airports need to produce, and make widely available, accurate and comprehensible information on their noise exposure patterns to allow, for example, prospective house buyers to make informed purchase decisions.

When this information strategy is in place it leads to a win/win situation. Noise sensitive residents are less likely to purchase houses under or close to flight paths so there is likely to be less community pressure on airports to restrict or modify operations.

#### > Presenting an 'accurate' picture in Environmental Impact Statements (EISs)

The prime purpose of a formal environmental assessment report, such as an EIS, is to ensure that the environmental impacts of a proposal are fully examined and that the decision-maker is fully aware of the outcomes that will occur if the proposal proceeds. Decision-makers on major airport or airspace projects are rarely aircraft noise experts and, if a fully informed decision is to be made, the aircraft noise information needs to be presented in a way that can be understood by the layperson. Providing comprehensible information in EISs takes the process beyond one which relies on the decision-maker simply having to rely on the advice of the 'expert'.

In a similar vein, if EIS processes are to be transparent, members of the public who may be affected by a proposal need to understand the likely outcomes if the proposal proceeds. Many members of the public use EISs as their prime source of information on the likely future noise exposure patterns generated by a project at an airport, for example, the construction of a new runway. It is now considered essential that an EIS no longer be treated purely as a technical document conveying information between the noise experts representing the parties involved. It is both a technical and an information document. It is envisaged that in future the aircraft noise requirements in the terms of reference for Commonwealth EISs will fully reflect this dual role.

#### > Providing advice to planners/prospective developers to place ANEF contours in context

Aircraft noise is normally only one of a range of issues that land use planners need to take into account when assessing a development application. Given the training and background of most land use planners it is not reasonable to expect them to be experts in aircraft noise matters.

The Australian Noise Exposure Forecast (ANEF) land use compatibility advice states that areas outside the 20 ANEF are 'acceptable' for any development. Since the only aircraft noise information generally presented to planners has been a set of ANEF contours, with the 20 ANEF contour being the outer one, it has probably not been unreasonable for planners in the past to have treated areas outside the 20 ANEF as being free of aircraft noise. However, it is now generally recognised that basing planning decisions solely on ANEF contours, without reference to other information (particularly on the location of flight paths), is likely to lead to less than optimal outcomes. For example, if there is a proposal to site a school in an area with an aircraft noise exposure of 19 ANEF it would be prudent, if the proposed school site is under a major flight path, to look for alternative locations. At the very least, even if there were no available alternative school sites, the designers of the building would be able to take into account the existence of the flight path.

The above points are intended to give a generic picture of the importance of producing aircraft noise information. Clearly, the extent to which resources need to be allocated in practice to the production of aircraft noise information will vary from airport to airport and depend on differing circumstances. The noise information requirements at a small airport that is distant from any population centre are naturally likely to be minimal compared to a capital city jet airport surrounded by residential areas.

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It is recognised that the ability of an airport to provide aircraft noise information depends very heavily on its access to the necessary monitoring data. Most Australian airports do not have a Noise and Flight Path Monitoring System (NFPMS) and therefore it is often not practical to gather all the desired information. The NFPMSs at the major Australian airports are operated by Airservices Australia and the ability for third parties such as the airports and consultants to produce and disseminate aircraft noise information is dependent on their ability to access the underpinning data.

#### 3 Right to know principles

Polluters have a responsibility to monitor and report on the pollution they are generating and the public has a right to know environmental pollution levels. It is self evident that if pollution levels are reported in a manner that is unintelligible to the non-expert there has not been effective disclosure of what is happening.

Our experience in recent years has shown that if a meaningful picture is to be painted of aircraft noise exposure patterns around an airport a person needs, at the least, to have access to the following information:

- where the flight paths are;
- at what times aircraft use a flight path (in particular sensitive times night/early morning, evenings and weekends);
- how often aircraft use the flight path;
- variations in activity levels from hour to hour, day to day, week to week, etc; and
- noise levels from individual flights.

It is considered best practice that every citizen has a 'right to know' this information if they so wish.

It is important that this information be made available in a disaggregated form and that, as far as possible, it be left unadjusted. That is, the detail should not be buried in an average day noise contour nor should information on what happens at sensitive times be hidden by the use of weightings. It is also important that the information cover areas which extend far beyond the 20 ANEF contour.

Consistent with earlier comments it would be expected that the 'right to know' principles would be applied on a common-sense basis. Detailed day-to-day monitoring information is not available for small Australian airports without a NFPMS and it may be that in most circumstances there will be little need for these airports to allocate significant resources to

produce aircraft noise information. As a general rule, it would not be unreasonable to expect that the resources allocated to producing aircraft noise information at an airport would be directly related to the extent to which aircraft overfly noise sensitive sites around the airport and/or the extent to which the airport wishes to influence land use planning decisions in the vicinity of its boundaries or its flight paths. This issue is further discussed in Section 16.

#### 4 Selecting the appropriate noise descriptor

Aircraft noise can be, and is, described in many ways. It is vital that when using an aircraft noise descriptor it is selected so that it matches the needs of the issue being examined. In the past this match has not been achieved effectively and this has contributed significantly to the expert and non-expert failing to reach a common understanding about aircraft noise exposure patterns around airports.

For the purpose of this document aircraft noise descriptors can be put in three broad categories: aircraft noise information; land use planning contours; and technical descriptors. These categories are defined solely for the purpose of establishing a definition of aircraft noise information in the context of this document. However, it is important to recognise in practice there may be, and indeed in many circumstances it is desirable that there is, an overlap between the categories. For example, when considering land use planning around an airport, it is now considered best practice that planners and decision-makers take into account both the land use planning contours which define statutory building eligibility areas and aircraft noise information. The information in this context is likely to relate to the location of flight paths and the levels of aircraft activity on those flight paths, for areas which extend beyond the contours. As indicated in Section 2, in the absence of consideration of flight path information for areas outside the contours, noise sensitive developments may be placed in areas of high overflight activity without alternative sites being examined. Therefore overlaying aircraft noise information on land use planning contours provides a more holistic approach to land use planning around an airport.

#### 4.1 Aircraft noise information

This category relates to information provided to an individual, for example a member of the public or a decision-maker, to help them understand what the aircraft noise exposure patterns around an airport are, or may be, like.

Experience has shown that non-experts do not want aircraft noise described in technical terms but want information based on 'everyday talk' – they want the noise described in terms of where the aircraft fly, how often, at what time, etc. When aircraft noise is described in this way a person is able to draw a good mental picture of what the exposure patterns are like. This then empowers them to use their own judgement about aircraft noise in making decisions, such as whether or not to buy a house, rather than having to rely on 'official' advice about the 'significance' or 'effect' of noise at a particular location.

For the purposes of this document this type of information based on 'everyday talk' is termed transparent aircraft noise information. Transparent aircraft noise information is the focus of this guidance material. This type of information has been shown to be particularly suited to the uses identified in Section 2. Examples of this type of information are shown and discussed in Part 2.

#### 4.2 Land use planning contours

Land use planning noise contours, known as Australian Noise Exposure Forecast (ANEF) contours in Australia, are designed as a tool to stop airports being 'built-out' by noise sensitive land uses.<sup>2</sup> They are prepared to provide guidance to land use planning authorities charged with the responsibility for making decisions on proposed land use developments in the vicinity of airports.

These contours define acceptable areas for the construction of different types of buildings around airports with the aim of achieving land uses compatible with the future aircraft noise.

These contours are generally drawn for years which are far into the future, for example in Australia at some airports up to 50 years in the future. In order to enable prudent land use planning, these distant contours often make allowance for a number of runway options, not all of which will be built, to keep open the choice of the location of the new runway(s) for some time into the future. Therefore, these contours do not normally show a picture of current or near-term noise exposure patterns around an airport. Experience has shown these contours, which are based on logarithmically averaged 'annual average day' aircraft noise energy, do not portray noise in a way that the non-expert can readily relate to.

Given the above, land use planning contours such as ANEFs are not considered suitable for use as an aircraft noise information tool.

<sup>2</sup> Historic ANEF contours are also used for establishing eligibility for which buildings are included in the Sydney and Adelaide Noise Amelioration Programs. For this application the contours are computed using data on flight paths, aircraft types, etc depicting what actually happened in a previous year rather than using a future projection as is used for computing land use planning contours (strictly these are referred to as Australian Noise Exposure Index (ANEI) contours).

#### 4.3 Technical descriptors

There are numerous technical aircraft noise descriptors which have specialist uses. These are generally used in Australia by acoustic experts who are examining particular 'micro' aspects of aircraft noise exposure or are preparing the technical parts of formal environmental assessment reports such as EISs. For example, terms such as Leq (equivalent continuous noise level), DNL (daynight noise level), SEL (sound exposure level), EPNL (effective perceived noise level), TA (time above), and many other similar descriptors, are commonly found in technical reports on aircraft noise. In addition, the ANEF has conventionally been used in Australia as the main technical descriptor for carrying out detailed noise assessments in formal environmental assessment reports.



In a similar manner to the ANEF, several of the technical descriptors – such as the Leq and DNL – are commonly used overseas to draw 'macro' noise contours around airports for defining boundaries for land use planning and acoustic insulation eligibility. As such these descriptors can be considered to fall into two rather than one of the noise descriptor categories.

The technical descriptors referred to in this sub-section generally have one thing in common – they do not portray noise exposure patterns in a way that a layperson can relate to or can readily understand. They also cannot generally be measured or computed without specialist equipment or knowledge. Accordingly, they are not considered suitable as tools for providing aircraft noise information to the non-expert.

Given this, and consistent with the comments in Section 2, it is important to be aware that the focus on technical descriptors in formal environmental assessment reports such as EISs now needs to change and to be balanced with aircraft noise information. An EIS that does not provide the decision-makers with a clear picture of the likely outcomes of a proposal, such as an EIS that relies solely on technical descriptors, would fall short of its purpose.

Some confusion has arisen between the use of TA, the amount of *Time Above* a certain threshold noise level which is commonly 70 dB(A), and the use of NA, the *Number of aircraft noise events* louder than a certain threshold noise level which is commonly 70 dB(A). It is important that these descriptors not be used interchangeably. TA is a useful tool for looking at 'micro' situations, for example, where a change in procedures may increase or decrease the length of noise events over a particular location. However, experience has shown that 'macro' whole of airport TA contours do not describe noise in a way that relates to a person's experience and can therefore be highly misleading. A person does not normally gauge the amount of aircraft noise exposure by adding up the number of seconds from each overflight which are 'loud' but rather in terms of the number of overflights. For example, a layperson would not

expect a great deal of noise if they were told they would receive say five minutes of noise a day above 70 dB(A). On the other hand, if the same noise exposure were expressed as 150 events a day louder than 70dB(A) they would be likely to have very different expectations. Feedback from community representatives is that the N70 gives the much more realistic picture of aircraft noise. Given this, the production and publication of 'whole of airport' TA contours for aircraft noise information purposes is not recommended.

#### 5 Recommended approaches for responding to information requests

These recommendations encapsulate the key lessons learnt from responding to requests for aircraft noise information from members of the public in recent years.

These suggested approaches evolved in circumstances where there was widespread community mistrust of 'official' aircraft noise information and where there was a critical need to re-build bridges between aviation authorities and the public.

Several of these suggestions run counter to what was standard practice up until about five years ago. However, since they have been adopted, these approaches have received supportive feedback and have led to positive outcomes for all parties.

#### > Provide facts – let the individual make up their own mind.

- Provide transparent information and then let the recipient form their own opinion of whether the noise is likely to affect them.
- Avoid making judgements on whether a person will or will not feel affected by a certain amount of aircraft noise.
- > Try to provide the information the enquirer wants.
  - Don't make judgements about the relevance of the information.
- > Be aware of the limitations of your data.
  - Advise the enquirer about any significant limitations of the data you are providing.
  - Take a balanced approach and try to avoid using fears of accuracy as an excuse for not providing data.

#### > Provide information that describes the noise in a way the enquirer can relate to.

- Before giving out information ask yourself the question 'Am I answering the question using the same language/terminology that the enquirer used when they asked it?'
- > Give the enquirer the type of information which relates to the question.
  - For example, don't give average day information if the question relates to a specific time period.

- > Attempt to provide information in a form which the enquirer can independently verify.
- > Don't provide noise contours without also giving out information on the flight paths underlying the contours.
- > Be prepared to provide detailed technical advice on aircraft operations or on aircraft noise if this is what the enquirer is seeking.
  - If you are not equipped to provide this material have well-established contacts and procedures so that the enquirer is able to obtain the information without being given the 'run around'.
- > Don't be afraid to point out the facts to the enquirer if their perception does not accord with what has actually happened.
  - Do not question their opinion on the extent to which they might consider themselves subjectively affected.
- > Avoid comparing aircraft noise with other noise sources such as road traffic.
  - While the sound pressure level of an aircraft overflight may be the same as a car passing down a road, using this as an argument for justifying aircraft noise is likely to generate a negative reaction; treat aircraft noise as a separate issue.
- > Clearly differentiate between current and future noise.
  - Make sure that the information provided to an enquirer relates to the time horizon that they are interested in. If a person asks for information on what the noise is like now don't use forecast information. Be careful about making promises on what may happen in the future; in particular, avoid generating unrealistic expectations about future reductions in noise exposure levels.

#### 6 Discussion on the recommended approaches

#### 6.1 Separating fact from interpretation

Until recent years aircraft noise information in Australia has essentially been based on a regime that gave 'interpretation' rather than 'facts'. If a person made an inquiry about aircraft noise they were often provided with the value of the ANEF exposure level at their house. This was accompanied by an interpretation of what this meant by reference to a published land use compatibility table or to the dose/response information which underpins the table. For example, areas with an aircraft noise exposure of less than 20 ANEF have conventionally been treated as having 'acceptable' levels of noise.



However, this interpretation of noise impacts was based on studies examining *community* rather than *individual* reaction. Therefore, due to the wide range in individual reactions to aircraft noise, this approach inevitably led to certain people believing they had been misled by 'official' information.

Consistent with the advice earlier in this document, experience has shown that the potential for a person being misled is much reduced if the person is provided with 'facts' while avoiding 'interpretation'. In this

context 'facts' means information in the form of flight path location, numbers and times of movements, etc – that is, transparent aircraft noise information. Once a person is equipped with the facts they can generally make an informed assessment for themselves of whether they will find the noise at a particular location 'acceptable'. For example this approach empowers the individual to factor aircraft noise into a house purchase decision rather than putting them in a position where they have to accept an 'official' judgement on the effects of the noise.

In a similar vein, the use of transparent noise descriptors in an EIS document allows an individual to form their own view on whether they are likely to find the noise exposure levels from a proposed project (such as the operation of a new runway at an airport) 'acceptable'. If they believe this will not be the case they are empowered to make a meaningful formal submission into the process and have their views considered by the decision-maker.

#### 6.2 Avoiding the filtering of data

In order to ensure transparency, it is important that strong efforts be made to provide the information that is being sought by a member of the public. Any indication that the information being sought is 'irrelevant' is only likely to lead to accusations of a 'cover up'.

Naturally, there must be a limit to the resources allocated in responding to requests and it will not always be possible to gather some data at acceptable levels of accuracy. However, experience has shown that a request which may appear convoluted, complex or excessive may be so because the enquirer is not sure of what to ask for or what is available. With discussion, it may be that the information can be more readily provided in a different but acceptable form.

#### 6.3 The accuracy of data

It is fundamental that when providing data to the public every effort should be made to ensure its accuracy. However, it is equally important that a balance be struck in this area and recognition be given to the fact that 'accuracy' cannot be considered in isolation. If data is 100% accurate but incomprehensible to the user then, despite the accuracy, it is likely to be misleading. Similarly, data may be accurate but if it is incomplete, for example it only provides information on aircraft noise very close to an airport, it is also likely to be misleading.

In practice, data is unlikely to ever be perfect and will nearly always have some form of minor deficiency or be based on certain assumptions. It is important that these 'imperfections' not be used as an excuse for withholding information. The preferred approach is to recognise the shortcomings in the data and to indicate to the recipient the level of confidence that may be placed on the information.

#### 6.4 Facilitating independent verification

Trust between an airport and its community can only be established if people have confidence in the truth of what they are being told. One of the best ways to achieve this is to, as far as possible, provide information in a form that can be readily verified by an individual without the need to have specialised expertise or equipment. Aircraft noise information based on numbers and times of movements, location of flight paths, etc can be readily verified. For example, it is not uncommon for a person to keep a log of the time each aircraft passes near their home – this information can be cross checked to ascertain whether it agrees with the 'official' published data. On the other hand, complex noise metrics generated by computer models, even if understood, cannot be easily verified by a member of the public.

#### 6.5 Matching the information

Until recent years, airports had no 'macro' information about aircraft noise exposure over surrounding communities other than ANEF contours. These contours (whether forecasts or historic contours) are based on the 'annual average day'. However, most requests about aircraft noise exposure patterns relate to shorter time periods such as the last two months, or to specific sensitive time slots such as Sunday mornings. Therefore, in the absence of specific information, there was a natural disconnect between the issues being raised by community members and the information being provided by the aviation authorities. As a result of recent developments it is now possible to readily produce and provide information which effectively shows the 'real' picture for any selected time period. It is important that advantage now be taken of these capabilities.

#### 6.6 Connecting perception with reality

It is not uncommon for a person's perception about what has happened to be quite different from what has actually occurred. By monitoring and reporting using transparent noise descriptors it is possible to have a meaningful debate with a person about what has actually

happened. For example, a person may believe that aircraft start flying over their home at 6.00am every Sunday morning. By keeping accurate records in the form of transparent information the veracity of this can be checked and shared with the complainant. This enables the two parties to discuss the issue using the same language.

#### 6.7 Providing flight path information

In recent years most complaints about aircraft noise at Australian airports have come from residents living in areas outside the conventional (ANEF) noise contours. This has been a key driver in community demands for information on the location of, and the level of activity on, flight paths. This type of information has proven to be useful both because it is much more comprehensible and because it generally extends to areas well outside those covered by the conventional contours.

#### Flight path reporting - present situation

information purposes, it is considered very important that comprehensive flight path information be provided which extends a long way from an airport to areas well beyond the outermost noise contour line. A weakness with all aircraft noise contours is that they can give the impression that there is no noise outside the contours, therefore the production of 'distant' flight paths is particularly important to demonstrate that aircraft noise does not stop at the outermost noise contour. For some airports, community interest in the location of flight paths can extend to flight paths up to a distance of 30 to 40km from the airport. In addition, 'distant' flight

path information shows that the shape of noise contours does not

When producing 'present situation' noise contours for aircraft noise

necessarily reflect where a significant number of the aircraft fly – the shape of some noise contours is particularly influenced by the loudest aircraft types and by landing aircraft.

#### Looking ahead - differentiating between the immediate, near and far future

While it is relatively easy to produce information on the location and usage levels of current flight paths around an airport, it is more complex to generate such information for the future. The level of confidence in such future information will reduce as time horizons or the distances from the airport increase.

During an EIS process for a major airspace change (for example, the introduction of a new runway) it should be possible, given the 'immediate' time horizon, to generate 'distant' flight path information to good levels of accuracy.



In circumstances where there is no expectation of changes in airspace design around an airport, and trends in demand are not volatile, it may also be possible to generate some reasonably robust future flight path information. This may be possible for areas distant from the noise contours and for a near term horizon.

When developing long term land use planning contours the time horizon can be up to 50 years and hence any flight path assumptions have to be conservative and only extend as far as is necessary to generate the contours. Irrespective of the restricted nature of the flight paths used in developing long term planning contours it is important, for reasons of transparency, that details of the flight paths used to generate the contours be made available to the public if this is requested.





#### 7 Overview

This section contains examples of transparent aircraft noise information that have been produced for some Australian airports. It is important that these be considered simply as examples and not be treated as the only way that aircraft noise can be described in a meaningful way. As indicated earlier, the prime purpose of this guidance material is to encourage new ideas and ways of describing aircraft noise, not to restrict them.

Most of the examples are presented in the form of printed graphical material. However, two examples – one based on sophisticated audio/visual presentations (Section 14) and the other on the Internet (Section 15) – are included to demonstrate that as technology evolves new avenues for portraying aircraft noise are appearing which go beyond printed graphics.



The printed graphics examples in this Part (Sections 8 – 13) have been generated by using either one or a combination of up to three distinct approaches. Information gathered by noise and flight path monitoring systems (NFPMS), supplemented by information from air traffic management systems, underpins most of the examples. Aircraft noise information which is computed rather than measured is sourced from the United States Federal Aviation Administration's Integrated Noise Model (INM). In most of the examples this base information has been manipulated using the DOTARS software, Transparent Noise Information Package (TNIP), to

produce the final product.

The first two approaches – NFPMS and INM – involve complex hardware and software and consequently output data can only practically be obtained by using well-trained specialist personnel. On the other hand TNIP has been developed with a simple interface which is specifically designed to let the non-expert interrogate databases and produce high quality graphical output.

The applicability of the examples will vary from airport to airport. It is anticipated that each airport will select aircraft noise information to meet its own specific needs at any particular time. The type of information generated will depend to a large extent on what base data is available and/or the cost of gathering this data. This is discussed in Section 16.

Experience has shown that all aircraft noise information has strengths and weaknesses and is open to misinterpretation. A summary sheet precedes the following examples which comments on the strengths and weaknesses of each of the sample descriptors. Some of the key deficiencies can generally be overcome by using a combination of two or more of the charts.

### 8 Flight path maps

#### **Overview**

Experience has shown that flight path maps are the basic aircraft noise information tool. Providing people with an indication of where aircraft fly effectively underpins all other aircraft noise information.

Examples of three different types of flight path map follow. These have been produced using the NFPMSs which are installed at major Australian airports.

#### Figure 8.1 A flight path map for one flight at Sydney Airport.

> This type of map is ideal to give to a person making a complaint or query about one particular flight. It clearly shows where the aircraft went and also shows the height of the aircraft in the vicinity of the enquirer's home.

#### Figure 8.2 An enhanced flight path map for Brisbane Airport showing the heights of aircraft.

- > This type of map gives a good 'macro' picture of the typical spread of flight paths and is useful for showing someone that there is a natural variation in the location of flight paths around a core track
- > This map uses a colour coding system to give an indication of the heights of aircraft.
- > Flight path maps covering a period of a few hours are useful to show how the noise exposure patterns at an airport vary depending on which runways are being used.

#### Figure 8.3 A track density plot for Brisbane Airport.

> Flight path maps for periods longer than a few days (for a busy airport) can tend to have too much information and present a confusing picture. Track density plots have been developed in order to synthesise this type of information and show the intensity of overflight activity for an extended period.



Departure of Eastern Airlines turbo prop aircraft on 18/7/99 at appox. 10.27. Lane Cove indicated.





Track plots coloured by height for jet arrivals during the period 2/12/2002 to 8/12/2002.



Track density plot for all aircraft operations during the 2002 calendar year.

#### Strengths

- > Flight path maps directly answer what is generally the first question asked about aircraft noise – where do the aircraft fly?
- > The maps are based on actual monitoring and do not rely on computer simulations.
- > The maps show that aircraft noise extends a long way from an airport and is not just confined to areas within an airport's noise contours.
- > The veracity of the information can be checked by observation although it is not as easy as it would appear to verify the accuracy of flight path maps by purely looking into the sky.

#### Weaknesses

- > Generic flight path maps do not provide a readily digestible 'macro' picture of the time distribution of overflights. That is, they do not normally contain information on the numbers of movements and the times at which they occurred.
- > Flight path maps can give the impression that aircraft will only be audible immediately under the flight path. They do not give direct information on 'noise'.
- > The maps are two dimensional and therefore, if colour coding is not used, they can give the impression that the altitude of an aircraft does not vary along the length of the flight path.

#### Suggested uses

- > responding to 'one-off' queries about a particular flight or flights over a short time period
- > input into noise assessment reports, for example, for airport consultative committees
- > environmental monitoring and reporting

#### Data source/software

> NFPMS

### 9 Flight path movements charts

#### **Overview**

Flight path movements charts were developed in consultation with the public to overcome some of the perceived weaknesses of flight path maps. They show a 'macro' picture of aircraft noise distribution around an airport.

In particular, the charts show that aircraft do not all follow the same track but tend to spread to generate distinct flight path zones. For many suburbs, aircraft overflight activity varies widely from day to day according to which runways are being used at the airport – runway use is primarily dictated by wind conditions. A flight path movements chart therefore contains, in addition to average day information, data on the busiest and quietest days during the period covered by the chart to give an indication of how noise varied over that period. Further details about flight path movements charts can be found in Chapter 2 of the DOTARS *'Expanding Ways'* Discussion Paper (see Glossary).



#### Figure 9.1 A jet flight path movements chart for Perth Airport.

#### Strengths

- > Information on flight path location and aircraft movement numbers is combined in a way that is understandable to the non-expert.
- > Information is taken beyond the 'average day' by giving data on day-to-day variations.
- > The charts are based on 'real' data and not on computer modelling.
- > The information on the chart can be verified without special expertise or equipment, for example, by keeping a log of flight times.
- > The charts enable a rapid assessment to be made of the extent to which noise is shared between suburbs.

#### Weaknesses

- > The charts can give the impression that there are more movements in the wider flight path zones – this is not necessarily the case but the visual impression can override the information on the number of movements shown in the boxes on the charts.
- > Aircraft will still be heard outside the flight path zones.

- > The charts capture approximately 90 per cent of flights; 'one-off' flight paths are not shown on the charts for reasons of clarity – the charts are designed to only show a 'macro' picture for the main jet flight path routes.
- > The charts provide information on aircraft movements not aircraft noise.
- > Similar to the flight path maps, flight path movements charts are two dimensional and therefore they can give the impression that the altitude of an aircraft does not vary along the length of the flight path zone.

#### Suggested uses

- > providing information to prospective house purchasers about typical aircraft noise exposure patterns around an airport
- > responding to queries about trends in aircraft noise exposure
- > giving a picture of how noise is distributed between suburbs around an airport
- > input into EISs and noise assessment reports, for example for airport consultative committees
- > providing advice to supplement ANEF contours, for example for land use planners and decision-makers
- > environmental monitoring and reporting, both regular reporting and 'State of the Environment'

#### Data source/software

> NFPMS and TNIP



1 Jan 2001 to 31 Dec 2001 All jets. Total number of aircraft movements = 48,597.

Note: Track H includes all arrivals to Runway 03 from the east and all departures from Runway 21 to the east. Track A is tracks B and C combined. Similarly, track F is track G and H combined.

## 10 Respite charts

#### **Overview**

The respite chart gives an indication of the extent to which different areas around an airport get 'breaks' from aircraft noise. The monitoring and reporting of these 'breaks' or 'respite' was a special priority for Sydney residents following the opening of the new runway at Sydney Airport in 1994.

The charts report respite by showing the proportion of hours during which there were no jet aircraft movements on each of the flight paths. For example, if the respite on a particular flight path is reported as '50%' it means that for 50 per cent of the clock hours during the period covered by the chart there were no movements on that flight path. A 'clock hour' means, for example, 8am to 9am. Further details about respite charts can be found in Chapter 3 of the DOTARS 'Expanding Ways' Discussion Paper (see Glossary).

#### Figure 10.1 A respite chart for Sydney Airport.

#### Strengths

- > The charts give information on what happens at 'sensitive times'.
- > The information on the chart can be verified without special expertise or equipment, for example, by keeping a log of aircraft times.
- > The charts are based on 'real' information and not on computer modelling.

#### Weaknesses

- > The information on the charts describes respite for each individual flight path zone in some cases respite on one track can be disturbed by movements on another track and therefore in these circumstances respite will be less than that reported.
- > On the other hand, the charts show respite based on one hour breaks this is a very blunt instrument and means that an area can have zero respite yet get only 24 overflights a day.

#### Suggested uses

- > providing information to prospective house purchasers about typical aircraft noise exposure patterns around an airport
- > responding to queries about trends in aircraft noise exposure
- > giving a picture of how noise is distributed between suburbs around an airport
- > providing information on what happens at sensitive times
- > input into EISs and noise assessment reports, for example for airport consultative committees
- > environmental monitoring and reporting, both regular reporting and 'State of the Environment'

#### Data source/software

> NFPMS and TNIP



1 Jan 2001 to 31 Dec 2001 All jets. Total number of aircraft movements = 156,069.

Note: Track A\* is track B and C combined.

A respite hour is a whole clock hour (eg 06:00 to 07:00) when there are no jet movements. Morning: 06:00 to 07:00 on week days. Daytime: 07:00 to 20:00 on week days. Evening: 20:00 to 23:00 on week days. Weekend: 06:00 to 23:00 on weekdays.



#### 11 Single event contours

#### Overview

When people show an interest in gaining information on noise levels they rarely want to know about logarithmically averaged noise levels such as the ANEF. They are almost always interested in knowing about single event noise levels.

Single event noise data is generally either provided by showing computer generated 'noise footprints' or by providing data on the noise levels registered by individual flights at the noise monitors around airports.

In the past, single event contours have most commonly been shown as 'straight in and straight out' footprints on a plain background to show the noise differences between different aircraft types. These contours lack any contextual information and therefore have not provided an individual with information directly relevant to their home. The attached single event contour has been placed on a flight path superimposed on a satellite image for an area close to Sydney Airport. This approach, which allows a person to see 'what it means for them', has received very positive comments from users.

## Figure 11.1 A single event contour for a B767 aircraft departing to the north-east from the third runway at Sydney Airport.

#### Strengths

- > The contours give a good indication of the sound pressure level at a person's home when an aircraft of a specified type operates on a specified flight path.
- > The information can be verified comparatively easily, for example, by the use of an inexpensive noise level meter.



#### Weaknesses

> The contour only relates to one flight path.

> Examples

- > No information is provided on how often or at what time flights will occur on the flight path.
- > The contour only applies to one type of aircraft, and, if a departure, for one stage length the noise a departing aircraft generates is very dependent on the distance to that aircraft's destination, that is on the amount of fuel being carried.
- > The contours are generated solely by computer modelling.

#### Suggested uses

- > responding to queries about the noise levels generated by individual aircraft
- > showing a comparative picture between operations by different types of aircraft, both between current aircraft and between old and new generation aircraft
- > input into EISs and noise assessment reports, for example, for airport consultative committees

#### Data source/software

> INM and TNIP

#### 12 N70 contours

#### **Overview**

The use of N70 contours evolved out of community interest in single event contours. In essence, the N70 contour map summarises single event data for a specified time period over the area surrounding an airport and has proven to be a good way to produce a 'whole of airport' picture of single event aircraft noise patterns.

The noise contours on an N70 chart indicate the number of aircraft noise events louder than 70 dB(A) which occurred on the average day during the period covered by the chart. An aircraft noise event of 70 dB(A) is one that is likely to disturb conversation inside a house with open windows. This event therefore may interfere with activities like watching television or using the telephone. Further details about N70 contours can be found in Chapter 4 of the DOTARS *'Expanding Ways'* Discussion Paper (see Glossary).

The term 'N70' has also commonly become used as a generic expression for the family of 'Number Above' descriptors. Contours showing the number of events above 60 dB(A) and 80 dB(A) are also frequently generated for specific applications – see the notes below for Figure 12.2.

#### Figure 12.1 An N70 contour for Canberra Airport.

#### Figure 12.2 An N60 contour for Bankstown Airport.

> There is generally a significant difference between the aircraft noise environment in the vicinity of major jet (RPT) airports and that around General Aviation (GA) airports. At GA airports the community, particularly residents of areas under training circuits, are exposed to noise from much quieter aircraft but the number of overflights is often significantly greater. Therefore, while a level of 70 dB(A) has been adopted as an indicator for RPT airports, given that a level of 60 dB(A) is typical of the noise level of aircraft in training circuits around a GA airport, the N60 is considered to be a more appropriate descriptor for these airports.







#### Strengths

- > N70s report noise by the number of single events which is the way a person generally experiences and perceives aircraft noise.
- > The contours are arithmetic for example, all other things being equal, if the number of flights on a flight path doubles, the N70 doubles.
- > The information can be relatively easily verified, for example, by cross-comparing with a measured N70 chart.
- N70s are useful for showing noise exposure in a meaningful way for short time periods, for example evening periods, as it takes information beyond the 'average day'.

#### Weaknesses

- > Like any noise contour an N70 contour can give the impression that there is no noise beyond the outer contour.
- > Some people distrust the contours as they are produced using computer models and not by measurement.
- > It is not readily apparent what a sound pressure level of 70 dB(A) will be like in practice.

#### Suggested uses

- > giving a 'macro' picture of noise around an airport to complement and put into perspective information based on flight paths and movement numbers and times, etc
- > input into EISs and noise assessment reports, for example for airport consultative committees
- > providing advice to supplement ANEF contours, for example for land use planners and decision-makers
- > environmental monitoring and reporting, both regular reporting and 'State of the Environment'

#### Data source/software

> INM and TNIP

### 13 Measured N70 charts

#### Overview

Despite the enormous efforts that have gone into verifying the output of computer models such as INM, members of the public tend to be very wary of computer modelled data and often have much more faith in data which has been recorded by an NFPMS. The measured N70 chart reports actual noise measurements made around an airport. This contrasts with N70 contours which are generated by computer modelling. The measured N70 not only provides information from a source that is more trusted by some people, it also provides a good tool for checking the accuracy of N70 contours.

At most major Australian airports, aircraft operations are monitored using an NFPMS. These systems gather large amounts of data and experience has shown that it is difficult to synthesise the results of the noise monitoring in a way that is meaningful. It has been found that a useful overview picture of aircraft noise monitoring data can be obtained by using the N70.

#### Figure 13.1 A measured N70 chart for Sydney Airport.

#### Strengths

- > The charts summarise a great deal of information in a way that is easy to comprehend.
- > The information is derived from noise monitoring not computer modelling.
- > The charts provide information on daily ranges in the N70 and also on noise exposure at sensitive times.
- > This form of representation allows a comparison to be made between computer generated N70 contours and measured N70 data.
- > Measured N70s allow a rapid overview examination to be made of the noise generated by particular operations or aircraft types, for example, departures by B747s.

#### Weaknesses

- > The charts only provide information for those locations at or very near to the noise monitoring terminals.
- > The information needs to be treated with caution since sound pressure levels can change rapidly even at a short distance from a noise-monitoring terminal particularly for landings.
- > It is not readily apparent what a sound pressure level of 70 dB(A) will be like in practice.

#### Suggested uses

- > summarising the results of a period of noise monitoring
- > cross-checking N70 contours
- > input into EISs and noise assessment reports, for example, for airport consultative committees
- > environmental monitoring and reporting

#### Data source/software

> NFPMS and TNIP



Morning: 0600: to 07:00. Daytime: 07:00 to 20:00. Evening: 20:00 to 23:00. Night: 23:00 to 06:00 (in the same day)

## 14 Audio/visual presentations

#### **Overview**

A number of audio/visual products have been developed in recent years to demonstrate aircraft noise to non-expert audiences via the medium of public 'noise simulation' presentations. These products are capable of generating very high quality sound and visual images. Typically the audio/visual tools would be used as a part of the consultation process on a major airport project such as the construction of a new runway.

A public noise simulation session is likely to be convened by an expert facilitator who uses the product to demonstrate a wide range of noise effects and to respond to queries raised by the audience. The demonstrations are likely to include, for example, showing the differences in noise generated by different aircraft types, the changes in noise generated by moving a flight path, the reduction in noise achieved by insulating a house, etc. The tools can also be used to help an audience understand the technical noise descriptors used in noise assessment reports.

#### Figure 14.1 Two screenshots from an audio/visual presentation.

#### Strengths

- > Gives a person a 'real life' experience of what the noise is like and clearly demonstrates the variations between different types of noise events.
- > Allows a group debate, with an expert facilitator, in a manner that goes beyond a public meeting that relies purely on static information.
- > Holding the presentations is a clear indication that an airport is taking a consultation process seriously and is attempting to directly answer questions raised by the public.

#### Weaknesses

- > The presentations are a 'one hit' experience a member of the audience is not able to revisit the information in order to think about it and may not be able to effectively remember noise information presented in this way for long.
- > The presentation is generally given in a group meeting and the noise effect may not be perceived to be the same as in the person's home.

#### Suggested uses

- > consultation processes for major airport projects such as the building of a new runway
- > informing groups, for example airport consultative committees, about aircraft noise issues
- > training airport staff involved with answering aircraft noise complaints

#### Data source/software

> Proprietary products



#### 15 Internet flight path sites

#### **Overview**

A number of overseas airports now provide the facility for flight paths to be viewed on their websites.

These sites allow a user to inter-actively find information about the flight paths in the vicinity of an airport (or airports in an area where there is more than one airport). Some of these sites allow the viewing of flight paths with a 10-minute delay. Another webpage design allows the flight paths to be viewed with a one day delay. The sites show a picture which is updated as the aircraft move. The base display uses colour codes to differentiate between arriving and departing, and jet and non-jet, aircraft. It also shows aircraft that are in transit and bypassing local airports. A user is able to zoom in or out on the image and can also ascertain the altitude of individual aircraft. In addition an individual aircraft can be selected and tracked as it traverses through the airspace. The sites also allow the user to re-play the flight tracks for any selected time period contained in the flight track database.

## Figure 15.1 Two screenshots from the Oakland International Airport web-based flight track and noise viewing system.

#### Strengths

- > Demonstrates transparency the airport is being open about what is happening.
- > Allows the public to see for themselves where the flight paths are, rather than having to receive a flight path map from a noise complaints centre.
- > Immediacy members of the public can receive almost real time information.

#### Weaknesses

- > The websites show what is happening at any particular time but do not explain why it is happening, for example, why a particular runway is being used.
- > The information is only available to people who have access to the Internet.
- > The 'snap-shot' approach of these sites does not show an aggregated picture of flight path patterns.

#### Suggested uses

- > responding to noise complaints
- > providing advice to prospective house buyers
- > informing the public about how airports operate
- > allowing compliance with noise abatement procedures to be informally checked

#### Data source/software

> Proprietary products







### 16 Producing the information

Producing aircraft noise information requires the commitment of resources. However, much of the material shown in this document is deliberately based on adapting, and/or representing in a different way, data that has already been gathered for other purposes. In many cases the incremental costs of producing useful and effective aircraft noise information may not be high.

The options for producing the types of information shown in Part 2 are strongly enhanced if an airport has an installed NFPMS. This does not mean that good information cannot be produced for those airports without an NFPMS.

#### 16.1 Airports equipped with an NFPMS - the larger jet airports

As a general rule these airports have the more persistent aircraft noise management issues – this may involve responding to community concerns and/or trying to protect the airport from encroachment by noise sensitive land uses. Flight path data is generated by the NFPMS on a continuous basis. Information on measured noise levels is also recorded on a continuous basis. Therefore this information is available for every operation into and out of an airport, except at times when the equipment is malfunctioning or is being calibrated/serviced.

Data on the times of operations and on the runways used at an airport is generally available from the airport's air traffic management system.

Given that all the necessary input data is generated on a more or less continuous basis, in theory it would be possible to produce all of the types of information shown in Part 2 on, say, a daily basis if this were considered desirable.

While these airports have all the necessary equipment in place to produce the information shown in Part 2, some parties interested in producing aircraft noise information have only limited access to the data underlying the information. As a result, their ability to produce the information may be curtailed.

#### 16.2 Airports without an NFPMS - the smaller airports

Some airports without an NFPMS do have to deal with significant aircraft noise issues and would clearly benefit from the ability to produce effective aircraft noise information.

In particular, over the years there have been strong community pressures on urban GA airports which have housing located directly beneath busy training circuits. Conventional monitoring of

noise at these airports using an NFPMS is not effective due both to the relatively low sound pressure levels generated by aircraft in training circuits and also to the fact that many of these aircraft are not equipped with radar transponders.



In addition many regional airports are interested in establishing noise buffers to ensure that options for the long-term development of the airport are not compromised. Experience has shown that if a fully informed debate is to take place on the establishment of a buffer it is essential that comprehensible aircraft noise information is produced which covers areas extending beyond the conventional ANEF land use planning contours.

While these airports do not have an NFPMS, many of them do have published ANEF contours. The files that were used to produce the contours contain data that can be extracted to produce effective aircraft noise information and therefore these airports are in a different situation to those without an ANEF contour.

#### Airports with ANEF contours

The following comments relate to ANEF modelling that has been undertaken relatively recently and with later versions of the noise contouring software INM. It would probably not be practical, or meaningful, to extract data from ANEF files which were generated more than five years ago.

In developing the noise contours the modeller will have determined the design of flight paths and allocated movements to those flight paths. This information can be extracted relatively easily from the model, for example using TNIP, and a form of average day flight path movements chart (Section 9) could be produced based on the information in the ANEF. The INM files can also be used to produce N70s (Section 12) and single event contours (Section 11).

In producing this information it is important to bear in mind the difference between current and future scenarios (see Section 6). The information in an ANEF may need significant adjustment if it is to be used to provide information on the current situation. In some circumstances it may not be possible to extract any useful information about the present from the ANEF files.

#### Airports without ANEF Contours

Provided that an airport uses relatively standard operating procedures it should be possible to carry out 'one-off' surveys to establish the general location and spread in flight paths and typical aircraft noise levels at nominated monitoring sites. Combining this with local knowledge about the times, numbers and origins/destinations of 'normal' flights should enable some broad indicative information about the noise exposure patterns around an airport to be produced, for example, in the form of a flight path movements chart or a measured N70 chart.

#### 16.3 Use of INM

As indicated in Part 2, the US Federal Aviation Administration's INM is required to produce the single event and N70 contour information. INM is used throughout the world by acoustic consultants working in the aircraft noise field.

A person should be well trained in the use of INM before the output can be treated with confidence. There are many consultants in Australia who can competently carry out INM work.

#### 16.4 Use of TNIP

Most of the examples of information in Part 2 can be produced very rapidly using TNIP.

In order to set up TNIP a number of files and graphic templates need to be produced. Importantly, monitoring data needs to be available in a specified format in order to produce output from TNIP. Expert advice is likely to be needed in setting up the package. However, once established TNIP can be maintained on an ongoing basis without the need for expert assistance, provided arrangements are in place for the monitoring files (which update the databases) to be provided in the correct format.

Once TNIP is set up the examples of noise information shown in Part 2, which use TNIP, can be produced by a person with little or no computing skills or training. TNIP has been designed to be particularly flexible and allows an unskilled person to interrogate databases and produce output based on a wide range of user selected parameters. For example, information can be produced for specific days, for any nominated aircraft type operating on any selected runway, etc.

TNIP is freeware and DOTARS is available to give advice on setting up the package at individual airports.

#### 17 Delivering the information

#### 17.1 Overview

Using transparent aircraft noise information presents the opportunity for a win/win situation. In the past there has often been a total disconnect between the different parties when discussing aircraft noise. Airports have stated that the noise situation is improving while members of the public have expressed an opposite view. In fact, both sides have been correct when viewing the issue from their own perspective. Conventional noise contours have been shrinking over the past decade as the noisy 'old generation' aircraft, for example B727 and F28, have been replaced by much quieter 'new generation' aircraft, for example B737-400 and B717. However,

on the other side of the coin aircraft movement numbers, and hence the numbers of noise events, have been increasing and the gaps, or periods of respite, between periods of aircraft overflight activity have been decreasing.



Ideally, the focus now needs to move from a debate on whether things are getting 'better' or 'worse' to one where both sides recognise that the nature of aircraft noise exposure patterns is changing and adopt noise descriptors which establish a common understanding on what is actually happening. Experience in recent years has shown that the transparent aircraft noise descriptors, as discussed in this document, provide the opportunity to establish this common understanding. Some form of agreed language needs to be in place before a meaningful dialogue can take place between the parties on strategies for managing

As indicated throughout this guidance material aircraft noise information can be produced in several different forms and, due to the fact that it describes aircraft noise in non-technical terms, can be used in a wide range of circumstances. In broad terms the information can be delivered in two distinct modes – reactively or proactively. While it is important that good quality information is available to respond to requests or to assist in resolving complaints, it is equally important that proactive efforts be made to ensure that transparent information is readily available to any member of the community.

Examples of the types of uses which suit each particular aircraft noise descriptor have been given in the cover sheets in Part 2. Figures 17.1 and 17.2 are 'mind maps' designed to give an overview of the relationship between the different descriptors. The first of these views the descriptors in terms of the type of information being sought, the second looks at the descriptors from the viewpoint of the functions being carried out.

The following sub-sections give some elaborations on the uses for the examples suggested in Part 2 and focuses on ways in which the information can be delivered to the target audience.

aircraft noise.







#### 17.2 Targeted information

#### > Responding to complaints

Experience has shown that short-term flight path maps, for example for one or a small number of flights, are the most appropriate tool for providing information to a complainant about individual flights or a particularly noisy day. These types of complaints tend to be made to airport noise enquiry services – ideally, noise enquiry units need to be able to provide copies of these maps to the complainant either through hard copy or electronically.

Written complaints to government departments and/or ministers tend to focus more on longerterm trends, such as claims that it has become noisier over the last two months. When responding to the complainant's letter, attaching copies of flight path movement and respite charts, coupled with N70 contours, has proven useful as this allows the cited time period to be placed in a macro context, such as, comparison between the last two months and the last year.

#### > Disclosure - providing advice to prospective house buyers

Conventionally aircraft noise disclosure has meant appending advice about aircraft noise on property titles, or property transaction notices, of houses situated within the 20 ANEF noise contour at some Australian airports. While this strategy is positive it is not without weaknesses. Firstly, the advice tends to be of a general form which conveys little 'real' information on what the noise is like – the advice may typically say the house is in a 'high noise area'. This approach does not catch houses outside the 20 ANEF contour but which are under a busy flight path. People buying in areas away from an airport often do not expect to be subject to aircraft noise. Clearly if a person buys a house expecting no aircraft noise and then receives a 'surprise' they are likely to be highly annoyed even by relatively low levels of aircraft noise.

It is therefore important that airports are able to provide copies of comprehensive transparent aircraft noise information on request to prospective house purchasers in order to minimise such surprises. Ideally this reactive approach can be supplemented by proactive approaches. For example, Melbourne Airport has for some years taken action to have information on flight paths outside the noise contours published in street directories. Publishing aircraft noise information on an airport's website is another excellent way to publicise the fact that there is noise outside the contours.

San Francisco Airport has recently indicated that real estate agents in the area are recommending to customers that they view the airport's 'near live' flight paths (Section 15) before they make property purchase decisions.

#### > Providing advice to planners/prospective developers to place ANEF contours in context

Land use planning contours are specifically designed to ensure that land around airports is

X

Part 3 > Producing and Delivering the Information

developed in a way that is compatible with aircraft noise. Under the ANEF system and its associated land use compatibility advice, land with an aircraft noise exposure of less than 20 ANEF is treated as 'acceptable' for any land use (with respect to aircraft noise). Land use planning decisions based on the 20 ANEF have been useful. However, as indicated in Section 2, relying solely on noise contours in the land use planning process is likely to result in less than optimal outcomes. In looking to future planning needs, it is now considered



highly desirable that those involved in land use planning decisions should also be provided with transparent noise descriptor information. This then allows the planners and the decision-makers to have an understanding of the noise environment covering the general, as well as the specific, geographic area under consideration.

Ideally, land use planners should also have an understanding of the assumptions underlying the land use planning noise contours they are using and be aware, for example, of the sensitivity of the location of the 'planning line' to changes in forecasts, aircraft types, flight path locations, etc. TNIP has built-in features which allow a user to readily ascertain this type of information. It would therefore be beneficial for an airport to sit down with the planners and interactively demonstrate how the ANEF contours have been arrived at.

#### > Noise assessment reports/EISs

This is another important area of use for transparent aircraft noise information. In the past these types of documents have tended to be treated purely as 'technical' documents conveying information between noise experts. However, it is now very apparent that non-experts use these documents, particularly formal EISs, as a prime source of information on future noise exposure patterns. There is a need for this information to be presented in a form that a non-expert can understand and relate to. It has been demonstrated in several recent documents that the concepts in this guidance material can be successfully incorporated into aircraft noise assessment reports.

Due to the speed at which TNIP can examine information and produce output, it is an excellent tool for carrying out 'what-if' analyses for EISs and noise assessment reports. It is now feasible to rapidly examine the noise outcomes of a wide range of different operating regimes for an airport and to produce this information in a form which is readily comprehensible to key persons who are not noise experts, for example airport management and senior bureaucrats. TNIP therefore facilitates the examination of many more options in EIS processes than has hitherto been practical.

In a similar vein it should now be possible to draw on these rapid 'what-if' capabilities to achieve much greater levels of community involvement in noise assessment processes than has previously been the case. In many circumstances it should be possible for a more or less

interactive session to be held with community representatives which allows examination of how the patterns of noise exposure around an airport would change if certain changes were made to an airport's operating regime.

#### > Informational material

It is not uncommon for airports to produce some form of public relations informational material on a range of matters associated with the airport, including the management of aircraft noise, which is directed at the communities living in the vicinity of the airport. This may take the form of annual reports, 'one-off' publications on particular issues such as land use planning, or may form part of an airport's website. The target audience for this type of material is almost always non-experts and, as a result, the transparent aircraft noise descriptors discussed in this paper are well suited to this application.

However, this can be a difficult area – 'information' can be seen to be 'propaganda' if it is not presented in a neutral way. Unsupported claims of 'world's best practice', 'things are much better than they were' and the like, are likely to generate negative responses. Providing regular comparative information based on data gathered and/or collated by an independent body, without any interpretation, is likely to attain a more positive result. In particular, the data will achieve a greater level of acceptance if the message is expressed in a way that a member of the public can verify for themselves, for example, the number of overflights a day.

#### > Use in the media

Flight path movements charts have been used in a number of Australian newspapers to describe noise exposure patterns around airports. This would appear to demonstrate that journalists, who communicate with audiences with non-specialist knowledge, have considered flight path movement charts in particular to be a good way to portray aircraft noise exposure patterns.

#### 17.3 Regular reporting

#### > Routine environmental reporting

The importance of routine environmental monitoring and reporting was discussed in Section 2.

Some form of routine environmental monitoring and reporting is carried out at most major airports in Australia. Noise and flight path monitoring systems are in place at these airports and the data generated by these systems, combined with data derived from the airports' air traffic management system, is used to produce regular monitoring reports. Quarterly reports are produced for all airports with an additional monthly report for Sydney Airport.

The quarterly reports contain information for the period on the distribution of flight paths as well as detailed information on runway use. The reports also include data on noise measurements – both in a summary form through the use of the N70 (plus N80 and N90) and

in a more disaggregated form. In addition to detailed runway use data, the monthly report for Sydney includes flight path movement, respite and measured N70 charts. These reports have received positive comments from community representatives and have demonstrated that transparent noise descriptors are particularly suited to giving a ready appreciation of both short-term variations and long-term trends in aircraft noise exposure patterns.

The reports are generally delivered through the various airport community consultative committees, however, this represents a relatively limited audience. Placing the report on an airport's website, for example, would give the report a much greater potential audience. If a wider audience is sought, a summary of the report could be included as a regular feature in an airport's community newsletter.

#### > Airport Internet sites

Most organisations, including airports, now have an Internet site which contains key information about that body's activities. This is an avenue which appears to offer great potential for communicating with the public on aircraft noise issues. However, in Australia to date, there has been little development in this area.

A number of major international airports now use websites to provide communities with routine information on aircraft noise exposure patterns. The most recent development has been the introduction of the Internet flight path sites in the United States (see Section 15).

The database interrogation and high quality graphical output concepts in TNIP would appear to offer an attractive way for the public to access noise exposure data. If a database and an appropriate interrogation/graphical output program were established on an airport's website it would potentially allow a level of access to data far beyond that currently available in Australia.

Only a limited number of charts can feasibly be included in the normal printed routine airport noise monitoring reports. However, if a tool such as TNIP were enabled for the Internet it would allow a member of the public to personally and remotely interrogate an airport's aircraft noise database and present them with the option to generate multiple charts specific to their circumstances at a time of their choosing.

#### > State of the Environment Reporting

Formal 'State of the Environment' reports are now generally being produced at national, state and local government levels on a regular long-term cycle as a means of tracking long terms changes in the environment. In the past, the reporting of aircraft noise exposure has been somewhat limited and typically restricted to computing the numbers of persons within certain noise contours. The new descriptors present the opportunity to throw a different light on trends in community aircraft noise exposure patterns.



Part 4 > Glossary

#### 18 Glossary

#### **ANEF - Australian Noise Exposure Forecast**

The ANEF system was developed in the early 1980s as a tool to provide guidance on land use planning around airports. In essence, the system involves the drawing up of ANEF noise contours and the restriction of specified land uses in certain ANEF zones according to the noise sensitivity of the nominated land use. This system is similar to land use planning regimes in a number of countries.

#### Expanding Ways to Describe and Assess Aircraft Noise – Discussion Paper

*Expanding Ways to Describe and Assess Aircraft Noise*, a Discussion Paper published by DOTARS in March 2000, describes and gives the background to a number of 'new' aircraft noise descriptors which arose out of the public debate that followed the opening of the new runway at Sydney Airport in 1994. It is available online at www.dotars.gov.au

#### **INM - Integrated Noise Model**

The *Integrated Noise Model* is an aircraft noise modelling software package produced by the United States Federal Aviation Administration. The first version of INM was developed in the late 1970s. The INM uses aircraft operational data such as flight paths, aircraft types, runways used, etc to compute noise contours for areas surrounding airports. ANEF contours are produced directly using INM. N70 contours are derived from detailed noise grids that have been produced using INM.

#### NFPMS - Noise and flight path monitoring system

Integrated noise and flight path monitoring systems at airports have been introduced progressively over the past decade. These systems produce data on the location of flight paths and on the noise level of aircraft at certain noise monitoring sites around airports. The information produced by these systems is used as the basis for reporting on routine aircraft noise monitoring and underpins most of the examples of transparent noise descriptors in this document.

#### N70

N70 is a term used generically to describe noise through reporting the number of aircraft noise events louder than a certain specified dB(A) level. It is also sometimes referred to as NA or *Number Above*. The noise level generally used in Australia is 70 dB(A) but charts showing information on the number of events louder than 60 dB(A) and 80 dB(A) are not uncommon.



#### Respite

*Respite* is a term used to report the breaks or gaps between periods of aircraft noise activity through reference to the percentage of whole hours over a specified time period, for example a day, when there have been no aircraft movements on specified flight paths.

#### **TNIP - Transparent Noise Information Package**

*TNIP* is a software package under development by DOTARS since late 2000. The package enables a user to rapidly interrogate aircraft activity and noise databases and to produce transparent noise descriptors. The package can be set up for any airport that has an NFPMS.

TNIP is freeware. To obtain a copy of the software, please contact the Department of Transport and Regional Services on [02] 6274 7111 or online at www.dotars.gov.au

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