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# STUDYING COMMUNITY DISTURBANCE AROUND GENERAL AND BUSINESS AVIATION AERODROMES

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## 1. INTRODUCTION

There are a number of established techniques for studying community disturbance as a result of aircraft noise around large airports and a recent European Economic Community study (Diamond and Walker, 1986) has demonstrated that it is possible to harmonise such studies across different countries. However, the methodology for undertaking studies around aerodromes whose traffic is predominantly general and business aviation is less clear.

In 1981 a study sponsored by the Department of Transport was undertaken around five aerodromes (DORA, 1982). The aims of that study were to examine whether the relationships between disturbance and noise level found at large airports held at small aerodromes. The results of the study suggested that disturbance around these aerodromes was fairly low but the study has been criticised by those who believed that the applied criteria were only appropriate to large airports; in particular, noise indices such as $L_{Aeq,12h}$ may not be appropriate for aerodromes where there is considerable variation in traffic and flight patterns. While there could be no substantial criticism on methodological grounds within its aims it was felt that there should be further study of relationships between noise exposure and community disturbance around small aerodromes. This paper outlines the methodology adopted in this further study. It first describes the design of the study and then discusses the fieldwork, particularly with respect to a number of problems which are relevant to all studies which aim to identify the level of annoyance in a community from a particular source.

## 2. DESIGN

The study involved five aerodromes: Biggin Hill, Elstree, Shoreham, Southampton and Wycombe. These were chosen to represent a broad range of both frequency and type of traffic by the Department of Transport Business Aviation Working Group, a committee convened by the Department of Transport. A basic requirement of the study was to identify a relatively small residential area close to each aerodrome which was representative of the entire surrounding locality and wherein relevant noise exposure variables could be estimated for each dwelling. In total, the areas were to provide the largest possible range of noise exposures. Within each area, a random sample of the population was interviewed using a comprehensive questionnaire covering many aspects of annoyance due to aircraft. Estimates of noise exposure were based on available air traffic statistics, on-site noise measurements and observations of aircraft movements. A single area was

identified near each of the aerodromes with the exception of Biggin Hill, where two were chosen.

It was intended to undertake the noise and social surveys contemporaneously.

2.1 Noise Survey

The noise measurement programme was designed to measure the noise exposure and to determine variations in the exposure over time. Observations of air traffic and noise measurements were made in each of the areas. Computer analysis of the data enabled contours of aircraft noise ($L_{Aeq}$) to be produced.

Air traffic information has been obtained for several months preceding the social surveys. The quality of the information varied depending upon each aerodrome's own need for the information. The air traffic information will be used to modify the basic $L_{Aeq}$ noise contours for different periods of the day, weekday and weekend and for the week and three months prior to the surveys.

The number of days during which observations of air traffic were made and noise data collected are summarised for each area in Table 1.

2.2 Social Survey

Most survey sites were quite small, and therefore the best sampling strategy was to enumerate the addresses in the area and draw a systematic sample. Individuals were identified within each household using a Kish Grid. The target sample size was 120 interviews in each area and it was estimated that 180 addresses would need to be selected to achieve this target. In addition, a further fifty reserve addresses were selected for each area to be used in the event of the target sample not being achieved. This number is rather high but as the fieldwork took place over the summer when general and business aviation is at its peak, it was expected that an abnormally large number of households would be ineligible as the occupants would be either away on holiday or had been immediately prior to the survey. The surveys were carried out at approximately two week intervals throughout the summer of 1986.

The questionnaire design was a major feature of this study. It incorporated established aircraft noise research questions such as "How bothered or annoyed are you by the aircraft noise around here?" but in addition featured a number of topics of specific relevance to general and business aviation aerodromes. Firstly, it was necessary to allow for variation in traffic over time. If the week prior to the survey had been unusual then responses could be affected; this is not normally the case in studies around large airports where noise exposures from scheduled aircraft tend to be relatively constant. In order to control for variation, questions were asked on whether the last week had been better, the same or worse than usual. Respondents were asked how annoyed they were when the noise was at its worst. These replies will be related to noise and air traffic data.

Secondly, it is important to determine whether the local aerodrome is the main source of annoyance or whether large aircraft heading to or from other aerodromes are the source of any problem; this is important in the case of small aerodromes affected by traffic using large ones such as Heathrow or Gatwick. A related problem is whether there are specific types of aircraft which cause annoyance; for example, aircraft flying circuits or those from flying clubs may be seen as being less necessary and therefore more annoying than military aircraft. These problems were tackled by asking the respondents to identify the types of aircraft heard in the vicinity of their home. The interviewer first asked for a spontaneous reply and then prompted the respondent with a list of those not mentioned spontaneously. The question is reproduced in Table 2. Reported large or jet aircraft would usually not be using the local aerodrome. The respondents were also asked which types of aircraft or flying annoyed them. In addition they were asked where the aircraft they heard were coming from or going to; mention of aerodromes other than the local aerodrome would indicate an alternative source of annoyance. However, the results show that, in the main, respondents identified the local aerodrome.

Thirdly, in order to identify whether particular types of flying caused annoyance, a question was asked about what the aircraft were doing when the respondent heard them (interviewers were instructed to make it clear that "flying" was not an option). This meant that respondents had the chance to identify circuits, flight path variation, landing or taking off as particular sources of irritation.

Fourthly, a number of questions were asked about whether the aerodrome was a good neighbour. This was considered especially important in studies of smaller aerodromes, where there is less likelihood of the local community being economically dependent on it. For example, respondents were asked about whether the aerodrome cared about the local community, about their use of the aerodrome and whether the aerodrome kept them informed of traffic changes.

## 3. FIELDWORK

Because of the greater variability of operations at small aerodromes compared with large commercial airports, the plan was that at each area the noise measurements should be made immediately before the social survey, thereby enabling more precise estimates to be made of the more recent noise exposure experienced by respondents. The social survey was to have an intensive fieldwork period of five days so as to ensure that all respondents had a similar noise exposure and that prior knowledge of the survey did not influence responses.

However, in the first area surveyed (Elstree) it was found to be impossible to undertake the noise measurements without being conspicuous to the residents of the area. There were fears that this could also warn respondents that there was a noise study taking place. While there is no

scientific research of this potential effect it is generally thought best that noise measurements should be "invisible".

In order to overcome this problem in other areas it was decided to determine the noise exposures using a two stage procedure. Initially the traffic and flight patterns before and during the period of the social survey were monitored and recorded with remote noise monitoring at a single central site only. The noise levels were measured after the social survey, as far as possible in conditions similar to those encountered immediately before the survey. Noise exposures for the period of the survey could therefore be imputed from this two stage approach. This complex procedure required the combination of the air traffic and flight pattern information with the measured noise levels for each type of aircraft using the aerodrome in order to provide the required noise exposure measures.

Another problem occurred at Shoreham. This small area contained a high proportion of bungalows on an estate occupied mainly by retired people. The interviewers, by virtue of being strangers, were conspicuous and it was apparent that some suspicion was aroused. This resulted in an abnormally large proportion of the initial sample refusing to provide any information.

The fieldwork continued successfully until the last area (Southampton) was due to be surveyed. One week before the fieldwork was due to start, a light aircraft from the aerodrome crashed on a local community centre close to the aerodrome but outside the survey area. The problem was further complicated by the fact that the pilot, who was killed, lived close to the survey area. It was felt that this could affect opinions about the aerodrome and light aircraft operations and the merits of continuing with the survey were discussed. In order to provide some guidance, a small sample of the population was interviewed in an area close to the survey area. A short questionnaire was designed to determine whether respondents had heard of the crash, whether this had affected their views of the aircraft and to ascertain their annoyance level. The results of this small survey suggested that opinions had been influenced by the crash in around ten per cent of the sample. It was decided that this was a sufficiently low percentage to permit the survey to go ahead. Accordingly it was decided to proceed, but the questionnaire used in Southampton was modified slightly to assess how much the area had been affected, and in the final analysis specific account will be required to control for the effects of the crash. An important aspect of the analysis will be to compare the annoyance responses of those who were influenced by the crash with those who were not.

The fieldwork was finished in September and response rates are summarised in Table 3.

## 4. CONCLUSIONS

This paper has described a number of methodological points which are specific to the study of annoyance around general and business aviation airports. Despite the potential problems all the data checks to date suggest that the fieldwork has been successful and that the full analysis of

the combined noise and social survey data will provide conclusions that will have important implications for policy decisions for general and business aviation.

## REFERENCES

I.D. DIAMOND and J.G. WALKER 1986 *Proc. Internoise 86*, 941-946. An international study of the influence of residual noise on community disturbance due to aircraft noise.

DORA Report 8203 1982 Reaction to aircraft noise near general aviation airfields. Chief Scientist's Division, Civil Aviation Authority.

TABLE 1: Record of observations of air traffic and noise measurements

| Survey Area | Runway used/ type of movement | Observations of Air Traffic (days) | Noise Measure-ments (days) |
|---|---|---|---|
| Elstree (Bushey) | 08 Landing | 0.5 | 0.5 |
| | 26 Take off | 6.5 | 6.5 |
| Wycombe (Lane End) | 07 Circuits | 1.0 | 1.0 |
| | 17 Landing | 0.5 | 0.0 |
| | 25 Circuits | 5.5 | 3.0 |
| Shoreham (Lancing) | 03 Landing | 2.0 | 1.5 |
| | 21 Take off | 5.0 | 2.0 |
| | 25 Take off | 0.0 | 0.5 |
| Biggin Hill (Village) | 03 Landing | 0.25 | 0.25 |
| | 11 Landing | 0.0 | 0.0 |
| | 21 Take off | 3.25 | 3.25 |
| | 29 Take off | 3.5 | 3.5 |
| Biggin Hill (New Addington) | 03 } | 0.25 | 3.5 |
| | 11 } Circuits | 0.0 | 0.5 |
| | 21 } | 3.25 | 0.0 |
| | 29 } | 3.5 | 0.5 |
| Southampton | 02 Landing | 6.0 | 2.5 |
| | 20 Take off | 1.0 | 2.5 |

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**TABLE 2: Question to identify types of aircraft heard.**

What kinds of flying are mainly involved around here - that is, what are the main sorts of aircraft and what is their function?
PROBE AS NECESSARY IN ORDER TO CODE: "What sort of aircraft is that?" or "What are those aircraft doing - what's their function?"
ALWAYS PROBE: "Are there any other main kinds of flying involved around here?" UNTIL FINAL "No"

FOR ALL TYPES OF FLYING NOT CODED AT (a) ASK

| b) Do you get ..... around here? | (a) CODE ALL THAT APPLY | (b) YES | NO | DON'T KNOW |
|---|---|---|---|---|
| .. airliners or big jets . . . | 1 | 2 | 3 | 8 |
| .. small jets, business, executive or small transport planes | 1 | 2 | 3 | 8 |
| .. flying school planes . . . | 1 | 2 | 3 | 8 |
| .. leisure flying and private or club flying using small, light aircraft . . . . . | 1 | 2 | 3 | 8 |
| .. military aircraft . . . . . | 1 | 2 | 3 | 8 |
| .. helicopters . . . . . | 1 | 2 | 3 | 8 |
| .. others (specify) _____ | 1 | | | |
| (Don't know) . . . . . | 1 | | | |

IF HELICOPTERS MENTIONED AT a) OR b), ASK

c) Are the helicopters that fly around here ..... READ OUT .....

... civil helicopters
... military helicopters
... or both civil and military?
(Don't know)

Table 3: DETAILED STATEMENT OF RESPONSE BY AREA

| AIRPORT | ELSTREE | | WYCOMBE | | SHOREHAM | | BIGGIN HILL (A) | | BIGGIN HILL (B) | | SOUTHAMPTON | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SITE NO | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
| Total issued (including reserves) | 174 | | 186 | | 211 | | 180 | | 193 | | 195 | |
| Found to be out of scope: | | | | | | | | | | | | |
| - no one at address had lived there 3 months + | 5 | | 6 | | 9 | | 3 | | 4 | | 5 | |
| - all occupants away during previous week | n/a | | 5 | | 4 | | 9 | | 3 | | 4 | |
| - premises vacant/business only etc | 4 | | 4 | | 6 | | 4 | | 2 | | 2 | |
| Total out of scope | 9 | | 15 | | 19 | | 16 | | 9 | | 11 | |
| Total in scope or believed to be in scope | 165 | 100 | 171 | 100 | 192 | 100 | 164 | 100 | 184 | 100 | 184 | 100 |
| Interview achieved at address | 119 | 72 | 118 | 69 | 109 | 57 | 131 | 80 | 121 | 66 | 127 | 69 |
| Interview not achieved | 46 | 28 | 53 | 31 | 83 | 43 | 33 | 20 | 63 | 34 | 57 | 31 |
| Reasons for non-response | | | | | | | | | | | | |
| Refusal (total) | 26 | 16 | 19 | 11 | 56 | 29 | 18 | 11 | 41 | 22 | 36 | 20 |
| * - complete refusal of all information at address | 6 | 4 | 7 | 4 | 26 | 14 | 12 | 7 | 21 | 11 | 8 | 4 |
| - selected person refused | 17 | 10 | 9 | 5 | 22 | 11 | 5 | 3 | 14 | 8 | 18 | 10 |
| - on behalf of selected person | 1 | 1 | 2 | 1 | 6 | 3 | 1 | 1 | 2 | 1 | 7 | 4 |
| - broke appointment and couldn't be recontacted | 2 | 1 | 1 | 1 | 2 | 1 | - | - | 4 | 2 | 3 | 2 |
| Non contact (total) | 18 | 11 | 30 | 17 | 24 | 12 | 13 | 8 | 22 | 12 | 16 | 9 |
| * - with anyone at address after 4+ calls | 9 | 6 | 19 | 11 | 18 | 9 | 7 | 4 | 10 | 5 | 5 | 3 |
| * - away during survey period/in hospital | 9 | 6 | 7 | 4 | 2 | 1 | 5 | 3 | 9 | 5 | 8 | 4 |
| - selected person not contacted | - | - | 4 | 2 | 4 | 2 | 1 | 1 | 3 | 2 | 3 | 2 |
| Other (total) | 2 | 1 | 4 | 2 | 3 | 2 | 2 | 1 | - | - | 5 | 3 |
| - senile/incapacitated/unwell | 1 | 1 | 3 | 1 | 1 | ·5 | 2 | 1 | - | - | 4 | 2 |
| - other | 1 | 1 | 1 | 1 | 1 | ·5 | - | - | - | - | 1 | 1 |

* These 3 categories of non response may include some who were ineligible