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TNO report

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Sleep disturbance and aircraft noise exposure
Questionnaires, diaries, and locations

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Summary

The project 'Sleep disturbance and night-time aircraft noise' has been carried out in the framework of the research program Health Impact Assessment Amsterdam Airport Schiphol (Gezondheidskundige Evaluatie Schiphol - GES). The project consisted of a pilot and main study. The field work of the main study has been carried out from November 1999 to April 2001.

In the main study 418 adult subjects, living at 15 locations at close distance and farther away from Schiphol, participated for 11 days and nights. At each location the study has been carried out in two succeeding intervals with about equal number of subjects.

Aircraft noise has been measured using one outdoor noise monitor and an indoor noise monitor in the bedroom of each subject.

After a subject agreed to participate in the study, he/she filled out an extensive questionnaire. During the field study at a location, a request to fill out a non-response questionnaire was sent at random to a part of the addresses that received the original invitation to participate. In total 451 non-respondents returned the non-response questionnaire. During their participation in the field study subjects filled out a diary on the computer each evening before going to bed and each morning after getting up. In this report detailed information is given about the results obtained from the questionnaires and diaries, and about the 15 locations. In TNO report 2001.206 the tables and figures supplementary to the present report are presented. This report does not consider other aspects of the study, such as results obtained with actimetry, and exposure-effect relationships. These relationships are given in TNO report 2002.027, together with details about the statistical analyses of the data. TNO-PG report 2002.028, RIVM report number 441520019, 2002, contains the main results of the study and estimates of the prevalence of effects of night-time aircraft noise in the vicinity of Schiphol, and is written in Dutch.

Locations

The report discusses the selection of the 15 locations. It is a prerequisite that the selected locations should be a good reflection of the residential areas in the vicinity of Schiphol airport, to be able to use the results for estimating the prevalence of adverse effects on sleep of aircraft to and from Schiphol. In the selection of the 15 locations the following aspects have been taken into account:

- *Night-time aircraft noise exposure.* Locations have been selected with only a few night-time aircraft (this turned out to be on average one indoor aircraft noise event on an indoor noise monitor in two nights between 23 and 6 hours) up to locations with the highest night-time aircraft noise exposure in residential areas in the vicinity of Schiphol;
- *Participation in the second phase of sound insulation program of Schiphol.* The sequence of possible locations has been chosen such that the field study at a location took place before the phase of the sound insulation program based on the night-time aircraft noise exposure started (which aimed at substantial sound insulation of the bedrooms), to avoid situations in which indoor night-time aircraft noise exposure changed substantially in the period just before the study took place;
- *Degree of urbanisation.* Urbanisation is classified in five categories from 1, very much urbanised, to 5, not urbanised. The selected locations cover these five urbanisation classes;

- *Type of dwellings.* Most of the possible locations have primarily houses in a row, detached and 2-under-1-roof houses, and high-rise flats and multi-storey buildings are rare. Where possible locations have been selected which include high-rise flats and multi-storey buildings;
- *Size of location.* Locations have been selected with at least 200 addresses in an area of 500 to 500 m;
- *Presence of other night-time noise sources.* Two locations have been selected with substantial local through traffic and two locations with (some) night-time railway traffic.

Night-time aircraft noise measurements

The outdoor noise monitor has been in operation from 22 hours in the evening to 9 hours in the morning during each night of the study nights. In total, the outdoor noise monitor measured nearly 17 000 aircraft noise events. At location 38 the largest number of aircraft noise events have been detected on the outdoor noise monitor (2143), and at location 44 the fewest (176). Night 5 (Friday night to Saturday morning) is on average the busiest night with 1763 aircraft noise events, compared to on average 1498 aircraft noise events during the 10 other nights.

From the indoor noise measurements the number of aircraft noise events measured in the bedrooms of subjects during their *sleep period time* has been assessed. The total number of aircraft noise events detected on the indoor noise monitors is 63242. At location 38 the number of indoor aircraft noise events have been detected: subjects have on average during 11 sleep period times been exposed to 342 indoor aircraft noise events. At location 44 the lowest number has on average been assessed: 20 indoor aircraft noise events during sleep of subjects. The average number of aircraft noise events during sleep are about a factor 1.7 times larger at night 5 (Friday night to Saturday morning) and at night 6 (Saturday night to Sunday morning) than at the other 9 nights. This is not only because there is more aircraft during night 5 and to a lesser extent also at night 6, but mainly because people sleep up to a later time in the morning on Saturday and Sunday morning.

Long-term night-time aircraft noise exposure

Data about long-term night-time aircraft noise exposure in 1999 and 2000 in the vicinity of Schiphol have been obtained from NLR. These data are based on *calculations*. For the present study, RIVM calculated by using the information obtained from NLR, values of night-time aircraft noise exposure appropriate for the place of the outdoor noise monitor at each of the 15 locations. Two of these long-term aircraft noise exposure measures are Lbu23-07h and Lbi23-07h, respectively the outdoor and indoor equivalent sound levels from 23 to 7 hours, averaged over one year.

Comparison of location-dependent and subject-related night-time aircraft noise exposure

From the outdoor and indoor aircraft noise exposure of subjects during the eleven sleep period times, for each subject the outdoor (Lo) and indoor equivalent sound level (Li) has been calculated, taking into account the duration of sleep period times. At a given location, Li varies from subject to subject. Li is a good reflection of the individual aircraft noise exposure, not only during the 11 sleep period times of a subject, but also on a time scale of a year (this will be shown in TNO report 2002.027).

In this report the relations between the median value of Lo and Lbu23-07h and between the

median value of Li and Lbi23-07h have been considered. The correlation coefficient between median Lo and Lbu23-07h is 0.88. On average, median Lo is about equal to Lbu23-07h. The correlation coefficient between median Li and Lbi23-07h is 0.75. On average, median Li is about equal to Lbi23-07h.

The report shows that if the individual values of Li of subjects are compared with Lbi23-07h there is a large scatter of data. This implies that at a given location (with a given value of Lbi23-07h which is equal for each subject at that location) the individual aircraft noise exposure during sleep period time varies considerable from subject to subject.

Selection of subjects

At nearly each location more than sufficient candidates were interested in participating in the study. To obtain a study population that resembled the population in the vicinity of Schiphol as much as possible, only a very few exclusion criteria have been used. Subjects have been excluded if they did plan to sleep elsewhere during one or more of the study nights, if they did have to nurse a family member extensively during night-time (this does not include the normal activities of taking care of young children), or if they did start using strong sleeping pills recently before the start of the study (within six weeks). To obtain a good reflection of the population in the vicinity of Schiphol selection has been based on age, gender, and further on sequence of showing interest to participate.

Results about subjects and non-respondents

In report 2001.206 the results obtained with subjects and non-respondents are discussed.

Comparison of results for subjects and non-respondents

One of the aims of the study is to provide information on basis of which the prevalence of adverse effects of night-time aircraft noise exposure on the population in the vicinity of Schiphol can be estimated. The non-response study has been undertaken to estimate a possible selection bias of subjects by first establishing differences in the distribution of variables in the population of subjects and in the population of non-respondents, and then assessing the consequences of the observed differences on exposure-effect relationships.

Twenty-one variables have been identified for which the distribution among subjects and the distribution among non-respondents is statistically significant different (for more information see chapter 5 and Appendix F of TNO report 2002.027). One of these variables is age: subjects are younger than non-respondents. When estimating the prevalence of adverse effects in the study population in the vicinity of Schiphol, age distribution of that population is known. Therefore, with respect to these estimates, differences between subjects and non-respondents are irrelevant. Differences in age distribution of subjects and non-respondents are able to explain differences between subjects and non-respondents in 10 of the other 20 variables. Since the recent start of using sleeping pills was used in the selection of subjects, and no selection has been applied to non-respondents, the selection procedure is able to explain all of part of the differences in use of sleeping pills between subjects and non-respondents. Therefore, there are nine variables (apart from age) with distributions that are different between subject and non-respondents, if age is taken into account. Four of the variables, with distributions that are different between subject and non-respondents, are related to or can be explained by the factor circumstances. These are citi-

zenship, composition of household, type of dwelling, job (own or inmates') related to Schiphol. The other five variables, with distributions that are different between subject and non-respondents, are related to attitudinal aspects. It concerns two variables (satisfaction with insulation against outdoor noises and satisfaction with insulation against neighbouring noises) that may have an association with adverse effects of aircraft noise and three variables that are related to aircraft noise (recognition living under a flight path, worried about health impact from aircraft noise, aircraft noise consequences of sleep). In two of the last three cases subjects evaluate their situation more positive than non-respondents, and in one case less positive. In TNO report 2002.027 exposure-effect relationships with these three variables as effect variables and night-time aircraft noise as exposure variable are given. Those exposure-effect relationships show only minor differences between subjects and non-respondents. Therefore, only small and unimportant differences exist between subjects and non-respondents, if age distribution is taken into account.

1 Introduction

1.1 Framework and objectives of the study

The study has been carried out in the framework of the research program Health Impact Assessment Schiphol (Gezondheidskundige Evaluatie Schiphol - GES). The Ministries of the Environment (VROM), Traffic (V&W), and Health (VWS) finance this program, and it is co-ordinated by the National Institute of Public Health and the Environment (RIVM). The field study has been carried out in the vicinity of airport Schiphol, located near Amsterdam.

The objectives of the study are:

- a. To assess relationships between night-time aircraft noise exposure and measures of sleep disturbance, health and daily functioning. The effect of aircraft noise in the so-called edges of the night (23 to 24 hours and 6 to 7 hours) is of special interest;
- b. To provide information on the basis of which the prevalence of effects induced by night-time aircraft in the population in the vicinity of Schiphol can be estimated.

The investigation consisted of a pilot and main study. The pilot study has been carried out in 1998 (Passchier-Vermeer et al., 1999). It has been undertaken to obtain information to design the main study in detail. The field investigation of the main study has been carried out in the period from November 1999 to April 2001. The results of the main study have been reported in:

- The present TNO report 2001.205 with detailed information about the subject and non-response population, obtained from questionnaires and diaries, and about the locations at which the main study has been carried out;
- TNO-report 2001.206 with tables and figures related to report 2001.205, and with pictures of locations;
- TNO report 2002.027, containing the statistical analyses of the study;
- TNO rapport 2002.028, RIVM rapportnummer 441520019, 2002, with the main results of the study and estimates of the prevalence of effects of night-time aircraft noise in the vicinity of Schiphol, written in Dutch.

The contents of the report is discussed in more detail in section 1.3.

1.2 Lay out of the main study

In the study 418 adult subjects participated. They were exposed during their participation in the study to night-time aircraft noise as it usually occurs in their bedroom. The study has been carried out successively at 15 locations in residential areas within 20 km from Schiphol. The villages and towns where the locations are situated together with their label are given in table 1 of chapter 5. In figure 1 of chapter 6 the 15 locations are indicated on a map of the surroundings of Schiphol. The map also shows the so-called 20 and 26 dB(A) night-time aircraft noise contours, calculated by NLR (Nationaal Lucht- en Ruimtevaartlaboratorium, National Aerospace Laboratory) on the

basis of aircraft during the night (for these contours night-time was taken as from 23 to 6 hours) to and from Schiphol in 2000.

At each location the study was carried out during two subsequent intervals of 11 days. For the assessment of night-time noise exposure of subjects, indoor and outdoor noise measurements have been carried out simultaneously from 22 – 9 hours during the nights the field study was performed at a given location. Indoor noise measurements have been performed in the bedroom of each subject during each of his/her participation nights. At each location one outdoor noise monitor has been in operation. In the memory of each operating outdoor and indoor noise monitor the measured equivalent sound levels over a second and information about the time of measurement in the period from 22 to 9 hours have been stored. Identification of aircraft noise events occurred by comparing the stored noise and time data with information obtained from FANOMOS, the flight track monitoring system of the Civil Aviation Enforcement Agency of the Ministry of V&W.

Subjects participated during one interval from a Monday evening starting at 22 hours until a Friday morning 11 days later. After a subject agreed to participate in the study, he/she filled out an extensive questionnaire (the English translation of the questionnaire is given in chapter 7 of this report). Participation in the study included the following tasks during each of the 11 participation days:

- Filling out a morning- and evening diary on a laptop made available to the subject by TNO (the English translations of the diaries are given in chapter 8 of this report);
- Performing a reaction time test on the laptop just before going to bed;
- Filling out a sleepiness strip five times during day and evening and wearing a watch which produced a noise signal at the times the sleepiness strip had to be filled out;
- Wearing an actimeter during 24 hours. The actimeters used (CNT actimeters, type AW4) look like small wrist watches and subjects wore these actimeters on the non-dominant wrist. The actimeters were read out three times during the 11 participation days in a personal computer by TNO. The actimeter is equipped with an event marker. Times at which the marker is pressed are also stored in the memory of the actimeter. Subjects pressed the marker twice when they intended to go to sleep and after they awoke to get up, and pressed the marker once whenever they woke up during their sleep.

Candidates for participating in the study have been recruited by mail. The request to participate and a leaflet with information about the tasks of a subject has been sent to about 3000 addresses. About 540 candidates showed interest in participating. About 440 possible subjects have been selected (see later in this report) for an in-take visit and further consultation. After this in-take visit about 20 persons decided not to take part in the study. All 418 subjects that actually started participation completed the study. At the end of participation subjects received vouchers to the value of € 113.

After the start of the second study interval at a location, a request to fill out a non-response questionnaire was sent at random to a part of the addresses that received the original invitation. In total 451 non-respondents (60%) returned the non-response questionnaire to TNO. Table 1 gives the number of non-respondents per location. After returning a completed non-response questionnaire non-respondents received vouchers to the value of about € 11.

1.3 Contents of the report

This report gives information obtained with the subject and non-response questionnaire, obtained with the evening- and morning diaries, and about locations including long-term night-time aircraft noise exposure at each location (obtained from NLR). Also, results of aircraft noise measurements obtained during the study at the 15 locations are given. This report does not present any relationships between night-time aircraft noise exposure and effect outcomes. These relationships are presented and discussed in TNO report 2002.027.

Chapter 2 of this report contains information about the locations and night-time aircraft noise exposure and a short introduction to the subject and non-response questionnaire. In TNO report 2001.206 detailed tables and figures with data from the subject and non-response questionnaire are given. In chapter 3 of this report this detailed information is reviewed and discussed. Chapter 4 reviews information obtained by the evening- and morning diaries.

Tables are included in chapter 5 and figures in chapter 6.

The English version of the subject questionnaire is given in chapter 7. In the heading of each section of the subject questionnaire, the questions included in the non-response questionnaire are given.

Chapter 8 includes the English version of the evening- and morning diary.

References are given at the end of the report.

2 Locations, subjects and non-respondents

2.1 Locations

2.1.1 Selection of locations

Selection of locations has been based on the following factors:

- *Night-time aircraft noise exposure.* This is the main selection criterion. At the start of the field work use has been made of 'Gebruiksplan Schiphol 2000', which gives the planned take-offs and landings at Schiphol from 01-11-1999 to 31-10-2000. The selection has been based on information about night-time aircraft noise from 23 to 6 hours. Figure 1 shows contours similar to those used in the selection of locations. Night-time aircraft noise exposed locations have been selected within and around the contours for the 'Zwanenburgbaan' (in the north south direction) and the 'Kaagbaan' (in the north-east south-west direction) because the Zwanenburg and Kaag runways are preferential runways for night-time aircraft. No location has been chosen in the vicinity of the Buitenveldertbaan, because this runway is used only if landing and take-off is not possible on the Zwanenburg and Kaagbaan because of weather conditions. This implies that it is not possible to plan in advance a period during which night-time aircraft occurs at that runway. Since it is our intention to study the effects of night-time aircraft noise not only on the most exposed people in the vicinity of Schiphol, not only locations within the 26 dB(A) night-time contour have been selected but also locations outside the 20 dB(A) contour. The contours concern aircraft from 23 to 6 hours only. Since sleep period times of people extend after 6 o'clock in the morning, CGS (Commissie Geluidhinder Schiphol) does receive complaints about night-time aircraft from people living in residential areas far away from the 20 dB(A) contour (Jaarverslag 1998 of CGS, 1999). Among the locations outside the 20 dB(A) contour with residents complaining about night-time aircraft noise is Leimuïden (location 39);
- *Participation in sound insulation program of Schiphol.* At the start of the main study, the first phase of the sound insulation program Schiphol, based on 24-hours aircraft noise exposure expressed in Ke, had been finished and the second phase based on Ke and the first phase of the program based on night-time aircraft noise exposure were running. In co-operation with Rijks Luchtvaart Dienst (RLD) of the Ministry of V&W and Project Geluidsisolatie Schiphol (Project Sound Insulation Schiphol) the sequence of possible locations has been chosen such that the field study at a location took place before the phase of the sound insulation program based on the night-time aircraft noise exposure started. Since all locations within the 40 Ke contour already participated in the first phase of the insulation program (participation usually implies that also the bedroom windows are double-glazed), and since it was on the other hand most desirable to include locations with the highest night-time aircraft noise exposure in the vicinity of Schiphol, also the last category of locations have been included. Possible locations have been visited by an expert in building acoustics to exclude streets with bedroom windows with assumed very high sound insulation;

- *Degree of urbanisation.* Satisfaction with the living environment, health, and noise annoyance of residents are among the factors that are related to the degree of urbanisation. Urbanisation is classified in five categories from 1, very much urbanised, to 5, not urbanised (CBS, 1999). Most residential areas in the municipality 'Haarlemmermeer', in which also Schiphol is situated, and at the north of Schiphol have degree of urbanisation 3, 4 or 5. Therefore urbanisation could only to some extent be taken into account. In table 2 the degree of urbanisation of each location has been included, and information about the size of the location to which the degree of urbanisation is applicable;
- *Type of dwellings.* In association with the degree of urbanisation, most residential areas within or along the 20 and 26 dB(A) contours for the Zwanenburgbaan and the Kaagbaan have houses in a row, detached and 2-under-1-roof houses; high-rise flats and multi-storey buildings are rare. Where possible locations have been selected which include high-rise flats and multi-storey buildings;
- *Size of location.* A location should contain at least about 200 addresses, to be able to recruit sufficient subjects. Only one outdoor noise monitor is used in the process of identification of aircraft noise events. In this process it is crucial that the times at which the aircraft noise event is detected on the out- and indoor noise monitors do not differ substantially. Therefore, locations have been selected with sufficient addresses in an area of 500 to 500 m;
- *Presence of other night-time noise sources.* The selected locations should be a good reflection of the residential areas within and around the 20 dB(A) night contour, also with respect to other night-time environmental noise sources. Main sources are road traffic; exposure to railway traffic does occur to a much lesser extent. Two locations have been selected with some night-time railway noise. With regard to road traffic noise, the results of the GES inventory study have been taken into account (TNO-PG and RIVM, 1998). That study shows that sleep disturbance in the vicinity of Schiphol from road traffic with speed over 50 km/hour occurs much less than sleep disturbance due to road traffic with speed less than 50 km/hour. Therefore some locations have been selected with local through traffic.

2.1.2 Description of locations

A picture of a part of each location is given in report 2001.206. Table 2 gives degree of urbanisation of each location.

2.1.3 Long-term aircraft noise exposure

Data about (night-time) aircraft noise exposure in 1999 and 2000 in the vicinity of Schiphol have been obtained from NLR. The aircraft noise data obtained from NLR are based on *calculations*, in which 'standardised' noise emissions of types of aircraft, actual distribution of types of aircraft and their procedures (landing or take-off), and standardised flight tracks (including models of deviations from the flight track) are used as input. For the present study, RIVM calculated by using the information obtained from NLR, values of (night-time) aircraft noise exposure valid for the location of the outdoor noise monitor at each of the 15 locations. The results are given in table 3. The data for 1999 are the value of K_e in classes of 5 width, and the outdoor equivalent sound level from 23 to 7 hours (in our study indicated by $L_{bu23-07h}$, and usually indicated by outdoor

$L_{Aeq23-07h}$ in dB(A)). The data for 2000 include the value of K_e , and outdoor values of $L_{Aeq23-06h}$, $L_{Aeq23-07h}$, and $L_{Aeq06-07h}$ (in dB(A)). The indoor value of $L_{Aeq23-07h}$ (in our study indicated by $L_{bi23-07h}$) has been obtained by subtracting 21 dB(A) from the outdoor $L_{Aeq23-07h}$. The aircraft noise exposure values for 1999 and 2000 are much the same. Only at two locations the difference between the outdoor value of $L_{Aeq23-07h}$ in 1999 and 2000 is 2 dB(A) or more: at Hillegom (location 40) and Haarlem (location 44) $L_{Aeq23-07h}$ decreased from respectively 34 and 33 dB(A) in 1999 to 31 dB(A) in 2000. Halfweg B (location 38) is the noisiest location in the vicinity of Schiphol, during day-time as well as during night-time. Hillegom and Haarlem are by far the quietest locations, at least if aircraft noise during sleep is considered.

2.1.4 Aircraft noise at locations during the study intervals

Table 4 presents for each measurement night the number of aircraft noise events detected on the outdoor noise monitor in the period from 22 hours in the evening to 9 hours in the morning for the two measurement intervals at a given location separately. In the last row of table 4 the total number of aircraft noise events are given for each measurement interval and in the last column the total number of aircraft during a specific night. In total, the outdoor noise monitor measured over 16 000 events on nights 1 to 11. At location 38 (Halfweg B) the largest number of aircraft noise events have been detected on the outdoor noise monitor, and at location 44 (Haarlem) the fewest. Night 5 (Friday night to Saturday morning) and night 7 (Sunday night to Monday morning) are on average somewhat more busy than other nights. Figures 2 to 16 (chapter 6) present the results per location and per measurement interval.

Table 5 gives information about the number of aircraft noise events measured in the bedrooms of subjects during their *sleep period time*. The table gives the average number of indoor aircraft noise events per night per interval. This average has been obtained by dividing the sum of all aircraft noise events detected on the indoor noise monitors during a sleep period time of each of the subjects by the number of subjects participating during that night. At the last row of the table, the average number of aircraft in bedrooms of subjects during a measurement interval is given. E.g., at interval 382, subjects have on average during 11 sleep period times been exposed to 415 aircraft noise events. The last column gives the result of a summation over 30 intervals of the average number of indoor aircraft noise events during sleep period times of subjects per night. The average values are largest at night 5 (Friday night to Saturday morning) and night 6 (Saturday night to Sunday morning), not only because there is more aircraft during these nights, but also because people sleep up to a later time in the morning. Figures 17 to 32 present the results per location and per measurement interval.

By comparing the corresponding figures and tables about a given location, it is obvious that number of the outdoor aircraft noise events and the number of indoor aircraft noise events show the same pattern. However, only a fraction of aircraft noise events detected on the outdoor noise monitor is registered on the indoor noise monitors. This fraction is given in table 6. The overall fraction is 0.30; at location 31 it is lowest (0.17 and 0.18) and at location 43 highest (0.46 and 0.48). There are several reasons why only a fraction of the outdoor aircraft noise events are registered on the indoor noise monitors, and why it varies from interval to interval, such as:

- The measuring time of the outdoor noise monitor (11 hours) is longer than the sleep period time of subjects (on average 7 hours and 13 minutes);

- The most busy aircraft hours with events on the outdoor noise monitor (from 6 to 9 hours in the morning) are usually partly outside sleep period times of subjects;
- Due to sound insulation, sound levels during an aircraft overflight are not high enough to allow the detection of an aircraft noise event on (some of) the indoor noise monitors, although the event is detected on the outdoor noise monitor;
- Weather conditions. In spring and summer people usually have their windows wider and more often opened than in autumn and winter.

Location 40 and 44 have been selected because of presumed absence of aircraft between 23 and 6 hours. With respect to location 40, 20 of the 271 aircraft noise events detected on the outdoor noise monitor took place between 23 and 6 hours of any of the measuring nights, which implies 0.9 events from 23 to 6 hours per night. It is aircraft passing by (nearly) each night between 5.30 and 6 hours. From the 587 aircraft noise events detected on the indoor noise monitors during sleep of subjects, 132 took place between 23 and 6 hours during 330 nights, which implies on average 0.25 aircraft on the indoor noise monitors between 23 and 6 hours per night. With regard to location 44, nearly half of the 608 aircraft noise events detected on the indoor noise monitors occur between 23 and 6 hours. This results in on average 0.90 aircraft between 23 and 6 hours per subject per night.

The results combined for both locations results in on average 0.57 aircraft between 23 and 6 hours per subject per night on the indoor noise monitors. This is about once in every two nights between 23 and 6 hours.

For each subject the out- and indoor equivalent sound level due to aircraft noise during each of his/her sleep period times (respectively Lo_{spt} and Li_{spt}) have been calculated. The cumulative distributions of all Lo_{spt} values of all subjects at a location are given in table 7 and figure 32 and of all Li_{spt} values in table 8 and figure 33. With respect to the outdoor values, it is obvious that Lo_{spt} at location 38 has the largest values and Lo_{spt} at location 40 and 44 the lowest values. The indoor values show that the cumulative distributions at location 38 and 35 are about the same. Table 9 and figure 34 present the cumulative distributions per location of the differences between Lo_{spt} and Li_{spt} , assessed per subject night. This difference, which may be considered as a measure of the actual sound insulation, is highest at location 33 and lowest at location 37.

2.1.5 Comparison of NLR data and the overall results of aircraft noise measurements

From the eleven Lo_{spt} and Li_{spt} values of each subject the overall outdoor (Lo) and overall indoor equivalent sound level (Li) of a subject over eleven sleep period times have been calculated, taking into account the duration of sleep period times.

$Lbi23-06h$ and $Lbi23-07h$ are location dependent variables: each subject at a given location has the same value of $Lbi23-06h$ and of $Lbi23-07h$, irrespective of the differences in actual aircraft noise exposure during sleep of subjects at the same location.

At a given location, Li varies from subject to subject. Li is a good reflection of the individual aircraft noise exposure during the 11 sleep period times of a subject. Li is, however, only a small sample of night-time aircraft noise exposure of subjects on a long-term basis, such as a year. The question is, therefore, whether Li is representative for the *long-term* individual night-time aircraft

noise exposure of subjects. In TNO report 2002.027 it has been made plausible that for subjects at all locations, with the exception of location 42, L_i can be considered as the long-term individual indoor aircraft noise exposure of subjects. At location 42 night-time aircraft operations over the location were much less frequent than should be expected from the yearly average.

In table 10 the equivalent sound levels on a yearly basis presented by NLR have been compared with the results of median values of L_o and L_i at the various locations. The correlation coefficient between median L_o and the outdoor equivalent sound level over 23 to 7 hours is 0.88. The regression coefficient of the best fitting straight line without a constant is 0.98. This implies that on average the outdoor equivalent sound level during sleep period times of subjects is about equal to outdoor $L_{Aeq23-07h}$ calculated on a yearly basis.

In figure 35 the median value of L_i at a location has been plotted as a function of $L_{bi23-07h}$ (indoor $L_{Aeq23-07h}$). The correlation coefficient is 0.75. The regression coefficient of the best fitting straight line without a constant is 0.92. The correlation coefficient between L_i and indoor $L_{Aeq23-06h}$ is 0.65 and the regression coefficient of the best fitting straight line without a constant is 1.04. It is not surprising that the correlation coefficient of L_i with $L_{Aeq23-07h}$ is higher than with $L_{Aeq23-06h}$, since $L_{Aeq23-07h}$ includes the noisy period from 6 to 7, and most subjects are still asleep during that hour.

In figure 36 L_o of each subject has been plotted as a function of $L_{bu23-07h}$. The correlation coefficient is 0.82. In figure 37 L_i of each subject has been plotted as a function of $L_{bi23-07h}$. The lowest value of L_i ($L_i = 0$ dB(A)) belongs to a subject with the lowest value of $L_{bi23-07h}$, and the highest value of L_i ($L_i = 45$ dB(A)) to a subject with the highest value of $L_{bi23-07h}$. There is, however, a large scatter of the data. This implies that at a given location (with a given value of $L_{bi23-07h}$ which is equal for each subject at that location) the individual aircraft noise exposure during sleep period time varies considerable from subject to subject.

2.2 Subjects and non-respondents

2.2.1 Selection of subjects and non-respondents

At most locations an invitation to participate in the study was sent to about 200 addresses located in a small part of a town or village. Persons or couples interested in participating were requested to respond to a few questions on a small application form. On the basis of this information, subjects and couples have been selected who fulfilled the following requirements: they planned to sleep during each of the study nights in their own bedroom, they did not have to nurse a family member extensively during night-time (this does not include the normal activities of taking care of young children), they did not start using strong sleeping pills recently (within six weeks). Which kind of sleeping pills and which use resulted in rejection of a candidate have been specified in the inception report before the start of the main study. In total about 20 candidates have been rejected because of the use of sleeping pills.

Usually more persons or couples than necessary for the study showed interest in participation. From the persons available, first (usually all) subjects were chosen with ages in the eldest (over 65 years) and youngest (18 – 35 years) age class, to avoid a too small number of subjects in these

two age classes. For the remaining two middle age classes (35 to 65 years) participants and couples were selected to obtain about an equal number and sufficient of participants in each of the two intervals, and further to obtain an equal number of male and female subjects. If there was still a choice, subjects were then selected in the order they returned their application form. A few persons were excluded because their application form was hardly filled out. The TNO field workers visited the candidates a week before the presumed participation interval started. After the intake-visit, candidates had the opportunity to decide whether they were willing to participate or not. A few persons abstained from participating due to practical problems or because they considered the tasks in the study too difficult to be performed by them. After the intake-visit, TNO did not actively exclude any person from participating. If the TNO field workers doubted whether the candidate was able to perform the required tasks in a proper way, either the person him/herself decided not to take part in the study or the subject was instructed again in detail at the start of the participation at the time the equipment was delivered.

The number of subjects at each location is given in table 1 of part 3 of this report. At location 39 (Krommenie), in first instance only 16 persons showed interest to participate in the study. Therefore another mailing was sent to other addresses, which resulted in a total of 24 subjects.

Each subject completed the study. Only in rare unexpected cases, subjects spent one or two nights not at home.

After the start of the second study interval at a location, a request to fill out a non-response questionnaire (included in the mailing) was sent to a part of the addresses that received the original invitation. The number of addresses at a location was equal to 1.6 times the number of subjects at that location. Assuming a response of about 60%, this would result in about equal numbers of subjects and non-respondents. Addresses were selected at random from addresses to which the first mailing was sent. (Keeping in mind the difficulty in obtaining a sufficient number of subjects at Krommenie, 60 addresses (2.5 times the number of subjects) were selected at that location).

The response turned out to be somewhat over 60%.

The questions in the non-response questionnaire are a selection of the questions in the questionnaire filled out by the subjects. Although it would have been advantageous to have the full subject questionnaire filled out by non-respondents as well, we assumed that the percentage of returned questionnaires would have been much less if this very extensive questionnaire had had to be filled out by non-respondents. All returned non-response questionnaires have been used in the analysis of the data. Therefore, no selection was made with respect to non-respondents.

2.2.2 Subject and non-response questionnaires

The subject questionnaire consists of four parts:

- 1. General;
- 2. Health and sleep;
- 3. Noise sensitivity;
- 4. Statements.

‘Noise sensitivity’ is measured by the Weinstein list. The inquiry ‘Statements’ is a shortened version of the ‘Utrechtse Coping List’.

The non-response questionnaire consists of two parts: 'general' and 'health and sleep' and some questions about the reasons for not having participated as subject in the study.

3 Discussion of results obtained with questionnaires

In report 2001.206 the results of the questionnaires filled out by subjects and by non-respondents are presented in detail. In this chapter only some specific aspects are discussed. Nearly all subject data have been presented with subjects divided by the location at which they live (see report 2001.206). Section 3.1 considers differences in subject data by location. The most prominent data of non-respondents have also been presented by location in report 2001.206. Section 3.2 shortly reviews these data. Section 3.3 discusses differences between subjects and non-respondents.

3.1 Subjects by location

With respect to night-time aircraft noise exposure, based on $L_{bu23-07h}$ ($L_{Aeq23-07h}$ on a yearly basis) for 2000, (see also figure 1) the locations can be classified as follows:

- highest night-time aircraft noise exposure: location 38;
- higher night-time aircraft noise exposure: locations 33, 34, 35, 36, and 45;
- lower night-time aircraft noise exposure: locations 31, 32, 37, 39, 41, 42, and 43;
- low night-time aircraft noise exposure: reference locations 40 and 44.

With regard to specific questions about aircraft noise and night-time aircraft noise, it is reasonable to expect that responses of subjects at location 38 are more negative, and responses of subjects at locations 40 and 44 are more positive than responses of all subjects. The following results support these assumptions:

- *annoyance due to daily noises (at home, at work)*: 20% of all subjects are not annoyed at all and at location 38 8% of the subjects;
- *satisfaction with the insulation of the house against outdoor noises*: subjects at location 40, and to a lesser extent also at locations 42 and 43, are more satisfied with the sound insulation against outdoor noises and subjects at locations 38 and 36 are less satisfied;
- *not opening windows because of the presence of aircraft noise*: 12% of all subjects refrain often or very often from opening windows because of the presence of aircraft noise. At location 38 this percentage (36%) is highest, and at locations 40, 42, and 43 (0%), and locations 41 and 44 (3%) lowest;
- *perception of and annoyance due to aircraft noise*: subjects at locations 40, 43 and 44 are less and subjects at locations 38 and 34 are more annoyed by aircraft noise than all subjects;
- *perception of aircraft noise at night*: at locations 35, 38, 41, and 45 aircraft noise is perceived every night by about 80% of the subjects, and at locations 40 and 44 by 18 and 30% and at all locations by 57%. All subjects at location 38 perceive night-time aircraft noise at least once a week;
- *awakening by night-time aircraft noise*: at locations 40 and 44 4% and 10% and at location 38 54% of the subjects wake up by aircraft noise (nearly) each night or at least once a week;
- *annoyance due to aircraft noise at night*: cumulative distributions of annoyance score show less annoyance due to aircraft noise at night at locations 40, 43 and 44 and more annoyance at location 38;

- *characterisation of living environment*: at the locations 34, 36, and 38 (nearly) all subjects identify their living situation by 'living under a flight path'; for all subjects this percentage is 28 and for locations 40 and 44 these percentages are 7 and 37% . The cumulative distributions of the degree subjects are worried about 'living under a flight path' show that subjects at location 40 and 44 are the least worried and subjects at location 38 are more worried than subjects at other locations. Subjects are hardly worried about 'living alongside a busy road'. With respect to 'living in the vicinity of a large airport', subjects at locations 34, 39, 40, and 43 are less worried than subjects at the other locations;
- *having fear or not when aircraft noise is perceived*: 60% of the subjects do (occasionally or frequently) experience fear when aircraft noise is perceived. Subjects at locations 31, 36, 38 and 39 score highest with over 70% of the subjects having some times fear when aircraft noise is perceived, and subjects at locations 40 and 44 lowest with about 34% of the subjects having sometimes fear when aircraft noise is perceived;
- *satisfaction about aircraft noise perceived in and outside the house*: at location 32, 40, 43 and 44 subjects are more satisfied and at locations 34 and 38 less satisfied than all subjects;
- *frequency of adverse effects of night-time aircraft noise on various aspects of sleep*: subjects at locations 40 and 44 show less frequent adverse effects than subjects at other locations. Subjects at location 38 score about average, although the number of subjects without any effect (score = 0) is lower than at any other location;
- *being worried that aircraft noise may impair health*: at location 40, 43 and 44 subjects are less worried and at locations 33 and 38 more worried compared to all subjects together.

For questions about noise other than aircraft noise, subjects at locations 38, 40 and 44 respond in about the same way as all subjects. E.g., the cumulative distributions at these locations for perception of, awakening and annoyance by night-time road traffic, industrial, and construction noise are not much different from these distributions at other locations. For questions about general aspects of sleep, subjects at locations 38, 40, and 44 also score about average. This holds, e.g., for sleep quality and general sleep problems.

The results also show outcomes that seem peculiar at first glance. E.g., 2% of the subjects, but none of the subjects at location 38, use personal hearing protection on a regular basis during night. In contrast, 10% of the subjects at location 44 use personal hearing protection frequently. The results of the diaries will show that in most cases personal hearing protection is used by subjects with a snoring partner.

A special position is hold by subjects at location 39. With regard to citizenship, of all subjects 10% is not married or does not live with a partner, and at location 39 42% of the subjects is single. Nearly three quarter of all subjects live in a house in a row, and at location 39 more than 80% of the subjects live in an apartment, situated in high blocks. One third of the houses is owned, and at location 39 the majority of houses is rented. Of all subjects, less than 10% characterise their living situation with 'living alongside a busy road', and at location 39 25% of the subjects is of this opinion. Also, opinions about effects of aircraft noise of subjects at location 39 are usually more negative than at other locations. Subjects at location 39 are more frequently afraid when they perceive aircraft noise. They also score more in a negative way with respect to

health and sleep, although the distribution of age at that location is about the same as the distribution for all subjects. Of all subjects 85% consider their health excellent or good, 9% fairly good and the remaining 5% have more negative feelings about their health. At location 39 this last percentage is 21%. With respect to the questions about health complaints, in the so-called voeg-list subjects at location 39 turn out to have more complaints than subjects do at any other location. At location 39 the frequent use of personal hearing protection at night is highest. With regard to the use of medicines, about 13% of all subjects use four or more types of medicines (prescribed or bought at the drugstore; this last category of medicines include aspirins and vitamins). At location 39 this percentage is 25.

Also subjects at location 43 show specific results. Of all subjects 10% is over 65 years; at location 43 this percentage is 37. 66% of all subjects have a job or are studying; at location 43 this percentage is 20. About two third of all subjects undertook action against the expansion of Schiphol or aircraft noise. At location 43 only one person (3%) undertook any action. No one at location 43 has a job related to Schiphol, in contrast to all subjects where 9% have a job related to Schiphol. Subjects at location 43 (and locations 40 and 44) are less annoyed by aircraft noise than subjects at other locations and they perceive less and are less annoyed by noise from road traffic, industry and construction and other noises (e.g. from neighbouring houses). With respect to living in the vicinity of a large airport, subjects at location 43 are less worried about this situation than subjects in the same night-time aircraft noise category. At location 43 (and locations 40, 44 and 32) subjects are more satisfied about the perception of aircraft noise around their house than subjects at other locations. In contrast to these observations is the result of the question about being worried that aircraft noise may impair their health. Subjects at location 43 turn out to be more worried than subjects at other locations.

3.2 Non-respondents by location

Reasons used most frequently by non-respondents why they did not participate as subject in the study are: 'aircraft noise does not burden me' (26%), 'I did not have time' (18%), 'I considered being a subject too burdening' (16%). Nearly 12% of the non-respondents stated that they did not receive an invitation, although the address to which the non-response questionnaire was sent was selected at random from the addresses where the initial invitations had been sent to some weeks earlier. Most probably, the invitation to participate as subject has not been circulated among family members.

With regard to questions about aircraft noise and night-time aircraft noise non-respondents at location 38 show the same trend in responses as subjects at that location. The same is applicable for non-respondents and subjects at locations 40 and 44. Compared to all non-respondents, the following observations are apparent:

- non-respondents at location 38 are more and non-respondents at locations 40 and 44 are less annoyed by aircraft noise than the average non-respondent;
- a larger percentage of non-respondents at location 38 perceives aircraft noise every night and a smaller percentage of non-respondents at location 40 and 44;

- at location 38 more and at location 40 and 44 less non-respondents wake up by aircraft noise (nearly) each night or at least once a week;
- cumulative distributions of annoyance score show less annoyance due to aircraft noise at night by subjects at locations 40 and 44 and more annoyance at location 38;
- non-respondents at location 38 score high with respect to fear when aircraft noise is perceived;
- satisfaction about aircraft noise perceived in and outside the house: at location 40 and 44 non-respondents are somewhat more satisfied and at location 38 less satisfied;
- being worried that aircraft noise may impair health: at location 40 and 44 non-respondents are less worried and at location 38 more worried;
- non-respondents at locations 40 and 44 show less and non-respondents at location 38 show more frequent adverse effects of night-time aircraft noise on sleep.

Non-respondents at that location do not reproduce most of the specific outcomes of subjects at location 39. Non-respondents have about the same results as all non-respondents with regard to citizenship, characterisation of their living situation with 'living alongside a busy road', fear when they perceive aircraft noise, experienced health, and number of health complaints.

Also, the specific outcomes of subjects at location 43 are not reproduced. Non-respondents at that location have compared to all non-respondents about the same age distribution, have undertaken the same number of actions against the expansion of Schiphol or aircraft noise, are about equally annoyed by aircraft noise. With respect to living in the vicinity of a large airport, non-respondents at location 43 are only somewhat less worried about this situation than non-respondents in the same night-time aircraft noise category. Finally, non-respondents at location 43 are less worried that aircraft noise may impair their health.

3.3 Comparison of subjects and non-respondents

One of the aims of the study is to provide information on basis of which the prevalence of adverse effects of night-time aircraft noise exposure on the population in the vicinity of Schiphol can be estimated. The non-response study has been undertaken to estimate a possible selection bias of subjects by first establishing differences in the distribution of variables in the population of subjects and in the population of non-respondents, and then assessing the consequences of the observed differences on exposure-effect relationships.

In TNO report 2002.027 21 variables have been identified for which the distribution among subjects and the distribution among non-respondents is statistically significant different (for more information see chapter 5 and Appendix F of TNO report 2002.027). These variables are given in table 11. One of these variables is age: subjects are younger than non-respondents. When estimating the prevalence of adverse effects in the study population in the vicinity of Schiphol, age distribution of that population is known. Therefore, with respect to these estimates, differences between subjects and non-respondents are irrelevant. Differences in age distribution of subjects and non-respondents are able to explain differences between subjects and non-respondents in 10 of the other 20 variables (see middle column of table 11). Since the recent start of using sleeping pills was used in the selection of subjects, and no selection has been applied to non-respondents,

the selection procedure is able to explain all of part of the differences between subjects and non-respondents. Therefore, there are nine variables (apart from age) with distributions that are different between subject and non-respondents, if age is taken into account.

In the last column of the table, the direction of the differences between subjects and non-respondents is given. Four of the variables, with distributions that are different between subject and non-respondents, are related to or can be explained by the factor circumstances. These are citizenship, composition of household, type of dwelling, job (own or inmates') related to Schiphol. Possibly, people in the higher age range, people that are single, and people that have a one-person household can make more easily time available to fill out a non-response questionnaire, while they do not want to participate in the study. Also, older people do have fewer relatives at home, which decreases the possibility of having inmates with jobs related to Schiphol.

The other five variables, with distributions that are different between subject and non-respondents, are related to attitudinal aspects. In four cases subjects evaluate their situation more positive than non-respondents (indicated by (+) in the last column), and once less positive (indicated by (-) in the last column). It concerns two variables (satisfaction with insulation against outdoor noises and satisfaction with insulation against neighbouring noises) that may have an association with adverse effects of aircraft noise and three variables that are related to aircraft noise (recognition living under a flight path, worried about health impact from aircraft noise, aircraft noise consequences of sleep). In two cases subjects evaluate their situation more positive than non-respondents, and once less positive. In TNO report 2002.027 exposure-effect relationships with these three variables as effect variables and night-time aircraft noise as exposure variable are given. Those exposure-effect relationships show only minor differences between subjects and non-respondents. Therefore, only small and unimportant differences exist between subjects and non-respondents, if age distribution is taken into account.

4 Evening and morning diaries

Subjects filled out 11 times a morning and an evening diary. This implies a total of 4598 morning and evening diaries. Due to some loss of data somewhat more than 4500 morning and evening diaries could be used for analysis. Chapter 8 contains the English version of the evening and morning diary. Results, obtained after data manipulation, are listed below.

- During 76% of the subject days and evenings subjects did not take any naps, during 15% of subjects days and evenings the total duration of naps was at most 30 minutes, and during 10 (0.2%) subject day and evenings the total duration was more than 90 minutes, with a maximum of 180 minutes;
- Three subjects smoked a pipe during in total 6 evenings. Eleven subjects smoked in total 66 cigars. The total number of times subjects smoked in the evening has been assessed by the following equation: total number = number cigarettes + 0.5*number of self-made cigarettes + 2*number of cigars + 0.5*number of pipes. The result is given in table 12. During nearly 80% of the subject evenings subjects did not smoke, during 5% of the evenings number of times smoked was at most 6, during 1% of the evenings at most 1%, and two subject nights the number of times smoked was 20 and 21 times;
- Subjects responded 515 times that something pleasant occurred to them during day or evening and 269 times that something unpleasant occurred to them,
- The responses to the questions about number of alcoholic drinks per evening, and number of cups of coffee per evening are given in table 13 and 14. They concern numbers per subject averaged over 11 evenings;
- Subjects have been questioned about activities during the evening, with more than one answer possible. The activities have been classified as follows:
 1. Listening to TV, radio, music, reading;
 2. Playing music, games;
 3. Working at home, studying, internetten;
 4. Meeting, working (outdoors);
 5. Going to the cinema, theatre;
 6. Doing sports;
 7. Being on the razzle(-dazzle), going to a pub;
 8. Walking the dog, going for a walk;
 9. Receiving guests, going for a visit;
 10. Shopping;
 11. Performing a hobby, handicraft, needlework, playing cards;
 12. House keeping, taking care of children, activities in and around the house;
 13. Other activities (like going to a funeral, hospital or performing other far reaching obligations).

Combinations of activities during the evening have been labelled by a value equal to 100 times the first activity plus the second activity. E.g. label 100 implies watching television, listening to the radio, reading (1) and no other activities. Label 108 implies watching television, listening to the radio, reading, (1) and walking the dog (8). The total number of nights sub-

jects watched tv, listened to the radio, or were reading, is therefore equal to the number of subject nights starting with 1 of 100 plus the number of subject nights ending with 01. This total is $3147+6+44+13+13+5+9+35+1+5 = 3278$. The result is given in table 15. In total 68% of the evening's subjects watched TV, listened to the radio, or was reading and 8% of the evenings they received guests or went out for a visit;

- Responses to questions about day- and evening-time noise annoyance are given in table 16. Subjects are during 89% of the days not at all annoyed by day-time noise and during 94% of the evenings not at all annoyed by evening-time noise;
- Table 17 shows that during 95.6% of the 24 hours medication (with exception of medication specifically used for sleep) has not been used, 3.4% of the 24 hours subjects used pain releasers, such as aspirin, and for 1% of subject day and evenings other medication has been used. This medication may induce sleepiness or cause deep(er) sleep. Whether medication has such capacities has been judged by a physician/epidemiologist of TNO-PG. The result is given in the right-hand columns. The capacity to induce sleepiness or deep(er) sleep has been given in three classes. In total during 6 24 hours medication more or less effective to induce sleepiness has been used;
- The use of sleeping pills is given in table 18. In total 57 nights subjects used sleeping pills more or less effective to induce sleepiness or deep(er) sleep. The effectiveness with respect to sleep-induction of medication and sleeping pills when used in combination, has been taken as the highest value of the effectiveness classes. In total, 60 times the use of medication or sleeping pills effective to induce sleepiness or deep(er) sleep have been reported in the diaries. In those cases where subjects did state in the questionnaire to use drugs and/or sleeping pills every day or night, and consequently were not supposed to confirm this each time in the diaries, it is assumed that the specified medication and/or sleeping pills have been used. The combined result from questionnaire and diaries is given in table 19. In total 23 subjects used sleeping pills and medication with sleep inducing capacities over in total 180 nights, which implies for those 23 subjects on average 7.8 nights per subject;
- In the morning diary subjects listed, where appropriate, the reasons why they had difficulty to fall asleep the night before. The result is given in table 20. During 3.3% of the subject nights the response was because of noises from outdoors. If that response was given, subjects have been requested to indicate what noises kept them from falling asleep. Twelve times subjects responded with aircraft noise;
- During 248 subject nights personal hearing protection was used, with during 34 nights the whole night. In 81% of these nights, the subject has a snoring partner;
- The mean number of awakenings reported in the morning diary (remembered awakenings) during sleep is 1.6 times a night, and the median value 1.0 times a night;
- The mean number of marker pressings during sleep is 1.3 times a night;
- Reasons for awakening for the first time during sleep is given in table 21. During 92 nights subjects have been awakened for the first time by aircraft noise. If also the second and later times are included, the total number of times subjects state to have been awakened by aircraft noise is 159, during 151 nights;
- In table 22 the ways of awakening in the morning are given. Subjects have been awakened by aircraft noise 21 times out of all nights;
- Table 23 gives the reasons why people get out of bed;

- Table 24 gives the position of the bedroom window before going to sleep. In conclusion: 75% of the nights the windows are to some extent opened. Change of position of the bedroom window during the night occurred in 121 nights. Reasons usually are related to climate (hot in bedroom, windy outside, too cold). In 22 cases noise from outside is mentioned as the main reason: in 13 cases aircraft noise, in two cases road traffic noise and the rest of the cases noise in general, without giving details. Nine out of the 13 cases concern locations 38 and 35.

5 Tables

Table 1: *Name and label of each location, number of subjects, number of persons who filled out a non-response questionnaire (non-respondents), and a measure of indoor night-time aircraft noise exposure (indoor aircraft noise equivalent sound level, Lbi23-07h) on a yearly basis. The outdoor aircraft noise equivalent sound level Lbu23-07h is 21 dB(A) higher than Lbi23-07h.*

location	label of location	number of subjects	number of non-respondents	Lbi23-07h in 2000 (in dB(A))
Nieuw-Vennep	31	28	28	26
Rijzenhout	32	27	35	23
Zwanenburg	33	27	35	27
Assendelft	34	26	27	27
Halfweg A	35	27	24	28
Kaag/Buitenkaag	36	26	26	27
Leimuiden	37	27	29	22
Halfweg B	38	28	28	31
Krommenie	39	24	40	26
Hillegom ****	40	28	31	10
Hoofddorp	41	30	29	19
Spaarndam	42	30	31	24
Warmond	43	30	36	26
Haarlem ****	44	30	26	10
Abbenes	45	30	26	29
Total		418	451	

**** locations assumed to be without night-time (23 – 6 hours) aircraft noise exposure

Table 2: Name and label of each location, number of inhabitants in a quarter or village and degree of urbanisation, classified by CBS (CBS, 1999).

location	label of location	number of persons in quarter or village	degree of urbanisation *
Nieuw-Vennep	31	810	3
Rijsenhout	32	1610	5
Zwanenburg	33	870	4
Assendelft	34	1430	4
Halfweg A	35	2280	4
Kaag/Buitenkaag	36	800	5
Leimuiden	37	1590	5
Halfweg B	38	2280	4
Krommenie	39	7830	1
Hillegom	40	7960	3
Hoofddorp	41	3130	2
Spaarndam	42	4710	3
Warmond	43	2085	4
Haarlem	44	8360	2
Abbenes	45	990	5

* degree of urbanisation

1	very much urbanised. > 2500 addresses per square km;
2	very urbanised. 1500 - 2500 addresses per square km;
3	urbanised. 1000 - 1500 addresses per square km;
4	less urbanised. 500 – 1000 addresses per square km;
5	not urbanised. < 500 addresses per square km.

Table 3: Name and label of each location, and data calculated by NLR about long-term aircraft noise in the years 1999 and 2000.

location	label	Ke in 1999 (in classes of 5 Ke)	L _{Aeq23-07h} outdoor in dB(A) in 1999	Ke in 2000	L _{Aeq23-06h} outdoor in dB(A) in 2000	L _{Aeq23-07h} outdoor in dB(A) in 2000	L _{Aeq06-07h} outdoor in dB(A) in 2000	L _{Aeq23-07h} indoor in dB(A) in 2000
Nieuw-Vennep	31	25-30	46	23	55	47	52	26
Rijsenhout	32	20-25	43	27	52	44	48	23
Zwanenburg	33	30-35	48	36	56	48	54	27
Assendelft	34	25-30	47	33	54	48	55	27
Halfweg A	35	30-35	48	33	55	49	56	28
Kaag/Buitenkaag	36	25-30	47	29	56	48	54	27
Leimuiden	37	<20	42	18	50	43	48	22
Halfweg B	38	40-45	51	48	62	52	59	31
Krommenie	39	25-30	47	26	55	47	53	26
Hillegom ****	40	<20	34	4	39	31	37	10
Hoofddorp	41	20-25	40	22	50	40	45	19
Spaarndam	42	20-25	44	24	53	45	48	24
Warmond	43	20-25	47	19	54	47	52	26
Haarlem ****	44	<20	33	8	39	31	37	10
Abbenes	45	30-35	49	34	58	50	55	29

**** locations assumed to be without night-time (23 – 6 hours) aircraft noise exposure

Table 4: Number of aircraft noise events on the outdoor noise monitor per night from 22 hours in the evening to 9 hours in the morning during a measurement interval at a given location.

	interval															
night	311	312	321	322	331	332	341	342	351	352	361	362	371	372	381	382
1	78	70	77	66	57	76	95	20	71	68	73	21	65	15	58	89
2	34	63	75	74	9	64	22	18	90	88	32	90	73	69	111	89
3	71	68	72	66	106	111	19	18	117	78	23	56	87	11	98	105
4	53	71	24	71	107	90	19	19	101	65	22	16	72	12	89	97
5	67	60	51	75	106	105	31	71	50	84	64	107	82	73	86	91
6	52	59	16	70	95	97	17	76	102	48	70	53	23	78	97	87
7	55	56	86	4	103	114	76	56	91	43	120	71	11	68	97	104
8	49	61	48	72	110	107	48	86	114	45	19	28	16	13	109	127
9	63	74	20	66	28	101	23	23	71	49	26	26	7	15	63	106
10	51	84	71	102	58	92	36	24	83	81	21	84	5	73	134	90
11	28	56	48	73	101	14	63	18	112	87	24	113	16	76	88	128
total	601	722	588	739	880	971	449	429	1002	736	494	665	457	503	1030	1113

	interval															
night	391	392	401	402	411	412	421	422	431	432	441	442	451	452		all
1	74	81	6	12		35	5	4	21	22	12	13	26	97		1407
2	29	60	10	16	60	62	2	7	50	22	8	13	25	67		1432
3	25	61	17	11	63	70	2	7	69	23	5	11	56	30		1556
4	91	55	5	13	79	70	7	8	56	22	15	11	66	55		1481
5	92	62	16	17	73	66	4	21	50	19	6	7	101	26		1763
6	30	33	2	4	66	57	14	5	57	21	1	4	68	28		1430
7	37	118	15	5	6	71	4	7	69	71	6	6	42	86		1698
8	61	103	10	17	15	16	3	19	62	37	9	5	67	29		1505
9	86	85	22	20	68	65	3	22	42	40	6	4	91	36		1351
10	19	31	18	22	65	25	5	15	49	46	9	12	88	40		1533
11	97	60	12	1	65	71	4	16	67	40	5	8	71	27		1589
total	641	749	133	138	560	608	53	131	592	363	82	94	701	521		16745

Table 5: Average numbers of aircraft noise events during sleep of subjects per night on the indoor noise monitor at a measurement interval at a given location.

	interval															
night	311	312	321	322	331	332	341	342	351	352	361	362	371	372	381	382
1	9.7	6.4	10.2	6.2	5.1	7.8	21.2	5.3	7.9	7.5	27.1	5.6	6.8	2.2	7.2	18.3
2	7.5	5.2	8.9	8.6	1.7	13.5	3.7	3.0	26.5	12.2	7.3	38.4	9.8	6.7	16.9	21.9
3	9.6	6.0	8.4	13.3	25.8	23.2	1.9	4.5	36.1	12.1	4.9	22.0	23.0	1.7	13.8	47.4
4	9.4	12.7	8.5	14.2	30.0	13.3	3.3	3.5	34.3	37.3	3.9	5.0	13.9	2.2	15.3	31.6
5	14.6	16.8	9.7	19.8	45.7	29.5	12.3	34.3	18.5	18.3	45.5	49.2	32.9	30.6	35.3	25.3
6	19.7	24.1	7.3	23.1	42.1	36.1	6.2	53.2	65.1	7.7	39.2	20.6	14.9	46.3	47.2	36.9
7	6.7	6.3	16.2	5.4	28.5	28.4	22.2	9.8	39.6	6.9	52.1	43.0	2.2	11.5	13.7	46.9
8	9.9	9.7	9.2	5.4	33.7	24.2	7.0	24.0	36.0	5.2	4.9	5.2	2.0	5.4	32.8	62.9
9	6.2	21.5	4.8	11.3	3.8	21.9	2.6	4.5	11.1	5.9	5.8	5.1	2.2	2.8	21.1	44.5
10	4.6	17.7	9.8	19.2	7.8	20.4	4.0	3.2	25.5	16.3	2.1	25.5	1.2	16.1	56.9	22.6
11	5.0	7.1	16.7	13.1	29.9	1.0	11.2	2.3	46.4	29.2	3.5	39.5	2.8	15.6	8.3	56.9
total	103	133	110	140	254	219	96	147	347	159	196	259	112	141	269	415

	interval															
night	391	392	401	402	411	412	421	422	431	432	441	442	451	452	all	
1	32.0	26.0	2.0	1.7	13.6	8.3	1.7	1.7	3.3	3.4	1.0	3.5	6.2	29.5	288	
2	11.2	28.4	1.6	2.0	5.1	9.3	0.0	3.1	23.7	4.2	2.0	2.8	7.1	2.8	295	
3	13.4	24.4	3.0	1.4	3.5	12.6	1.0	1.7	34.9	6.2	1.4	2.4	31.4	7.4	398	
4	34.5	22.1	3.0	3.5	7.3	16.1	1.6	2.5	24.6	6.4	1.6	3.1	28.8	25.8	419	
5	47.8	33.2	6.2	4.9	23.9	26.1	1.5	6.9	28.6	6.4	1.8	1.8	61.6	6.3	695	
6	12.9	20.4	1.4	2.5	26.6	25.9	4.1	1.4	31.3	9.6	1.0	1.4	41.1	8.9	678	
7	13.2	54.2	2.4	2.7	1.5	18.0	1.3	2.0	32.1	34.3	2.1	2.0	16.3	33.8	555	
8	11.0	39.7	2.0	1.6	2.7	6.4	1.7	4.1	26.6	21.6	1.7	2.0	30.1	3.0	432	
9	30.2	43.5	3.3	2.9	7.7	10.6	1.0	6.3	23.7	22.3	1.0	1.0	35.6	3.3	368	
10	5.7	14.7	2.0	3.0	4.5	8.6	1.5	1.8	28.9	26.3	1.9	2.6	29.1	4.8	389	
11	34.3	17.8	2.7	0.0	6.1	17.7	2.0	6.3	24.8	25.0	1.5	1.9	35.3	4.1	468	
total	246	324	30	26	103	160	17	38	283	166	17	24	323	130	4985	

Table 6: Fraction of numbers of aircraft noise events during sleep of subjects on the indoor noise monitors and on the outdoor noise monitor between 22 and 9 hours at a measurement interval at a given location.

at a given location																
	interval															
	311	312	321	322	331	332	341	342	351	352	361	362	371	372	381	382
fraction	0.17	0.18	0.19	0.19	0.29	0.23	0.21	0.34	0.35	0.22	0.40	0.39	0.24	0.28	0.26	0.37
	interval															
	391	392	401	402	411	412	421	422	431	432	441	442	451	452		all
fraction	0.38	0.43	0.22	0.19	0.18	0.26	0.32	0.29	0.48	0.46	0.21	0.26	0.46	0.25		0.30

Table 7: Cumulative distribution of outdoor equivalent sound levels due to aircraft noise during sleep of subjects (Loaspt in dB(A)).

%	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	all
10	37.8	41.3	44.5	42.9	43.2	47.3	40.9	49.9	44.9	24.9	42.4	28.2	45.7	25.3	46.6	30.4
20	39.2	42.2	45.8	44.2	44.5	47.5	41.5	52.3	45.4	26.6	43.3	29.6	46.2	28.9	47.9	38.9
30	40.9	42.9	46.9	45.0	45.7	47.5	41.7	52.9	46.0	27.1	43.8	30.1	46.5	29.5	48.5	42.2
40	41.1	43.2	47.3	45.3	47.1	47.9	42.1	53.6	47.0	29.2	44.4	30.7	46.7	30.0	49.2	44.1
50	41.9	44.4	47.5	46.1	49.7	48.2	42.4	54.2	47.6	30.1	44.6	34.3	47.3	30.4	49.7	45.3
60	43.3	44.7	48.4	46.8	51.2	48.5	42.8	55.0	48.0	30.6	45.1	38.9	47.7	30.5	51.3	46.8
70	44.3	45.3	48.5	47.4	51.8	49.3	43.3	56.1	48.4	31.0	45.2	39.6	47.8	30.8	51.5	47.8
80	44.5	46.8	48.7	47.9	52.7	49.6	43.6	56.9	49.3	31.7	45.5	40.4	48.0	31.1	52.0	48.9
90	45.3	48.2	49.0	48.4	53.3	49.7	44.0	57.4	49.9	32.2	46.0	41.3	48.3	32.4	52.6	51.5

Table 8: Cumulative distribution of indoor equivalent sound levels due to aircraft noise during sleep subjects (*Liaspt* in dB(A)).

%	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	all
10	11.2	13.0	15.8	17.2	20.7	23.4	19.3	23.7	18.7	3.2	21.2	5.8	19.4	3.7	20.4	10.8
20	14.4	17.0	16.7	21.0	23.7	23.7	21.6	24.5	19.7	4.2	22.8	7.1	20.2	7.1	22.5	15.1
30	15.5	18.2	18.4	21.8	24.9	24.7	23.8	26.4	21.7	4.6	25.0	9.3	20.9	8.1	23.3	18.7
40	18.7	20.3	18.6	22.4	28.1	25.5	24.9	28.4	23.6	9.4	25.6	12.1	21.9	8.8	24.7	21.1
50	19.6	22.2	20.1	23.7	29.2	26.4	25.7	29.9	27.0	11.4	26.0	12.4	23.5	9.4	25.4	23.1
60	19.7	22.5	21.7	25.2	31.0	27.7	26.4	30.9	28.6	12.2	28.0	13.8	25.8	14.1	26.3	24.7
70	20.5	24.0	23.4	25.5	32.7	29.9	27.1	32.1	29.7	13.2	29.8	15.5	28.2	14.5	27.1	26.4
80	22.6	24.3	25.9	27.2	33.5	30.8	28.7	37.1	31.9	14.3	30.8	17.4	32.0	16.0	28.7	28.9
90	24.3	26.1	34.2	31.4	35.2	31.4	30.5	41.1	33.6	16.4	31.9	23.8	32.7	19.1	34.5	31.9

Table 9: Cumulative distribution of the difference between outdoor and indoor equivalent sound level due to aircraft noise during sleep of subjects (*Loaspt* – *Liaspt* in dB(A)).

	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	all
10	19.7	19.4	12.4	15.6	16.7	13.7	13.0	12.5	14.4	14.8	13.5	16.6	14.7	9.9	17.7	15.2
20	20.8	20.5	21.9	17.5	17.1	17.3	13.9	17.1	16.6	16.3	15.2	17.8	16.2	15.8	23.0	17.1
30	22.4	21.4	24.9	19.0	18.0	18.3	14.9	21.4	18.1	17.1	16.0	18.3	18.9	16.6	23.7	18.3
40	23.3	22.5	25.8	19.6	18.5	19.8	15.2	22.0	19.0	17.8	17.0	20.1	21.0	17.6	23.8	20.0
50	23.9	22.9	26.6	20.9	19.7	21.6	15.9	25.7	20.8	19.6	17.5	22.4	24.1	20.5	24.1	21.8
60	24.7	24.5	28.4	24.7	20.5	22.4	17.2	26.0	23.8	20.3	18.8	23.0	24.7	21.4	24.5	22.9
70	25.5	25.3	28.7	25.2	21.3	23.0	18.2	27.6	24.8	20.9	19.5	24.0	25.8	22.0	25.2	24.2
80	25.9	25.6	29.6	26.0	23.3	24.2	22.0	29.7	26.2	22.4	21.0	24.7	27.1	22.1	27.8	25.5
90	26.9	26.8	31.2	30.0	25.8	25.0	22.8	33.0	26.9	23.5	22.7	26.0	27.3	22.5	28.9	27.3

Table 10: Information about long-term night-time aircraft noise exposure obtained from NLR and obtained by in- and outdoor noise measurements during 22 nights at each location.

location	label	Lo in dB(A)	L _{Aeq23-07h} out- doors in dB(A) in 2000 NLR	Li in dB(A)	L _{Aeq23-06h} indoors in dB(A) in 2000 NLR	L _{bi23-07h} in dB(A) in 2000
Nieuw-Vennep	31	42	47	20	23	26
Rijsenhout	32	44	44	22	22	23
Zwanenburg	33	48	48	20	26	27
Assendelft	34	46	48	24	24	27
Halfweg A	35	50	49	29	23	28
Kaag/Buitenkaag	36	48	48	26	24	27
Leimuiden	37	42	43	26	19	22
Halfweg B	38	54	52	30	26	31
Krommenie	39	48	47	27	22	26
Hillegom ****	40	30	31	11	6	10
Hoofddorp	41	45	40	26	18	19
Spaarndam	42	34	45	12	23	24
Warmond	43	47	47	24	20	26
Haarlem ****	44	30	31	9	8	10
Abbenes	45	50	50	25	26	29

**** locations assumed to be without night-time (23 – 6 hours) aircraft noise exposure

Table 11: Variables with a statistical significant difference in distribution among subjects and non-respondents and whether the difference can be explained by differences in age composition of subjects and non-respondents.

label	variable	difference explained by age	Direction of the difference between subjects and non-respondents. Subjects are/have/show
a2	age		Younger
a3	citizenship	-	Lower percentage single
a4	composition of household	-	Less one-person-households
a5	number of children	+	More children at home
b1	number of years in living environment	+	Living shorter in present environment
b3	type of dwelling	-	Living less in apartments
b8	satisfaction with insulation against outdoor noises	-	More satisfied (+)
b9	satisfaction with insulation against neighbouring noises	-	More satisfied (+)
d1a	night-time perception road traffic noise	+	Higher percentage
d2b	awakening by aircraft noise	+	Less awakened
d3a	annoyance night-time road traffic noise	+	More annoyed
e1_3n	recognition 'living under a flight path'	-	Higher percentage agrees (-)
e1_6n	recognition 'living at a busy street'	+	Higher percentage agrees
e_6	worried about 'living at a busy street'	+	More worried
f4	sum actions against Schiphol	+	More actions
f5	job (own of inmates') related to Schiphol	-	Less jobs
f8	worried about health impact from aircraft noise	-	Less worried (+)
g1	experienced health	+	Better experienced health
g8	hearing problems	+	Less problems
g19b	use of sleeping pills	-	(Less sleeping pills)
g28	aircraft noise consequences on sleep	-	Less effects (+)

Table 12: Cumulative distribution of total number of times subjects smoked during the evening. The total number = number cigarettes + 0.5*number of self-made cigarettes + 2*number of cigars + 2*number of pipes.

number of times smoked	cumulative percentage
0	79.5
1	80.6
2	84.1
3	87.6
4	90.3
5	92.7
6	95.4
7	96.6
8	97.9
9	98.4
10	99.0
11	99.0
20	99.9
21	100.00

Table 13: Cumulative distribution of average number of cups of coffee per evening per subject.

Average number of cups of coffee per evening	Cumulative percentage of subjects
0	8.9
1	42.4
2	81.3
3	96.9
4	99.5
4.3	100.0

Table 14: Cumulative distribution of average number of alcoholic drinks per evening per subject.

Average number of alcoholic drinks per evening	Cumulative percentage of subjects
0	22.1
1	59.7
2	82.5
3	90.9
4	96.9
5	98.6
6	100.0

Table 15: Activities during evening-time of subjects.

Label of combined activities	combined activity		activities according to first item	
	number of subject evenings	percentage of subject evenings	number of subject evenings	percentage of subject evenings
100	1331	28.9	3147	68.4
102	323	7.0		
103	610	13.3		
104	87	1.9		
105	9	0.2		
106	96	2.1		
107	46	1.0		
108	233	5.1		
109	255	5.5		
110	23	0.5		
111	51	1.1		
112	71	1.5		
113	12	0.3		
200	58	1.3	101	2.2
201	6	0.1		
203	7	0.2		
204	3	0.1		
206	5	0.1		
207	3	0.1		
208	3	0.1		
209	15	0.3		
212	1	0.0		
300	152	3.3		
301	44	1.0		
302	8	0.2		
304	5	0.1		
306	7	0.2		
307	2	0.0	274	6.0
308	15	0.3		
309	30	0.7		
310	5	0.1		
311	2	0.0		
312	3	0.1		
313	1	0.0		

400	155	3.4		
401	13	0.3		
402	1	0.0		
403	4	0.1		
406	2	0.0		
407	5	0.1		
408	6	0.1		
409	12	0.3		
412	1	0.0	199	4.3
500	36	0.8		
507	5	0.1		
509	3	0.1		
513	1	0.0	45	1.0
600	80	1.7		
601	13	0.3		
602	1	0.0		
603	5	0.1		
607	4	0.1		
608	4	0.1		
609	4	0.1		
612	1	0.0	112	2.4
700	82	1.8		
701	5	0.1		
708	1	0.0		
709	1	0.0		
713	1	0.0	90	2.0
800	22	0.5		
801	9	0.2		
803	2	0.0		
804	1	0.0		
807	1	0.0		
809	9	0.2	44	1.0
900	286	6.2		
901	35	0.8		
902	4	0.1		
903	15	0.3		
904	4	0.1		
906	3	0.1		
907	2	0.0		
908	4	0.1		
911	5	0.1		
912	6	0.1		
913	1	0.0	365	7.9
1000	17	0.4		
1009	1	0.0	18	0.4
1100	55	1.2		
1101	1	0.0	56	1.2
1200	25	0.5		
1201	5	0.1	30	0.7
1300	14	0.3	14	0.3
missing	103	2.2	103	2.2
total	4598	100.0	4598	100

Table 16: Cumulative distribution of day- and evening-time noises annoyance score of subjects.

Noise annoyance score	Cumulative percentage of the annoyance score for day-time noises	Cumulative percentage of the annoyance score for evening-time noises
0	88.8	93.6
1	88.8	93.6
2	89.0	93.7
3	89.7	94.1
4	91.0	94.8
5	92.8	95.9
6	95.6	97.4
7	97.7	98.7
8	99.3	99.7
9	99.9	99.9
10	100	100

Table 17: Type of medication used during day, evening, or night and percentage of subjects using medication (left hand side of table, responses in evening diary). Medication classified according to their sleep-inducing effect and percentage of subjects using this medication (right hand side of table).

type of medicine	percentage of subject days	effect	percentage of subject days
no medicine	95.6	Not used or no sleep-inducing effect (0)	99.87
Pain releasers, aspirin etc.	3.4	Induction of sleepiness symptom (1)	0.07
Other medication	1.0	Sleep-induction important side-effect (3)	0.04
		Sleep-induction main effect (4)	0.02

Table 18: Type of sleeping pills used before going to sleep, and percentage of subjects using these pills (left hand side of table). Sleeping pills classified according to their sleep-inducing effect and percentage of subjects using these pills (right hand side of table).

type of sleeping pill	percentage of subject nights	effect	percentage of subject nights
No sleeping pills	98.68	Not used or no sleep-inducing effect (0)	98.71
1	1.27	Sleep-induction a symptom (1)	0.02
other type	0.04	Sleep-induction important side-effect (3)	0.29
		Sleep-induction main effect (4)	0.98

Table 19: Percentage of subject nights medication or sleeping pills has been used or not, classified according to the sleep-inducing effect of medication or sleeping pill.

Effect of medication or sleeping pills	Percentage of subject nights
Not used or without sleep-inducing effect (0)	95.9
Sleep-induction is a symptom (2)	1.3
Sleep-induction is an important side-effect (3)	1.6
Sleep-induction is main effect (4)	1.3

Table 20: Distribution of subject evenings according to reasons for difficulty to fall asleep.

Reasons for difficulty to fall asleep	Percentage of subject nights
Irrelevant, no reason	93.2
Worries	1.2
Weather (cold, hot, windy)	0.6
Illness, not feeling well	1.0
Noises in the house, at neighbours house	0.5
Noises from outside not from aircraft	0.4
Aircraft noise	0.3 (12 subject nights)
Other reasons	2.8

Table 21: Distribution of reasons for awakening for the first time during sleep.

Reasons for awakening for the first time during sleep period time	Percentage of subject nights
Not awakened	28.3
Sanitary reasons, thirsty, hungry	36.4
Looking after inmate	4.8
Worries	0.9
Weather (cold, hot, windy)	2.5
Illness, not feeling well	1.2
Noises in the house, at neighbours house	1.3
Noises from outside not from aircraft	1.3
Aircraft noise	(92 subject nights) 2.0
Other reasons	21.3

Table 22: Distribution of ways of awakening in the morning.

Awakening in the morning	Percentage of subject mornings
Spontaneously	45.7
By alarm clock/clock-radio	37.7
Awakened by a member of the family	13.4
In another way, not by aircraft noise	2.6
By aircraft noise	0.5 (21 subjects mornings)

Table 23: Distribution of reasons to get out of bed.

Reasons getting out of bed	Percentage of subject mornings
To go to work/start working	38.7
To take care of family members	13.8
Other obligations	9.9
A habit, without a specific reason	30.8
Other reason	6.8

Table 24: *Position of the bedroom window(s) before going to bed.*

Position of bedroom window	Percentage of subject nights
Fully closed	25.3
Small opening	43.4
Opened at hand's breath	22.9
Half opened	4.8
Fully opened	3.5

6 Figures

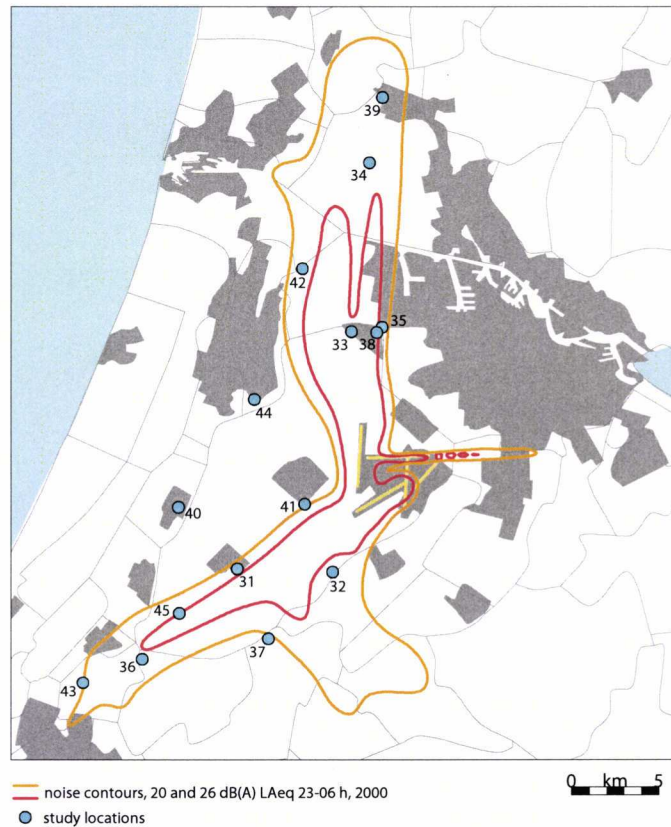


Figure 1:

Map of the surroundings of Schiphol Airport. Numbers are the labels of the 15 locations. The map also shows the so-called 20 and 26 dB(A) night-time (23 – 6 hours) aircraft noise contours $L_{Aeq,23-06h}$ equal to 20 and 26 dB(A). These contours have been calculated on the basis of aircraft to and from Schiphol in the year 2000.

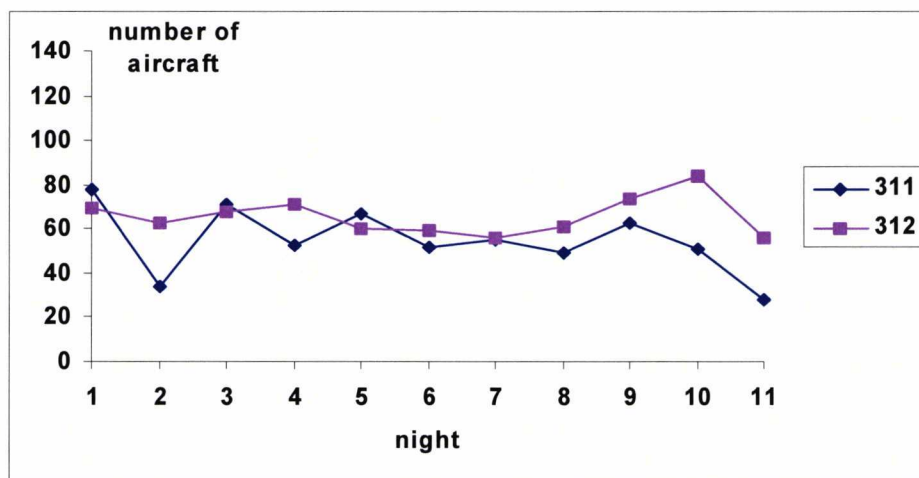


Figure 2: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 31, study interval 1 and 2.

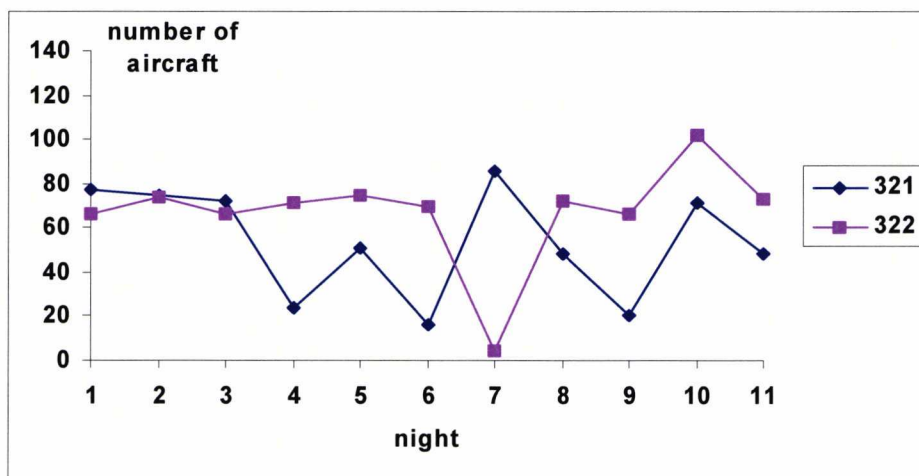


Figure 3: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 32, study interval 1 and 2.

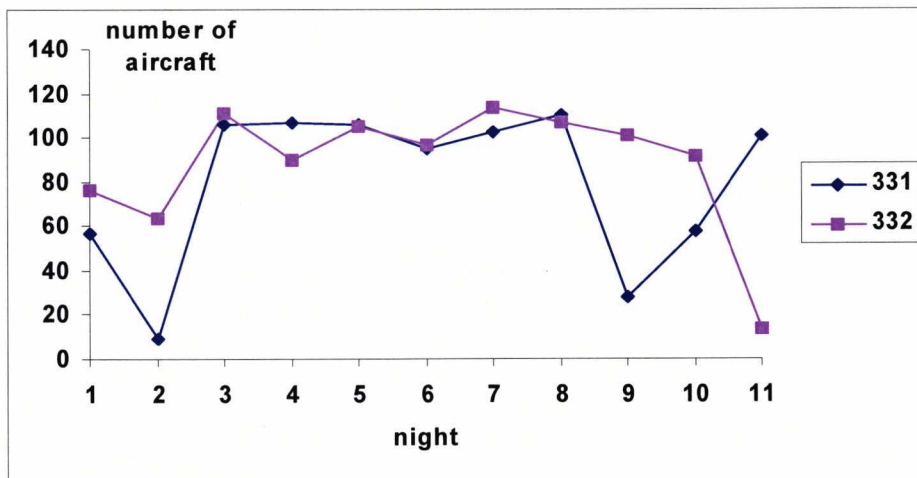


Figure 4: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 33, study interval 1 and 2.

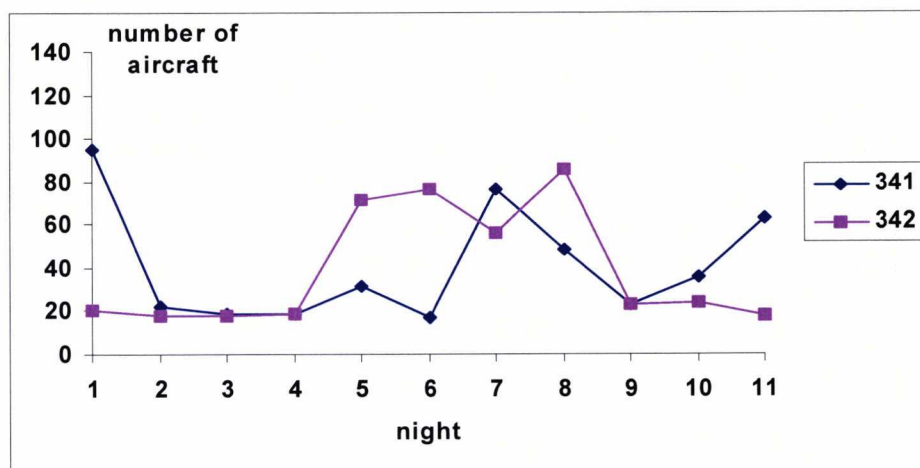


Figure 5: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 34, study interval 1 and 2.

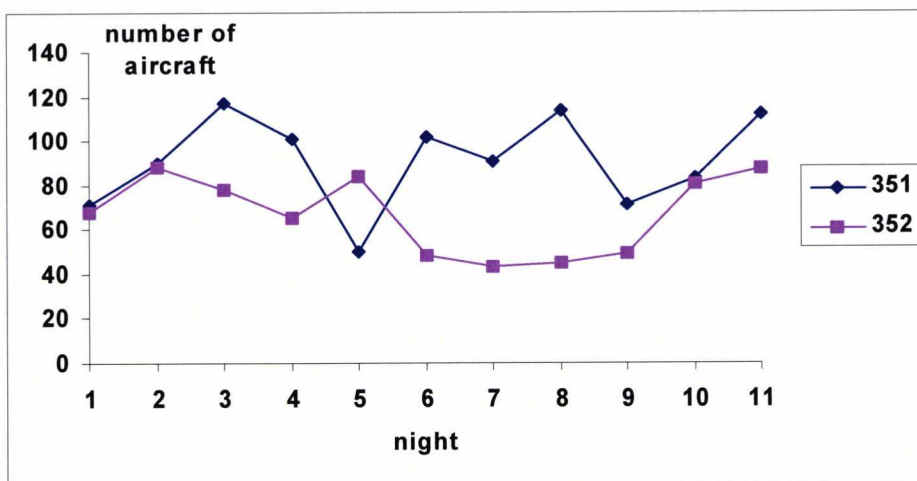


Figure 6: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 35, study interval 1 and 2.

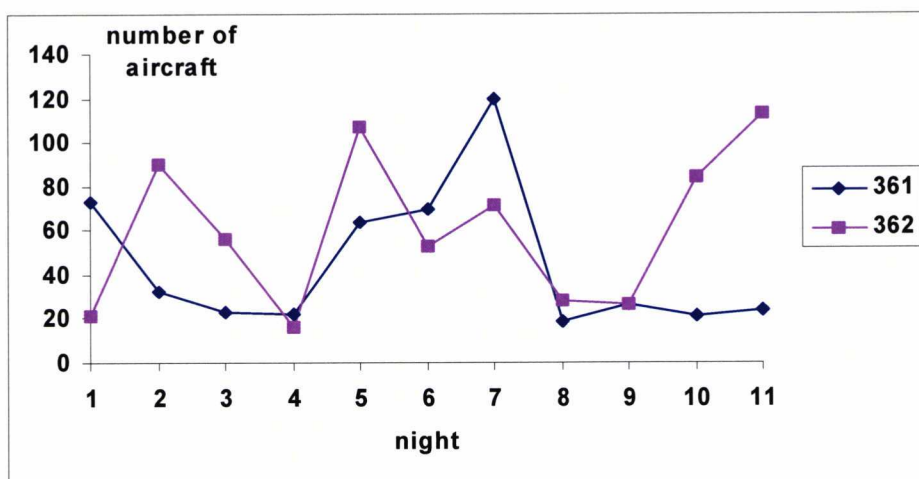


Figure 7: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 36, study interval 1 and 2.

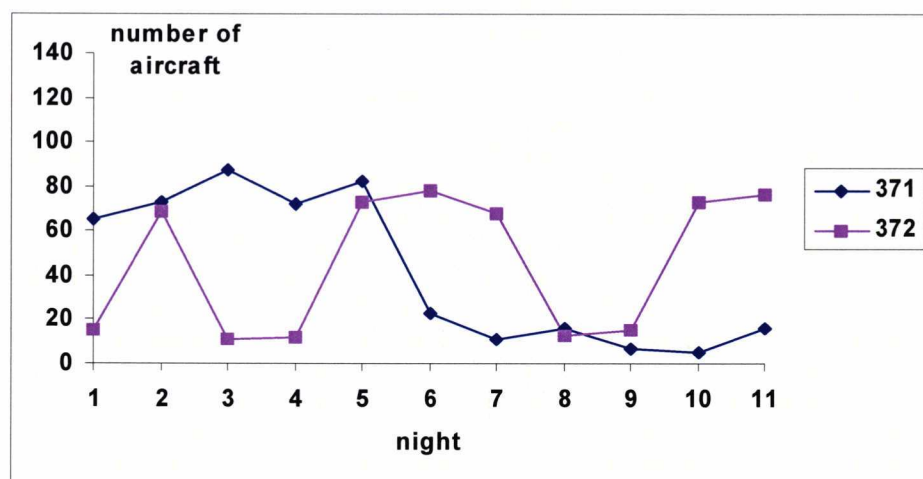


Figure 8: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 37, study interval 1 and 2.

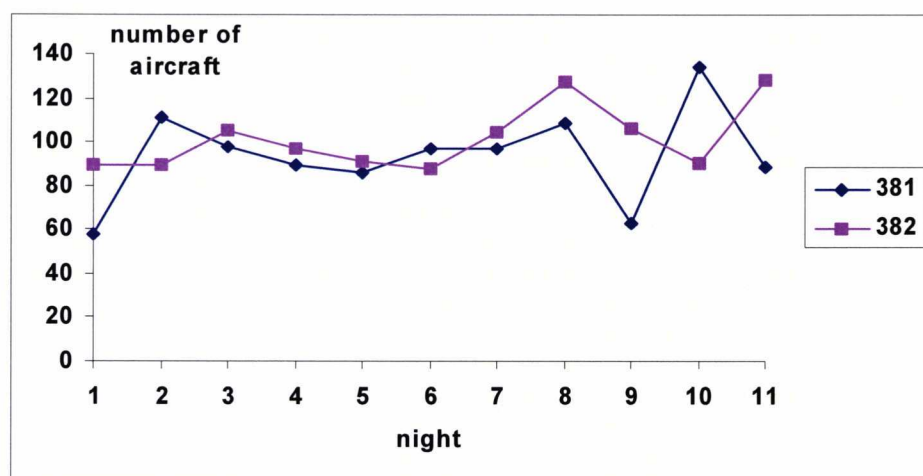


Figure 9: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 38, study interval 1 and 2.

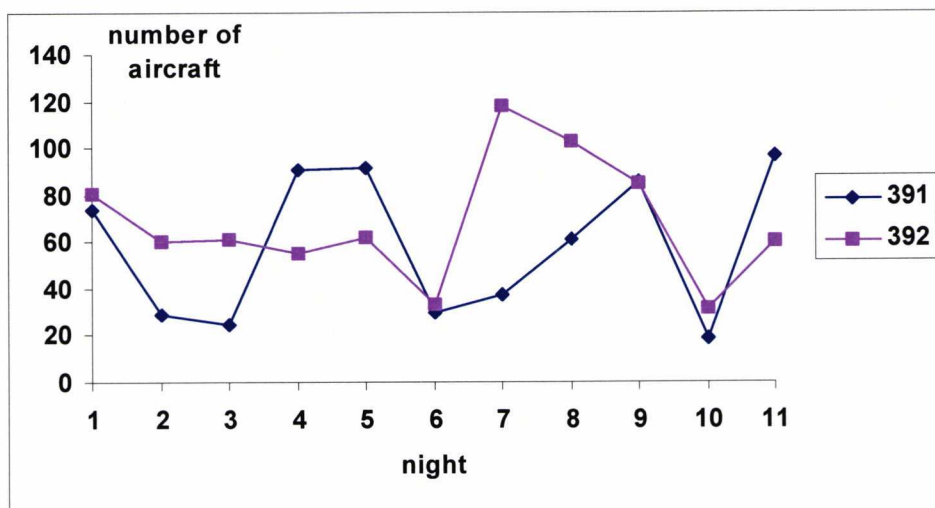


Figure 10: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 39, study interval 1 and 2.

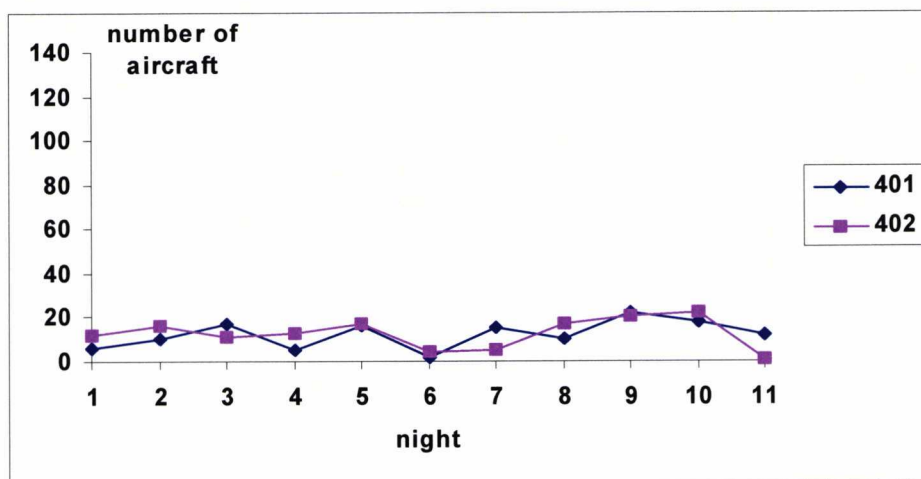


Figure 11: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 40, study interval 1 and 2.

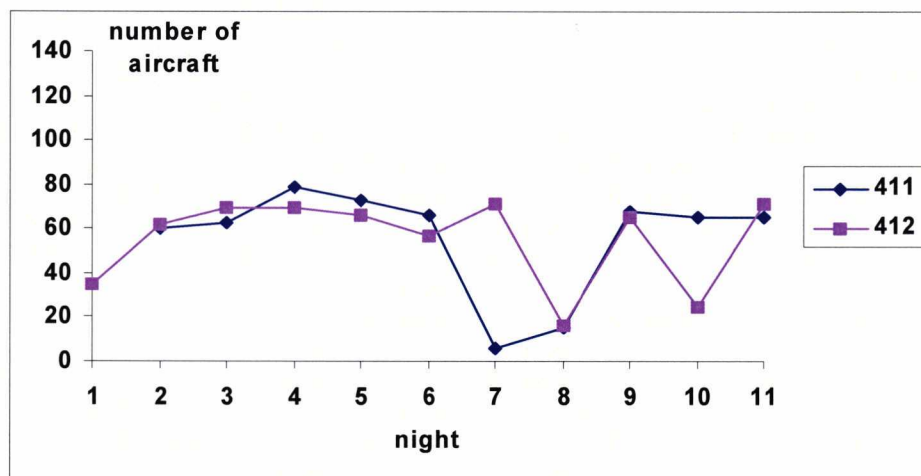


Figure 12: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 41, study interval 1 and 2.

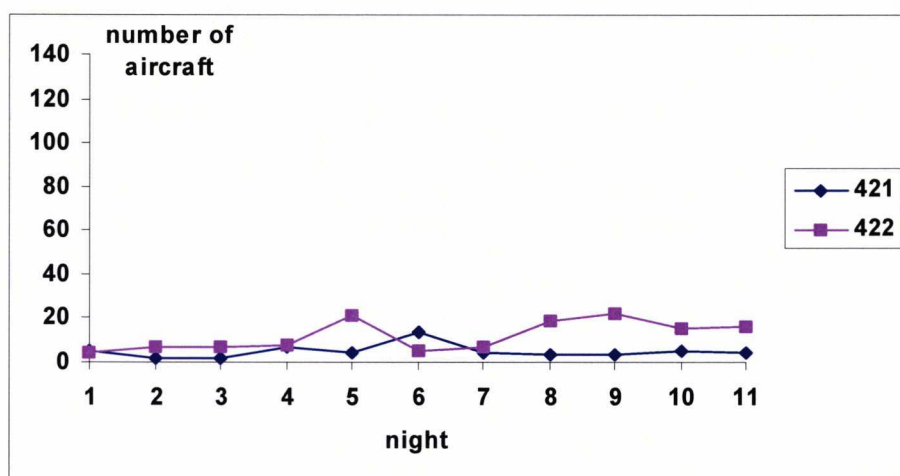


Figure 13: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 42, study interval 1 and 2.

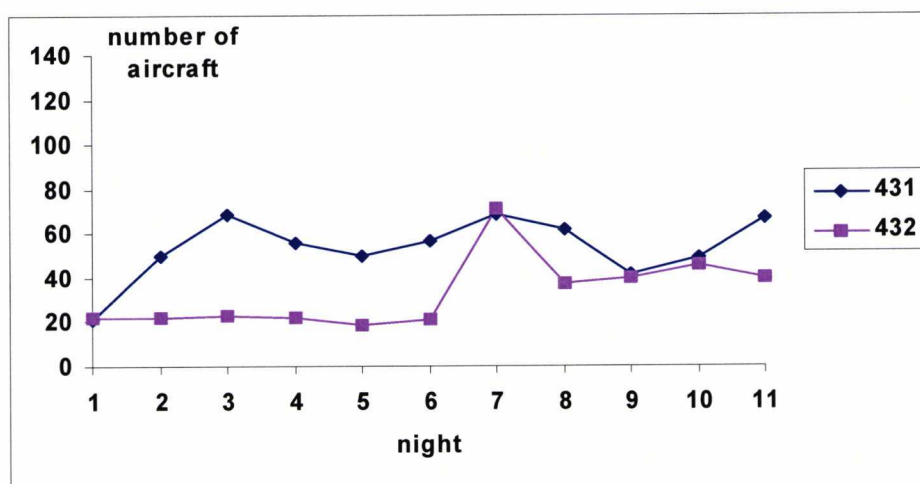


Figure 14: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 43, study interval 1 and 2.

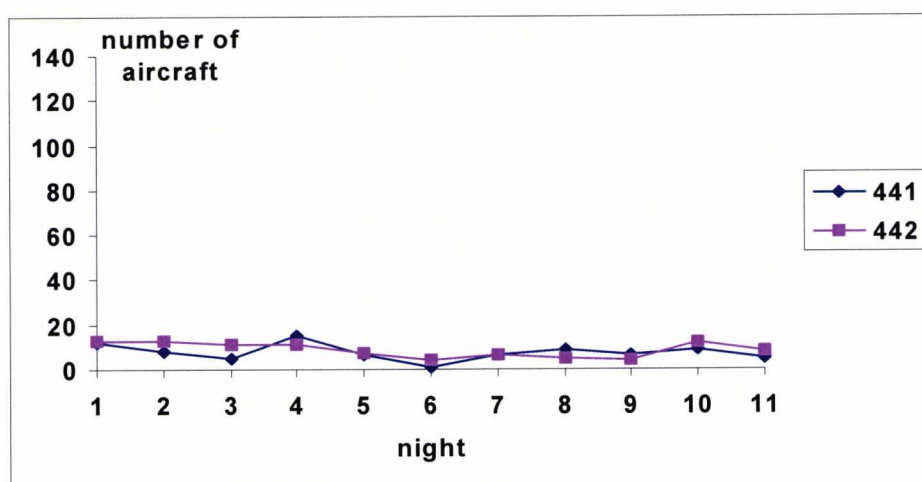


Figure 15: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 44, study interval 1 and 2.

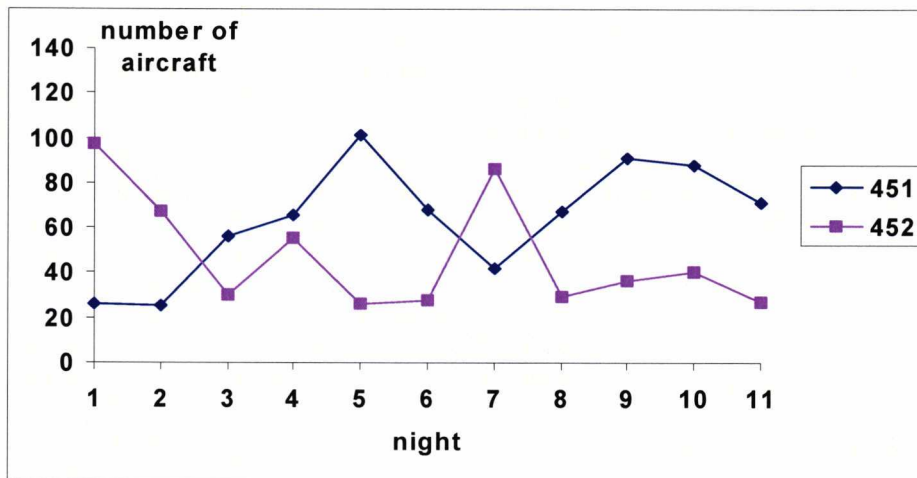


Figure 16: Number of aircraft detected on the outdoor noise monitor between 22 hours in the evening and 9 hours next morning as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 45, study interval 1 and 2.

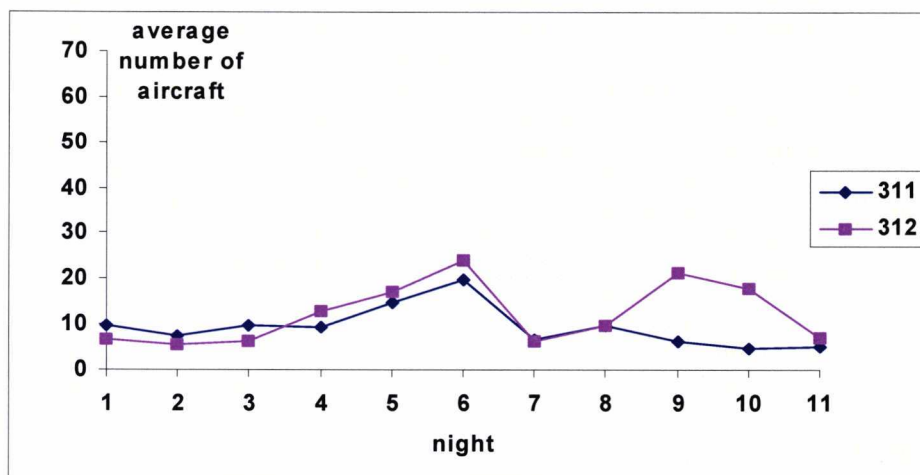


Figure 17: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 31, study interval 1 and 2.

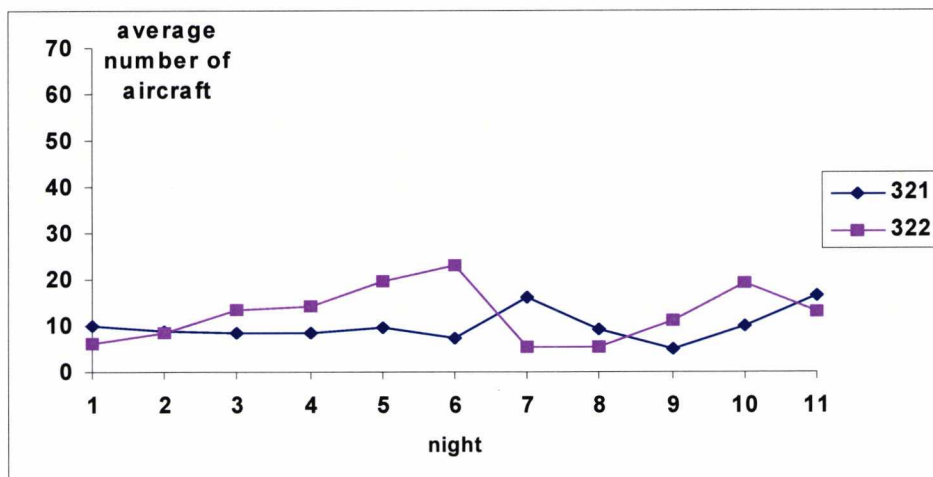


Figure 18: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 32, study interval 1 and 2.

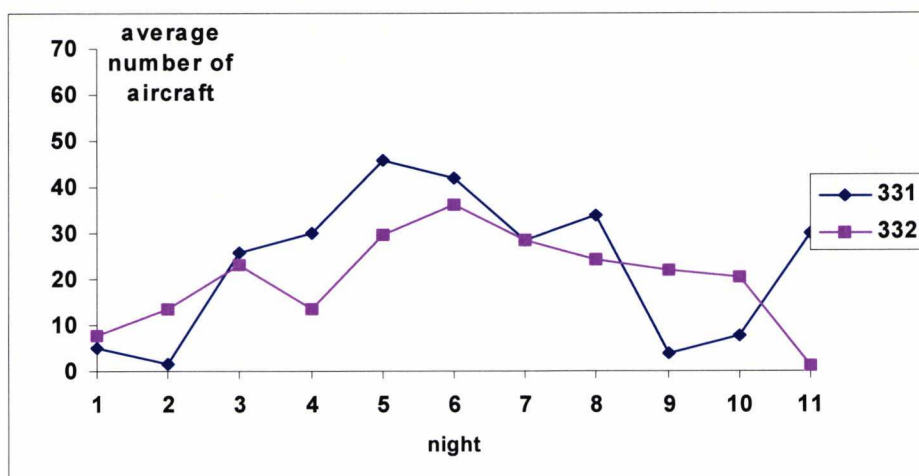


Figure 19: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 33, study interval 1 and 2.

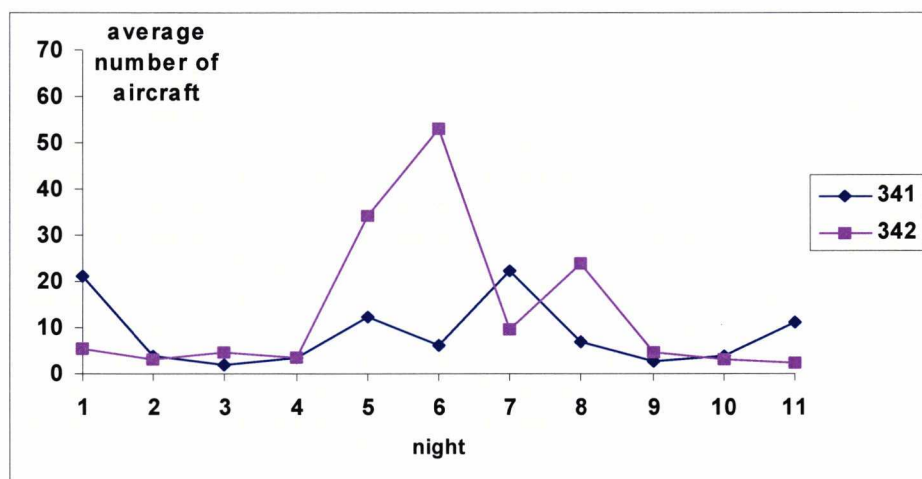


Figure 20: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 34, study interval 1 and 2.

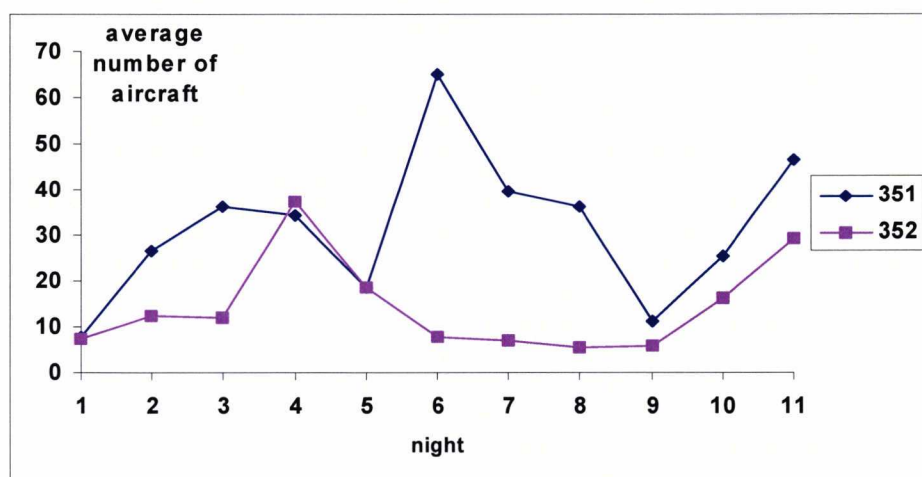


Figure 21: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 35, study interval 1 and 2.

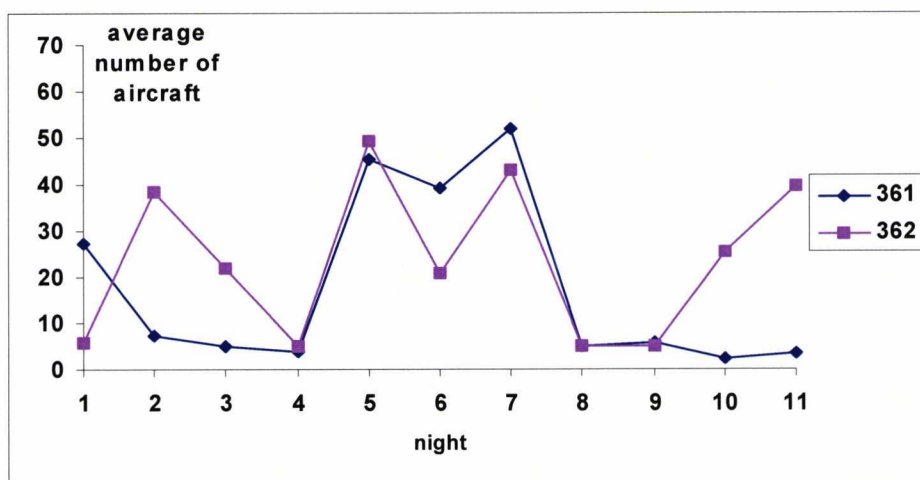


Figure 22: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 36, study interval 1 and 2

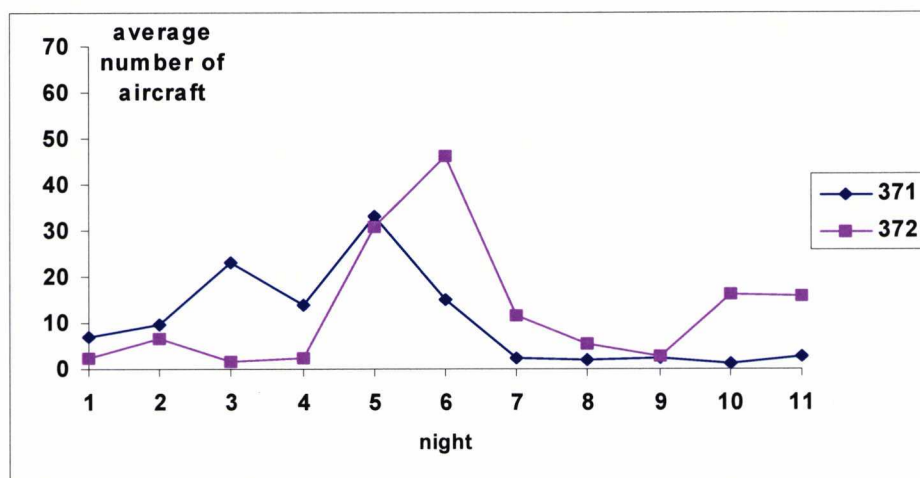


Figure 23: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 37, study interval 1 and 2.

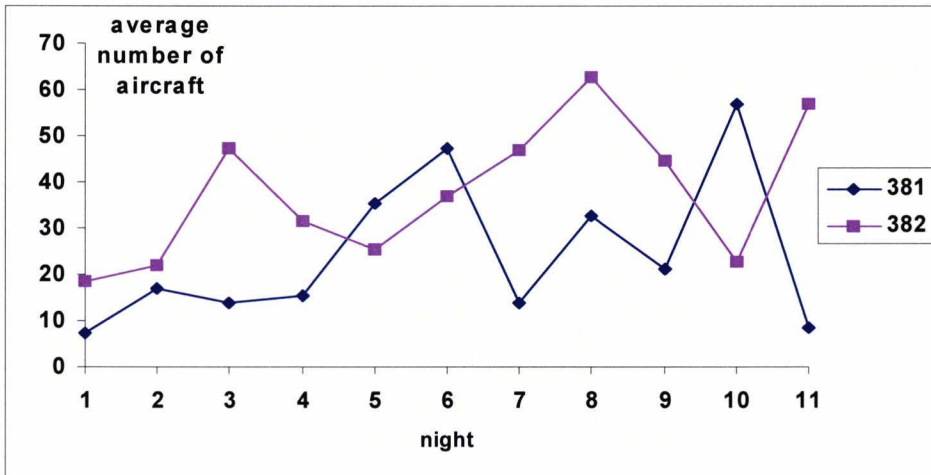


Figure 24: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 38, study interval 1 and 2.

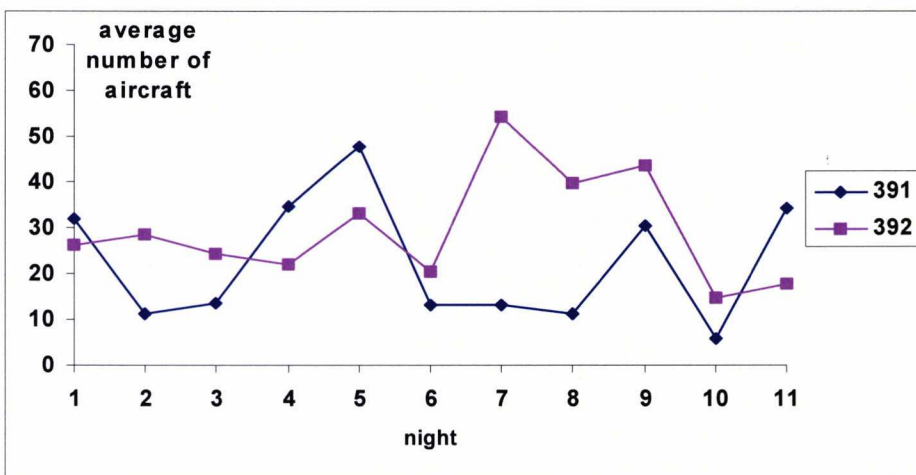


Figure 25: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 39, study interval 1 and 2.

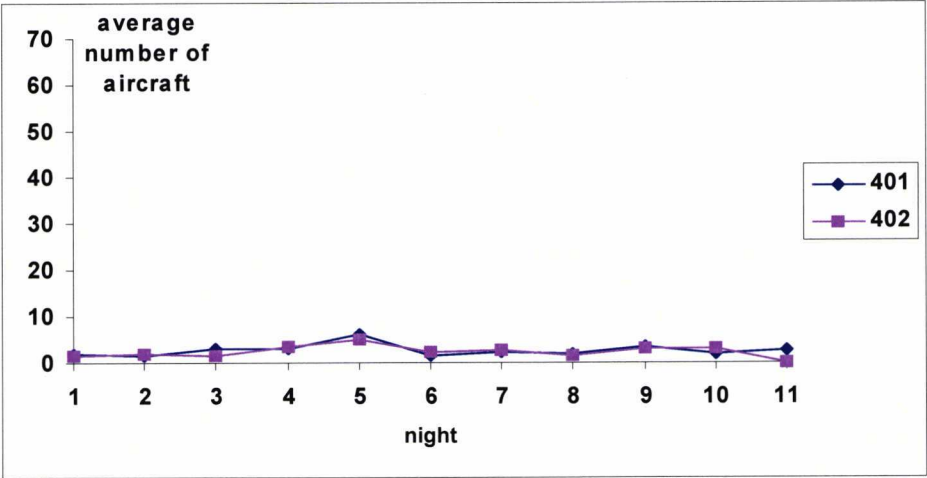


Figure 26: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location , study interval 1 and .2

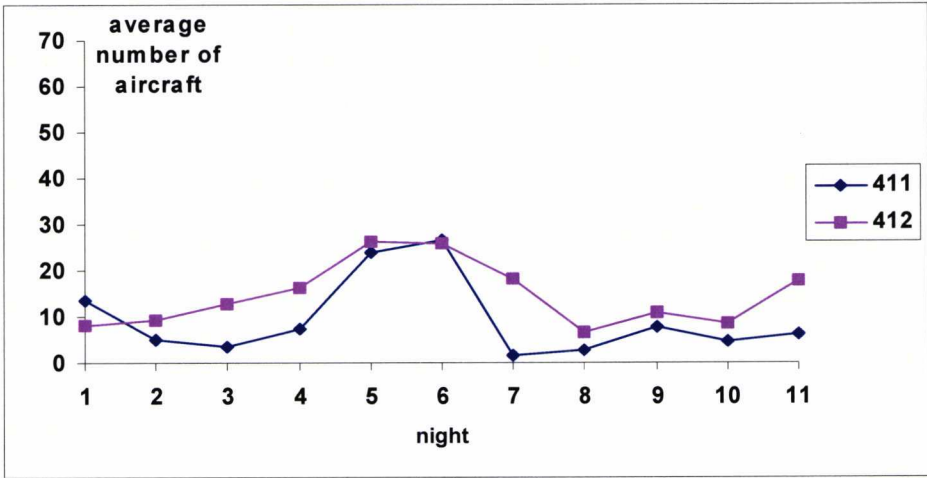


Figure 27: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 41, study interval 1 and 2.

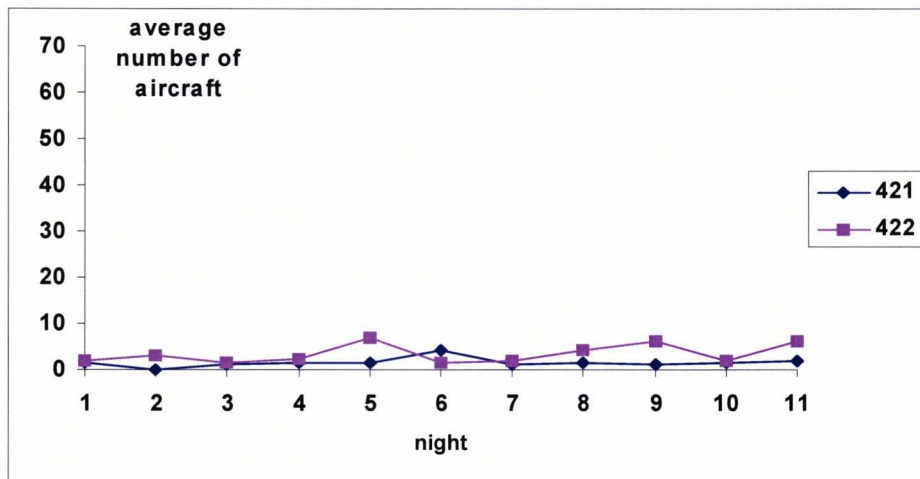


Figure 28: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 42, study interval 1 and 2.

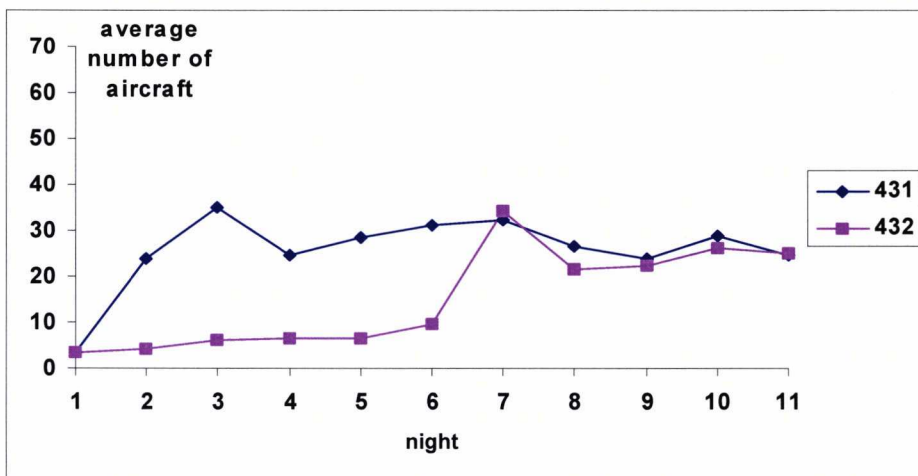


Figure 29: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 43, study interval 1 and 2.

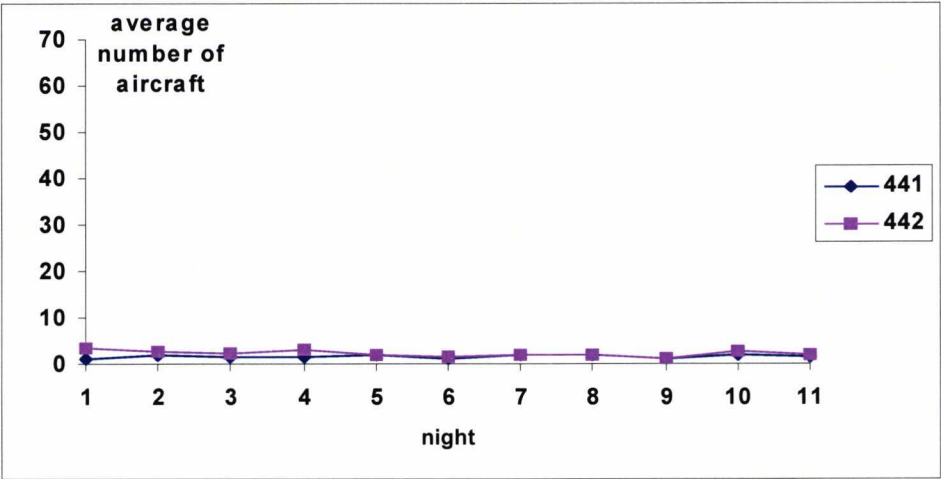


Figure 30: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 44, study interval 1 and 2.

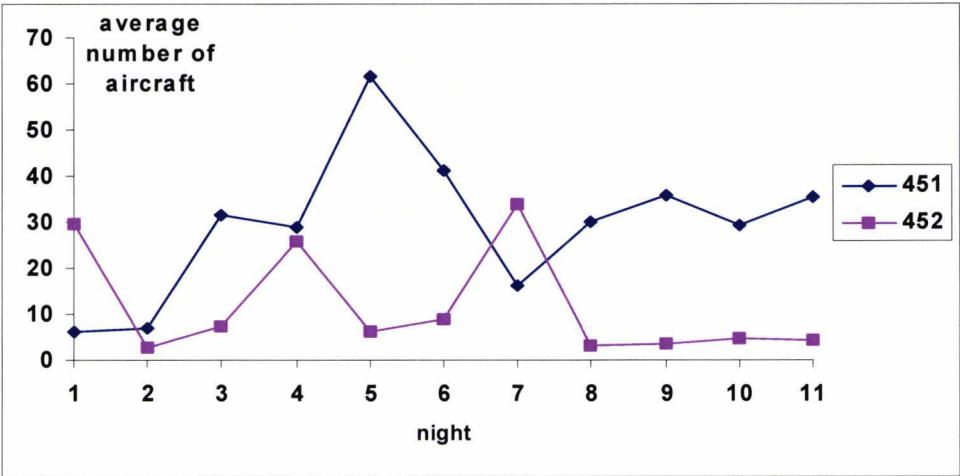


Figure 31: Number (per night averaged over subjects) of aircraft detected on the indoor noise monitors during sleep period time of subjects as a function of participation night (night 1 = Monday, night 2 = Tuesday etc.) Location 45, study interval 1 and 2.

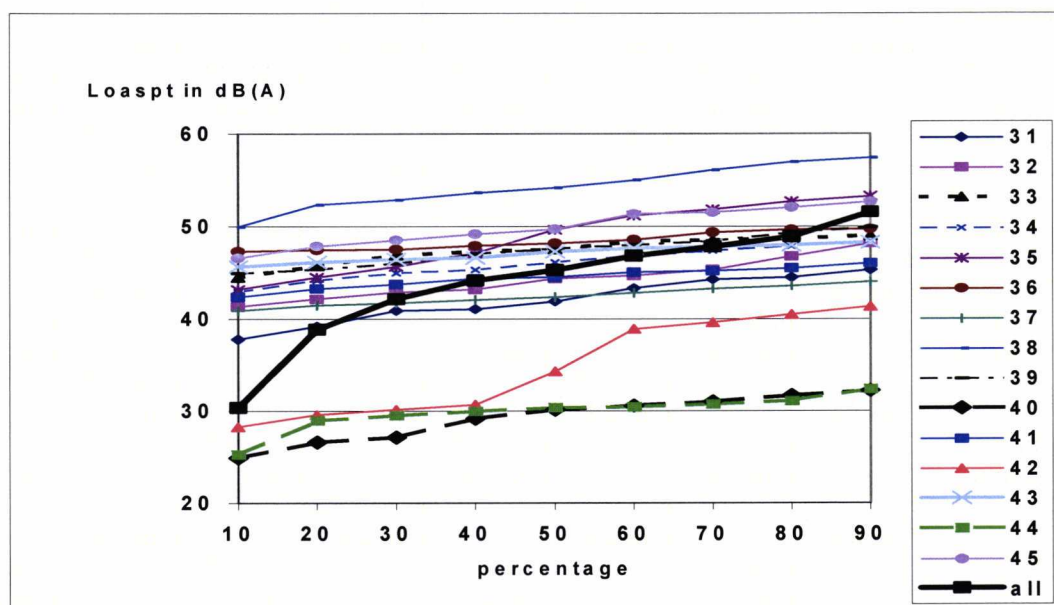


Figure 32: Cumulative distribution of the outdoor equivalent sound level due to aircraft noise during sleep period time of subjects.

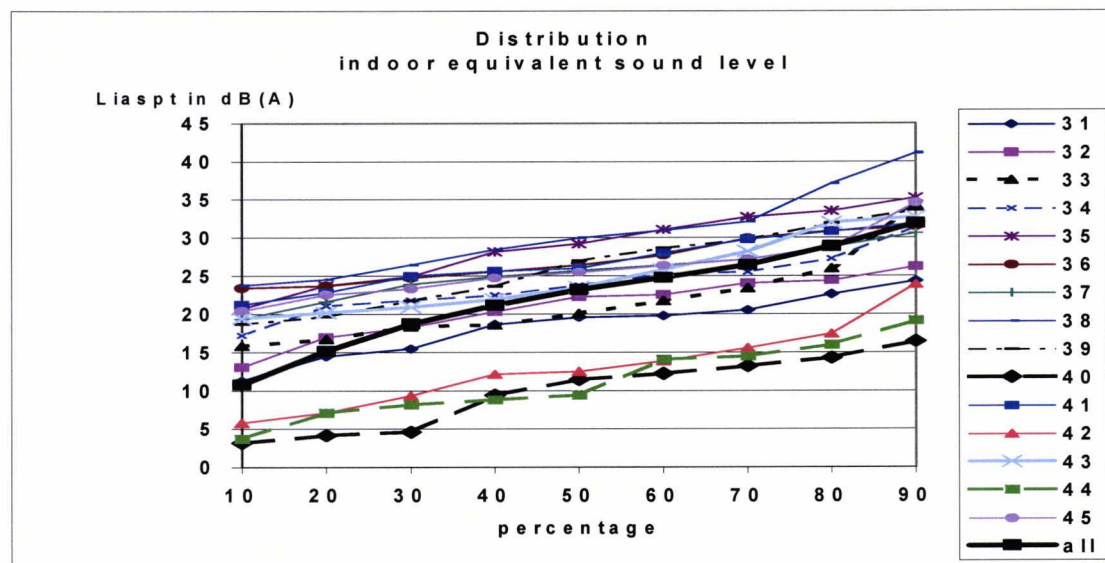


Figure 33: Cumulative distribution of the indoor equivalent sound level due to aircraft noise during sleep period time of subjects.

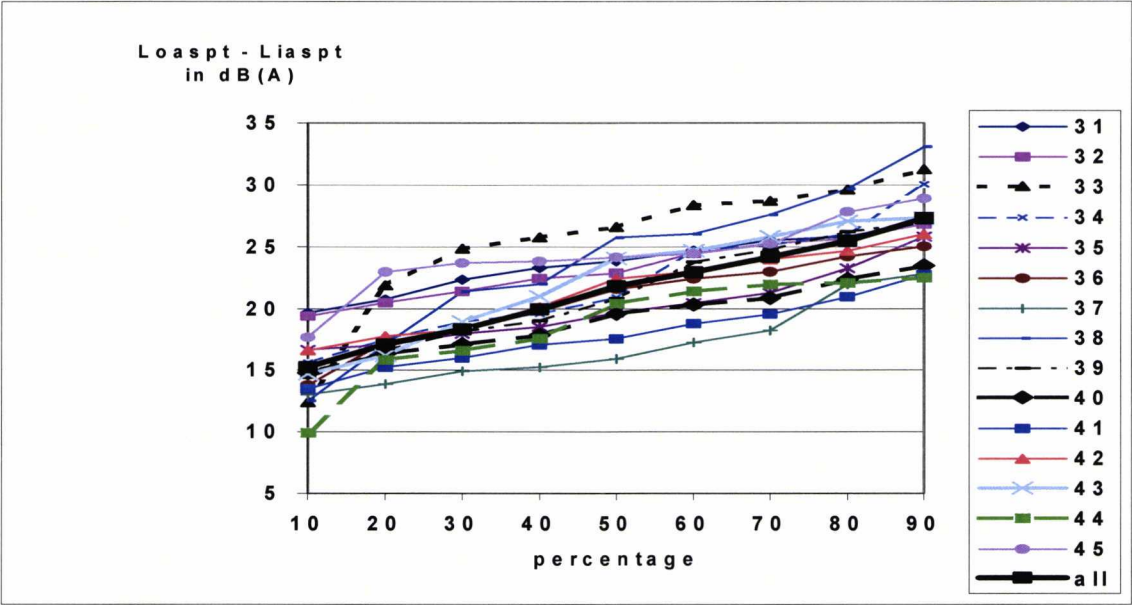


Figure 34: Cumulative distribution of the difference between outdoor and indoor equivalent sound level due to aircraft noise during sleep period time of subjects.

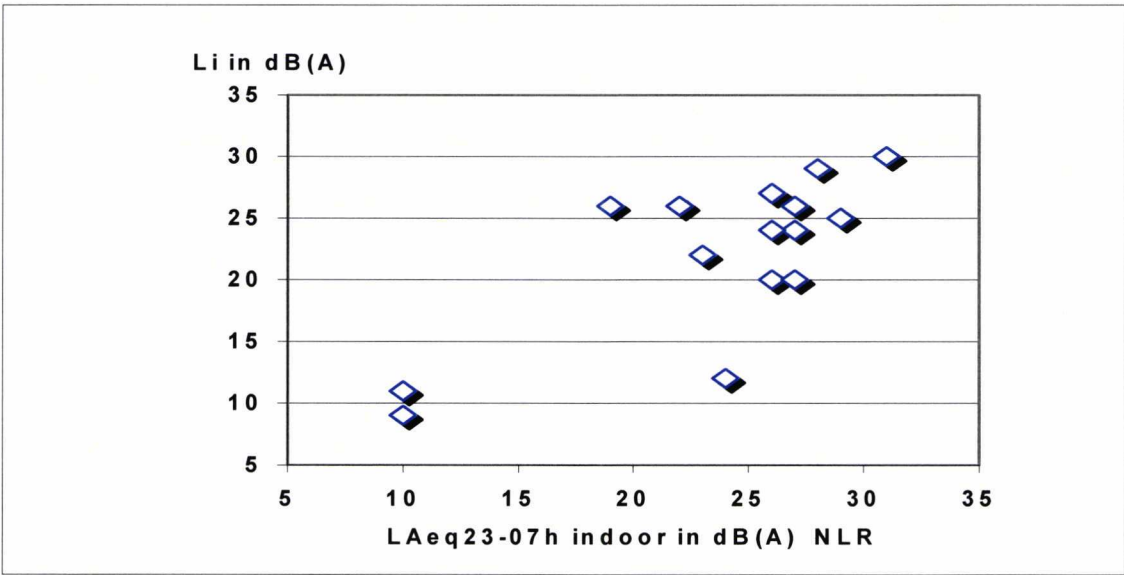


Figure 35: Median value of equivalent sound level during sleep period time of subjects measured indoors (L_i) at the 15 locations as a function of indoor equivalent sound level from 23 to 7 calculated by NLR for 2000.

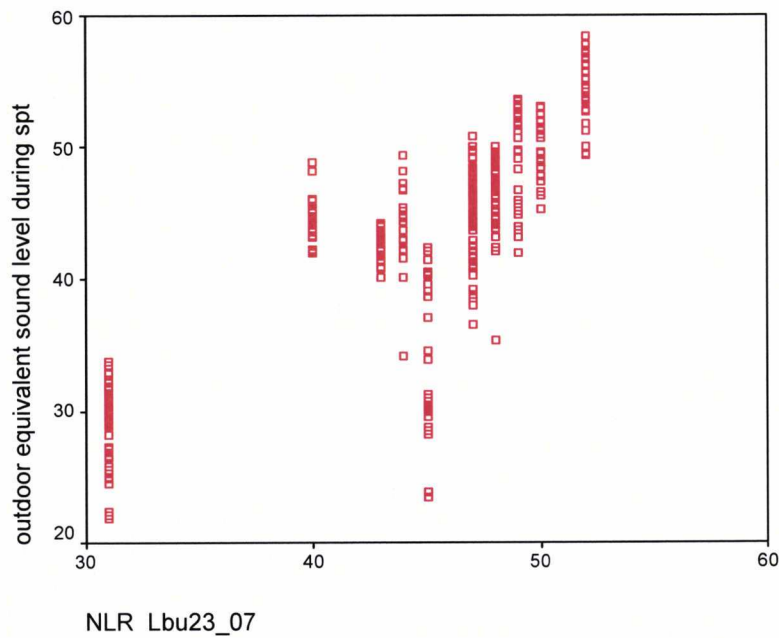


Figure 36: Lo as a function of $Lbu23-07h$. Correlation coefficient equal to 0.82. Regression equation is: $Lo = -2.0 + 1.02 * Lbu23-07h$

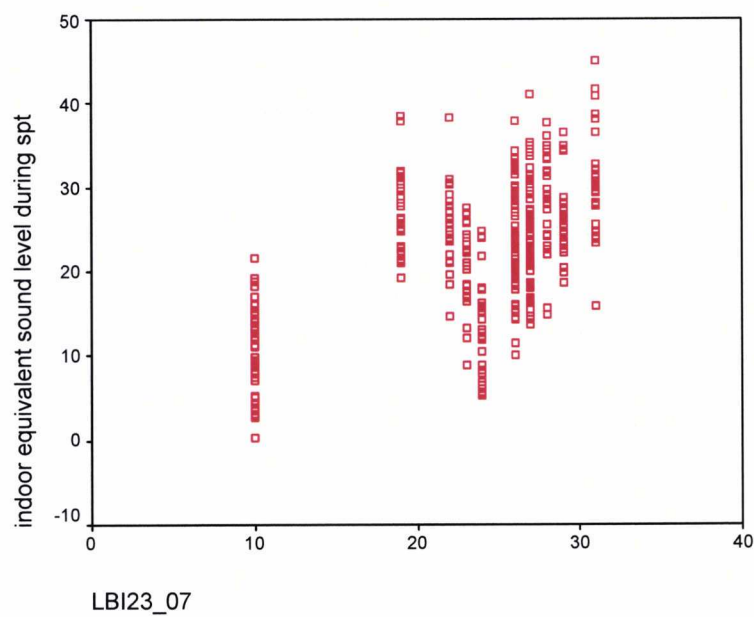


Figure 37: Li as a function of $Lbi23-07h$. Correlation coefficient is equal to 0.57. Regression equation is: $Li = 4.3 + 0.76 * Lbi23-07h$

7 Questionnaire

SLEEP DISTURBANCE IN THE VICINITY OF SCHIPHOL

Questionnaire for SUBJECTS Written questionnaire

SUBJECT NUMBER xxxppp

Xx: location X interval ppp subject

(to be filled out by TNO-PG)

.....
Check of personal data

Name (first initials and family name):

Gender (circle): male/female

Street and number:

Postal code and town:

PLEASE READ THIS CAREFULLY BEFORE YOU START ANSWERING THE QUESTIONS

We ask you to fill out this questionnaire by yourself. If you do not know the answer about a specific fact (such as the year your house was built) you may consult somebody else. However, it is important that you express your own opinion.

The questionnaire consists of four parts: 1. General, 2. Health and sleep, 3. Noise sensitivity, and 4. Statements. Each part contains a small introduction. First, read the questions carefully and give the answer that is most applicable to you.

Part 3 and 4 are filled out by putting a cross in the appropriate box. Just give one answer to each question (see example 1 on this page), unless indicated differently (see example 2). Some questions in part 1 and 2 have more than one part (a,b,c). Please fill out each part (see example 3). To answer some of the questions, you have to use a bar for your answer (see example 4). Please give only one answer in the bar and do not put a cross on the separator of two boxes.

PAY ATTENTION!

If you are ready, please go through the questionnaire to be sure that you did not forget to answer a question.

If you need more information, please contact us by telephone.

Good luck!

Examples

1. Do you have a dog? ☒ yes
☐ no ⇒ **proceed to question 5**
2. What kind of meat do you offer your dog?
(more than one answer possible) ☒ tinned meat
☐ fresh meat
☐ different, that is
3. How many times do **you** perform the following activities **(please, give one cross on each line)**
- | | over
2 times
a day | 2 times
a day | 1 time
a day | less 1 time
a day | seldom
or never |
|------------------------------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|
| a go for a walk with the dog | ☒ | ☐ | ☐ | ☐ | ☐ |
| b give the dog fresh water | ☐ | ☒ | ☐ | ☐ | ☐ |
| c wash the dog | ☐ | ☐ | ☐ | ☐ | ☒ |
4. How much do you like to carry out the following activities?
(please, give one cross on each line)
- | | not carried
out | 0 =
not at all
liked | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 =
very much
liked |
|------------------------------|-------------------------------------|----------------------------|-------------------------------------|---|---|---|---|---|-------------------------------------|---|---|----------------------------|
| a go for a walk with the dog | ☐ | | | | | | | | ☒ | | | |
| b give the dog fresh water | ☐ | | ☒ | | | | | | | | | |
| c wash the dog | ☒ | | | | | | | | | | | |

General**A. Personal situation****Non-response: A1 ...A8, A12, A15, A16****Explanation:***These questions relate to your present situation.*

- A1** Are you male or female? ☐ male
☐ female
- A2** What is your age? years
- A3** What is your citizenship? ☐ married, living together
☐ single
- A4** How many members does your family consist of,
including yourself? persons

- A5** If your family consists of children living at your home,
how many of them have the following age(s) number
- | | |
|----------------------|-------|
| younger than 4 years | ..... |
| 4 to 12 years | ..... |
| 13 to 18 years | ..... |
| 19 years and over | ..... |
- A6** In which country were you born?
- ☐ Netherlands
 - ☐ Suriname or the Antils
(Aruba inclusive)
 - ☐ Indonesia (former Dutch East
Indies inclusive)
 - ☐ different, that is
- A7** What is the highest education that you finished?
(please, give one answer only)
- ☐ no education
 - ☐ primary school
 - ☐ lower vocational education
 - ☐ MAVO (or Mulo)
 - ☐ middle vocational education
 - ☐ HAVO/VWO (or
HBS/Gymnasium/MMS)
 - ☐ higher vocational education
 - ☐ college, university
 - ☐ different, that is
- A8** What description applies best to you?
please, give one answer only)
- ☐ I have a full-time payed job
32 hours a week or more
 - ☐ I have a part time payed job,
between 19 and 32 hours a
week
 - ☐ I have a part-time payed job,
less than 19 hours a week
 - ☐ I am fulltime housewife/man
 - ☐ I am retired (early)
 - ☐ I follow courses/ I study
 - ☐ I am a volunteer
 - ☐ I am jobless/looking for a job
 - ☐ I am disabled/unfit for work
 - ☐ different, that is

[illegible]

A11 How long are you exposed at your work daily to so much noise, that talking is impossible?

☐ complete worktime

☐ 4 - 8 hours

☐ 1 – 4 hours

☐ less than 1 hour

☐ incidental

☐ never

[illegible]

A13 How many days a week are you away from home for at least 6 hours during daytime (06.00-19.00 hours)?

days

0	1	2	3	4	5	6	7

A14 How many evenings (19.00-01.00 hours) a week are you away from home for at least three hours?

evenings

0	1	2	3	4	5	6	7

A15 How satisfied are you with your house?

☐ extremely satisfied

☐ very satisfied

☐ satisfied

☐ dissatisfied

☐ very dissatisfied

A16 How satisfied are you about living in your present neighbourhood?

- ☐ extremely satisfied
☐ very satisfied
☐ satisfied
☐ dissatisfied
☐ very dissatisfied

B. Living conditions	Non response: B1 ... B3, B8, B9
-----------------------------	--

Explanation:

These questions relate to your house and your present housing conditions. Please answer these questions, where necessary with assistance of others.

B1 For how long do you live in this neighbourhood?
 (when shorter than 1 year

..... years
 months)

B2 For how long do you live in this house?
 (when shorter than 1 year

..... years
 months)

B3 In what type of house do you live?

- ☐ flat or apartment building (downstairs)
☐ flat or apartment building (upstairs)
☐ terraced house
☐ house at the end of a row
☐ semi-detached house
☐ free standing or linked bungalow
☐ different

B4 Is this house:

- ☐ rented
☐ bought
☐ different

B5 When was the house built?

- ☐ before 1980
☐ 1980 or later
☐ do not know

B6 Which of the following thermic insulation provisions have been installed double glass in your house?
(more than one answer possible)

- ☐ windows in the living room with
☐ windows in your bedroom with double double glass
☐ cavity wall insulation
☐ roof insulation
☐ different, such as closed slits (draught-excluders and kit)
☐ no thermic insulation provisions
☐ unknown

B7 Have acoustical insulation provisions been installed in your house against:

- ☐ aircraft noise
- ☐ road traffic noise
- ☐ railway noise
- ☐ industrial noise
- ☐ no insulation provisions ⇒ **proceed to B8**

If yes, which of the following provisions have been installed in your house?
(**more than one answer possible**)

- ☐ windows in the living room with double glass
- ☐ windows in your bedroom with double glass
- ☐ cavity wall insulation
- ☐ roof insulation
- ☐ sound damping ventilation grids or cabinets
- ☐ different
- ☐ unknown

B8 To which extent are you satisfied with the insulation of your house against outdoor noises?

0 =

10 =

very

very

dissatisfied

satisfied

0 1 2 3 4 5 6 7 8 9 10

--	--	--	--	--	--	--	--	--	--	--

B9 To which extent are you satisfied with the insulation of your house against noises from neighbouring dwellings?

0 =

10 =

very

very

dissatisfied

satisfied

0 1 2 3 4 5 6 7 8 9 10

--	--	--	--	--	--	--	--	--	--	--

B10 Would you like to ventilate your house more often, but refrain from it due to aircraft noise?

- ☐ yes, much more often
- ☐ yes, often
- ☐ sometimes
- ☐ hardly ever
- ☐ never

C. Sounds**Non-response: C1, C2****Explanation:**

The questions concern the perception and annoyance of sounds during the last year in and around your house. The questions do not relate to sounds in your working situation or when you are somewhere else, but to sounds in your house, in your garden or on your balcony.

In question C1 various sound sources are given. Please indicate how many times you perceive sound from these sound sources. Question C2 is related to annoyance due to the sounds of the various sound sources.

C1	How many times do you perceive sound from the following sound sources? (please, give one answer on each line)	daily	a least once a week	at least once a month	at least once a year	never
	a traffic on roads	☐	☐	☐	☐	☐
	b aircraft	☐	☐	☐	☐	☐
	c industrie/factories	☐	☐	☐	☐	☐
	d construction/demolishing activities	☐	☐	☐	☐	☐

C2	How <u>annoying</u> or <u>not annoying</u> is sound from the following sources? (please, give one answer on each line)	not perceived	0 = not annoying at all	10 = very much annoying
	a traffic on roads	☐	0 1 2 3 4 5 6 7 8 9 10	
	b aircraft	☐		
	c industries/factories	☐		
	d construction/demolishing activities	☐		

D. Nocturnal sounds**Non-response: D1 ... D3****Explanation:**

After you went to bed you may hear sounds from outside. If you are very much accustomed to these sounds, you may even not realise that you hear them. You only hear the sounds when you take special notice. Question D1 deals with sounds you hear when you take special notice. Question D2 relates to awakening from these sounds and question D3 with annoyance due to the sounds.

After you went to bed you may hear sounds from inside your own or neighbouring house(s). If you are very much accustomed to these sounds, you may even not realise that you hear them. You only hear the sounds when you take special notice. Question D4 deals with sounds you hear when you take special notice. Question D5 relates to awakening from these sounds and question D6 with annoyance due to the sounds.

Please, take the preceding twelve months as reference.

a	traffic on roads	☐	☐	☐	☐	☐
b	aircraft	☐	☐	☐	☐	☐
c	industries/factories	☐	☐	☐	☐	☐
d	construction/demolishing activities	☐	☐	☐	☐	☐

D2 How many times do you wake up by sound from the following sound sources?
(please, give one answer on each line)

a	traffic on roads	☐	☐	☐	☐	☐
b	aircraft	☐	☐	☐	☐	☐
c	industries/factories	☐	☐	☐	☐	☐
d	construction/demolishing activities	☐	☐	☐	☐	☐

D3 How much are you annoyed by sound in your bedroom from the following sources?
(please, give one answer on each line)

[illegible]

D4 How many times do you perceive sound from the following sound sources in your bedroom?
(please, give one answer on each line)

D4		How many times do you <u>perceive</u> sound from the following sound sources in your bedroom? (please, give one answer on each line)	each night	at least once a week	at least once a month	at least once a year	never
a	permanent installations in own house (dish washer, washing-machine, central heating, fan, etc)	☐	☐	☐	☐	☐	
b	permanent installations in neighbours houses (dish washer, washing-machine, central heating, fan, etc)	☐	☐	☐	☐	☐	
c	sanitary provisions (toilet) own house	☐	☐	☐	☐	☐	
d	sanitary provisions (toilet) neighbours	☐	☐	☐	☐	☐	
e	laughing/talking own house	☐	☐	☐	☐	☐	
f	children crying own house	☐	☐	☐	☐	☐	
g	children crying/laughing/talking neighbours	☐	☐	☐	☐	☐	

h	own pets	☐	☐	☐	☐	☐
i	radio/tv/music own house	☐	☐	☐	☐	☐
j	pets/radio/tv/music neighbours	☐	☐	☐	☐	☐
k	different, that is	☐	☐	☐	☐	☐

each	at least	at least	at least	never
night	once	once	once	
	a	a	a	
	week	month	year	

a	permanent installations in own house (dish washer, washing-machine, central heating, fan, etc)	☐	☐	☐	☐	☐
b	permanent installations in neighbours houses (dish washer, washing-machine, central heating, fan, etc)	☐	☐	☐	☐	☐
c	sanitary provisions (toilet) own house	☐	☐	☐	☐	☐
d	sanitary provisions (toilet) neighbours	☐	☐	☐	☐	☐
e	laughing/talking own house	☐	☐	☐	☐	☐
f	children crying own house	☐	☐	☐	☐	☐
g	children crying/laughing/talking neighbours	☐	☐	☐	☐	☐
h	own pets	☐	☐	☐	☐	☐
i	radio/tv/music own house	☐	☐	☐	☐	☐
j	pets/radio/tv/music neighbours	☐	☐	☐	☐	☐
k	different, that is	☐	☐	☐	☐	☐

not	0 =	10 =
perceived	not	very
	annoying	much
	at all	annoying

[illegible]

E. Safety**Non-response: E1, E2****Explanation:***The questions relate to your present opinion*

- E1** How do you characterize your own living situation? **(more than one answer possible)**
- ☐ living in the neighbourhood of a nuclear power-station
 - ☐ living in the neighbourhood of a chemical factory
 - ☐ living under a flightpath of a large airport
 - ☐ living along a route for dangerous substances
 - ☐ living in a polder under sea level
 - ☐ living in a busy street
 - ☐ living in the vicinity of a large airport
 - ☐ living on polluted soil
 - ☐ living in a area for agriculture and bulb-growing
 - ☐ I do not know
- E2** How worried or not are you about your own safety in the situations you indicated in E1 **(please, give one answer on each line)**
- | | | | | | | | | | | | |
|--|---------|---------|---|---|---|---|---|---|---|---|----|
| | 0 = | 10 = | | | | | | | | | |
| | not | very | | | | | | | | | |
| | worried | much | | | | | | | | | |
| | at all | worried | | | | | | | | | |
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
- a. living in the neighbourhood of a nuclear power-station
 - b. living in the neighbourhood of a chemical factory
 - c. living under a flightpath of a large airport
 - d. living along a route for dangerous substances
 - e. living in a polder under sea level
 - f. living in a busy street
 - g. living in the vicinity of a large airport
 - h. living on polluted soil
 - i. living in a area for agriculture and bulb-growing

F. Attitude towards Schiphol and aircraft noise**Non-response: F3 ... F8****Explanation:***The questions relate to different periods.*

- F1** Did you start or finish a holiday or business flight to or from Schiphol Airport during the last two years?
- ☐ yes ⇒ **go to question F3**
☐ no
- F2** What was the main reason for not taking a flight from and to Schiphol? **(please, only one answer)**
- ☐ no need to fly
 - ☐ flying is too expensive
 - ☐ fear for flying
 - ☐ for environmental reasons

F3 What is your opinion about the expansion of Schiphol?

- ☐ taken another preferred means of transport
☐ different

0 = very positive 10 = very negative

0	1	2	3	4	5	6	7	8	9	10

F4 Which of the following steps have you or your family members during the last five years taken against aircraft noise or the expansion of Schiphol?
(more than one answer possible)

- ☐ phoned police, municipality or province to complain
☐ went to police, municipality or province
☐ written to police, municipality or province
☐ signed a petition
☐ attended a public meeting or a demonstration
☐ became a member of an organization against aircraft noise
☐ written a letter to a newspaper
☐ phoned the CGS (Commissie Geluidhinder Schiphol)
☐ took steps to move
☐ did nothing
☐ different

F5 Is your work or the work of one of your family members related directly or indirectly to Schiphol?

- ☐ yes
☐ no
☐ not applicable

F6 Were you during the last twelve months ever startled or frightened by the sound of an airplane?

If yes, why were you startled or frightened?
might crash (more than one answer possible)

- ☐ yes
☐ no ⇒ **go to question F7**
☐ no aircraft noise heard
 ⇒ **go to question F7**
☐ I was afraid that the airplane
☐ it sounded different than usual
☐ the noise was very loud
☐ the noise started so suddenly
☐ it reminded me of the war
☐ the sound was squeezing

If yes, how many times were you startled or frightened during the last twelve months?

daily	at least once a week	at least once a month	at least once
☐	☐	☐	☐

F7 How satisfied are you with aircraft noise in the vicinity of your house?

0 =	10 =
not at all	very much
dissatisfied	dissatisfied
0 1 2 3 4 5 6 7 8 9 10	
☐	☐

F8 How worried are you that aircraft noise in the vicinity of your house may cause health complaints?

0 =	10 =
not at all	very much
worried	worried
0 1 2 3 4 5 6 7 8 9 10	
☐	☐

2. Health and sleep

Non-response: 1, 2, 8, 9, 19, 20, 26, 27, 28

Explanation:

The questions relate to the **last twelve months**.

1. How is your health in general?

- ☐ excellent
☐ good
☐ fairly good
☐ sometimes good, sometimes bad
☐ bad

2. Below, a number of health complaints are given. Please indicate beneath question A with yes or no whether it applies to you. If it applies to you, please indicate beneath question B whether this is also applicable at night.

	Question A		Question B	
	no	yes	if yes, also at night	
			no	yes
1. Are you frequently troubled with pain in the chest or the cardiac region?	☐	☐	☐	☐
2. Are you frequently troubled with pain in your gastric region?	☐	☐	☐	☐
3. Are you quickly out of breath?	☐	☐	☐	☐
4. Is your stomach rather often out of order?	☐	☐	☐	☐
5. Do you have complaints about pain in bones and muscles?	☐	☐	☐	☐
6. Are you frequently troubled with pain in the back?	☐	☐	☐	☐

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 7. Do you frequently have feelings of tiredness? | ☐ | ☐ | ☐ | ☐ |
| 8. Are you frequently troubled with headache? | ☐ | ☐ | ☐ | ☐ |
| 9. Are you frequently dizzy? | ☐ | ☐ | ☐ | ☐ |
| 10. Are you frequently troubled with a benumbed feeling or twinklins in your limbs? | ☐ | ☐ | ☐ | ☐ |
| 11. Are you frequently apathetic? | ☐ | ☐ | ☐ | ☐ |
| 12. Do you usually wake up tired and not rested In the morning? | ☐ | ☐ | ☐ | ☐ |
| 13. Are you tired sooner than you consider normal? | ☐ | ☐ | ☐ | ☐ |
| 14. Do you awake at night because you have to go to the bathroom? | ☐ | ☐ | ☐ | ☐ |
| If yes, how many times on average per night? |times | | | |

- | | | | |
|---|-------|--------------------------|--------------------------|
| | | no | yes |
| 3. Did you last year undergo any surgery? | | ☐ | ☐ |
| What was the reason? | ..... |  |  |
| How many nights did you stay in the hospital? | |nights | |

- | | | | |
|--|-------|--------------------------|--------------------------|
| | | no | yes |
| 4. Did something very unpleasant happen to you last year? | | ☐ | ☐ |
| (e.g. severe illness, decease of family or friend, severe road accident, criminal offence) | | | |
| If applicable, indicate the event | ..... |  |  |

- | | | | |
|--|-------|--------------------------|--------------------------|
| | | no | yes |
| 5. Question to women only: | | | |
| Are you pregnant? | | ☐ | ☐ |
| If yes, how many months? | ..... |  |  |
| If yes, does your pregnancy affect your sleep? | | ☐ | ☐ |

- | | | | |
|---|-------|--------------------------|--------------------------|
| | | no | yes |
| 6. Do you ever use drugs? | | ☐ | ☐ |
| If yes, which drugs? | ..... |  |  |
| If yes, are you able to avoid using them without problems during your participation in the investigation? | | ☐ | ☐ |

- | | | | |
|---|-------|--------------------------|--------------------------|
| | | no | yes |
| 7. Do you ever use alcoholic beverages? | | ☐ | ☐ |
| If yes, how many days a week on average? | ..... |  |  |
| If yes, how many glasses a day on average on: | | | |
| a. Monday through Thursday? | ..... |  |  |
| b. Friday through Sunday? | ..... |  |  |

no yes

8. Do you have difficulties in understanding speech in noisy surroundings? ☐ ☐
 If yes, do you have difficulties in understanding speech in quiet surroundings? ☐ ☐
9. Do you wear hearing aids and or are you hard of hearing? ☐ no ☐ yes
10. Do you ever use earplugs or other products to reduce sound during night-time? ☐ never
☐ seldomly, only in exceptional circumstances
☐ seldomly, only in case of extreme loud noise from outside the house
☐ frequently
☐ more than half the nights
☐ (nearly) every night
11. Do you snore while you are asleep? ☐ never ⇒ **go to question 13**
☐ seldom
☐ frequently
☐ more than half the nights
☐ (nearly) each night
☐ do not know
12. How long do you snore on average while you are asleep? ☐ very short
☐ a quarter of an hour
☐ an hour
☐ half the sleep period time
☐ more than half the sleep period time
☐ (nearly) the full sleep period time
☐ do not know
13. Does your partner snore? ☐ never ⇒ **go to question 15**
☐ seldom
☐ frequently
☐ more than half the nights
☐ (nearly) each night
☐ do not know ⇒ **go to question 15**
☐ no bed partner ⇒ **go to question 15**
14. How long does your bed partner snore on average while asleep? ☐ very short
☐ a quarter of an hour
☐ an hour
☐ half the sleep period time
☐ more than half the sleep period time

- ☐ (nearly) the full sleep period time
☐ do not know

15. What is your weight? kg

16. What is your length? cm

Below several types of medicine are specified, which you may be using at present. Sleeping pills are considered separately.

17. Which drugs/medicine(s) do you use
that are *prescribed by your
family doctor or specialist?*
(more than one answer possible)

- ☐ no drugs/medicines
☐ against pain and fever, such as aspirine
☐ against cough, cold, sore throat or influenza
☐ medicine for heart, bloodcirculation and
blood pressure
☐ against nervousness
☐ against pain in the bones/rheumatic pains
☐ antibiotics
☐ against asthma
☐ hormones
☐ against diabetes
☐ laxatives
☐ against allergies, skin troubles
☐ diuretics
☐ against gastric complaints
☐ against depressions
☐ other medicine(s), that is:
.....
☐ type of medicine unknown

18. Which drugs/medicines do you use
without a prescription?
(more than one answer possible)

- ☐ no drugs/medicines
☐ against pain and fever
☐ against cough, cold, sore throat or influenza
☐ vitamins, minerals, tonics
☐ laxatives
☐ against gastric complaints
☐ against nervousness
☐ against pain in the bones/rheumatic pains
☐ against skin troubles
☐ homeopatics
☐ other medicines, that is:
.....

19. How often do you use sleeping pills or tranquillizers on behalf of your sleep?
- How many months do you use sleeping pills or tranquillizers on behalf of your sleep?
- How do you procure these sleeping pills or tranquillizers?
- Please fill out the type of sleeping pills or tranquillizers as complete as possible
-
20. Do you use common or garden means to fall asleep?
- If yes, what?.....
21. At what time are you usually going to sleep on weekdays?
22. At what time do you usually wake up on weekdays?
23. At what time are you usually going to sleep during the weekends?
24. At what time do you usually wake up during weekends?
- ☐ each night
- ☐ frequently
- ☐ now and then
- ☐ never ⇒ **go to question 20**
- ☐ less than one month
- ☐ between one and twelve months
- ☐ longer than twelve months
- ☐ prescription by family doctor or specialist
- ☐ not on prescription, through pharmacy or chemist
- ☐ different
- ☐ always
- ☐ often
- ☐ sometimes
- ☐ seldom
- ☐ never
- ☐ before 22.00 o'clock
- ☐ between 22.00 and 23.00 o'clock
- ☐ between 23.00 and 24.00 o'clock
- ☐ after 24.00 o'clock
- ☐ before 6.00 o'clock
- ☐ between 6.00 and 7.00 o'clock
- ☐ between 7.00 and 8.00 o'clock
- ☐ between 8.00 and 9.00 o'clock
- ☐ after 9.00 o'clock
- ☐ before 22.00 o'clock
- ☐ between 22.00 and 23.00 o'clock
- ☐ between 23.00 and 24.00 o'clock
- ☐ between 24.00 and 1.00 o'clock
- ☐ after 1.00 o'clock
- ☐ before 08.00 o'clock
- ☐ between 8.00 and 9.00 o'clock
- ☐ between 9.00 and 10.00 o'clock
- ☐ after 10.00 o'clock

- ☐ always
☐ often
☐ sometimes
☐ seldom
☐ never

- [illegible]

- ☐ often I do not sleep a moment
- ☐ often I get out of bed during the night
- ☐ often I toss about in bed during the night
- ☐ often I wake up several times during the night
- ☐ I think that I usually sleep very bad
- ☐ often I do not sleep more than five hours a night
- ☐ I usually fall asleep easily
- ☐ I usually stay awake longer than half an hour after I went to bed
- ☐ it is difficult to fall asleep after awakening in the course of the night
- ☐ I usually feel rested in the morning after rising

- (the answer most applicable on each line)

- [illegible]

Explanation:

1 = agree completely

2 = agree rather

3 = agree somewhat

4 = *disagree somewhat*

5=disagree rather

6 = disagree completely

Response possibilities

1

2

3

4

5

6

☐☐☐

9

☐☐

1 = completely agree

6 = *completely disagree*

1

2

3

4

5

6

- [illegible]

- | | | | | | | | |
|-----|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 17. | Motorcycles should be required to have bigger mufflers. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18. | I find it hard to relax in a noisy situation. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 19. | I get mad at people who make noise that keeps
me from falling asleep or getting work done. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 20. | I wouldn't mind living in an apartment with thin walls. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21. | I am sensitive to noise. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

4. Coping with problems and events**Non-response: not*****Explanation:***

People react differently when they are faced with problems or unpleasant events. How an individual reacts depends on the nature of the problem and its severeness. However, the individual reactions are IN GENERAL more often in one direction than in the other.

Hereafter actions to problems are given PLEASE INDICATE AFTER EACH STATEMENT HOW YOU WOULD REACT BY PUTTING A CROSS IN ONE BOX. There are no good or wrong answers. Please do not forget to reply on each line to a statement.

- | | <i>seldom
or never</i> | <i>some-
times</i> | <i>often</i> | <i>very
often</i> |
|---|----------------------------|--------------------------|--------------------------|--------------------------|
| 1. Give in to avoid difficult situations..... | ☐ | ☐ | ☐ | ☐ |
| 2. Resign yourself with the course of events | ☐ | ☐ | ☐ | ☐ |
| 3. Share your cares with somebody..... | ☐ | ☐ | ☐ | ☐ |
| 4. Intervene immediately if there are problems..... | ☐ | ☐ | ☐ | ☐ |
| 5. Look for diversion | ☐ | ☐ | ☐ | ☐ |
| 6. Look at the problem from all angles..... | ☐ | ☐ | ☐ | ☐ |
| 7. Avoid difficult situations as much as possible..... | ☐ | ☐ | ☐ | ☐ |
| 8. Invent various solutions to solve a problem..... | ☐ | ☐ | ☐ | ☐ |
| 9. Act purposefully to solve a problem..... | ☐ | ☐ | ☐ | ☐ |
| 10. Ask somebody for assistance..... | ☐ | ☐ | ☐ | ☐ |
| 11. Order the various aspects of a problem..... | ☐ | ☐ | ☐ | ☐ |
| 12. Think about something not related to the problem..... | ☐ | ☐ | ☐ | ☐ |
| 13. Show your feelings..... | ☐ | ☐ | ☐ | ☐ |
| 14. Look for comfort and comprehension..... | ☐ | ☐ | ☐ | ☐ |
| 15. Show that you are worried about something | ☐ | ☐ | ☐ | ☐ |

8 Diaries

8.1 Morning diary

ID CODE

Sleep disturbance

Morning diary

	Date	_____ day, ____ - ____ - ____
1	Good morning 1. What day is it today?	☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
2	2. How rested do you feel at this moment?	1 ☐ extremely alert 2 ☐ 3 ☐ alert 4 ☐ 5 ☐ neither sleepy or alert 6 ☐ 7 ☐ sleepy, but not fighting sleep 8 ☐ 9 ☐ extremely sleepy, fighting sleep, effort to stay awake

3	Did you use sleeping pills last evening or night?	1 ☐ yes → Go to question 3a 2 ☐ no → Go to question 4
3a	At what time did you use them?	.....
4	Did you use home medicines last evening or night to fall asleep?	1 ☐ yes → Go to question 4a 2 ☐ nee → Go to question 5
4a	At what time did you use them?	.....
4b	What did you use?	.....
5	At what time did you go start trying to go to sleep?	.....
5a	Did you press the marker at that time?	1 ☐ yes → Go to question 7 2 ☐ no → Go to question 7 3 ☐ Not at the right time → Go to question 6
6	Should you have pressed the marker earlier or later?	1 ☐ earlier → Go to question 6a 2 ☐ later → Go to question 6b
6a	How many minutes earlier?	 minutes
6b	How many minutes later?	 minutes
7	How difficult was it yesterday to fall asleep? 0 = not difficult at all 10 = very difficult	012345678910
8	How long did it take you to fall asleep?	 minutes
9	If you had problems falling asleep last night, what was the reason?	1 ☐ Worries → Go to question 10 2 ☐ Weather (cold, hot, windy) → Go to question 10 3 ☐ Illness, not feeling well → Go to question 10 4 ☐ Noises in the house, at neighbours house

		→ Go to question 10 5 ☐ Noises from outside → Go to question 9a 6 ☐ Other reason → Go to question 9b 7 ☐ No reason → Go to question 10											
9a	Describe the noises which caused you problems to fall asleep												
9b	Describe the other reason which caused you problems to fall asleep												
10	Did you use protection against noises, such as earplugs?	1 ☐ no 2 ☐ yes, a part of the night 3 ☐ yes, whole night											
11	How well did you sleep last night? 0 = very bad 10 = very well	0 1 2 3 4 5 6 7 8 9 10 <table border="1" style="margin: auto;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>											
12	Did you awake and fell asleep again in the course of the night?	1 ☐ yes → Go to question 12a 2 ☐ no → Go to question 14											
12a	How many times did you wake up during the night?	 times											
12b	What was the reason or were the reasons of waking up in the course of the night? (question is repeated the required number of times)	1 ☐ Sanitary reasons, thirsty, hungry → Go to question 12e 2 ☐ Looking after inmate → Go to question 12e 3 ☐ Worries → Go to question 12e 4 ☐ Weather (cold, hot, windy) → Go to question 12e 5 ☐ Illness, not feeling well → Go to question 12e 6 ☐ Noises in the house, at neighbours house → Go to question 12e 7 ☐ Noises from outside → Go to question 12c 8 ☐ Other → Go to question 12d											

12c	Describe the noises which did wake you up	.....
12d	Describe the other reason which did wake you up	.....
13	Did you press the marker when you woke up during the night?	1 ☐ yes (each time) 2 ☐ sometimes 3 ☐ I suppose so, but I am not sure 4 ☐ I do not remember 5 ☐ no (not once)
14	At what time did you wake?	hours
14a	Did you press the marker when you woke?	1 ☐ yes 2 ☐ I do not know 3 ☐ no
15	How did you wake?	1 ☐ spontaneously → Go to question 16 2 ☐ by alarm clock/clockradio → Go to question 16 3 ☐ awakened by a member of the family → Go to question 16 4 ☐ in another way → Go to question 15a
15a	The other way I woke is	.....
16	At what time did you get out of bed?	.....
17	What was the reason to get out of bed? ☐ ☐ ☐ ☐	1 ☐ To go to work/start working → Go to question 18 2 ☐ To take care of family members → Go to question 18 3 ☐ Other obligations → Go to question 18 4 ☐ a habit, without a specific reason → Go to question 18 5 ☐ other reason → Go to question 17a
17a	I got out of bed for the following other reason	.....

18	How well did you sleep tonight?	1 ☐ very well 2 ☐ good 3 ☐ reasonable 4 ☐ rather bad 5 ☐ bad
19	What was at bedtime the position of the window of your bedroom?	1 ☐ Fully closed 2 ☐ Small opening 3 ☐ Opened at hand's breath 4 ☐ Half opened 5 ☐ Fully opened
20	Was this position changed during the night?	1 ☐ yes → Go to question 20a 2 ☐ no → End of diary
20a	At what time?.	.....
20b	What was the position after the change?	1 ☐ Fully closed 2 ☐ Small opening 3 ☐ Opened at hand's breath 4 ☐ Half opened 5 ☐ Fully opened
20c	What was the reason for the change of the position of the window?	.....

8.2 Evening diary

ID CODE					

Sleep disturbance	Evening diary
-------------------	---------------

	Date	_____ day, ____ - ____ - _____
1	How sleepy do you feel at this moment?	1 ☐ extremely alert 2 ☐ 3 ☐ alert 4 ☐ 5 ☐ neither sleepy or alert 6 ☐ 7 ☐ sleepy, but not fighting sleep 8 ☐ 9 ☐ extremely sleepy, fighting sleep, effort to stay awake
2-6		Score at about 10.00 hours Score at about 12.30 hours Score at about 15.00 hours Score at about 17.30 hours Score at about 20.00 hours
7		1 ☐ yes → Go to question 7a 2 ☐ no → Go to question 8
7a	How long did you sleep before 18.00 hours?	1 ☐ less than 15 minutes 2 ☐ 15 to 30 minutes 3 ☐ 30 to 60 minutes

		4 ☐ more than 60 minutes											
8	Did you take any naps today after 18.00 hours?	1 ☐ yes → Go to question 8a 2 ☐ no → Go to question 9											
8a	How long did you sleep after 18.00 hours?	1 ☐ less than 15 minutes 2 ☐ 15 to 30 minutes 3 ☐ 30 to 60 minutes 4 ☐ more than 60 minutes											
9	Did anything unusual and pleasant happen to you today?	1 ☐ yes → Go to question 9a 2 ☐ no → Go to question 10											
9a	If yes, what?												
10	Did anything unusual and unpleasant happen to you today?	1 ☐ yes → Go to question 10a 2 ☐ no → Go to question 11											
10a	If yes, what?												
11	Did the sounds in your vicinity (work, at home, otherwise) annoy you today?	1 ☐ yes → Go to question 11a 2 ☐ no → Go to question 12											
11a	How much did the sounds annoy you? 0 = not at all 10 = very much	0 1 2 3 4 5 6 7 8 9 10 <table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>											
12	Did the sounds in your vicinity (work, at home, otherwise) annoy you this evening?	1 ☐ yes → Go to question 12a 2 ☐ no → Go to question 13											
12a	How much did the sounds annoy you? 0 = not at all 10 = very much	0 1 2 3 4 5 6 7 8 9 10 <table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>											
13	Did you have serious worries today (including the evening)?	1 ☐ yes → Go to question 13a 2 ☐ no → Go to question 14 Different											

13a	If yes, what caused the worries?	1 ☐ Problems, illness partner or other family members 2 ☐ Problems, illness friends or family 3 ☐ Financial problems 4 ☐ Job-related problems 5 ☐ Other worries
14	What did you do this evening More than one answer possible	1 ☐ Listening to TV, radio, music, reading → Go to question 15 2 ☐ Playing music, games → Go to question 15 3 ☐ Working at home, studying, internetten → Go to question 15 4 ☐ Meeting, working (outdoors) → Go to question 15 5 ☐ Going to the cinema, theatre → Go to question 15 6 ☐ Doing sports → Go to question 15 7 ☐ Being on the razzle(-dazzle), going to a pub → Go to question 15 8 ☐ Walking the dog, going for a walk → Go to question 15 9 ☐ Receiving guests, going for a visit → Go to question 15 10 ☐ Other activity → Go to question 14a
14a	Describe the other activity	.....
15	Did you smoke this evening after supper?	1 ☐ yes → Go to question 15a 2 ☐ no → Go to question 16
15a	How many cigarettes did you smoke this evening?	.....

15b	How many self made cigarettes did you smoke this evening?	.....
15c	How many cigars did you smoke this evening?	.....
15d	How many pipes did you smoke this evening?	.....
16	Did you drink any coffee, tea, coke or energy drinks (e.g. 'red bull') this evening?	1 ☐ yes → Go to question 16a 2 ☐ no → Go to question 17
16a	If yes, how many cups or glasses? (do not include decaffeinated products)	.....
17	Did you take any alcoholic drinks after 17.00 hours?	1 ☐ yes → Go to question 17a 2 ☐ no → Go to question 18
17a	If so, how many glasses?	.....
18	Did you take any medication other than your normal medicines today?	1 ☐ yes → Go to question 18a 2 ☐ no → Go to question 19
18a	What medication and for what reason?	.....
19	Did you take off the actimeter today?	1 ☐ yes, once → Go to question 19a 1 ☐ yes, two times → Go to question 19a,b 1 ☐ yes, three times → Go to question 19a,b,c 2 ☐ no → The diary is finished.
19a	When did you take off and put on again the actimeter?	.....
19b	When did you take off and put on again the actimeter for the second time?	.....
19c	When did you take off and put on again the actimeter for the third time?	

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