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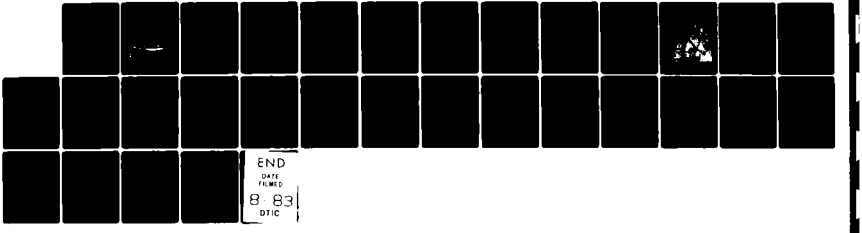

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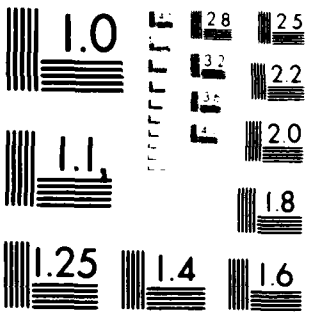
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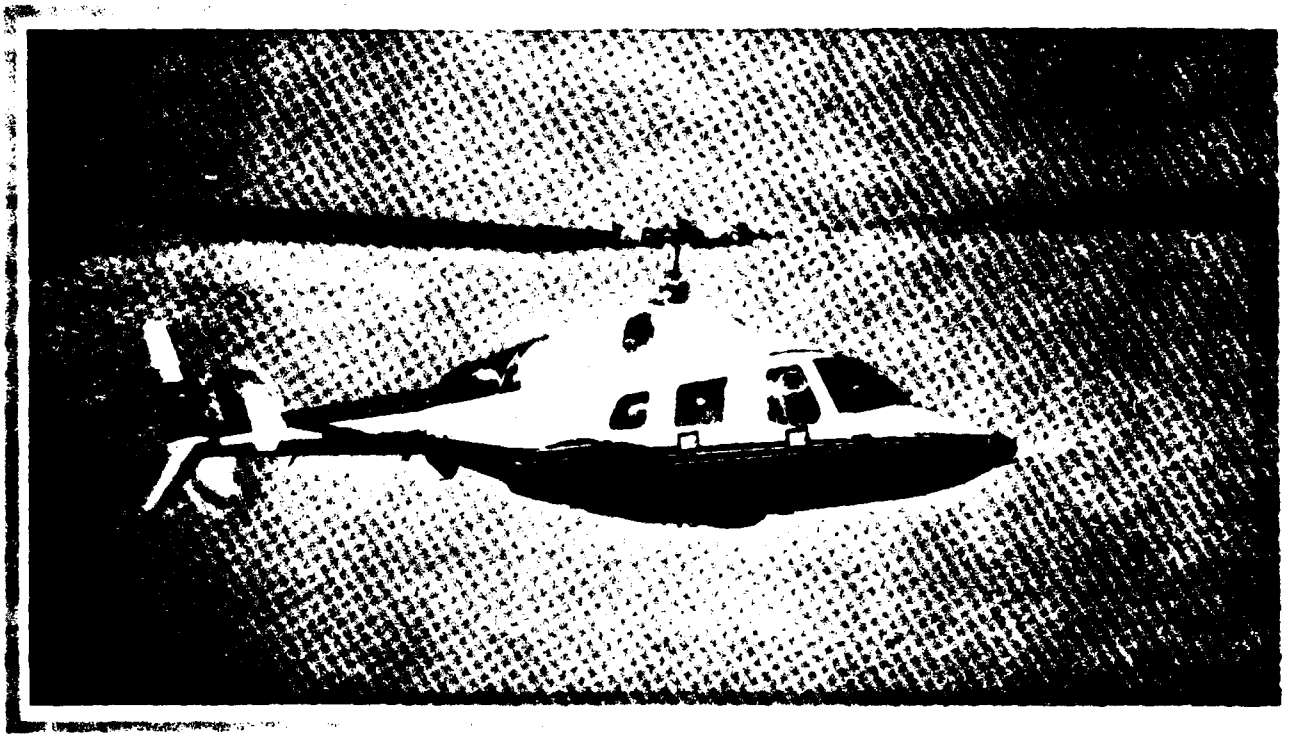
Helicopter Noise Survey Conducted at Norwood Massachusetts on April 27, 1983

by

Steven R Albersheim



U.S. Department of Transportation

Federal Aviation Administration

Office of Environment and Energy

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16. Abstract

The FAA conducted a noise measurement survey of helicopter operations at Norwood, Massachusetts on April 27, 1983. The purpose was to gather needed information for defining noise problems with in-service helicopter operations at a general aviation airport in a suburban area.

Noise level data were sampled over a period of approximately 8 hours. The data collected reflect noise levels at two different residential sites from all local source of noise during that particular sampling period. These data from helicopter "target of opportunity" are termed "survey data" as opposed to "controlled test data" in order to reflect the limited control factors which contribute to the variability of the measured noise.

17. Key Words	18. Distribution Statement
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1.0 Introduction

The FAA is in the process of performing noise field surveys of helicopter operations in urban areas within the United States. The purpose is to gather needed information for defining noise problems with in-service helicopter operations within urban and suburban areas.

On April 27, 1983, the FAA conducted a noise survey at the Norwood Municipal Airport. Noise level data measured for statistically valid sample periods at two selected sites, reflect the noise levels at these sites from all local sources during that particular day. The noise data as monitored with helicopter operations are "targets of opportunity" for the "survey data" as opposed to "controlled test data" in order to reflect the limited control over factors which contribute to the variability of the measured noise levels.

1.1 Selection Criteria for Heliport Noise Survey

In selecting a heliport or an airport to be included in this survey the following criteria were used:

- location of people near the heliport which could be impacted by daily operations
- sufficient number of operations (i.e., landings and takeoffs) to signify a potential noise problem
- good ground access encouraging use and growth of helicopter operations

- potential for future growth and expansion of operations
- availability of monitoring locations to obtain reasonable community noise levels with respect to helicopter operations

Evaluation of the criteria is more or less a subjective analysis for selecting a heliport for monitoring. Location of people near the heliport is considered the most important factor and therefore has greater impact than any other factor for including the heliport in the survey.

On April 27, 1983, a noise survey was performed at the Norwood Municipal Airport to evaluate the impact of helicopter operations at this facility on the residential areas adjacent to the airport. Norwood was selected as a candidate site because of the following reasons: (1) there have been reported noise complaints from helicopter operations; (2) the ingress and egress routes of the helicopters and the hangar facilities for helicopter maintenance are in close proximity to residential areas; (3) there is the potential for growth in helicopter operations; and (4) monitoring sites could be selected which could portray community noise levels in a residential area with respect to a limited number of helicopter operations.

2.0 Site Description

2.1 Norwood Municipal Airport

The Norwood Municipal Airport is located approximately 15 miles southwest of Boston Logan International Airport. The airport is owned by the city of Norwood and operated by Boston Metropolitan Airport (BMA). The Norwood area is primarily residential with some light industry.

Figure 1 shows the location of the airport in relation to the nearby residential communities. Figure 2 shows the approach and departure paths for noise abatement procedures at Norwood. Helicopter operators are to follow the same procedures as General Aviation (Appendix A).

The approved traffic patterns keep aircraft away from noise sensitive areas as indicated in Figure 2. However, there are occasions when aircraft will depart from the approved procedures resulting in noise complaints by neighbors.

The airport serves as a helicopter base for T.V. Channel 4, State Police, and New England Power. The following helicopters operate out this facility: Bell 206L, Bell 47 and Hughes 500-C. Both Bells normally are parked and serviced at hangar 5, whereas the Hughes 500 is located at hangar Nominei Trust which is north of hangar 5. This hangar facility is also much farther away from the residential area.

Helicopters making an approach or a departure are normally expected to follow the approved noise abatement procedures. Their final approach and taxi procedure is to stay just west of Runway 17/35 placing them over a grass median between the taxi way and the runway (Figures 3a & 3b). Helicopters heading to hangar facility 5 air taxi at about 30 ft above ground level. Transient helicopters using the airport follow the same approach procedure; however, they park out on a grass field near the runway.

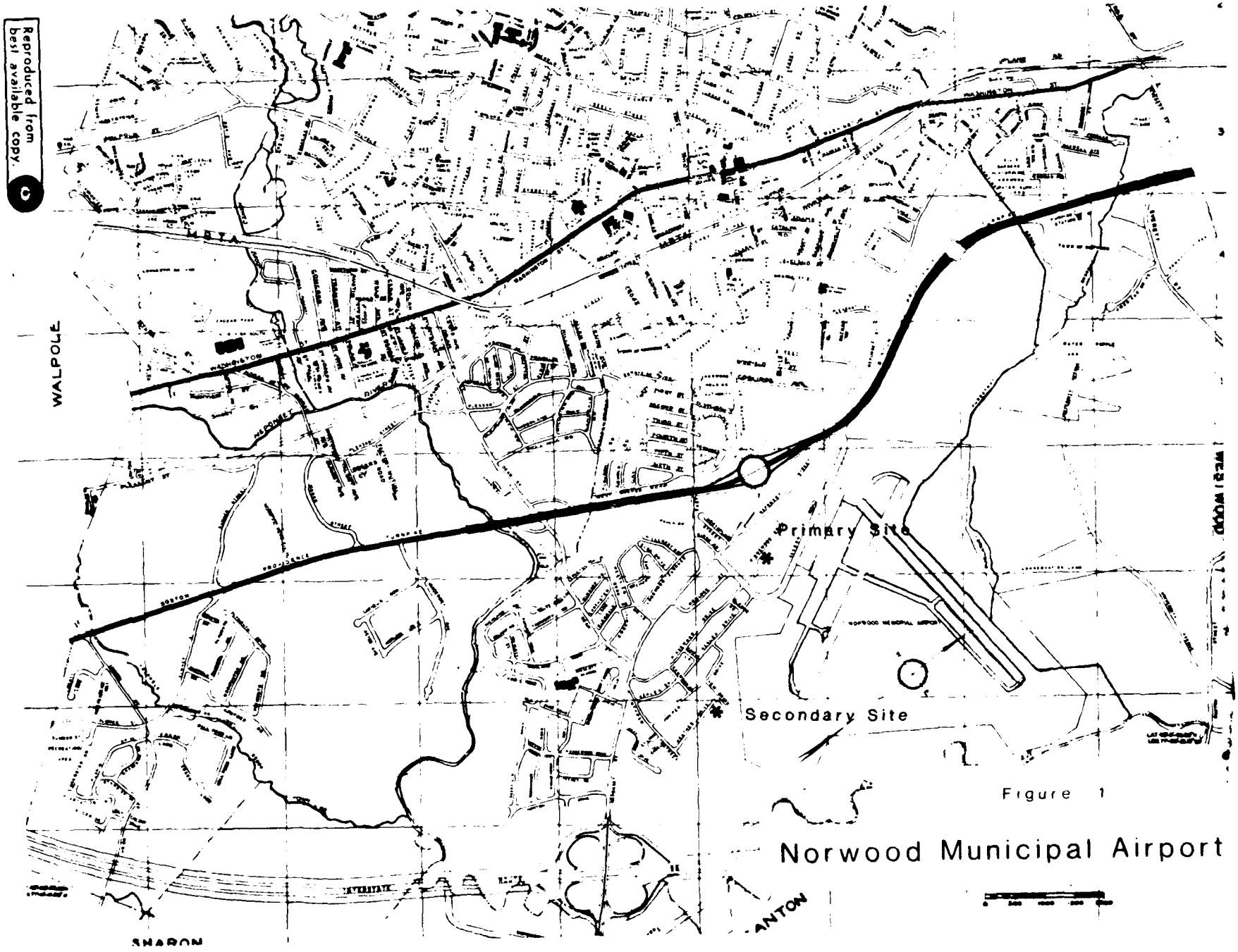


Figure 1

Norwood Municipal Airport

Norwood Noise Abatement Procedures

RECOMMENDED VFR DEPARTURE ROUTES

RECOMMENDED TAXI PLANS & TRAFFIC PATTERNS

NOISE SENSITIVE AREAS

N

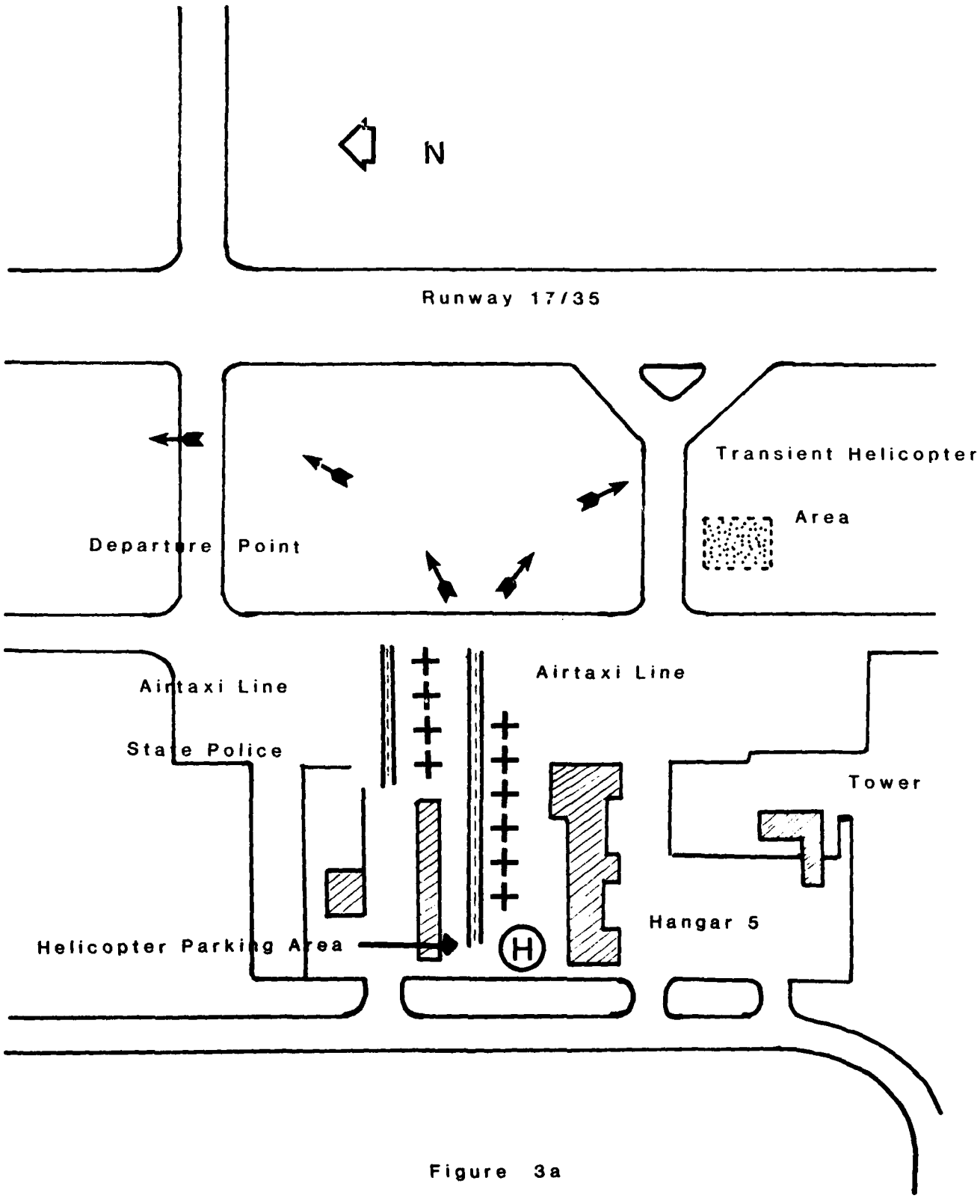


Figure 3a

Helicopter Parking Facilities at Hangar 5

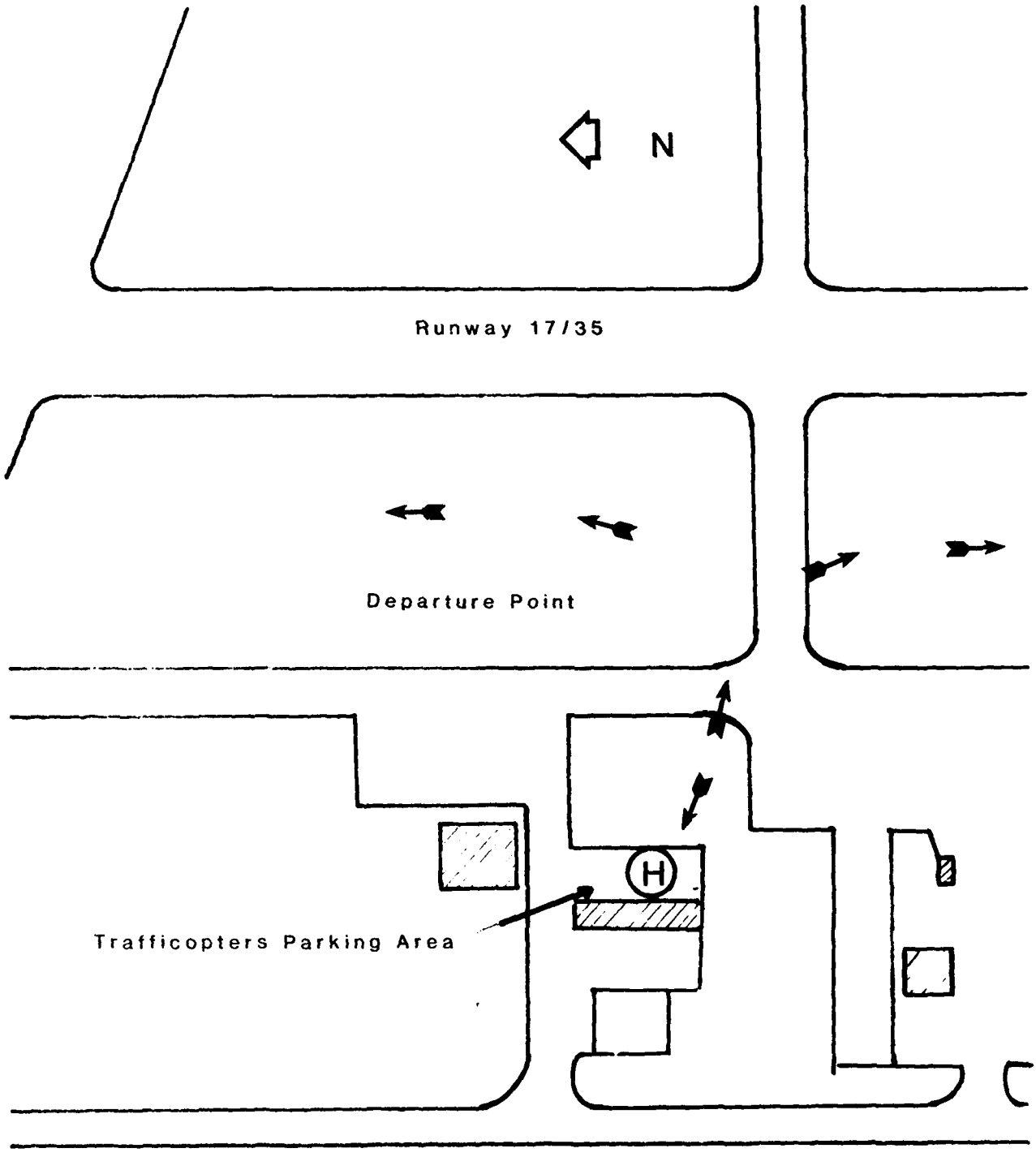


Figure 3b

Helicopter Facilities at Hangar Nominei Trust

3.0 Noise Survey

3.1 Test Approach

GEN RAD 1988 and 1945 noise monitoring equipment were used at selected monitoring sites. These systems computed the L_{eq} for a defined sample period and recorded the maximum noise level (L_{MAX}) on the A-weighted scale. (See Appendix B for definitions of various sound levels.) The GEN RAD 1945 Community Noise Analyzer (CNA) also provided the statistical distribution of the exceedance of noise levels. Graphic level time-history recordings were also produced at both monitoring sites. The GLR recordings provided a hard copy record of the temporal changes of noise levels observed during sampling periods. Operators noted the local intrusive sounds in a log and on the graphic level recorder.

3.2 Noise Measurement Equipment

At the primary site a GEN RAD 1988 Precision Integrating Sound Level Meter (ISLM) with DC output was connected to a Metrosonics 404 Graphic Level Recorder. At the secondary site a GEN RAD 1945 (CNA) with DC output was connected to a Metrosonics 404 Graphic Level Recorder. Each system powered a P-42 microphone preamplifier driving a GEN RAD, 1/2 inch electret microphone. The microphone-preamplifier assembly was mounted five (5) feet above ground level with the microphone oriented in a straight-up position. The GLR operated at a paper transport speed of 24 seconds per centimeter (150 cm/hr). Each instrument was calibrated before and after each survey measurement period. During the sampling period additional calibrations were taken between the initial and final calibrations to check for drift in the system.

Each system deployed was capable of collecting maximum A-weighted sound level, integration time, and equivalent sound level. The data presented in this report are a compilation of these acoustical measurements. A schematic of the acoustical measurement system is shown in Figure 4.

4.1 Monitoring Sites

Figure 1 shows the respective locations of the two monitoring sites. The primary site was located on Ridgewood Drive. The microphone was located on a tripod on the grass medium strip between the sidewalk and the street. The 1988 was deployed at this site. The site was situated so that the microphone was in direct line with hangar 5 where the helicopters are serviced. The site was approximately 1000 ft from hangar 5. The purpose of monitoring at this location was to assess the noise impact on this residential area from taxiing helicopters and routine maintenance of helicopters.

The secondary site was located at Yew and Heather Drive. The microphone was located on a tripod on the grass medium strip between the sidewalk and the street. The CNA was deployed at this site. The purpose of monitoring at this location was to assess the noise impact on this residential area from normal routine ingress and egress of helicopters on runway 17/35. This site was located approximately 1400 ft from the glide slope for this runway. It should be noted that runway 17/35 was closed the day of monitoring due to repair work being performed. General aviation aircraft used runway 10/28 for approaches and departures. Most aircraft were departing to the northwest this day. There were no jet

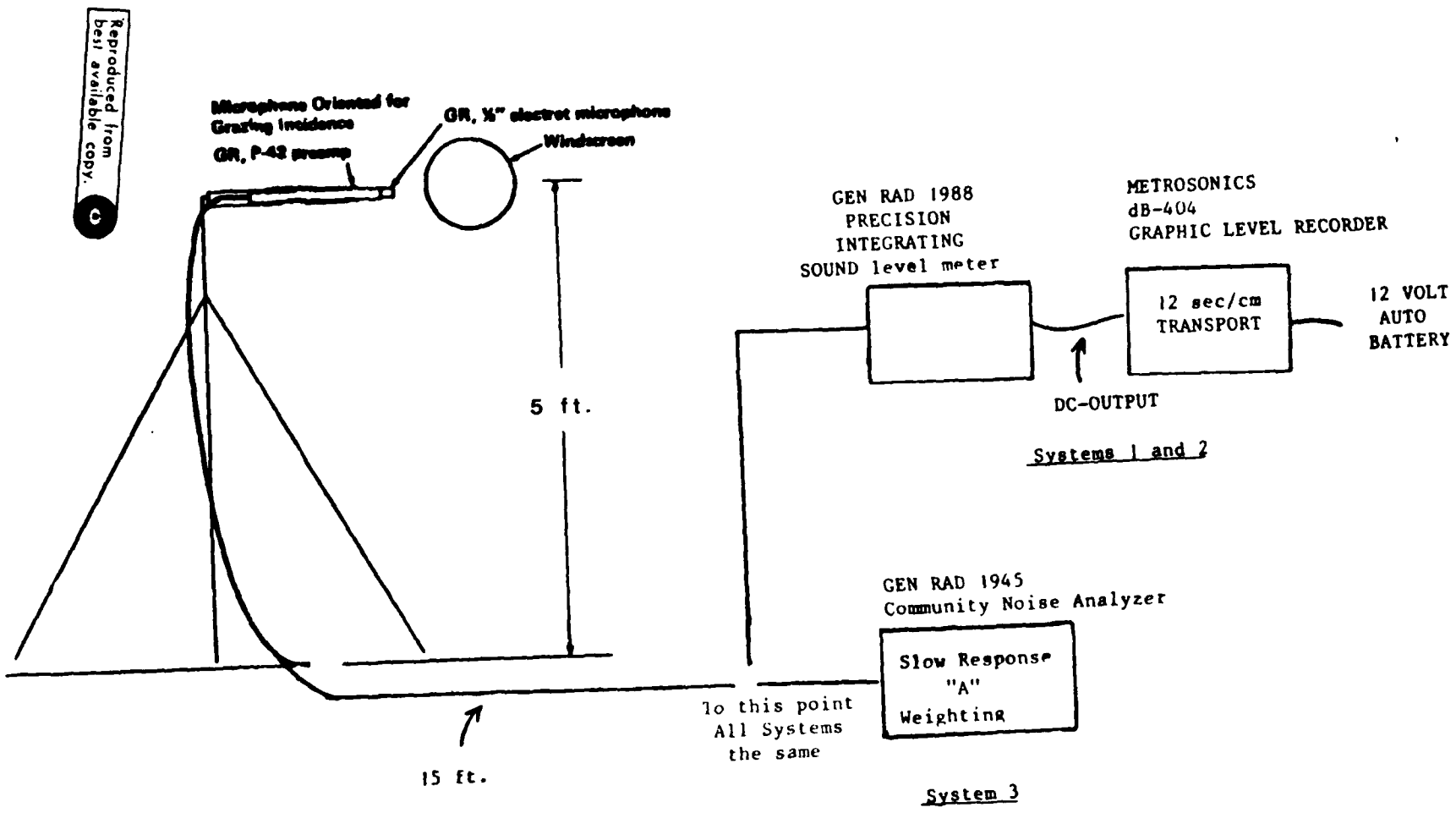


Figure 4 Noise Measurement System

general aviation observed during the sampling period. However, helicopter operators were requested to make their normal approach along runway 17/35 and normal taxiing procedure.

5.0 Discussion of the Data

5.1 Weather and View Dr

Sampling of noise occurred between the hours of approximately 0700 to 1700 hours with a break during 1145 to 1400 hours. Table 1 presents the statistical distribution of exceedance of noise levels for selected hourly samples. The statistical distributions for the first two hours were lost due to questionable values recorded in several statistical categories. The system was subsequently checked out for possible malfunctions. None was found; therefore, the L_{MAX} values were usable and considered valid. Table 2 presents a listing of selected examples of the L_{MAX} for individual events. The loudest source of noise recorded at this site was associated with a toy tricycle which passed by the microphone at a distance of approximately 15 ft, however, this was not the predominant source of noise at this site. In reviewing the statistical distribution of the data and L_{MAX} as presented in Tables 1 and 2 respectively, there is very little variation in the noise levels in this residential area. Figure 5 presents a graphical view of noise levels for various sources of noise. The residual noise level which can be represented by L_{90} (i.e., the noise level exceeded 90 percent of the time) was greater than 45 dB(A). In comparing this value with the L_{50} (average of 49 dB(A)) and the L_{eq} (average of 52.8) there is very little variation. Therefore, it can be seen that the noise levels were constant throughout the day.

In examining the L_{MAX} data it is clearly seen that helicopters making approaches to the airport were not any noisier than general aviation aircraft using this facility. However, because the number

TABLE 1

STATISTICAL DISTRIBUTION OF NOISE LEVELS AS MEASURED AT YEW AND HEATHER DR, NORWOOD MASSACHUSETTS ON APRIL 27, 1983

Start Time	End Time	L_{MAX}	L_{MIN}	L_1	L_5	L_{10}	L_{20}	L_{50}	L_{90}	L_{99}	L_{eq}
9:22	10:22	66	42	63	*	54	*	*	45	44	52
10:39	11:39	69	40	61	*	55	53	49	45	43	52
1:42	2:42	69	42	65	59	56	53	50	47	45	54
2:46	3:46	71	43	62	58	55	53	49	46	44	52
3:51	4:52	74	41	64	59	57	54	49	44	42	62

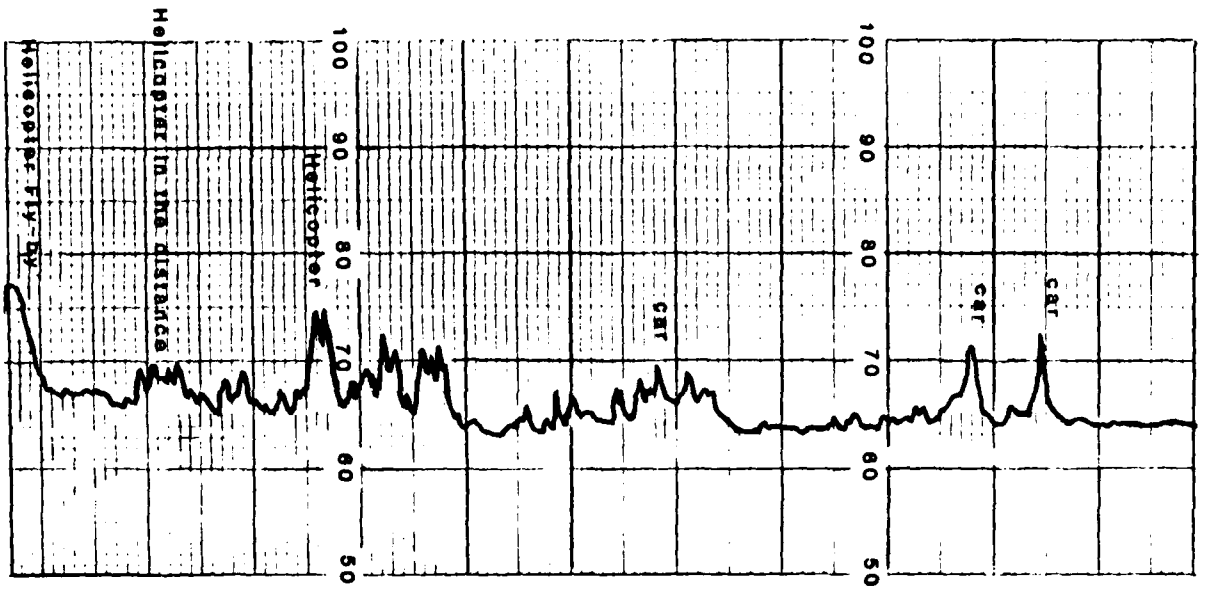
* Lost data

TABLE 2

SELECTED MAXIMUM SLOW RESPONSE
NOISE LEVELS MEASURED AT YEW AND
HEATHER DR, NORWOOD, MASSACHUSETTS APRIL 27, 1983

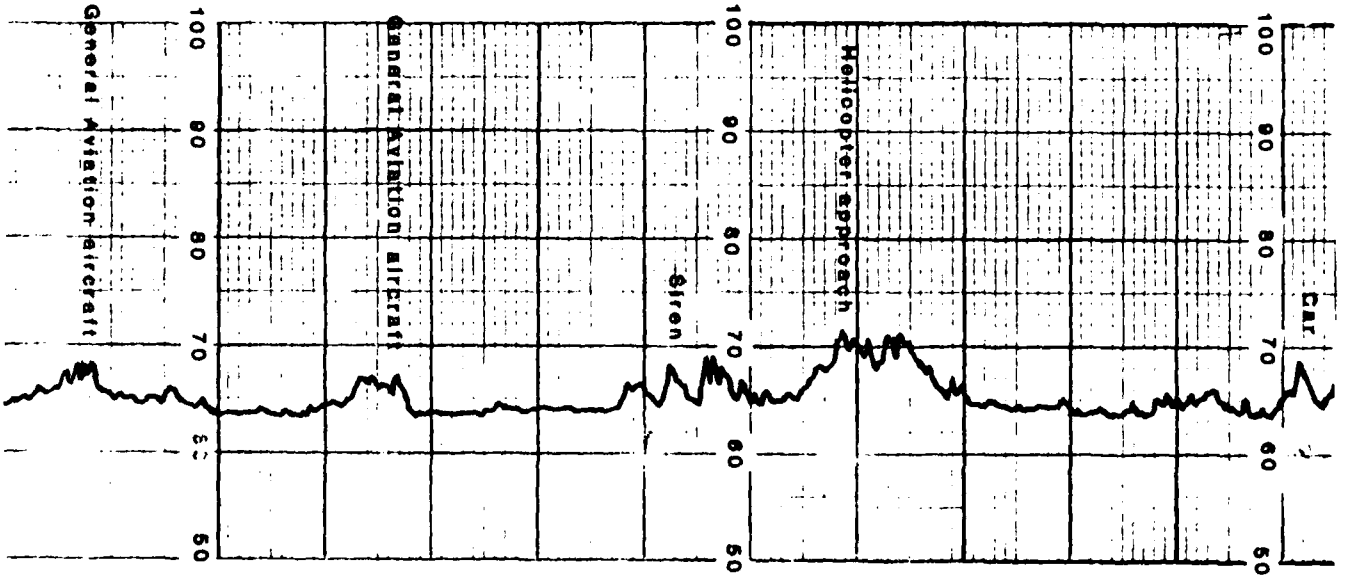
TIME OF DAY	DESCRIPTION OF EVENT	MAXIMUM dB(A)
MORNING START 0700 HRS	Train Whistle in Distance	57.0
	Helicopter	57.7
	Chirping Bird	61.8
	Construction at Airport	55.0
	General Aviation Aircraft Takeoff	59.0
	Helicopter in the Distance	54.0
	Helicopter Approaching	63.0
	Car Pass-by	57.8
	General Aviation Aircraft Directly Overhead	77.0
	General Aviation Aircraft Takeoft	61.0
	Car Pass-by	64.8
	General Aviation Aircraft Takeoff	55.3
	Helicopter Fly-by	68.3
	Helicopter Circling	57.8
	Helicopter Blade Slap in the Distance	56.2
	General Aviation Aircraft & Helicopter	63.5
	Car Horn	59.1
	General Aviation Aircraft Takeoff	54.0
	Helicopter Fly-by at 1000 + ft.	56.0
	High Altitude Jet Aircraft Overhead	57.5
	General Aviation Aircraft Takeoff	54.4
	Helicopter Fly-by Over Neighborhood	74.2
	General Aviation Aircraft Takeoff	61.8
	Car Pass-by	58.5
AFTERNOON START 1:42	Helicopter Fly-by	66.0
	Helicopter Fly-by	61.0
	General Aviation Aircraft	56.0
	General Aviation Aircraft	65.0
	Car Pass-by	66.0
	Children Playing	61.0
	General Aviation Aircraft Car Pass-by	69.4
	Two Cars Pass-by	65.0
	Bird Chirping	59.0
	General Aviation Aircraft Takeoff	62.0

TIME OF DAY	DESCRIPTION OF EVENT	MAXIMUM dB(A)
AFTERNOON START		
1:42	Children Yelling	71.0
	General Aviation Aircraft Takeoff and Car Pass-by	66.0
	Jet Aircraft at High Altitude	64.0
	Pick-up Truck Pass-by	67.0
	Car Pass-by	62.0
	Helicopter	58.0
	Big Wheel (toy tricycle)	74.4
	Pick-up Truck	68.0
	Car Pass-by	66.5
	Car Pass-by	60.0
	Car Pass-by	67.5
	General Aviation Aircraft Takeoff	63.0



dB(A)

From run 4 of the CNA



dB(A)

From run 1 of the CNA

Figure 5 Time History of Selected Noise Events at Heather and Yew Dr.

of general aviation operations is so much greater than the helicopter operations the general aviation aircraft will have a greater influence on raising the L_{eq} in the area. Even though some of the noise events associated with helicopter operations approached the levels of general aviation aircraft, the number of operations is practically insignificant and would not change the L_{eq} as measured during the survey at this site.

5.2 Ridgewood Dr

Sampling of noise occurred between the hours of approximately 0700 to 1700 hours with a break during 1145 to 1400 hours. Table 3 presents selected L_{MAX} values observed during the survey and Table 4 presents the L_{eq} and L_{MAX} for various sampling periods. During the first two sampling periods L_{eq} values were not obtained because of overloads to the 1988 system. This was the result of two intrusive noise events which exceeded the range setting of the 1988. When this occurred, real time integration of L_{eq} stopped, however, the L_{MAX} values of events which occurred before the intrusive event are still considered valid.

The loudest source of noise during the survey was a motorcycle which passed by the microphone at a distance of approximately 15-20 ft. The L_{MAX} recorded for this event was 96.1 dB(A). The second most intrusive noise event was a school bus pass-by which was associated with an L_{MAX} of 80 dB(A). However, the most significant contributors to raising the L_{eq} were the numerous departures of general aviation aircraft. Aircraft operations on this day were departing to the northwest and then turning to the left behind the residential neighborhood where the monitor was located.

In general most general aviation aircraft takeoffs were associated with L_{MAX} ranging from 60 to 70 dB(A). The highest L_{MAX} observed was 78 dB(A). During the survey periods 111 general aviation takeoffs were observed. When comparing the number of helicopter operations with respect to general aviation operations and the L_{MAX} observed for helicopters operating out of the hangar 5 facility, the noise associated with the helicopters would not change the L_{eq}. The highest L_{MAX} noted for helicopter operations was 71.7 dB(A). Most helicopter operations had a L_{MAX} in the low 60's. The average L_{eq} calculated with helicopter operations was 56.2 dB(A) and without helicopter operations it was 58.5 dB(A). In essence there was no real change in the L_{eq} with or without helicopters. Figure 6 presents a graphical view of noise levels for various sources of noise.

Perhaps the most interesting observation noted with helicopters was that during periods when the helicopters were idling at hangar 5 during their 2-minute shut down period the noise level observed at the monitoring site was on the order of 50-52 dB(A). During periods when there were no other sources of noise the minimum noise level being recorded was in the range of 44-46 dB(A). Therefore, it is shown that the helicopter raised the noise level above the base but noise levels associated with helicopter operations are so much lower than the general aviation that they do not change the L_{eq}.

TABLE 3

SELECTED MAXIMUM SLOW RESPONSE NOISE LEVELS
AS MEASURED AT RIDGEWOOD DR
APRIL 27, 1983

TIME OF DAY	DESCRIPTION OF EVENT	MAXIMUM dB(A)
MORNING START		
0700	General Aviation Aircraft Takeoff	67
	School Bus Departing	75
	Helicopter Idling on Pad	60
	Helicopter Taxiing/Departing	62
	Training Whistle in the Distance	65
	Car Door Slams	59
	Helicopter Idling on Pad	57
	Helicopter Taxiing/Departing	61
	Car Pass-By	67
	General Aviation Aircraft Takeoff Circles Behind Residence	66
	General Aviation Aircraft Fly-by	67
	Siren in Distance	63
	Helicopter Circling	60
	Twin-engine General Aviation Aircraft Takeoff	72
	Car Pass-by	67
	School Bus	80
	Birds Chirping	52
	General Aviation Aircraft Takeoff	65
	Helicopter Fly-by	51
	Commercial Jet at High Altitude	53
	UPS Truck	71
	Motorcycle	80+
	General Aviation Aircraft Takeoff	58
	Helicopter Fly-by	62
	Helicopter Fly-by	61
	Helicopter Circling	59
	General Aviation Aircraft Takeoff	61
	General Aviation Aircraft Takeoff	60
	General Aviation Aircraft Fly-by	56
	General Aviation Aircraft Takeoff	72
	Car Horn	67
	General Aviation Aircraft Takeoff Circled Directly Back Over Houses	68
	Helicopter Approaching Pad	61
	Helicopter Lifts Off	70
	Helicopter Fly-by	71
	General Aviation Aircraft Fly-by	62

TIME OF DAY	DESCRIPTION OF EVENT	MAXIMUM dB(A)
MORNING START		
0700 (Cont'd)	General Aviation Aircraft Takeoff	68
	Helicopter Fly-by	58
	Helicopter Taxiing into Pad	51
	General Aviation Aircraft Takeoff Circles Back Over Houses	70
AFTERNOON START		
1:47	Bell 206L Approaches from South to the Pad	61
	Bell 206L Lifts off to the South	67
	General Aviation Aircraft Takeoff	70
	General Aviation Takeoff Circles Back Behind Houses	74
	Car Starts Up and Pulls Away From Curb	67
	General Aviation Aircraft Twin Engine Takeoff Turn Circles Back Behind Houses	75
	Car Horn	68
	General Aviation Aircraft Takeoff	55
	School Bus Departs (approximately 100 ft from Microphone)	76
	General Aviation Aircraft Takeoff Circles Back Behind Houses	70
	Train Whistle in Distance	54
	General Aviation Aircraft Fly-by at 1000 ft plus	50
	General Aviation Aircraft Passes Directly Over Houses	74
	Car Pass-by	64
	Motorcycle	80
	Helicopter Idling on Pad	53
	Siren in Distance	60
	Car Pass-by	69
	General Aviation Aircraft Takeoff Circles Behind Houses	56
	Car Pass-by	66
	Car Pass-by	64

TABLE 4

L_{eq} VALUES MEASURED FOR SELECTED SAMPLING PERIODS
AT RIDGEWOOD DR, NORWOOD, MASSACHUSETTS
APRIL 27, 1983

SOURCES OF NOISE DURING SAMPLING PERIOD	LENGTH OF SAMPLE	L_{eq}	L_{MAX}	SOURCE OF L_{MAX}
Helicopters, General Aircraft Aircraft, Car Horn	10 min.	59.3	73.9	General Aviation Aircraft Takeoff
Helicopter, General Aviation Aircraft, Car Pass-by	20 min.	53.6	65.2	Car Pass-by
General Aviation Aircraft, Pick-up Truck, Car Horn	15 min.	57.1	71.5	Pick-up Truck
Helicopter, General Aviation Aircraft, and Cars	30 min.	54.9	71.7	Helicopter
Helicopter, General Aviation Aircraft, and Cars	30 min.	57.8	75.3	Twin-engine General Aviation Aircraft
General Aviation Aircraft, Cars, Car Horn, School Bus	30 min.	59.2	83.2	Not Noted
General Aviation Aircraft, Train Whistle, Car Horn, Cars, School Bus	30 min.	59.1	80.9	School Bus
Helicopters, General Aviation Aircraft, Motorcycle, Cars	60 min.	55.6	79.4	Motorcycle

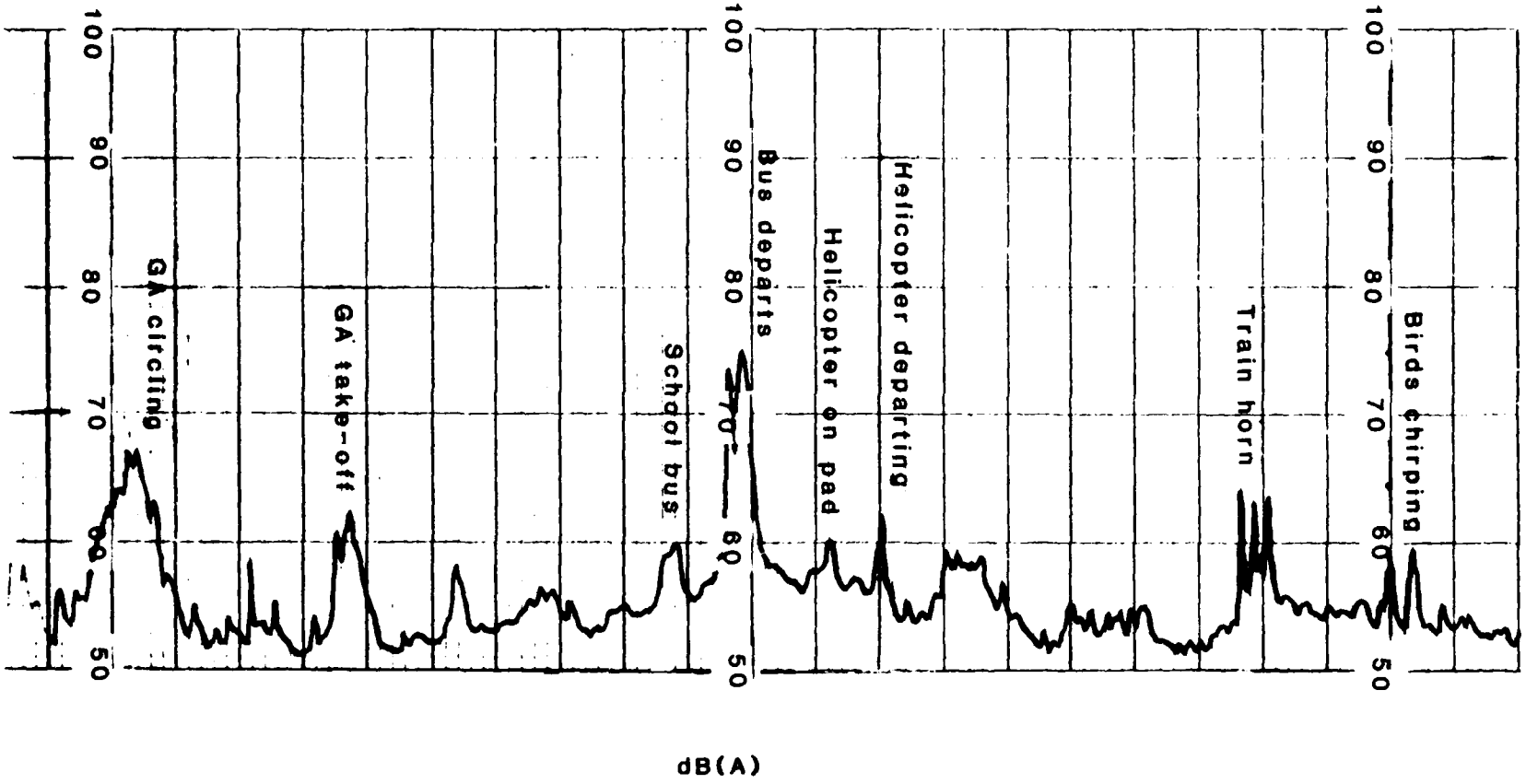


Figure 6 Time History of Selected Noise Events at Ridgewood Dr.

APPENDIX A

NOISE ABATEMENT REGULATION

I. THE REGULATION

The noise regulations effective at Norwood Airport will be those specified in FAR 36. FAR 36 is a Federal regulation which designates the noise standards for newly designed and manufactured aircraft and establishes certain compliance dates.

Advisory Circular AC-36-3A which identifies current noise levels at Appendix "C" take-off locations, with the top three listed aircraft excluded, is the basis for establishing a 75 DBA noise level.

A. Effective on February 23, 1981, except as hereinafter provided, no aircraft using Norwood Airport shall exceed 87 EPNdb or 75 DBA noise levels, as measured in the Federal Aviation Regulation (FAR) 36 Take-off Point, as listed in FAA Circulars 36-1A, 36-1B, 36-3, and any pertinent subsequent FAA Circulars.

B. (Propeller Driven) Referring to FAA Advisory Circular AC No. 36-3 dated 5/29/79 in which, starting on Page 5 through 6, estimated takeoff noise levels in terms of DBA are given, those aircraft listed as 75 DBA or below are approved.

C. A three member committee appointed by the Norwood Airport Commission or by a designee of the Commission will be authorized by a majority vote to designate those unlisted planes that have estimated takeoff noise levels of 75DBA or below and such planes will be deemed approved. Members of such a committee will be appointed from the membership of the Touch and Go Committee.

II. EXCEPTIONS TO THE REGULATIONS

A. Non-conforming aircraft owners/operators who wish to utilize Norwood Airport may apply to the Norwood Airport Commission for exemption, using a standard form which delineates the following terms:

1) Takeoffs will be made only when they are planned to follow the "Norwood Airport Minimal Sound Tracks".

2) Operator agrees to comply with ATC procedures and Rules and Regulations of the FAA.

3) Operator agrees that takeoffs will be made following the aircraft operating procedure described as "NBAA Close-In Departure Procedure". (See attached)

4) Operator agrees to make approaches and landings following the aircraft operating procedures described as "NBAA Approach and Landing Procedure" "VFR/IFR". (See attached)

B. Exemptions will be granted by the Norwood Airport Commission on the following bases:

1) Transient aircraft that have used Norwood Airport in the 12 months previous to August 1, 1980 will be granted a Grandfather Right for three (3) years.

2) Aircraft currently based at Norwood will be granted a perpetual exemption as long as they are based at Norwood.

3) Replacement aircraft that are unlisted at the time of purchase will be granted a perpetual exemption as long as the noise level, as determined by the three member committee in Section I.C., is not greater than the aircraft that is being replaced.

4) All other exemptions for non-conforming aircraft will be decided by majority vote of the Norwood Airport Commission.

C. All noise regulations are waived under emergency situations. The pilot shall file a report with the Airport Manager(s) prior to departure.

III. MODIFICATIONS TO THE REGULATIONS

A. The regulations will not be modified for nine months trial period after the effective date.

B. Subsequently, revisions and/or amendments to the regulations may be proposed by Massachusetts Aeronautics Commission and/or the Norwood Airport Commission.

C. Proposed revisions and/or amendments will become effective with mutual consent of the Massachusetts Aeronautics Commission and the Norwood Airport Commission.

D. In the unlikely event that controversy develops between the Massachusetts Aeronautics Commission and the Norwood Airport Commission, said controversy shall be settled by arbitration in accordance with the Commercial Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the Arbitrator(s) may be entered in any court having jurisdiction thereof.

IV. QUALIFICATIONS TO THE RECOMMENDATIONS

A. The Committee concedes that its recommendation is an ambitious undertaking for the Norwood Airport Commission, the Airport Manager, and parties represented by the Committee. To insure the effectiveness of the proposals the Committee feels it should qualify its recommendations as follows:

1) That the Committee (or a Committee) be authorized by the Norwood Airport Commission to continue its work of studying, monitoring, and as may be required making further recommendations to the Commission as the noise situation may dictate.

2) That the recommendations, if adopted by the Commission and submitted to the Massachusetts Aeronautics Commission for approval, be described as a "TEMPORARY AND EXPERIMENTAL REGULATION" promulgated for the sole and exclusive purpose of gathering data and experience to evaluate a practical and economical means by local regulation of achieving a reduction of aircraft generated noise to an acceptable level in the area surrounding the Norwood Airport. Only that noise generated by aircraft landing or taking off from Norwood are to be considered.

3) That the Commission take steps to insure that its manager:

   a) Record all noise complaints on a standard form and file same with the Commission for future evaluation by the Commission and the Committee.

   b) Notify all based aircraft owners of the regulation and related procedures.

   c) Organize a plan to insure that all visiting aircraft be advised of the regulation.

   d) If a visiting aircraft, which by virtue of its recorded noise level, is in violation of the regulation, the Commission should require that the Airport Manager so advise the operator and issue a warning that a second occurrence will result in a violation being filed with the appropriate authority.

4) That the Touch & Go Committee be authorized by the Norwood Airport Commission to receive all comments from whatever source and by majority vote submit reports and recommendations through the Norwood Airport Commission to the Massachusetts Aeronautics Commission.

5) Adoption of the experimental plan shall be contingent upon the Norwood Airport Commission seeking funds and authorizing the Touch & Go Committee to expend such funds for advertising, printing and mailing notices, et cetera, in connection with advising users of the Airport of its "Experimental Regulation".

APPENDIX B

DESCRIPTORS OF SOUND*

TYPICAL USE	NAME OF DESCRIPTOR	NATURE OF DESCRIPTOR
To describe steady airconditioning sound in a room or measure maximum sound level during a vehicle passby with a simple sound level meter.	A-weighted Sound Level	The momentary magnitude of sound weighed to approximate the ear's frequency sensitivity.
To describe noise from a moving source such as an airplane, train, or truck.	A-weighted Sound Exposure Level (Sel)	A summation of the energy of the momentary magnitudes of sound associated with a single event to measure the total sound energy of the event.
To measure average environmental noise levels to which people are exposed.	Equivalent Sound Level (L_{eq})	The A-weighted sound level that is "equivalent" to an actual time varying sound level, in the sense that it has the same total energy for the duration of the sound.
To characterize average sound levels in residential areas throughout the day and night.	Day-Night Sound Level (L_{dn})	The A-weighted equivalent sound level for a 24-hour period with 10 decibels added to nighttime sounds (10 pm - 7 am).
To measure the loudest sound produced during a sample period.	Maximum Sound Level (L_{MAX})	The maximum A-weighted sound level for a given time interval or event.

* The unit for all descriptors is the decibel.

Source: Protective Noise Levels, condensed version of EPA Levels document. EPA publication 550/9-79-100 November 1978.

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