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THE NEED FOR AIRPORT NOISE MONITORING SYSTEMS. THEIR USES, AND --ETC(U)
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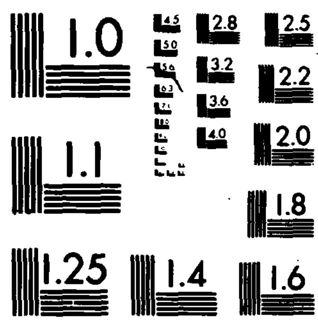

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US Department of Transportation
Federal Aviation Administration

The Need for Airport Noise Monitoring Systems

Office of Environment And Energy
Washington, D.C. 20591

Their Uses and Value in Promoting Civil Aviation

FAA-EE-80-40

September 1980

By J. Steven Newman

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16. Abstract

The need for airport noise monitoring systems is addressed from a variety of perspective focusing on potential benefits to airport proprietors, the airlines, noise impacted airport communities, and civil aviation in general. The operation and cost of typical noise monitoring systems is discussed. Various techniques for noise data presentation are also reviewed. The uses of radar tracking data in providing aircraft identification, position and ground track information is explored. Legal requirements for monitoring are specified and airport use restrictions are discussed. A list of U.S. and foreign airports with noise monitoring systems is presented. FAA research efforts pertaining to airport noise monitoring systems are also outlined.

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1.0 INTRODUCTION

Airport noise monitoring systems provide an important tool for assessing noise levels around airports and provide concrete evidence that airport proprietors, state governments and the Federal Government are serious about controlling aviation noise impact on communities surrounding airports.

2.0 WHY MONITOR AIRCRAFT NOISE?

Monitoring systems identify the source of noise so that action may be specifically directed to reducing noise. Monitoring systems enable the airport proprietor to assess alternative flight procedures designed to minimize the impact of aircraft noise on the communities that surround the airport. Systems also provide the capability to investigate specific public inquiries and complaints. In addition, monitoring data are useful in assessing compliance with noise abatement departure and arrival procedures. Further, monitoring systems can serve as research tools for learning more about aircraft noise variability, propagation and impact on people.

The net effect of monitoring is to provide a means to address and partially alleviate a problem which threatens to limit growth and expansion of commercial aviation. As the noise impacted public has become more sophisticated both in technical and legal areas, airport proprietors, and airlines are more frequently finding themselves in court confronting plaintiffs fortified with their own noise data.

3.0 REVIEW OF THE PROBLEM

Aircraft noise and residential developments historically do not mix. Nonetheless, our airports are virtually surrounded by homes. It is true that, in some cases, communities have enveloped existing airports. It is also true that communities which coexisted amicably with airports prior to the introduction of jet aircraft have become increasingly inundated with aircraft noise. Responsibility for the existing situation can be shared by all participants in the air transportation system, local airport communities, and all levels of Government. The growth of the problem has followed the growth of population, the growth of airline traffic, ineffective, politically motivated "land use planning," the demand for housing, overzealous real estate developments, Congressional inaction on land use legislation, and delays in the evolution and implementation of aircraft noise reduction technology.

4.0 WHAT A MONITORING SYSTEM DOES

Most systems use monitors which provide a continuous measure of the instantaneous sound level in the environment as well as a running total or summation of the sound energy which is accumulated and reported for each one-hour period of the day. The one-hour summations are accumulated to form a grand total of the acoustical energy at the end of each day.

Some systems also simultaneously employ data processing and/or gating techniques which differentiate between aircraft and non-aircraft noise sources in order that the relative contribution of sources can be assessed for each measurement location.

The other key element in some systems is radar tracking information recorded from the FAA air traffic computer system. The time correlated tracking information can be combined with the aircraft noise level information to identify specific aircraft associated with each noise event. Radar tracking data are currently used only at FAA-operated Washington National (DCA) and Dulles-International (IAD) Airports.

4.1 How Typical Monitoring Systems Operate

The following outline largely reflects the characteristics of the FAA Washington National (DCA), Dulles International Airport Noise Monitoring System, however, the general operating principles are representative of most systems in the U.S.

The operational functions consist of gathering and processing noise, and in some cases, radar tracking data.

The noise data acquisition involves:

1) Noise measurement using microphones typically mounted atop utility poles.

2) Data filtering using the A-weighting scale, an international standard that approximates the response of the human ear. At some IAD and DCA locations, an additional electronic unit has been added which permits a more sophisticated measurement of aircraft flyovers known as Effective Perceived Noise Level (EPNL). EPNL is the noise measurement used by the FAA in certification of turbojet and transport category aircraft and helicopters.

3) Data formatting into digital mode.

4) Data transmission from the monitoring sites via telephone lines or other means to the Noise Monitoring Computer.

5) Data processing to differentiate between community noise and likely aircraft noise events.

6) Data accumulation in appropriate storage registers.

The radar tracking data are received in magnetic recordings and input to the Data Management Computer which interacts with the Noise Monitoring Computer to match up aircraft radar reports with likely aircraft noise events.

4.2 <u>What Does a Monitoring System Cost</u>?

Continuous monitoring of airport noise usually involves the following principal components:

a. Microphones or hydrophones;

b. Field equipment enclosures with microphone power, signal pre-processing and data transmission capabilities; and

c. A central processor (computer) to receive, analyze and store data transmitted from the field.

The purchase cost of an airport noise monitoring system can be considered proportional to the number of measurement sites. This trend is observed as systems with more measurement sites usually provide more data processing. Thus, central computer costs are seen to increase with the number of sites.

In terms of 1980 U.S. dollars, a system designed to provide A-Weighted Sound Level (dBA), Noise Exposure Level (NEL), and Day-Night Level (Ldn) will cost approximately $16,000 per site plus $50,000 to $75,000 for the central computer to purchase and install.

The personnel costs associated with operating an airport noise monitoring system is entirely dependent upon the degree of interest the airport proprietor has in utilizing system capabilities. At some airports the individual responsible for operating the noise monitoring system has other principle duties and devotes only minimal time to assuring that automatic reporting functions operate properly. At other airports concerned with exploiting all of the monitoring system capabilities, there may be an entire office staffed with an acoustical engineer, environmental and public relations specialists, and technicians.

The maintenance and periodic calibration of the monitoring system is usually handled through a maintenance contract. The cost of such a contract is approximately $1,000 (U.S. 1980) per measurement site per year. If a monitoring system operator has his own technicians to assist in maintenance, this cost can be reduced.

4.3 What is the Cost of Tracking Data Reduction?

The FAA is currently involved in changing from tape to disc recording of tracking data from its air traffic control radar system. In the future, only disc format will be available. Reading and processing radar track discs will require approximately $150,000, including $80,000 for a disc drive. The disc reading cost will be prohibitive for most airport proprietors, unless the costs can be distributed across other airport budget areas. This option is discussed in more detail in Section 10.1.

4.4 Aircraft Identification by Other Means

When acquisition of radar tracking information is not possible, it is still highly desirable to identify the aviation noise events by aircraft type and carrier. Many different techniques have been employed at airports in the United States including:

1) Monitoring air traffic control radio frequencies and manually spotting and logging events;

2) Recording time coded air traffic control tower radio conversations and replaying the tape, matching noise events with aircraft identification; and

3) Using information from computer controlled, departure gate information displays.

Aircraft identification remains a difficult task without radar tracking information and research into alternative methodologies is to be encouraged.

5.0 APPLICATIONS ADVANTAGEOUS TO THE AIRLINES

The following paragraphs provide examples of how airport noise monitoring data have been used to support commercial aviation, while at the same time, assessing aircraft noise exposure and working toward minimizing environmental impact.

5.1 The FAA fixed monitoring system used at JFK for the year-long Concorde monitoring revealed that the Concorde approach noise levels were lower than many of the other types of aircraft using JFK. This type of solid data quieted many of the more extreme assertions concerning Concorde noise levels.

5.2 In June of 1978, a mobile measurement program conducted by the FAA at Santa Monica Municipal Airport provided important data which showed that some business jet aircraft are less noisy than some propeller-driven aircraft. This measurement program helped convince the courts to invalidate the jet-ban at Santa Monica.

5.3 FAA monitoring of the Concorde SST at Dulles showed that approximately a 6 dB reduction in sound level can be achieved on approach through use of a decelerating approach.

5.4 Airport noise monitoring systems can provide competitive incentive to airlines to minimize the noise impact on communities surrounding an airport. As an example, consider the scenario at Washington National Airport involving one airline in October of 1978. The average B727 departure noise level by air carrier and measurement location is published each month. One carrier's 727's appeared at the top of the list for October. The ranking appeared in an article in the Washington Post. In response to the adverse publicity, the airline initiated changes which resulted in significantly lower levels the following month.

5.5 The airlines will receive the long term benefits of avoiding confrontation, protest and litigation wherever it tries to modify its operation. As pointed out above, noise monitoring systems can work in their favor and very often do.

6.0 APPLICATIONS ADVANTAGEOUS TO THE AIRPORT PROPRIETOR AND THE COMMUNITY

Monitoring data provide the opportunity to pursue a wide range of analytical studies designed to guide the airport proprietor in actions to reduce noise impact. Airport monitoring system data are often used to assess changes in airport operating policy such as designating flight tracks or instituting noise abatement flight procedures. Data can also be used to analyze the short and long-term noise exposure in communities surrounding the airport.

6.1 At the outset, establishment of an airport noise monitoring system stimulates positive interaction between the proprietor and local government and community groups. The selection of sites gives all parties the opportunity to work together toward a common objective. This first step in community involvement is important in enhancing the perception of the airport as a concerned neighbor. The National Aviation System has the opportunity to be seen as responsive in dealing with the complicated problem of reducing environmental impact while assuring the highest degree of safety and maintaining an efficient air navigation system.

6.2 An important attribute of some airport noise monitoring systems is the ability to discriminate between aircraft and nonaircraft noise sources. This capability provides an indication of whether or not aircraft are the dominant environmental noise source at a given location, thus establishing a context for evaluating the aircraft noise impact. Figure 1 shows a location very close to Dulles International Airport where aircraft noise clearly dominates the acoustical environment. On the other hand, Figure 2 shows a location where other sources play a much bigger role in creating the overall noise climate.

6.3 The monthly average data acquired from monitoring systems can be used to track long-term trends in noise exposure. The trends will display evidence of so-called "creeping incrementalism" wherein noise exposure increases in small "insignificant" steps which, if added together, represent a large change in noise impact. On the other hand, this type of data can show the improvement of various noise abatement actions over the years. Airport noise monitoring systems tell those

FIGURE 1

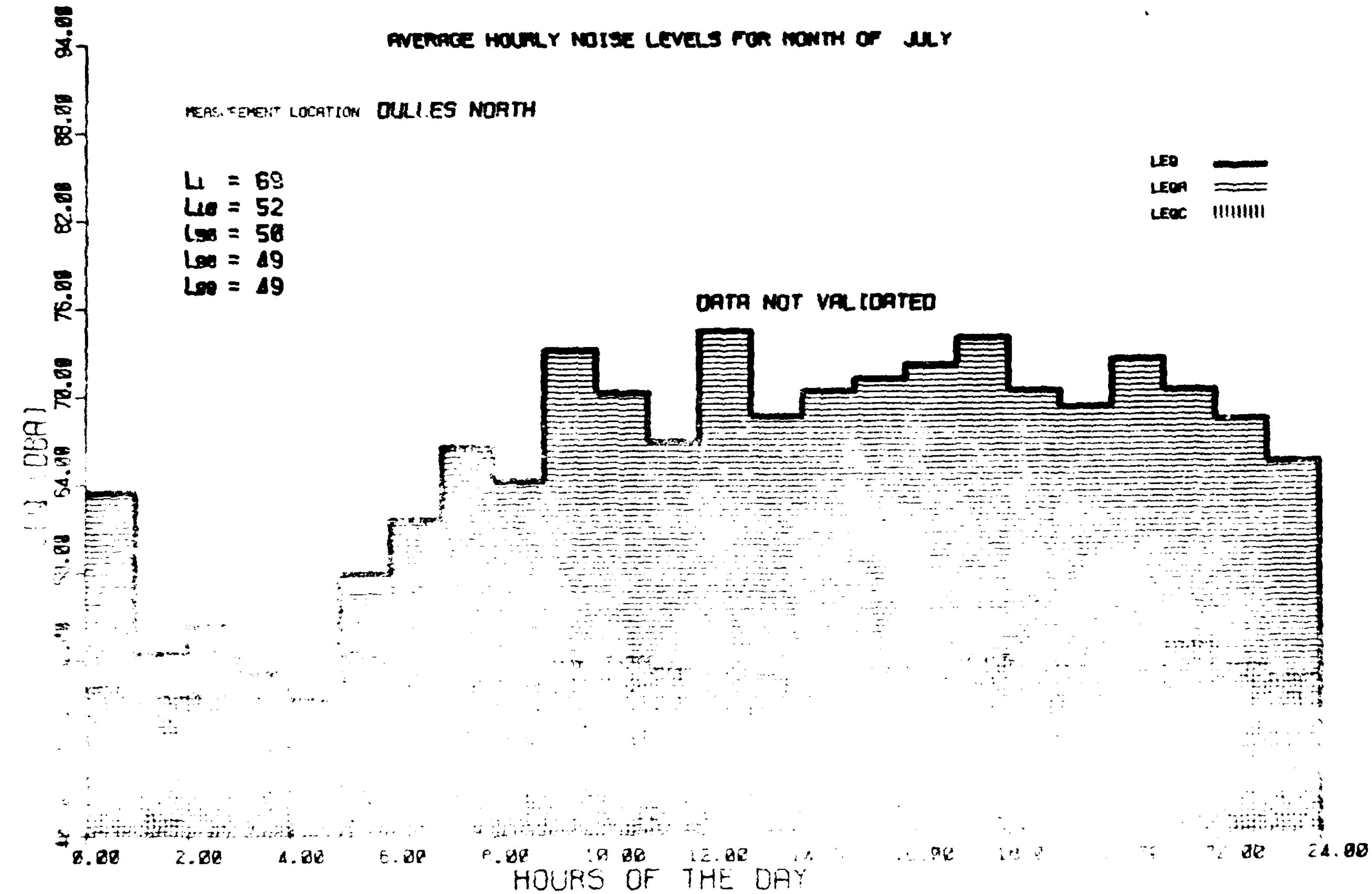
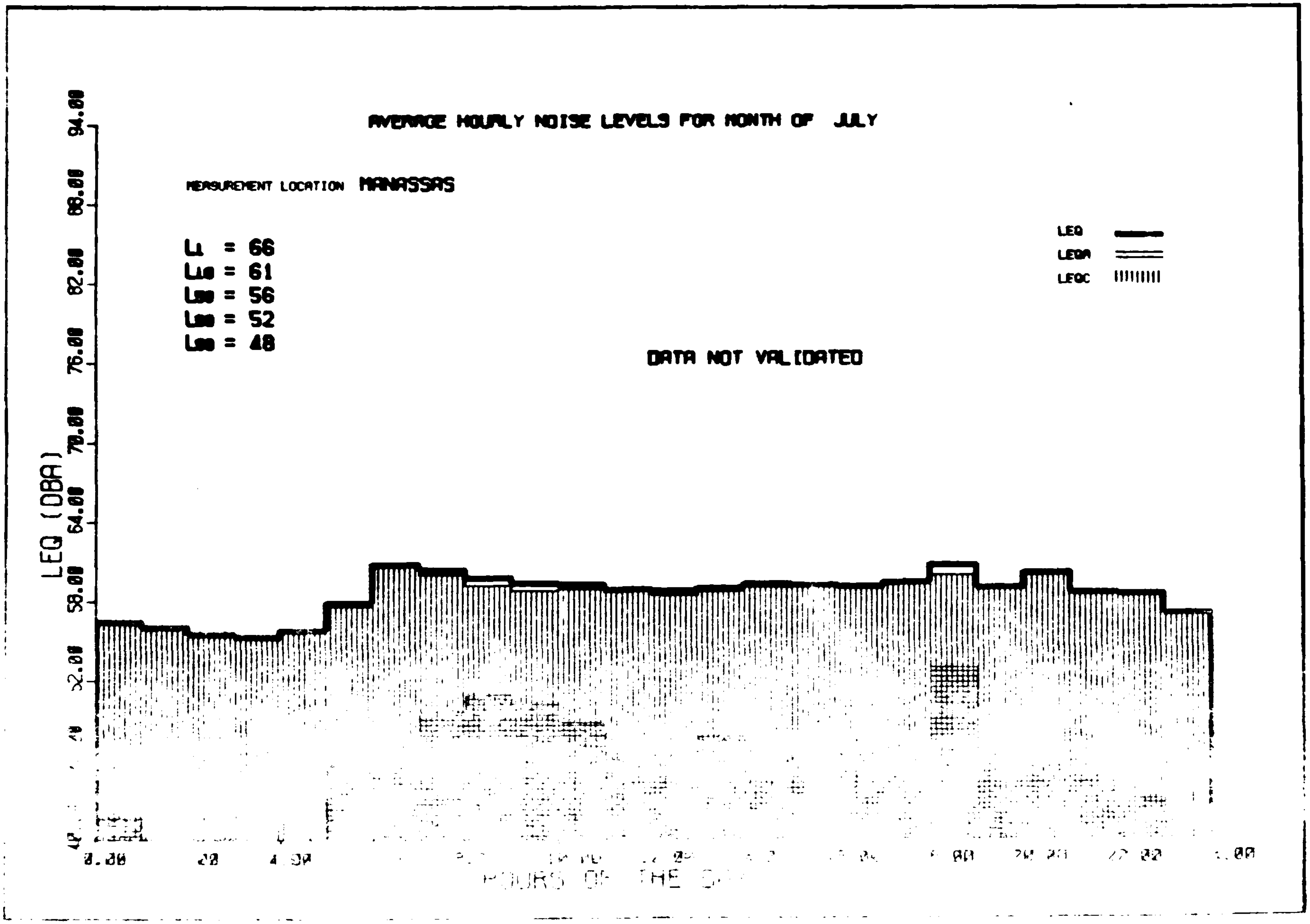

AVERAGE HOURLY NOISE LEVELS FOR MONTH OF JULY
MEASUREMENT LOCATION DULLES NORTH
L1 = 69
L10 = 52
L50 = 50
L90 = 49
L99 = 49
LEQ
LEQA
LEQC
DATA NOT VALIDATED
94.00
88.00
82.00
76.00
70.00
64.00
0.00
2.00
4.00
6.00
12.00
24.00
HOURS OF THE DAY

FIGURE 2



AVERAGE HOURLY NOISE LEVELS FOR MONTH OF JULY
MEASUREMENT LOCATION MANASSAS
DATA NOT VALIDATED
LEQ
LEQA
LEQC
LEQ (DBA)
94.00
88.00
82.00
76.00
70.00
64.00
58.00
HOURS OF THE

concerned with airport noise what the noise exposure is and how it is changing. Figure 3 shows the monthly Ldn value plotted for a site near Dulles International Airport over a 22-month period.

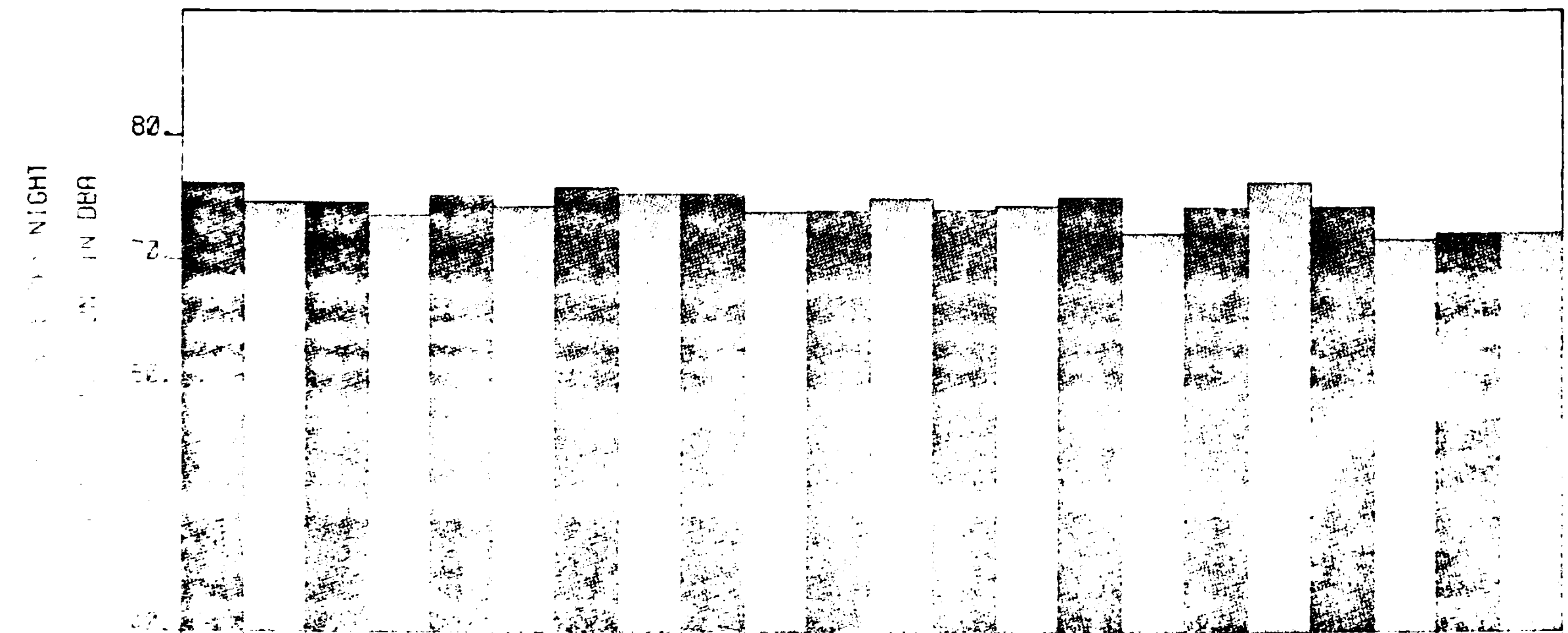
6.4 An airport noise monitoring system is capable of quantifying changes in ambient or background noise at measurement sites. Such information depicts the changing context for evaluating aircraft noise exposure. Display of those trends is also beneficial to local and Federal officials concerned with monitoring trends in environmental noise exposure.

6.5 Another useful function performed by airport noise monitoring systems is the generation and display of average hourly noise exposure levels. These data show the aircraft and community noise exposure contributions for each of the 24-hours in the day (see Figures 1 and 2). This time distribution allows the proprietor to focus on the exposure during noise sensitive times and also to identify those hours, not necessarily the busiest hours, during which high exposures occur.

6.6 Airport noise monitoring systems are capable of serving as watchdogs, identifying any single noise event which exceeds preset threshold levels. This feedback can be provided to the proprietor, airline, pilot and controller. Communication of this type increases the awareness of all parties to the objective of minimizing environmental noise impact. Single event "feedback information" can also be used to address public inquiries and complaints in a more responsive manner.

FIGURE 3

VARIATION IN MONTHLY AVERAGE DAY-NIGHT (LDN) SOUND LEVEL



	MAR78	APR78	MAY78	JUN78	JUL78	AUG78	SEP78	OCT78	NOV78	DEC78	JAN79
MEAN	76.06	74.57	74.56	73.58	[illegible]	74.32	75.83	75.27	[illegible]	[illegible]	73.80
STANDARD DEVIATION	2.07	2.95	2.06	5.64	1.52	2.2[illegible]	1.05	1.35	[illegible]	1.76	2.10
SAMPLE SIZE	11.	23.	31	4.	29.	28.	24.	26.	27.	28	22.

	FEB79	MAR79	APR79	MAY79	JUN79	JUL79	AUG79	SEP79	OCT79	NOV79	DEC79
MEAN	74.92	[illegible]	[illegible]	75.00	72.12	[illegible]	76.18	74.16	71.69	72.13	72.07
STANDARD DEVIATION	[illegible]	1.90	2.51	2.10	5.59	2.25	1.71	1.00	2.48	9.52	2.46
SAMPLE SIZE	26.	30.	26.	28.	17.	18.	25.	11.	19.	30.	14.

CHANTILLY

6.7 Single event noise level data can be stored for each location by aircraft type. Each month an average level can be computed along with the standard deviation. Further, the entire statistical distribution can be analyzed providing a complete profile of variation in level during the month. This variation is the result of many influences including wind, temperature, relative humidity, pilot technique, controller bias, and aircraft weight. Using the statistical distribution, the analyst can identify what noise exposure level is exceeded one percent, or five percent or any other selected percent of the time a particular aircraft type overflies a given location. The selected percentile level can then be used as the system exceedance threshold. This statistical approach avoids establishing unrealistic thresholds. It is noted that the exceedence threshold would typically be determined for the population of noisiest aircraft operating at a given airport.

6.8 An airport noise monitoring system can provide research data with which to address several aspects of acoustical propagation and the influences of weather. Correlation of local meteorological data along with monitoring data can often explain unusually high levels.

6.9 Monitoring data can be used as a statistical tool to examine the random variability of cumulative noise levels at each measurement location, thus providing a guide for identifying unusual deviations.

6.10 The airport proprietor can correlate aircraft noise data with population density and demographic information to assist in developing airport noise abatement policies. Another useful technique is plotting complaint density along with noise measurement data on the same map. These analyses provide important perspectives, useful in achieving a viable airport land use plan.

7.0 DATA REPORTING

An old axiom says "There is no point in debating a question that can be settled simply by examining the facts." As one approach to "reporting the facts," consider the FAA monitoring report for Washington National and Dulles.

The Data Management Computer produces summary reports of noise levels for each microphone location organized by aircraft type, airline, and operation (departure or arrival), see Figure 4. Data files are also maintained for hourly and daily totals of overall noise exposure. Examples of average hourly data were shown in Figures 1 and 2. Periodically reports are issued which utilize these data along with representative flight track density plots generated from the radar tracking tapes. Figures 5 and 6 show the presentation format currently used. Section 10.0 of this report discusses other possible modes of presenting the same data.

8.0 FEEDBACK TO PILOTS AND CONTROLLERS

Another important result of monitoring is the feedback available to air traffic controllers. There is a growing awareness among controllers that noise related community action often results in a call for reduced

FIGURE 4

TYPICAL CENTRAL FILE DATA OUTPUT

SITE: CHAIN BRIDGE   AIRPORT DCA   MONTH JULY
DEPARTURES

TYPE	CARRIER	NO. FLIGHT	AVG. MAX. A-WEIGHT	AVG. DUR IN SEC	AVG. SR IN N.M.	AVG. ALT IN FT.
AC21	XX	1	79.0	39.0	0.7	3535
AC69	XX	1	72.0	3.0	0.5	2809
B272	AA	1	78.0	20.0	0.5	2577
B727	AA	75	79.3	18.8	0.5	2866
B727	BN	28	81.1	23.8	0.5	2932
B727	DL	45	80.3	21.8	0.6	2998
B727	EA	112	79.2	19.1	0.5	2880
B727	NA	56	80.6	21.2	0.5	2646
B727	PI	14	78.2	19.4	0.5	3031
B727	TW	46	81.8	24.4	0.6	3251
B727	UA	52	78.9	21.4	0.6	3175
B727	XX	1	78.0	16.0	0.5	2914
B737	PI	24	74.8	10.1	0.6	2973
B737	UA	33	75.3	11.7	0.6	3255
BA11	AL	31	78.4	21.6	0.7	3392
DC9	AL	60	76.5	14.7	0.6	3199
DC9	EA	102	76.2	13.9	0.6	3329
FFJ	XX	3	74.3	10.7	0.6	3307
G2	XX	4	81.0	38.3	0.7	3818
HS25	XX	1	77.0	35.0	0.9	3650
L329	XX	2	87.0	39.0	0.5	2905
LR24	XX	1	74.0	16.0	1.2	6882
N265	XX	5	79.6	32.0	0.8	4330
SW4	XX	1	74.0	7.0	0.4	2154
TS61	XX	1	71.0	1.0	0.9	1686
YS11	PI	6	74.7	5.7	0.4	1938

ABOVE TABLE REPRESENTS NOISE MEASUREMENTS
CORRELATED WITH RADAR TRACK DATA FOR 13 DAYS

capacity, conceivably affecting controllers' salaries in some extreme cases. Air carriers and their pilots also appreciate the feedback which shows the results of their efforts to adhere to noise abatement departure procedures. The presence of hard, tangible data provides a means to encourage involvement and participation of pilots in achieving noise abatement objectives.

9.0 MINIMUM NOISE PROCEDURE PLANNING

Many airlines use tailored departure procedures designed to avoid exceeding limits established by the airport operator. As an example, the Port Authority of New York and New Jersey requires airlines to calculate the takeoff noise level they expect to create based on existent wind and temperature conditions along with the aircraft weight. If calculations show an exceedence will occur, the carrier must offload or use a different runway or take whatever action is necessary to avoid a violation. Some European airports also require strict adherence to prescribed noise abatement procedures. While most air carriers would prefer a standardized set of noise abatement procedures for all airports, land use and topographical differences necessitate airport specific procedures to achieve minimum noise impact in each case.

10.0 USE OF TRACKING DATA

The most severe noise impacts resulting from aircraft operations occur in those areas beneath or immediately adjacent to flight tracks. One analytical technique (briefly mentioned in Section 7.0), used at DCA and IAD, is quantification of air traffic density flowing through the various boxes of grids overlaying the respective airports (see Figures 5 and 6). The primary flight path at DCA has been enclosed by several boxes following the river, while adjacent areas are divided into one-half mile squares. The IAD area has been divided into a grid of one-half mile squares.

The shading in each box corresponds to the percentage of total operation of transponder equipped commercial and general aviation aircraft which passed through the area below 7,000 feet above ground level during a typical day. This presentation clearly shows where the air traffic moves. The air traffic flow density data are presented by airport and direction of operation (north or south).

Another possible presentation format could show the total number of aircraft passing through each grid block (Figure 7), while an alternative presentation could show the percentage of the total number of aircraft passing through each grid block.

An additional analytical tool available from flight track data (a capability of the DCA and IAD systems) is rate-of-climb information. By examination of climb rates over various segments of departure tracks, it is possible to monitor adherence to prescribed takeoff procedures.

Individual events could also be plotted as shown in Figure 8 in order to take a closer look at unusually loud noise events, recurring complaint situations, and/or widely reported deviations from noise abatement

TYPICAL FLIGHT TRACK DENSITY PLOT

WASHINGTON NATIONAL AIRPORT

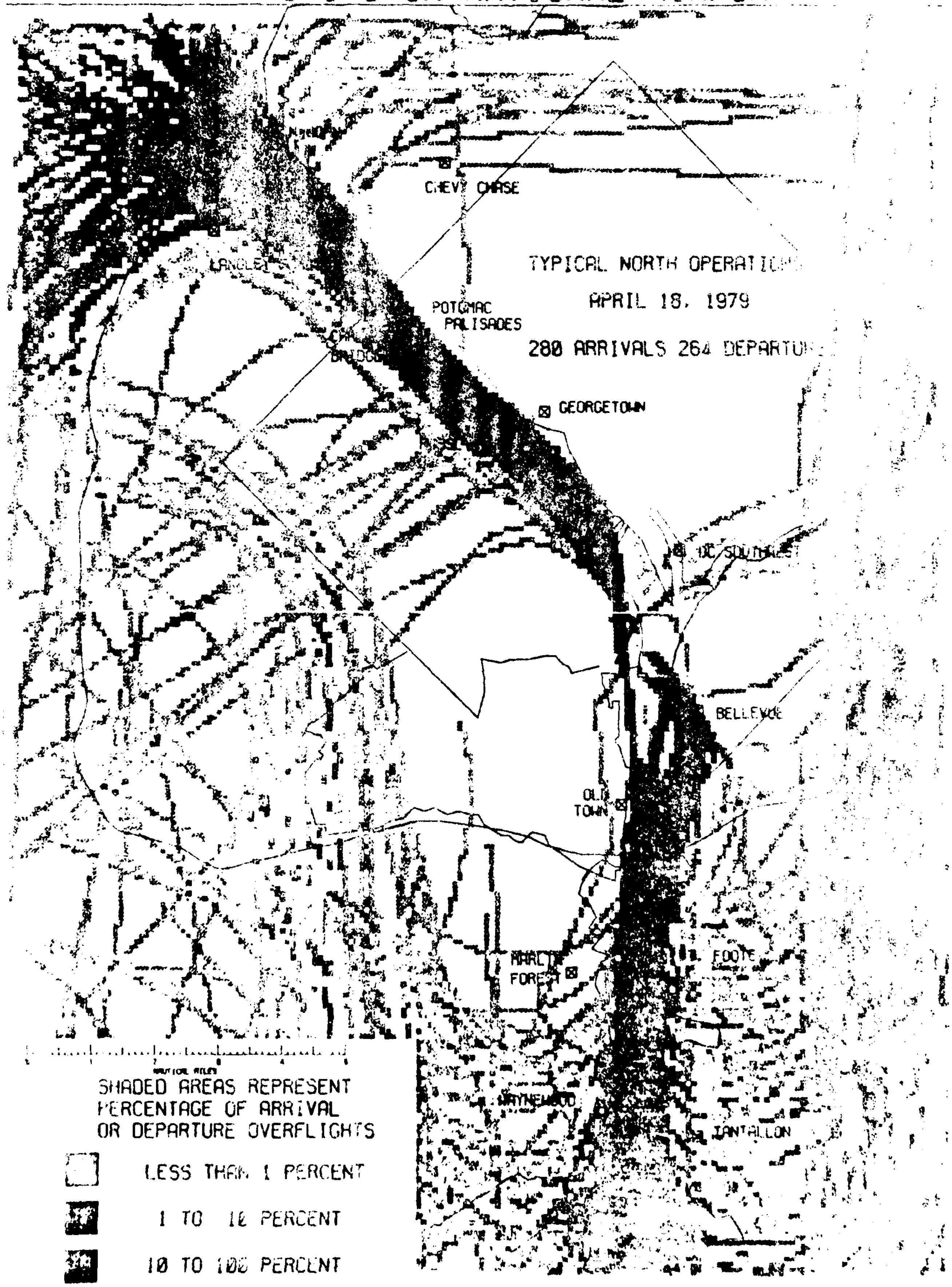


FIGURE 6

TYPICAL FLIGHT TRACK DENSITY PLOT

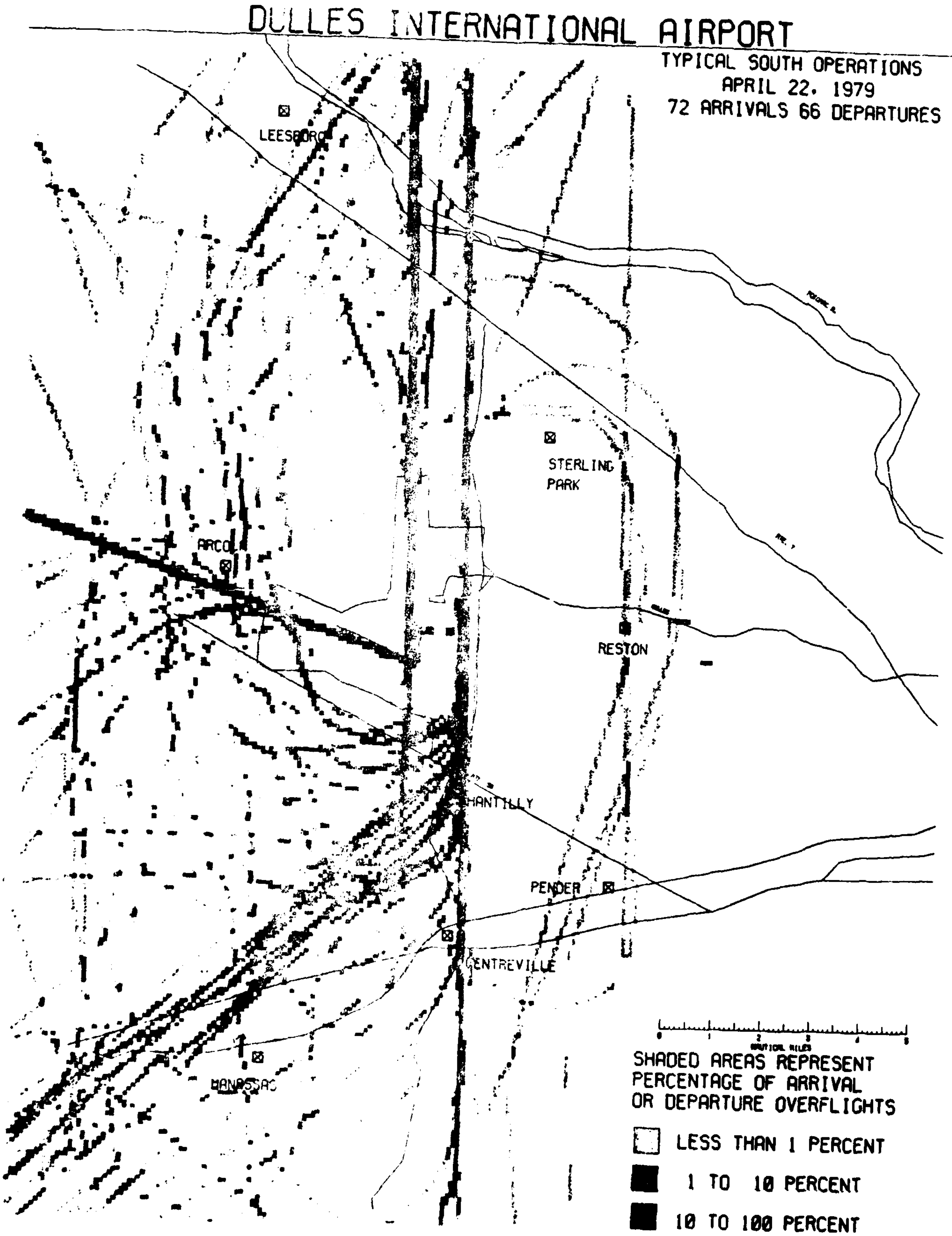
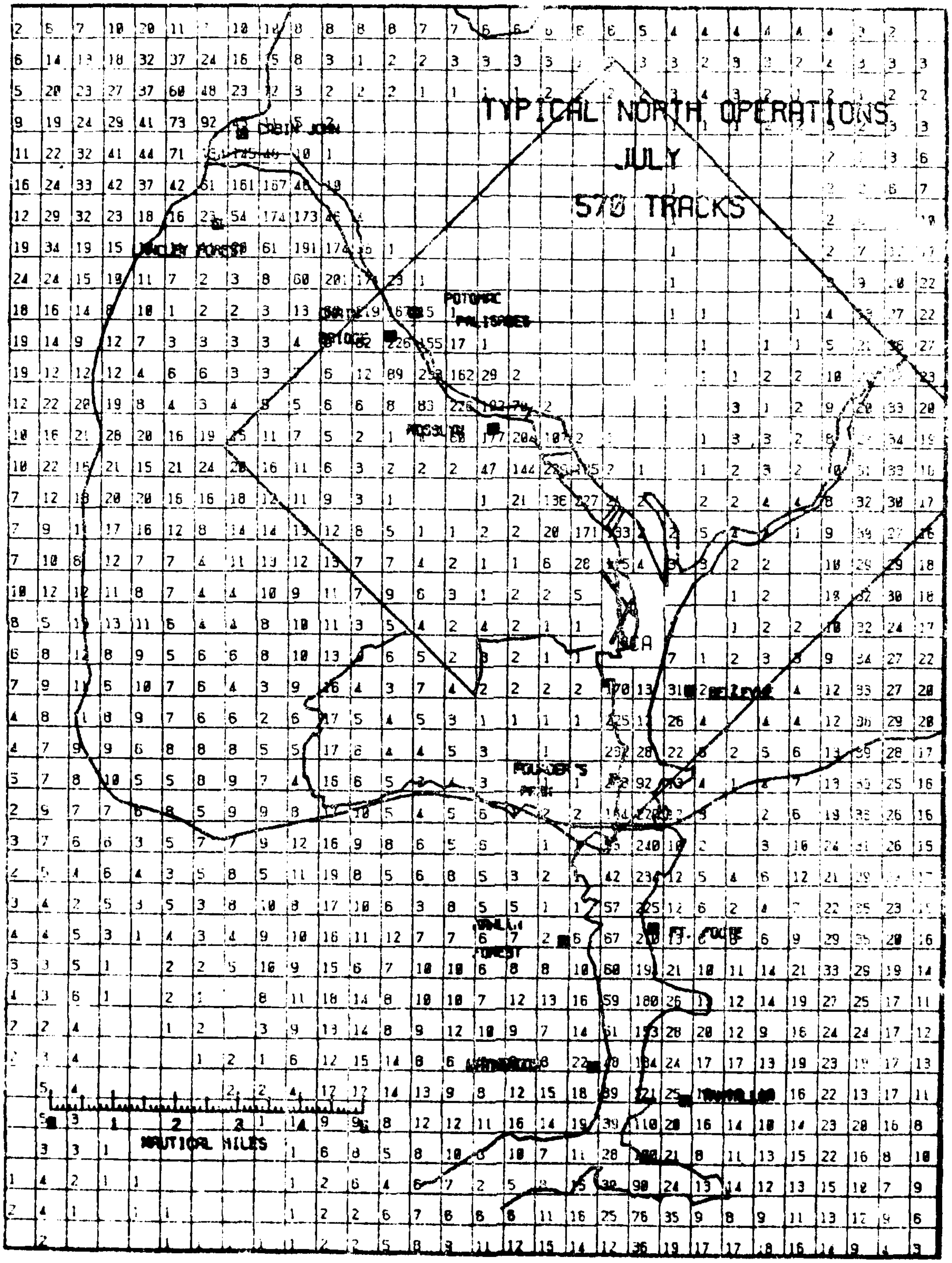


FIGURE 7

ALTERNATIVE FLIGHT TRACK DENSITY PLOT

WASHINGTON NATIONAL AIRPORT

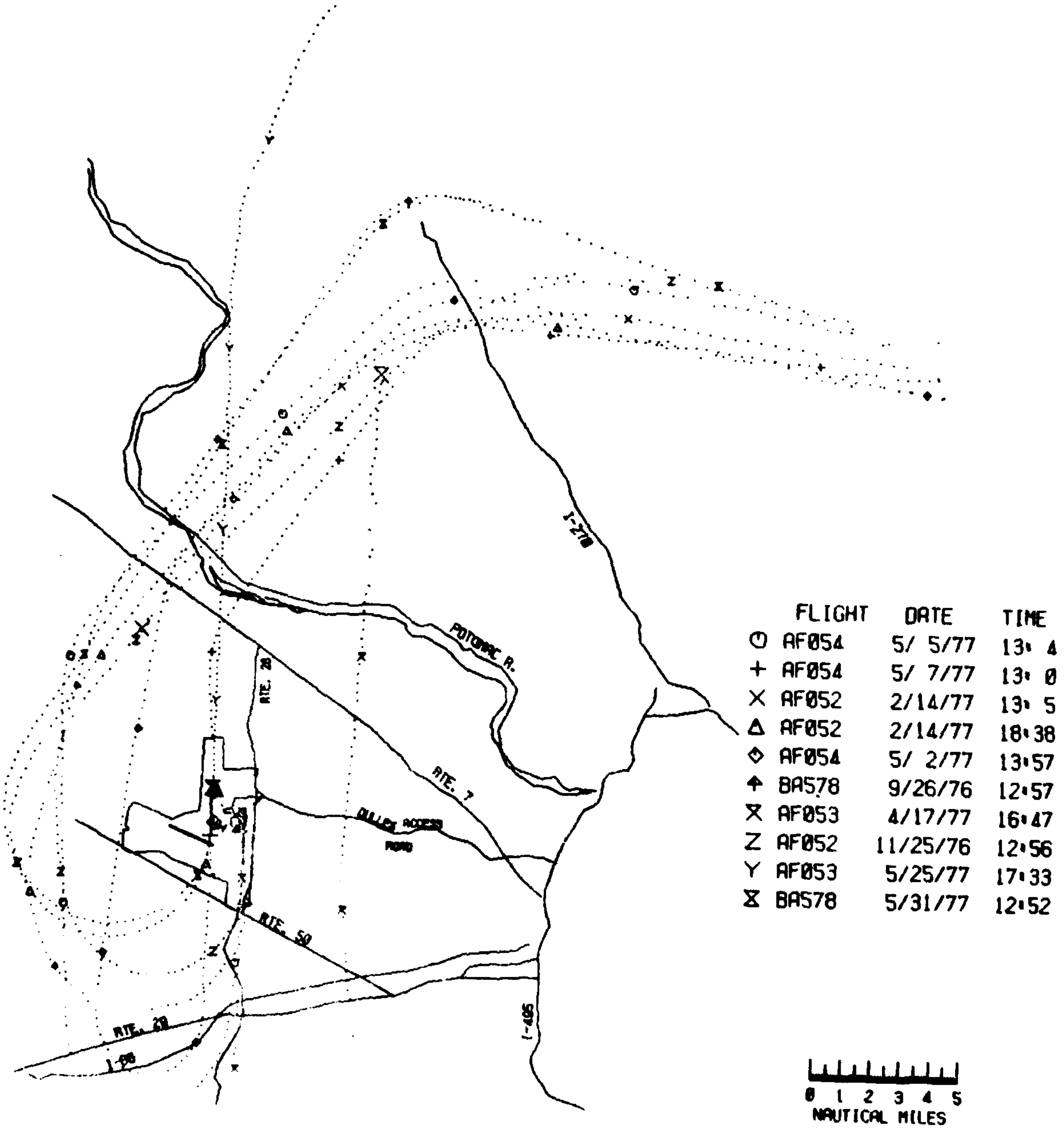


Note: Plot shows the actual number of aircraft passing through each grid block.

FIGURE 8

TYPICAL SINGLE EVENT RADAR GROUND TRACKS

DULLES INTERNATIONAL AIRPORT



approach or departure procedures unrelated to safety considerations. It must be emphasized that tracking data made available by the FAA are for use in problem solving and analysis and not for enforcement purposes.

10.1 Other Uses for the Tracking Data Reduction Capability/Spreading The Cost of the Tracking Reduction/Computer Hardware

It is important to note that noise monitoring systems having flight track reduction capabilities can be used for other worthwhile purposes. The IAD-DCA track analysis capability has been used to help air traffic control tower chiefs and airport proprietors with airspace management analyses in Chicago, Los Angeles, New York, Miami, and San Francisco. Special noise related track analyses have also been conducted for Pittsburgh, Washington National, Dulles, JFK, and Philadelphia.

A further application of tracking data is analysis of fuel use. As fuel costs have climbed, now representing approximately 30 percent of airline operating costs, fuel conservation is of paramount importance. Tracking data could, for example, be used to assess miles flown within the terminal control area for specified aircraft types for various carriers and at prescribed altitudes. Other proposed applications include validation of the FAA fuel-burn model currently under development. It may also be possible to use radar tracking data for air pollution analyses, especially investigation of particulate deposition.

A final application of the software capabilities required for track reduction is in airport management. The track processor would be available for bookkeeping, payroll, landing fee, and other administrative activities. The multi-function approach would make it possible to distribute capital costs for an airport noise measurement-tracking system, across a number of different budget areas.

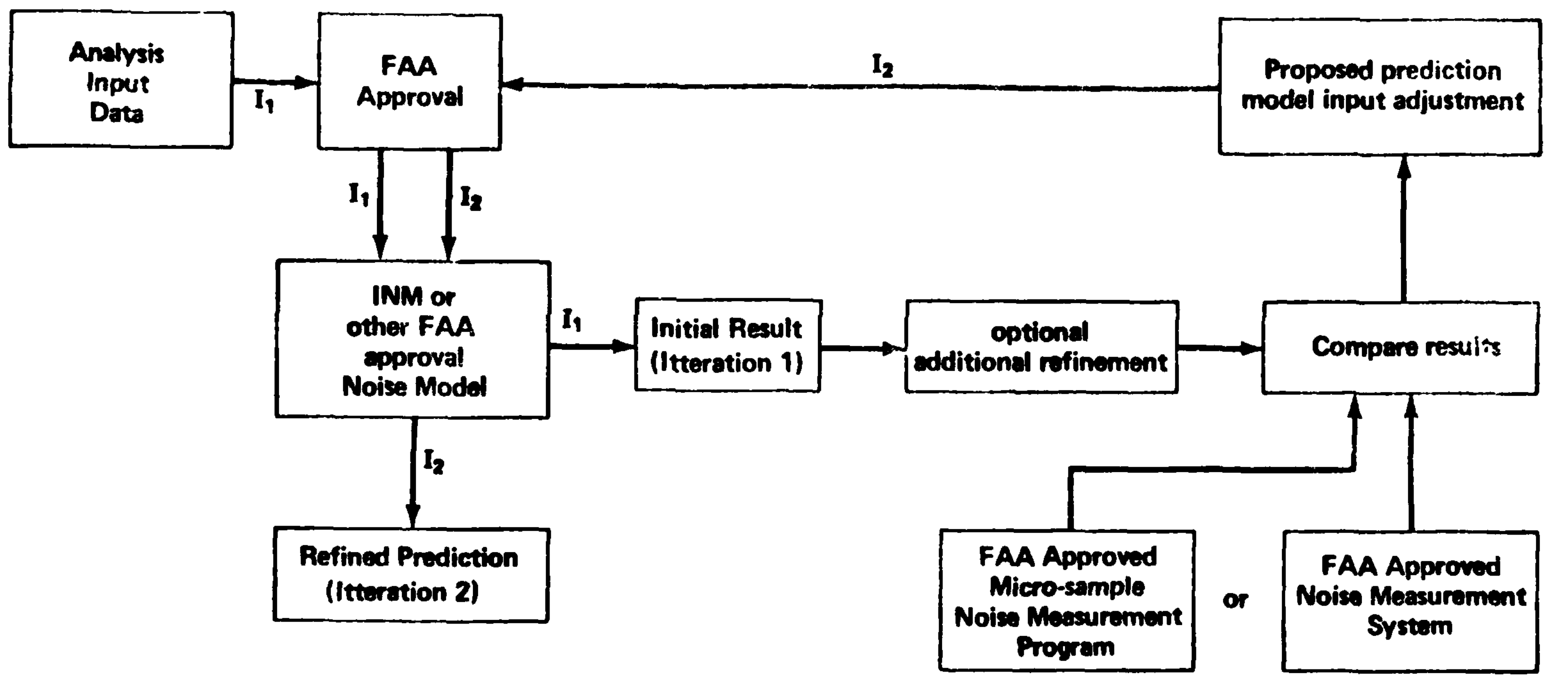
In summary, the track reduction capability has the potential of benefitting the air traffic control tower and the airport proprietors, environmental, accounting, and business staffs.

11.0 USE OF MONITORING SYSTEM DATA IN "TUNING UP" PREDICTED NOISE EXPOSURE CONTOURS

The flow diagram shown in Figure 9 sets out a process by which noise contours can be generated. The key feature of this process is the "feedback loop" provided by cumulative noise exposure data acquired either from continuous airport noise monitoring systems or from micro-sample field measurement programs using proper sampling techniques. This prediction process provides the analyst an opportunity to reevaluate his input assumptions and seek a reasonable explanation for differences between measured and predicted values. If suitable justification can be provided, the analyst reruns the noise prediction model. Theoretically several iterations could be run if justified each time on the basis of better input assumptions.

FIGURE 6

AIRCRAFT NOISE EXPOSURE PREDICTION



12.0 POSSIBLE CRITERIA FOR FAA FUNDED CONTINUOUS AIRPORT NOISE MONITORING SYSTEMS

Section 104(a) of the Aviation Safety and Noise Abatement Act of 1979 provides the Secretary of Transportation the latitude to identify measures which can be taken as part of an airport noise compatibility program. Continuous airport noise monitoring systems fall into this category.

Airport noise monitoring systems can provide important input to the process of refining airport noise contours.

All airport noise monitoring systems funded under the Act would be required to meet maximum FAA specifications. It is expected that any FAA approved noise monitoring system would have the following minimum capabilities:

1) Provides continuous measurement of dB(A) at each site.

2) Provides hourly Leq data.

3) Provides daily Ldn data.

4) Provides single event maximum A-weighted sound level data.

Desirable capabilities include:

a. Aircraft event discrimination ability.

b. Single event NEL data for each aircraft event.

c. Differentiation between ambient and aircraft contributions to hourly Leq and Ldn.

Data presentation is considered a vital component of the noise monitoring system. Each system would be requested to submit periodic (e.g., quarterly) reports to the FAA Office of Environment and Energy as well as to local city, county, and state governmental bodies and planning commissions. A minimum report content and format would be suggested. Additional analyses (similar to those contained in the FAA Dulles/Washington National reports) will be encouraged.

13.0 LEGAL REQUIREMENTS FOR AIRPORT NOISE MONITORING SYSTEMS

The State of California Administrative Code, Title 21, Chapter 2.5, Subchapter 6 specifies "California Airport Noise Standards." This law promulgated in late 1970 requires that any airport which has a "noise problem" must monitor aircraft noise as a means for validating noise impact contour boundaries. Continuous monitoring is required "for airports with 1,000 or more homes within the noise impact boundary based on a CNEL of 70 dB." CNEL is the "California Noise Exposure Level," a measure of cumulative noise exposure. Continuous measurements are only required within residential areas while intermittent measurements are allowed at other locations.

13.1 Use of Airport Noise Monitoring Systems as a "Passive Guard" in Enforcing Airport Use Restrictions

The United States Acting Assistant Attorney General has submitted an AMICUS CURIAE brief in the matter of Santa Monica Municipal Airport Association and National Business Aircraft Association, et. al. versus

City of Santa Monica, et. al. In this brief, the Government introduces the expression "Passive Guard," a pseudonym for the airport noise monitoring system which would: -

"serve as a 'passive guard' against those pilots who deviate from accepted techniques and fly in an excessively noisy manner.

If employed in such a fashion, that SENEL would have no impact on airspace management or flight safety. In our view, that type of a system would not be federally exempted."- -

The brief puts forth the position that ". . .once a proprietor such as Santa Monica had made a determination of which aircraft by type are acceptable, it could then employ its SENEL, adjusted to reflect that determination plus a margin for variable conditions to identify those pilots operating otherwise acceptable aircraft that were flown in an unnecessarily noisy fashion."

The filing of this brief represents an important statement of U.S. Government policy concerning the use of airport noise monitoring systems.

Key points of interest:

a. The airport noise limit must be applied in a nondiscriminatory fashion.

b. The exceedance threshold would be keyed to the upper limit or a selected percentile of the noise level variability distribution for the noisiest aircraft type allowed to operate.

c. If any of the permitted aircraft types exceed the limit, then the proprietor can cite the pilots in violation.

Although the groundwork has been laid for implementing "passive guard" type systems, many details still must be addressed. At the present time, no airport in the United States has established such a system.

14.0 NORTH AMERICAN AIRPORTS WITH PERMANENT NOISE MONITORING SYSTEMS

The following list identifies North American airports with permanent noise monitoring systems. Airports are also identified which have indicated an intention to acquire a system during 1981. The vast majority of other airports also utilize a variety of portable monitoring equipment. There are currently three manufacturers of airport noise monitoring systems in the United States. The list includes Bolt, Beranek and Newman of Cambridge, Massachusetts, EG&G Hydrospace of San Diego, California, and Tracor of Austin, Texas.

Washington National
Dulles International
Honolulu International

Los Angeles International

Ontario International

San Diego International

Torrance Municipal

Seattle Tacoma International

San Francisco International

San Jose Municipal

Orange County

Burbank

Montreal (Canada)

Toronto (Canada)

Read-Hillview Airport (Santa Clara County, California)

LaGuardia

JFK International

Newark International

Santa Monica Municipal

Cleveland International

Long Beach (Possible System Acquisition in 1981)

Kansas City International (Possible System Acquisition in 1981)

[illegible] AIRPORT NOISE MONITORING SYSTEMS IN EUROPE AND JAPAN

European constructors of airport noise monitoring systems include Bruel and Kjaer (B&K), a Danish concern, Compagnie Internationale de Services Informatique (C.I.S.I.), a French company, and Siemens, a German manufacturer. A partial list of airports with noise monitoring systems is provided below.

Europe

- London/Heathrow, U.K.
- Paris/Roissy-Charles de Gaulle, France
- Paris/Orly, France
- Nice/Cote d'Azur, France
- Toulouse, France
- Zurich, Switzerland
- Basle/Mulhouse, France-Switzerland
- Geneva, Switzerland
- Oslo, Norway
- Copenhagen/Kastrup, Denmark
- Istra, France
- Lyon, France
- Bordeaux, France
- Stockholm/Arlanda, Sweden
- Stockholm/Bromma, Sweden
- Budapest, Hungary

Japan

- Tokyo
- Osaka
- Fukuoka

16.0 RELATED RESEARCH AND DEVELOPMENT

The FAA is currently completing a performance study of the IAD-DCA noise monitoring system. The results from this analysis are expected to provide practical recommendations for upgrading overall system functions. Study areas include:

a) Event threshold settings;

b) Aircraft discrimination accuracy;

c) Calibration stability, and

d) Wind noise influences.

A separate task involved design and installation of wind detection/cutout hardware and software. This enhancement is expected to result in more accurate quantification of ambient noise.

A third task involved development of a prototype position discrimination system which will improve the ability to separate community noise events from aircraft noise events. The discrimination system uses an inexpensive microphone array driving a phase comparison network to determine the noise source location. In another area the IAD-DCA system is being used to validate the FAA Integrated Noise Model, a computer based noise contour generating methodology. It is planned to repeat phases of the validation process for another airport equipped with a continuous monitoring system.

17.0 FAA AIRPORT NOISE MONITORING SYSTEM INFORMATION EXCHANGE PROGRAM

The FAA, Office of Environment and Energy is establishing a "clearinghouse" for information and developments pertaining to Airport Noise Monitoring Systems.

Program objectives include exchanging technical and application information concerning:

1) Noise event type discrimination
2) Microphones and hydrophones
3) Telephone line "errors"
4) Effects of wind on system performance
5) Site selection
6) Threshold adjustment
7) Data storage and management
8) Data processing
9) Report formatting
10) Analytical presentations

Further, the program will foster discussion and assessment of noise monitoring system specifications and provide guidance to prospective purchasers of noise monitoring systems.

Information will also be provided concerning mobile noise monitoring equipment, microsampling, statistical requirements, deployment techniques, and preparation of environmental assessments.

REFERENCES

1. Washington National Airport/Dulles International Airport Monthly Monitoring Reports, U.S. Department of Transportation, Federal Aviation Administration.

2. Personal Communication, Jack Zimmerman, EG&G, Hydrospace Challenger, August 1960.

3. Personal Communication, B. K. Cooper, TRACOR, August 1980.

4. Personal Communication, Jens A. Jensen, Bruel and Kjaer, November 9, 1980.

5. Brief for the United States of America Amicus Curiae, Department of Justice, in the U.S. Court of Appeals for the Ninth Circuit, Santa Monica Airport Association and National Business Aircraft Association, et. al. Versus City of Santa Monica, et. al.

6. State of California Administrative Code, Title 21, Chapter 2.5, Subchapter 6, California Airport Noise Standards.

7. Personal Communication, John Melaragni, Bolt, Beranek and Newman, August 1980.