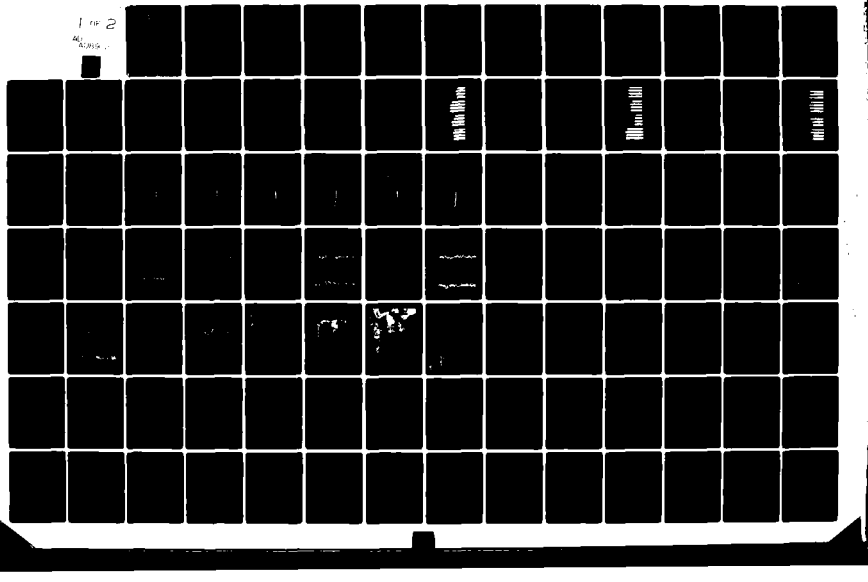
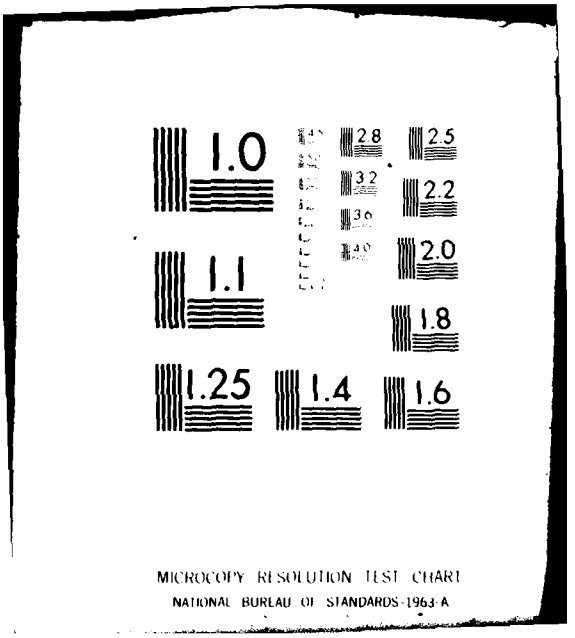
AD-A089 111 FEDERAL AVIATION ADMINISTRATION WASHINGTON DC OFFICE --ETC F/G 1/2
WASHINGTON NATIONAL AIRPORT FLIGHT EXTENSION TEST, NOISE MONITO--ETC(U)
MAY 80 J R HARE, D W FORD
UNCLASSIFIED FAA/EE-80-25 NL




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LEVEL II

Washington National Airport Flight Extension Test

Noise Monitoring Data Report

U.S. Department of Transportation
Federal Aviation Administration

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

FAA-EE-80-25

May 1980
Final Report

James R. Hare, Jr.
David W. Ford

EXECUTIVE SUMMARY

This report summarizes the noise measurements obtained during the Washington National Airport Flight Extension Test which was conducted during the summer of 1979, by the Federal Aviation Administration in cooperation with the Washington Area Council of Governments. During this test, south departing turbojet aircraft were directed to fly over the Potomac River corridor an additional five miles prior to being directed toward their destinations. Monitoring sites were set up in the affected areas to determine the effect of the change in operations on the ambient noise levels.

Equivalent noise levels (Leq) were obtained on an hourly basis and averaged for each site. The results show no statistically significant change in averaged equivalent noise levels at three sites. Significant decreases in Leq were recorded at four sites and five of the twelve sites observed some statistically significant increase in equivalent sound levels.

STATISTICAL CHANGE IN EQUIVALENT SOUND LEVELS

		No Change	Decrease	Increase
Close-in Virginia Sites	Marlan Forest		X	
	Mount Vernon Hosp.		X	
	Waynewood	X		
	Mount Vernon		X	
Close-in Maryland Sites	Fort Foote	X		
	Dania Hills		X	
	FCC, Riverview	X		
	Tantallon			X
Southern Sites, W.	National Colonial Farm			X
	Gunston Hall			X
Southern Sites, E.	Alice Ferguson Found.			X
	Accokeek Park			X

Those sites farthest from the centerline of the flight path and up to ten miles from the airport, such as Mount Vernon, the Mount Vernon Hospital, and the Dania Hills benefitted the most from the change in flight pattern in terms of the subsequent reduction in aircraft noise. Average equivalent levels at these sites were 2.2 to 7.1 dB quieter during the test period. The community of Tantallon, Maryland experienced an increase in averaged equivalent noise levels of 2.3 dB (morning period), while Accokeek Park experienced a 13.6 dB increase (afternoon period). The monitors at Gunston Hall and the National Colonial Farm sites measured a statistically significant increase in equivalent levels only during the evening periods, due to a small difference in traffic concentration during this period.

Maximum levels (dBA) were also recorded for single aircraft events. The average maximum noise levels for the single event, during the afternoon period at Accokeek Park, for example, increased from 6.5 dB(A) to 13.5 dB(A) over the normal operational levels, varying with aircraft type. This increase in maximum levels, combined with the increased number of overflights (from 0 to 5 per hour before to 15 to 20 per hour during the test period) produced the increase in average equivalent noise levels in the southern region of the affected area.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

During the summer of 1979, the Federal Aviation Administration (FAA) in cooperation with the Metropolitan Washington Council of Governments (COG) instituted a temporary change in the south departure procedure for turbojet aircraft from Washington National Airport. This test was carried out in conjunction with a noise monitoring program conducted by the FAA's Office of Environment and Energy to evaluate the impact of the alternative routing on the community sound levels. The test was requested by the Board of Directors of the Council of Governments in the form of a resolution sent to the FAA and the COG undertook the sampling of community response to the test procedure.

1.1 Test Period

The test period was from August 4 to September 22, 1979. Measurements were taken at 12 locations throughout Maryland and Virginia. Data were also taken approximately two weeks before and three weeks after the flight test period in order to obtain "normal operation" data for comparison.

1.2 Normal and Test Period Aircraft Operations

The current south departure procedure requires all turbojet aircraft to maintain a departure heading over the Potomac River corridor (183 degree radial) for approximately five nautical miles, before they are directed to their destination. During the test period, turbojet aircraft were requested to maintain the corridor heading (183/187 degree radial) for an additional five nautical miles. The resulting change in noise levels in the communities affected by the flight path extension are given in this report. Typical flight patterns are presented in Figures 6 through 11.

2.0 NOISE MONITORING PROCEDURE

2.1 Monitoring Periods

Data were gathered on an hourly basis, with observers at each site recording the hourly averages and single event maximum A-Weighted sound levels. Hourly data were grouped into three periods: morning (data collected from 10:00 to 11:00 and 11:00 to 12:00), afternoon (13:00 to 14:00 and 14:00 to 15:00), and evening (19:00 to 20:00, 20:00 to 21:00, 21:00 to 22:00). Weekend data were also recorded and averaged on a 24-hour basis. The noise exposure was quantified using the Equivalent Sound Level (LEQ) which expresses the average acoustical energy occurring during a sample period. During the test period, 930 hours of hourly data were collected and 1,750 single aircraft events were recorded. The average equivalent noise levels for south departures are presented in Figures 3, 4, and 5.

2.2 Site List

The data contained in this report were recorded at sites in the following twelve communities:

Marlan Forest, Virginia - Permanent system

Mount Vernon Hospital, Virginia - Portable system

Waynewood, Virginia - Permanent system

Mount Vernon, Virginia - Portable system

Fort Foote, Maryland - Permanent system

Dania Hills, Maryland - Portable system

Riverview, Maryland (Federal Communications Center) - Portable system

Tantallon, Maryland - Permanent system

National Colonial Farm, Bryan Point, Maryland - Portable system

Gunston Hall, Mason Neck, Virginia - Portable system

Alice Ferguson Foundation, Mockley Point, Maryland - Portable system

Accokeek Park, Accokeek, Maryland - Portable system

Measurement site locations are shown in Figure 1. Detailed site descriptions are provided in Appendix A, along with topographical maps and sample graphic histories.

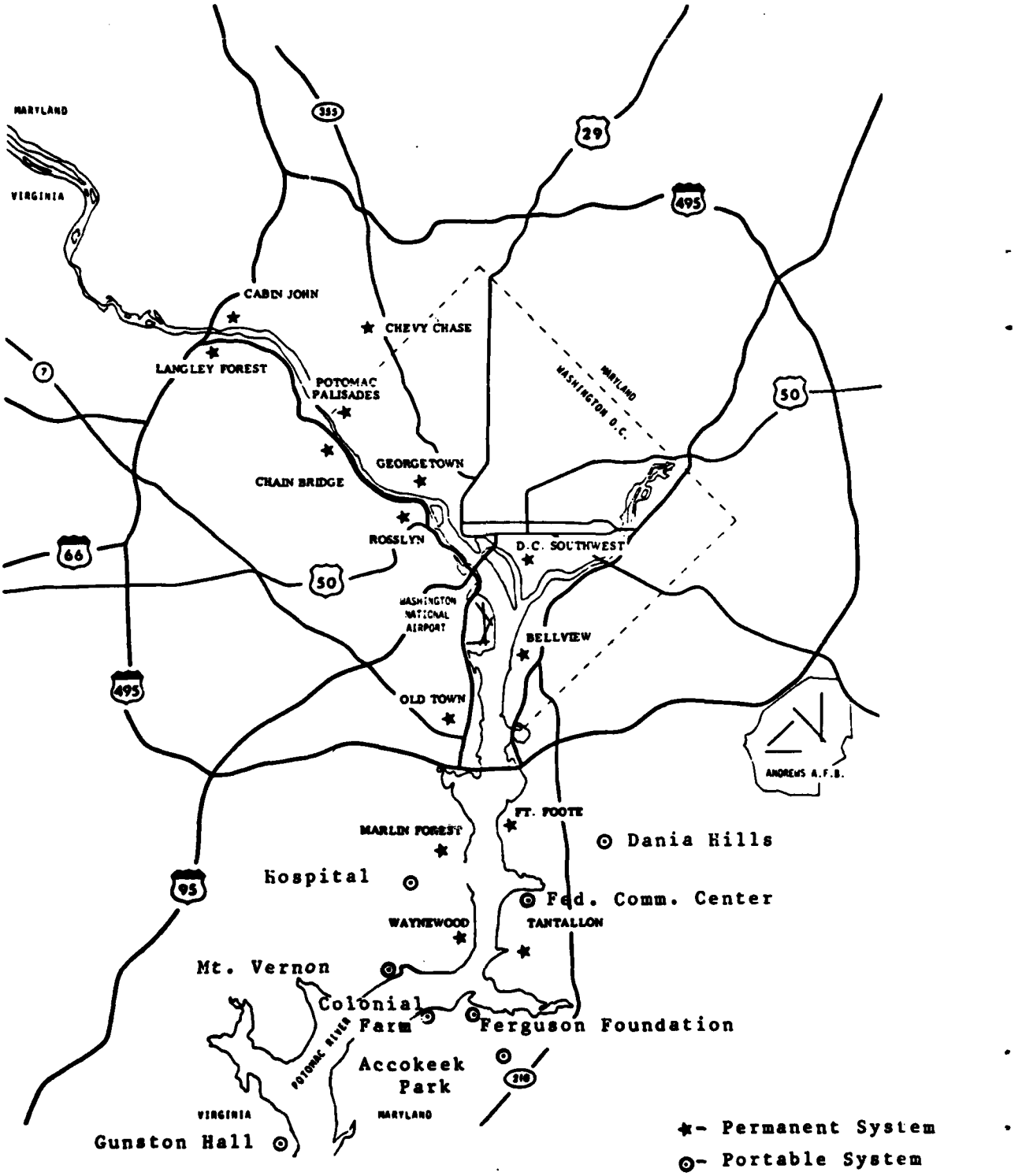
2.3 SITING OF THE PORTABLE MONITORING SYSTEM

The sites were chosen to best show the impact of the flight path extension test upon the various communities by using the following guidelines:

1. The sites were located within or near communities affected.

2. The sites were chosen to complement the permanent system sites already in place and operating.

3. The sites were to be away from reflecting surfaces which could influence the signal being measured.



FAA/WMA Noise Monitoring Sites

Figure 1.

Other important considerations included:

1. Property owner acceptance of siting request;
2. Security from tampering and vandalism of the equipment; and
3. The accessibility of the proposed site.

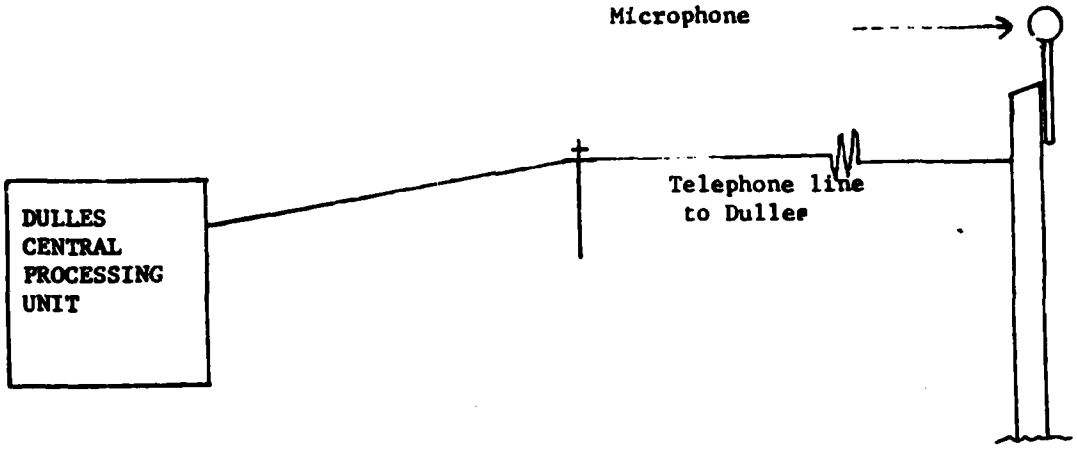
3.0 INSTRUMENTATION

3.1 Permanent System

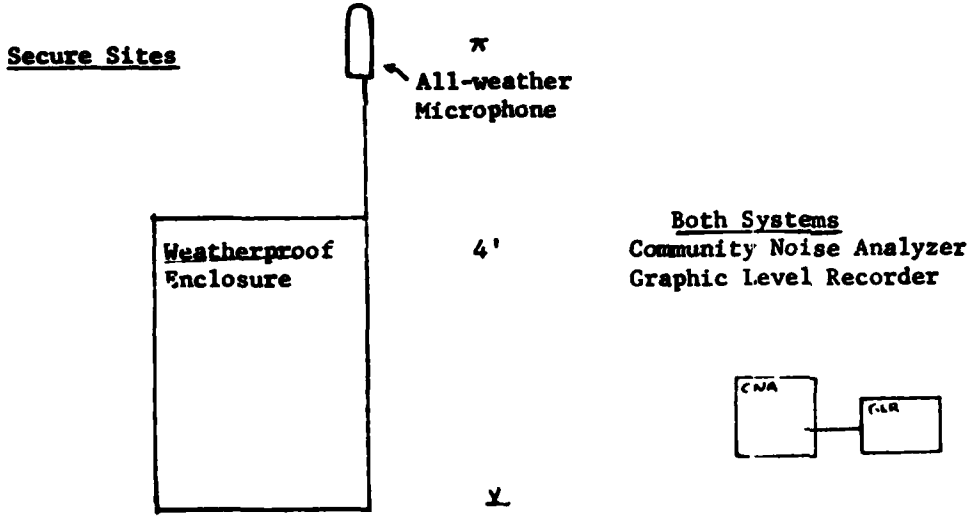
Two systems were employed to collect data during this test. One system (which supplied data from four locations) is part of the permanently installed Washington Metropolitan Noise Monitoring system. This system is comprised of a hydrophone, mounted approximately six meters above the ground, connected to an electronics package which "A"-weights and digitizes the noise data. These data are then tramsitted via standard, class-three, telephone lines to a central processing unit located at Dulles International Airport and stored for later processing into statistical metrics.

3.2 Portable System

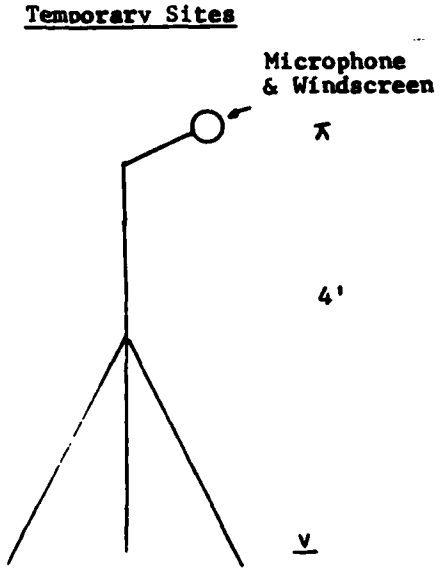
The second system augmented the permanent system with an additional eight portable noise monitoring units. This system provided hourly statistical values (defined on page 12) single-event data, and a graphic time histories. Included in this system was a GenRad 1945 Community Noise Analyzer (CNA), a GenRad all-weather microphone system including the 1962-9601 electret microphone, and 1560-P42 preamp. This system meets the requirements of ANSI S1.4-1971 and IEC 179-1965 type 1 noise measurement systems. Each system also included a Metrosonics graphic



Washington Metropolitan Airports Permanent Noise Monitoring System



FAA/AEE Portable Monitoring System



MONITORING SYSTEM CONFIGURATIONS

Figure 2.

level recorder which, when driven by the GR 1945, provided a graphic time history of the community noise. These instruments were housed inside an all-weather enclosure which was anchored securely to the ground. A schematic drawing of the equipment layout is given in Figure 2. Because of limited security, the Accokeek Park unit was removed each evening whereas the equipment at all other sites remained installed for the duration of the test.)

4.0 DATA COLLECTION PROCEDURE

Data were collected on an hourly basis primarily during three periods: morning (10:00 to 11:00, 11:00 to 12:00), afternoon (13:00 to 14:00, 14:00 to 15:00), and evening (19:00 to 20:00, 20:00 to 21:00, 21:00 to 22:00). Twenty-four hour runs were also made on weekends, starting the Community Noise Analyzers at midnight (0000) on Friday and continuously monitoring through midnight (0000) Sunday night.

4.1 Calibration

Calibration of the intruments was carried out before and after each of the periods, with a GenRad 114 dB, 1 KHZ calibrator. An electrical noise floor reading was also taken after each calibration to insure an adequate signal-to-noise ratio.

4.2 Single Event Data Collection

Single-event data were recorded at each site by observers, as each aircraft passed overhead. The maximum A-weighted sound level (dBA) reading was taken from the CNA display and aircraft type, airline, and

the angle of elevation were also noted. At the end of each period, the statistical data were retrieved from the CNA's which were then reset for the next period.

4.3 Data Reported

Although this test only affected the aircraft departing to the south, data were recorded throughout the entire test period regardless of the operation. The north data has been included as an appendices for future reference. Also, remarks were recorded during each test period to identify what noise sources made up the ambient. In the event that noise intrusions occurred during an hour which would prevent an objective comparison to another hour, these data were eliminated. Examples of such intrusion would be lawn mowers and the thunder of electrical storms.

5.0 DATA DESCRIPTION

The majority of data gathered during the Washington National Airport Flight Extension Test was calculated by the GenRad Community Noise Analyzer as it occurred at the site. This instrument is designed to calculate noise levels over a preset period of time and produce 'L_{xx}' values or levels which describe the noise during the period. The L_{xx} values reported are calculated from "A"-weighted noise levels and are defined as follows:

$L_{1.0}$ = The noise level which was exceeded one percent of the time period.

L_{10} = The noise level which was exceeded 10 percent of the time period.

L_{EQ} = The level of constant sound which has the same energy as the time varying sound over a given period of time.

The balance of the data, collected by the Washington Metropolitan Airports Permanent System, is also presented in terms of L_{xx} values. From these L_{xx} values, conclusions can be drawn as to the intensity of the noise, the duration of the noise levels and the total contribution by all noise sources, to the ambient sound levels in the community. These L_{xx} values were averaged for comparison and analyzed statistically.

6.0 STATISTICS

In order to accurately assess the impact of the test on community noise levels, the students T-test [1/] was used to test for significant differences. Because the sample size of each period was less than thirty, the variance of the two populations of aircraft (before test and during test) were unknown and unequal and the sample sizes were not equal, the following formula for the T-value was used to evaluate the difference between the two averages:

$$T' = \frac{X_1 - X}{\sqrt{\left(\frac{s_1^2}{n_1}\right) + \left(\frac{s_2^2}{n_2}\right)}}$$

Where T' is the statistic representing the difference between two means, X_1 is the mean of the reference case operations, X_2 is the mean of the test case operations, s_1 and s_2 are the standard

1/ Meyer, Stewart L., Data Analysis for Scientists and Engineers, John Wiley and Sons Company, 1975.

deviation of the reference and test samples, respectively, and n_1 and n_2 are the size of the reference and test operations. This statistic has approximately a t distribution with v degrees of freedom, where the population variance (v) is determined by:

$$v = \left[\frac{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}{\left(\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1}\right) + \left(\frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}\right)} \right] - 2$$

Where s_1 and s_2 are the standard deviations of the reference and test samples and n_1 and n_2 are the number of data points in the reference and test samples. The statistics t' and v are then entered into the table of critical values of the t distribution to test the null hypothesis. The null hypothesis assumed X_1 was not different than X_2 or $X_1 = X_2$. The rejection of the null hypothesis (i.e., $X_1 = X_2$) indicates that the difference between the two mean values is statistically significant. The null hypothesis was accepted or rejected with a 95 percent certainty. Significance determined by the above test was noted on Figure 3 through 5 by the triangle mark and by an asterisk in the summary of net changes, Table 1.

7.0 RESULTS

The results of the Washington National Flight Extension Test noise monitoring effort are discussed below on a site by site basis. Table 1 presents a summary of the net changes in overall LEQ values and

DCA FLIGHT PATH EXTENSION TEST

RESULTS SUMMARY

SOUTH OPERATIONS

Site	Net Changes in LEQ's dB				Average Weekday Change
	Morning	Afternoon	Evening	Weekend	
Marlan Forest, Va.	-1.7	-2.9*	-2.6*	-2.2	-2.4
Mt. Vernon Hospital, Va.	-5.0*	-2.2*	-6.4*	-3.5	-4.5
Waynewood, Va.	0.9	1.3	0.9	0.8	1.0
Mount Vernon, Va.	-4.8*	-3.5*	-2.7*	-1.0	-3.7
Fort Foote, Md.	-0.9*	-0.6	-0.3	-0.2	-0.6
Dania Hills, Md.	-7.1*	-2.2	-3.0*	-3.5	-4.1
Federal Comm. Center, Md.	0.2	0.2	0.6	0.8	0.3
Tantallon, Md.	2.3*	2.2*	4.2*	3.0	2.9
Colonial Farm, Md.	-1.9	-0.1	5.1*	6.0	1.0
Gunston Hall, Va.	0.6	1.0	8.3*	-	3.3
Alice Ferguson, Md.	6.8*	7.2*	9.3*	8.0	7.8
Accokeek Park, Md.	10.2*	13.6*	7.5	-	10.4

*Indicates statistical significance.

NET CHANGES IN AVERAGE EQUIVALENT SOUND LEVELS (L_{eq})

TABLE 1

Figures 3, 4, and 5 compare the LEQ levels before and after the test. The sites have been grouped relative to the flightpath and distance from the airport, thus those sites closest to the left margin of each of the figures are closest to the airport. Note on Table 1 that the changes which were statistically significant have been marked and the negative or positive signs indicate decreasing or increasing noise, respectively.

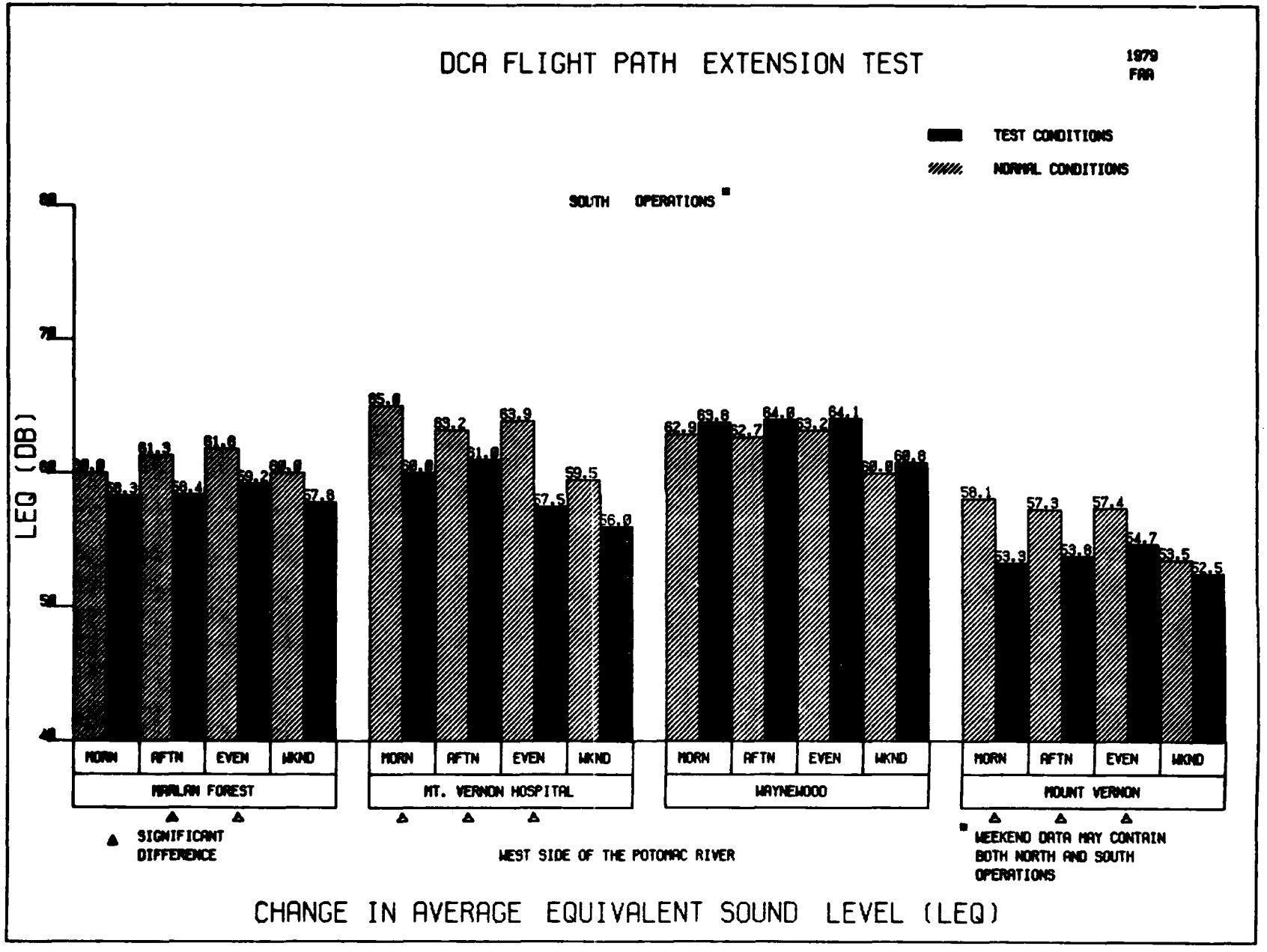
7.1 West Side of the Potomac River - South Operations

7.1.1 Marlan Forest, Virginia

This site experienced a decrease in average equivalent sound levels (L_{eq}) during the test period in all of the time periods. However, a statistically significant change was not indicated for the morning or weekend time periods. Equivalent noise levels, during the afternoon period, were reduced by 2.9 dB to an average L_{eq} of 58.4 dB. It is clearly shown in Figures 6 through 11 that the test flight pattern reduced the number of direct overflights, however, some of the potential benefit was lost due to the increased volume of the traffic over the Potomac River corridor directly to the east to this site. The weekend data presented for comparison are south/north combined days as no totally south, 24-hour periods were measured during timeframe of the test.

7.1.2 Mount Vernon Hospital, Virginia

The reduction in average L_{eq}'s at this site reflect the improvement in noise levels which were predicted for the area. The greatest change occurred during the evening sampling period, with a decrease in average L_{eq} of 6.4 dB. Ambient levels at this site, both


DCA FLIGHT PATH EXTENSION TEST
1979
FAA
TEST CONDITIONS
NORMAL CONDITIONS
SOUTH OPERATIONS *
LEQ (DB)
MORN
AFTN
EVEN
WKND
MARLAN FOREST
MT. VERNON HOSPITAL
WAYNEWOOD
MOUNT VERNON
59.0
58.3
61.3
58.4
61.0
59.2
60.0
57.8
65.0
60.0
63.2
61.0
63.9
57.5
59.5
56.0
62.9
63.8
62.7
64.0
63.2
64.1
60.0
60.0
58.1
53.9
57.3
53.8
57.4
54.7
53.5
52.5
▲ SIGNIFICANT DIFFERENCE
WEST SIDE OF THE POTOMAC RIVER
* WEEKEND DATA MAY CONTAIN BOTH NORTH AND SOUTH OPERATIONS
CHANGE IN AVERAGE EQUIVALENT SOUND LEVEL (LEQ)

before and during the test period were largely influenced by the street traffic, buses, construction trucks and emergency vehicles which used the roads near the site. Weekend data include mixed south/north 24-hour periods due to a lack of totally south days. Again, Figures 6 through 11 show the different flight patterns for each time period. The average maximum noise levels of single aircraft events decreased during the test period for the majority of aircraft types. The largest sample was decreased by 6.0 dB (727 afternoon period) and this generally reflects the decreased L_{eq} levels.

7.1.3 Waynewood, Virginia

Waynewood experienced no significant change in average noise levels duringf the test. Although this site is in theory subject to fewer direct flyovers during test operations, it is only .5 miles from the center of the test flight path and the increased concentration of aircraft over the river keep the noise levels approximately the same (see Figures 6 through 11).

7.1.4 Mount Vernon, Virginia

Mount Vernon registered a significant decrease in L_{eq} levels during test period of 4.8 dB in the morning, 3.5 dB in the afternoon, and 2.7 dB in the evening time period. This reduction was due to the decreased number of overflights as seen in Figures 6 through 11. Turbojet aircraft passed well to the east to of the Mount Vernon area during the test extension of the flight pattern. No obvious decrease occurred during the weekend periods and no significance could be demonstrated by the statistical analysis because of the small sample

size. The average maximum levels for all aircraft events and all aircraft types were dramatically reduced during the test. The average maximum level of a 737 flyover, for instance, was decreased by 10.1 dB(A) during the morning hours and 7.0 dB(A) during the afternoon measurement hours as a result of the change in flight patterns. This difference is not fully reflected in the change in L_{eq} levels due to the increased numbers of aircraft passing approximately two miles to the east of the site.

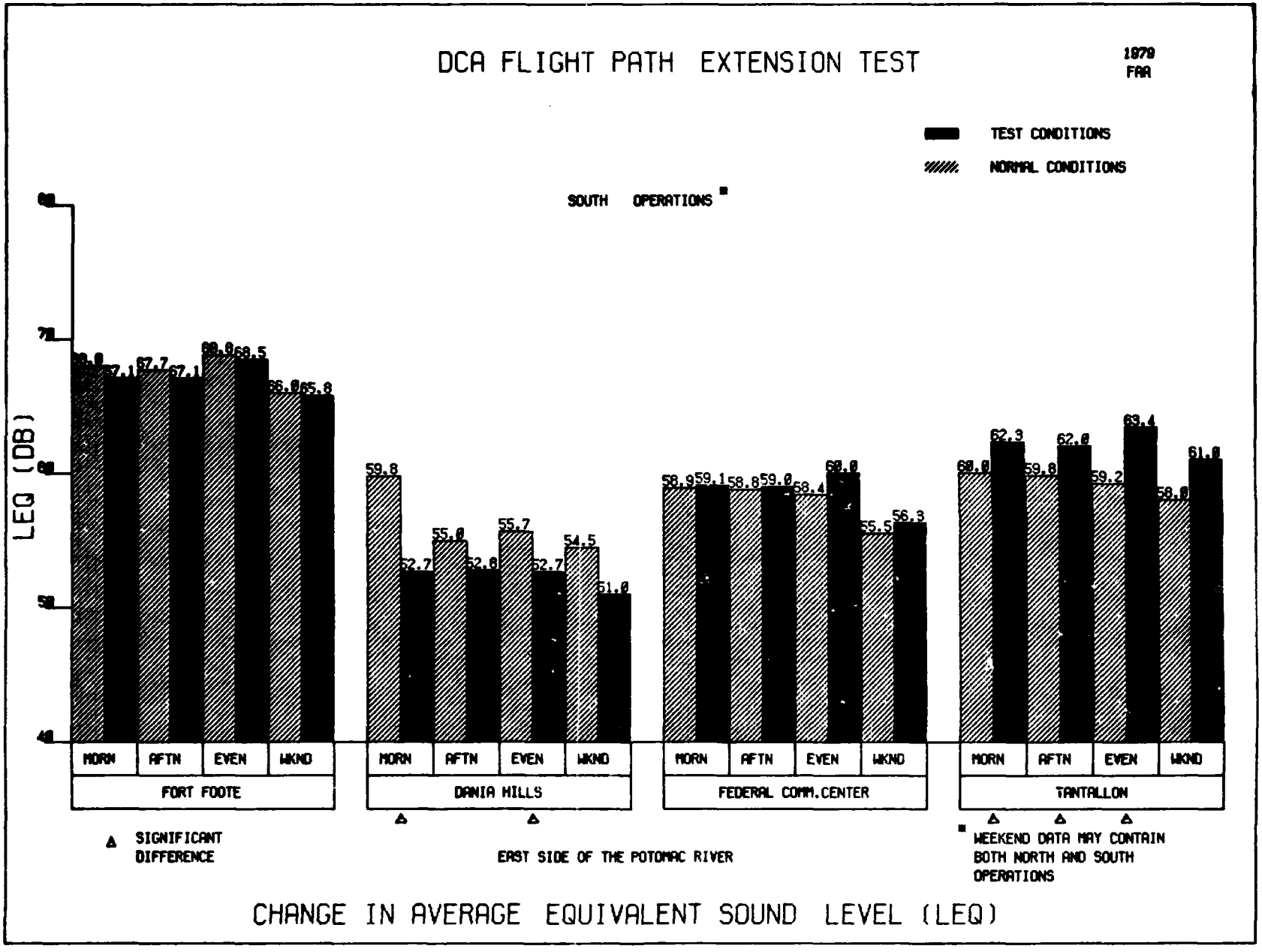
7.2 East Side of the Potomac River - South Operations

7.2.1 Fort Foote, Maryland

There was no statistically significant change in equivalent noise levels at the Fort Foote monitoring location. Because it is located close to the river corridor and close to the airport, all turbojet aircraft, regardless of the change in operating procedure, overflew this site (see Figures 6 through 11). The relatively high equivalent levels (L_{eq}) measured at this site were due to traffic generated street noise as well as the aircraft traffic.

7.2.2 Dania Hills, Maryland

Dania Hills showed the greatest improvement (7.1 dB decrease in the mornings) in average equivalent sound levels, of all the sites during the south departure extension test. Noise levels during the test represent ambient community noise with a background of jet rumble emanating from aircraft over the river corridor. Turbojet rumble was also present at this site during south arrival reverse thrust operations


DCA FLIGHT PATH EXTENSION TEST
1979
FAA
TEST CONDITIONS
NORMAL CONDITIONS
SOUTH OPERATIONS ■
LEQ (DB)
70
60
50
40
67.1
67.7
67.1
69.0
69.5
66.0
65.0
59.8
52.7
55.0
52.0
55.7
52.7
54.5
51.0
58.9
59.1
58.8
59.0
60.0
55.5
56.3
60.0
62.3
59.8
62.0
59.2
63.4
58.0
61.0
MORN
AFTN
EVEN
WKND
FORT FOOTE
DANIA HILLS
FEDERAL COMM.CENTER
TANTALLON
△ SIGNIFICANT DIFFERENCE
EAST SIDE OF THE POTOMAC RIVER
■ WEEKEND DATA MAY CONTAIN BOTH NORTH AND SOUTH OPERATIONS
CHANGE IN AVERAGE EQUIVALENT SOUND LEVEL (LEQ)

on overcast days. The average improvements in L_{eq} levels were 4.7 dB during the weekday measurement hours and 3.5 dB on the weekends. Average single event maximum levels were decreased during the test period. The greatest change was 7.0 dB(A) (727s during the morning measurement period) and this change is reflected in the decrease in equivalent noise levels measured at this site.

7.2.3 Federal Communications Center, Riverview, Maryland

There was no statistically significant change in measured equivalent sound levels at this site. The number of overflights was reduced by the change in operating procedure, but this was offset by the increased traffic to the west of the site. The average maximum sound levels for single aircraft events also show no change resulting from the change in procedure.

7.2.4 Tantallon, Maryland

The Tantallon site recorded a statistically significant increase in equivalent sound levels during the period of extended operations. The greatest increase (4.2 dB) occurred during the evening hours. However, averaged maximum single event data were consistently one to two dB(A) lower during the test period. Because all aircraft were routed to the west of this site during the test period, the L_{eq} was increased in response to the increase in the number of aircraft in the area. This change is graphically illustrated in Figures 6 through 11.

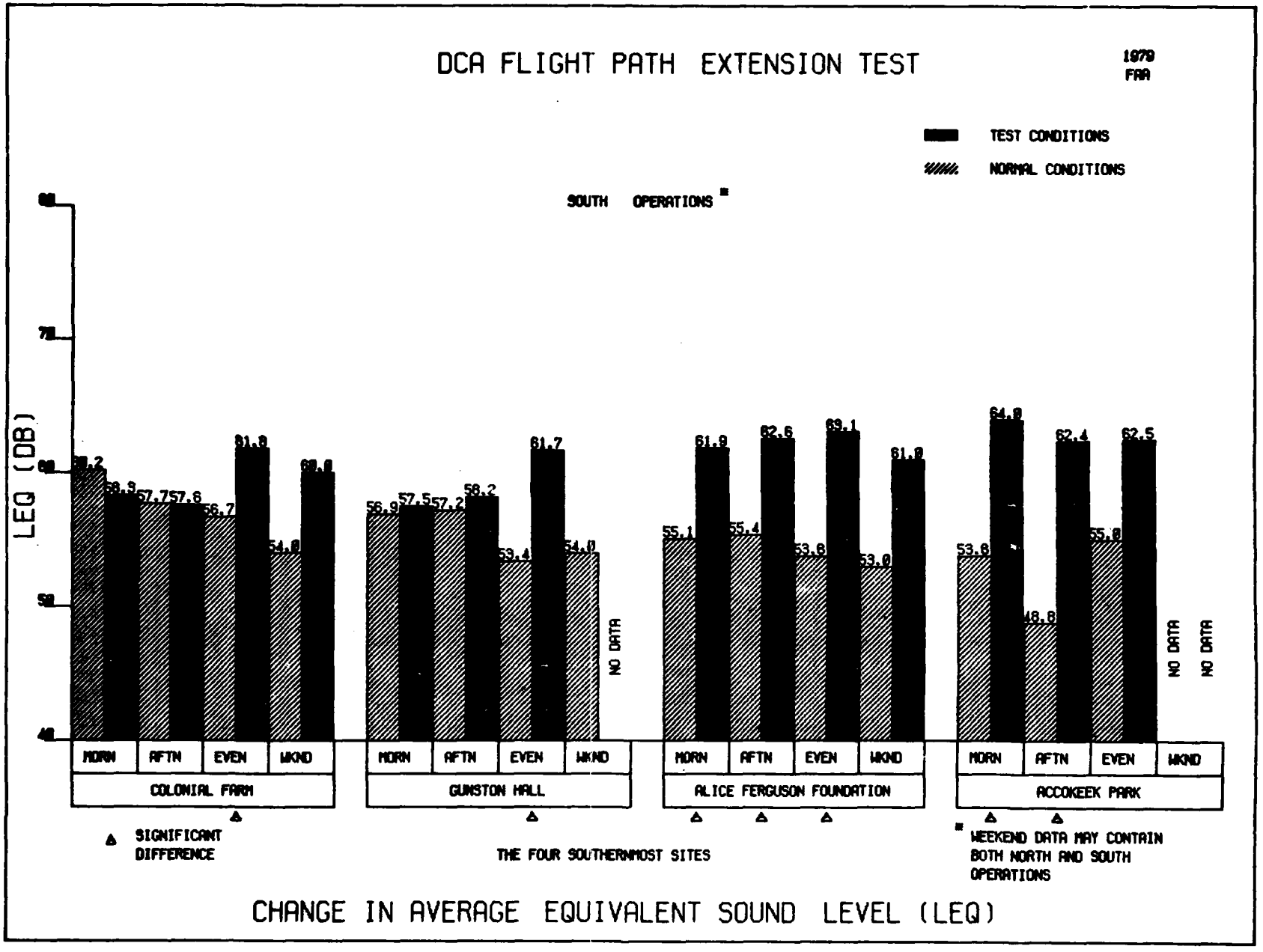
7.3 THE FOUR SOUTHERNMOST SITES - SOUTH OPERATIONS

7.3.1 National Colonial Farm, Bryan Point, Maryland

The impact of the test procedures on the equivalent noise levels at this site was mixed. No statistically significant change was measured during the morning and afternoon periods but an increase during the evening period of 5.1 dB was significant. The weekend data, as it was a very small sample, may have been influenced by a temporary increase in activity at the farm which would raise the ambient noise levels over a 24-hour period. The increase during the evening hours is due to an increased percentage of aircraft which overfly the site after turning towards their destination during this time period. Figures 10 and 11 illustrate this difference in operation.

7.3.2 Gunston Hall, Mason Neck, Virginia

Gunston Hall had results similar to Colonial Farm. Morning and afternoon differences were not significant but a 6.2 dB increase in noise levels during the evening time periods was significant. This variation is due to the increased number of overflights during the evening period. This site is also affected by military aircraft from Fort Belvoir, mostly helicopters. The effect of the military aircraft on evening and weekend time periods is largely unknown due to the lack of direct observational data. No south weekend data were collected during the test. The single aircraft event data gathered at this site represents the large increase in sound level associated with the rerouting of aircraft into an area of low ambient noise. The average


DCA FLIGHT PATH EXTENSION TEST
1979
FAA
TEST CONDITIONS
NORMAL CONDITIONS
SOUTH OPERATIONS *
LEQ (DB)
MORN
AFTN
EVEN
WKND
COLONIAL FARM
GUNSTON HALL
ALICE FERGUSON FOUNDATION
ACCOKEEK PARK
NO DATA
NO DATA
NO DATA
SIGNIFICANT DIFFERENCE
THE FOUR SOUTHERNMOST SITES
* WEEKEND DATA MAY CONTAIN BOTH NORTH AND SOUTH OPERATIONS
CHANGE IN AVERAGE EQUIVALENT SOUND LEVEL (LEQ)

maximum level of the observed 727's increased 12.9 dB(A). However, the sample size indicates the relative lack of direct flyovers at this site, either before or during the test. This is reflected in the average L_{eq} values which show little change in two of the three time periods.

7.3.3 Alice Ferguson Foundation, Mockley Point, Maryland

The Alice Ferguson Foundation experienced a large increase in the average L_{eq} associated with the additional overflights. L_{eq} levels during the evening hours were 9.3 dB higher during test than during normal operations. No statistical significance may be attached to the weekend results due to the small sample size. The ambient noise at this site is low due to its rural location, several hundred yards from the nearest paved road. The perceived loudness of the individual aircraft events more than doubled at this site as a result of the change in departure procedure. Maximum levels for observed 737's increased by 11.1 dB(A) (afternoon period) and by 15.2 dB(A) for observed 727's. These increases in maximum levels were reflected in the averaged equivalent noise levels reported above.

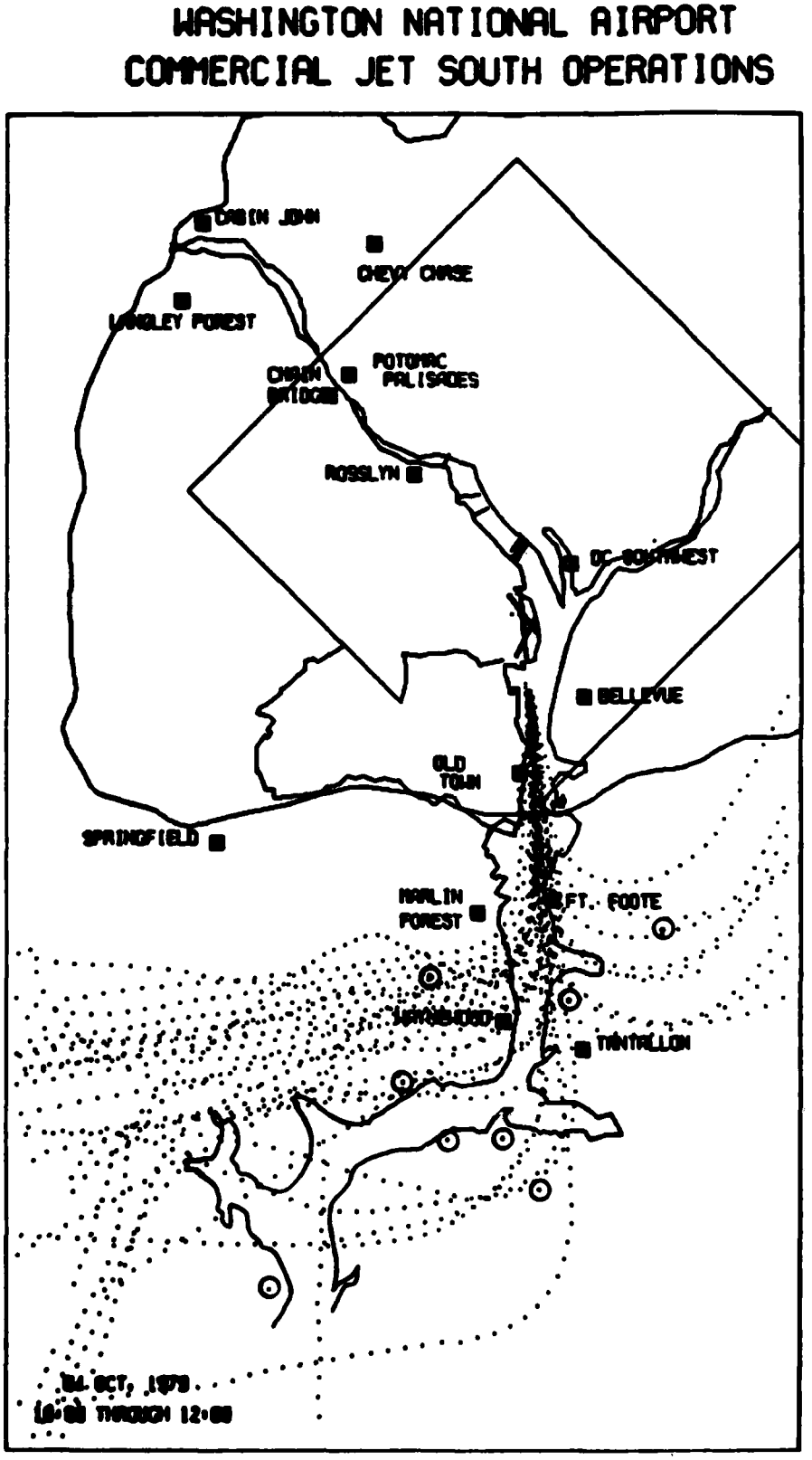
7.3.4 Accokeek Park, Maryland

Accokeek Park was subjected to the greatest increase in noise levels. Test L_{eq} levels during the week averaged 10.4 dB above higher operation community noise levels. Afternoon levels were 13.6 dB normal during the test than they were during the normal south departure patterns. As at the Alice Ferguson site, ambient noise levels during the morning and evening periods are produced mainly by birds and insects. Very few cars traveling on Indian Head Highway--the nearest major

road--could be heard at the monitoring site. Figure 5 shows the drop in noise levels during the afternoon, normal operations, which reflects the lessened activity of insects and birds as the day gets warmer. Weekend data were not collected at this site as the lack of security prohibited leaving instruments unattended. The maximum noise levels of the individual aircraft event was increased by an average of 12.6 dB(A). Again, the increase in maximum sound levels, as a result of the change in departure patterns, doubled the perceived loudness of individual aircraft events.

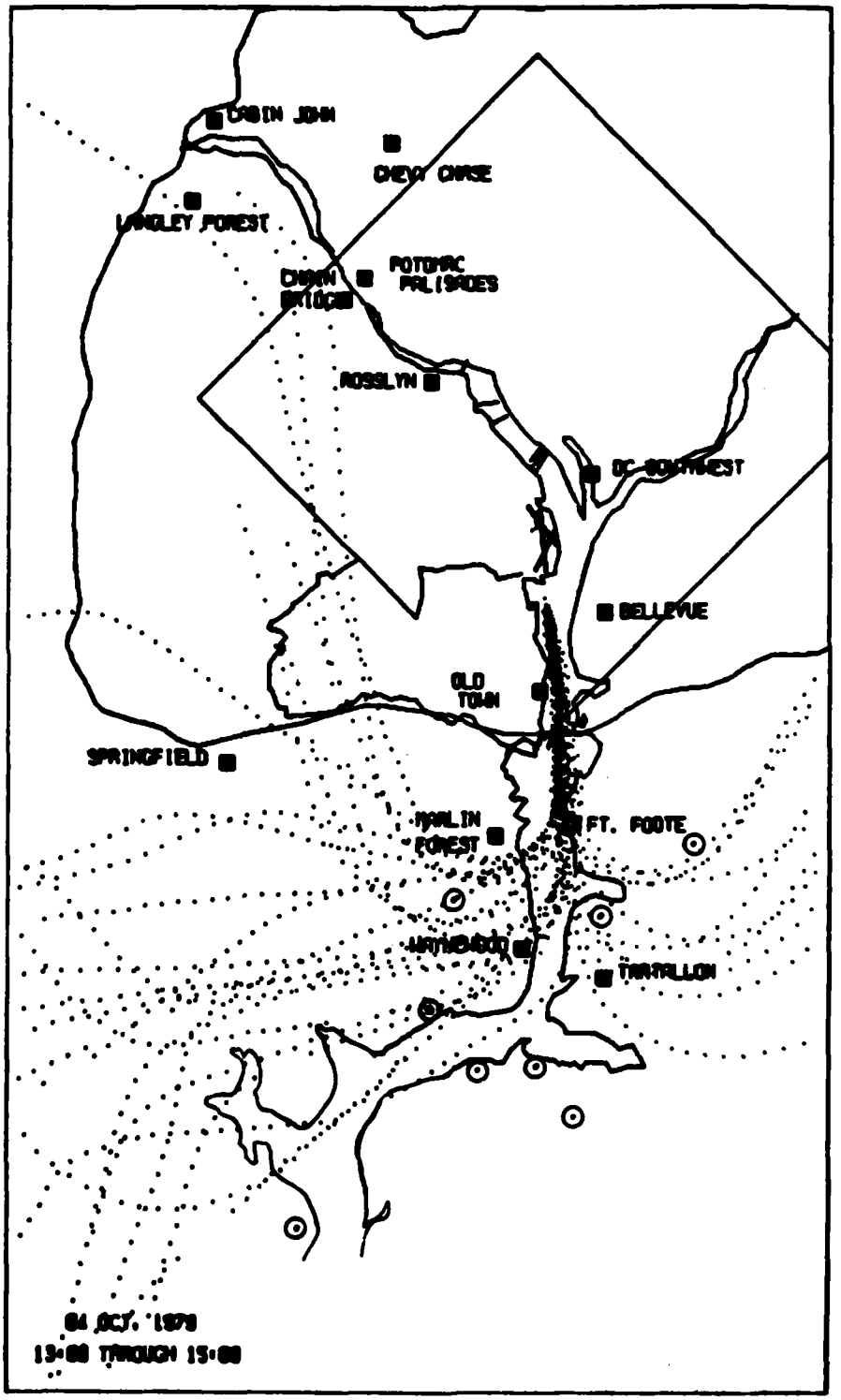
8.0 CONCLUSION

The data gathered during the flight extension test clearly indicates that the operational procedures which reduced the noise levels in the Mount Vernon and Oxon Hill areas resulted in increased noise levels in southern Prince Georges County.



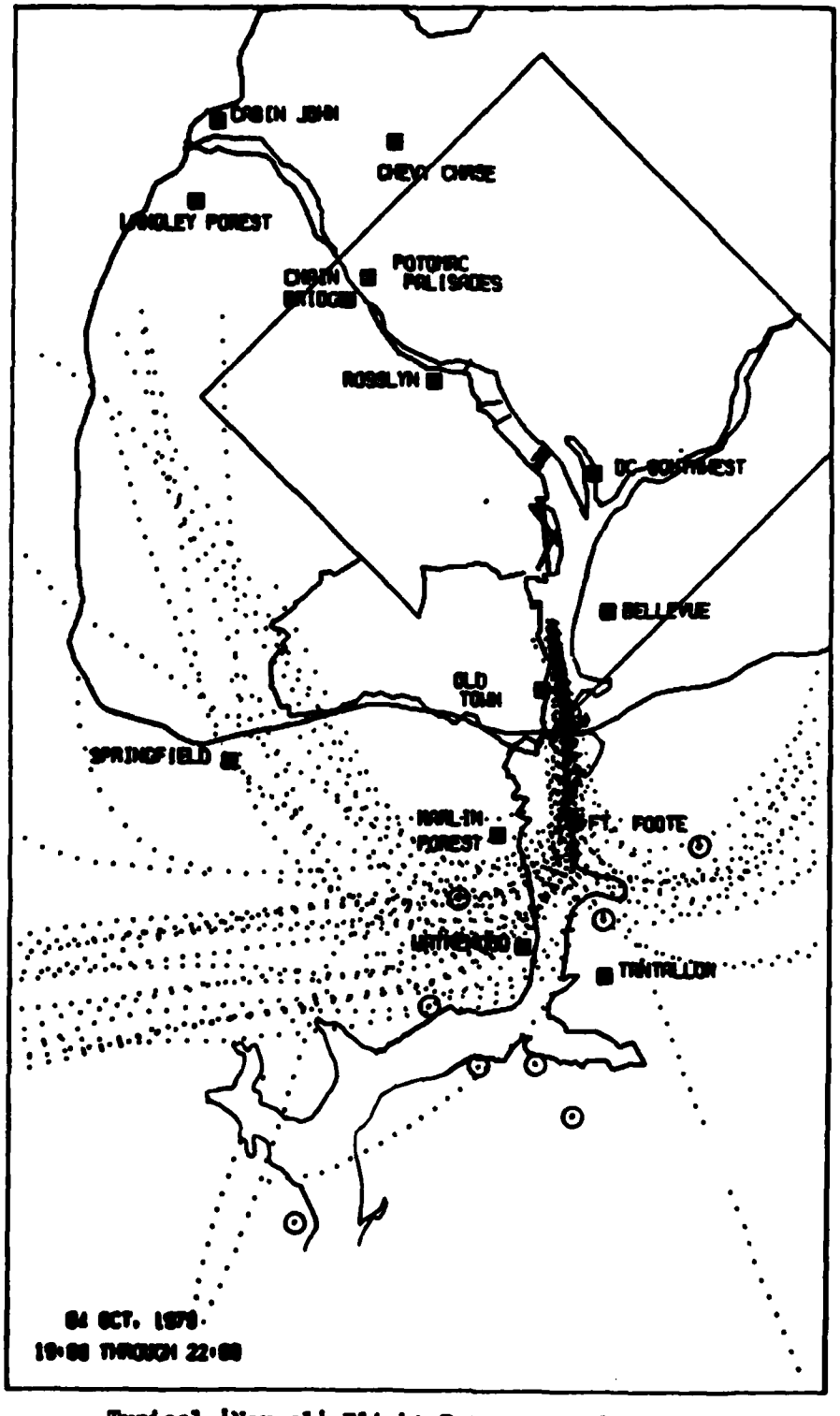
Typical 'Normal' Flight Patterns and Density
Morning Operations
Figure 6.

WASHINGTON NATIONAL AIRPORT
COMMERCIAL JET SOUTH OPERATIONS



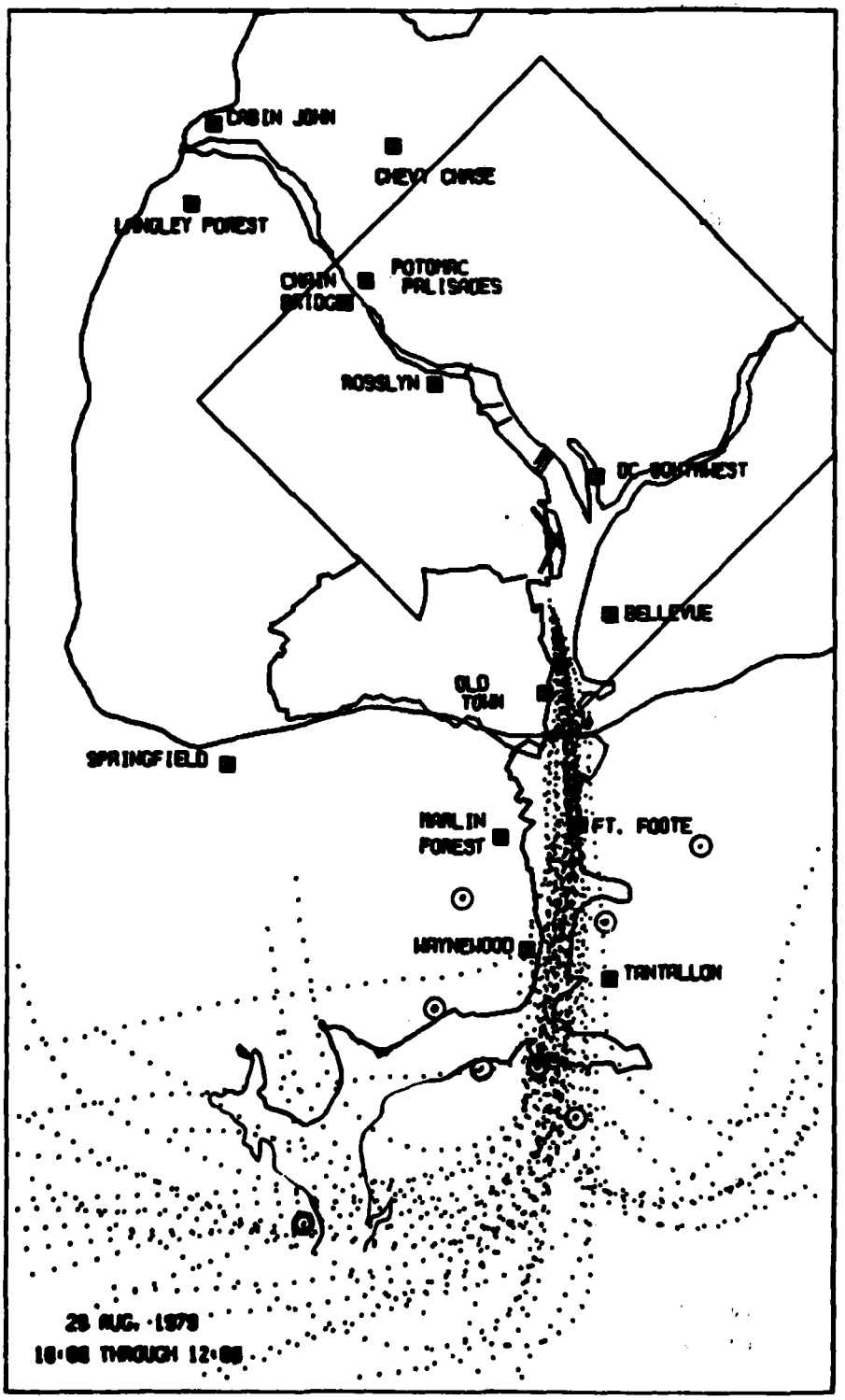
Typical 'Normal' Flight Patterns and Density
Afternoon Operations
Figure 7.

WASHINGTON NATIONAL AIRPORT
COMMERCIAL JET SOUTH OPERATIONS



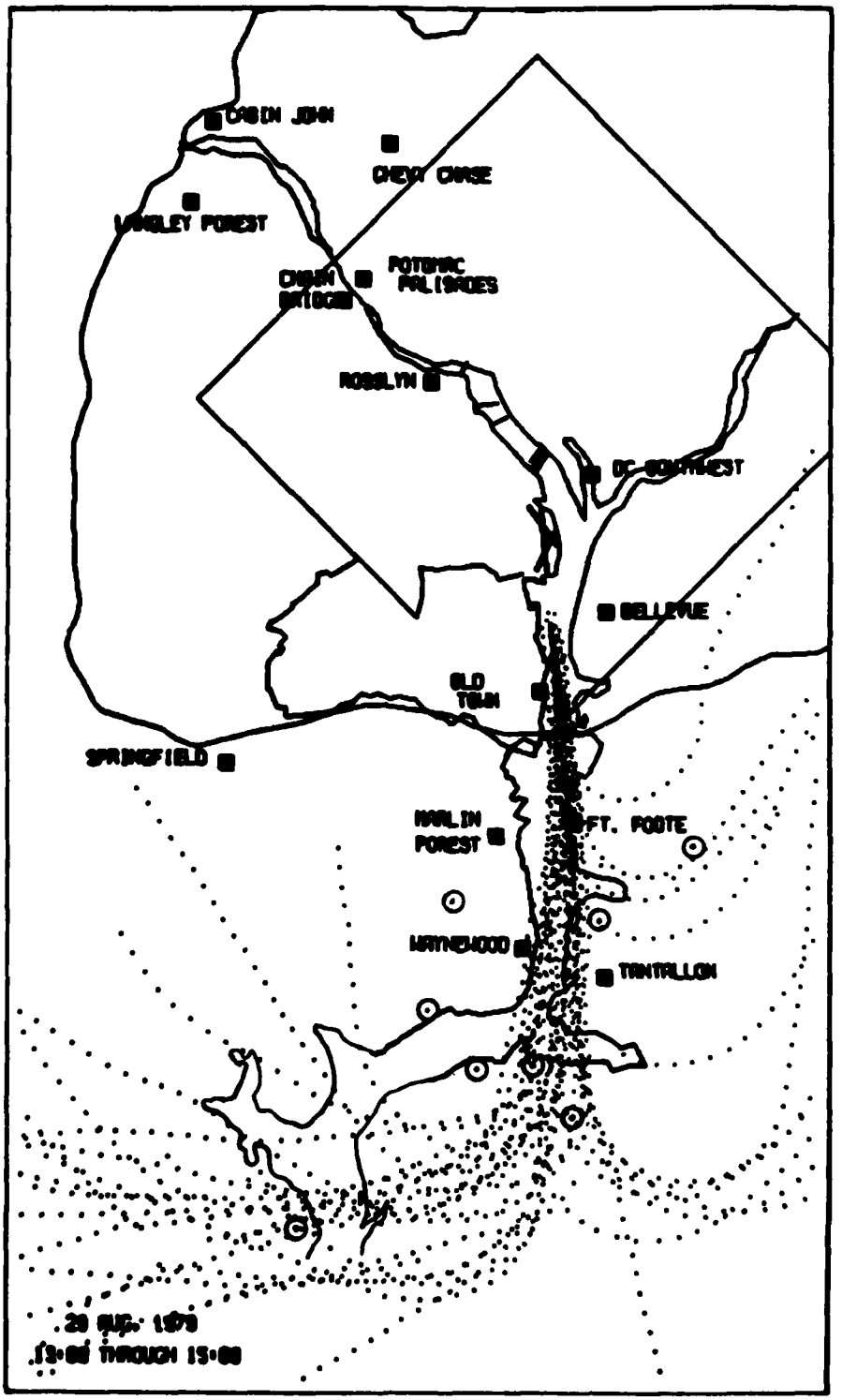
Typical 'Normal' Flight Patterns and Density
Evening Operations
Figure 8.

WASHINGTON NATIONAL AIRPORT
COMMERCIAL JET SOUTH OPERATIONS



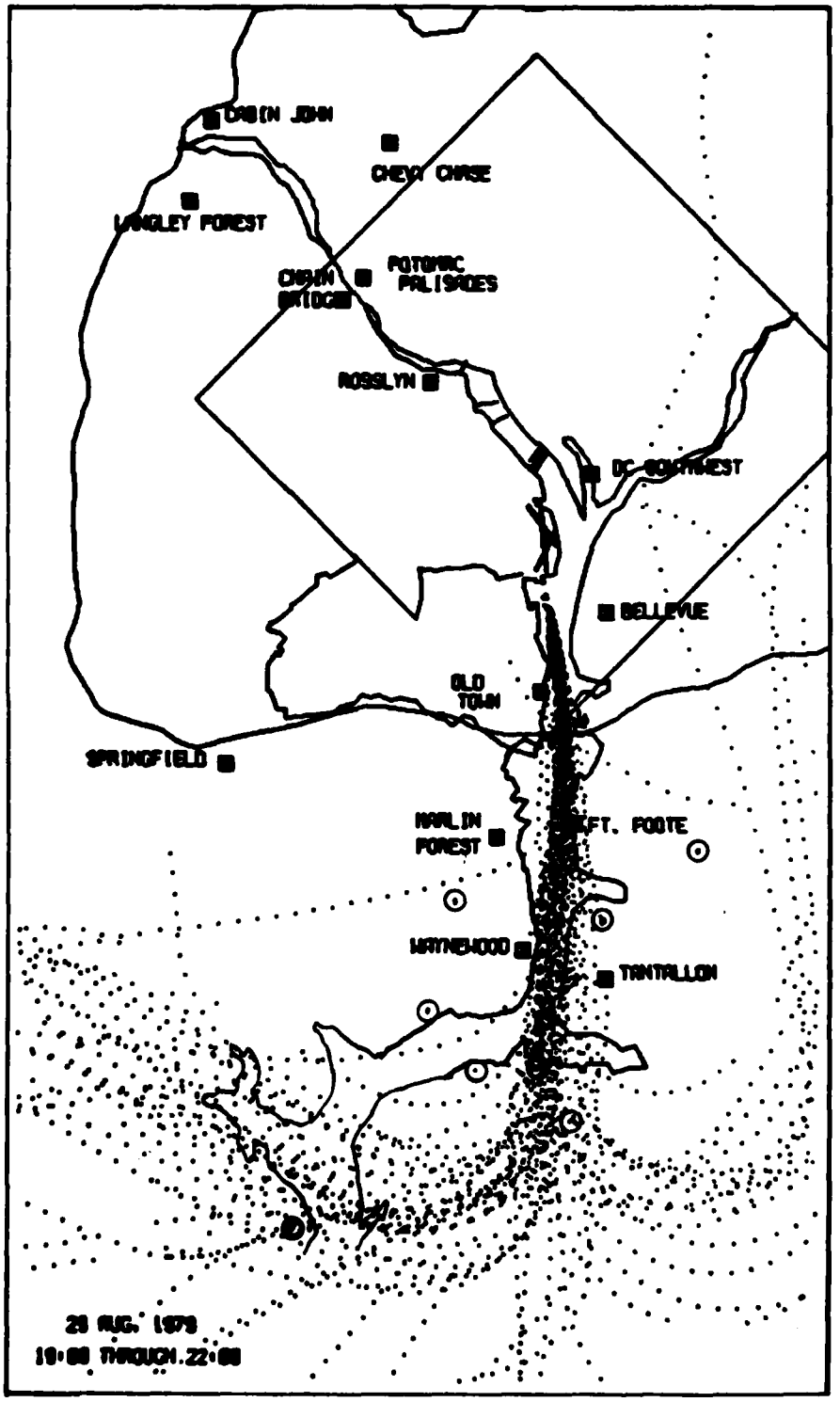
Typical 'Test' Flight Patterns and Density
Morning Operations
Figure 9.

WASHINGTON NATIONAL AIRPORT
COMMERCIAL JET SOUTH OPERATIONS



Typical 'Test' Flight Patterns and Density
Afternoon Operations
Figure 10.

WASHINGTON NATIONAL AIRPORT
COMMERCIAL JET SOUTH OPERATIONS



Typical 'Test' Flight Patterns and Density
Evening Operations
Figure 11.

DCA FLIGHT EXTENSION TEST

		Normal			Test		
		#	SD	Avg.	#	SD	Avg.
Fort Foote Maryland	L_1	9	1.3	80.0	11	3.7	79.2
	L_{10}	9	2.3	70.0	11	3.5	70.6
	L_{EQ}	9	1.0	68.0	11	3.3	67.1
Dania Hills Maryland	L_1	6	3.8	71.8	9	2.6	62.4
	L_{10}	6	2.9	57.7	9	2.1	55.0
	L_{EQ}	6	1.7	59.8	9	2.4	52.7
Fed. Comm. Ctr, Md.	L_1	7	1.4	71.3	10	1.4	70.3
	L_{10}	7	2.3	60.4	10	1.0	62.6
	L_{EQ}	7	1.2	58.9	10	0.9	59.1
Tantallon Maryland	L_1	9	4.4	71.2	12	1.8	72.6
	L_{10}	9	1.6	61.2	12	2.3	65.3
	L_{EQ}	9	2.6	60.0	12	1.8	62.3
Marlan Forest, Va.	L_1	9	4.4	71 2	11	1.9	67.7
	L_{10}	9	1.6	61.2	11	2.0	61.0
	L_{EQ}	9	2.6	60.0	11	1.6	58.3
Mt. Vernon Hospital, Va	L_1	6	2.2	74.5	10	2.1	66.0
	L_{10}	6	1.6	63.7	10	1.5	59.4
	L_{EQ}	6	1.8	65.0	10	1.5	60.0
Waynewood Virginia	L_1	9	3.3	75.1	12	3.1	74.6
	L_{10}	9	2.7	64.4	12	3.1	66.8
	L_{EQ}	9	2.5	62.9	12	3.0	63.8
Mount Vernon Virginia	L_1	10	1.7	71.6	7	2.7	61.1
	L_{10}	10	1.9	60.1	7	2.4	55.3
	L_{EQ}	10	2.8	58.1	7	2.4	53.3
Colonial Farm, Md.	L_1	6	4.3	72.7	9	2.2	66.2
	L_{10}	6	3.1	60.5	9	2.0	60.3
	L_{EQ}	6	3.6	60.2	9	2.3	58.3
Gunston Hall Virginia	L_1	9	2.2	65.3	2	2.8	65.0
	L_{10}	9	2.9	56.3	2	2.1	56.5
	L_{EQ}	9	2.3	56.9	2	2.1	57.5
Alice Ferg. Found., Md.	L_1	8	3.0	68.9	7	1.8	73.6
	L_{10}	8	3.1	58.4	7	2.2	64.6
	L_{EQ}	8	3.1	55.1	7	1.7	61.9
Accokeek Park, Md.	L_1	6	3.6	66.3	6	1.6	76.3
	L_{10}	6	2.3	53.0	6	2.8	66.8
	L_{EQ}	6	3.3	53.8	6	2.2	64.0

Averaged Morning Data Table 2 South Operations

DCA FLIGHT EXTENSION TEST

		Normal			Test		
		#	SD	Avg.	#	SD	Avg.
Fort Foote Maryland	L_1	9	1.8	81.0	15	2.6	79.1
	L_{10}	9	2.6	71.2	15	2.1	69.9
	L_{EQ}	9	2.6	67.7	15	2.2	67.1
Dania Hills Maryland	L_1	8	5.4	67.5	9	3.2	62.0
	L_{10}	8	2.2	54.8	9	3.3	55.6
	L_{EQ}	8	3.8	55.0	9	2.7	52.8
Fed. Comm. Ctr, Md.	L_1	9	1.7	71.4	8	1.3	69.9
	L_{10}	9	3.0	61.8	8	1.3	62.3
	L_{EQ}	9	1.9	58.8	8	1.2	59.0
Tantallon Maryland	L_1	11	2.3	72.2	17	2.1	72.2
	L_{10}	11	2.3	61.6	17	1.9	64.9
	L_{EQ}	11	2.4	59.8	17	1.9	62.0
Marlan Forest, Va.	L_1	8	3.7	72.6	16	3.0	68.1
	L_{10}	8	1.6	62.3	16	2.4	61.1
	L_{EQ}	8	3.1	61.3	16	2.1	58.4
Mt. Vernon Hospital, Va	L_1	6	1.8	72.2	8	2.0	66.8
	L_{10}	6	1.5	62.3	8	1.8	60.1
	L_{EQ}	6	1.7	63.2	8	2.1	61.0
Waynewood Virginia	L_1	10	2.5	75.3	17	3.0	75.6
	L_{10}	10	2.8	64.4	17	2.8	66.5
	L_{EQ}	10	2.6	62.7	17	2.2	64.0
Mount Vernon Virginia	L_1	12	2.5	70.3	8	4.2	63.3
	L_{10}	12	3.5	59.2	8	2.0	56.5
	L_{EQ}	12	2.3	57.3	8	2.9	53.8
Colonial Farm, Md.	L_1	9	4.1	70.0	14	2.4	67.1
	L_{10}	9	3.0	58.3	14	2.0	60.4
	L_{EQ}	9	3.3	57.7	14	1.5	57.6
Gunston Hall Virginia	L_1	10	4.6	66.6	11	5.0	66.6
	L_{10}	10	4.2	56.6	11	4.3	58.1
	L_{EQ}	10	4.3	57.2	11	3.7	58.2
Alice Ferg. Found., Md.	L_1	7	5.8	66.9	12	3.7	74.6
	L_{10}	7	4.1	56.9	12	2.7	65.2
	L_{EQ}	7	4.5	55.4	12	1.8	62.6
Accokeek Park, Md.	L_1	8	4.4	60.0	8	1.6	75.1
	L_{10}	8	2.9	50.0	8	2.5	65.5
	L_{EQ}	8	3.8	48.8	8	1.9	62.4

Averaged Afternoon Data Table 3 South Operations

DCA FLIGHT EXTENSION TEST

		Normal			Test		
		#	SD	Avg.	#	SD	Avg.
Fort Foote Maryland	L_1	11	2.0	81.5	27	1.7	80.6
	L_{10}	11	2.8	71.5	27	2.2	71.6
	L_{EQ}	11	2.1	68.8	27	1.7	68.5
Dania Hills Maryland	L_1	18	4.6	67.7	14	4.0	61.2
	L_{10}	18	2.2	55.7	14	2.5	55.0
	L_{EQ}	18	3.4	55.7	14	2.6	52.7
Fed. Comm. Ctr, Md.	L_1	15	1.7	71.2	25	3.7	70.1
	L_{10}	15	1.9	61.7	25	2.9	63.2
	L_{EQ}	15	1.6	59.4	25	2.7	60.0
Tantallon Maryland	L_1	11	2.2	70.8	25	1.6	73.8
	L_{10}	11	2.5	61.1	25	1.2	66.5
	L_{EQ}	11	2.1	59.2	25	1.4	63.4
Marlan Forest, Va.	L_1	11	1.5	74.1	25	2.1	67.5
	L_{10}	11	1.7	63.2	25	1.4	61.9
	L_{EQ}	11	0.9	61.8	25	1.3	59.2
Mt. Vernon Hospital, Va	L_1	8	1.7	73.5	15	2.4	64.1
	L_{10}	8	2.1	63.0	15	1.9	56.3
	L_{EQ}	8	1.4	63.9	15	2.4	57.5
Waynewood Virginia	L_1	9	3.2	75.2	21	1.5	75.6
	L_{10}	9	5.5	65.4	21	2.1	67.1
	L_{EQ}	9	4.2	63.2	21	1.6	64.1
Mount Vernon Virginia	L_1	12	2.4	70.2	15	3.6	61.7
	L_{10}	12	2.5	59.3	15	4.5	58.3
	L_{EQ}	12	2.2	57.4	15	4.1	54.7
Colonial Farm, Md.	L_1	7	5.8	66.1	16	3.6	69.0
	L_{10}	7	3.5	58.7	16	3.4	64.8
	L_{EQ}	7	3.5	56.7	16	3.3	61.8
Gunston Hall Virginia	L_1	7	6.2	63.1	6	4.3	72.0
	L_{10}	7	7.4	51.1	6	1.7	61.8
	L_{EQ}	7	6.3	53.4	6	1.4	61.7
Alice Ferg. Found., Md.	L_1	8	5.9	63.5	18	2.1	74.7
	L_{10}	8	2.7	56.0	18	2.9	66.8
	L_{EQ}	8	3.7	53.8	18	2.0	63.1
Accokeek Park, Md.	L_1	1	0	67	4	1.7	74.5
	L_{10}	1	0	54	4	2.6	66.3
	L_{EQ}	1	0	55	4	2.4	62.5

EVENING DATA - SOUTH OPERATIONS

TABLE 4

DCA FLIGHT EXTENSION TEST

		Normal			Test		
		#	SD	Avg.	#	SD	Avg.
Fort Foote Maryland	L_1	1	-	79	9	1.4	77.2
	L_{10}	1	-	65	9	1.0	65.4
	L_{EQ}	1	-	66	9	1.7	65.8
Dania Hills Maryland	L_1	2	2.1	67.5	1	-	62
	L_{10}	2	0.7	51.5	1	-	54
	L_{EQ}	2	0.7	54.5	1	-	51
Fed. Comm. Ctr, Md.	L_1	2	5.7	65.0	3	2.1	67.7
	L_{10}	2	4.2	54.0	3	2.1	57.7
	L_{EQ}	2	.7	55.5	3	1.5	56.3
Tantallon Maryland	L_1	1	-	69	9	2.6	69.6
	L_{10}	1	-	60	9	1.4	61.7
	L_{EQ}	1	-	58	9	3.4	61.0
Marlan Forest, Va.	L_1	1	-	71	9	2.1	66.3
	L_{10}	1	-	61	9	1.5	60.0
	L_{EQ}	1	-	60.0	9	1.4	57.8
Mt. Vernon Hospital, Va	L_1	2	1.4	68.0	1	-	62.0
	L_{10}	2	0.7	55.6	1	-	55
	L_{EQ}	2	0.7	59.5	1	-	56
Waynewood Virginia	L_1	1	-	72	8	2.0	73.1
	L_{10}	1	-	61	8	1.2	61.3
	L_{EQ}	1	-	60	8	1.4	60.8
Mount Vernon Virginia	L_1	2	2.1	65.5	2	0.7	61.5
	L_{10}	2	0.7	52.5	2	1.4	53.0
	L_{EQ}	2	0.7	53.5	2	0.7	52.5
Colonial Farm, Md.	L_1	2	1.4	66.0	3	3.2	65.7
	L_{10}	2	0.7	55.5	3	8.7	60.0
	L_{EQ}	2	1.4	54.0	3	5.2	60.0
Gunston Hall Virginia	L_1	2	2.1	61.5	-	-	60.0
	L_{10}	2	2.0	50.0	-	-	-
	L_{EQ}	2	1.4	53.0	-	-	-
Alice Ferg. Found., Md.	L_1	2	2.1	63.5	2	0	73.0
	L_{10}	2	1.4	54.0	2	0.7	62.5
	L_{EQ}	2	1.4	53.0	2	0	61.0
Accokeek Park, Md.	L_1	-	-	-	-	-	-
	L_{10}	-	-	-	-	-	-
	L_{EQ}	-	-	-	-	-	-

WEEKEND DATA (24 HR), SOUTH AND SOUTH/NORTH COMBINED OPERATIONS

TABLE 5

APPENDIX A

DESCRIPTION OF MONITORING SITES

APPENDIX A

LIST OF FIGURES

A1.0 DESCRIPTION OF THE MONITORING SITES

The Washington National Airport, Flight Extension Test, Noise Monitoring Program utilized two different systems, at twelve sites in Maryland and Virginia to measure the change in noise levels as a result of the change in aircraft traffic patterns. This Appendix contains the specific descriptions of each site as well as topographic maps, to show their relative positions and, for the portable systems, a sample graphic history of typical noise levels before and after the change in operations.

A1.0.1 Description of the Graphic History

Each of the graphic histories presented, represent a timed trace of noise levels, with time increasing to the right in relation to the speed of the chart (such as 15 cm/hour) and with noise levels increasing to the top of the chart (scaled on the left from 20 dB(A) to 100 dB(A)). Calibration with a known signal of 114 dB(A) at a frequency of 1000 Hz, is labeled near the top of the chart. The noise floor, or the level of electronic noise in the system is noted near the bottom of each chart. These two traces indicate the dynamic range of the noise monitoring system and also can be used to check the scale of the graphic recording. Turbojet aircraft events are marked with arrows and some of the more significant 'other' noise sources are also marked. The date of the graph and the operation, either test or normal, is printed in the lower right-hand corner of each graphic history. All of the graphs were produced during south departure days. Finally, the equivalent noise level (L_{eq}) for the hour shown is printed in the top right corner of each graph, for comparison of the two histories presented.

A1.1 Marlan Forest, Virginia

The Marlan Forest permanent system monitor is located in the community of Marlan Forest on Warrington Place, approximately 1/2 mile from the Potomac River. Noise data are continuously recorded by the Dulles computer and the data presented for this site were compiled from its files. This site is also relatively close to the flight path of the aircraft. It is located on a quiet, dead-end street away from traffic and is typical of an older suburban neighborhood with mature trees on a relatively narrow street.

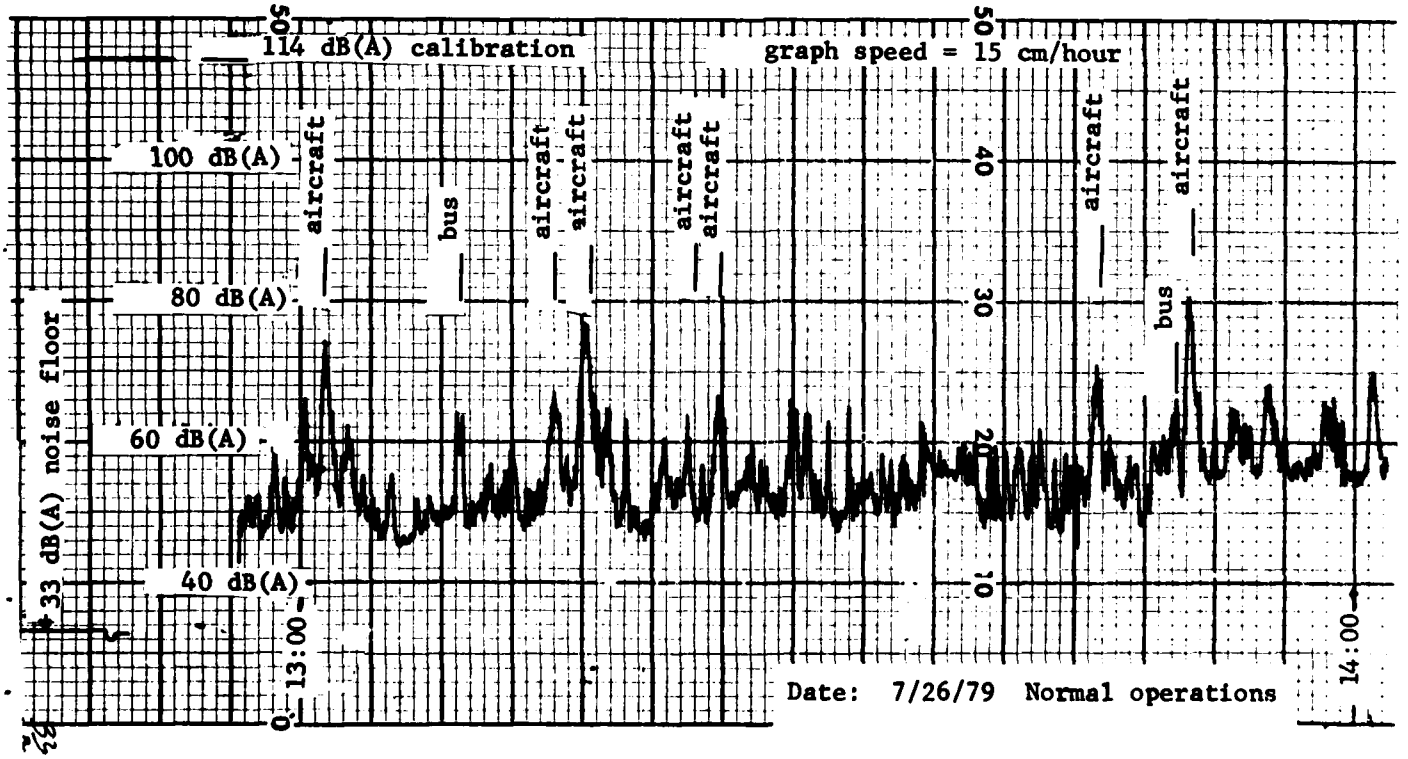
A1.2 Mount Vernon Hospital, Virginia

This portable unit was on the grounds of the Mount Vernon Hospital, located on Clingwood Road and Sherwood Hall. It is half way between the two southernmost permanent system monitors in Marlan Forest and Waynewood, Virginia, and approximately two miles from the Potomac River. During normal operations, this site is under the flight path of aircraft turning towards north and west destinations. This site was located closer to other sources of noise than were the other sites. Traffic noise and the noise of the emergency equipment of the hospital and fire station contributed to the ambient levels. Figures A1 and A2 are representative graphic histories of one hour during the normal and test operations, respectively. The test operations history was recorded at 30 cm/hr or twice the speed of the graph in Figure A1, which makes it twice as long as the normal operations history. Note the greater levels and frequency of events during the normal operations time period.

1979
FAA

DCA FLIGHT PATH EXTENSION TEST

See Figure A-2.



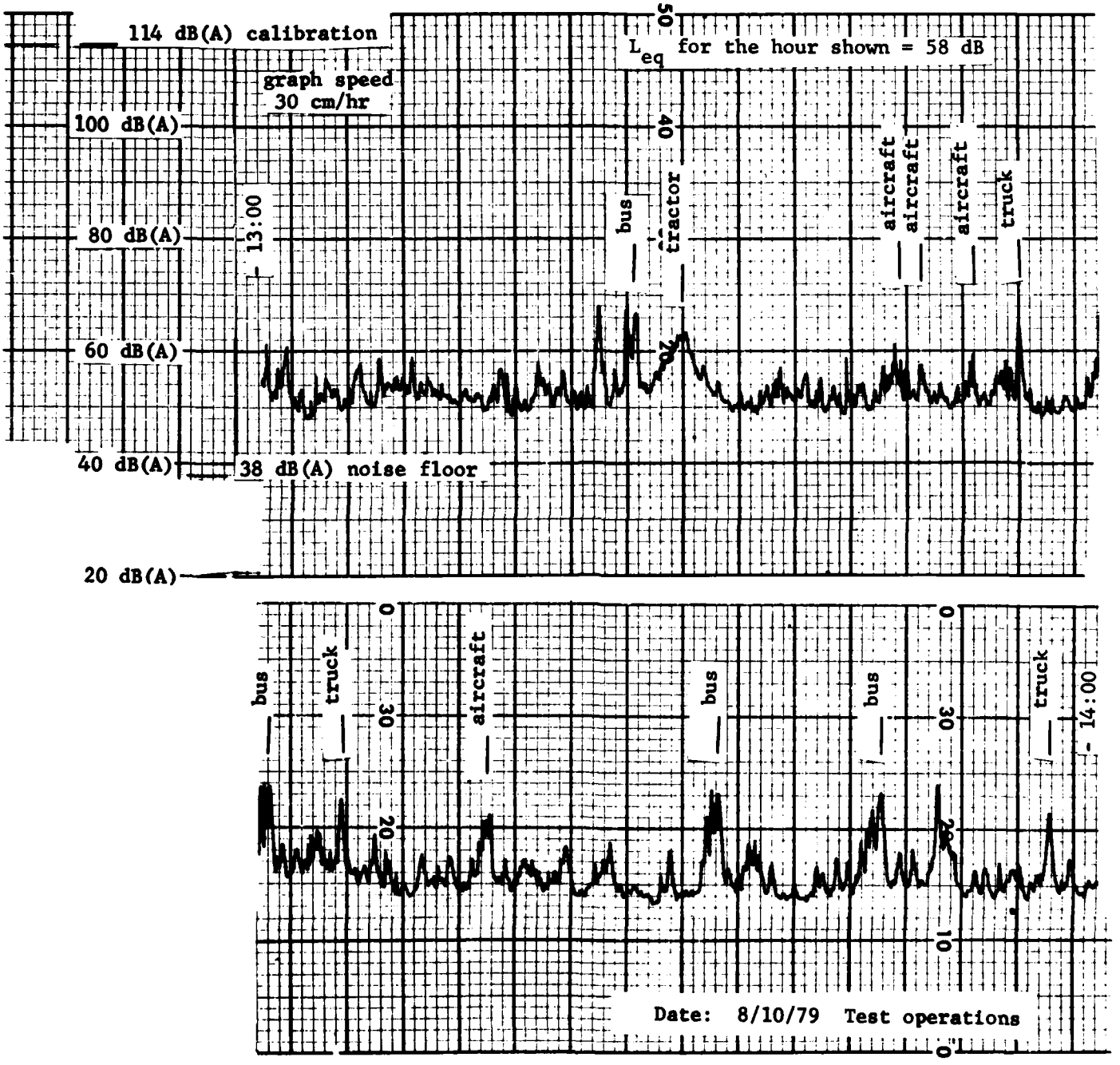
HOSPITAL SITE Time: 13:00-14:00

Typical South Operation

Figure A-1.

1979
FAA

DCA FLIGHT PATH EXTENSION TEST



HOSPITAL SITE Time: 13:00-14:00

Typical South Operation

Figure A-2.

A1.3 Waynewood, Virginia

The Waynewood permanent system monitor is located in the community of Waynewood, Virginia on Alyce Place. This site is approximately 1,500 feet west of the Potomac River. A macadam turnaround is directly to the east of the monitor pole with residences to the west, north, and south. Turbojet aircraft are generally between 2,800 and 3,500 feet above the monitor at this site.

A1.4 Mount Vernon, Virginia

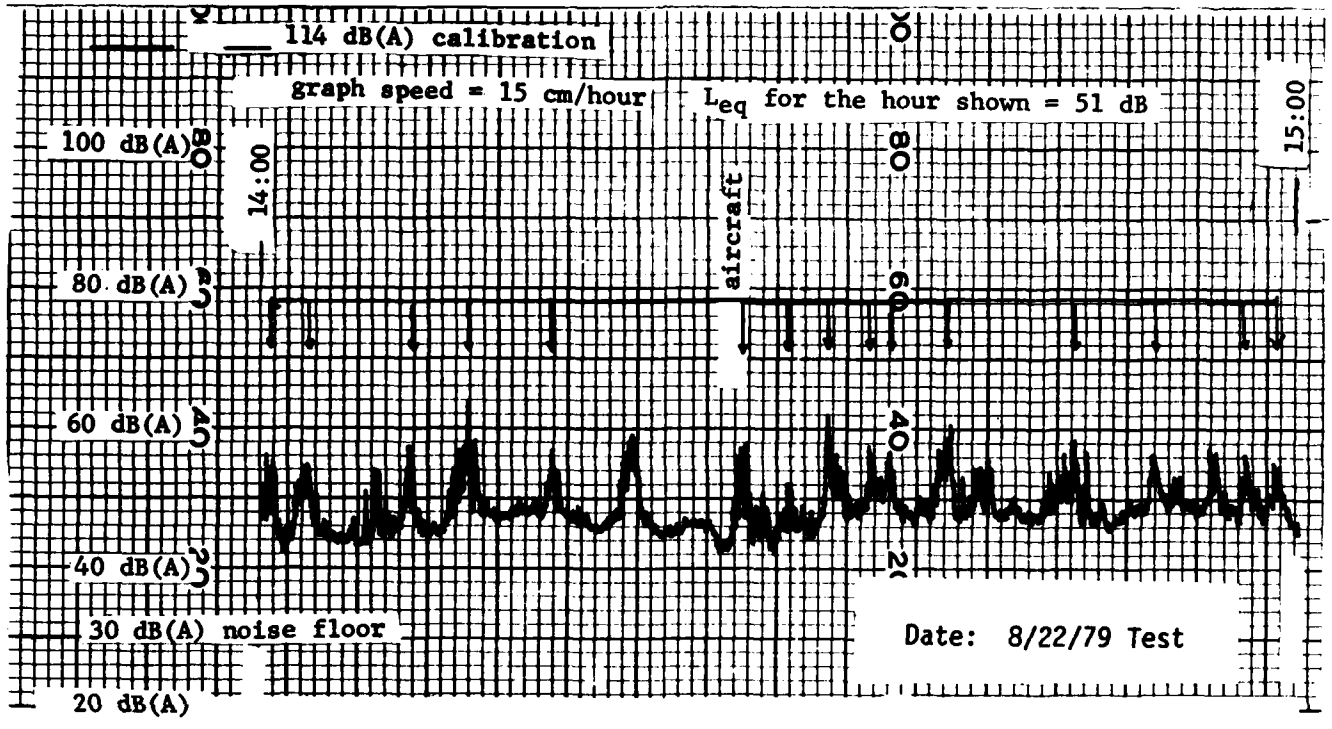
This site (using a portable system) is located on the grounds of Mount Vernon, away from the tourist areas and approximately 300 yards from the Potomac River. This site is approximately three miles to the west of the extended flight path but directly under the flight path of aircraft turning to the west during normal operations. The monitor was located in the middle of a large grassy field. The ambient noise was typical of a suburban setting due to traffic on the Mount Vernon Parkway. It was chosen as a noise sensitive area which could be affected by this test. Note on Figure A3 the greatly reduced maximum sound levels during test operations (top chart). The frequency of operations remained fairly constant. This figure illustrates the changes which caused the significant decrease in noise levels during the test operations.

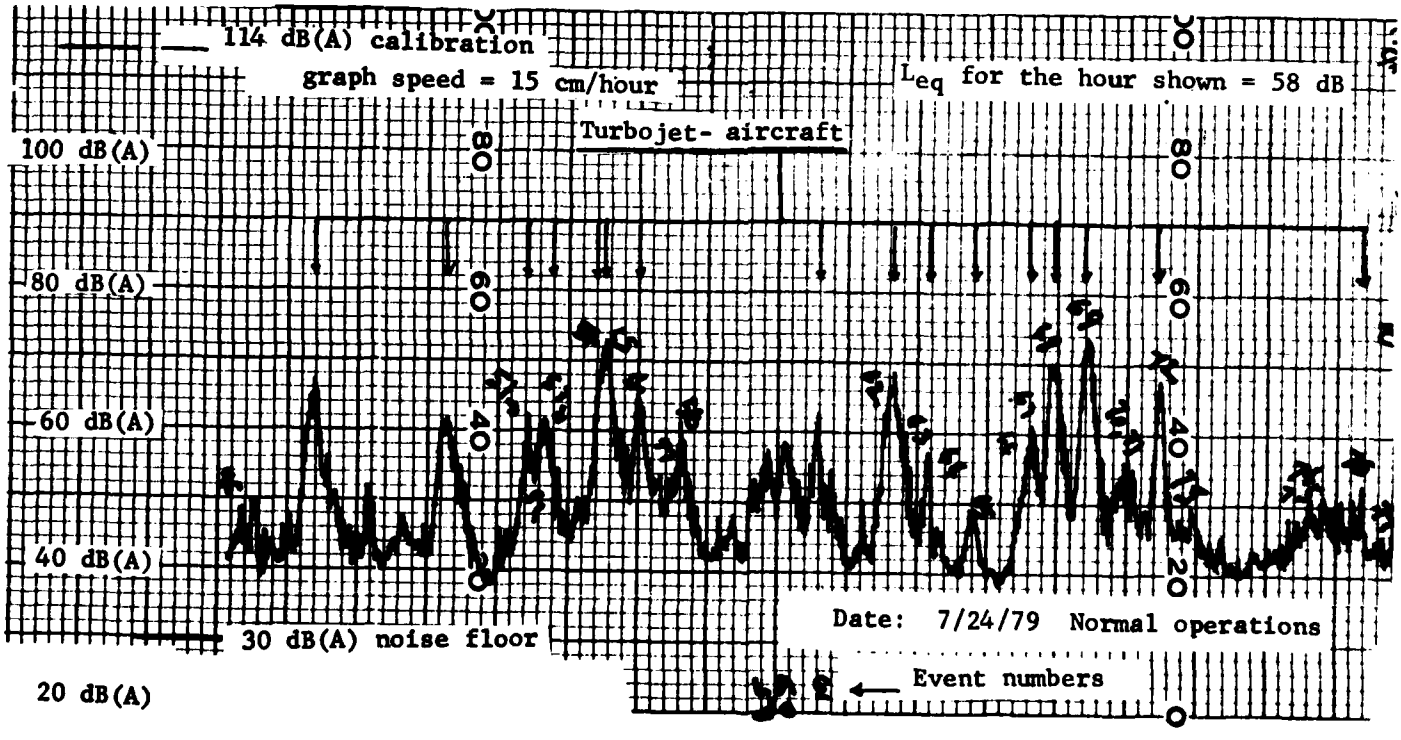
A1.5 Fort Foote, Maryland

The Fort Foote site, located on Fort Foote Road in North Fort Foote Village, is a permanent system monitor which continuously records noise data. This site is located approximately 2,000 feet east of the

1979
FAA

DCA FLIGHT EXTENSION TEST





MOUNT VERNON Time: 14:00-15:00

Typical South Operation

Figure A-3.

Potomac River, with a grassy field to the west and a secondary road to the east. Excluding aircraft, ambient noise levels are primarily generated by the traffic on Fort Foote Road.

A1.6 Dania Hills, Maryland

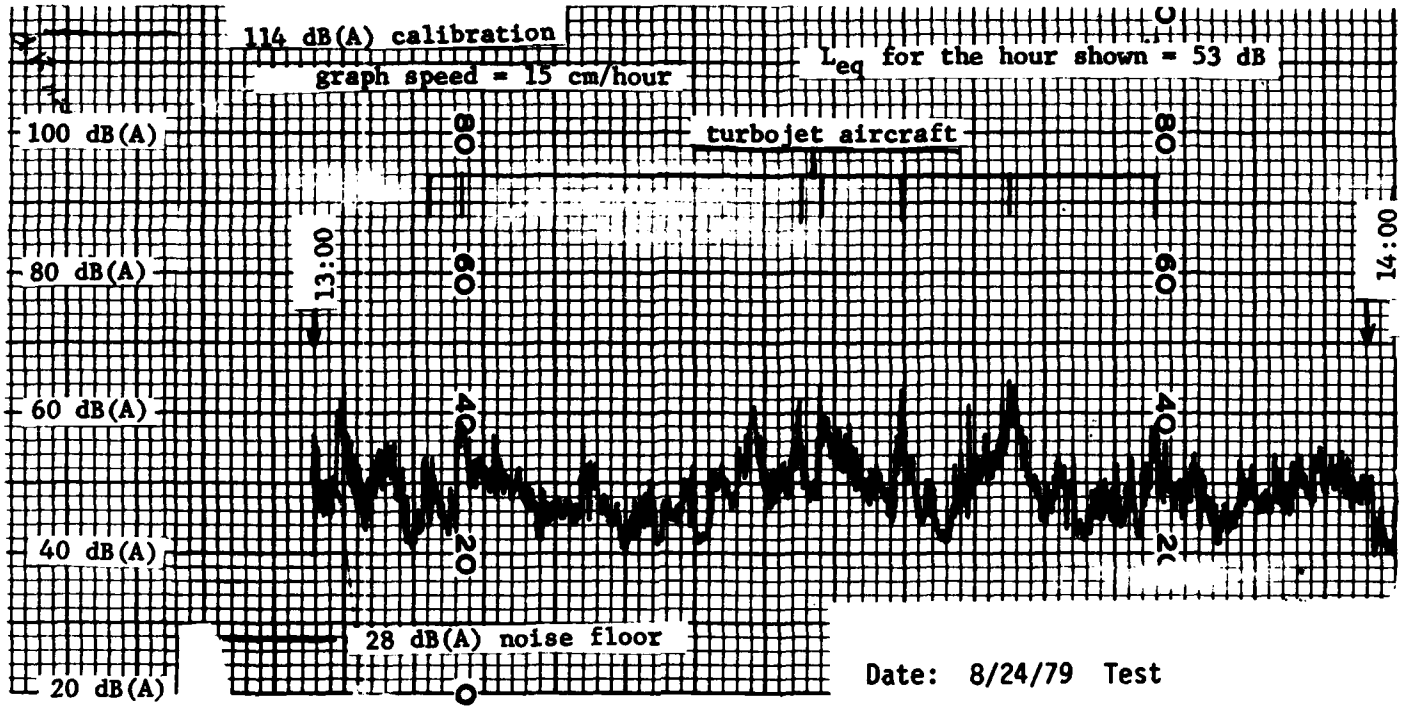
The portable monitoring unit at this site is on the south slope of a hill overlooking the community of Dania Hills on Dania Drive and Dania Court. Indian Head Highway, Old Fort Road, and Palmer Road surround the community on the west, south, and north, respectively. Dania Hills is approximately three miles east of the Potomac River corridor and was selected as a noise monitoring site to determine the effect of the test upon communities located further from the river. Figure A4 illustrates a time history of community noise at the Dania Hills site both before and during the test. The background levels on the normal operations chart are three or four dB(A) higher due to construction noise but the greater noise levels produced by the aircraft events during this period are still evident. The higher levels during normal operations were due mainly to aircraft turning east at the five mile point at a relatively low altitude.

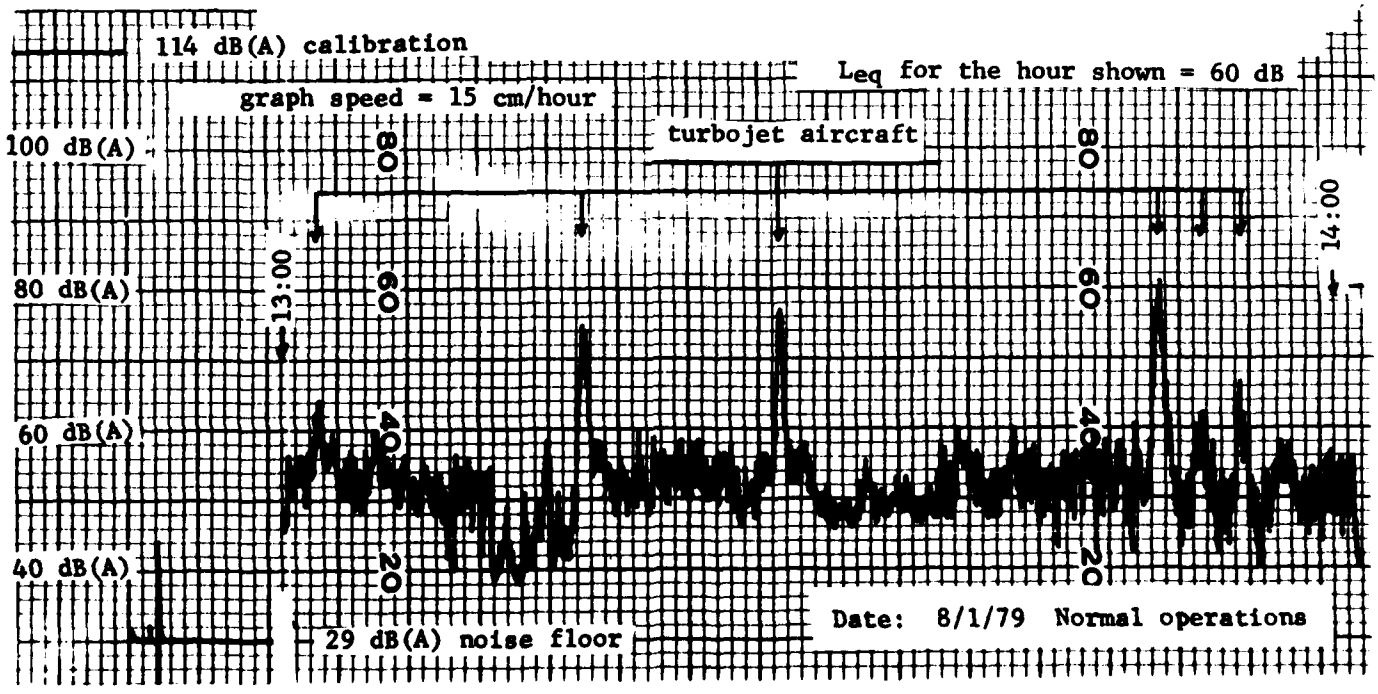
A1.7 Federal Communications Center (FCC), Riverview, Maryland

This portable noise monitoring unit was located on the grounds of the Federal installation on Riverview Road, approximately one mile east of the Potomac River. The communities of Riverview, Tantallon North, Tantallon on the Potomac, and Tantallon Square surround the site on the northwest, west, south, and east sides, respectively. The

1979
FAA

DCA FLIGHT PATH EXTENSION TEST





DANIA HILLS Time: 13:00-14:00

Typical South Operation

Figure A-4.

microphone was surrounded by a grassy field and mowed lawn, approximately 500 feet from Riverview Road. The FCC site was chosen for its location between the two outermost permanent system sites, Fort Foote and Tantallon. This area is one of the most heavily impacted during normal south operations.

Figures A5 and A6 can only be approximately compared due to different chart speeds, but the normal operation period (Figure A6) shows the high noise levels of the direct overflight with four aircraft events over 70 dB(A). The test pattern reduced the number of direct overflights although some aircraft drift close to the Maryland shore.

A1.8 Tantallon, Maryland

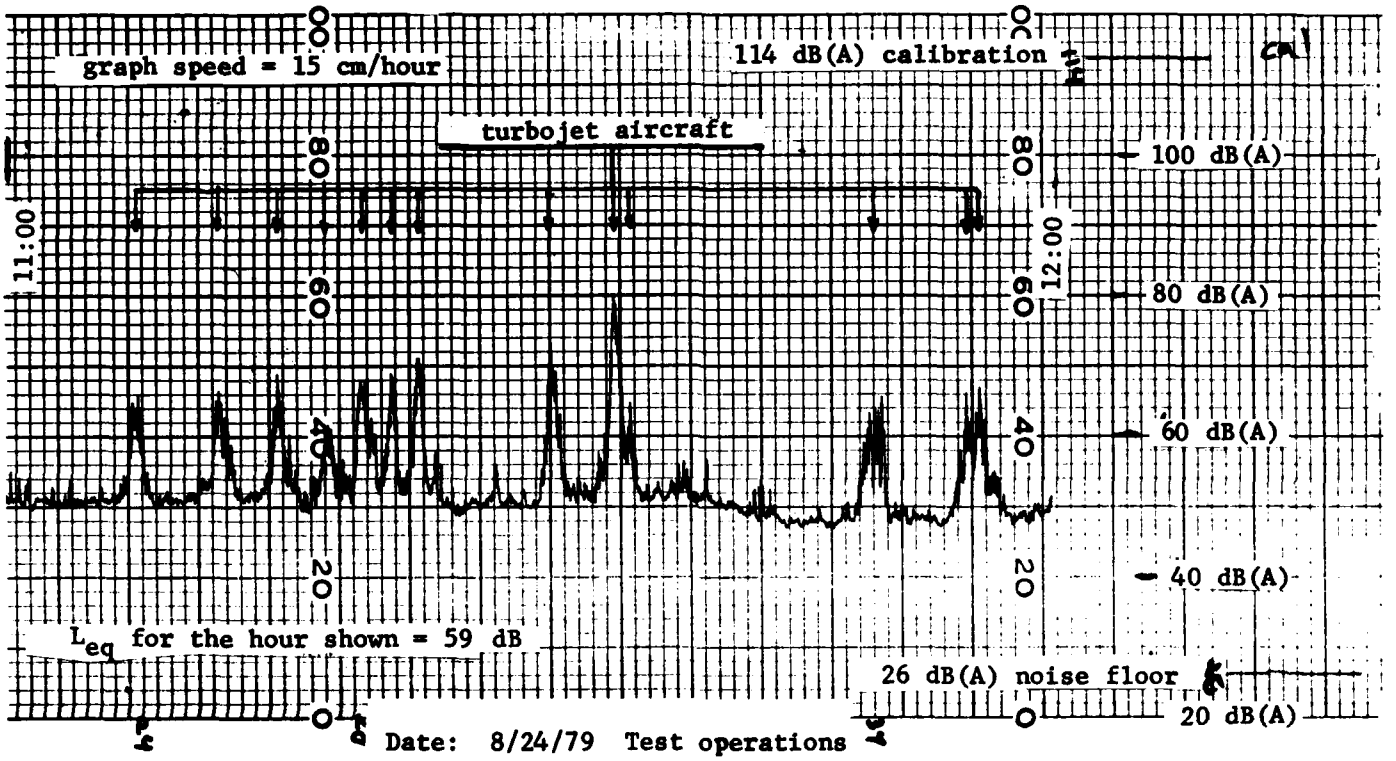
The Tantallon permanent monitoring site is located on Tantallon Drive, in the community of Tantallon on the Potomac. Approximately one mile from the Potomac River, this site is bordered on the south by the grass of the Tantallon country club and residences to the east and west. Traffic on Tantallon Drive is light but occasionally very noisy. This site is affected by aircraft from a long distance during normal operations, as they turn towards their destination before flying that far south. During test operations, the additional concentration of aircraft over the river increased the frequency of events at this location.

A1.9 National Colonial Farm, Bryan Point, Maryland

The portable unit at this site was located 50 feet from the Potomac River, on Bryan Point Road of the National Colonial Farm on the property. The flight path is approximately 1.5 miles to the east of the monitor which affords a good example of sideline impact, on a relatively

1979
FAA

DCA FLIGHT PATH EXTENSION TEST



For normal operation, see Figure A-6.

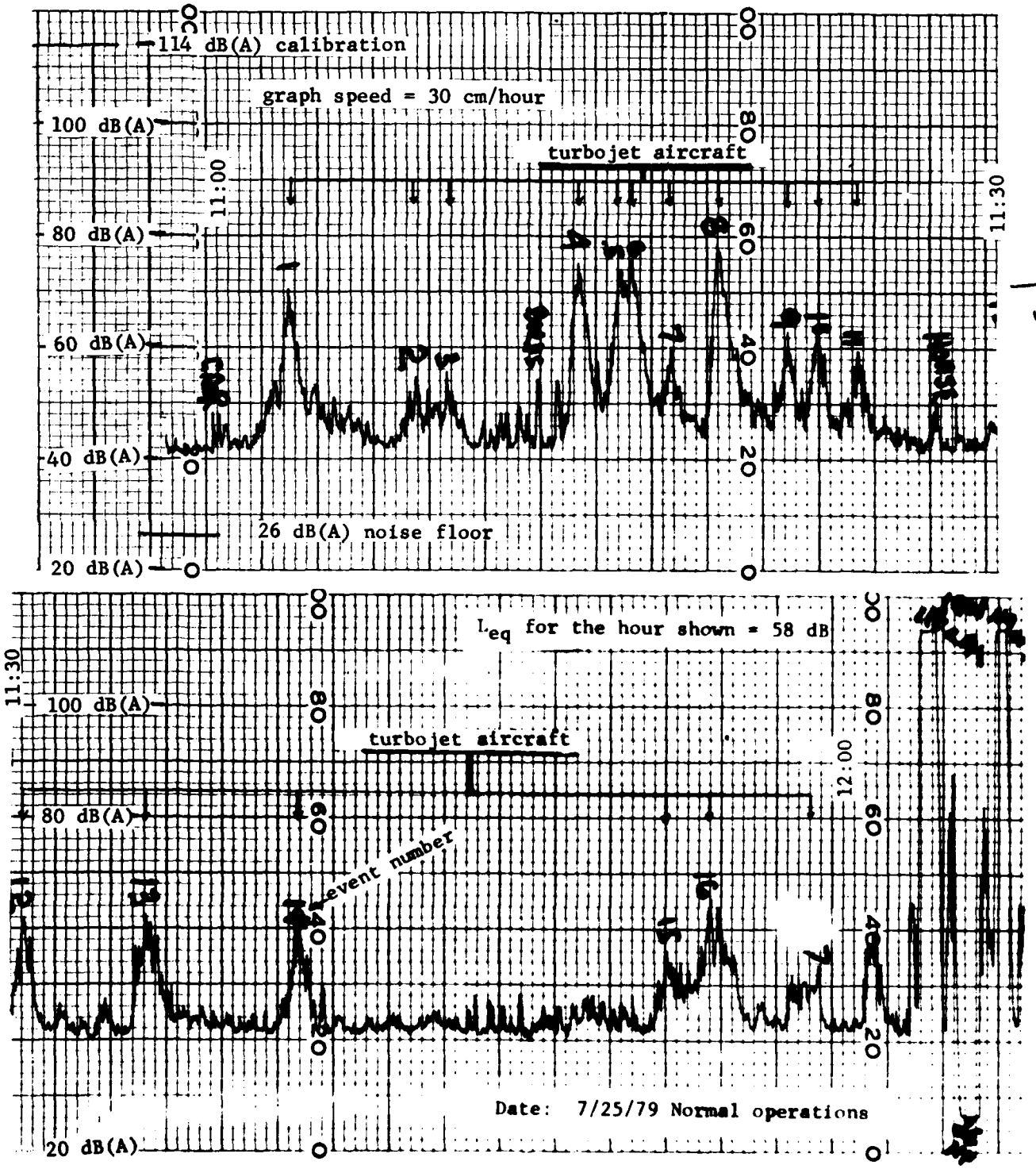
FEDERAL COMMUNICATIONS CENTER Time: 11:00-12:00

Typical South Operation

Figure A-5 .

1979
FAA

DCA FLIGHT PATH EXTENSION TEST



FEDERAL COMMUNICATIONS CENTER Time: 11:00-12:00

Typical South Operation

Figure A-6.

sensitive area. Due to its proximity to the river and its rural environment, the background noises of the birds and crickets reached 55 and 60 dB(A) during the early morning and then again in the evening. This type of noise was not unique to this site but the level was higher than most of the other monitoring sites. This effect is illustrated on Figure A7 which presents two hours which occurred during the test period. The high background level of 59 dB(A) was due to insect noises. The differences in the relative humidity and temperature are the likely causes of the increased activity. Normal operation charts were similar to the histories presented, as graphic recordings were not made during the evening hours, the period of significant change in noise levels.

A1.10 Gunston Hall, Mason Neck, Virginia

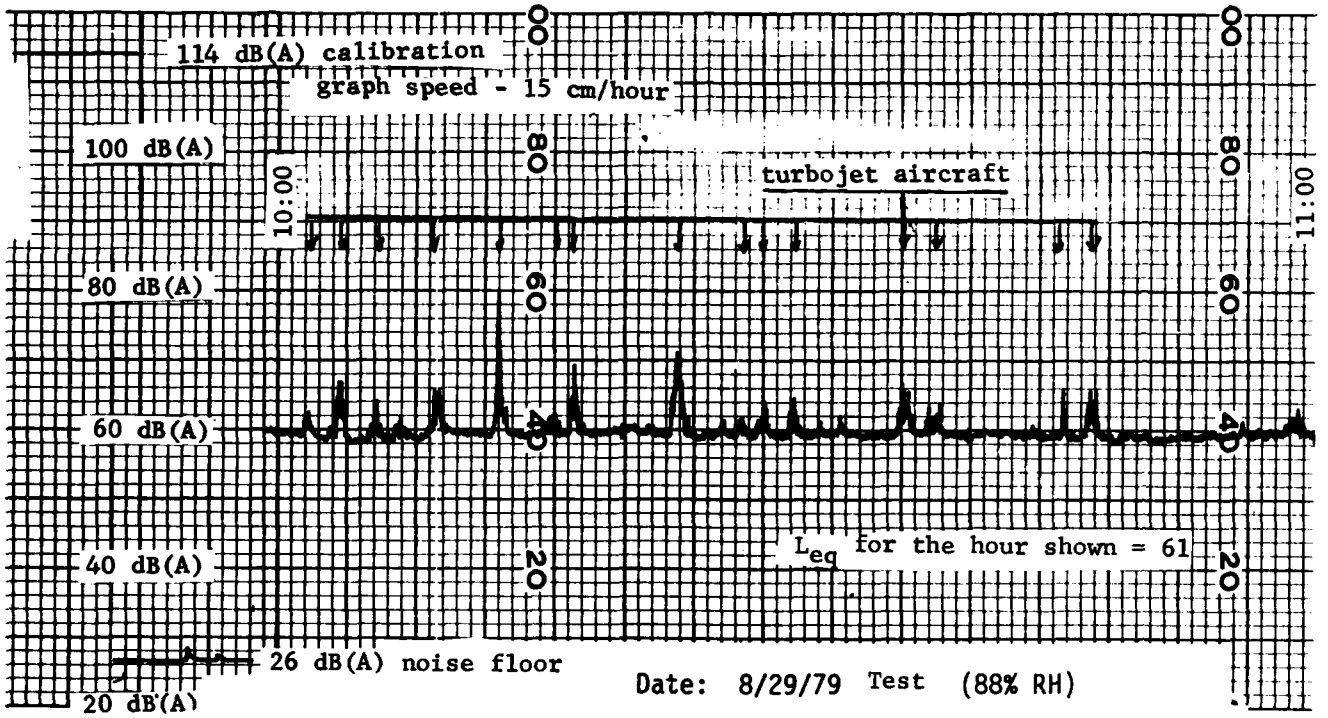
This site, utilizing a portable system, was located on the grounds of Gunston Hall, on Gunston Road, approximately 1/2 mile from the Potomac River at Gunston Cove (see Figure A-16). This site was chosen to represent an area which might be impacted by the extension of the flight path. The system enclosure was set up in the middle of a large hay field. Due to its rural setting, the ambient noise associated with natural night noises was in the 50 to 40 dB(A) range during the morning and evening hours. The time histories presented in Figure A8 illustrate the increased frequency of events during the test period as well as the relatively small change in overall noise levels.

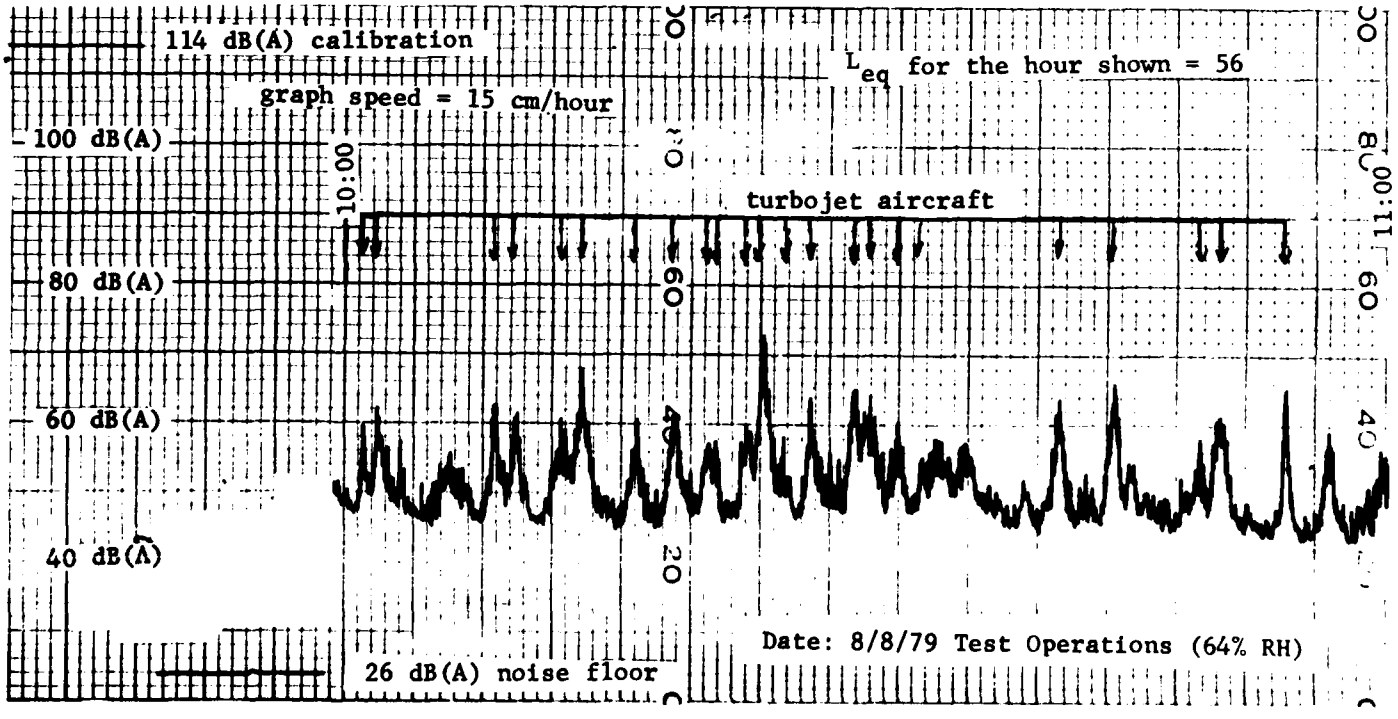
A1.11 Alice Ferguson Foundation, Mockley Point, Maryland

The Ferguson Foundation site (using a portable system) is on the grounds of the Alice Ferguson Foundation for Environmental Study located

1979
FAA

DCA FLIGHT PATH EXTENSION TEST





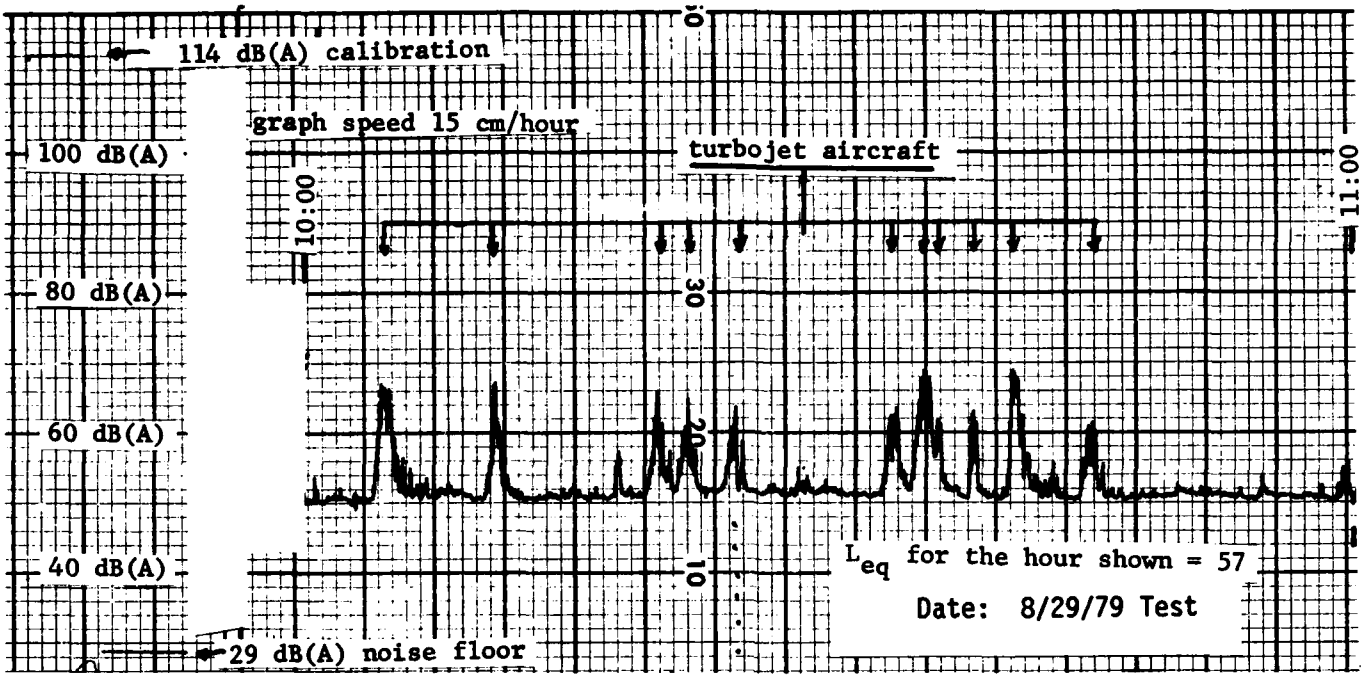
COLONIAL FARMS Time: 10:00-11:00

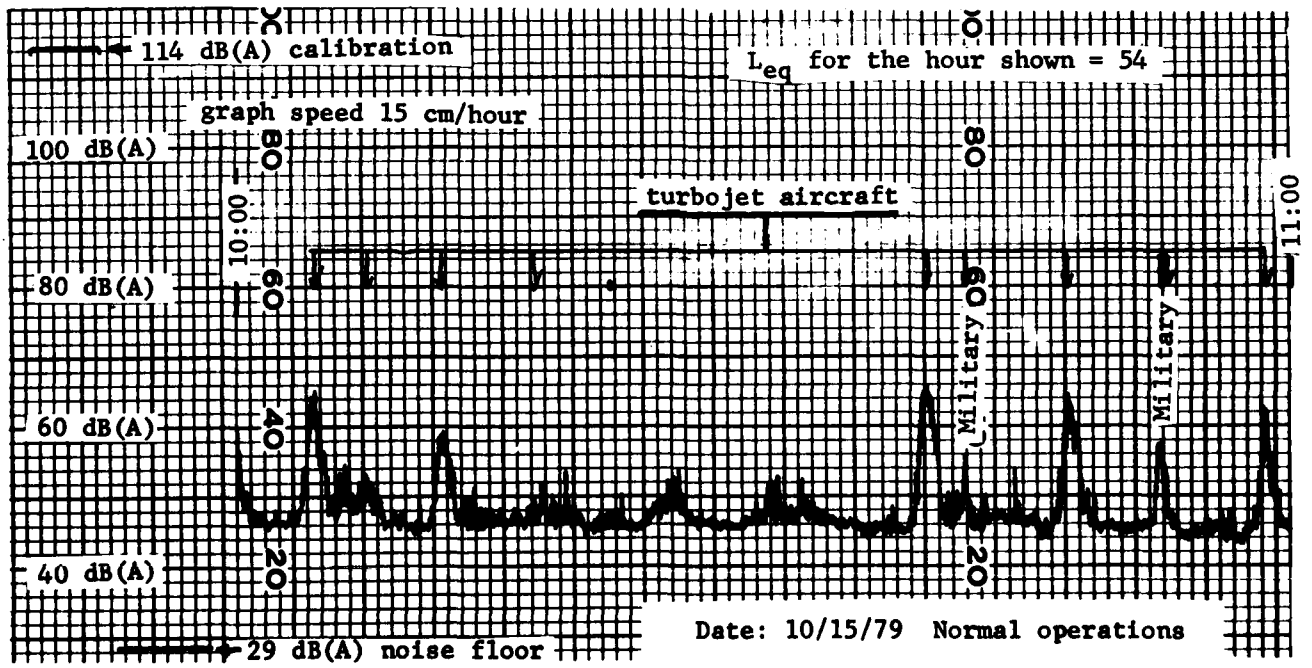
Typical South Operation

Figure A-7.

1979
FAA

DCA FLIGHT PATH EXTENSION TEST





GUNSTON HALL Time: 10:00-11:00

Typical South Operation

Figure A-8.

on Bryan Point Road and Mockley Point Road (see Figure A-15). The extended flight path during south operations is approximately 1/2 mile to the east of the site, which is situated in a grassy field with a clear view of the river. Local ambient noise is typical of a rural environment as the nearest paved road is 1,500 feet to the south. This site afforded an excellent opportunity to examine noise differentials in what must be classified as a sensitive area due to its use as an Environmental Study area for Maryland school children.

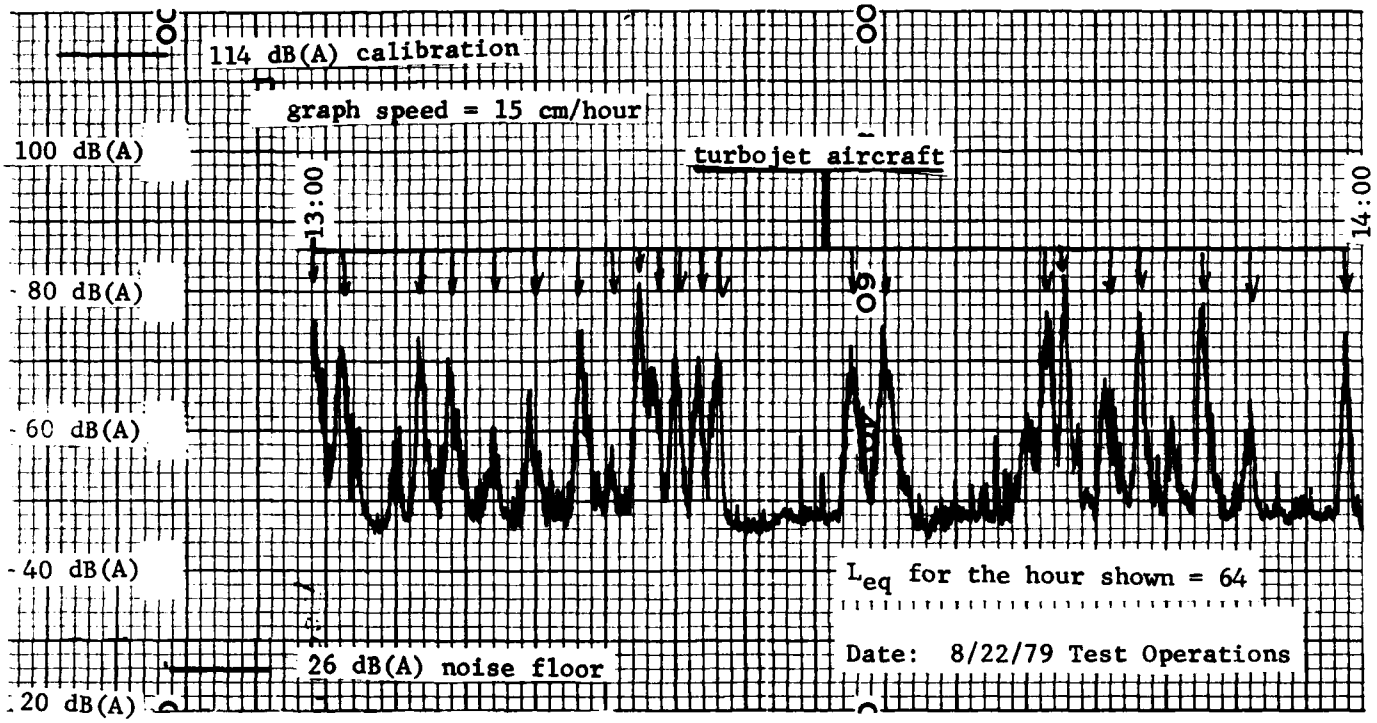
Figure A9 dramatically illustrates the increased frequency of overflights and the difference between aircraft peak noise levels and the local ambient noise levels. During the change in operations, this difference was often over 20 dB(A) (for the individual aircraft flyover). Aircraft noise at this site, during normal south departure operations, was due to aircraft that delayed turning east or west after passing the five mile turn point.

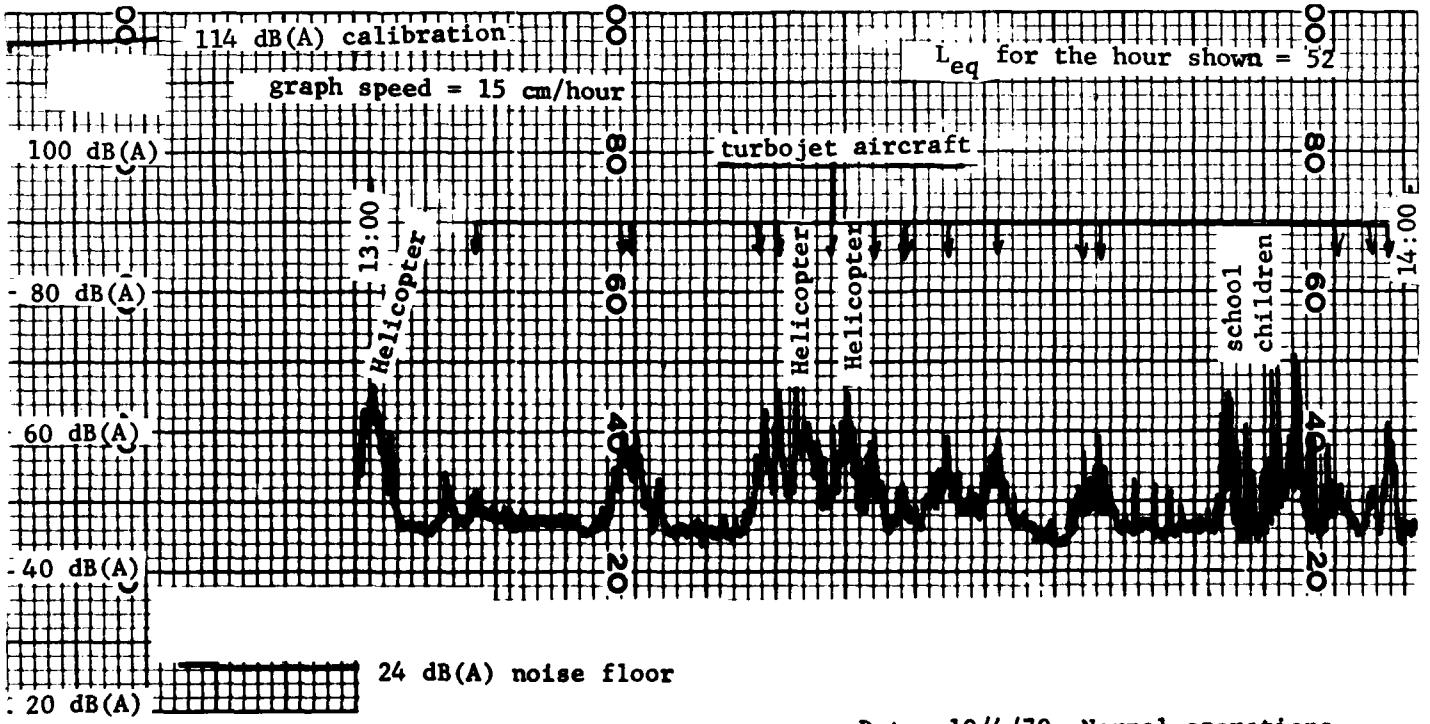
A1.12 Accokeek Park, Maryland

The Park site is located on Livingston Road to the east of the Accokeek Elementary School, close to the ten mile point of the extended flight plan (see Figure A-17). A portable noise monitoring unit used to collect data was removed each evening due to the relatively high traffic through the area and the potential vandalism threat. The microphone was situated in an open field approximately 100 feet from surrounding woods. The site offered a good sample of the generally low ambient noise levels in the Accokeek area and a good demonstration of the "worst case" noise

1979
FAA

DCA FLIGHT PATH EXTENSION TEST





Date: 10/4/79 Normal operations

FERGUSON FOUNDATION Time: 13:00-14:00

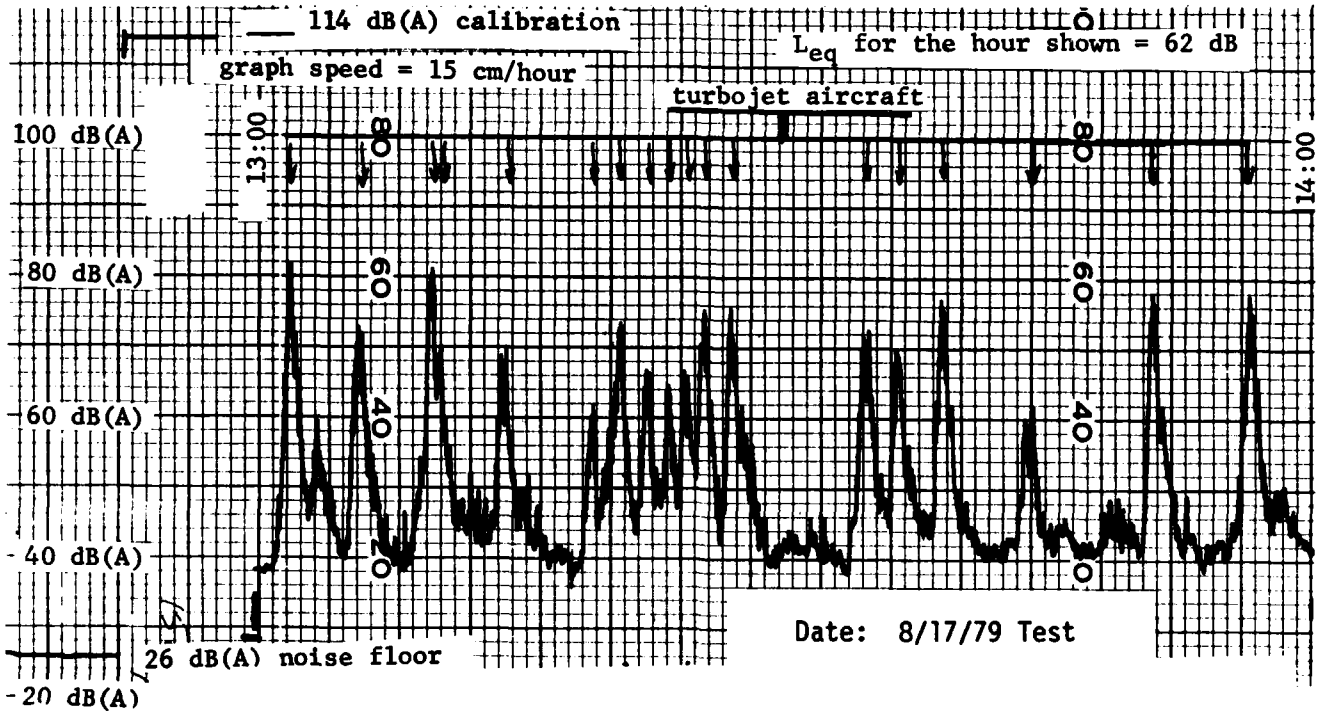
Typical South Operation

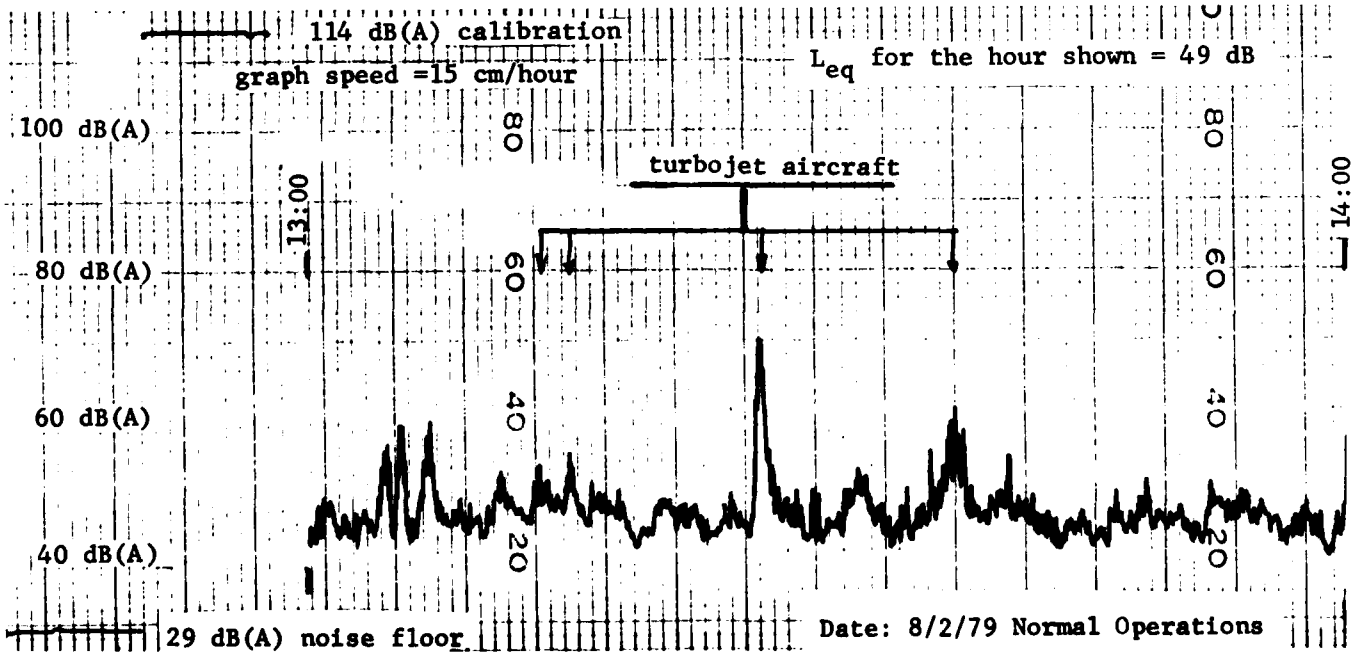
Figure A-9.

interference due to the direct overflights of the site. Figure A10 illustrates the typical test operation with aircraft noise levels peaking from 20 to 40 dB(A) higher than the ambient noise levels. The frequency of events was also increased from 0 to 3 aircraft per hour during normal operations to 16 to 20 per hour during the test.

1979
FAA

DCA FLIGHT PATH EXTENSION TEST





ACCOKEEK PARK Time: 13:00-14:00

Typical South Operation

Figure A-10.

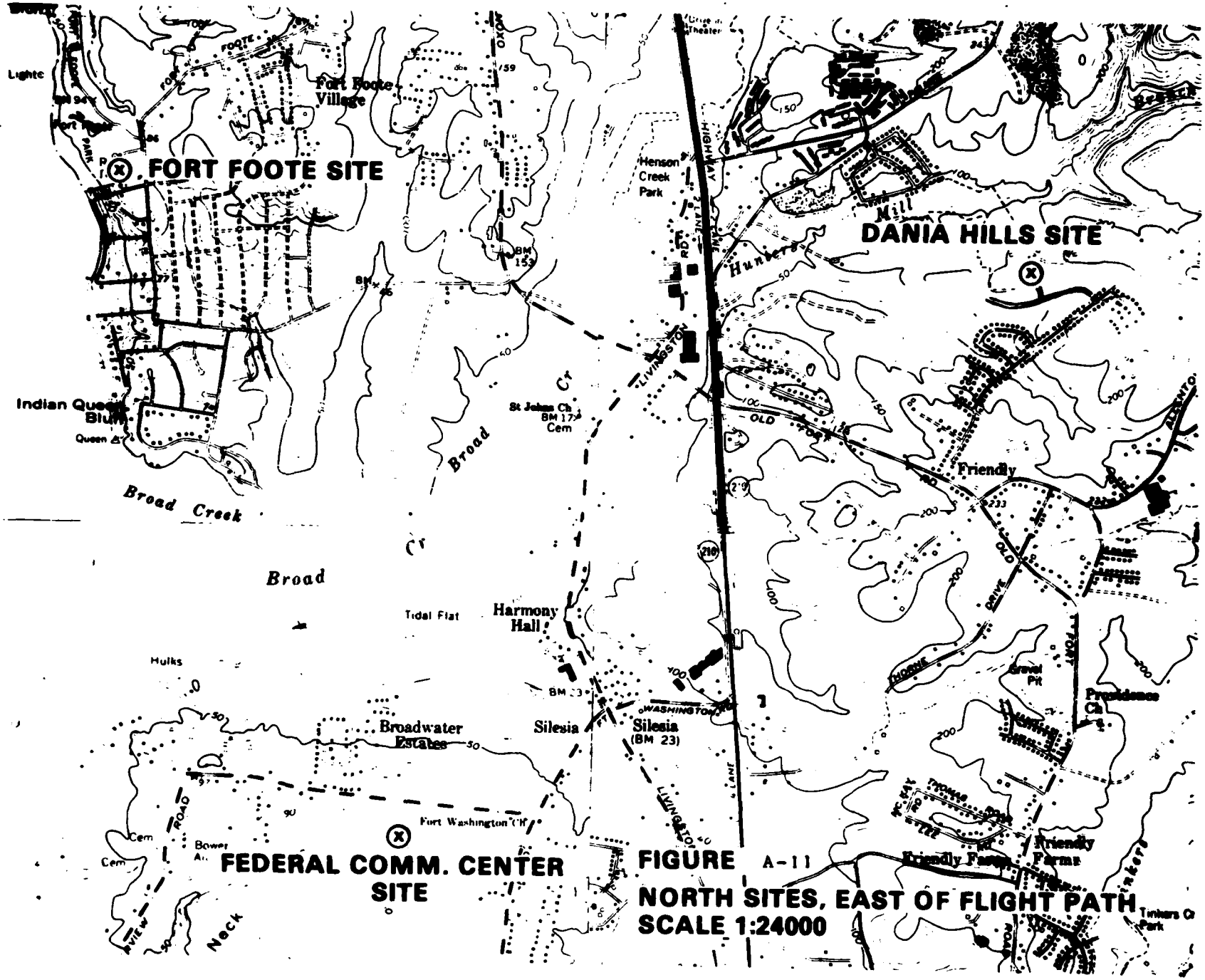
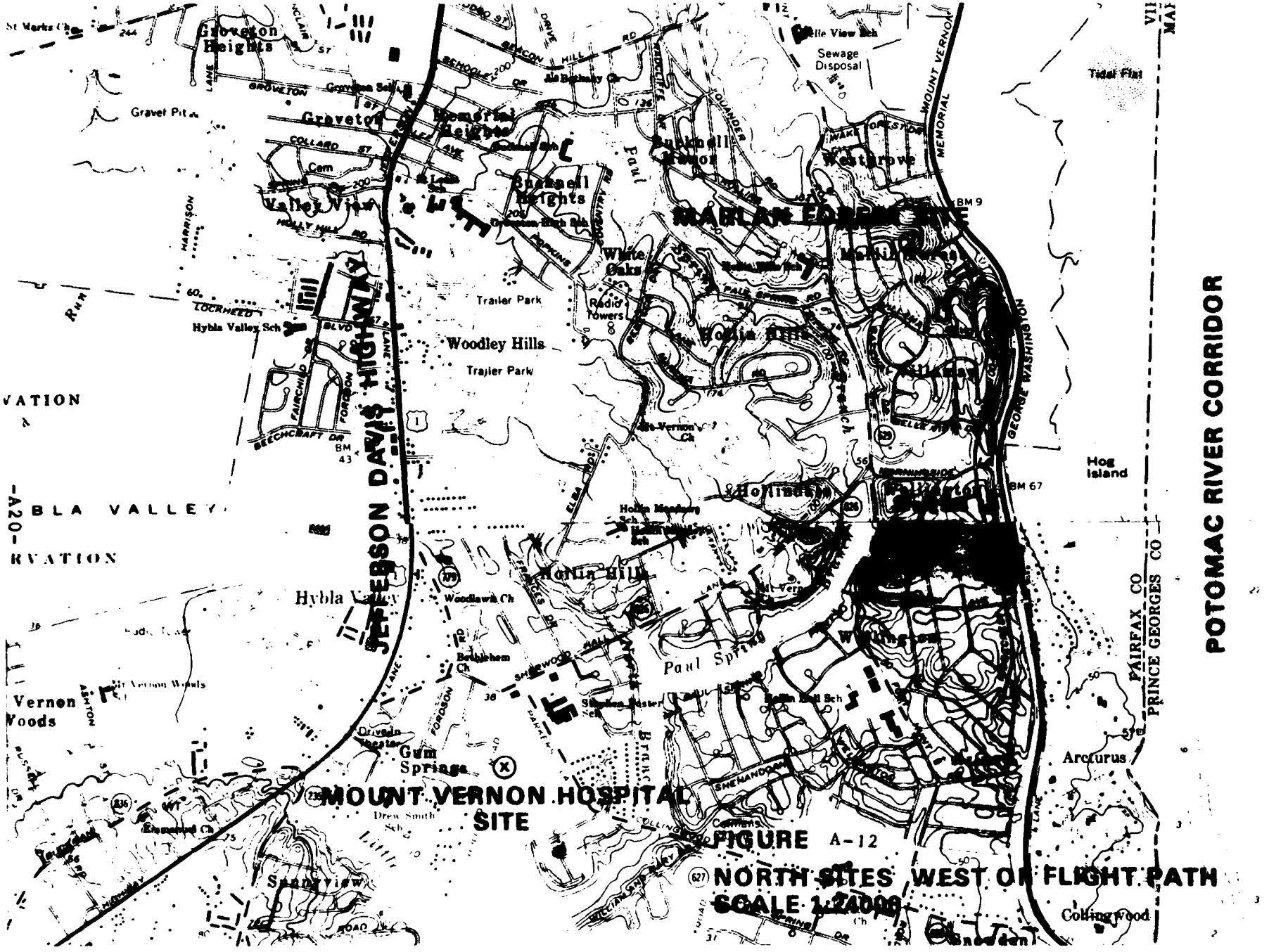


FIGURE A-11

NORTH SITES, EAST OF FLIGHT PATH

SCALE 1:24000


JEFFERSON DAVIS HIGHWAY
POTOMAC RIVER CORRIDOR
MOUNT VERNON HOSPITAL SITE
Groveton Heights
Gravelly Pt
Valley View
Shirlington
Woodley Hills
Trailer Park
Hybla Valley Sch
Hollin Hills
Hollin Meadows Sch
Hollin Hall
Radio Towers
White Oaks
Sewage Disposal
Tidal Flat
Hog Island
Mt Vernon Ch
Woodlawn Ch
Bethlehem Ch
Gum Springs
Vernon Woods
Mt Vernon Woods
Drew Smith Sch
Sunny View
Arcturus
Collingwood
Paul Spring
Hybla Valley
FAIRFAX CO
PRINCE GEORGES CO
FIGURE A-12
NORTH SITES WEST OF FLIGHT PATH
SCALE 1:24000

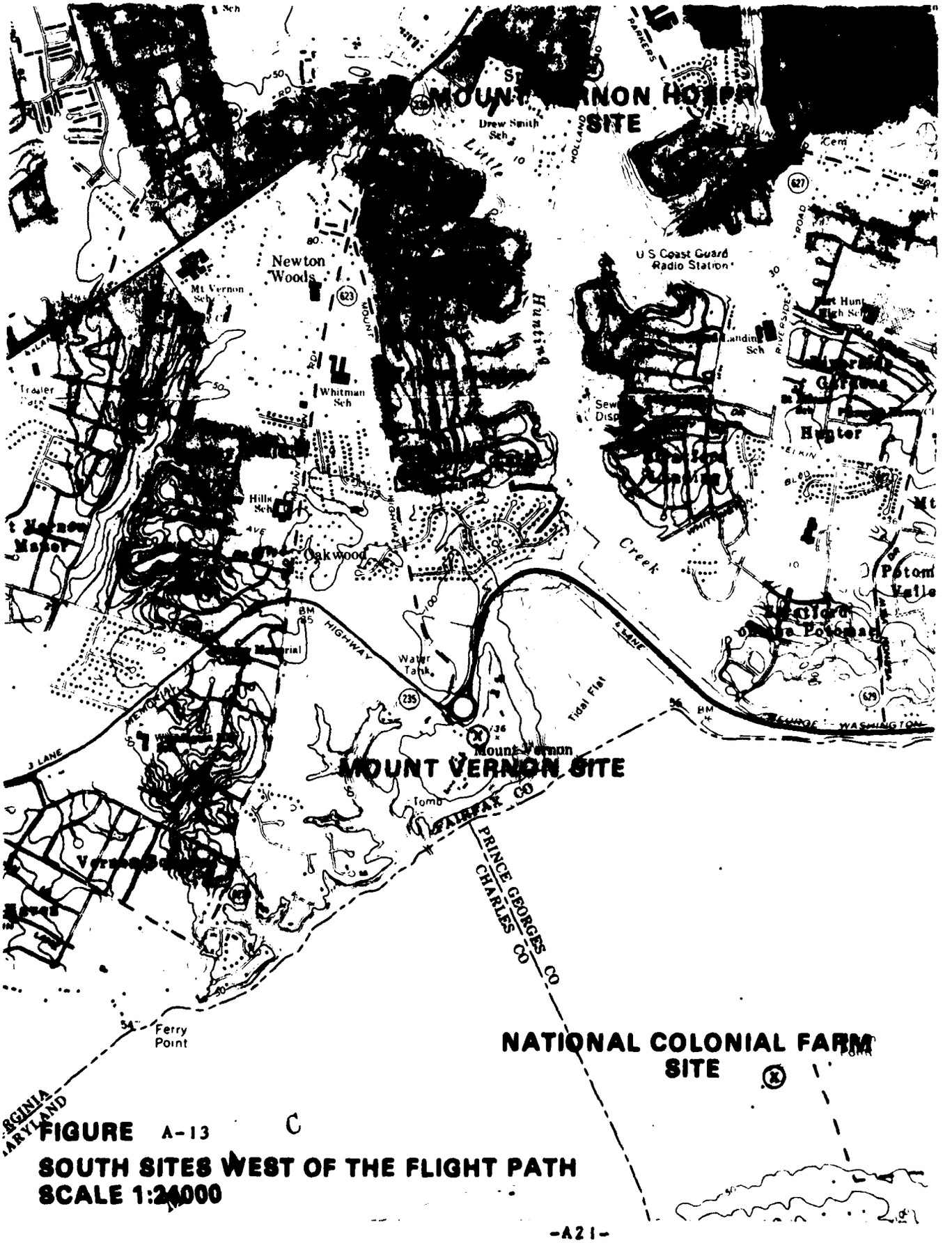


FIGURE A-13

SOUTH SITES WEST OF THE FLIGHT PATH
SCALE 1:24000

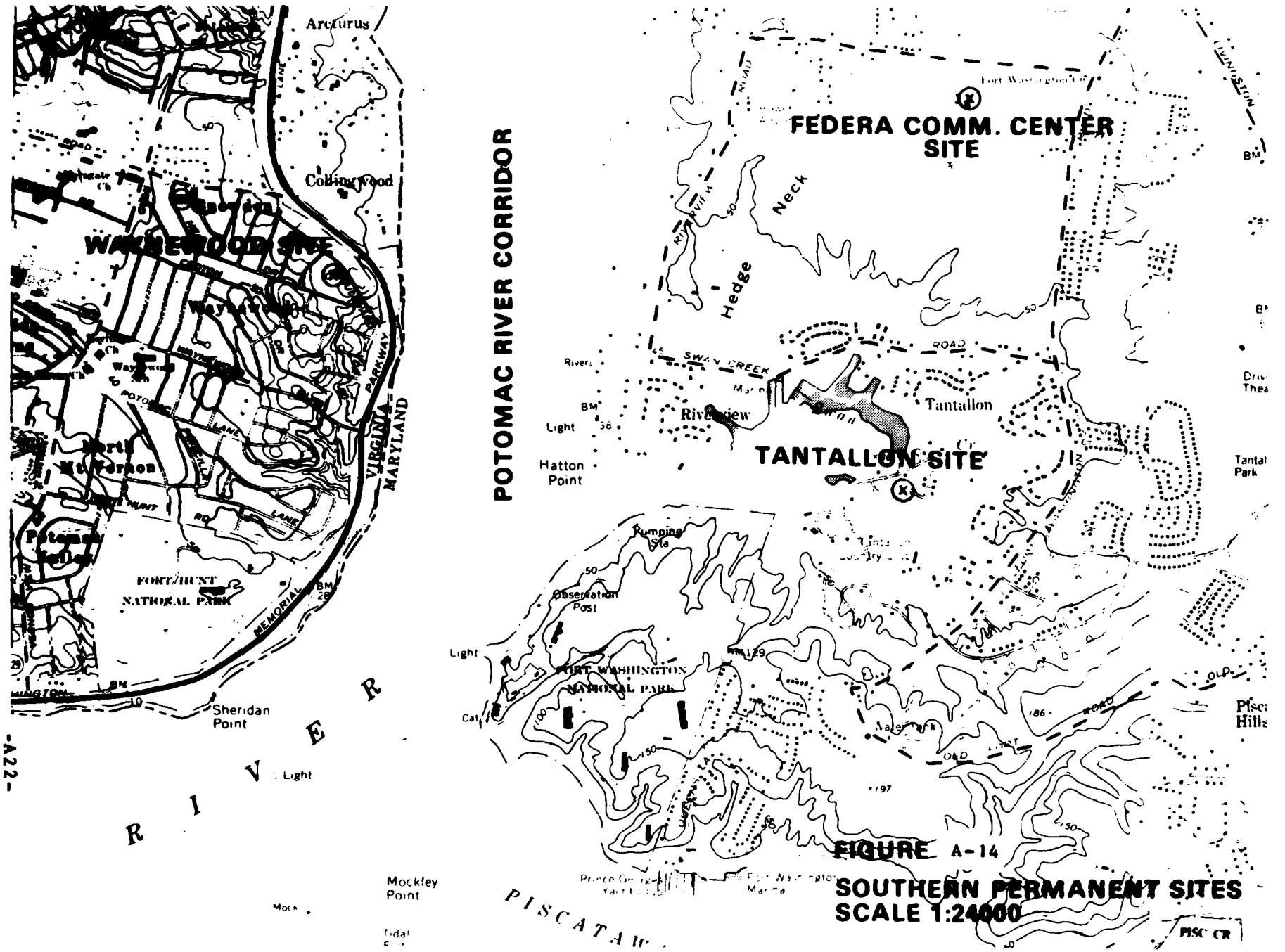


FIGURE A-14

SOUTHERN PERMANENT SITES
SCALE 1:24000

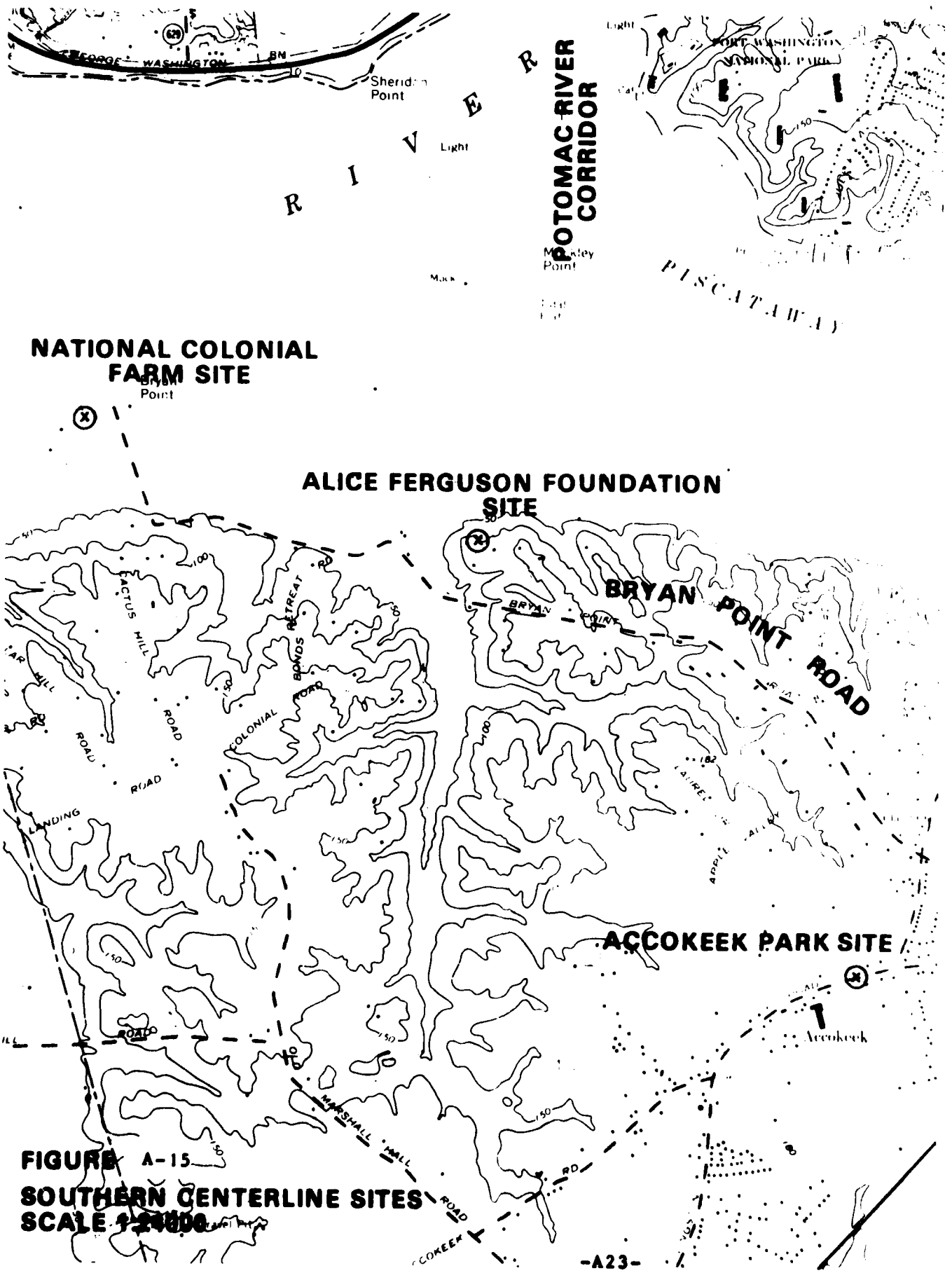


FIGURE A-15

SOUTHERN CENTERLINE SITES

SCALE 1:24000

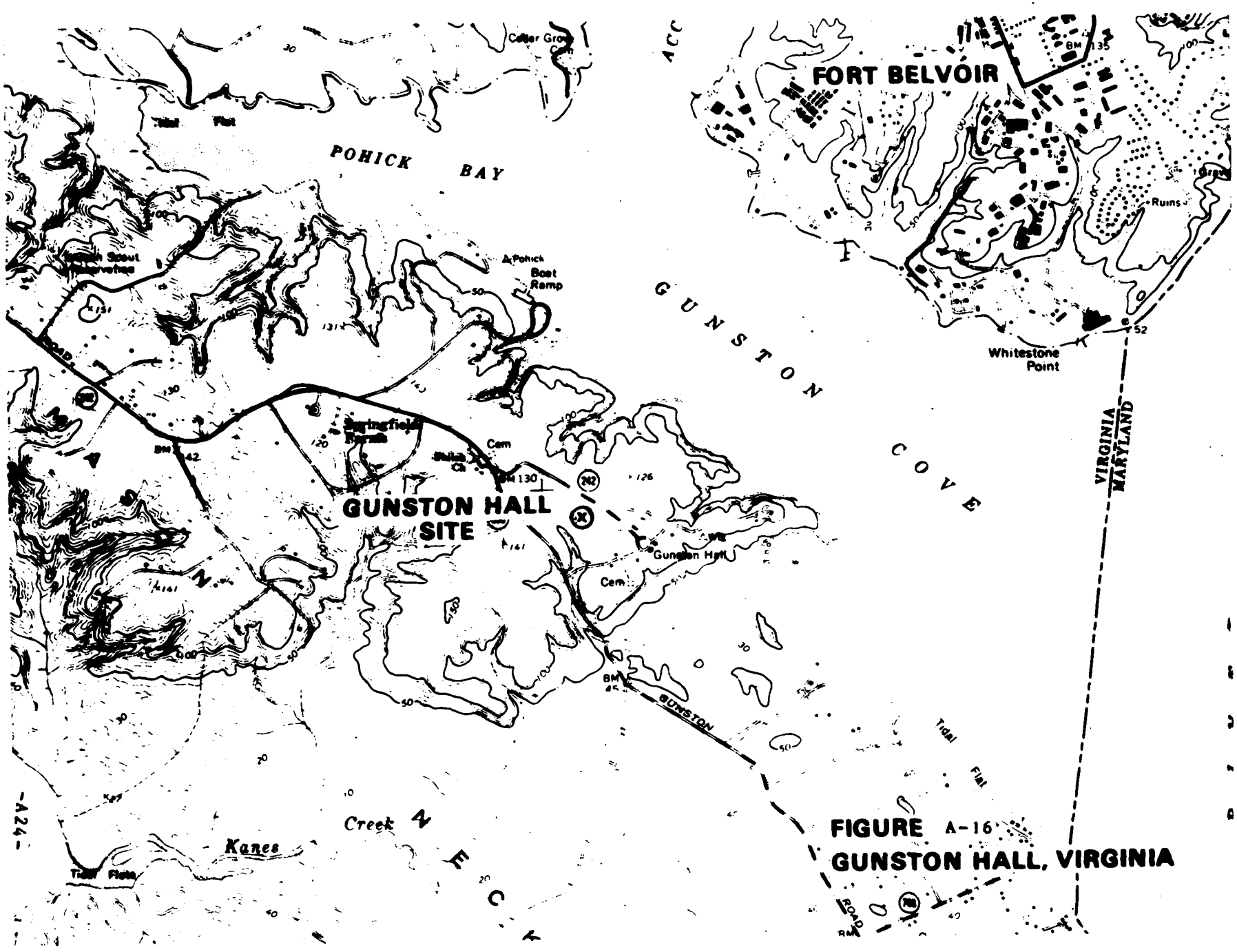


FIGURE A-16
GUNSTON HALL, VIRGINIA

APPENDIX B

AVERAGED MAXIMUM SOUND LEVELS FOR TURBOJET AIRCRAFT EVENTS

- SOUTH DEPARTURES -

List of Tables

B1.0 SINGLE AIRCRAFT EVENT DATA

These single event data were recorded at each site by observers as they occurred. Very often, weather conditions obscured visibility which reduced the number of planes observed. The four aircraft which were observed most often are averaged and listed separately. The "other" category includes all other commercial jets observed as well as some general aviation business jets. In almost all cases, a large standard deviation of the sample resulted from the generally dispersed flight pattern and pilot technique. These data have been included to show the general peak noise environment at each site during test and normal operations. All data are average maximum dB(A) recorded for each aircraft listed. However, care must be taken to note that the average may be biased by such factors as observer technique, atmospheric conditions, and pilot technique. Aircraft noted by one observer may be ignored as too far away by another.

Single event data were also produced by the permanent system monitors but these data are biased upwards due to the threshold requirement necessary to automatically distinguish aircraft events. Thus, the averaged permanent system data may not be directly compared to the portable system averages. For the purposes of this appendix, the permanent system mentioned above will be denoted as Sys: 1 in the upper left corner of the table for each site. Similarly, the portable system will be denoted as Sys: 2.

DCA FLIGHT EXTENSION TEST

Marlan Forest, Virginia — South Departures

Sys: 1	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	19	72.1	2.4	4	73.8	3.2	36	73.2	2.5	2	81.0	2.8
B-737	4	71.5	1.7	3	77.3	3.8	2	71.5	0.7	-	-	-
DC-9	9	72.6	2.7	1	78.0	-	8	72.6	2.5	-	-	-
BAC-111	1	72.0	-	-	-	-	4	76.5	1.3	-	-	-
Other	1	-	-	-	-	-	-	-	-	-	-	-

Waynewood, Virginia — South Departures

Sys: 1	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	119	76.4	3.2	9	75.9	2.4	140	76.8	3.6	3	76.0	7.8
B-737	27	73.5	2.7	4	72.8	2.9	29	73.5	2.2	1	72.0	-
DC-9	50	73.8	2.3	5	74.0	3.7	60	75.1	2.4	1	72.0	-
BAC-111	5	73.6	2.9	-	-	-	18	75.8	3.6	1	77.0	-
Other	-	-	-	-	-	-	-	-	-	-	-	-

= Number of events; Avg. = Average maximum dB(A); S.D. = Standard Deviation

AVERAGED MAXIMUM SOUND LEVELS FOR SINGLE AIRCRAFT EVENTS (dBA)

TABLE-B1

DCA FLIGHT EXTENSION TEST

Mount Vernon Hospital, Virginia — South Departures

Sys: 2	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	1	59.0	0	38	69.0	8.4	21	61.5	3.3	28	67.5	8.3
B-737	1	64.0	0	14	65.9	3.8	5	62.2	2.3	11	68.9	7.5
DC-9	-	-	-	15	69.7	7.2	6	62.8	3.7	8	62.6	4.7
BAC-111	-	-	-	2	65.0	1.4	4	62.3	.5	4	59.8	7.8
Other	-	-	-	10	66.4	4.5	1	56.0	0	5	64.4	5.5

Mount Vernon, Virginia — South Departures

Sys: 2	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	27	57.8	4.7	29	67.0	7.9	23	59.4	5.9	40	67.0	7.5
B-737	10	54.8	3.0	15	64.9	4.9	6	59.8	6.9	24	66.8	6.8
DC-9	15	56.1	3.5	15	66.9	6.3	9	57.3	3.1	20	63.0	8.7
BAC-111	1	61.0	0	2	65.0	12.7	6	60.7	3.4	14	62.9	11.0
Other	7	53.1	3.5	7	58.4	5.5	7	54.9	5.8	20	63.3	8.9

= Number of events in sample; Avg. = Average dB(A); S.D. = Standard Deviation

AVERAGED MAXIMUM SOUND LEVELS FOR SINGLE AIRCRAFT EVENTS (dB(A))

TABLE B-2

DCA FLIGHT EXTENSION TEST

Fort Foote, Maryland — South Departures

Sys: 1	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	125	80.8	3.7	22	81.4	2.7	166	80.6	3.8	11	79.7	5.8
B-737	48	76.0	2.5	6	77.0	3.8	56	77.1	3.7	3	79.7	5.5
DC-9	81	78.1	3.2	15	79.0	3.4	73	77.6	3.2	4	80.0	4.1
BAC-111	7	79.1	5.2	-	-	-	28	79.7	2.9	3	81.0	1.7
Other	-	-	-	-	-	-	-	-	-	-	-	-

Tantallon, Maryland — South Departures

Sys: 1	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	72	74.6	2.8	15	76.7	2.7	106	74.7	3.0	12	75.2	3.6
B-737	16	72.5	1.6	6	73.8	3.3	17	72.9	1.8	3	74.0	3.0
DC-9	36	72.9	1.8	11	73.5	1.9	27	72.9	1.9	3	71.3	0.6
BAC-111	3	75.3	3.8	-	-	-	14	75.1	2.9	1	71.0	-
Other	-	-	-	-	-	-	-	-	-	-	-	-

= Number of events; Avg. = Average maximum dB(A); S.D. = Standard Deviation

AVERAGED MAXIMUM SOUND LEVELS FOR SINGLE AIRCRAFT EVENTS (dB(A))

TABLE-B3

DCA FLIGHT EXTENSION TEST

Dania Hills, Maryland — South Departures

Sys: 2	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	15	58.60	5.46	21	65.57	11.32	16	61.56	8.74	8	61.25	5.78
B-737	4	55.00	2.16	7	57.57	3.87	1	47	0	1	54	0
DC-9	6	63.33	3.5	17	64.12	7.04	20	61.75	6.4	5	59.2	9.42
BAC-111	-	-	-	1	67	0	-	-	-	1	72	0
Other	1	56	0	6	67.83	7.55	6	58	3.52	1	63	0

Federal Communications Center, Riverview, Maryland — South Departures

Sys: 2	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	86	68.72	3.97	62	67.56	5.81	61	58.54	3.78	44	59.27	3.82
B-737	35	66.86	2.72	25	62.64	5.55	22	58.36	5.79	12	56.58	3.26
DC-9	48	67.04	3.31	36	68.06	4.76	43	59.93	4.77	24	59.92	3.65
BAC-111	5	69.4	3.51	1	74	0	3	64	10.58	3	60.33	2.08
Other	12	66.17	8.14	9	66.11	6.19	9	56	4.18	20	56.70	6.73

= Number of events in sample; Avg. = Average dB(A); S.D. = Standard Deviation

AVERAGED MAXIMUM SOUND LEVELS FOR SINGLE AIRCRAFT EVENTS (dB(A))

TABLE B4

DCA FLIGHT EXTENSION TEST

National Colonial Farm, Maryland — South Departures

Sys: 2	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	29	63.31	4.31	-	-	-	31	54.97	4.62	-	-	-
B-737	7	62.57	4.47	-	-	-	13	56.69	3.77	-	-	-
DC-9	14	63.57	2.98	-	-	-	12	57.67	3.50	-	-	-
BAC-111	1	62	0	-	-	-	1	55	0	-	-	-
Other	2	59.5	4.95	-	-	-	8	52.5	3.16	-	-	-

Gunston Hall, Virginia — South Departures

Sys: 2	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	-	-	-	18	60.83	7.06	-	-	-	-	-	-
B-737	-	-	-	8	66.13	2.17	-	-	-	-	-	-
DC-9	-	-	-	7	63.71	4.5	-	-	-	1	61	0
BAC-111	-	-	-	-	-	-	-	-	-	-	-	-
Other*	23	63.52	5.04	2	54	8.49	5	49.4	6.31	3	54	4

*Due to inclement weather, aircraft sightings were not possible, all jet aircraft events grouped together.

= Number of events in sample; Avg. = Average dB(A); S.D. = Standard Deviation

AVERAGED MAXIMUM SOUND LEVELS FOR SINGLE AIRCRAFT EVENTS (dBA)

TABLE B5

DCA FLIGHT EXTENSION TEST

Alice Ferguson Foundation, Maryland — South Departures

Sys: 2	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	39	73.21	5.68	4	62.5	9.81	12	60.17	3.95	3	62.33	4.04
B-737	15	68.4	3.52	4	60.25	5.62	4	64.75	8.26	2	61.5	6.36
DC-9	27	69.67	4.45	3	67	7.21	6	59.33	4.08	-	-	-
BAC-111	2	69.5	12.02	-	-	-	1	62	0	-	-	-
Other	4	62.75	7.63	1	58	0	6	58.83	9.45	1	58	0

Accokeek Park, Maryland — South Departures

Sys: 2	AM Test #	AM Test Avg.	AM Test S.D.	AM Normal #	AM Normal Avg.	AM Normal S.D.	PM Test #	PM Test Avg.	PM Test S.D.	PM Normal #	PM Normal Avg.	PM Normal S.D.
B-727	33	75.58	4.56	13	63.62	10.19	26	61.58	6.59	5	57.4	8.62
B-737	17	70.88	3.74	6	60.33	6.28	2	57.5	10.61	1	51	0
DC-9	23	72.61	4.61	5	58.4	9.32	17	58.7	5.1	0	0	0
BAC-111	1	77	0	-	-	-	2	66.5	6.36	-	-	-
Other	7	60.43	5.09	3	66.67	3.06	10	61.7	10.99	2	52.5	2.12

= Number of events in sample; Avg. = Average dB(A); S.D. = Standard Deviation

AVERAGE MAXIMUM SOUND LEVELS FOR SINGLE AIRCRAFT EVENTS (dB(A))

TABLE B6

APPENDIX C

METEOROLOGICAL DATA

JULY 23 - OCTOBER 19, 1979

Temp	=	Temperature in degrees Fahrenheit
Pres	=	Atmospheric pressure in inches of Mercury
Wind Sp	=	Speed in Knots
Win Dir	=	True heading of wind 0 - 360^{o}
Rel Hum	=	Relative wet/dry Humidity
Weather	=	Precipitation and obstruction to vision
Operation	=	Direction of inbound and outbound flights from National Airport

WEATHER DATA

START TIME OF DATA RUN

13:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
7/24	84°	30.12	5	160	70%		S
7/25	83°	29.98	10	180	80%		S
7/26	84°	29.84	8	220	85%	Rain	S
7/27	87°	29.87	8	260	54%		N
7/28	88°	29.91	4	260	64%	Haze	S
7/29	88%	29.82	4	90	73%		N
7/30	80°	29.93	7	360	82%		N
7/31	89°	29.93	5	60	68%		N/S
8/1	92°	29.89	8	180	62%		S
8/2	91°	29.80	13	180	85%		S
8/3	87°	29.93	8	20	73%		N
8/4	91°	29.99	9	360	51%		N
8/5	91°	29.99	11	290	52%		N
8/6	89°	29.93	12	340	54%		N
8/7	85°	30.03	5	170	50%		N
8/8	95°	29.93	12	310	55%		S/N
8/9	87°	30.07	6	170	61%		N
8/10	95°	29.82	12	260	49%		N/S
8/11	92°	29.73	6	270	51%		S
8/12	64°	29.86	16	30	93%	Rain	N
8/13	77°	30.05	13	330	50%		N
8/14	86°	29.98	11	240	47%		N/S
8/15	73°	30.04	15	320	51%		N
8/16	75°	30.19	10	320	50%		N
8/17	76°	30.19	6	140	42%		S
8/18	70°	30.01	14	230	81%	Rain	S

WEATHER DATA

START TIME OF DATA RUN

14:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
7/24	86°	30.08	8	180	68%		S
7/25	84°	29.94	10	180	72%		S
7/26	84°	29.83	8	240	85%	Rain	S
7/27	88°	29.85	11	310	48%		N
7/28	88°	29.90	6	170	66%	Haze	S
7/29	89°	29.81	5	10	68%	Rain	N
7/30	81°	29.93	9	350	79%		N
7/31	89°	29.92	6	140	66%		S
8/1	92°	29.87	9	180	66%		S
8/2	91°	29.79	12	180	75%		S
8/3	86°	29.91	8	350	72%		N
8/4	91°	29.91	10	290	54%		N
8/5	91°	29.93	12	320	49%		N
8/6	90°	29.92	8	330	52%		N
8/7	86°	30.01	6	180	53%		S
8/8	95°	29.92	7	320	56%	Thunder	N
8/9	89°	30.05	5	320	52%		N
8/10	96°	29.80	12	250	50%		S
8/11	90°	29.70	7	160	60%	Thunder, Rain	S
8/12	64°	29.85	16	30	93%	Rain	N
8/13	78°	30.04	9	250	54%		N
8/14	86°	29.96	10	250	47%		S
8/15	73°	30.04	14	310	50%		N
8/16	77°	30.17	9	330	45%		N
8/17	77°	30.17	5	130	42%		S
8/18	76	30.00	13	230	84%		S

WEATHER DATA

START TIME OF DATA RUN
19:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
7/24	85°	30.06	7	160	70%		S
7/25	83°	29.90	3	90	85%	Thunder	S
7/26	86°	29.79	8	210	75%		S
7/27	85°	29.86	7	360	57%		N
7/28	78°	29.90	5	240	94%		S
7/29	80°	29.83	11	20	94%	Thunder	S/N
7/30	83°	29.91	6	80	80%		N
7/31	87°	29.90	8	170	72%		S
8/1	87°	29.84	6	190	75%		S
8/2	78°	29.83	9	240	91%	Rain, Thunder	N
8/3	79°	29.92	5	40	94%	Rain	N
8/4	87°	29.96	10	310	55%		N
8/5	80°	29.940	8	240	82%		N
8/6	87°	29.90	7	320	56%		N
8/7	84°	29.95	10	200	63%		S
8/8	78°	30.00	18	320	85%	Rain, Thunder	S
8/9	85°	29.99	9	210	65%		S
8/10	91°	29.74	8	210	60%		S
8/11	69°	29.81	10	40	87%	Rain	N
8/12	65°	29.89	15	350	84%		N
8/13	76°	30.01	7	220	56%		S
8/14	82°	29.90	8	230	57%		S
8/15	70°	30.08	12	320	55%		N
8/16	73°	30.16	8	330	50%		N
8/17	73°	30.13	9	150	62%		S
8/18	70°	29.94	8	21	90%	Rain	S

WEATHER DATA

START TIME OF DATA RUN

20:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
7/24	82°	30.06	6	170	77%		S
7/25	78°	29.92	3	200	94%		S
7/26	84°	29.79	9	220	80%		S
7/27	81°	29.87	8	360	67%		N
7/28	77°	29.90	4	250	94%		S
7/29	78°	29.84	14	40	94%	Rain	N
7/30	84°	29.91	4	80	77%		N
7/31	85°	29.90	7	170	80%		S
8/1	86°	29.85	7	170	85%		S
8/2	78°	29.85	6	340	91%		N
8/3	79°	29.93	6	360	91%		N
8/4	85°	29.98	8	310	59%		N
8/5	80°	29.950	7	200	85%		N/S
8/6	86°	29.92	7	300	59%		N
8/7	81°	29.95	9	210	70%		S
8/8	76°	29.93	8	140	91%	Rain	S/N
8/9	84°	29.99	8	180	75%		S
8/10	90°	29.76	8	240	64%	Rain	S
8/11	69°	29.77	16	40	87%	Rain	N
8/12	65°	29.91	16	360	81%		N
8/13	74°	30.03	8	210	62%		S
8/14	65°	29.91	6	260	59%		S
8/15	68°	30.10	10	320	57%		N
8/16	70°	30.17	7	330	55%		N
8/17	72°	30.13	10	150	57%		S
8/18	70°	29.94	7	210	93%	Rain	S

WEATHER DATA

START TIME OF DATA RUN

21:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
7/24	82°	30.08	9	180	80%		S
7/25	79°	29.92	0	00	88%		S
7/26	83°	29.81	7	230	82%		S
7/27	80°	29.89	S	360	67%		N
7/28	77°	29.90	3	230	94%		S
7/29	77°	29.87	12	10	91%		N
7/30	81°	29.92	4	90	85%		N
7/31	83°	29.91	7	180	85%		S
8/1	84°	29.86	6	150	85%		S
8/2	78°	29.88	0	00	88%		N
8/3	79°	29.95	5	80	94%		N
8/4	83°	29.98	7	330	65%		N
8/5	78°	27.96	6	200	85%		S
8/6	83°	29.95	6	340	72%		N
8/7	80°	29.96	8	210	77%		S
8/8	76°	29.98	10	200	91%		S
8/9	78°	30.03	13	60	79%		S/N
8/10	83°	29.81	16	320	83%	Rain, Thunder	S/N
8/11	69°	29.80	11	30	90%	Rain	N
8/12	65°	29.92	13	34	84%		N
8/13	72°	30.05	8	220	68%		S
8/14	79°	29.94	17	350	63%		S/N
8/15	66°	30.12	7	320	63%		N
8/16	69°	30.19	6	340	59%		N
8/17	71°	30.14	9	160	57%		S
8/18	71°	29.95	4	240	93%	Rain	S

WEATHER DATA

START TIME OF DATA RUN

10:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
8/19	77°	29.95	0	00	82%	Haze	N
8/20	77°	30.01	8	40	77%		N
8/21	73°	30.00	14	40	94%	Rain, Fog	N
8/22	75°	30.07	4	50	71%		N
8/23	77°	30.06	6	170	88%		S
8/24	83°	29.99	8	160	82%		S
8/25	82°	30.00	6	220	82%	BKN	S
8/26	82°	30.10	5	210	82%	Haze	N
8/27	82°	29.99	8	210	82%	OVC	S
8/28	77°	29.97	4	70	91%	Haze	N
8/29	79°	29.93	12	200	85%	OVC	S
8/30	85°	29.95	7	310	72%	CLR	S/N
8/31	81°	30.05	5	20	65%	SCT	N
9/1	79°	30.08	7	130	80%		N/S
9/2	80°	29.99	10	180	88%		S
9/3	81°	29.93	8	180	85%		S
9/4	78°	29.99	4	100	88%	Haze, Fog	N
9/5	77°	29.98	8	110	100%	Rain	S
9/6	83°	29.58	17	290	65%		S/N
9/7	79°	29.76	9	350	77%		N
9/8	69°	29.940	14	350	73%		N
9/9	69°	30.170	8	30	63%		N
9/10	72°	30.14	5	170	73%		N
9/11	78°	30.05	6	300	62%		S/N
9/12	73°	30.16	5	30	74%		N
9/13	75°	30.10	8	100	76%		S

WEATHER DATA

START TIME OF DATA RUN

11:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
8/19	81°	29.95	4	50	72%	Haze	N
8/20	81°	30.00	8	80	69%		N
8/21	71°	30.02	13	20	90%	Rain, Fog	N
8/22	77°	30.06	5	130	67%		N
8/23	79°	30.06	9	160	82%		S
8/24	83°	29.97	8	180	82%		S
8/25	83°	30.00	7	170	85%	BKN	S
8/26	84°	30.09	6	180	77%	Haze	N
8/27	84°	29.98	8	210	80%	BKN	S
8/28	79°	29.97	5	60	85%	Haze, SCT	N
8/29	81°	29.92	12	210	85%	OVC	S
8/30	87°	29.94	8	360	68%	OVC	N
8/31	87°	30.05	3	50	57%	SCT	N
9/1	81°	30.07	8	90	77%		S
9/2	81°	29.97	7	170	85%		S
9/3	82°	29.93	6	230	74%	Rain	S
9/4	80°	29.99	3	200	85%	Haze	N
9/5	78°	29.95	8	100	100%	Rain	S
9/6	84°	29.61	17	260	63%		N
9/7	82°	29.76	3	10	55%		N
9/8	72°	29.95	12	360	71%		N
9/9	72°	30.16	7	40	59%		N
9/10	73°	30.12	9	170	71%		N/S
9/11	81°	30.05	4	320	59%		N
9/12	75°	30.15	6	50	74%		N
9/13	78°	30.07	5	120	72%		S

WEATHER DATA

START TIME OF DATA RUN

13:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
8/19	85°	29.92	5	170	59%		S
8/20	84°	30.00	6	80	63%		N
8/21	75°	30.01	10	80	74%		N
8/22	80°	30.50	5	220	63%		S
8/23	83°	30.02	10	170	72%	OVC	S
8/24	85°	29.95	8	180	77%		S
8/25	88°	29.99	7	160	73%	BKN	S
8/26	86°	30.07	6	180	75%	BKN	S
8/27	89°	29.94	9	180	75%	SCT	S
8/28	83°	29.93	4	190	77%	BKN	N
8/29	85°	29.93	9	220	75%	OVC	S
8/30	89°	29.93	9	340	62%	Haze	N
8/31	87°	30.05	4	130	57%	OVC	N/S
9/1	83°	30.06	7	130	67%		S
9/2	83°	29.93	11	170	82%		S
9/3	83°	29.91	6	240	74%		S/N
9/4	83°	29.97	3	50	77%		N
9/5	77°	29.89	14	140	100%	Rain	N/S
9/6	87°	29.64	14	260	61%		N
9/7	83°	29.75	5	60	57%		N
9/8	74°	29.95	13	340	60%		N
9/9	75°	30.15	6	30	54%		N
9/10	76°	30.08	9	220	58%		S
9/11	84°	30.03	3	50	55%		N
9/12	78°	30.13	4	180	77%	Haze	S
9/13	78°	30.05	8	100	72%	Rain	S

WEATHER DATA

START TIME OF DATA RUN

14:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operati
8/19	86°	29.92	6	180	61%		S
8/20	85°	29.98	4	50	59%		N
8/21	76°	30.01	10	110	74%		N
8/22	82°	30.04	6	190	57%		S
8/23	84°	30.01	13	140	70°		S
8/24	87°	29.93	10	180	75%		S
8/25	89°	29.98	8	180	66%	BKN	S
8/26	87°	30.06	6	180	77%	BKN	S
8/27	88°	29.91	10	180	75%	SCT	S
8/28	84°	29.90	5	180	77%	SCT	N/S
8/29	87°	29.90	12	210	70%	BKN	S
8/30	90°	29.92	9	290	62%	SCT, Haze	N
8/31	89°	30.01	4	140	54%		S
9/1	84°	30.06	9	100	63%		S
9/2	84°	29.91	13	170	77%		S
9/3	83°	29.90	5	240	72%		N/S
9/4	86°	29.950	4	130	70%		N
9/5	77°	29.86	13	130	100%	Rain	S
9/6	87°	29.65	16	270	61%		N
9/7	84°	29.74	5	70	57%		N
9/8	77°	29.94	14	330	56%		N
9/9	75°	30.14	4	70	46%		N
9/10	76°	30.06	10	210	58%		S
9/11	85°	30.02	3	60	57%		N
9/12	80°	30.11	3	150	65%	Haze	S
9/13	77°	30.03	5	120	77%		S

WEATHER DATA

START TIME OF DATA RUN

19:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operatic
8/19	75°	29.93	5	190	91%	Rain	N
8/20	80°	29.95	8	110	69%		N
8/21	73°	30.01	8	100	76%		N
8/22	77°	30.10	5	160	71%		S
8/23	80°	29.96	8	130	82%		S
8/24	84°	29.89	9	150	72%	Rain, Thunder	S
8/25	79°	29.99	8	310	88%	Rain	N
8/26	82°	30.00	7	180	80%	SCT	S
8/27	75°	29.94	6	80	97%	Rain	N
8/28	81°	29.90	8	140	85%	BKN	S
8/29	82°	29.89	9	180	88%	BKN, Rain	S
8/30	85°	29.91	6	270	70%	OVC, Haze	N
8/31	82°	30.01	7	130	72%		S
9/1	81°	30.02	6	110	74%		S
9/2	82°	29.87	10	170	82%		S
9/3	80°	29.20	12	190	85%		S
9/4	81°	29.95	9	180	82%		S
9/5	78°	29.64	19	130	94%	Rain, Fog	S
9/6	83°	29.68	9	290	59%		N
9/7	78°	29.75	5	220	82%		S
9/8	71°	30.00	12	360	62%		N
9/9	73°	30.11	7	340	50%		N
9/10	72°	30.02	7	180	73%		S
	76°	30.03	6	60	79%		N
	75°	30.08	4	80	77%		N
		29.95	10	100	85%	Haze	S

WEATHER DATA

START TIME OF DATA RUN

20:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operatic
8/19	75°	29.93	0	00	94%	Haze	N
8/20	79°	29.96	6	120	74%		N
8/21	71°	30.04	6	140	82%		N
8/22	76°	30.03	9	140	79%		S
8/23	78°	29.97	9	140	88%		S
8/24	80°	29.92	6	250	88%	Rain, Thunder	S
8/25	77°	30.02	0	00	88%	Rain	S/N
8/26	81°	30.01	5	180	82%	SCT	S
8/27	75°	29.94	5	120	97%	Rain	N/S
8/28	80°	29.92	10	180	85%	BKN	S
8/29	81°	29.90	8	200	91%	OVC, Fog	S
8/30	84°	29.92	8	270	75%	OVC	N
8/31	81°	30.04	4	210	72%		S
9/1	80°	30.03	6	120	79%		S
9/2	81°	29.89	10	180	88%		S
9/3	78°	29.92	7	200	88%		S
9/4	79°	29.97	5	180	88%		S
9/5	78°	29.63	14	130	91%	Rain	S
9/6	83°	29.69	9	290	55%		N
9/7	76°	29.78	6	230	88%		S
9/8	69°	30.03	12	350	66%		N
9/9	70°	30.12	3	130	57%		N
9/10	70°	30.02	8	190	84%		S
9/11	75°	30.05	5	100	85%	Haze	N
9/12	73°	30.10	5	110	79%		N
9/13	76°	29.94	10	90	88%	Haze	S

WEATHER DATA

START TIME OF DATA RUN

~~11:00~~

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operatic
9/14	82°	29.60	13	180	85%		S
9/15	71°	30.04	9	340	55%		N
9/16	71°	30.26	5	50	51%		N
9/17	75°	30.26	5	190	58%		S
9/18	75°	30.03	8	190	69%		S
9/19	77°	29.90	18	320	54%		N
9/20	64°	30.19	5	170	54%		S
9/21	70°	29.97	12	170	97%	Rain	S
9/22	73°	29.72	9	350	90%	Rain	N
9/23	66°	30.11	14	30	70%		N
9/24	67°	30.25	8	70	63%		N
9/25	66°	30.19	6	60	81%		N
9/26	71°	30.17	3	110	76%		N
9/27	72°	30.19	7	60	68%		N
9/28	72°	30.05	4	90	87%	Rain	N
9/29	77°	29.95	5	160	87%		S
9/30	73°	29.92	7	50	93%	Rain, Fog	N
10/1	71°	29.77	3	90	84%		N
10/2							N
10/3	72°	29.73	13	270	59%		N
10/4	72°	29.90	8	180	71%		S
10/5	68°	29.56	6	220	93%	Rain	S
10/6	62°	29.84	8	180	58%		S
10/7	65°	29.60	17	250	48%		N
10/8	64°	29.94	12	260	43%		N/S
10/9	68°	29.67	13	200	78%		S

WEATHER DATA

START TIME OF DATA RUN

13:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operatic
9/14	85°	29.58	12	190	82%		S
9/15	74°	30.03	11	31	50%		N
9/16	73°	30.24	5	360	48%		N
9/17	77°	30.22	6	180	54%		S
9/18	78°	29.97	10	170	60%		S
9/19	77°	29.91	16	330	47%		N
9/20	68°	30.13	6	180	53%		S
9/21	71°	29.92	9	190	94%	Rain, Fog	S
9/22	71°	29.73	12	360	93%	Rain	N
9/23	70°	30.10	12	30	55%		N
9/24	69°	30.22	8	50	57%		N
9/25	70°	30.14	5	50	79%		N
9/26	74°	30.14	6	180	71%		N
9/27	76°	30.16	7	100	54%		N
9/28	72°	30.00	4	30	94%	Rain	N
9/29	81°	29.93	7	330	72°		N
9/30	73°	29.90	8	60	93%		N
10/1	70°	29.75	11	290	94%	Rain	N/S/N
10/2							N
10/3	73°	29.73	14	300	55%		N
10/4	74°	29.85	8	170	66%		S
10/5	60°	29.52	6	320	93%	Rain	N
10/6	65°	29.78	12	210	54%		S
10/7	62°	29.59	17	280	43%		N
10/8	67°	29.91	12	290	43%		S/N
10/9	71°	29.65	4	300	73%		S

WEATHER DATA

START TIME OF DATA RUN

14:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operatic
9/14	86°	29.55	12	190	80%		S
9/15	75°	30.02	11	330	98%		N
9/16	75°	30.21	4	360	50%		N
9/17	78°	30.19	5	160	52%		S
9/18	78°	29.94	10	180	60%		S
9/19	77°	29.91	14	340	39%		N
9/20	69°	30.11	9	180	51%		S
9/21	71°	29.88	8	180	94%		S
9/22	71°	29.73	12	20	90%		N
9/23	71°	30.09	11	60	53%		N
9/24	69°	30.20	9	50	61%		N
9/25	69°	30.13	4	30	81%		N
9/26	77°	30.12	6	180	69%		S
9/27	76°	30.15	6	90	56%		N
9/28	72°	29.98	3	20	100%	Rain	N
9/29	79°	29.92	9	330	69%		N
9/30	73°	29.89	9	60	93%		N
10/1	72°	29.73	7	300	90%		N
10/2							S
10/3	75°	29.73	12	280	52%		N
10/4	75°	29.81	10	170	64%		S
10/5	62°	29.48	3	220	90%	Rain, Fog	N
10/6	66°	29.74	13	200	52%		S
10/7	63°	29.61	19	280	45%		N
10/8	68°	29.89	11	270	37%		N
10/9	69°	29.66	6	310	79%		N

WEATHER DATA

START TIME OF DATA RUN

19:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operatic
9/14	77°	29.71	8	320	71%		N
9/15	69°	30.06	6	340	59%		N
9/16	69°	30.22	4	160	68%		N/S
9/17	72°	30.14	7	200	64%		S
9/18	73°	29.88	8	180	79%		S
9/19	69°	29.97	10	320	49%		N
9/20	65°	30.07	7	150	75%		S
9/21	73°	29.78	10	180	100%	Rain	S
9/22	67°	29.83	15	10	93%		N
9/23	65°	30.13	7	60	65%		N
9/24	66°	30.19	8	60	73%		N
9/25	69°	30.13	4	110	81%		N
9/26	69°	30.11	5	160	90%		N
9/27	70°	30.14	4	50	73%		N
9/28	73°	29.94	6	240	100%	Fog	N
9/29	75°	29.91	3	140	85%		N
9/30	71°	29.88	12	40	93%		N
10/1	70°	29.71	4	180	97%		N
10/2							S
10/3	71°	29.82	7	250	64%		S
10/4	71°	29.80	11	150	71%		S
10/5	56°	29.62	14	250	72%		N/S
10/6	63°	29.70	8	190	70%		S
10/7	56°	29.73	14	300	64%		N
10/8	61°	29.86	6	180	65%	Rain	S
10/9	55°	29.85	9	350	90%		N

WEATHER DATA

START TIME OF DATA RUN
20:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operatic
9/14	77°	29.76	8	330	71%		N
9/15	68°	30.08	6	340	66%		N
9/16	68°	30.23	4	210	71%		S
9/17	70°	30.15	7	180	76%		S
9/18	72°	29.88	10	200	76%		S
9/19	67°	30.01	7	330	54%		N
9/20	65°	30.08	7	160	75%		S
9/21	73°	29.79	9	190	100%	Rain	S
9/22	67°	29.86	10	10	93%	Rain, Fog	N
9/23	64°	30.16	8	60	70%		N
9/24	65°	30.20	8	60	70%		N
9/25	68°	30.140	3	120	81%		N
9/26	70°	30.11	3	180	84%		N
9/27	69°	30.15	5	40	79%		N
9/28	73°	29.94	5	230	100%	Rain, Fog	N
9/29	75°	29.92	0	00	85%		N
9/30	70°	29.89	13	50	93%		N
10/1	70°	29.73	6	210	94%		N/S
10/2							S
10/3	70°	29.85	8	320	68%		S/N
10/4	70°	29.79	13	160	73%		S
10/5	54°	29.65	7	230	83%		S
10/6	61°	29.69	7	180	75%		S
10/7	56°	29.76	15	300	62%		N
10/8	60°	29.88	7	180	78%	Rain	S
10/9	55°	29.88	8	350	90%		N

WEATHER DATA

START TIME OF DATA RUN

21:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
9/14	76°	29.79	12	320	67%		N
9/15	67°	30.10	7	330	68%		N
9/16	67°	30.23	5	170	73%		S
9/17	68°	30.15	6	170	76%		S
9/18	70°	29.88	6	220	81%		S
9/19	65°	30.03	7	340	58%		N
9/20	65°	30.07	9	160	78%		S
9/21	73°	29.79	12	180	100%	Rain	S
9/22	66°	29.88	12	30	93%	Rain, Fog	N
9/23	63°	30.17	9	60	70%		N
9/24	64°	30.20	7	60	73%		N
9/25	68°	30.14	3	130	81%		N
9/26	67°	30.12	5	170	93%		N
9/27	69°	30.15	5	40	81%		N
9/28	73°	29.93	6	180	97%	Fog	N
9/29	73°	29.93	5	80	94%		N
9/30	69°	29.89	13	40	97%		N
10/1	68°	29.75	5	180	100%		S
10/2							S
10/3	69°	29.87	8	290	68%		N
10/4	69°	29.79	7	190	76%		S
10/5	54°	29.67	8	250	83%		S
10/6	61°	29.70	9	180	75%		S
10/7	56°	29.78	13	290	59%		N
10/8	58°	29.89	9	180	84%	Rain	S
10/9	53°	29.90	8	330	93%		N

WEATHER DATA

START TIME OF DATA RUN

10:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
10/10	37°	29.93	9	340	100%	Rain	N
10/11	50°	29.90	6	220	86%		S
10/12	58°	29.69	10	190	80%		S
10/13	55°	29.86	10	340	83%	Rain	N
10/14	55°	30.15	10	300	64%		N
10/15	55°	30.23	10	190	59%		S
10/16	59°	30.15	2	120	75%		S
10/17	60°	30.20	4	360	90%	Fog	N
10/19	67°	30.20	3	80	78%	Haze, Fog	N
7/22	79°	30.08	10	180	85%	Haze	S
7/23	82°	N/A	8	170	N/A		S

WEATHER DATA

START TIME OF DATA RUN

11:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
10/10	38°	29.92	9	360	100%	Rain, Fog	N
10/11	52°	29.89	10	230	80%		S
10/12	61°	29.67	7	180	75%		S
10/13	52°	29.88	10	330	71%	Rain	N
10/14	55°	30.17	13	300	57%		N
10/15	58°	30.21	9	200	99%		S
10/16	61°	30.15	3	180	72%		S
10/17	60°	30.20	2	90	90%		N
10/19	70°	30.19	6	170	71%	Haze	N
7/22	80°	30.09	7	160	82%		
7/23	85°	N/A	10	180	N/A		S

WEATHER DATA

START TIME OF DATA RUN

13:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
10/10	42°	29.88	8	30	93%	Rain	N
10/11	54°	29.84	9	170	77%		S
10/12	57°	29.61	5	200	78%		S
10/13	54°	29.88	12	320	62%		N
10/14	57°	30.13	10	290	53%		N
10/15	61°	30.15	10	190	54%		S
10/16	64°	30.10	0	00	63%		S
10/17	70°	30.15	3	160	63%		N
10/19	75°	30.15	9	190	62%		S
7/22	84°	30.08	7	160	72%		
7/23	89°	N/A	10	170	N/A		S

WEATHER DATA

START TIME OF DATA RUN

14:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
10/10	44°	29.82	8	360	93%		N
10/11	54°	29.82	8	170	72%		S
10/12	61°	29.64	5	260	84%	Rain, Fog	S
10/13	54°	29.88	9	320	49%		N
10/14	58°	30.12	11	320	53%		N
10/15	61°	30.12	11	190	52%		S
10/16	67°	30.09	3	160	49%		S
10/17	70°	30.12	3	90	63%		N
10/19	76°	30.14	10	190	58%		S
7/22	84°	30.07	8	170	72%		
7/23	86°	N/A	8	160	N/A	Thunder, Rain	S

WEATHER DATA

START TIME OF DATA RUN

19:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
10/10	44°	29.88	5	310	79%		N
10/11	52°	29.78	6	130	77%		S
10/12	55°	29.68	4	190	100%	Fog	N
10/13	51°	29.97	8	330	54%		N
10/14	52°	30.16	5	250	57%		N
10/15	54°	30.08	6	200	72%		S
10/16	59°	30.14	3	180	83%		S
10/17	65°	30.14	3	200	81%		S
10/19	66°	30.13	10	150	76%		S
7/22	82°	30.06	9	180	74%		
7/23	78°	N/A	5	200	N/A		S

WEATHER DATA

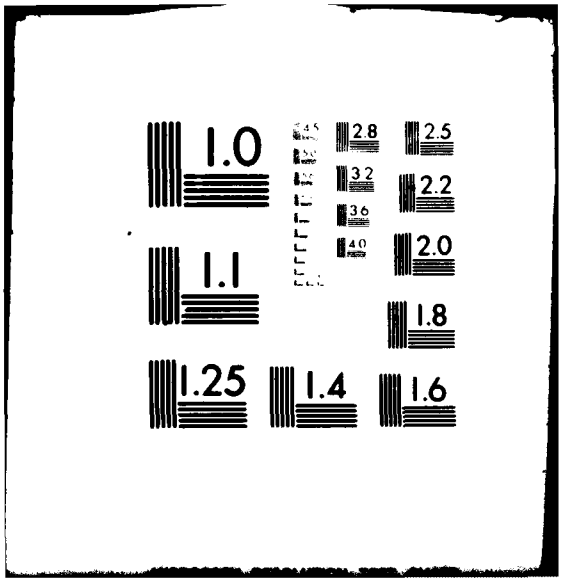
START TIME OF DATA RUN

20:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
10/10	43°	29.91	7	280	89%		N
10/11	52°	29.78	7	160	80%	Rain	S
10/12	55°	29.68	3	200	100%	Fog	N
10/13	50°	29.98	7	310	56%		N
10/14	51°	30.17	7	280	61%		N
10/15	53°	30.09	6	190	80%		S
10/16	58°	30.14	4	190	83%		S
10/17	64°	30.15	3	80	81%		S
10/19	64°	30.14	8	170	81%		S
7/22	80°	30.08	8	170	79%		S
7/23	77°	N/A	10	190	N/A		S

AD-A089 111 FEDERAL AVIATION ADMINISTRATION WASHINGTON DC OFFICE --ETC F/G 1/2
WASHINGTON NATIONAL AIRPORT FLIGHT EXTENSION TEST. NOISE MONITO--ETC(U)
MAY 80 J R HARE, D W FORD
UNCLASSIFIED FAA/EE-80-25 NL

END
DATE FILMED
10-80
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

WEATHER DATA

START TIME OF DATA RUN

21:00

Date	Temp °F	Press. in Hg.	Wind Speed	Wind Dir.	Relative Humidity	Weather	Operation
10/10	42°	29.89	3	260	92%		N
10/11	52°	29.78	7	180	86%		S
10/12	55°	29.69	2	120	100%	Fog	N
10/13	49°	29.98	8	320	58%		N
10/14	50°	30.18	6	280	63%		N
10/15	52°	30.10	5	210	80%		S
10/16	56°	30.15	5	210	93%		S
10/17	62°	30.17	6	120	84%		S
10/19	62°	30.15	7	190	87%		S
7/22	80°	30.10	8	170	82%		S
7/23	76°	N/A	8	190	N/A		S

APPENDIX D

AVERAGE HOURLY DATA - NORTH OPERATIONS

Ops. Dir. = Direction of inbound and outbound aircraft from DCA.

L_1 = Average dBA level exceeded 1% of the time periods.

L_{10} = Average dBA level exceeded 10% of the time periods.

L_{EQ} = Average Equivalent level calculated for time periods.

These data were collected during the National Airport Flight Extension Test and is reported here separately for future use. These data represent the environmental impact of normal north operations on the communities south of the airport. As this was not one of the purposes of this test, these data are not analyzed here but reported so that they might be used during a future EIS, or other test/measurement programs.

NORTH OPERATIONS
Afternoon Period

		Normal			Test		
		#	SD	Avg.	#	SD	Avg.
Fort Foote, Maryland	L_1	5	0.9	74.4	16	2.4	76.4
	L_{10}	5	1.1	65.6	16	2.1	67.1
	L_{EQ}	5	0.9	62.4	16	2.2	64.4
Dania Hills, Maryland	L_1	2	1.4	64.0	14	3.2	62.3
	L_{10}	2	3.5	48.0	14	3.8	52.4
	L_{EQ}	2	2.1	52.5	14	3.1	51.2
Fed. Comm. Center, Md.	L_1	4	1.0	63.8	14	2.1	63.1
	L_{10}	4	2.2	53.8	14	2.1	55.1
	L_{EQ}	4	1.7	52.3	14	1.7	52.7
Tantallon, Maryland	L_1	4	1.0	69.3	16	2.6	70.0
	L_{10}	4	1.4	60.0	16	2.5	61.0
	L_{EQ}	4	2.4	57.3	16	2.6	59.4
Marlan Forest, Va.	L_1	4	2.5	63.8	16	3.4	63.1
	L_{10}	4	2.1	56.3	16	2.4	56.6
	L_{EQ}	4	2.6	54.3	16	2.3	55.1
Mt. Vernon Hospital	L_1	4	1.0	66.8	12	1.9	67.4
	L_{10}	4	1.5	58.8	12	2.8	59.6
	L_{EQ}	4	0.8	59.0	12	1.8	60.0
Waynewood, Virginia	L_1	4	1.9	65.5	15	1.5	68.5
	L_{10}	4	2.2	58.0	15	1.8	59.9
	L_{EQ}	4	2.4	55.5	15	1.3	58.7
Mt. Vernon Virginia	L_1	4	4.3	56.8	15	2.8	59.2
	L_{10}	4	1.7	48.5	15	2.9	51.5
	L_{EQ}	4	1.7	47.5	15	2.2	49.7
Colonial Farm, Md.	L_1	3	6.1	61.7	16	6.1	64.6
	L_{10}	3	2.0	54.0	16	2.6	54.1
	L_{EQ}	3	2.5	53.7	16	3.6	55.0
Gunston Hall, Va.	L_1	2	1.4	55.0	6	3.2	61.0
	L_{10}	2	0.7	48.5	6	2.4	50.5
	L_{EQ}	2	0.7	50.5	6	2.0	53.0
Alice Ferg. Found. Md.	L_1	5	1.1	63.4	3	2.3	65.3
	L_{10}	5	1.6	54.0	3	2.7	55.0
	L_{EQ}	5	1.5	52.2	3	1.7	54.0
Accokeek, Maryland	L_1	1	-	64.0	11	3.2	63.4
	L_{10}	1	-	54.0	11	3.2	54.0
	L_{EQ}	1	-	52.0	11	2.6	52.0

NORTH OPERATIONS
Morning Period

		Normal			Test		
		#	SD	Avg.	#	SD	Avg.
Fort Foote, Maryland	L_1	3	0.6	74.7	17	2.7	75.4
	L_{10}	3	1.0	65.0	17	1.9	66.5
	L_{EQ}	3	0.6	62.7	17	2.4	63.9
Dania Hills, Maryland	L_1	6	2.7	60.3	13	5.1	64.9
	L_{10}	6	1.6	49.2	13	6.2	55.6
	L_{EQ}	6	1.5	48.5	13	4.4	54.2
Fed. Comm. Center, Md.	L_1	6	1.8	61.8	12	1.8	62.4
	L_{10}	6	1.6	54.7	12	1.6	56.1
	L_{EQ}	6	2.8	53.2	12	1.7	54.3
Tantallon, Maryland	L_1	4	2.2	68.3	20	2.3	70.3
	L_{10}	4	2.2	59.8	20	2.3	61.4
	L_{EQ}	4	2.2	57.3	20	3.1	60.1
Marlan Forest, Va.	L_1	4	2.9	62.5	16	2.5	63.8
	L_{10}	4	0.6	56.5	16	3.6	58.7
	L_{EQ}	4	0.8	54.0	16	2.0	55.6
Mt. Vernon Hospital	L_1	5	0.8	66.2	12	1.2	66.2
	L_{10}	5	0.8	57.8	12	0.9	58.8
	L_{EQ}	5	0.6	58.6	12	0.8	59.6
Waynewood, Virginia	L_1	4	1.0	66.5	19	6.9	71.2
	L_{10}	4	1.4	59.0	19	3.8	62.0
	L_{EQ}	4	1.3	56.5	19	5.4	60.3
Mt. Vernon Virginia	L_1	4	3.4	60.0	13	2.8	61.5
	L_{10}	4	3.9	51.5	13	2.1	53.3
	L_{EQ}	4	2.5	49.5	13	1.9	52.0
Colonial Farm, Md.	L_1	No Data			12	4.1	63.7
	L_{10}				12	4.9	57.1
	L_{EQ}				12	3.7	56.2
Gunston Hall, Va.	L_1	2	0	61.0	5	6.3	58.0
	L_{10}	2	0.7	51.5	5	3.4	51.2
	L_{EQ}	2	1.4	54.0	5	5.4	53.4
Alice Ferg. Found. Md.	L_1	2	0.7	62.5	5	3.0	62.8
	L_{10}	2	0.7	56.5	5	1.1	55.4
	L_{EQ}	2	2.8	57.0	5	1.5	54.4
Accokeek, Maryland	L_1	1	-	65.	8	5.6	64.3
	L_{10}	1	-	55.	8	3.6	52.9
	L_{EQ}	1	-	52.	8	6.1	53.3

NORTH OPERATIONS
Evening Period

		Normal			Test		
		#	SD	Avg.	#	SD	Avg.
Fort Foote, Maryland	L_1	9	2.3	77.9	21	2.0	75.9
	L_{10}	9	2.5	68.9	21	1.4	67.2
	L_{EQ}	9	2.1	66.1	21	2.0	64.6
Dania Hills, Maryland	L_1	3	3.5	65.0	12	2.6	62.2
	L_{10}	3	2.1	58.3	12	2.6	52.4
	L_{EQ}	3	2.3	54.7	12	2.3	51.1
Fed. Comm. Center, Md.	L_1	6	4.1	67.8	10	3.1	64.2
	L_{10}	6	4.2	58.8	10	2.8	57.3
	L_{EQ}	6	2.9	57.7	10	2.9	54.7
Tantallon, Maryland	L_1	10	2.0	69.6	20	1.0	68.5
	L_{10}	10	2.5	62.1	20	1.4	61.2
	L_{EQ}	10	2.0	59.1	20	1.2	58.8
Marlan Forest, Va.	L_1	8	2.1	62.5	21	1.8	63.1
	L_{10}	8	1.2	57.4	21	1.9	58.7
	L_{EQ}	8	1.3	55.0	21	2.0	56.7
Mt. Vernon Hospital	L_1	5	3.5	63.2	14	2.6	63.8
	L_{10}	5	2.9	55.8	14	2.4	56.4
	L_{EQ}	5	2.5	56.1	14	2.0	57.4
Waynewood, Virginia	L_1	10	1.6	67.0	16	1.8	67.9
	L_{10}	10	1.8	59.3	16	1.4	60.5
	L_{EQ}	10	1.7	57.4	16	1.3	57.9
Mt. Vernon Virginia	L_1	3	1.5	61.3	15	3.1	60.5
	L_{10}	3	2.0	55.0	15	2.6	52.6
	L_{EQ}	3	0.6	53.7	15	2.2	51.5
Colonial Farm, Md.	L_1	7	2.6	62.7	17	4.4	64.5
	L_{10}	7	2.7	53.4	17	4.0	59.6
	L_{EQ}	7	2.4	51.4	17	4.1	58.0
Gunston Hall, Va.	L_1	4	1.0	53.8	4	3.7	59.5
	L_{10}	4	1.0	52.3	4	3.6	57.0
	L_{EQ}	4	0.8	53.0	4	4.8	55.5
Alice Ferg. Found. Md.	L_1	6	1.7	63.8	6	6.0	64.7
	L_{10}	6	1.6	56.2	6	5.1	56.3
	L_{EQ}	6	2.2	54.2	6	4.5	55.3
Accokeek, Maryland	L_1	1	-	67	4	1.7	74.5
	L_{10}	1	-	54	4	2.6	66.3
	L_{EQ}	1	-	55	4	2.4	62.5

NORTH OPERATIONS
Weekend Data

		Normal			Test		
		#	SD	Avg.	#	SD	Avg.
Fort Foote, Maryland	L_1	No Data			4	3.6	74.0
	L_{10}				4	2.4	64.5
	L_{EQ}				4	2.5	63.3
Dania Hills, Maryland	L_1	No Data			2	4.2	60.0
	L_{10}				2	0.7	53.5
	L_{EQ}				2	1.4	51.0
Fed. Comm. Center, Md.	L_1	No Data			2	2.1	65.5
	L_{10}				2	2.1	55.5
	L_{EQ}				2	1.4	54.0
Tantallon, Maryland	L_1	2	0.7	68.5	5	1.6	67.2
	L_{10}	2	0	58.0	5	1.7	59.4
	L_{EQ}	2	0.7	57.5	5	2.4	57.8
Marlan Forest, Va.	L_1	2	0.7	62.5	5	7.1	68.4
	L_{10}	2	0	57.0	5	2.1	60.0
	L_{EQ}	2	0	55.0	5	5.3	58.8
Mt. Vernon Hospital	L_1	No Data			2	2.1	63.5
	L_{10}				2	2.8	57.0
	L_{EQ}				2	2.8	59.0
Waynewood, Virginia	L_1	No Data			6	1.7	68.0
	L_{10}				6	1.3	59.0
	L_{EQ}				6	2.5	57.0
Mt. Vernon Virginia	L_1	No Data			2	7.1	65.0
	L_{10}				2	2.8	52.0
	L_{EQ}				2	0.7	53.5
Colonial Farm, Md.	L_1	No Data			1	-	42.0
	L_{10}				1	-	37.0
	L_{EQ}				1	-	36.0
Gunston Hall, Va.	L_1	No Data			2	1.4	57.0
	L_{10}				2	0.7	50.5
	L_{EQ}				2	0.7	52.5
Alice Ferg. Found. Md.	L_1	No Data			No Data		
	L_{10}						
	L_{EQ}						
Accokeek, Maryland	L_1	No Data			No Data		
	L_{10}						
	L_{EQ}						