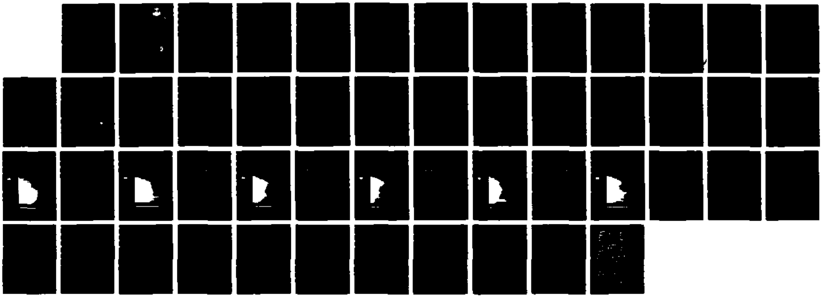
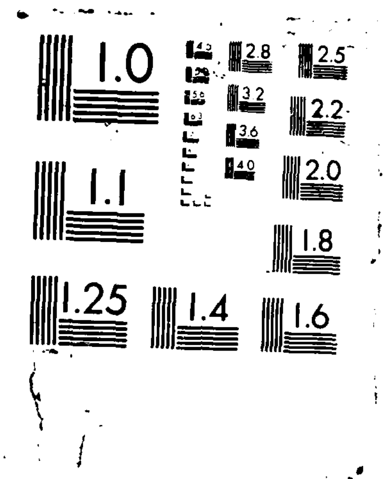
AD-A189 966 NOISE ASSESSMENT OF UNSUPPRESSED TF-34-GE-100A ENGINE AT WARFIELD ANG BAL..(U) AIR FORCE OCCUPATIONAL AND ENVIRONMENTAL HEALTH LAB BROOKS AF.. 1/1

UNCLASSIFIED W J SHAFFER ET AL. DEC 87 F/G 20/1 NL




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

USAFOEHL REPORT

87-164EH0441LNA

NOISE ASSESSMENT of UNSUPPRESSED TF-34-GE-100A ENGINE at WARFIELD ANG, BALTIMORE MD

WINSTON J. SHAFFER II, 2Lt, USAF, BSC
JOHN C. ELLIS II, Maj, USAF, BSC

December 1987

Final Report

Distribution is unlimited; approved for public release

USAF Occupational and Environmental Health Laboratory
Human Systems Division (AFSC)
Brooks Air Force Base, Texas 78235-5501

NOTICES

When Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever. The fact that the Government may have formulated, or in any way supplied the said drawing, specifications, or other data, is not to be regarded by implication, or otherwise, as in any manner licensing the holder or any other person or corporation; or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

The mention of trade names or commercial products in this publication is for illustration purposes and does not constitute endorsement or recommendation for use by the United States Air Force.

Do not return this copy. Retain or destroy.

Air Force installations may direct requests for copies of this report to: USAF Occupational and Environmental Health Laboratory (USAFOEHL) Library, Brooks AFB TX 78235-5501.

Other Government agencies and their contractors registered with the DTIC should direct requests for copies of this report to: Defense Technical Information Center (DTIC), Cameron Station, Alexandria VA 22314.

Non-Government agencies may purchase copies of this report from: National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield VA 22161

The Public Affairs Office has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nations.

This report has been reviewed and is approved for publication.

JOHN J. COUGHLIN, Colonel, USAF, BSC
Commander

Prepared By:

WINSTON J. SHAFFER II, 2Lt, USAF, BSC
Consultant, Industrial Hygiene Engineer

JOHN C. ELLIS II, Maj, USAF, BSC
Consultant, Industrial Hygiene Engineer

Reviewed By:

WILEY TAYLOR, Lt Col, USAF, BSC
Chief, Industrial Hygiene Branch

SHELTON R. BIRCH, Col, USAF, BSC
Chief, Consultant Services Division

NCLASSIFIED
CURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

a. REPORT SECURITY CLASSIFICATION nclassified	1b. RESTRICTIVE MARKINGS
. SECURITY CLASSIFICATION AUTHORITY /A	3. DISTRIBUTION/AVAILABILITY OF REPORT Distribution is unlimited; approved for public release.
. DECLASSIFICATION/DOWNGRADING SCHEDULE /A	
PERFORMING ORGANIZATION REPORT NUMBER(S) SAFOEHL Report 87-164EH0441LNA	5. MONITORING ORGANIZATION REPORT NUMBER(S)
a. NAME OF PERFORMING ORGANIZATION SAF Occupational and Environ-ental Health Laboratory — 6b. OFFICE SYMBOL (If applicable) ECH	7a. NAME OF MONITORING ORGANIZATION
c. ADDRESS (City, State, and ZIP Code) rooks AFB TX 78235-5501	7b. ADDRESS (City, State, and ZIP Code)
a. NAME OF FUNDING/SPONSORING ORGANIZATION ame as 6a. — 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
c. ADDRESS (City, State, and ZIP Code) ame as 6c.	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO

1. TITLE (Include Security Classification)

oise Assessment of Unsuppressed TF34-GE-100A Engines at Warfield ANG, Baltimore MD (U)

2. PERSONAL AUTHOR(S)

nston J. Shaffer II, 2Lt, USAF, BSC; John C. Ellis II, Major, USAF, BSC

3a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM ____ TO ____	December 1987	50

6. SUPPLEMENTARY NOTATION

7. COSATI CODES

FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

Noise	Noise Barrier	TF34-GE-100A
TF34	Community Noise	Jet Engine Noise
Barrier	Engine Noise	Noise Suppressor

9. ABSTRACT (Continue on reverse if necessary and identify by block number)

his report presents the results of noise data measurements of an unsuppressed TF34-GE-100A ngine and a community noise survey of the local area around the engine. Three recommenda-ions were made. A two barrier design should be installed as an interim noise control easure. Justification and installation of a noise suppressor, as a long term solution, hould be pursued. Day-night sound levels should continue to be monitored until an adequate hracterization of the airport noise environment is obtained.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Winston J. Shaffer II, 2Lt, USAF, BSC	22b. TELEPHONE (Include Area Code) (512) 536-3214 — 22c. OFFICE SYMBOL ECH

DD Form 1473, JUN 86 — Previous editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

ACKNOWLEDGEMENT

The entire survey was completely successful due to the outstanding efforts of MSgt Charles A. Smith of the base BEE shop at the Warfield ANG. The tireless effort of the survey team members in collecting the data is greatly appreciated: Capt Terry M. Fairman, Capt Jeffrey J. Jenkins, 2Lt Ali Y. Ali, MSgt Abel B. de la Rosa, and A1C Donald W. Johnson. The written report was made possible by the help of Capt Jeffrey J. Jenkins, who did the computer data analysis of the noise data, and Mr David Potter of USAFOEHL/CVM who helped in the programming of the barrier design program.

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

Contents

I. INTRODUCTION

A. Purpose. This report provides results of analysis of noise data recorded during the 22-26 June 1987 survey of an unsuppressed TF34-GE-100A engine at Warfield ANG. In addition, it includes a noise barrier design solution. The base bioenvironmental shop had requested an in-depth community noise survey be accomplished.

B. Problem. At the time of the survey the Warfield ANG was responsible for performing maintenance on the TF34-GE-100A engine of the A-10 aircraft for all Air National Guard units. After engine maintenance was completed, an extensive engine run which could last up to 5 hours was done. The noise from these engine runs was creating complaints by the civilian community.

C. Scope. This report provides the results of an in-depth community noise survey. The report recommends a solution to provide the quickest and best short term, as well as long term, solution. Technical feasibility or cost associated with actual construction of the solution was not considered. The final decision is left up to the base.

II. FINDINGS

A. Methodology. Three different types of noise surveys were performed: far field noise measurements in a 100 meter circle around the unsuppressed TF34-GE-100A engine, day-night sound levels (Ldn) measured at five sites with noise dosimeters, and noise recordings at three of the five sites, as shown in Figure A.1 of Appendix A. Also, meteorological data was taken approximately every 15 minutes throughout the entire noise survey.

B. 100 Meter Circle. Far field noise data from the unsuppressed TF34-GE-100A engine was to be collected at a radius of 100 meters every ten degrees centered on the engine exhaust outlet. However, this was not possible because of obstructions (the 120 and 130 degree positions) or rugged terrain (the 140 thru 160 degree positions). Noise data collected at the 170 thru 200 degree positions was not usable because the microphone was being overloaded by exhaust blast. Therefore, only 27 locations were usable. The measurements were made at times when air traffic noise was minimal. Figure A.2 of Appendix A shows actual measurement points of selected sites. These sites were chosen to show the highest values on the 100 m circle. Noise data around the circle was collected on audio tape in 35 second segments by portable tape recording systems. The tapes were later analyzed at USAFOEHL. The survey was accomplished by using three teams to record noise data with separate systems at different locations. The microphone of the system, attached to a hand-held pole, was pointed at the source (zero degree angle of incidence) and vertically scanned from 0.5 to 3 meters for approximately a 35 second period during data acquisition at each measurement location to eliminate anomalies in using a fixed microphone. These recorded noise data samples were then time-integrated on a one-third octave band digital frequency analyzer to derive a root-mean-square sound pressure level.

1. Only the background noise level and highest noise level, which occurs when the engine was running at 96% rpm, are presented. These two are the only measurements required to establish a credible solution. Background noise levels were recorded at all measurement locations in order to determine the ambient noise level at each measurement site. Background levels were at least 10 dB less than the total measured noise level. The correction applied to background noise levels is a function of the difference between background noise and total noise level. The results which list Overall Sound Pressure Levels (OASPL) and Overall Sound Pressure Levels A-weighted (OASLA) values were determined by third octave band analysis of the recorded data for the frequency range 5 to 10,000 Hertz (Hz). Meteorological data, which was recorded approximately every 15 minutes, is reported in Table B.1, Appendix B. The weather was within acceptable limits for performing accurate measurements.

2. Table B.2, Appendix B is a data summary of noise measurements taken around the circle. OASPL and OASLA values are presented as a function of the measurement location and power setting of the engine. Only those measurement locations where acceptable (A-weighted sound levels (dB(A)) were attained are presented. Figure A.2, Appendix A lists these values on the circle.

C. Day-night Levels. The day-night sound level (Ldn) of major areas of interest was measured at five sites. These sites represent locations which are in the direction of, or close to, where people work or rest. Site 1 was located at Building 5045, known as the KO building, where maintenance personnel work. Site 2 was located on Mr Conrad's property where some of the complaints were coming from. Site 3 (Lynbrook Road) was located on Air Force property close to adjacent civilian property. Site 4 (POL Area) was located in the direction of the maintenance hangar. Site 5 (Wilson Point Road) was located in the direction of the fire station and residental area. Figure A.1 of Appendix A depicts the site locations. Two Metrosonic dB-310 noise dosimeters were used at each site to measure the Ldn. Two 24 hour periods were recorded. The dosimeters were attached approximately 6 ft above the ground to poles, fences, or trees. One of the dosimeters measured one minute intervals while the other dosimeter measured one hour intervals. In order to calculate a Ldn, a doubling rate of 3 dB was used. Ten dB was added to each hourly averaged sound level (Lavg) from 2200 to 0700. Each dosimeter calculated an intrusive noise level and a median noise level. An intrusive noise level, Ln(10), is a noise level occurring 10% of the time, and a median noise level, Ln(50), occuring 50% of the time. The intrusive level, Ln(10), is the noise level many people perceive as intruding in their lives and the median noise level, Ln(50), is the average noise level to which people are exposed. The first 24 hour period started at 1800 on 23 June 1987 and ended at 1800 on 24 June 1987. The second 24 hour period started at 1100 on 25 June 1987 and ended at 1100 on 26 June 1987. Tables B.3 and B.4 in Appendix B list the Lavgs for each hour of the Ldn data and the Ldn for that site and time period. Values shown do not include the 10 dB added for the 0700 to 2200 time period to compute Ldn. In Table B.5, Appendix B, the intrusive and median noise levels are reported.

D. Site Locations. Noise measurements were also made at sites 1, 2, and 3. This data was recorded exactly the same way as the data recorded around the 100 meter circle. This provided actual noise levels near areas/directions of work or rest during engine operation. Table B.6, Appendix B reports the OASPL and OASPLA at these three sites. No measurements were made at the two other sites. Results of the one-third octave band analysis for sites 1, 2, and 3 are reported in Appendix C and presented in both graphical and tabular form.

III. NOISE CONTROL

A. Maryland Law. Code of Maryland Regulations, Title 10, Health and Mental Hygiene, Subtitle 20, Chapter 01 - Control of Noise Pollution is the local law governing noise. This law establishes environmental noise standards using time dependent allowable noise levels for three different zoning districts and is summarized in Table D.1, Appendix D. Table D.2 of Appendix D shows the maximum allowable noise levels depending on zoning districts. However, the provisions of the regulation do not apply to airports licensed by the State Aviation Administration. Therefore, the noise being generated by the Maryland Air National Guard may be exempt from any noise standard. The Warfield ANG should use the general rules established in the noise standard as a goal to show a good faith effort to reduce adverse impacts on the surrounding community.

B. Noise suppressor. The best long term solution to almost any unsuppressed engine run noise is a noise suppressor system. It provides a quiet environment not only for the community but also provides good occupational protection for the test cell personnel. The maximum noise level is 77 dB(A) at 100 meters. This would provide substantial noise reduction at the Conrad's property. In addition, the base will always know for sure what kind of reduction will be achieved with a well established noise suppressor design and nighttime runs could possibly be made. A noise suppressor system costs about 2.1 million dollars and takes 3-5 years to be approved and installed.

C. Noise Barrier. A noise barrier is less costly and can be installed in a much shorter time. However, the barrier does not provide the noise reduction afforded by a noise suppressor, nor does it protect test cell personnel from hearing loss.

IV. DISCUSSION

A. The noise contribution by the engine runs on overall community noise could not be evaluated using the Ldn values shown in Tables B.3 and B.4, Appendix B. There was too much variance in the data. Airport and other noises cannot be separated. The Lavgs used to calculate Ldns showed no correlation between noise levels and site locations. However, the Lavg at the Conrad site between 0700 and 2200 was approximately 55 dB(A) or greater. The Lavg was 61 dB(A) at Conrad's during engine runs which was only a 6 dB(A) difference. Therefore, short duration engine runs should have had little effect on Ldn measurements.

B. The intrusive noise level, Ln(10), shown in Table B.5, Appendix B is the noise level that people perceive as intruding in their lives. The Ln(10) for Mr Conrad's was 59 dB(A) and the OASPLA was 61.1 dB(A) at Mr Conrad's when the engine was running at 96% rpm. This condition was probably causing all the complaints. In order to stop the complaints, the noise generated by the engine runs should be much less than Ln(10) and approaching the Ln(50). In addition, if for any reason the engine should be run at night, the OASPL at Mr Conrad's should not exceed the allowable nighttime residential noise level of 55 dB(A).

C. The noise barriers are designed to reduce the noise from 61 dB(A) at Conrad's property line to 52 dB(A). The noise barrier design is described in Appendix E.

V. CONCLUSIONS

A. Complaints were arising from jet engine run ups because intrusive noise levels of 61 dB(A) generated from these operations were being produced. Control measures should be designed to reduce these levels to as close to 47 dB(A) as is practical, but at least to 55 dB(A).

B. The day-night sound levels measured during the survey all exceeded 55 dB(A), however, only two days were measured. These levels in themselves were not the cause of the complaints. In addition, engine runs did not appear to be a major contributor to noise levels.

C. Installation of two barriers provides the best interim solution until a permanent noise suppressor can be built.

VI. RECOMMENDATIONS

A. Install the two barrier design as an interim noise control measure.

B. Pursue the justification for and installation of a noise suppressor as a long term solution.

C. Continue to monitor day-night sound levels until an adequate characterization of the airport noise environment is obtained.

REFERENCES

1. AFR 161-35, Hazardous Noise Exposure (9 April 1982)

2. The Bureau of National Affairs, Inc. "Maryland Environmental Noise Control Regulation." Noise Regulation Reporter. Washington DC pp 81:5731-5733 (1987)

3. Miller, Laymon N., Noise Control for Buildings and Manufacturing Plants. Bolt Beranek and Newman Inc., (1982)

4. Thuman, Albert, and Richard K. Miller, Fundamentals of Noise Control Engineering. New Jersey: Prentice-Hall, (1986)

(This page left blank)

(This page left blank)

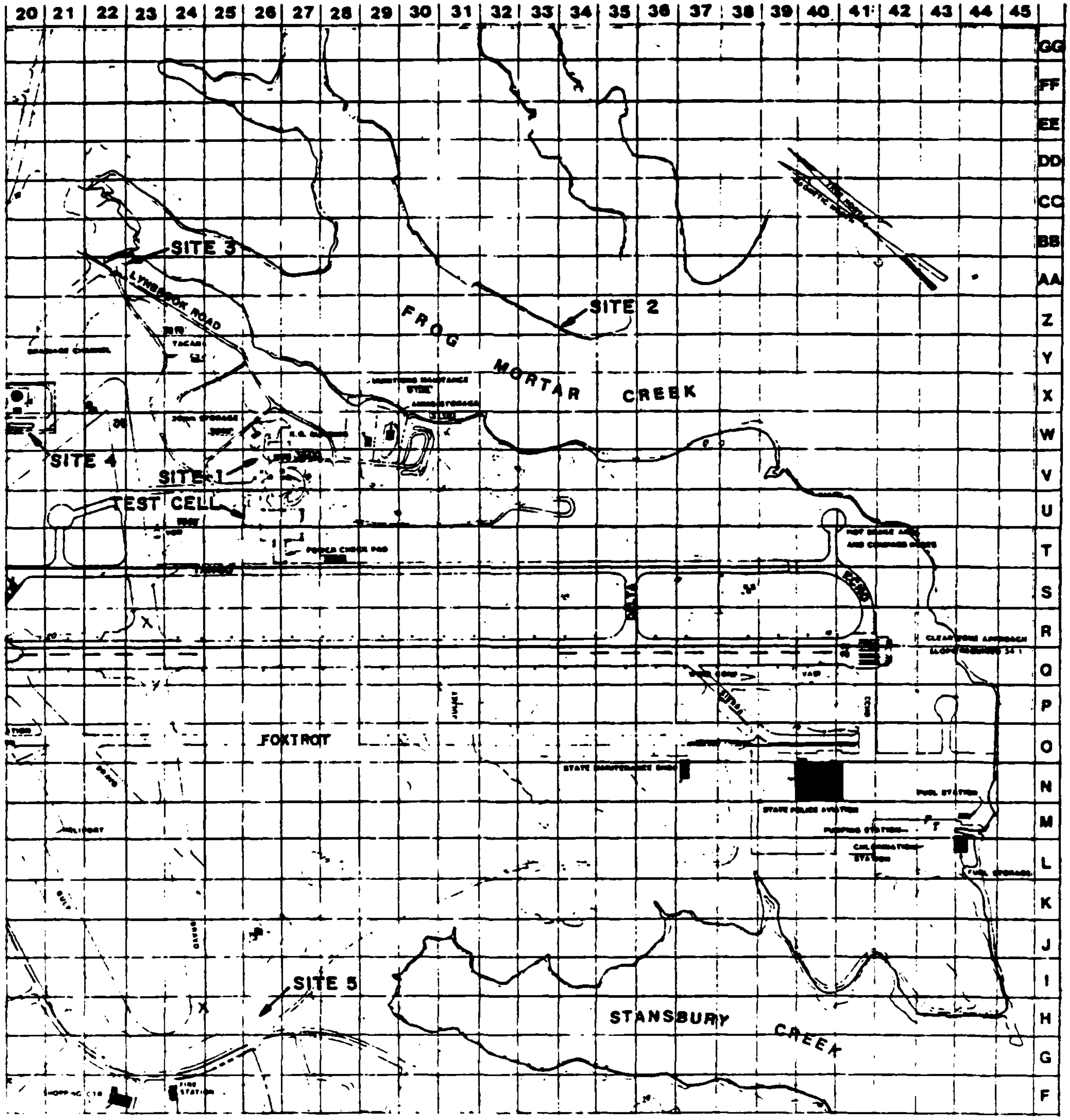


Fig. A.1: Test cell location on grid map of Warfield ANG Base

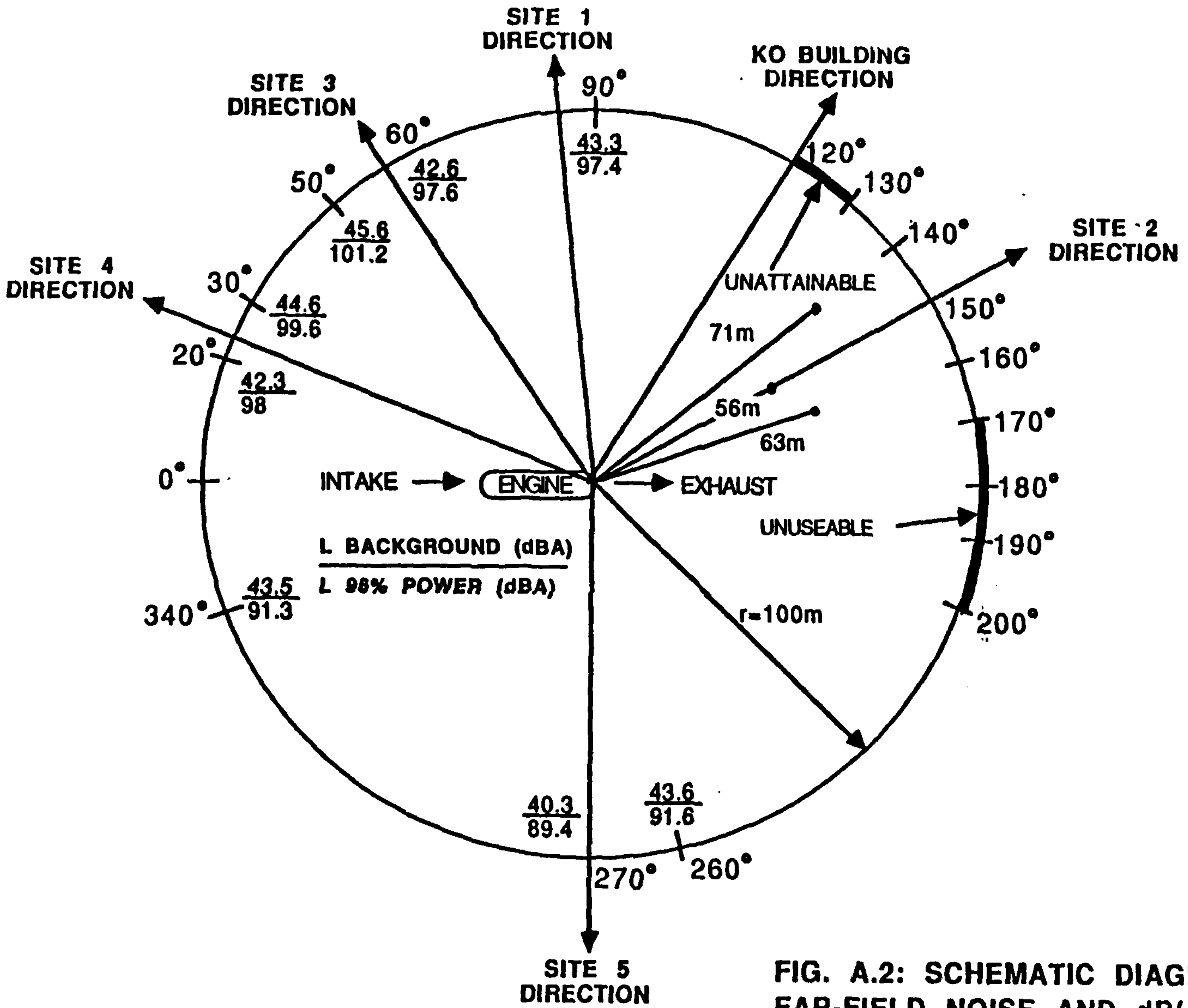


FIG. A.2: SCHEMATIC DIAGRAM OF FAR-FIELD NOISE AND dB(A) MEASUREMENTS AT WARFIELD ANG.

APPENDIX B

Noise Survey Data Summary

(This page left blank)

TABLE B.1: Meteorological data taken during survey at Warfield ANG, Baltimore MD

Date: 24 JUN 87 Location: Trimpad

Time	Temp (F)	RH (Percent)	BP (in. Hg)	Wind Speed (MPH)	Wind Direction* (degrees)
18:00	80	56	29.97	< 5	152
18:30	80	56	29.94	5-6	132
18:45	79	60	29.92	6	180
19:00	79	60	29.92	< 5	180
19:15	79	52	29.91	< 5	150
19:30	78	56	29.90	< 5	120
19:45	78	52	29.90	< 5	98
20:00	77	55	29.89	< 5	222
20:15	76	58	29.91	< 5	172
21:45	72	76	29.89	< 5	0
22:00	74	50	29.89	< 5	0
22:15	74	64	29.89	< 5	22
22:30	70	76	29.91	< 5	297
23:10	70	80	28.89	< 5	0
23:30	70	80	28.98	< 5	89

Date: 25 JUN 87 Location: Site 2

Time	Temp (F)	RH (Percent)	BP (in. Hg)	Wind Speed (MPH)	Wind Direction* (degrees)
0900	72	77	29.98	< 5	268
0915	74	77	30.00	< 5	220
0930	79	60	30.00	< 5	269
0945	77	69	30.00	< 5	160
1000	77	69	30.00	< 5	200

* Magnetic Compass Direction

TABLE B.2: Noise Level Versus Angle for the TF 34-GE-100A Engine.

ANGLE	DISTANCE	BACKGROUND OASPL dB	BACKGROUND OASLA dB(A)	96% RPM OASPL dB	96% RPM OASLA dB(A)
0	100 m	72.8	56.0	95.8	96.1
10	100 m	67.3	44.1	96.4	96.8
20	100 m	66.8	42.3	97.5	98.0
30	100 m	68.4	44.6	99.0	99.6
40	100 m	69.9	43.5	100.6	101.1
50	100 m	68.0	45.6	101.0	101.2
60	100 m	67.3	42.6	98.2	97.6
70	100 m	66.4	45.0	97.2	96.3
80	100 m	67.0	45.6	98.6	98.1
90	100 m	69.1	43.3	98.1	97.4
100	100 m	67.8	40.3	96.3	95.0
110	100 m	65.7	41.4	95.8	91.9
140	71 m	64.3	55.3	107.7	100.1
150	56 m	64.8	42.5	112.3	98.5
160	63 m	62.1	39.6	108.9	95.2
210	100 m	63.5	38.5	105.0	92.0
220	100 m	60.7	36.1	103.0	95.6
230	100 m	63.4	37.3	100.3	93.1
240	100 m	61.4	39.3	98.4	93.1
250	100 m	67.3	38.3	97.2	94.2
260	100 m	64.8	43.6	94.7	91.6
270	100 m	62.5	40.3	93.0	89.4
280	100 m	63.4	43.6	99.4	99.9
290	100 m	62.9	41.4	94.5	94.0
300	100 m	67.6	40.9	91.1	90.1
310	100 m	64.5	43.2	96.8	97.3
320	100 m	65.1	47.0	97.3	98.1
330	100 m	64.6	39.2	92.8	92.9
340	100 m	65.9	43.5	91.5	91.3
350	100 m	66.8	44.3	95.9	96.5

NOTE: Only acceptable measurement locations are shown. Distances are with reference to the engine exhaust.

Table B.3: Hourly Lavg (dB(A)) Measured by Metrosonics Noise Dosimeter to Determine Ldn for All Five Sites on 23-24 June 1987

Sites:	Bldg 5045	Conrad's	Lynbrook	POL	Wilson Point
Ldn:	78.9	58.7	62.2	72.5	63.6
TIME:					
07:00	70.1	55.7	69.4	80.9	59.0
08:00	88.3	55.7	68.6	82.9	63.4
09:00	62.1	55.2	54.7	70.9	57.4
10:00	72.5	57.8	56.8	63.3	60.4
11:00	67.8	57.5	55.6	60.1	58.1
12:00	89.7	63.4	57.2	71.5	59.8
13:00	77.4	56.0	51.5	58.7	57.1
14:00	78.3	58.0	56.2	61.8	55.7
15:00	66.7	60.5	55.0	62.2	55.1
16:00	68.2	58.3	56.4	66.9	59.6
17:00	59.8	61.6	52.4	62.0	58.3
18:00	53.5	59.5	52.2	55.1	53.7
19:00	60.7	61.6	53.5	63.0	55.2
20:00	49.7	58.9	50.4	56.4	50.4
21:00	58.6	54.8	51.2	57.9	62.4
22:00	60.4	52.7	52.1	60.2	61.6
23:00	47.2	45.6	56.0	62.4	58.9
00:00	47.5	47.6	56.8	62.7	60.6
01:00	46.3	46.4	53.8	60.9	57.1
02:00	44.1	44.3	51.0	55.7	52.9
03:00	43.3	43.4	49.7	51.8	47.4
04:00	45.4	44.0	49.7	48.2	46.1
05:00	50.0	47.8	50.2	45.7	48.8
06:00	69.2	49.7	54.7	54.2	48.4

Note: Values shown do not include the 10 dB added to compute Ldn.

Table B.4: Hourly Lavg (dB(A)) Measured by Metrosonics Noise Dosimeter to Determine Ldn for All Five Sites on 25-26 June 1987

Sites:	Bldg 5045	Conrad's	Lynbrook	POL	Wilson Point
Ldn:	66.9	58.5	56.8	63.2	56.7
TIME:					
07:00	60.5	58.1	55.0	59.4	59.4
08:00	55.1	54.4	52.1	60.2	50.5
09:00	69.7	57.8	54.8	61.4	56.8
10:00	75.4	58.0	55.7	75.3	56.9
11:00	63.2	54.7	55.3	54.3	53.4
12:00	75.3	55.6	54.1	59.3	56.1
13:00	67.5	57.0	51.5	57.0	56.4
14:00	67.1	56.5	52.3	55.6	54.4
15:00	69.4	56.2	52.8	61.6	55.7
16:00	69.5	60.4	55.7	59.0	56.8
17:00	61.7	58.7	53.2	54.6	57.2
18:00	55.8	62.1	55.6	53.8	54.3
19:00	54.6	61.8	49.6	52.1	53.6
20:00	50.0	57.1	52.6	52.9	53.3
21:00	51.5	57.1	50.2	52.9	52.7
22:00	53.4	51.1	49.4	48.6	49.6
23:00	43.9	53.3	46.4	47.3	49.6
00:00	43.2	43.5	48.2	46.6	46.1
01:00	44.9	44.2	49.8	52.8	48.0
02:00	46.3	44.9	48.1	49.1	49.7
03:00	44.0	43.5	48.4	47.0	46.2
04:00	44.4	43.5	50.9	48.9	43.9
05:00	49.1	48.5	51.3	47.0	46.9
06:00	45.4	52.0	49.9	50.3	48.8

Note: Values shown do not include the 10 dB added to compute Ldn.

TABLE B.5: Intrusive and Median Noise Levels Calculated by the Metrosonic dB-310 Noise Dosimeter During Ldn Measurements

Time Period:	FROM: 18:00, 6/23/87 TO: 18:00, 6/24/87		FROM: 11:00, 6/25/87 TO: 11:00, 6/26/87	
Site	Ln(10) dB(A)	Ln(50) dB(A)	Ln(10) dB(A)	Ln(50) dB(A)
Bldg 5045	74	48	71	45
Conrad's	58	47	59	47
Lynbrook	57	49	52	47

TABLE B.6: Overall Sound Pressure Level (OASPL) and Overall Sound Level A-Weighted, (OASLA) Versus Site Locations from TF 34-GE-100A engine.

		BACKGROUND		96% RPM	
SITE	DISTANCE	OASPL dB	OASLA dB(A)	OASPL dB	OASLA dB(A)
Bldg 5045	125 m	65.6	59.9	87.3	82.5
Conrad's	735 m	67.3	47.5	82.8	61.1
Lynbrook	455 m	64.2	48.0	71.4	56.0

(This page left blank)

APPENDIX C

1/3 Octave Band Analysis

(This page left blank)

Table C.1: Measured Noise Spectrum Levels of the TF34 Engine Mounted on the A/M37T-20 Test Cell.
Site: Bldg 5045. Warfield ANG. Balt. MD.
Background Noise Measurement.

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
5	47.7	0.0	0.0			
6.3	45.2	0.0	0.0			
8	43.6	0.0	0.0	51.7	4.8	35.4
10	49.7	0.0	35.4			
12.5	48.2	0.0	37.0			
16	48.2	0.0	39.8	55.2	5.7	47.9
20	52.9	2.4	46.7			
25	47.0	2.3	42.6			
31.5	54.0	14.6	51.0	55.5	16.9	52.5
40	47.3	12.7	45.3			
50	57.7	27.5	56.4			
63	47.9	21.7	47.1	59.7	33.7	58.7
80	54.6	32.1	54.1			
100	52.2	33.1	51.9			
125	49.3	33.2	49.1	54.6	37.7	54.4
160	45.9	32.5	45.8			
200	44.2	33.3	44.2			
250	47.3	38.7	47.3	52.0	44.3	52.0
315	49.0	42.4	49.0			
400	50.1	45.3	50.1			
500	53.6	50.4	53.6	56.8	53.8	56.8
630	51.7	49.8	51.7			
800	51.2	50.5	51.2			
1000	49.4	49.4	49.4	54.9	54.7	54.9
1250	49.4	50.0	49.4			
1600	49.3	50.3	49.2			
2000	47.6	48.9	47.4	52.8	54.0	52.6
2500	46.9	48.1	46.6			
3150	46.3	47.5	45.8			
4000	45.4	46.4	44.6	50.1	51.1	49.3
5000	44.1	44.6	42.8			
6300	41.7	41.6	39.7			
8000	38.7	37.6	35.7	44.1	43.5	41.6
10000	35.9	33.4	31.5			

OVERALL LEVELS (5 - 10000 Hz)

OASPL = 65.3 dB
OASLA = 59.9 dB(A)
OASLC = 64.0 dB(C)
C-A VALUE = +4.1

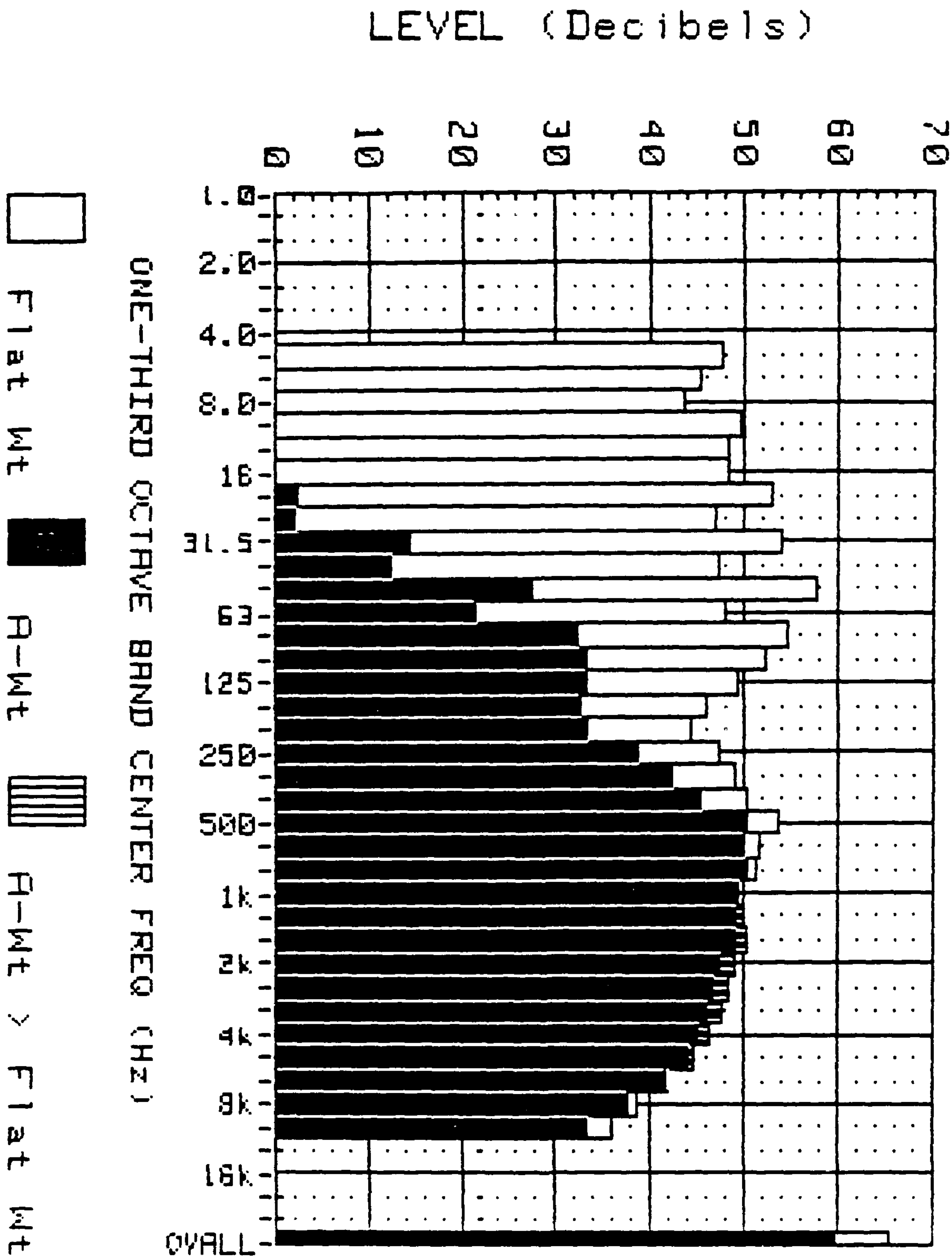


Figure C.1: Measured Noise Spectrum (SPL vs A-Wt Levels) of the TF34 Engine Mounted on the A/M37T-20 Test Cell. Site: Bldg 5045. Warfield ANG. Balt. MD. Background Noise Measurement.

Table C.2: Measured Noise Spectrum Levels of the TF34 Engine Mounted on the A/M37T-20 Test Cell.
Site: Bldg 5045, Warfield ANG, Balt. MD.
Engine Power: 96% RPM.

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
5	57.4	0.0	0.0			
6.3	51.0	0.0	0.0			
8	52.4	0.0	0.0	59.1	4.8	42.8
10	57.1	0.0	42.8			
12.5	59.5	0.0	48.3			
16	66.7	10.0	58.2	71.0	18.7	63.8
20	68.5	18.0	62.3			
25	64.3	19.6	59.9			
31.5	70.0	30.6	67.0	73.8	37.1	71.1
40	70.5	35.9	68.5			
50	77.0	46.8	75.7			
63	74.8	48.6	74.0	81.7	56.9	80.8
80	78.2	55.7	77.7			
100	79.7	60.6	79.4			
125	75.8	59.7	75.6	82.0	65.2	81.8
160	74.4	61.0	74.3			
200	73.3	62.4	73.3			
250	71.5	62.9	71.5	76.4	67.5	76.4
315	69.4	62.8	69.4			
400	67.5	62.7	67.5			
500	67.6	64.4	67.6	72.5	69.4	72.5
630	68.0	66.1	68.0			
800	66.5	65.7	66.5			
1000	67.1	67.1	67.1	71.3	71.3	71.3
1250	66.1	66.7	66.1			
1600	65.0	66.0	64.9			
2000	65.1	66.3	64.9	70.6	71.8	70.4
2500	67.0	68.3	66.7			
3150	79.2	80.4	78.7			
4000	67.5	68.5	66.7	79.7	80.8	79.1
5000	64.6	65.1	63.3			
6300	69.6	69.5	67.5			
8000	61.3	60.2	58.3	70.6	70.2	68.3
10000	60.3	57.8	55.8			

OVERALL LEVELS (5 - 10000 Hz)

OASPL = 87.3 dB OASLA = 82.5 dB(A)
OASLC = 86.6 dB(C) C-A VALUE = +4.1

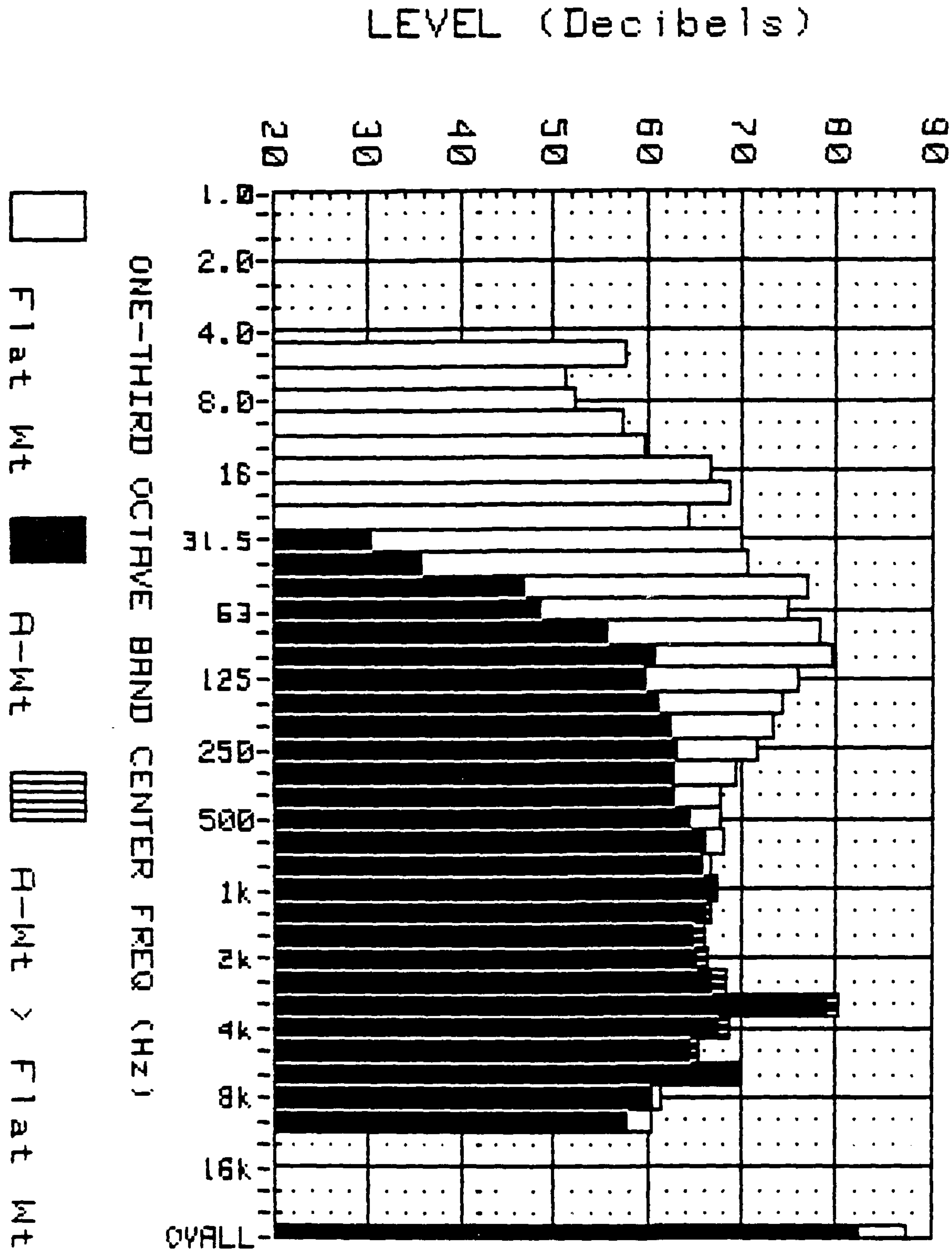


Figure C.2: Measured Noise Spectrum (SPL vs A-Wt Levels) of the TF34 Engine Mounted on the A/M37T-20 Test Cell.
Site: Bldg 5045. Warfield ANG. Balt. MD.
Engine Power: 96% RPM.

Table C.3: Measured Noise Spectrum Levels of the TF34 Engine Mounted on the A/M37T-20 Test Cell.
Site: Conrad Property Line. Balt. MD.
Background Noise Measurement.

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
5	47.8	0.0	0.0			
6.3	51.1	0.0	0.0			
8	56.2	0.0	0.0	60.9	4.8	44.0
10	58.3	0.0	44.0			
12.5	51.2	0.0	40.0			
16	51.4	0.0	42.9	56.4	5.4	48.3
20	52.0	1.5	45.8			
25	52.2	7.5	47.8			
31.5	52.1	12.8	49.1	56.8	18.9	53.8
40	51.8	17.2	49.8			
50	55.5	25.4	54.2			
63	55.6	29.4	54.8	60.2	34.7	59.3
80	54.9	32.5	54.5			
100	56.7	37.6	56.4			
125	56.9	40.8	56.7	60.3	43.6	60.0
160	50.3	36.9	50.2			
200	47.6	36.7	47.6			
250	43.8	35.2	43.8	49.6	40.1	49.6
315	40.2	33.6	40.2			
400	37.6	32.8	37.6			
500	35.6	32.4	35.6	40.4	36.7	40.4
630	32.2	30.3	32.2			
800	29.0	28.2	29.0			
1000	30.5	30.5	30.5	35.1	35.1	35.1
1250	31.1	31.7	31.1			
1600	33.2	34.2	33.1			
2000	34.7	35.9	34.5	39.0	40.2	38.8
2500	34.7	36.0	34.4			
3150	28.6	29.8	28.1			
4000	26.8	27.8	26.0	31.8	32.8	31.0
5000	24.5	25.0	23.2			
6300	21.6	21.5	19.6			
8000	19.2	18.1	16.2	24.3	23.6	21.7
10000	16.1	13.6	11.7			

OVERALL LEVELS (5 - 10000 Hz)

OASPL = 66.5 dB | OASLA = 47.5 dB(A)
OASLC = 63.6 dB(C) | C-A VALUE = +16.1

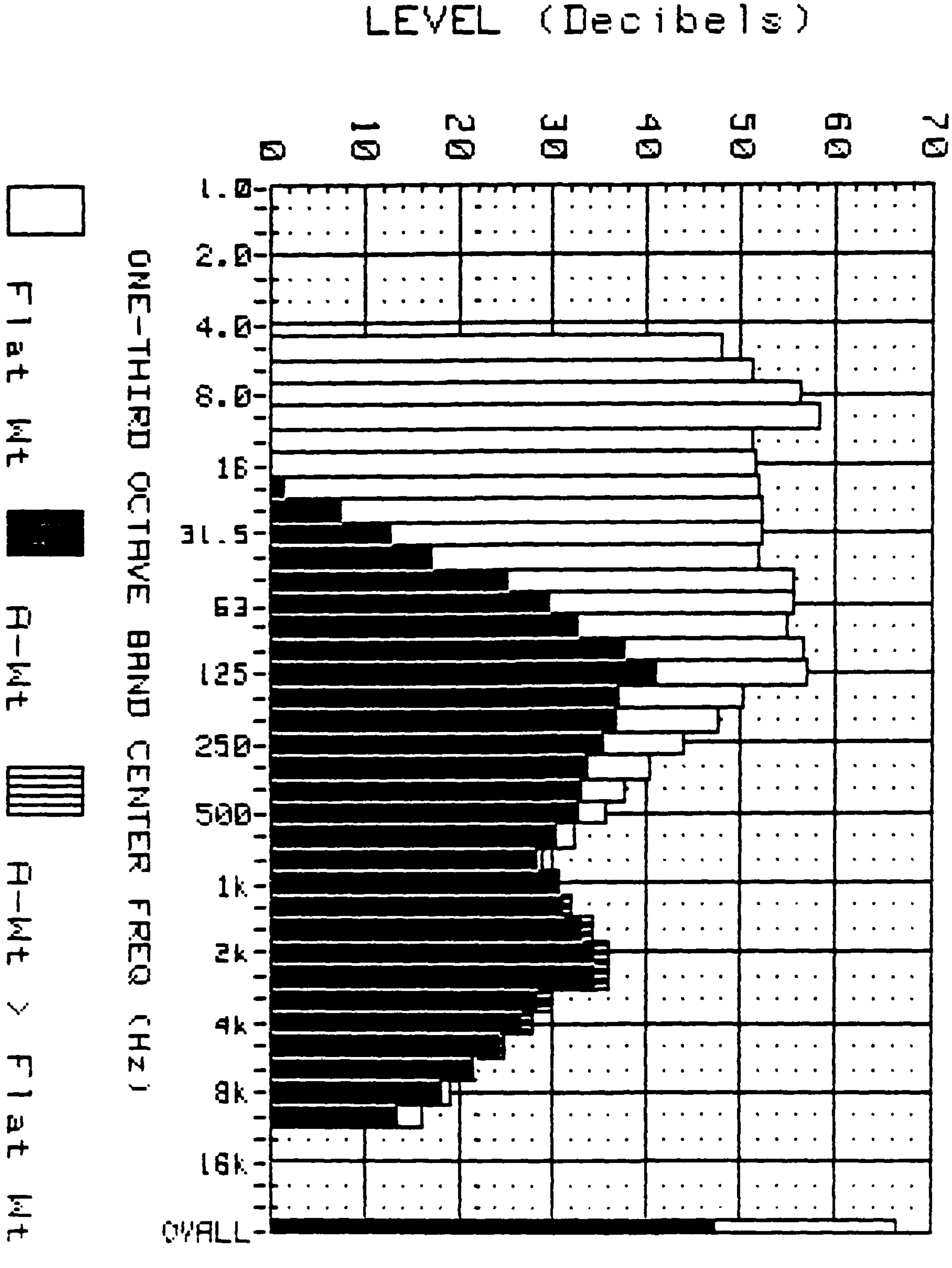


Figure C.3: Measured Noise Spectrum (SPL vs A-Wt Levels) of the TF34 Engine Mounted on the A/M37T-20 Test Cell. Site: Conrad Property Line. Balt. MD. Background Noise Measurement.

Table C.4: Measured Noise Spectrum Levels of the TF34 Engine Mounted on the A/M37T-20 Test Cell.
Site: Conrad Property Line. Balt. MD.
Engine Power: 96% RPM.

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
5	52.0	0.0	0.0			
6.3	53.7	0.0	0.0			
8	58.5	0.0	0.0	63.0	4.8	46.1
10	60.3	0.0	46.0			
12.5	59.9	0.0	48.7			
16	63.0	6.3	54.5	68.9	16.9	61.8
20	66.8	16.3	60.6			
25	69.4	24.6	64.9			
31.5	71.6	32.2	68.6	76.5	39.7	73.8
40	73.3	38.7	71.3			
50	73.4	43.2	72.1			
63	73.4	47.2	72.6	78.4	53.3	77.6
80	74.0	51.5	73.5			
100	73.7	54.6	73.4			
125	70.9	54.8	70.7	76.0	58.8	75.7
160	65.8	52.4	65.7			
200	59.9	49.0	59.9			
250	52.4	43.8	52.4	60.9	50.8	60.9
315	49.1	42.5	49.1			
400	46.8	42.0	46.8			
500	44.5	41.3	44.5	49.8	46.2	49.8
630	42.8	40.9	42.8			
800	41.6	40.8	41.6			
1000	44.5	44.5	44.5	47.7	47.7	47.7
1250	42.2	42.8	42.2			
1600	38.5	39.5	38.4			
2000	39.0	40.2	38.8	43.5	44.7	43.3
2500	38.8	40.0	38.5			
3150	42.9	44.1	42.4			
4000	32.5	33.5	31.7	43.5	44.6	42.9
5000	30.6	31.1	29.3			
6300	30.5	30.4	28.6			
8000	31.1	30.0	28.1	35.7	34.5	32.6
10000	31.0	28.5	26.7			

OVERALL LEVELS (5 - 10000 Hz)

OASPL = 82.2 dB   OASLA = 61.0 dB(A)
OASLC = 80.8 dB(C)   C-A VALUE = +19.8

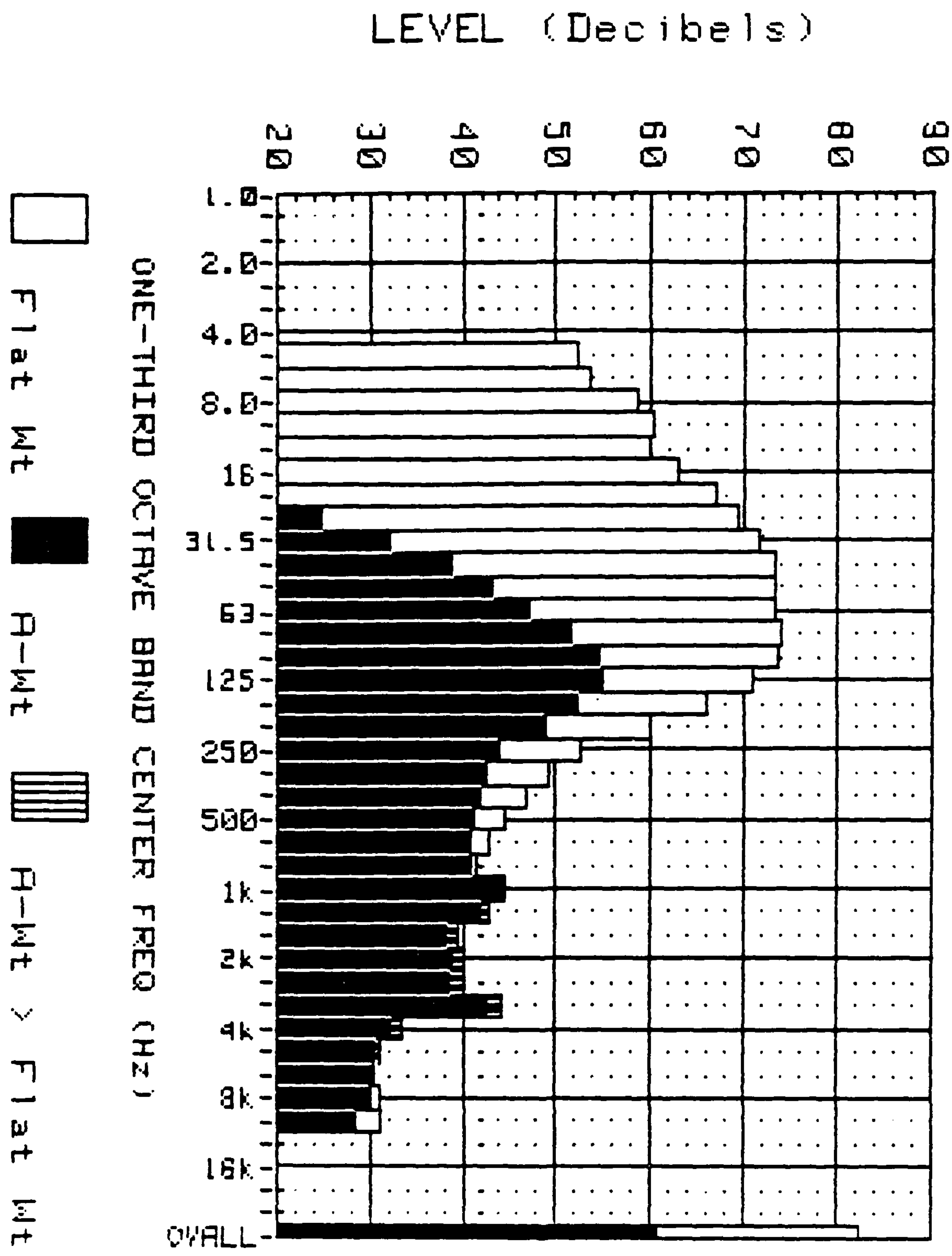


Figure C.4: Measured Noise Spectrum (SPL vs A-Wt Levels) of the TF34 Engine Mounted on the A/M37T-20 Test Cell.
Site: Conrad Property Line. Balt. MD.
Engine Power: 96% RPM.

Table C.5: Measured Noise Spectrum Levels of the TF34 Engine Mounted on the A/M37T-20 Test Cell.
Site: Lynbrook. Warfield ANG. Balt. MD.
Backgound Noise Measurement.

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
5	46.5	0.0	0.0			
6.3	46.2	0.0	0.0			
8	48.2	0.0	0.0	52.9	4.8	35.1
10	49.4	0.0	35.0			
12.5	50.9	0.0	39.7			
16	50.5	0.0	42.0	55.9	5.3	47.9
20	51.9	1.4	45.7			
25	50.0	5.3	45.7			
31.5	53.1	13.7	50.1	56.0	17.8	53.0
40	49.8	15.2	47.9			
50	52.2	22.0	50.9			
63	51.5	25.3	50.7	56.2	30.5	55.3
80	50.4	27.9	49.9			
100	47.0	27.9	46.7			
125	43.1	27.0	42.9	49.2	32.4	49.0
160	41.2	27.8	41.1			
200	40.8	29.9	40.8			
250	39.8	31.2	39.8	44.8	36.1	44.8
315	39.2	32.6	39.2			
400	39.0	34.3	39.0			
500	38.0	34.8	38.0	42.3	38.7	42.3
630	34.4	32.5	34.4			
800	32.3	31.5	32.3			
1000	32.2	32.2	32.2	36.4	36.3	36.4
1250	30.1	30.7	30.1			
1600	28.2	29.2	28.1			
2000	25.4	26.6	25.2	31.6	32.7	31.4
2500	26.4	27.7	26.1			
3150	26.4	27.6	25.9			
4000	24.6	25.6	23.8	40.8	41.4	39.6
5000	40.6	41.1	39.3			
6300	44.8	44.7	42.8			
8000	19.9	18.8	16.9	44.8	44.7	42.8
10000	18.7	16.2	14.3			

OVERALL LEVELS (5 - 10000 Hz)

OASPL = 62.1 dB　　OASLA = 48.0 dB(A)

OASLC = 58.8 dB(C)　　C-A VALUE = +10.8

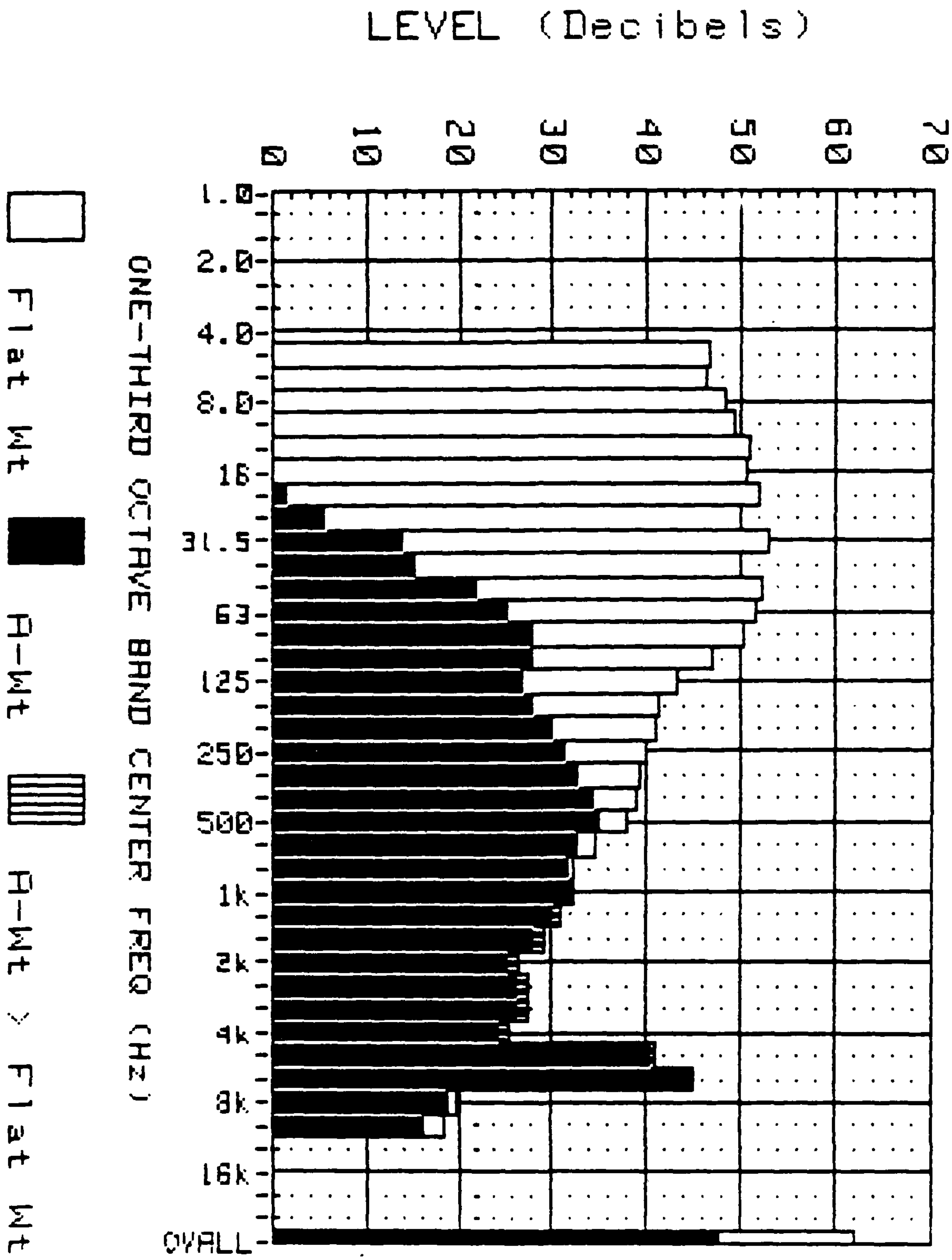


Figure C.5: Measured Noise Spectrum (SPL vs A-Wt Levels) of the TF34 Engine Mounted on the A/M37T-20 Test Cell. Site: Lynbrook. Warfield ANG. Balt. MD. Backgound Noise Measurement.

Table C.6: Measured Noise Spectrum Levels of the TF34 Engine Mounted on the A/M37T-20 Test Cell.
Site: Lynbrook. Warfield ANG. Balt. MD.
Engine Power: 96% RPM.

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
5	53.7	0.0	0.0			
6.3	51.7	0.0	0.0			
8	50.9	0.0	0.0	56.7	4.8	38.7
10	52.9	0.0	38.6			
12.5	53.2	0.0	42.0			
16	54.6	0.0	46.1	58.8	6.4	50.8
20	54.3	3.8	48.1			
25	57.8	13.1	53.4			
31.5	59.3	19.9	56.3	64.3	27.4	61.6
40	61.0	26.4	59.0			
50	60.9	30.7	59.6			
63	61.3	35.1	60.5	65.7	40.4	64.9
80	60.6	38.1	60.1			
100	56.4	37.3	56.1			
125	53.2	37.1	53.0	58.4	40.9	58.1
160	46.2	32.8	46.1			
200	41.3	30.4	41.3			
250	40.2	31.6	40.2	45.0	36.2	45.0
315	38.7	32.1	38.7			
400	37.8	33.0	37.8			
500	39.5	36.3	39.5	44.3	41.4	44.3
630	40.7	38.8	40.7			
800	42.7	41.9	42.7			
1000	50.7	50.7	50.7	53.2	53.4	53.2
1250	48.7	49.3	48.7			
1600	43.6	44.6	43.5			
2000	43.4	44.6	43.2	47.7	48.8	47.5
2500	41.5	42.7	41.2			
3150	44.3	45.5	43.8			
4000	33.4	34.4	32.6	45.1	46.2	44.5
5000	35.1	35.6	33.8			
6300	42.5	42.4	40.5			
8000	24.1	23.0	21.1	42.5	42.4	40.5
10000	18.4	15.9	14.0			

OVERALL LEVELS (5 - 10000 Hz)

OASPL = 69.5 dB — OASLA = 56.0 dB(A)

OASLC = 67.5 dB(C) — C-A VALUE = +11.5

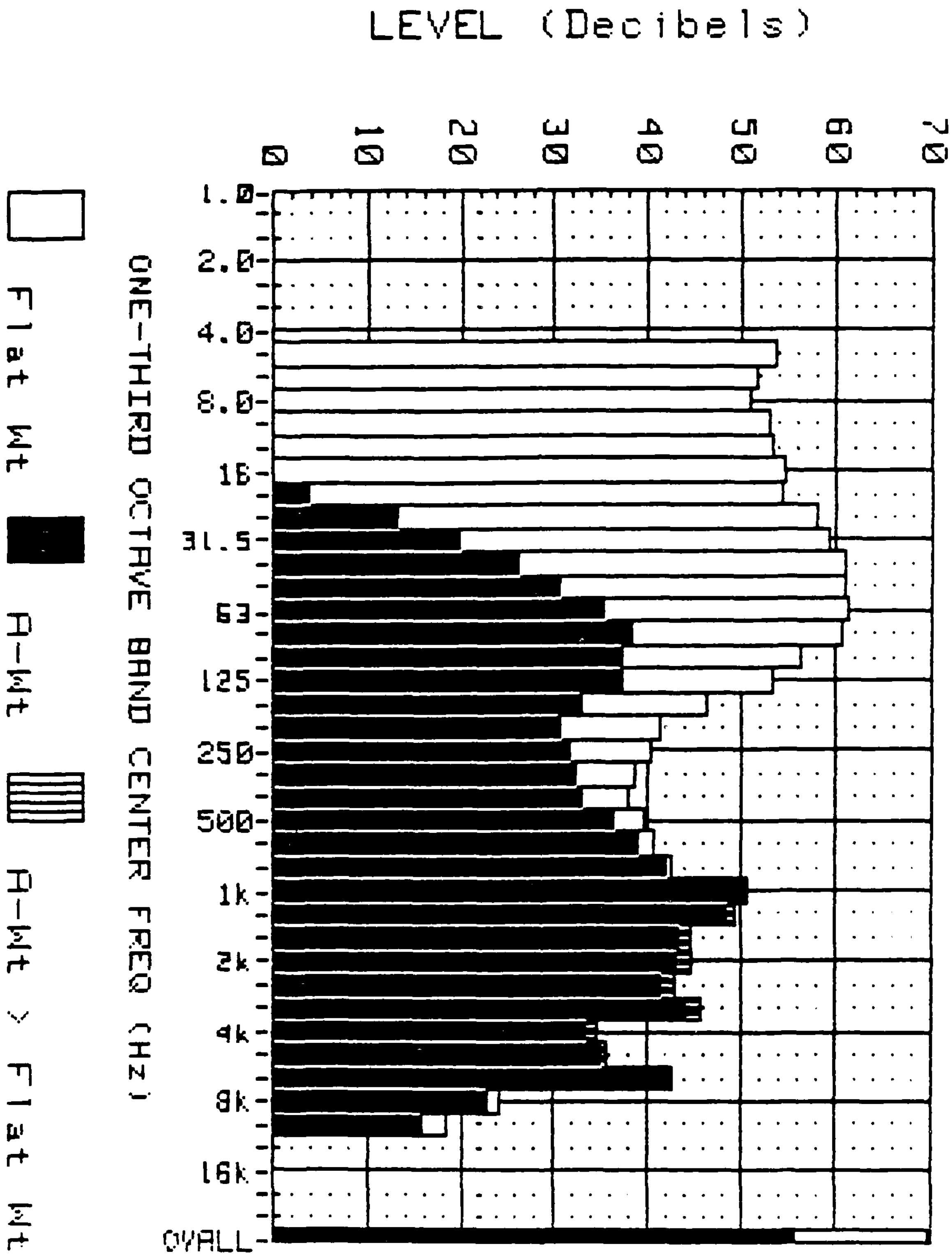


Figure C.6: Measured Noise Spectrum (SPL vs A-Wt Levels) of the TF34 Engine Mounted on the A/M37T-20 Test Cell. Site: Lynbrook, Warfield ANG, Balt. MD. Engine Power: 96% RPM.

APPENDIX D

Maryland Law

(This page left blank)

TABLE D.1: Summation of Maryland Environmental Noise Standards *

Zoning District	Level dB(A)	Measure
Industrial	70	Leq(24)
Commercial	64	Ldn
Residential	55	Ldn

* Code of Maryland Regulations, Title 10, Health and Mental Hygiene, Subtitle 20, Chapter 01.

TABLE D.2: Summation of Maryland Maximum Allowable Noise Levels (dBA) for Receiving Land Use Categories *

Zoning District	Day Level dB(A)	Night Level dB(A)
Industrial	75	75
Commercial	67	62
Residential	65	55

* Code of Maryland Regulations, Title 10, Health and Mental Hygiene, Subtitle 20, Chapter 01.

(This page left blank)

APPENDIX E

Barrier Design and Calculations

(This page left blank)

Noise Barrier Design

1. Purpose: The purpose of the two barriers is to reduce the noise from the TF34-GE-100A engine and C-130 aircraft engine. In addition, the second barrier will also reduce noise at the KO building and provide a better workplace for the workers. Figure E.1, depicts the barrier design and Tables E.1 through E.3 list the calculated values. Barrier 1 is 75 ft long, centered on the line of sight between the exhaust of the TF34-GE-100A engine and site 2, 75 ft away from the exhaust, and the top of the barrier is 40 ft above sea level. Barrier 2 is 60 ft long, centered on the line of sight between the center of the C-130 engine and the center of the KO building door, 70 ft away from the exhaust, and 35 ft above sea level. The barrier can be made out of any material that meets the sound transmission loss requirements in Tables E.1 through E.3. Any width of earth greater than 1 inch should meet the requirement. Therefore, a possible material could be earth. The base will have to decide which is the most cost effective material. Another possible material might be to stack metal containers like the ones already placed between the KO building and the trimpad.

2. Barrier Design: The barriers were designed, using a computer program to determine their dimensions and placement, to reduce noise on the other side by creating a noise shadow. The optimum barrier is as close as possible and as high as possible. The program assumes a level surface and uses one-third octave noise data and source-to-receiver distances. This brings up two problems:

a. At Mr Conrad's the OASPLA and one-third octave band data of the C-130 is not known for certain. The base BEE shop did not feel information on the C-130 was necessary. However, data taken by the Metrosonics dosimeters showed an overall noise level of approximately 51 dB(A). Therefore, to use the program, certain octave levels were assumed. By assuming the noise levels are related proportionally to the noise levels of the TF34-GE-100A, the C-130 aircraft engine noise levels can be found.

b. The mathematical equations used to determine noise reduction of a barrier assume a level path between source and receiver. The land between the engine noise and noise receiver is hilly terrain. Therefore, a level surface of 20 ft, the trimpad's height of contour, is used. So in Tables E.1 through E.3 a barrier height of 15 ft is equivalent to a 35 ft contour.

3. Barrier Limitations: The recommendations in this report are inseparable from the conditions existing at the time of the survey. Change any parameter and the results will not be the same.

a. This solution only applies to a TF34-GE-100A engine on the test stand and cannot be expected to solve a noise problem caused by a plane being tested on the trimpad.

b. If any physical objects are moved, the noise level at Mr Conrad's could rise. Therefore, do not cut down any trees or move the metal containers. In fact, planting additional trees may be beneficial.

c. Using an outdoor barrier has several major uncertainties. The exact amount of reduction will not be known until after the barrier is built. These values will change with wind and temperature variations.

4. Barrier Results: The noise reduction values generated by the computer program are shown in Tables E.1 through E.3. The first barrier is predicted to reduce noise level generated by the TF34-GE-100A at Mr Conrad's to 52 dB(A). The second barrier is used to reduce the noise generated by the C-130 engine at Mr Conrad's to 44 dB(A). In addition, the barrier for the C-130 engine will reduce the OASPLA at site 1 (KO building) to 67 dB(A) ensuring worker safety. A 3 dB(A) allowance was built into the OASLA to account for imperfections in the equations, barrier, and noise levels. This can be seen in the fact that the OASLA created by the TF34-GE-100 engine is expected to be 52 dB(A) at site 2, instead of the 55 dB(A) goal. Even though the noise reduction will not be as great as a noise suppressor system, and barrier noise reductions will change with conditions, a barrier design is a viable option.

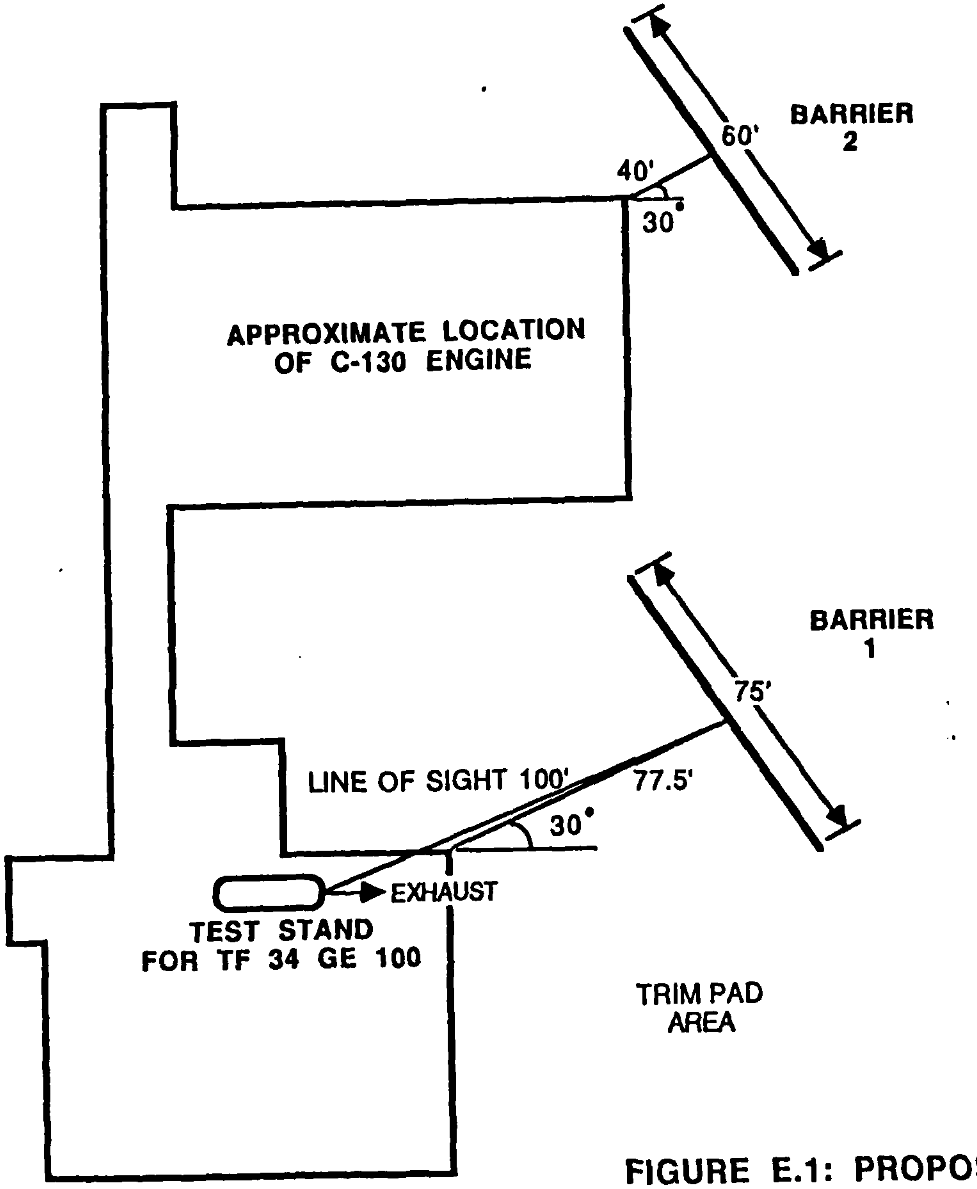


FIGURE E.1: PROPOSED BARRIER LOCATIONS
AT MARTIN STATE AIRPORT
BALTIMORE, MARYLAND

TABLE E.1: EXPECTED NOISE LEVEL OF TF34-GE-100A ENGINE AT CONRAD'S WITH NOISE BARRIER IN PLACE

	FIXED VALUES	
THE DISTANCE BETWEEN SOURCE AND RECEIVER IS:	2400.0	FT
THE SOURCE HEIGHT IS:	6.0	FT
THE SOURCE WIDTH IS:	15.0	FT
THE RECEIVER HEIGHT IS:	0.0	FT
	VARIABLE VALUES	
THE DISTANCE BETWEEN SOURCE AND BARRIER IS:	100.0	FT
THE DISTANCE BETWEEN BARRIER AND RECEIVER IS:	2300.0	FT
THE BARRIER HEIGHT IS:	20.0	FT
	CALCULATIONS	
THE PATHLENGTH IS:	2.02	FT
THE BARRIER WIDTH IS:	74.3	FT
EFFECTED RECEIVER WIDTH IS:	2859.0	FT
80% OF CALCULATED NOISE REDUCTION FOR A RECEIVER WIDTH OF:	880.0	FT
50% OF CALCULATED NOISE REDUCTION FOR A RECEIVER WIDTH OF:	1659.2	FT

OCTAVE FREQUENCY BAND, HZ

31 63 125 250 500 2000 4000 8000

THE NOISE LEVELS MEASURED AT THE RECEIVER'S LOCATION (dBA)

39.7	53.3	58.8	50.8	46.2	47.7	44.7	44.6	34.5

NOISE REDUCTION AT RECEIVER DUE TO BARRIER (dBA):

6.1	7.6	9.1	10.6	12.9	15.2	16.7	17.5	18.2

REQUIRED SOUND TRANSMISSION LOSS OF BARRIER (dB):

16.1	17.6	19.1	20.6	22.9	25.2	26.7	27.5	28.2

EXPECTED NOISE LEVELS AT RECEIVER DUE TO BARRIER (dBA):

33.6	45.7	49.7	40.2	33.3	32.5	28.0	27.1	16.3

Lavg = 52 dBA

TABLE E.2: EXPECTED NOISE LEVEL OF TF34-GE-100 ENGINE AT BUILDING 5045 WITH NOISE BARRIER IN PLACE

	FIXED VALUES	
THE DISTANCE BETWEEN SOURCE AND RECEIVER IS:	410.0	FT
THE SOURCE HEIGHT IS:	6.0	FT
THE SOURCE WIDTH IS:	4.0	FT
THE RECEIVER HEIGHT IS:	6.0	FT
	VARIABLE VALUES	
THE DISTANCE BETWEEN SOURCE AND BARRIER IS:	200.0	FT
THE DISTANCE BETWEEN BARRIER AND RECEIVER IS:	210.0	FT
THE BARRIER HEIGHT IS:	15.0	FT
	CALCULATIONS	
THE PATHLENGTH IS:	0.40	FT
THE BARRIER WIDTH IS:	31.0	FT
EFFECTED RECEIVER WIDTH IS:	114.7	FT
FOR OF CALCULATED NOISE REDUCTION FOR A RECEIVER WIDTH OF:	40.7	FT
50% OF CALCULATED NOISE REDUCTION FOR A RECEIVER WIDT' F:	77.2	FT

OCTAVE FREQUENCY BAND, HZ

	31	63	125	250	500	1000	2000	4000	8000
THE NOISE LEVELS MEASURED AT THE RECEIVER'S LOCATION (dBA)	37.1	56.9	65.2	67.5	69.4	71.3	71.8	80.8	70.2
NOISE REDUCTION AT RECEIVER DUE TO BARRIER (dBA):	5.8	6.7	8.6	9.6	11.5	14.4	17.3	19.2	21.1
REQUIRED SOUND TRANSMISSION LOSS OF BARRIER (dB):	15.8	16.7	18.6	19.6	21.5	24.4	27.3	29.2	31.1
EXPECTED NOISE LEVELS AT RECEIVER DUE TO BARRIER (dBA):	31.3	50.2	56.6	57.9	57.9	56.9	54.5	61.6	49.1

Lavg = 67 dBA

TABLE E.3: EXPECTED NOISE LEVEL OF C-130 AIRCRAFT ENGINE AT CONRAD'S WITH NOISE BARRIER IN PLACE

	FIXED VALUES	
THE DISTANCE BETWEEN SOURCE AND RECEIVER IS:	2400.0	FT
THE SOURCE HEIGHT IS:	6.0	FT
THE SOURCE WIDTH IS:	15.0	FT
THE RECEIVER HEIGHT IS:	0.0	FT
	VARIABLE VALUES	
THE DISTANCE BETWEEN SOURCE AND BARRIER IS:	75.0	FT
THE DISTANCE BETWEEN BARRIER AND RECEIVER IS:	2325.0	FT
THE BARRIER HEIGHT IS:	12.0	FT
	CALCULATIONS	
THE PATHLENGTH IS:	0.95	FT
THE BARRIER WIDTH IS:	50.4	FT
EFFECTED RECEIVER WIDTH IS:	2283.0	FT
80% OF CALCULATED NOISE REDUCTION UPVIEW MORE DATA UP	726.4	FT
50% OF CALCULATED NOISE REDUCTION FOR A RECEIVER WIDTH OF:	1388.7	FT

OCTAVE FREQUENCY BAND, HZ

	31	63	125	250	500	1000	2000	4000	8000
THE NOISE LEVELS MEASURED AT THE RECEIVER'S LOCATION (dBA)	30.0	44.0	49.0	41.0	37.0	38.0	35.0	35.0	25.0
NOISE REDUCTION AT RECEIVER DUE TO BARRIER (dBA):	5.3	6.1	7.6	9.1	10.6	12.9	15.2	16.7	17.5
REQUIRED SOUND TRANSMISSION LOSS OF BARRIER (dB):	15.3	16.1	17.6	19.1	20.6	22.9	25.2	26.7	27.5
EXPECTED, NOISE LEVELS AT RECEIVER DUE TO BARRIER (dBA):	24.7	37.9	41.4	31.9	26.4	25.1	19.8	18.3	7.5

Lavg = 44 dBA

Distribution List

	Copies
HQ AFSC/SGPB Andrews AFB DC 20334-5000	1
HQ USAF/SGPA Bolling AFB DC 20332-6188	1
HQ ANGSC/SGB Andrews AFB DC 20331-6008	1
USAF Regional Medical Center Wiesbaden/SGB APO New York 09220-5300	1
OL AD, USAFOEHL APO San Francisco 96274-5000	1
USAFSAM/TSK Brooks AFB TX 78235-5301	1
Defense Technical Information Center (DTIC) Cameron Station Alexandria VA 22319	2
175 TAC Clinic/SGPB 2701 Eastern Blvd Baltimore MD 21220-2899	5
HQ HSD/EV Brooks AFB TX 78235-5000	1

END
DATE
FILMED
4-88
DTIC