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AEROSPACE MEDICAL RESEARCH LAB WRIGHT-PATTERSON AFB OH F/G 1/2
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 124, F-104D A--ETC(U)
AUG 79 R G POWELL

UNCLASSIFIED AMRL-TR-75-50-VOL-124

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER AMRL-TR-75-50- Vol -124	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK F-104D Aircraft, Near and Far-Field Noise.	5. TYPE OF REPORT & PERIOD COVERED Volume 124 of a Series	
7. AUTHOR(s) Robert G. Powell	6. PERFORMING ORG. REPORT NUMBER A 081544	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Aerospace Medical Research Laboratory Aerospace Medical Division, Air Force Systems Command, Wright-Patterson AFB OH	8. CONTRACT OR GRANT NUMBER(s) 17) 07, 08	
11. CONTROLLING OFFICE NAME AND ADDRESS Same as above	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62202R 16) 7231 07-03 7231 08-07	
12. REPORT DATE Aug 79	13. NUMBER OF PAGES 88	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) 9) Technical Repts	15. SECURITY CLASS. (of this report) Unclassified	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Noise F-104D Aircraft Noise Environments Bioenvironmental Noise Aircraft		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The USAF F-104D is a day/night fighter powered by a J79-GE-7/A turbojet engine. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for three engine/power configurations. Near-field data are reported for sixteen locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted		

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sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distances from the source. Refer to Volume 1 of this handbook, "USAF Bioenvironmental Noise Data Handbook, Vol 1: Organization, Content and Application", AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing definitions of quantities, symbols, equations, applications, limitations, etc.

PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723107, Technology to Define and Assess Environmental Quality of Noise from AF Operations and 723108 Crew Safety in Operational Noise Environments.

The author gratefully acknowledges Mr. John Cole for his assistance in preparing this report, Col Justus Rose and Mr. Robert England for their assistance in acquiring the raw data, Mr. Keith Kettler, Mr. Henry Mohlman and Mr. Fred Lampley of the University of Dayton for assistance in the mechanics of data processing, and Mrs. Peggy Massie for assistance in typing and preparation of the graphics.

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INTRODUCTION

The USAF F-104D is a day/night fighter aircraft powered by a J79-GE-7/A turbojet. The aircraft was manufactured by the Lockheed Aircraft Corporation and the engine by the General Electric Company.

This volume provides measured and extrapolated data defining bioacoustic environments produced by this aircraft during ground runup operations. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with ground runups of the F-104D aircraft.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type, noise data in the handbook describe the noise produced during *ground operations* of aircraft, ground support equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Volume 2 provides a method and data for adjusting the handbook's far-field noise data, which are for standard meteorological conditions (15°C temperature, 70% rel humidity, 0.760 meters Hg barometric pressure), to derive comparable data for other meteorological conditions. Refer to *Volumes 1 and 2* (references 1 and 2) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., inflight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of each updated index.

Direct any questions concerning the technical data in this report and other handbook volumes to: AMRL/BBE, Wright-Patterson AFB, OH 45433; AUTOVON 78-53675 or 78-53664; Commercial (513) 255-3675 or (513) 255-3664.

1. Cole, John N., *USAF Bioenvironmental Noise Data Handbook Volume 1: Organization, Content and Application*, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.
2. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 2: Procedure to Evaluate Effects of Non-standard Meteorological Conditions on Far-Field Noise*, AMRL-TR-75-50 (2), AMRL, WPAFB, OH, 1975.

NEAR-FIELD NOISE

MEASUREMENTS

AMRL acquired near-field noise data on the F-104D aircraft during ground runup operations of its turbojet engine. For these tests the aircraft was located on a concrete runup pad at Eglin AFB with no significant reflecting surfaces in the vicinity except the ground plane. Table 1 gives the surface meteorological conditions and the seven engine/power conditions. The ground-crew chief selected power conditions and near-field locations generally used during routine maintenance or engine runup for pre-flight checks.

At each near-field location a test engineer randomly moved a hand-held microphone in and around each location, probing all areas where a crew member's head would normally be located. He recorded all the noise samples on magnetic tape. During analysis of each sample, he determined the octave band root-mean-square sound pressure using a -4 or 8-second integration time to derive a power-averaged level for each location.

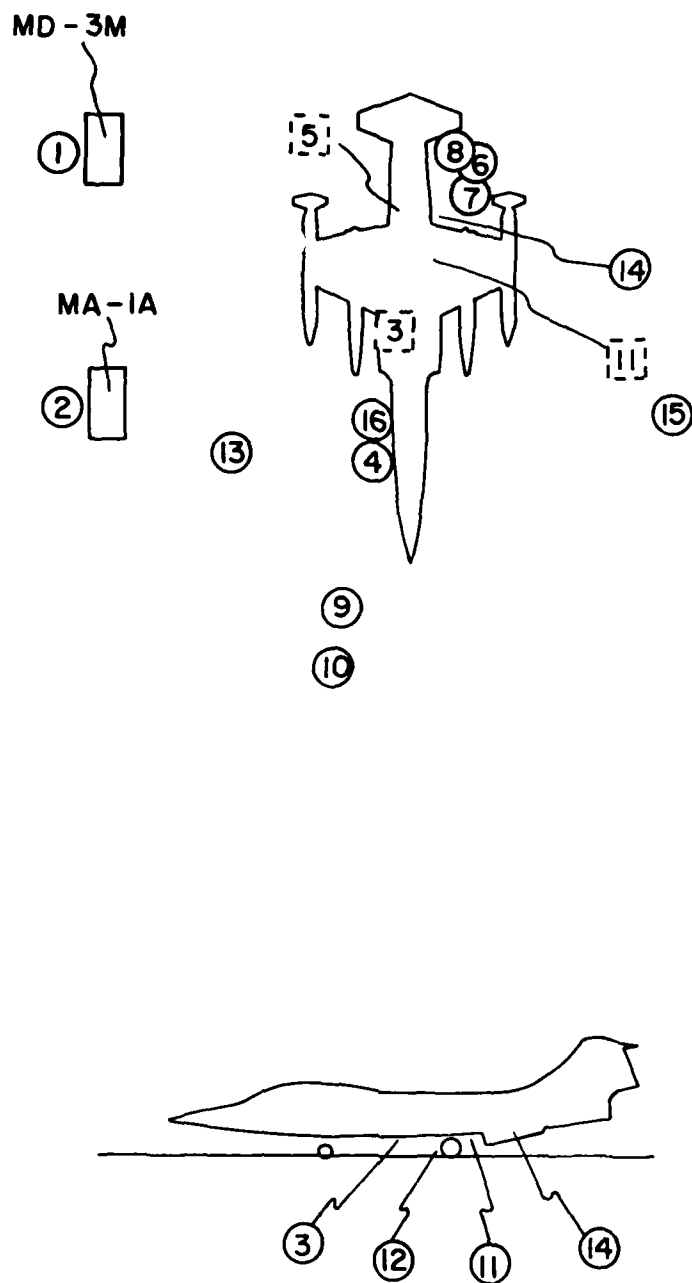
Figure 1 shows the sixteen near-field locations where ground crews are usually located for maintenance and/or preflight checkout operations. Estimates of noise levels at other locations are difficult in the near-field since the noise source is spatially distributed i.e., not a point source. The noise levels at near-field locations can vary widely depending upon relative distances from each noise source (intake noise, exhaust noise, panel resonances, internal engine noise through the engine wall, etc).

Table 1 lists the numeric/alphabetic designators used on the data pages in this report to identify the measurement locations and test conditions. For example, the designator 1/A means ground crew location 1 and test condition A.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced by the F-104D aircraft at the sixteen ground crew locations. This table includes the overall, 1/3 octave band, and octave band levels. From these data one can calculate the variety of measures given in Table 3, which are widely used to assess the effects of noise on personnel and their performance.

All near-field data are for the meteorological conditions at the time of test but are valid for all typical airbase meteorology because of the short sound propagation distances involved.



**Figure 1. Near-Field Measurement Locations at
Trim Pad Eglin AFB FL**

TABLE 1
MEASUREMENT LOCATIONS AND TEST CONDITIONS
FOR NEAR-FIELD NOISE MEASUREMENTS

F-104D Aircraft, Ground Runup, Eglin AFB
12 Aug 71
Tail # 071323

Ground Crew Location

1	Operator MD-3M
2	Operator MA-1A
3	Air Hose Removal
4	Crew Chief Ladder
5	Leak Check
6	Air Brake Check
7	Flap Check
8	Aileron Check
9	Marshall
10	Marshall
11	LG Compartment Check
12	Wheel Chock Pull
13	Trim Personnel
14	Trim Adjustment
15	Trim Personnel
16	Panel Check

Aircraft Engine Operation

A	MD-3M Operating
B	MD-3M and MA-1A Operating
C	Idle Power, MD-3M and MA-1A Operating
D	Idle Power
E	80% RPM Power
F	Military Power
G	Afterburner Power

Meterology

Temperature	23.9 C
Bar Pressure	0.769 M Hg
Rel Humidity	90%
Wind	
—Speed	3.1 M/Sec (6 Kt)
—Direction	350 Deg

FAR-FIELD NOISE

MEASUREMENTS

AMRL acquired far-field data during two 1-hour test periods at Eglin AFB. Figure 2 shows the ground runup pads, ground cover, aircraft orientation and the microphone measurement sites on each semi-circle. The centers of the 50 and 75 meter radius semi-circles used in surveying the J79-GE-7/A engine were on the ground directly below the intersection of the aircraft's centerline and the plane passing through the exhaust-nozzle's exit.

The ground runup pad (Hot Cargo Pad) used for the idle and military power measurements did not have a blast deflector, therefore, the jet exhaust was in a "free-flow" condition. However the trim pad used for the afterburner power measurements did have a blast deflector installed as part of the facility. In this case the aircraft was placed on a long tie-down cable so that the distance between the exhaust nozzle and the deflector was 52 meters. At this distance there was minimal interaction between the noise source and the blast deflector so that the afterburner noise measurements acquired at 50 meters were essentially in a "free-flow" condition and should be used as such.

Table 4 provides cockpit readout of the engines RPM for each setting used in far-field tests. Also listed in this table are the surface meteorological conditions during data acquisition.

All microphone measurement sites are in the acoustic far-field of the source where the sound wave fronts spherically diverge and the noise source may be regarded as a point source.

Test personnel acquired far-field noise data at Eglin AFB by using a hand-held microphone (1.7 meters / 5½ feet above the ground plane and pointed at the noise source. 0° incidence) and sequentially recording 5-10 seconds of data at each far-field location on a portable microphone/tape recorder system. The samples were then time-integrated to derive a root-mean-square sound pressure level.

RESULTS

Table 5 lists the overall and 1/3 octave band SPL measured at the far-field locations under meteorological conditions at the time of the test. Data in all other figures and tables are based on these levels. These data were normalized to 100 meters distance and standard meteorological conditions (15°C temperature, 70% relative humidity, 0.760 meter Hg barometric pressure) and used to derive the graphic data in Figure 3 which provides a compact summary of the far-field noise characteristics of the F-104D aircraft in a standard format.

Figure 4 and Table 6 present two basic acoustic measures, the acoustic power levels and the directivity index, respectively. The acoustic power level describes the power radiated by the source as a function of frequency. The directivity index is a standard acoustical engineering measure that describes the geometric way in which the source radiates this power as a function of both frequency and angle from source. These basic source measures are primarily of interest for acoustical engineers and noise generation/control specialists.

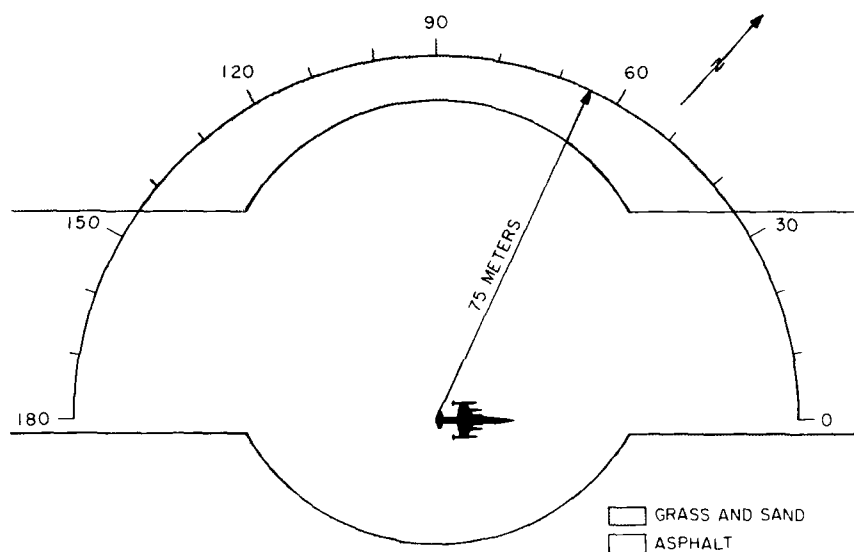


Figure 2(a). Far-Field Measurement Locations at the Hot Cargo Pad, Eglin AFB FL

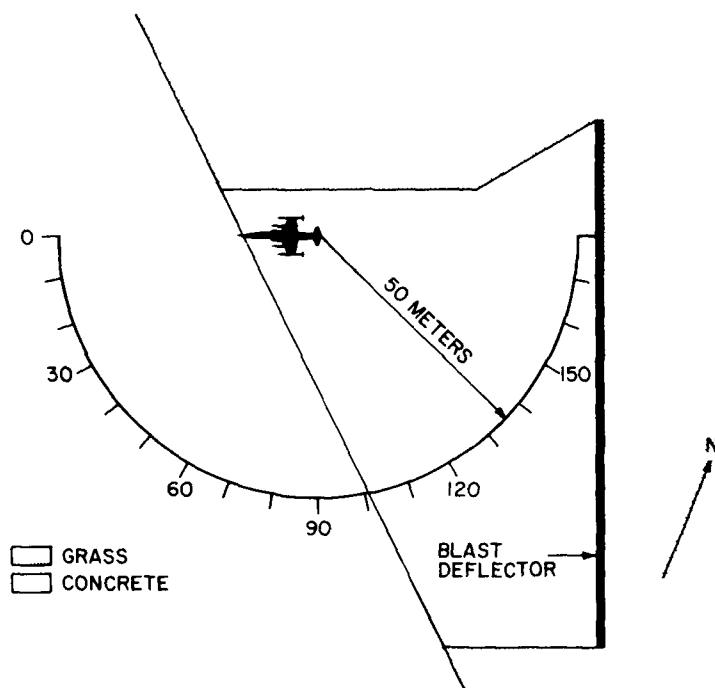


Figure 2(b). Far-Field Measurement Locations at Trim Pad Eglin AFB FL

Estimates of noise levels for intermediate power conditions (e.g., 88% engine RPM) can be determined as explained in Volume 1 of this handbook.

Figures 5 through 11 are sets of equal noise contours describing seven different measures of noise as a function of angle and distance from the source for standard day meteorology. They are, respectively, overall sound pressure level, C-weighted sound level, A-weighted sound level, perceived noise level, speech interference level, permissible exposure times for personnel and octave band sound pressure levels.

Data excessively influenced by spurious background/electronic noise were eliminated from all figures and tables. No data are presented at the 180 degree location for the military power setting and at the 170, and 180 degree locations for the afterburner power setting because of turbulent air flow behind the aircraft. Typically, the A-weighted levels for these angles are 10 to 20 dBA below the level measured at the preceding microphone location.

Test personnel performed noise surveys during quiet periods when the background noise was minimal, e.g., early in the morning when no other aircraft or engine test stands were operating. Data eliminated because they were near the background/electronic noise were generally not significant because the levels were so low (e.g., Table 5 at idle power).

Volume 2 of the handbook describes the influence of meteorology on far-field noise environments, and provides, if required, the factors necessary to adjust the handbook's standard meteorological day data.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB) 1/3 OCTAVE BAND													IDENTIFICATION:
2													OMEGA 3.2
NOISE SOURCE/SUBJECT: (OPERATION:)													TEST 71-019-105
F-104D AIRCRAFT ()													RUN 01
GROUND CREW ()													18 JAN 79
NEAR FIELD NOISE LEVELS ()													PAGE F1
LOCATION/CONDITION													
FREQ (HZ)	1/A	2/B	2/C	3/D	4/B	4/D	5/D	6/D	7/E	8/D	9/D	10/D	11/D 12/D
25	77	79	80	93	75	85	89	92	94	98	81	77	87 91
31.5	81	84	84	110	76	95	103	100	96	108	90	86	102 105
40	89	84	87	113	78	99	107	109	103	110	94	91	112 113
50	91	86	87	112	72	91	108	112	110	107	97	88	113 112
63	90	88	89	97	75	84	93	99	103	94	87	81	100 100
80	92	85	89	96	81	93	93	93	100	95	86	84	96 97
100	110	100	100	94	97	87	93	98	101	92	88	83	93 97
125	108	99	99	98	97	84	94	94	97	94	88	82	95 102
160	104	97	100	100	96	84	92	97	94	97	87	84	95 99
200	105	92	96	89	90	85	85	103	94	94	82	80	91 92
250	105	91	92	88	91	90	83	96	97	96	83	78	88 87
315	95	92	92	91	90	90	87	93	97	96	88	79	92 89
400	93	92	93	95	93	94	90	94	94	94	91	83	96 94
500	94	89	93	94	89	106	89	93	94	93	104	90	100 96
630	92	88	89	98	86	110	91	90	94	91	102	89	101 98
800	92	85	88	89	80	97	86	90	95	90	91	83	91 90
1000	92	83	84	89	79	95	86	88	96	89	92	87	90 88
1250	87	85	87	90	79	97	87	89	98	89	93	87	90 89
1600	89	90	90	95	82	105	91	89	103	90	97	90	97 94
2000	87	92	91	96	83	102	92	93	107	89	97	88	97 96
2500	84	94	91	96	85	100	90	89	110	87	101	89	98 97
3150	83	93	93	92	87	95	88	87	112	86	94	86	94 91
4000	82	95	94	92	88	93	89	87	114	87	94	86	94 91
5000	78	95	94	89	87	91	92	88	116	87	92	84	93 91
6300	76	102	96	86	88	91	87	85	119	91	85	91	88 88
8000	74	116	106	87	93	90	91	84	120	98	91	85	91 90
10000	70	110	107	89	94	86	96	84	118	85	87	84	92 94
OVERALL	114	117	112	117	105	113	112	115	125	114	110	100	116 117

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)						IDENTIFICATION:	
2 1/3 OCTAVE BAND							
NOISE SOURCE/SUBJECT:						OMEGA 3.2	
(						TEST 71-019-105	
(						RUN 02	
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LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)												
2 OCTAVE BAND												
NOISE SOURCE/SUBJECT: (OPERATION:) IDENTIFICATION:)												
F-104D AIRCRAFT () OMEGA 3.2												
GROUND CREW () TEST 71-019-105												
NEAR FIELD NOISE LEVELS () RUN 01												
() 18 JAN 79												
() PAGE J1												
LOCATION/CONDITION												
FREQ (HZ)	1/A	2/B	2/C	3/D	4/B	4/D	5/D	6/D	7/E	8/D	9/D	10/D 11/D 12/D
31.5	89	88	89	115	81	100	108	110	104	112	95	92 112 114
63	96	91	93	112	83	96	108	112	111	107	97	90 113 112
125	112	103	104	103	102	90	98	101	103	99	92	88 99 105
250	108	96	99	94	95	93	90	104	101	100	90	84 95 94
500	98	94	97	101	95	111	95	97	99	98	106	93 104 101
1000	96	89	91	94	84	101	91	94	101	94	97	90 95 94
2000	92	97	95	100	88	107	95	95	112	94	104	93 102 100
4000	86	99	98	96	92	98	95	92	119	91	98	90 98 96
8000	79	117	110	92	97	94	98	89	124	92	95	89 96 96
OVERALL	114	117	112	117	105	113	112	115	125	114	110	100 116 117

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:									
2											
OCTAVE BAND											
NOISE SOURCE/SUBJECT:		OPERATION:									
F-104D AIRCRAFT											
GROUND CREW											
NEAR FIELD NOISE LEVELS											
		LOCATION/CONDITION									
FREQ (HZ)		13/F	14/E	15/E	15/G	16/G	16/J				
31.5		97	116	92	109	104					
63		102	122	99	113	103					
125		108	126	99	119	95					
250		109	120	96	117	88					
500		114	120	92	118	99					
1000		119	115	88	123	92					
2000		114	120	90	122	100					
4000		109	119	91	118	95					
8000		104	118	87	112	88					
OVERALL		122	130	104	128	109					

TABLE: MEASURES OF HUMAN NOISE EXPOSURE													IDENTIFICATION:
3													OMEGA 3.2
NOISE SOURCE/SUBJECT: (OPERATION:)													TEST 71-019-105
F-104D AIRCRAFT ()													RUN 01
GROUND CREW ()													18 JAN 79
NEAR FIELD NOISE LEVELS ()													PAGE H1
LOCATION/CONDITION													
1/A	2/B	2/C	3/D	4/B	4/D	5/D	6/D	7/E	8/D	9/D	10/D	11/D	12/D
HAZARD/PROTECTION													
G-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC	114	115	109	115	104	113	110	113	112	109	99	115	115
OASLA	103	116	109	105	99	112	102	102	125	101	108	98	107
T	18	P	6	13	36	3.8	21	21	P	25	8	42	9
MINIMUM QPL EAR MUFFS													
OASLA*	92	92	88	87	82	88	83	87	100	84	84	74	87
T	120	120	240	285	679	240	571	285	30	480	480	960	285
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA*	88	90	84	85	77	82	81	84	95	82	78	69	85
T	246	170	480	404	960	679	807	480	71	679	960	960	404
V-51R EAR PLUGS													
OASLA*	81	86	81	80	74	87	76	79	94	78	82	71	82
T	807	339	807	960	960	285	960	960	85	960	679	960	679
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA*	69	76	70	70	61	72	65	68	84	67	68	58	70
T	960	960	960	960	960	960	960	960	480	960	960	960	960
H-133 GROUND COMMUNICATION UNIT													
OASLA*	81	86	80	82	72	83	77	80	95	78	80	71	82
T	807	339	960	679	960	571	960	960	71	960	960	960	679
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL	95	93	95	98	89	107	94	95	104	95	102	92	100
ANNOYANCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)													
TONE CORRECTION (C IN DB)													
PNLT	119	130	124	122	115	126	118	118	137	116	124	113	123
C	2	2	1	2	1	3	1	1	0	0	2	1	2

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.
P ADDITIONAL EAR PROTECTION REQUIRED.

[illegible]

TABLE 4
TEST CONDITIONS
FOR FAR-FIELD NOISE MEASUREMENTS

F-104D Aircraft, Ground Runups
 Eglin AFB FL, 2 August 1971, Tail # 071323
 Eglin AFB FL, 12 August 1971, Tail # 071323

Aircraft Engine Operation

Idle	67 % RPM, Core Speed
Military	100 % RPM, NC
Afterburner	100 % RPM, NC

Meteorology

Idle and Military	Temperature	27.8 C
	Bar Pressure	0.761 M Hg
	Rel Humidity	73 %
	Wind — Speed	2.6 M/SEC (5 KTS)
	— Direction	170 Deg
Afterburner	Temperature	23.9 C
	Bar Pressure	0.769 M Hg
	Rel Humidity	90 %
	Wind — Speed	3.1 M/SEC (6 KTS)
	— Direction	350 Deg

TABLE 1		MEASURED SOUND PRESSURE LEVEL (DB)																	IDENTIFICATION:	
5		1/3 OCTAVE BAND																	OMEGA 1.4	
		DISTANCE = 75 METERS																	TEST 75-002-033	
		NOISE SOURCE/SUBJECT:																	RUN 01	
		(OPERATION:																	18 SEP 78	
		(F-104D AIRCRAFT																	PAGE 2	
		(J79-GE-7/A ENGINE																		
		(FAR FIELD NOISE																		
		(METEOROLOGY:																		
		(TEMP = 28 C																		
		(BAR PRESS = .761 H HG																		
		(REL HUMID = 73 %																		
		(FREE FLOW																		
FREQ (HZ)		ANGLE (DEGREES)																		
		0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
25	70<	58<	58<	58<	57<	56<	70<	79	71<	69<	71<	74<	72<	70<	72<	73<	72<	72<	73<	72<
31.5	78	76<	77	79	78	80	80	80	81	81	81	81	82	81	80	81	80	79	78	78
40	82	82	81	82	83	86	85	85	85	86	85	86	86	84	83	83	82	82	80	80
50	78	78	78	80	82	83	81	80	78	77	76	76	78	80	81	82	80	79	74	74
63	71<	68<	70<	71<	74<	74<	75<	75<	71<	70<	70<	72<	73<	75<	76<	76<	75<	73<	69<	68<
80	70<	71<	72<	75	76	76	76	76	74	76	75	72<	75	77	78	78	79	77	65<	66<
100	71<	69<	70<	72<	72<	72<	72<	74<	67<	71<	73<	73<	72<	74<	75	76	76	76	73<	
125	71<	70<	71<	74	71<	69<	74	75	75	75	74	75	76	76	77	76	74	69<		
160	73	70<	73	74	71<	73	73	76	75	75	75	77	78	78	78	77	75	73		
200	69<	66<	67<	68<	67<	67<	71<	66<	69<	69<	70<	72<	74	74	73	71<	68<	68<		
250	68<	65<	65<	66<	64<	65<	65<	65<	65<	67<	68<	69<	72	74	74	72	67<	64<		
315	68	70	67	67	64<	65	65	65	66	67	68	70	74	77	75	74	69	67		
400	71	74	72	70	69	69	67	68	70	72	74	76	77	77	78	73	69	67	53<	51<
500	84	81	79	75	71	71	71	72	69	71	71	73	74	75	73	70	67	68	56<	48<
630	78	80	82	76	76	75	75	71	71	66	66	69	70	72	69	69	66	69	55<	52<
800	68	71	70	68	69	65	64	63	64	63	64	65	68	70	72	69	65	64	62	46<
1000	69	69	65	66	64	64	63	62	63	63	63	65	68	67	64	61	60	59	44<	44<
1250	69	69	69	66	67	68	64	63	64	64	64	66	69	66	62	61	60	60	44<	42<
1600	73	74	72	74	72	74	73	73	72	72	69	66	68	69	69	65	64	70	54	47<
2000	74	74	71	77	71	77	71	79	73	71	69	66	67	68	68	64	64	68	53	48
2500	77	77	74	80	73	79	71	79	71	69	67	68	65	67	65	61	64	63	51	49
3150	70	68	67	67	67	68	68	66	64	63	63	64	63	65	62	58	60	59	46<	44<
4000	68	66	67	66	68	68	67	67	63	62	62	65	64	67	64	60	60	59	45	43<
5000	65	64	61	63	64	65	61	61	61	60	60	63	63	67	64	59	59	56	42<	39<
6300	63	63	60	63	64	62	60	59	59	59	60	63	65	67	65	59	59	55	40<	40<
8000	63	62	60	63	63	63	62	59	58	57	59	62	64	66	64	59	58	56	42<	39<
10000	59	59	56	59	60	58	54	54	53	54	50	60	61	61	59	55	57	56	40<	36<
OVERALL	89	88	88	89	88	91	90	89	89	89	88	89	90	90	89	89	88	87	83	83

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)																		
1/3 OCTAVE BAND																		
DISTANCE = 75 METERS																		
NOISE SOURCE/SUBJECT: (OPERATION:)																		
F-104D AIRCRAFT (MILITARY POWER)																		
J79-GE-7/A ENGINE (100% RPM)																		
FAR FIELD NOISE (FREE FLOW)																		
FREQ (HZ) 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180																		
ANGLE (DEGREES)																		
25	74<	76<	77	76<	77<	79	80	79	83	85	86	86	90	93	97	100	100	97
31.5	78	77<	78	79	79	81	81	81	85	86	88	89	91	95	102	102	102	95
46	80	79	81	79	81	81	83	84	86	85	88	91	95	99	103	106	106	95
50	79	79	80	80	81	81	83	85	87	89	90	90	96	102	107	108	105	90
63	81	82	81	83	86	84	87	87	89	90	93	94	103	104	110	113	107	90
80	83	83	84	84	85	86	88	89	91	93	94	96	103	107	113	115	109	92
100	85	85	86	87	88	88	90	91	93	95	97	99	106	111	115	120	112	94
125	86	87	89	89	90	90	92	94	95	97	99	101	108	114	115	121	115	92
160	90	91	91	91	93	92	95	95	97	99	101	104	111	118	117	121	118	94
200	89	90	91	90	92	90	93	95	96	98	100	104	110	117	117	115	115	91
250	87	87	88	88	91	91	91	92	95	97	99	102	108	114	118	113	115	91
315	82	89	91	91	90	92	93	94	96	98	101	104	111	117	119	121	117	91
400	87	93	94	93	93	94	95	98	99	101	103	108	112	117	121	121	117	87
500	88	89	92	93	97	95	96	99	101	102	104	108	111	115	119	116	113	85
630	87	88	92	93	94	93	93	96	97	99	102	105	113	112	117	117	114	85
800	90	90	95	95	99	97	97	100	101	103	104	107	109	112	114	113	111	82
1000	85	87	93	94	98	97	95	98	99	100	102	104	108	109	114	113	110	81
1250	80	84	90	91	95	95	94	99	99	100	101	102	104	105	109	108	105	78
1600	79	82	89	91	95	95	94	100	101	103	104	104	104	104	109	106	101	78
2000	76	79	87	89	93	95	93	99	100	102	104	103	101	103	107	104	99	77
2500	75	78	86	87	92	92	91	98	99	102	103	102	100	101	106	105	100	75
3150	68	73	81	84	89	88	87	95	97	98	100	97	98	100	102	105	99	72
4000	67	72	81	83	88	87	87	95	96	98	99	97	99	100	102	104	99	71
5000	64	70	78	80	85	85	84	92	93	95	96	94	97	97	100	99	93	68
6300	62	69	77	78	83	83	83	91	91	93	94	93	95	95	98	99	90	67
8000	61	69	76	76	82	82	81	89	89	91	92	92	93	95	98	98	88	65
10000	61	67	73	73	78	78	78	84	85	87	89	89	91	92	96	96	85	61
OVERALL	98	100	103	103	106	106	106	110	111	113	114	116	121	126	128	129	126	104

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)																			
1/3 OCTAVE BAND																			
DISTANCE = 50 METERS																			
NOISE SOURCE/SUBJECT:																			
OPERATION:																			
AFTERBURNER POWER																			
100% RPM																			
DEFLECTED FLOW																			
METEOROLOGY:																			
TEMP = 24 C																			
BAR PRESS = .758 M HG																			
REL HUMID = 90 %																			
PAGE 2																			
IDENTIFICATION:																			
OMEGA 1.4																			
TEST 75-002-060																			
RUN 03																			
F-104D AIRCRAFT																			
J79-GE-7/A ENGINE																			
FAR FIELD NOISE																			
FREQ (HZ)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
25	90	91	91	90	92	92	92	92	94	96	95	100	102	107	111	114	109		
31.5	94	95	93	94	95	95	94	94	97	97	99	102	106	113	116	116	111		
40	95	97	95	95	97	97	97	98	100	101	101	104	109	116	119	121	112		
50	94	96	95	96	96	99	98	99	100	101	102	105	110	119	122	121	109		
63	97	99	97	98	98	99	100	101	102	104	105	107	113	123	125	123	110		
80	99	101	99	100	100	102	102	102	104	105	106	110	116	126	128	124	112		
100	101	102	103	103	103	104	104	106	106	108	110	113	116	120	131	133	127	113	
125	104	106	105	104	104	105	106	106	108	109	111	114	118	123	129	132	130	113	
160	105	106	107	106	107	108	107	109	109	111	114	118	124	127	128	125	110		
200	103	104	105	104	104	106	105	106	108	109	113	117	124	126	131	125	108		
250	104	104	103	104	105	106	105	107	110	112	115	118	126	133	128	123	107		
315	101	104	105	107	108	109	108	110	111	113	117	121	126	133	128	123	107		
400	99	104	108	106	107	107	108	109	109	111	115	120	125	128	127	121	103		
500	98	102	104	103	105	105	106	108	111	112	114	120	124	129	124	119	103		
630	101	103	105	106	107	106	109	110	110	112	114	121	125	127	125	120	102		
800	97	98	101	101	103	103	104	105	107	107	110	117	121	124	120	114	99		
1000	95	97	100	99	103	105	103	104	104	104	111	115	120	121	119	112	98		
1250	94	95	98	97	101	108	101	101	100	103	114	113	118	119	115	110	97		
1600	93	95	98	99	99	108	102	101	104	109	116	113	118	118	115	109	97		
2000	94	97	101	101	99	107	105	108	109	113	116	115	116	117	114	108	95		
2500	95	97	102	100	99	105	106	110	109	112	113	114	112	115	112	107	92		
3150	90	93	97	97	98	104	105	106	107	109	112	113	112	115	112	106	92		
4000	87	91	94	94	95	101	103	102	103	106	110	110	112	113	109	104	90		
5000	85	88	92	92	92	98	99	100	101	105	108	108	110	111	107	101	87		
6300	84	86	90	90	91	97	99	99	101	104	107	108	110	111	107	101	86		
8000	81	84	88	88	88	95	96	97	99	101	105	105	109	109	105	99	83		
10000	81	83	87	87	87	93	96	96	98	101	105	106	109	110	105	99	82		
OVERALL	113	114	116	116	116	119	118	120	121	123	126	130	134	140	139	136	122		
LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.																			

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

FIGURE: NORMALIZED FARFIELD NOISE LEVELS

3
DISTANCE = 100 METERS

NOISE SOURCE/SUBJECT:

F-104D AIRCRAFT

J79-GE-7/A ENGINE

FAR FIELD NOISE

NOISE SOURCE/SUBJECT: ; OPERATIONS:

F-1040	AIRCRAFT	(	IOLE POWER
--------	----------	---	------------

J79-GE-7/A ENGINE 1 67% RPM

FAR FIELD NOISE (FREE FLOW

NOISE SOURCE/SUBJECT :
{ OPERATIONS:
) METEOROLOGY:

F-1040 AIRCRAFT (IOLE POWER (BAR PRESS =

J79-GE-7/A ENGINE (67% RPM) REL HUMID = 70 %

FAR FIELD NOISE (FREE FLOW)

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NOISE SOURCE/SUBJECT:
      ( OPERATION:
      ) METEOROLOGY:
      ) RUN 01

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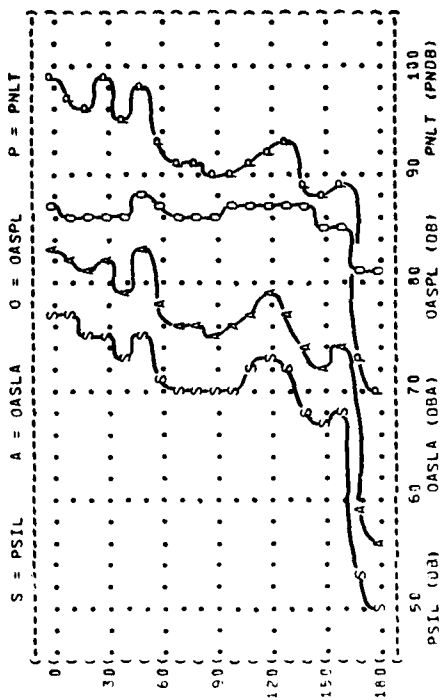
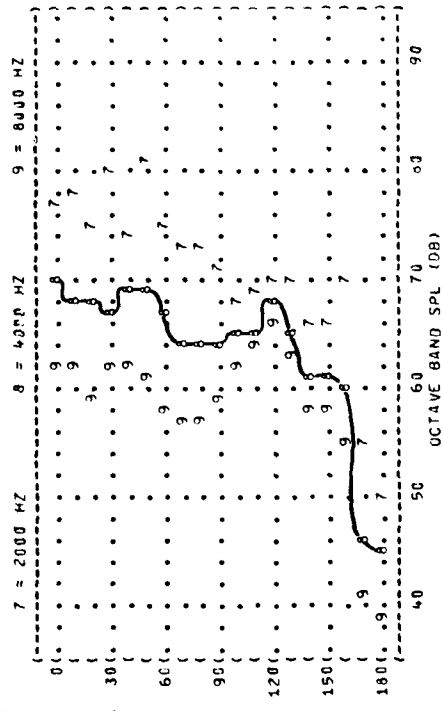
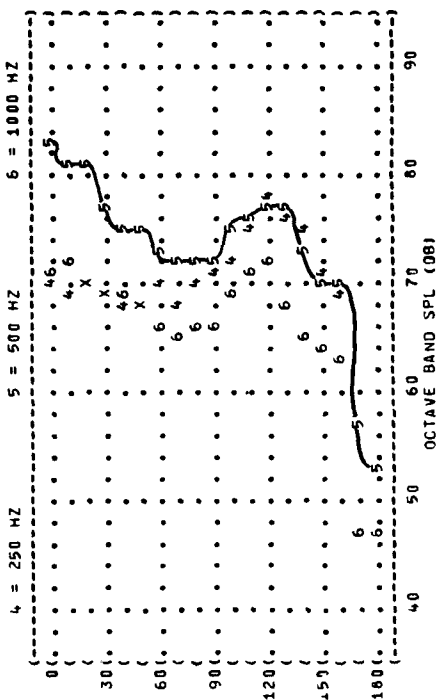
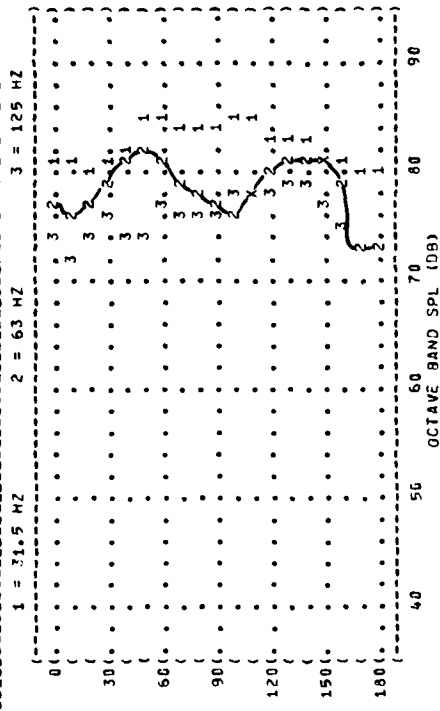
F-104D AIRCRAFT (IOLE POWER) BAR PRESS = .760 M HG) 10 SEP 70

J79-GE-77A ENGINE

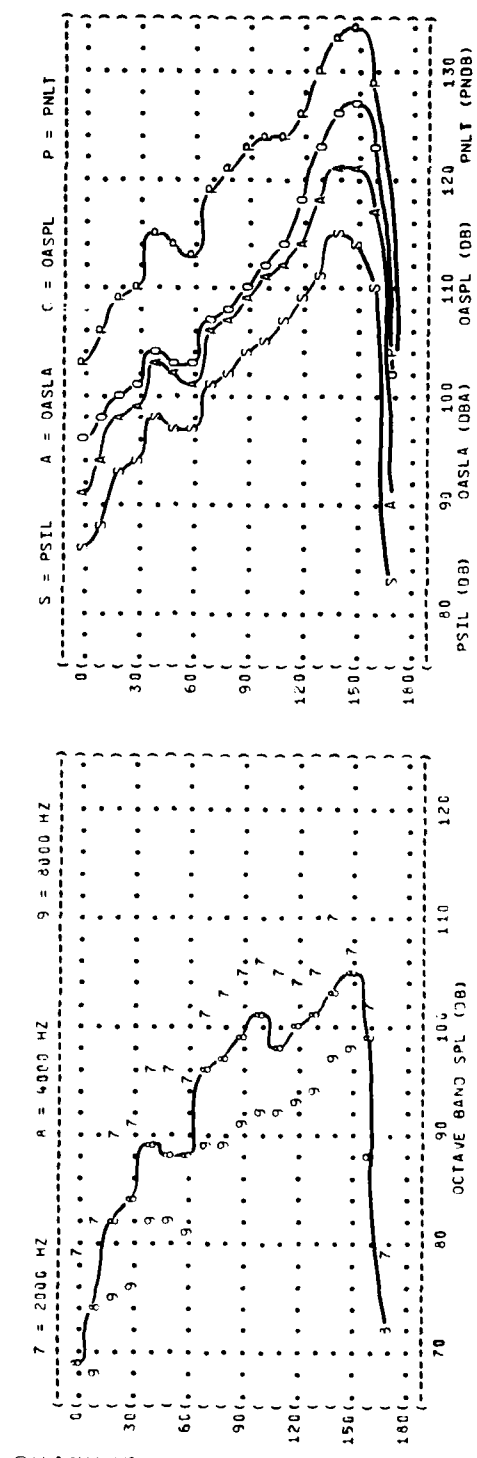
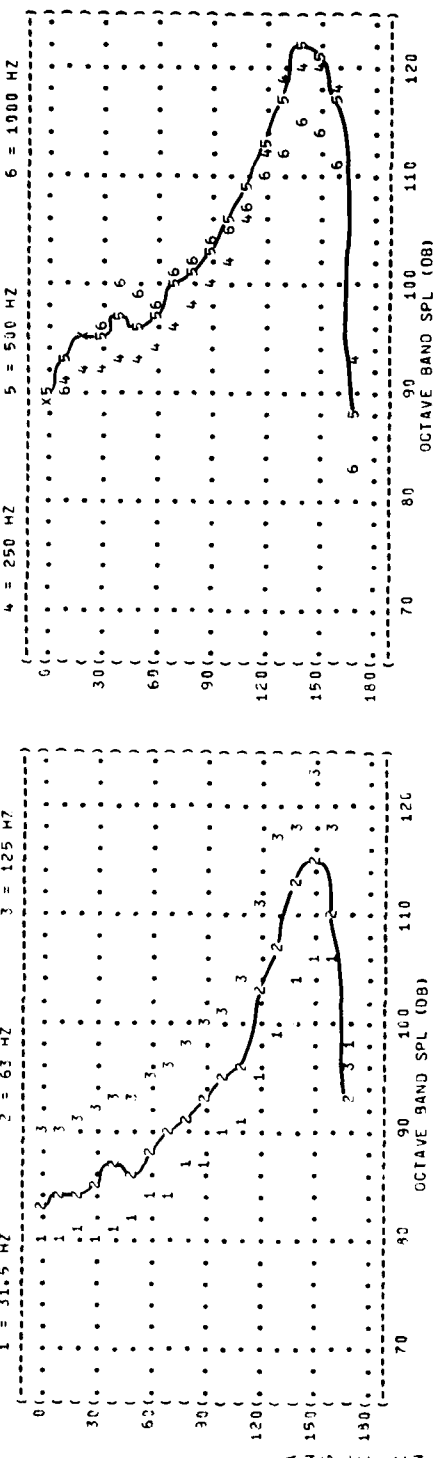
FAR FIELD NOISE (FREE FLOW) PAGE 8

F-104D AIRCRAFT () IOLE POWER () BAR PRESS = .760 M HG) 10 SEP 78

J79-GE-7/A ENGINE
(67% RPM
) REL HUMID = 70 %
)
)



(FIGURE 1 NORMALIZED FARFIELD NOISE LEVELS
 (3 DISTANCE = 100 METERS
 (NOISE SOURCE/SURFACE
 (F-104D AIRCRAFT
 (J79-GE-7/A ENGINE
 (FAR FIELD NOISE
 (OPERATION:
 (MILITARY POWER
 (100% RPM
 (FREE FLOW
 (METEOROLOGICAL:
 (TEMP = 15 C
 (BAR PRESS = .763 M HG
 (REL HUMID = 70 %
 (PAGE 6
 (IDENTIFICATION:
 (OMEGA 1.44
 (TEST 75-002-033
 (RUN 03
 (10 SEP 78
 (6 = 1900 HZ
 (5 = 500 HZ
 (4 = 250 HZ
 (3 = 125 HZ
 (2 = 63 HZ
 (1 = 31.5 HZ



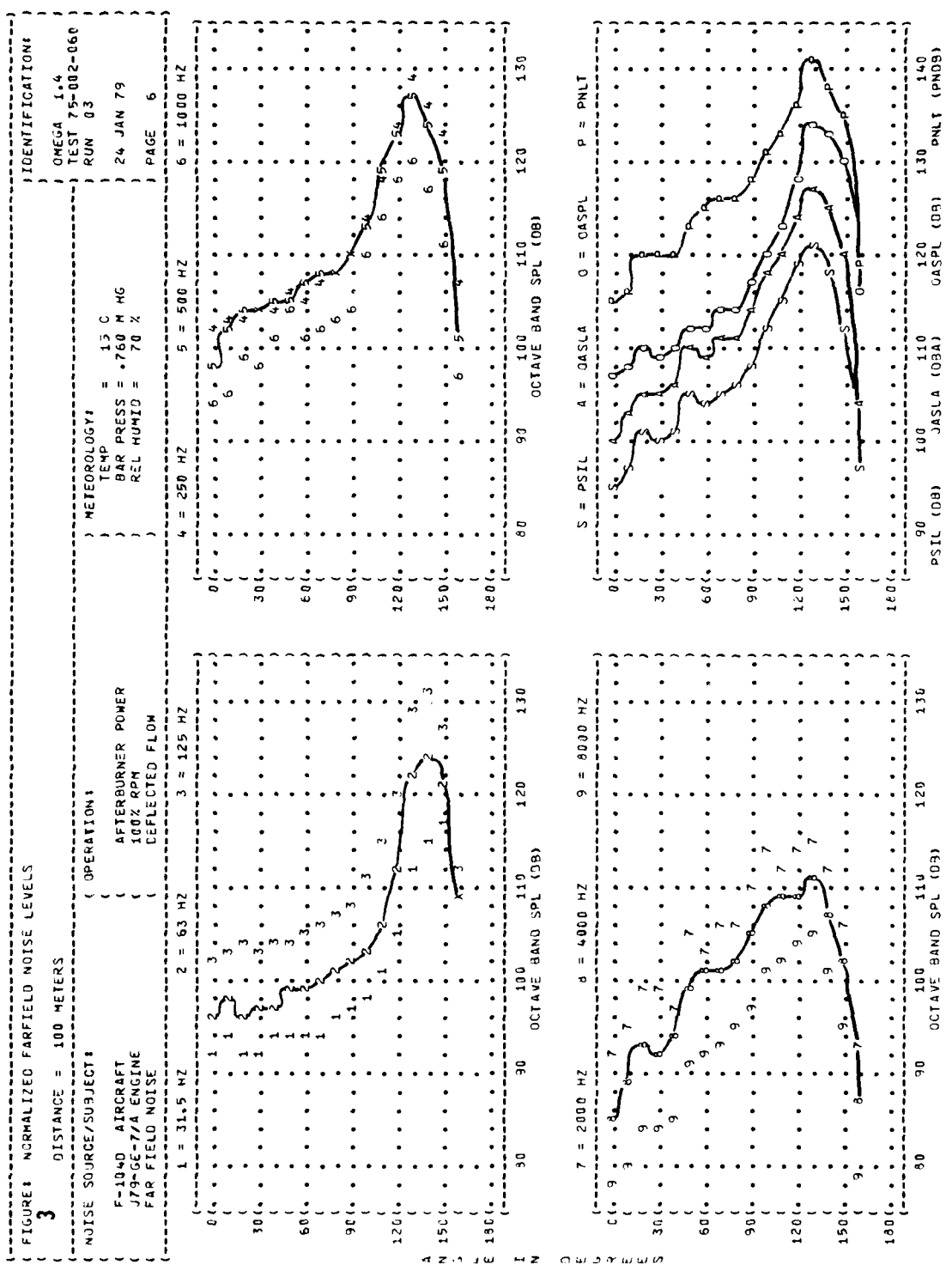


FIGURE 4: ACOUSTIC POWER LEVEL (PWL)

IDENTIFICATION: OMEGA 1.4
 TEST 75-002-033
 RUN 01

NOISE SOURCE/SUBJECT: F-1040 AIRCRAFT
 J79-GE-7/A ENGINE
 FAR FIELD NOISE

OPERATION: IDLE POWER
 67% RPM
 FREE FLOW

METEOROLOGY: TEMP = 28 C
 BAR PRESS = .761 M HG
 REL HUMID = 73 %

18 SEP 78
 PAGE 3

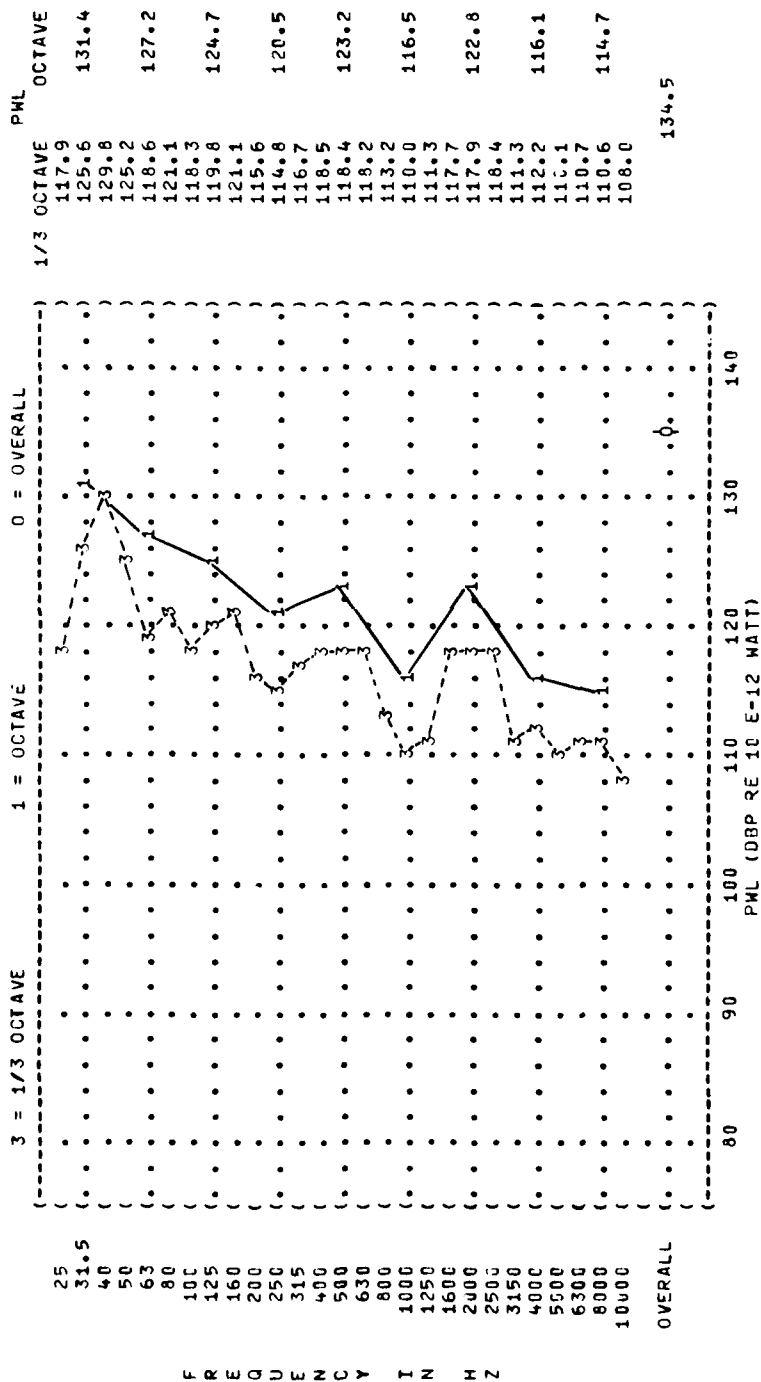


FIGURE: ACOUSTIC POWER LEVEL (PWL)

•
•
•
•
•
•

OMEGA 1.4
TEST 75-002-033

RUN 03

6
P
6
L
C
6
4

01 DEC 67

PAGE 3

.....

CTAVE **OCTAVE**

136.9

139.6
142.5
145.0

144.3

148.0	153.0
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150.5
154.3

155.5 160.5

157.1
155.4

152.4 160.6

157.3

158.4 161.4

154.6

153.0 154.0 155.0 156.0 157.0 158.0 159.0 160.0 161.0 162.0 163.0 164.0 165.0 166.0 167.0 168.0 169.0 170.0 171.0 172.0 173.0 174.0 175.0 176.0 177.0 178.0 179.0 180.0 181.0 182.0 183.0 184.0 185.0 186.0 187.0 188.0 189.0 190.0 191.0 192.0 193.0 194.0 195.0 196.0 197.0 198.0 199.0 200.0 201.0 202.0 203.0 204.0 205.0 206.0 207.0 208.0 209.0 210.0 211.0 212.0 213.0 214.0 215.0 216.0 217.0 218.0 219.0 220.0 221.0 222.0 223.0 224.0 225.0 226.0 227.0 228.0 229.0 230.0 231.0 232.0 233.0 234.0 235.0 236.0 237.0 238.0 239.0 240.0 241.0 242.0 243.0 244.0 245.0 246.0 247.0 248.0 249.0 250.0 251.0 252.0 253.0 254.0 255.0 256.0 257.0 258.0 259.0 260.0 261.0 262.0 263.0 264.0 265.0 266.0 267.0 268.0 269.0 270.0 271.0 272.0 273.0 274.0 275.0 276.0 277.0 278.0 279.0 280.0 281.0 282.0 283.0 284.0 285.0 286.0 287.0 288.0 289.0 290.0 291.0 292.0 293.0 294.0 295.0 296.0 297.0 298.0 299.0 300.0 301.0 302.0 303.0 304.0 305.0 306.0 307.0 308.0 309.0 310.0 311.0 312.0 313.0 314.0 315.0 316.0 317.0 318.0 319.0 320.0 321.0 322.0 323.0 324.0 325.0 326.0 327.0 328.0 329.0 330.0 331.0 332.0 333.0 334.0 335.0 336.0 337.0 338.0 339.0 340.0 341.0 342.0 343.0 344.0 345.0 346.0 347.0 348.0 349.0 350.0 351.0 352.0 353.0 354.0 355.0 356.0 357.0 358.0 359.0 360.0 361.0 362.0 363.0 364.0 365.0 366.0 367.0 368.0 369.0 370.0 371.0 372.0 373.0 374.0 375.0 376.0 377.0 378.0 379.0 380.0 381.0 382.0 383.0 384.0 385.0 386.0 387.0 388.0 389.0 390.0 391.0 392.0 393.0 394.0 395.0 396.0 397.0 398.0 399.0 400.0 401.0 402.0 403.0 404.0 405.0 406.0 407.0 408.0 409.0 410.0 411.0 412.0 413.0 414.0 415.0 416.0 417.0 418.0 419.0 420.0 421.0 422.0 423.0 424.0 425.0 426.0 427.0 428.0 429.0 430.0 431.0 432.0 433.0 434.0 435.0 436.0 437.0 438.0 439.0 440.0 441.0 442.0 443.0 444.0 445.0 446.0 447.0 448.0 449.0 450.0 451.0 452.0 453.0 454.0 455.0 456.0 457.0 458.0 459.0 460.0 461.0 462.0 463.0 464.0 465.0 466.0 467.0 468.0 469.0 470.0 471.0 472.0 473.0 474.0 475.0 476.0 477.0 478.0 479.0 480.0 481.0 482.0 483.0 484.0 485.0 486.0 487.0 488.0 489.0 490.0 491.0 492.0 493.0 494.0 495.0 496.0 497.0 498.0 499.0 500.0 501.0 502.0 503.0 504.0 505.0 506.0 507.0 508.0 509.0 510.0 511.0 512.0 513.0 514.0 515.0 516.0 517.0 518.0 519.0 520.0 521.0 522.0 523.0 524.0 525.0 526.0 527.0 528.0 529.0 530.0 531.0 532.0 533.0 534.0 535.0 536.0 537.0 538.0 539.0 540.0 541.0 542.0 543.0 544.0 545.0 546.0 547.0 548.0 549.0 550.0 551.0 552.0 553.0 554.0 555.0 556.0 557.0 558.0 559.0 560.0 561.0 562.0 563.0 564.0 565.0 566.0 567.0 568.0 569.0 570.0 571.0 572.0 573.0 574.0 575.0 576.0 577.0 578.0 579.0 580.0 581.0 582.0 583.0 584.0 585.0 586.0 587.0 588.0 589.0 590.0 591.0 592.0 593.0 594.0 595.0 596.0 597.0 598.0 599.0 600.0 601.0 602.0 603.0 604.0 605.0 606.0 607.0 608.0 609.0 610.0 611.0 612.0 613.0 614.0 615.0 616.0 617.0 618.0 619.0 620.0 621.0 622.0 623.0 624.0 625.0 626.0 627.0 628.0 629.0 630.0 631.0 632.0 633.0 634.0 635.0 636.0 637.0 638.0 639.0 640.0 641.0 642.0 643.0 644.0 645.0 646.0 647.0 648.0 649.0 650.0 651.0 652.0 653.0 654.0 655.0 656.0 657.0 658.0 659.0 660.0 661.0 662.0 663.0 664.0 665.0 666.0 667.0 668.0 669.0 670.0 671.0 672.0 673.0 674.0 675.0 676.0 677.0 678.0 679.0 680.0 681.0 682.0 683.0 684.0 685.0 686.0 687.0 688.0 689.0 690.0 691.0 692.0 693.0 694.0 695.0 696.0 697.0 698.0 699.0 700.0 701.0 702.0 703.0 704.0 705.0 706.0 707.0 708.0 709.0 710.0 711.0 712.0 713.0 714.0 715.0 716.0 717.0 718.0 719.0 720.0 721.0 722.0 723.0 724.0 725.0 726.0 727.0 728.0 729.0 730.0 731.0 732.0 733.0 734.0 735.0 736.0 737.0 738.0 739.0 740.0 741.0 742.0 743.0 744.0 745.0 746.0 747.0 748.0 749.0 750.0 751.0 752.0 753.0 754.0 755.0 756.0 757.0 758.0 759.0 760.0 761.0 762.0 763.0 764.0 765.0 766.0 767.0 768.0 769.0 770.0 771.0 772.0 773.0 774.0 775.0 776.0 777.0 778.0 779.0 780.0 781.0 782.0 783.0 784.0 785.0 786.0 787.0 788.0 789.0 790.0 791.0 792.0 793.0 794.0 795.0 796.0 797.0 798.0 799.0 800.0 801.0 802.0 803.0 804.0 805.0 806.0 807.0 808.0 809.0 810.0 811.0 812.0 813.0 814.0 815.0 816.0 817.0 818.0 819.0 820.0 821.0 822.0 823.0 824.0 825.0 826.0 827.0 828.0 829.0 830.0 831.0 832.0 833.0 834.0 835.

151.9
148.2
156.3

148.7

147.5 152.6

147.0
144.7

144.9 148.8

141.9
141.1

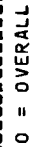
145.2

139.1

166.6

1

19



4 8 W 0 3 W Z U 7 H Z I N

FIGURE: ACOUSTIC POWER LEVEL (PWL)

4

IDENTIFICATION:

OMEGA 1.4

TEST 75-002-060

RUN 03

24 JAN 79

PAGE 3

NOISE SOURCE/SUBJECT:

OPERATION:

METEOROLOGY:

TEMP = 24 C

AFTERBURNER POWER

BAR PRESS = .758 M HG

100% RPM

REL HUMID = 90 %

DEFLECTED FLOW

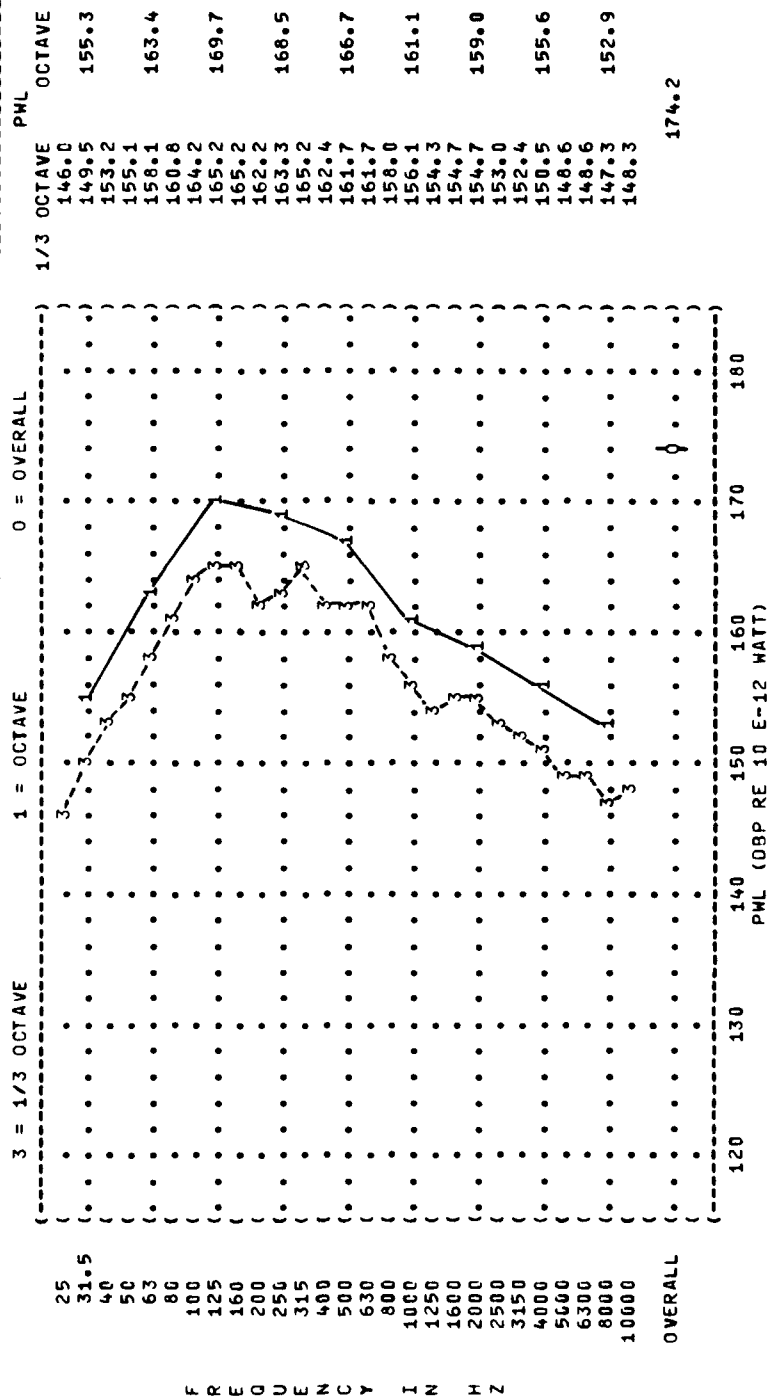


TABLE: DIRECTIVITY INDEX (DB)										IDENTIFICATION:									
6										OMEGA 1.4									
NOISE SOURCE/SUBJECT:										TEST 75-002-033									
F-104D AIRCRAFT										RUN 93									
J79-GE-7/A ENGINE										18 SEP 78									
FAR FIELD NOISE										PAGE 4									
OPERATION:										METEOROLOGY:									
MILITARY POWER										TEMP = 2° C									
100% RPM										BAR PRESS = .761 M HG									
FREE FLOW										REL HUMID = 73 %									
FREQ	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
(HZ)																			
1/3 OCTAVE																			
25	-18	-15	-14	-16	-15	-13	-12	-13	-8	-7	-6	-6	-2	1	6	9	8	6	
31.5	-17	-18	-16	-16	-15	-15	-13	-13	-9	-9	-6	-5	-3	1	8	8	8	1	
40	-18	-18	-17	-18	-16	-16	-14	-14	-12	-12	-9	-6	-2	2	6	9	9	-3	
50	-20	-20	-19	-19	-18	-18	-16	-14	-14	-12	-10	-9	-3	3	8	9	6	-9	
63	-22	-21	-21	-20	-17	-19	-16	-16	-14	-13	-10	-9	-3	2	7	10	5	-12	
80	-23	-22	-22	-21	-21	-19	-18	-16	-15	-13	-11	-9	-2	2	7	10	4	-14	
100	-24	-24	-23	-22	-21	-21	-19	-18	-16	-14	-12	-10	-3	2	6	11	3	-15	
125	-24	-23	-21	-21	-21	-20	-18	-16	-15	-13	-11	-9	-3	3	5	11	5	-19	
160	-22	-21	-21	-21	-19	-20	-17	-16	-15	-12	-11	-8	-1	6	5	9	6	-17	
200	-21	-20	-19	-20	-18	-20	-17	-15	-14	-12	-10	-6	0	7	7	5	5	-19	
250	-22	-22	-21	-21	-18	-18	-17	-15	-14	-12	-10	-7	-1	5	9	4	6	-18	
315	-23	-21	-21	-21	-20	-19	-18	-17	-16	-14	-11	-8	-1	5	7	9	5	-21	
400	-26	-20	-19	-20	-20	-19	-18	-15	-14	-12	-10	-5	-1	4	8	8	4	-26	
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800	-18	-17	-13	-12	-8	-10	-11	-8	-6	-4	-3	0	2	5	6	6	3	-25	
1000	-21	-19	-13	-12	-8	-9	-11	-8	-7	-6	-4	-3	1	3	7	7	4	-25	
1250	-22	-19	-12	-12	-7	-8	-8	-4	-4	-3	-1	0	2	3	7	5	2	-25	
1600	-24	-21	-13	-12	-7	-7	-9	-2	-1	0	1	1	1	1	7	3	-1	-25	
2000	-26	-22	-15	-13	-8	-7	-9	-2	-1	1	3	2	-1	1	6	3	-2	-24	
2500	-26	-22	-15	-13	-9	-8	-9	-2	-1	2	2	2	1	1	5	5	-1	-25	
3150	-30	-25	-17	-14	-9	-10	-11	-3	-1	0	2	-1	0	2	4	7	1	-26	
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10000	-28	-22	-16	-16	-11	-11	-11	-5	-4	-2	0	0	2	3	7	7	-4	-28	
OCTAVE																			
31.5	-17	-17	-16	-17	-16	-15	-14	-13	-10	-10	-7	-6	-3	2	7	9	9	1	
63	-22	-22	-21	-20	-19	-19	-17	-16	-14	-12	-11	-9	-2	2	7	10	4	-12	
125	-23	-22	-21	-21	-20	-20	-18	-17	-15	-13	-11	-9	-2	5	5	10	5	-17	
250	-23	-22	-20	-21	-19	-19	-18	-17	-15	-13	-11	-7	-1	6	8	7	5	-20	
500	-24	-20	-18	-18	-16	-17	-16	-13	-12	-10	-8	-4	0	4	8	7	4	-25	
1000	-19	-18	-13	-12	-8	-9	-10	-7	-6	-4	-1	2	1	2	7	6	3	-25	
2000	-25	-22	-14	-12	-8	-7	-9	-2	-1	1	2	1	1	1	6	4	-1	-25	
4000	-30	-25	-17	-15	-9	-10	-11	-3	-2	0	2	-1	1	2	4	6	0	-26	
8000	-30	-23	-16	-16	-10	-10	-10	-3	-3	-1	1	0	2	3	6	6	-4	-27	
OVERALL	-23	-21	-18	-18	-15	-15	-15	-11	-10	-8	-7	-5	0	5	7	8	5	-17	

TABLE: DIRECTIVITY INDEX (DB)										IDENTIFICATION:									
6										OMEGA 1.4									
NOISE SOURCE/SUBJECT:										TEST 75-002-660									
(										RUN 03									
(										F-104D AIRCRAFT									
(										J79-GE-7/A ENGINE									
(										24 JAN 79									
(										FAR FIELD NOISE									
(										PAGE 4									
FREQ										ANGLE (DEGREES)									
(HZ)										(									
1/3 OCTAVE																			
(25																			
(31.5																			
(40																			
(50																			
(63																			
(80																			
(100																			
(125																			
(160																			
(200																			
(250																			
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(400																			
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(630																			
(800																			
(1000																			
(1250																			
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(2500																			
(3150																			
(4000																			
(5000																			
(6300																			
(8000																			
(10000																			
OCTAVE																			
(31.5																			
(63																			
(125																			
(250																			
(500																			
(1000																			
(2000																			
(4000																			
(8000																			
OVERALL																			

FIGURE: OVERALL SOUND PRESSURE LEVEL (OASPL)
EQUAL LEVEL CONTOURS (DB)

5

IDENTIFICATION:

OMEGA 1.4

TEST 75-002-033

RUN 03

METEOROLOGY:

TEMP = 15 C

BAR PRESS = .760 H HG

REL HUMID = 70 %

OPERATIONS:

MILITARY POWER

100% RPM

FREE FLOW

NOISE SOURCE/SUBJECT:

F-104D AIRCRAFT

J79-GE-7/A ENGINE

FAR FIELD NOISE

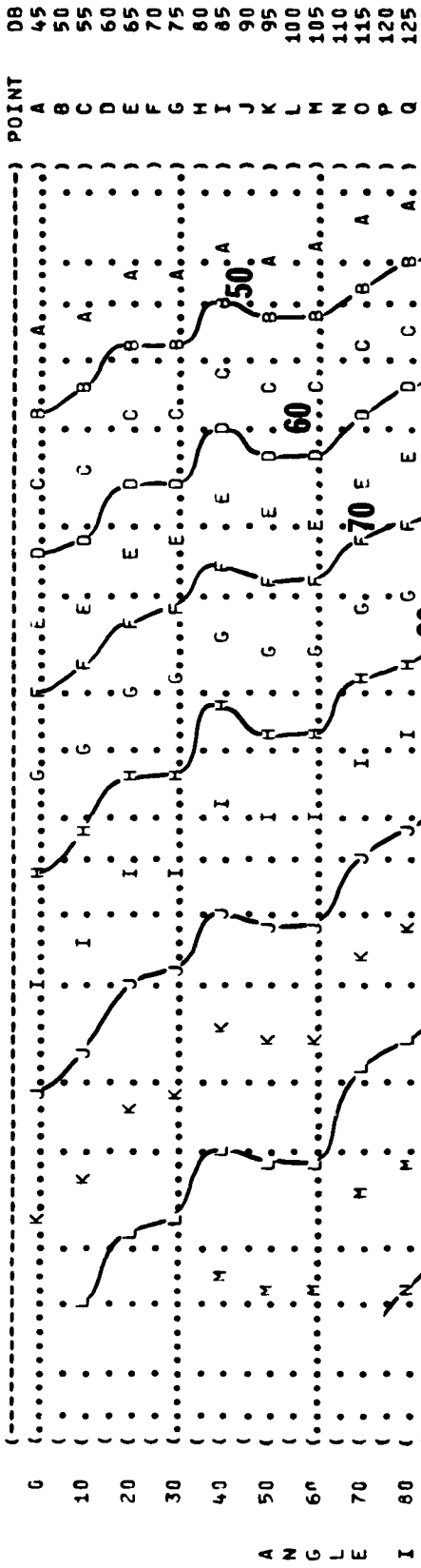


FIGURE: OVERALL SOUND PRESSURE LEVEL (OASPL)
EQUAL LEVEL CONTOURS (DB)

5

IDENTIFICATION:

OMEGA 1.4

TEST 75-002-060

03
RUN

24 JUL

1) METEOROLOGY:

TEMP = 15 C

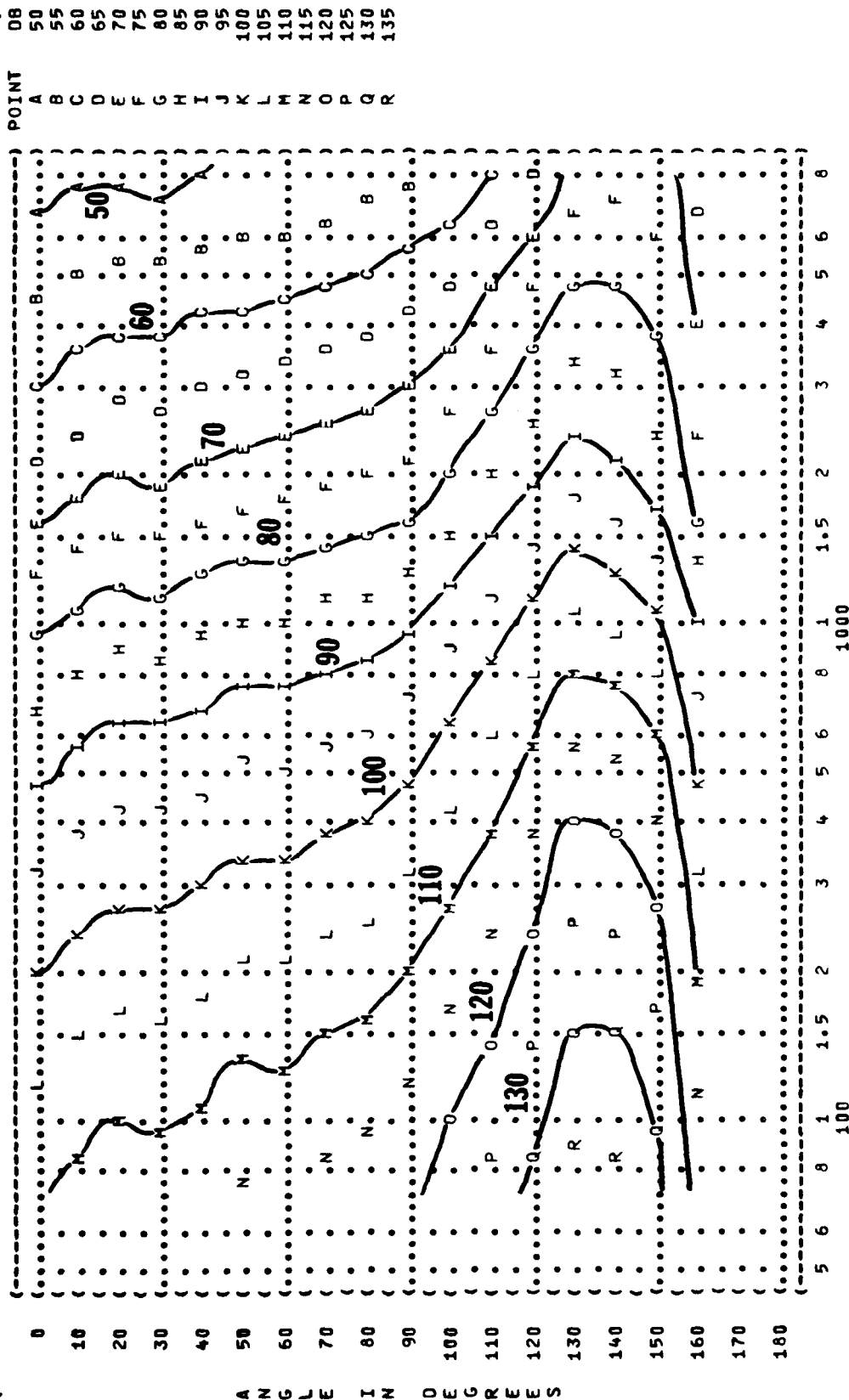
BAR PRESS = .760 M HG

REL HUMID = 70 %

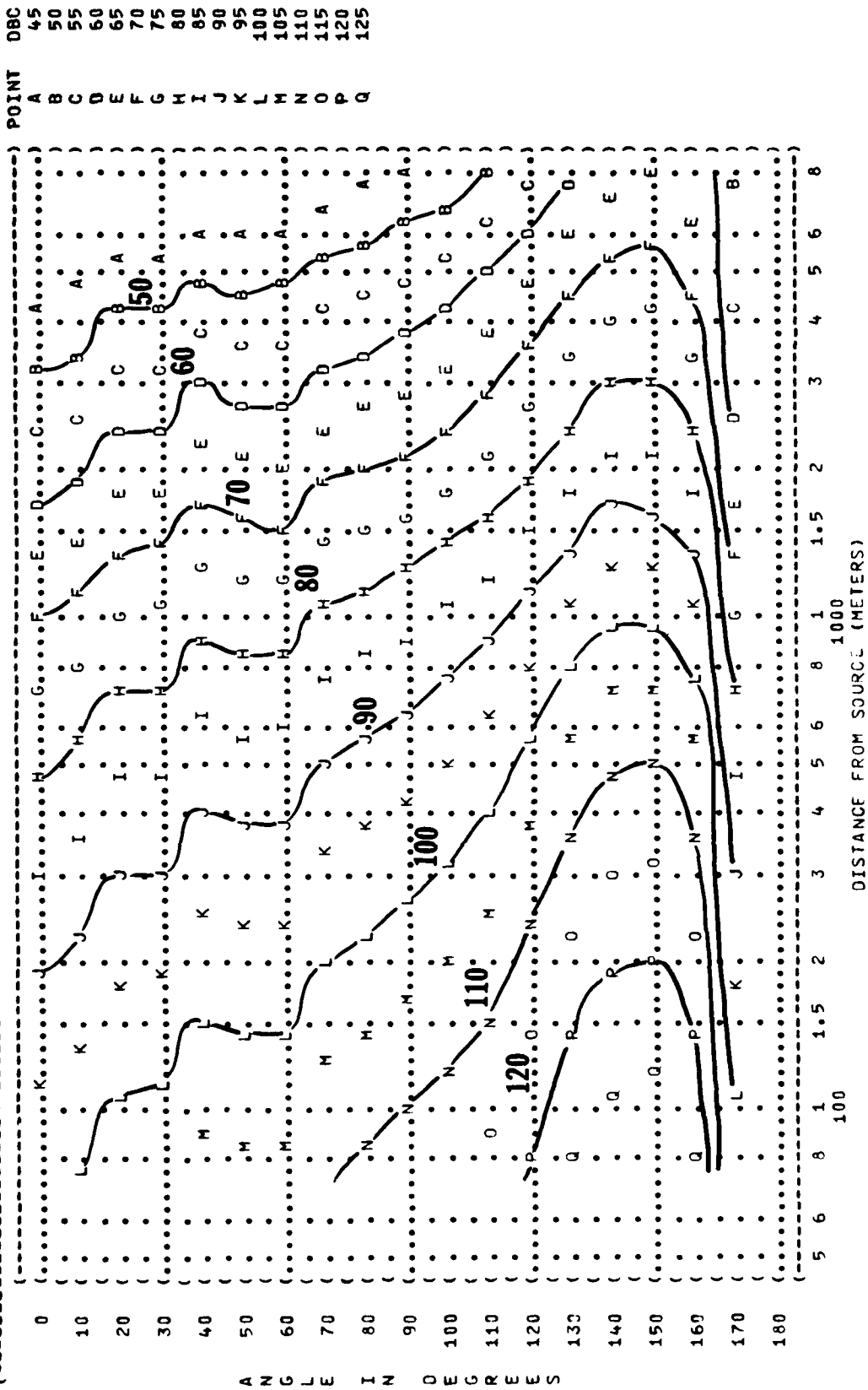
OPERATIONS:

(1) AFTERBURN

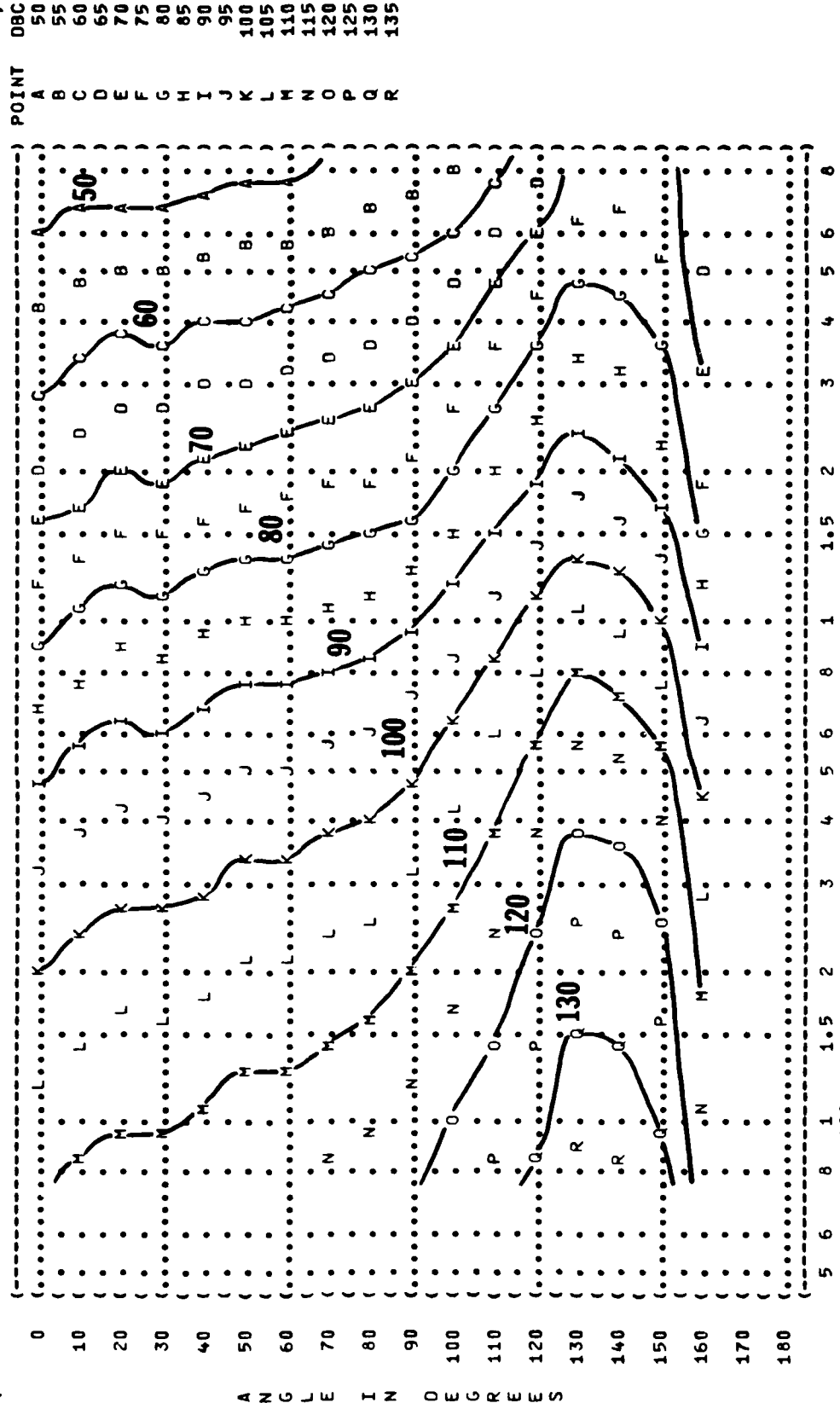
(100% RPM



(FIGURE: C-WEIGHTED OVERALL SOUND LEVEL (OASLC)
 (6
 (EQUAL LEVEL CONTOURS (DBC)
 () IDENTIFICATION:
 () OMEGA 1.4
 () TEST 75-002-033
 () RUN 03
 () METEOROLOGY:
 () TEMP = 15 C
 () BAR PRESS = .760 M HG
 () REL HUMID = 70 %
 () 18 SEP 78
 () PAGE 14
 ()
 (NOISE SOURCE/SUBJECT: (OPERATION:
 ()
 () F-104D AIRCRAFT (MILITARY POWER
 () J79-GE-7/A ENGINE (100% RPM
 () FAR FIELD NOISE (FREE FLOW

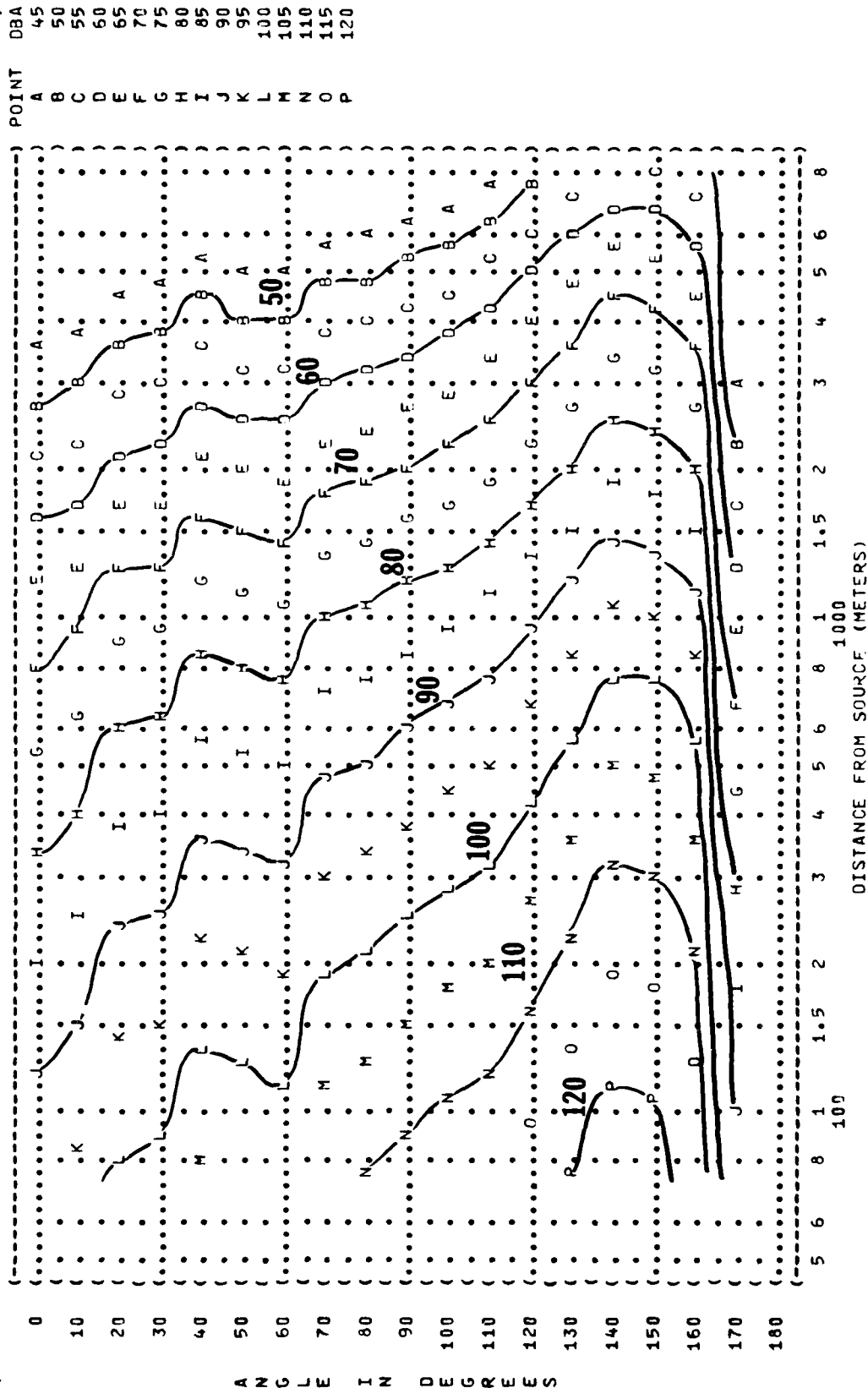


() FIGURE: C-WEIGHTED OVERALL SOUND LEVEL (OASLC)
 () IDENTIFICATION:
 () 6
 () EQUAL LEVEL CONTOURS (DBC)
 () OMEGA 1.4
 () TEST 75-002-060
 () NOISE SOURCE/SUBJECT: () OPERATION:
 () METEOROLOGY:
 () F-104D AIRCRAFT () AFTERBURNER POWER () TEMP = 15 C
 () J79-GE-7/A ENGINE () 100% RPM () BAR PRESS = .760 M HG
 () FAR FIELD NOISE () DEFLECTED FLOW () REL HUMID = 70 %
 () 24 JAN 79
 () PAGE 14
 () RUN 03

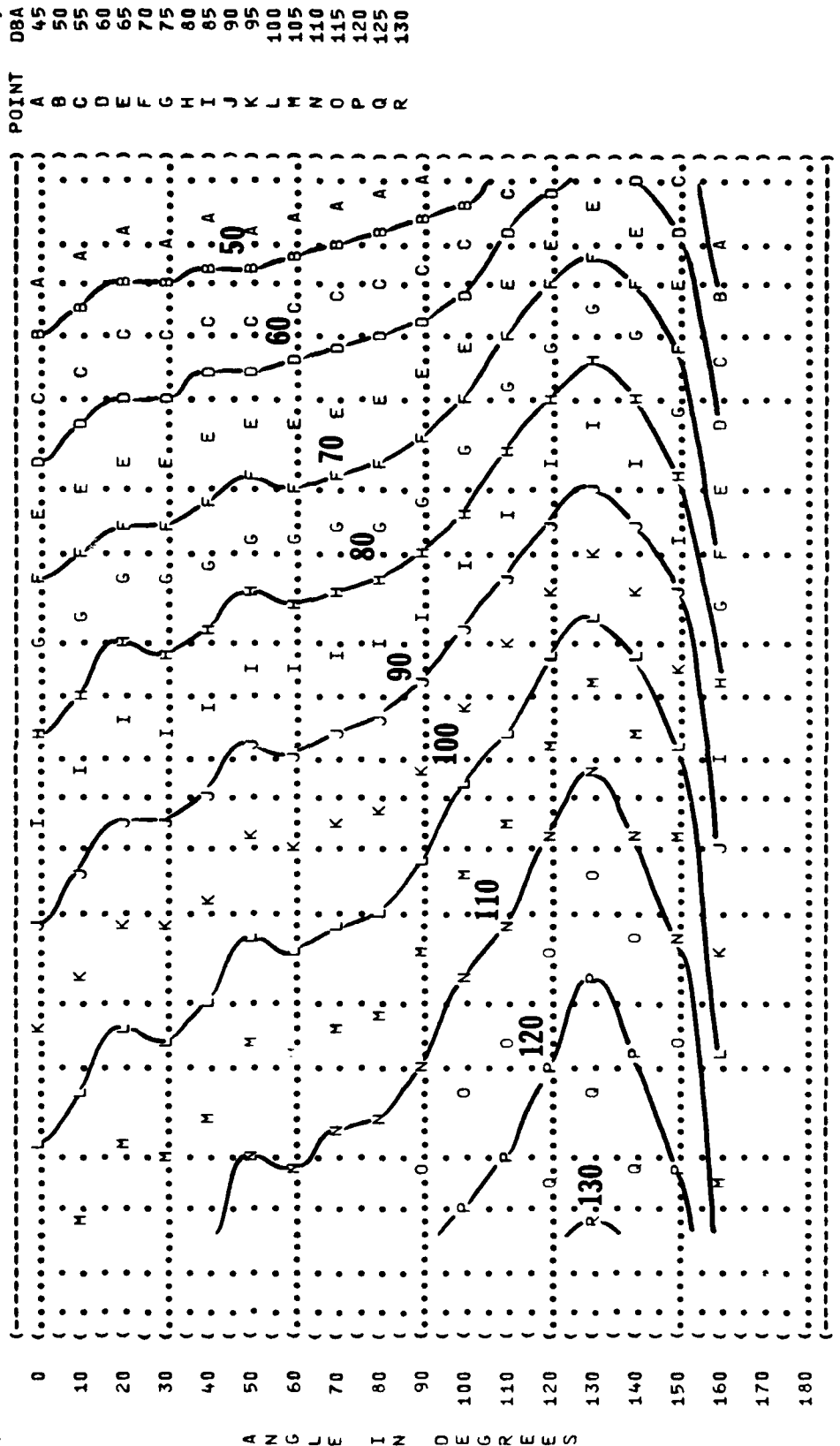


A N G L E I N D E G R E E S

FIGURE:	A-WEIGHTED OVERALL SOUND LEVEL (OASLA)	EQUAL LEVEL CONTOURS (DBA)	IDENTIFICATION:
7			
NOISE SOURCE/SUBJECT:	OPERATION:	METEOROLOGY:	
F-104D AIRCRAFT	MILITARY POWER	TEMP = 15 C	
J79-GE-7/A ENGINE	100% RPM	BAR PRESS = .760 M HG	18 SEP 78
FAR FIELD NOISE	FREE FLOW	REL HUMID = 70 %	
			PAGE 15

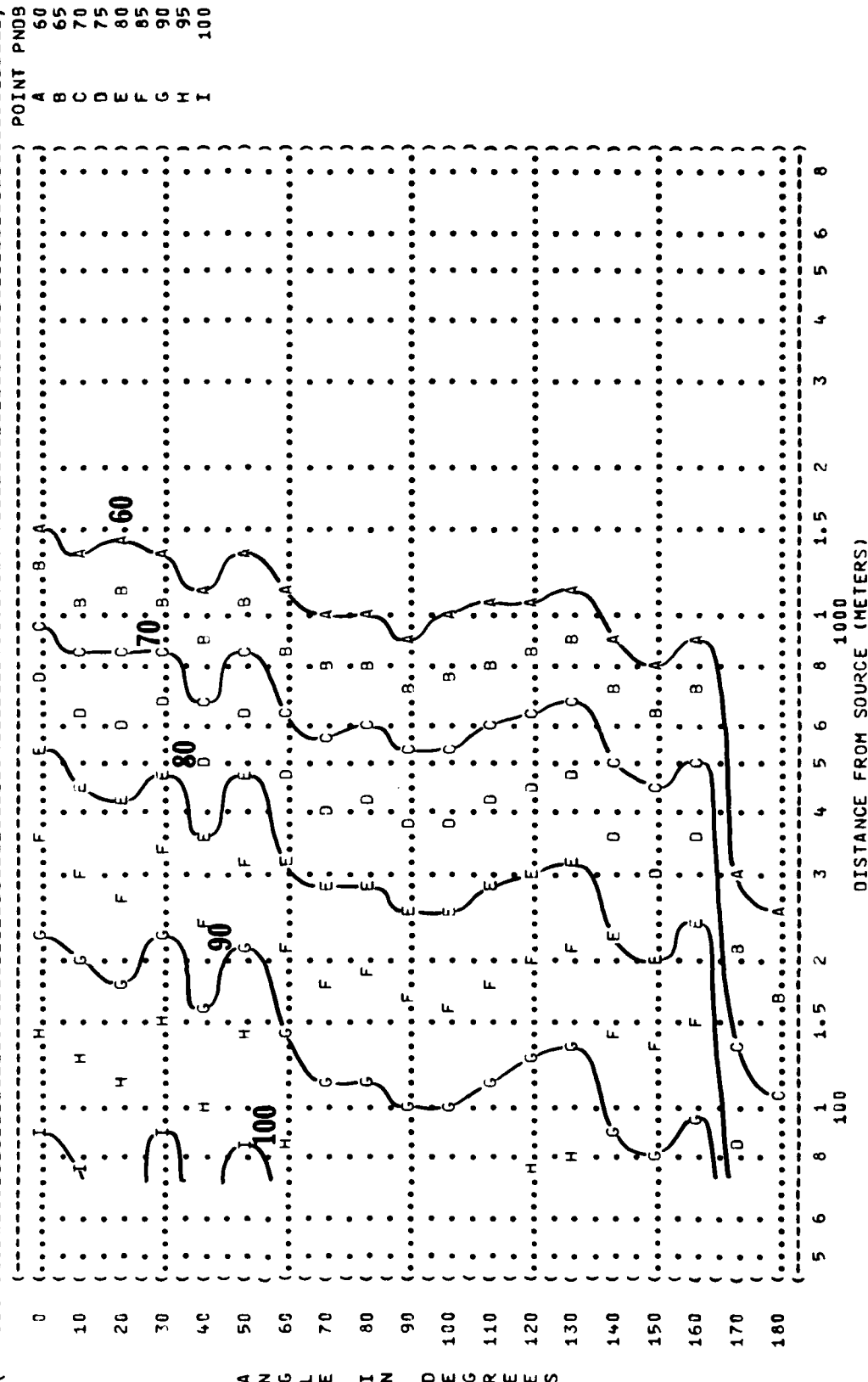


(FIGURE: A-WEIGHTED OVERALL SOUND LEVEL (OASLA)
 (7
 (EQUAL LEVEL CONTOURS (DBA)
 () IDENTIFICATION:
 ()
 () OMEGA 1.4
 () TEST 75-002-060
 () RUN 03
 ()
 () METEOROLOGY:
 () TEMP = 15 C
 () BAR PRESS = .760 M HG
 () REL HUMID = 70 %
 () 24 JAN 79
 ()
 () NOISE SOURCE/SUBJECT:
 () OPERATION:
 ()
 () F-1040 AIRCRAFT
 () AFTERBURNER POWER
 () 100% RPM
 () DEFLECTED FLOW
 ()
 () PAGE 15



A
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(-----)
( FIGURE: PERCEIVED NOISE LEVEL WITH SMOOTH TONE CORRECTION {PNLT} ) IDENTIFICATION: )
(      8 EQUAL LEVEL CONTOURS (PNOB) ) )
( ) ) OMEGA 1.4 )
(-----)
( NOISE SOURCE/SUBJECT: ) OPERATION: ) METEOROLOGY: )
( ) ) ) ) ) )
( F-104D AIRCRAFT ) IDLE POWER ) TEMP = 15 C ) )
( J79-GE-7/A ENGINE ) 67% RPM ) BAR PRESS = .760 M HG ) )
( FAR FIELD NOISE ) FREE FLOW ) REL HUMID = 70 % ) )
( ) ) ) ) PAGE 16 )
(-----)
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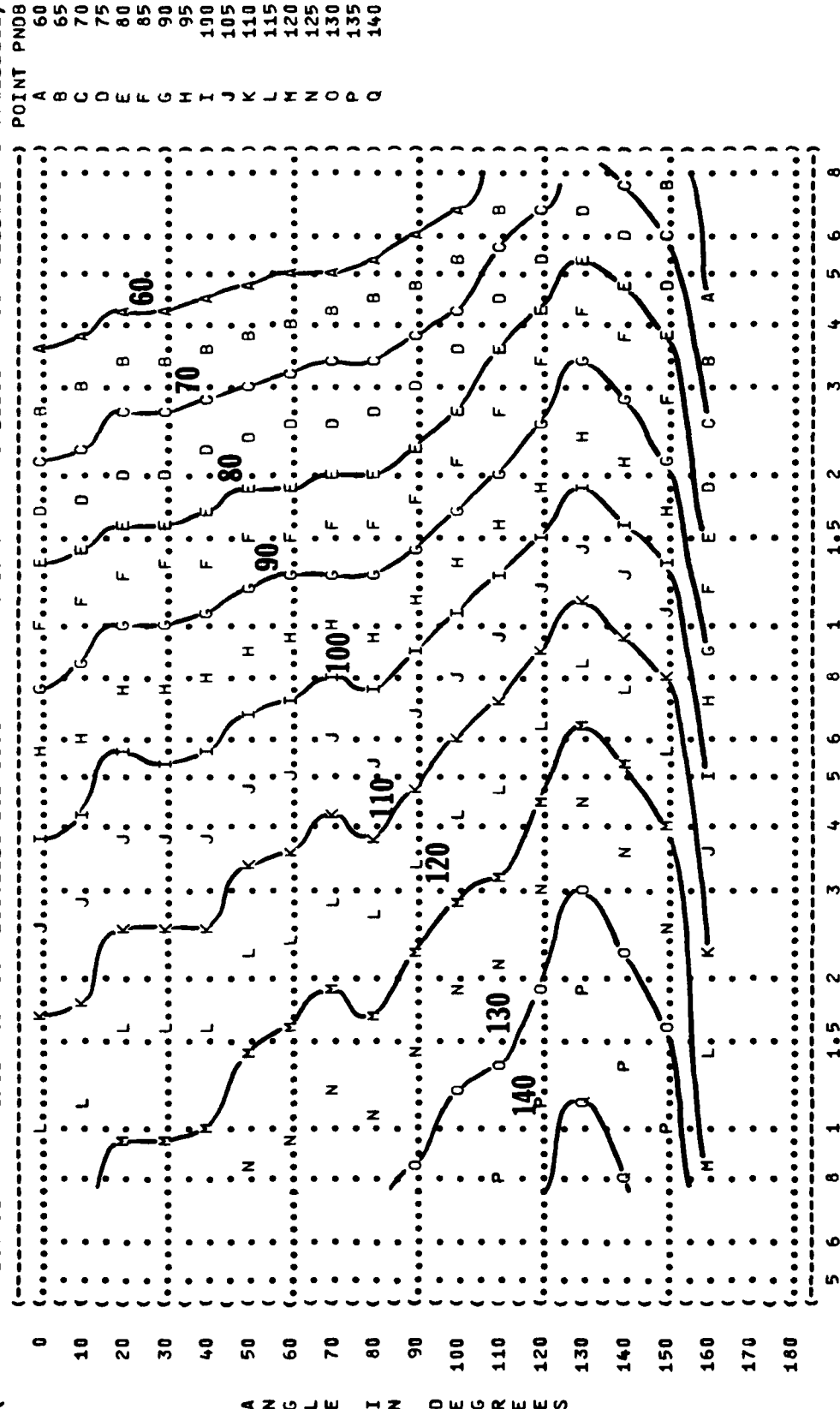
PERCEIVED NOISE LEVEL WITH SMOOTH TONE CORRECTION {PNLT}
EQUAL LEVEL CONTOURS (PNDB)

POINT	PND8
A	60
B	65
C	70
D	75
E	80
F	85
G	90
H	95
I	100
J	105
K	110
L	115
M	120
N	125
O	130
P	135



39

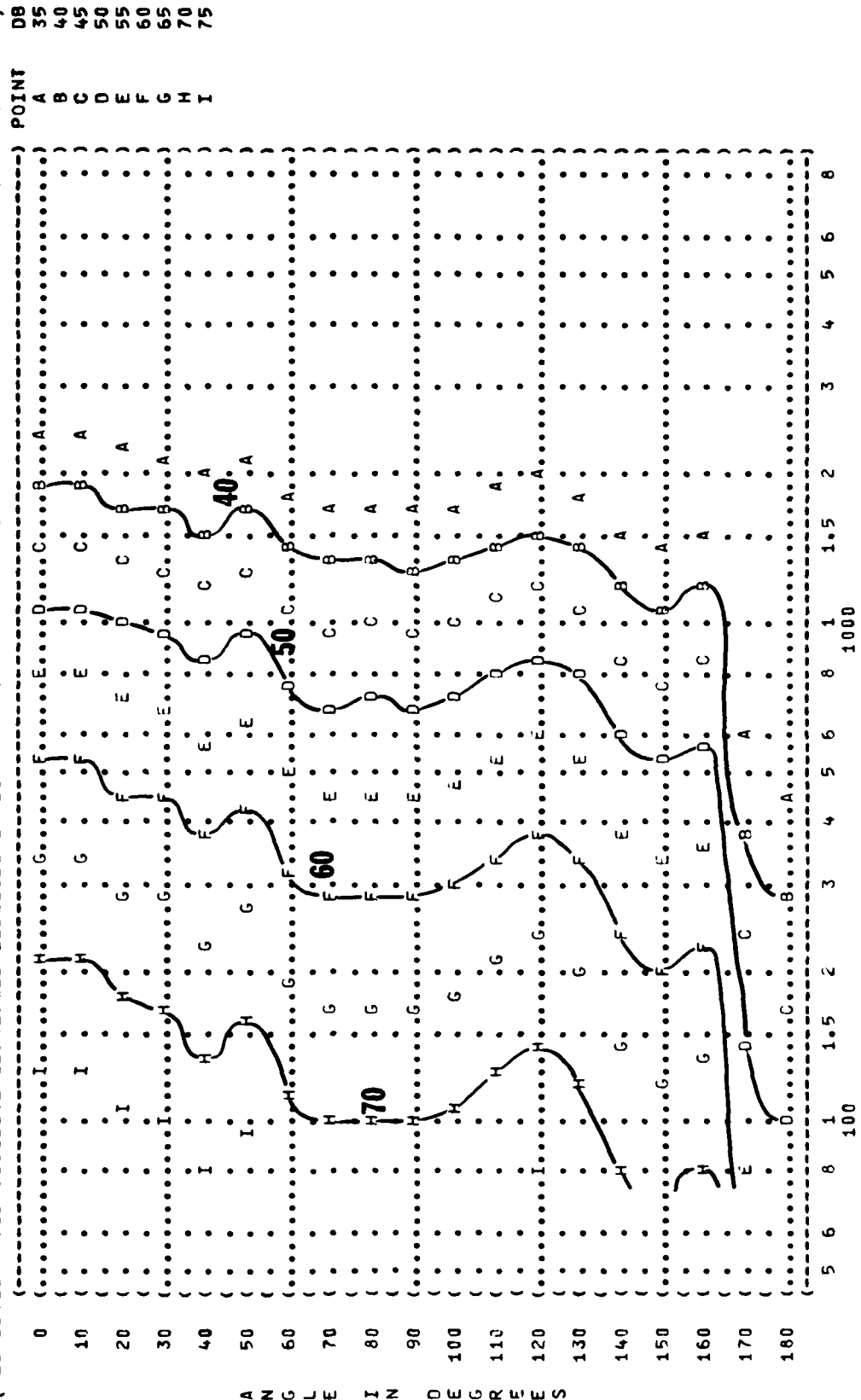
(FIGURE: PERCEIVED NOISE LEVEL WITH SMOOTH TONE CORRECTION {PNLT}
 (8
 (EQUAL LEVEL CONTOURS (PNDB)
 () IDENTIFICATION:)
 () OMEGA 1.4
 () TEST 75-002-060
 () RUN 03
 ()
 (NOISE SOURCE/SUBJECT:) OPERATION:) METEOROLOGY:)
 () TEMP = 15 C
 (F-104D AIRCRAFT) AFTERBURNER POWER) BAR PRESS = .760 M HG
 (J79-GE-7/A ENGINE) 100% RPM) REL HUMID = 70 %
 (FAR FIELD NOISE) DEFLECTED FLOW)
 () PAGE 16
 ()



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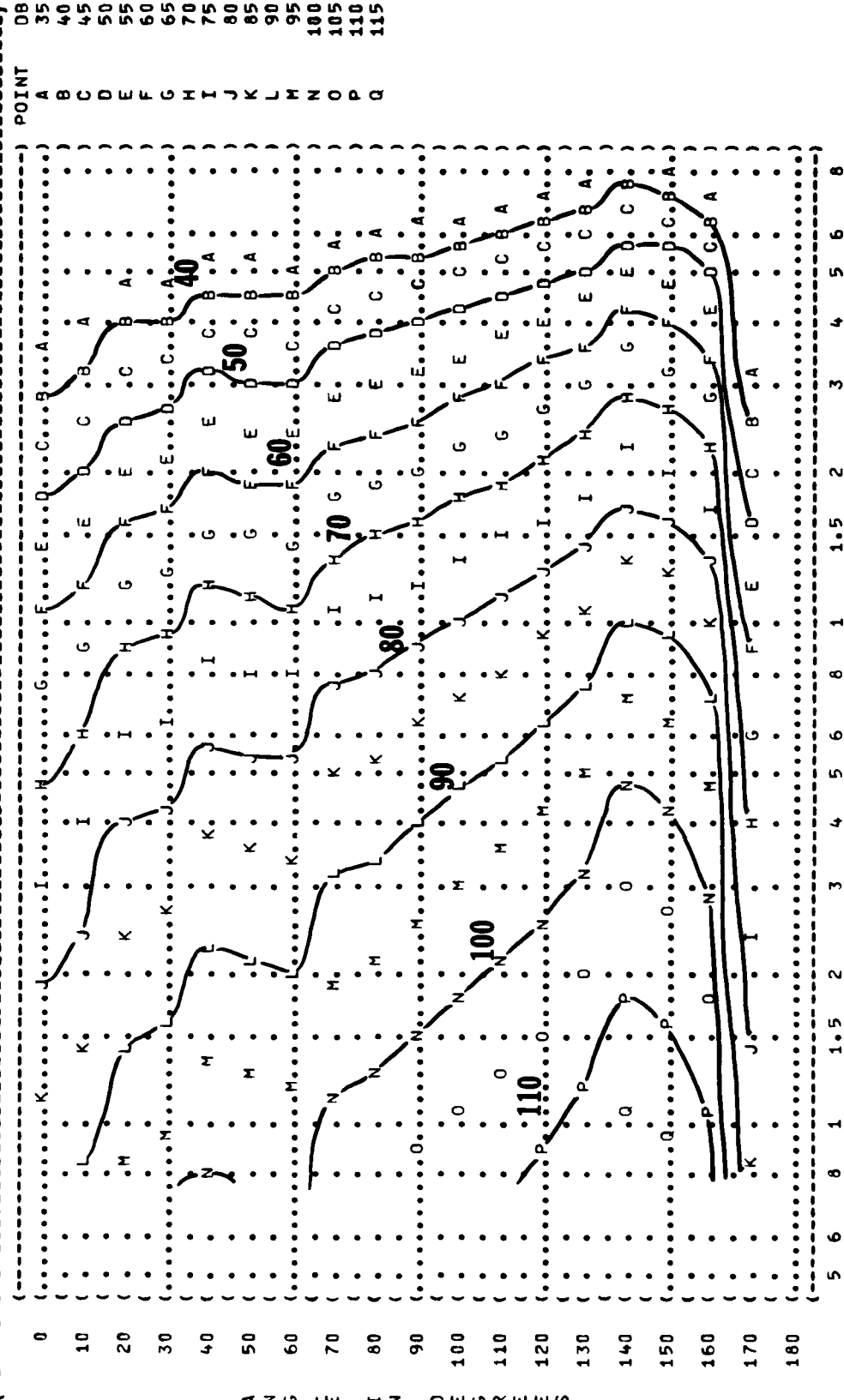
(-----)
( FIGURE: PREFERRED SPEECH INTERFERENCE LEVEL {PSIL} ) IDENTIFICATION:
(   EQUAL LEVEL CONTOURS   (DB) )
(
( 9 )
(-----)
( NOISE SOURCE/SUBJECT: ) OPERATION: ) METEOROLOGY:
(
( F-104D AIRCRAFT ) IDLE POWER ) TEMP = 15 C
( J79-GE-7/A ENGINE ) 67% RPM ) BAR PRESS = .760 M HG
( FAR FIELD NOISE ) FREE FLOW ) REL HUMID = 70 %
(-----)
( PAGE 17 )
(-----)

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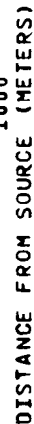


DISTANCE FROM SOURCE (METERS)

(FIGURE: PREFERRED SPEECH INTERFERENCE LEVEL (PSIL)
 (EQUAL LEVEL CONTOURS (DB)
 (9
 (IDENTIFICATION:
 ()
 () OMEGA 1.4
 () TEST 75-002-033
 () RUN 03
 (NOISE SOURCE/SUBJECT: (OPERATION:
 () METEOROLOGY:
 () TEMP = 15 C
 () F-1040 AIRCRAFT (MILITARY POWER
 () BAR PRESS = .760 M HG
 () J79-GE-7/A ENGINE (100% RPM
 () REL HUMID = 70 %
 () FAR FIELD NOISE (FREE FLOW
 ()
 () PAGE 17



1



43

PERSONNEL MAY BE EXPOSED UP TO 960 MINUTES PER DAY
AT ALL DISTANCES FROM SOURCE EQUAL TO OR GREATER THAN 75 METERS
FOR ALL ANGLES EVALUATED (INDICATED BY < AT LEFT)
UNDER THE FOLLOWING EAR PROTECTION CONDITIONS:

MINIMUM QPL EAR MUFFS
AMERICAN OPTICAL 1700 EAR MUFFS
V-51R EAR PLUGS
COMFIT TRIPLE FLANGE EAR PLUGS
H-133 GROUND COMMUNICATION UNIT

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H-133 GROUND COMMUNICATION UNIT

[illegible]

() FIGURE: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)) IDENTIFICATION:)
 () 10) EQUAL TIME CONTOURS (MINUTES))
 () AMERICAN OPTICAL 1700 EAR MUFFS) OMEGA 1.4
 ()) TEST 75-002-033)
 () NOISE SOURCE/SUBJECT: () OPERATION:) METEOROLOGY:)
 ())) TEMP = 15 C)
 () F-104D AIRCRAFT) MILITARY POWER) BAR PRESS = .760 M HG) 18 SEP 78)
 () J79-GE-7/A ENGINE) 100% RPM) REL HUMID = 70 %)
 () FAR FIELD NOISE) FREE FLOW) PAGE 9)

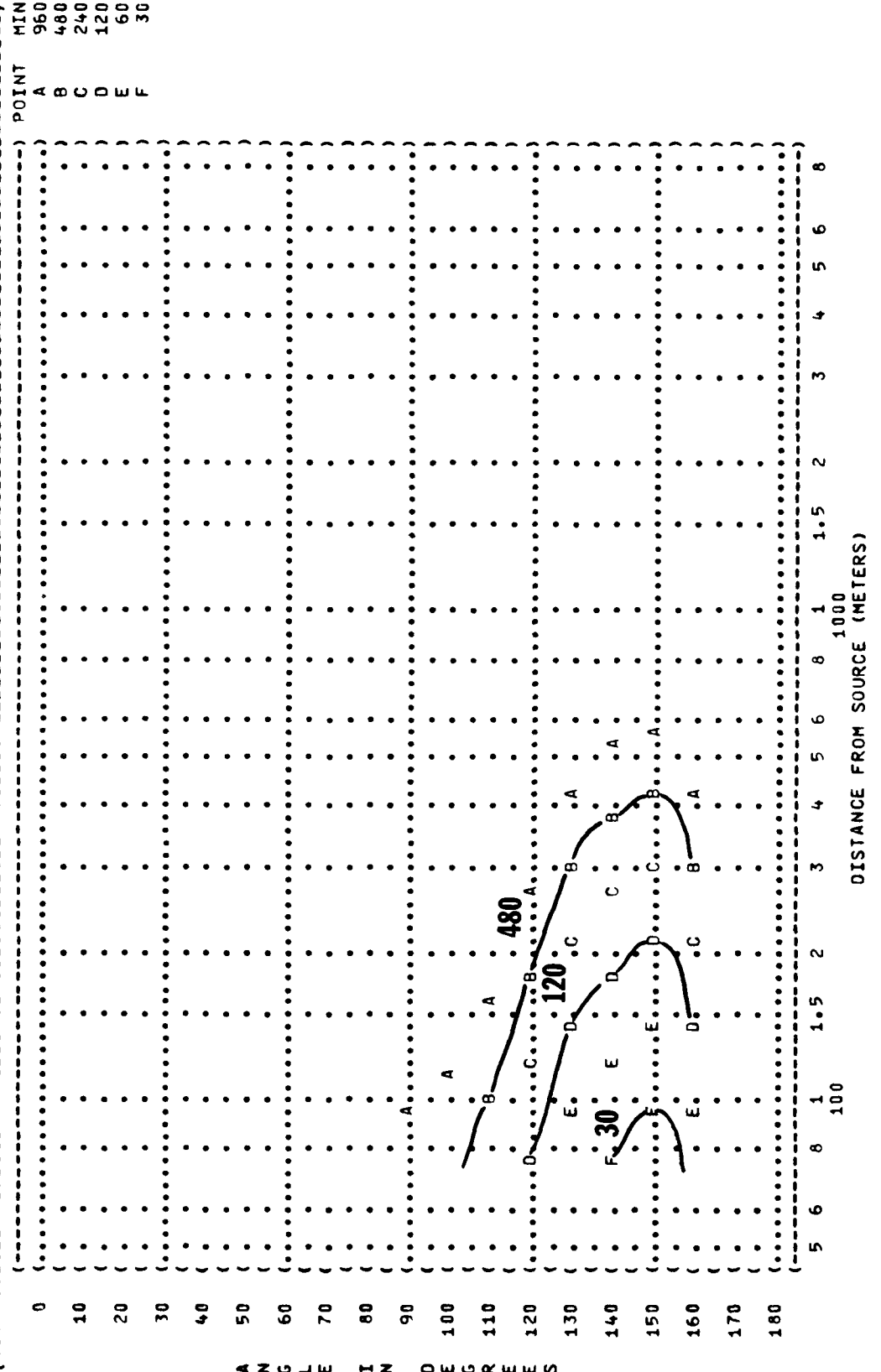


FIGURE: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)

IDENTIFICATION:

10

EQUAL TIME CONTOURS (MINUTES)

OMEGA 1.4

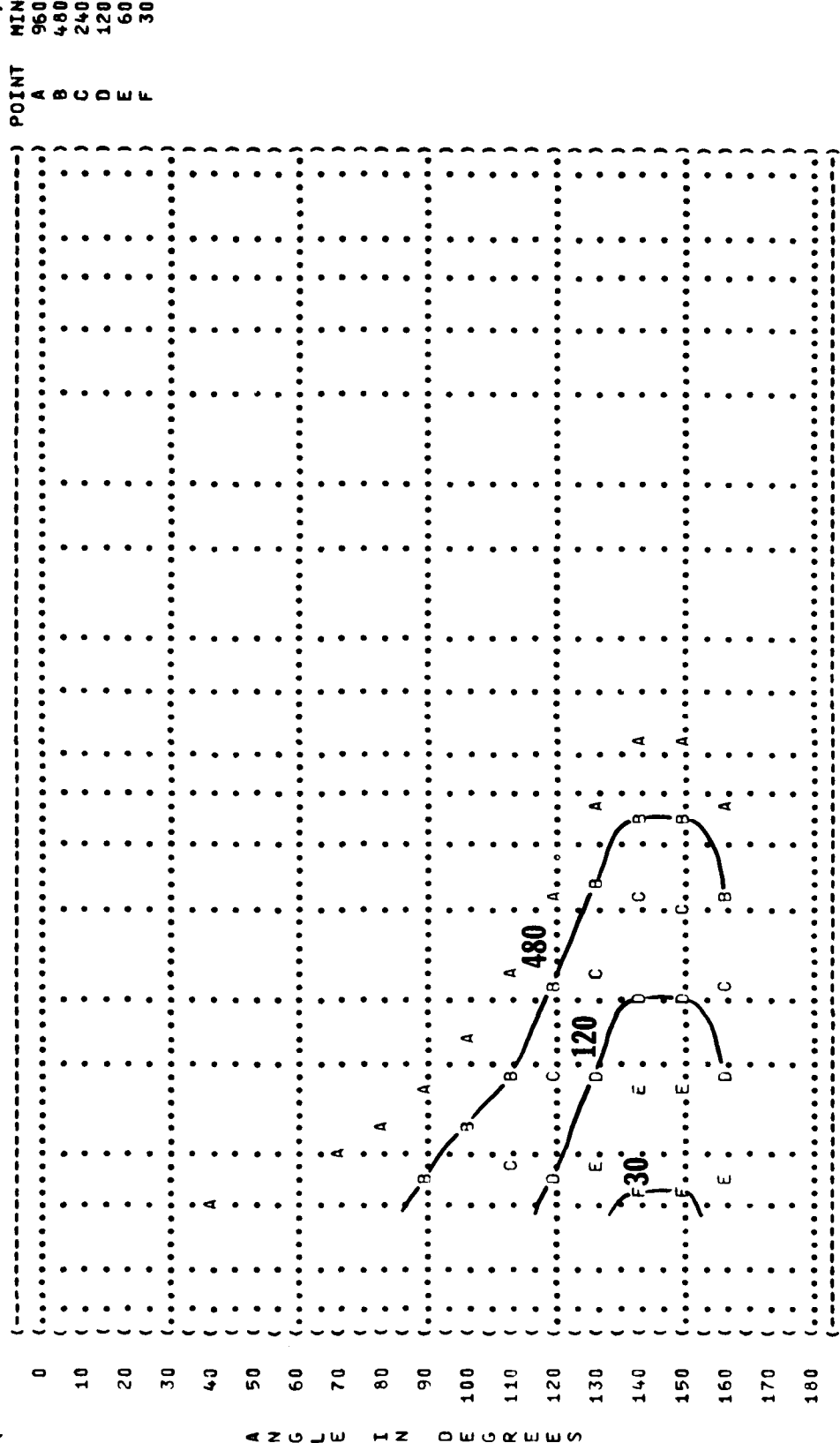
TEST 75-002-033

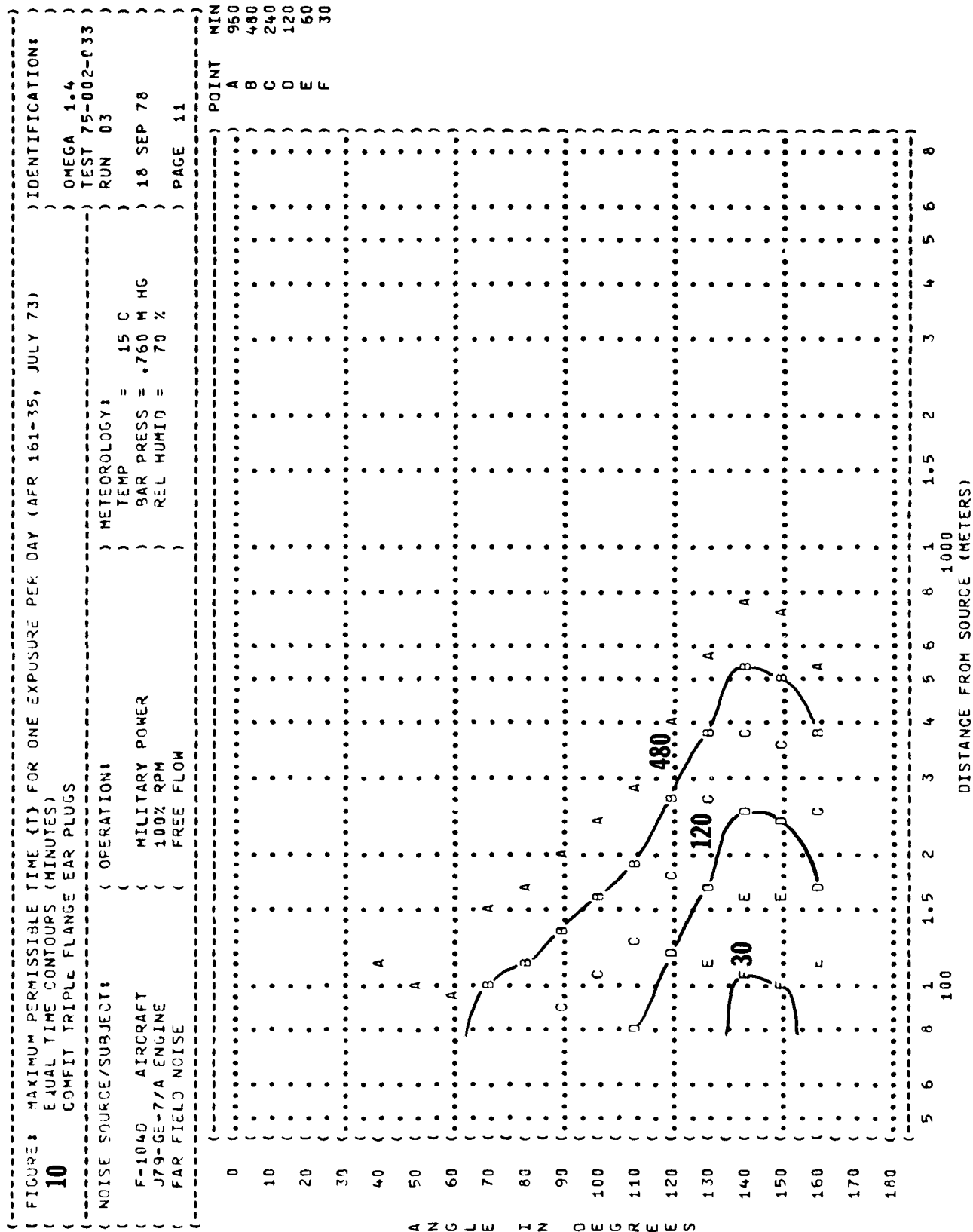
NOISE SOURCE/SUBJECT: (OPERATION:) METEOROLOGY: (TEMP = 15 C) RUN 03

F-104D AIRCRAFT (MILITARY POWER) BAR PRESS = .760 H HG

J79-GE-7/A ENGINE (100% RPM) REL HUMID = 70 %

FAR FIELD NOISE (FREE FLOW) PAGE 10





	(	-	-	)	MIN	POINT
0	(	.	.	.		A 960
	(	.	.	.		B 480
10	(	.	.	.		C 240
	(	.	.	.		D 120

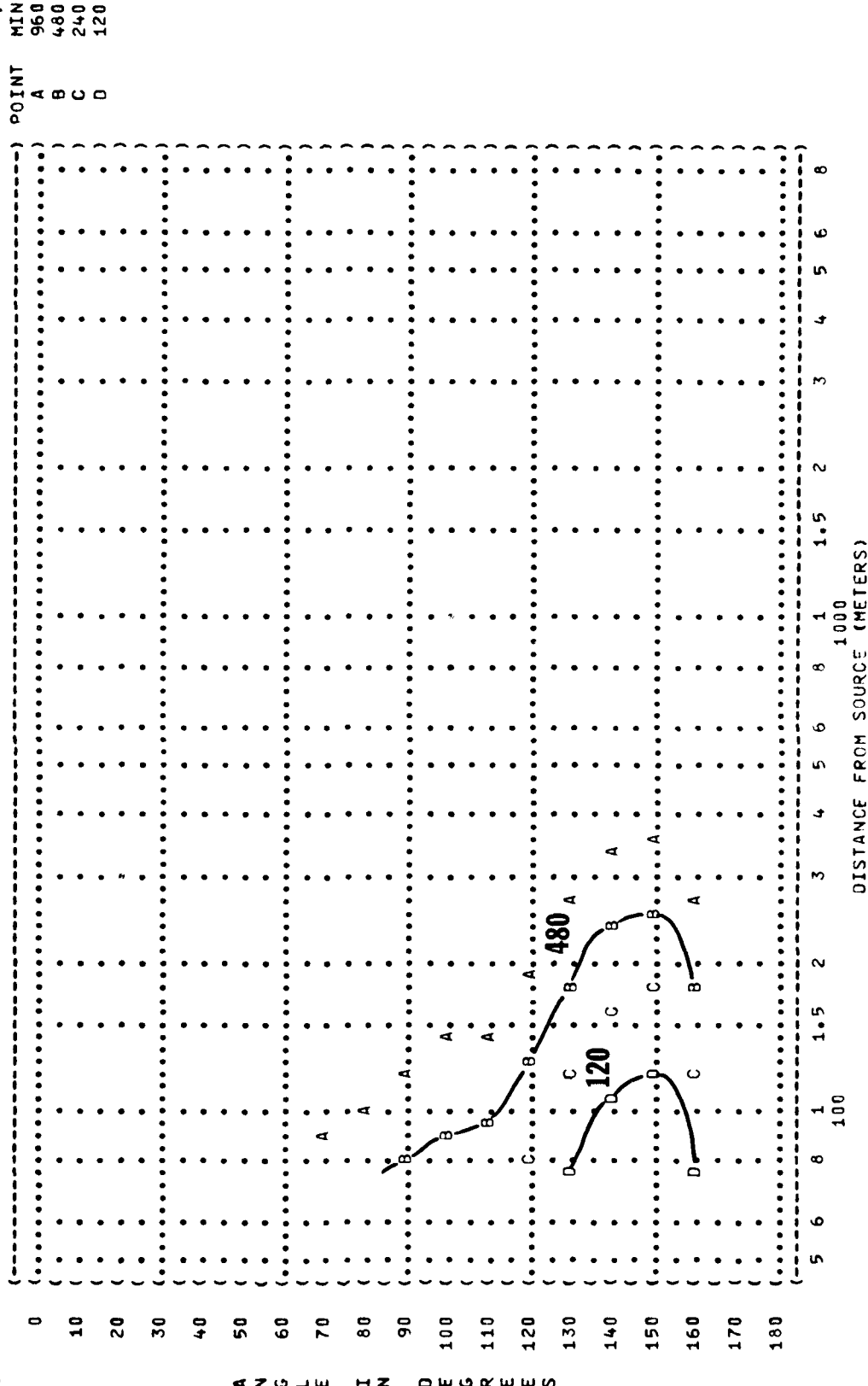


Figure 1 is a graph showing the dependence of the number of points (POINT) on the number of minima (MIN) for the function $y = 100 - 100 \cos(2\pi x/10)$. The x-axis is labeled MIN and ranges from 0 to 40. The y-axis is labeled POINT and ranges from 2 to 960. The graph displays a series of peaks and valleys. The peaks are labeled A, B, C, D, E, F, G, H, I, J. The valleys are labeled A, B, C, D, E, F, G, H, I, J. The graph shows that the number of points increases as the number of minima increases, with a periodic pattern of peaks and valleys.

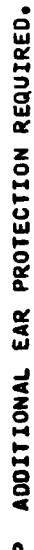


FIGURE: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)

IDENTIFICATION:

10 EQUAL TIME CONTOURS (MINUTES)

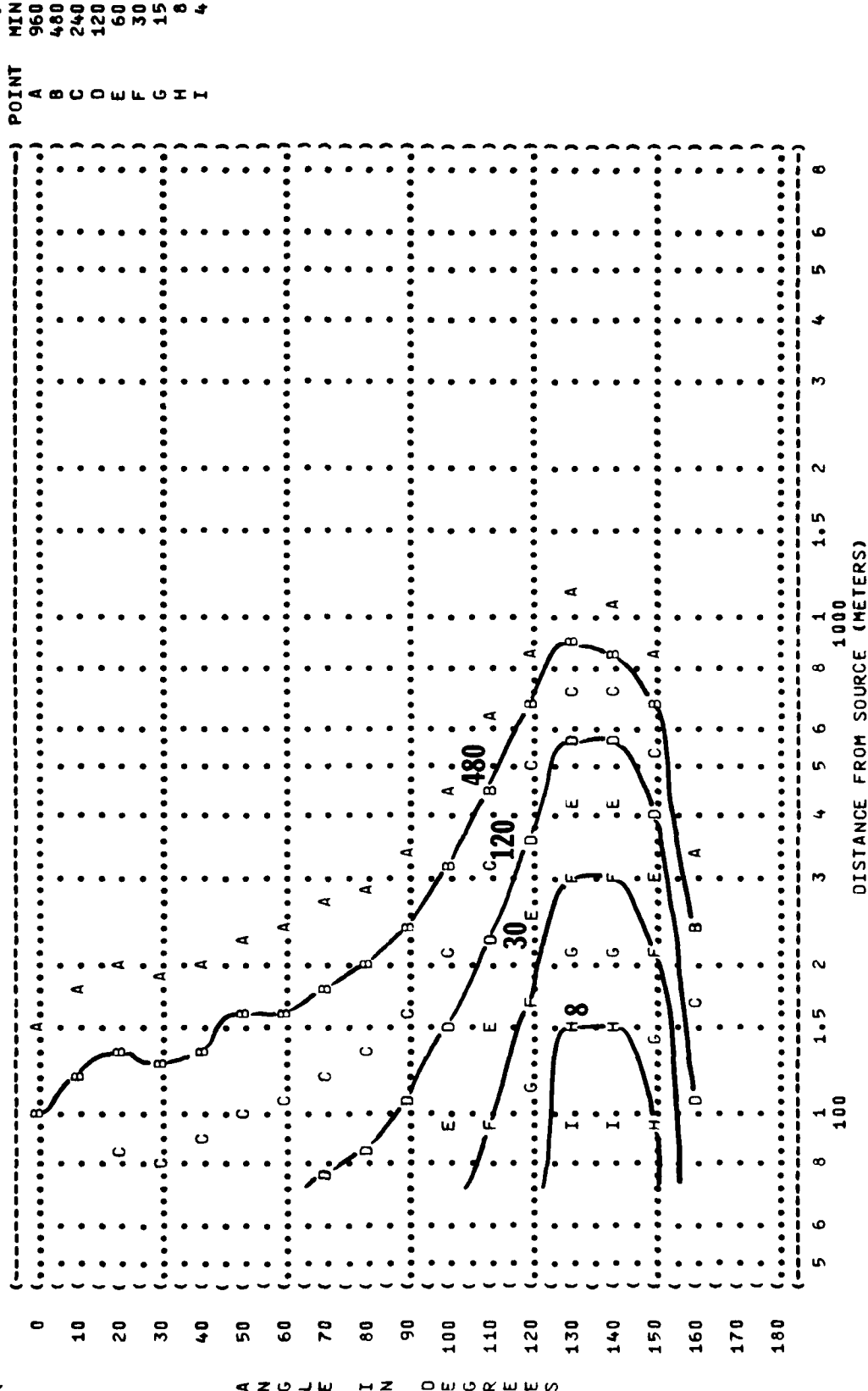
MINIMUM QPL EAR MUFFS

NOISE SOURCE/SUBJECT: (OPERATION:) METEOROLOGY: TEMP = 15 C) 24 JAN 79)

F-104D AIRCRAFT (AFTERBURNER POWER () BAR PRESS = .760 M HG)

J79-GE-7/A ENGINE (100% RPM () REL HUMID = 70 %)

FAR FIELD NOISE (DEFLECTED FLOW)) PAGE 8)



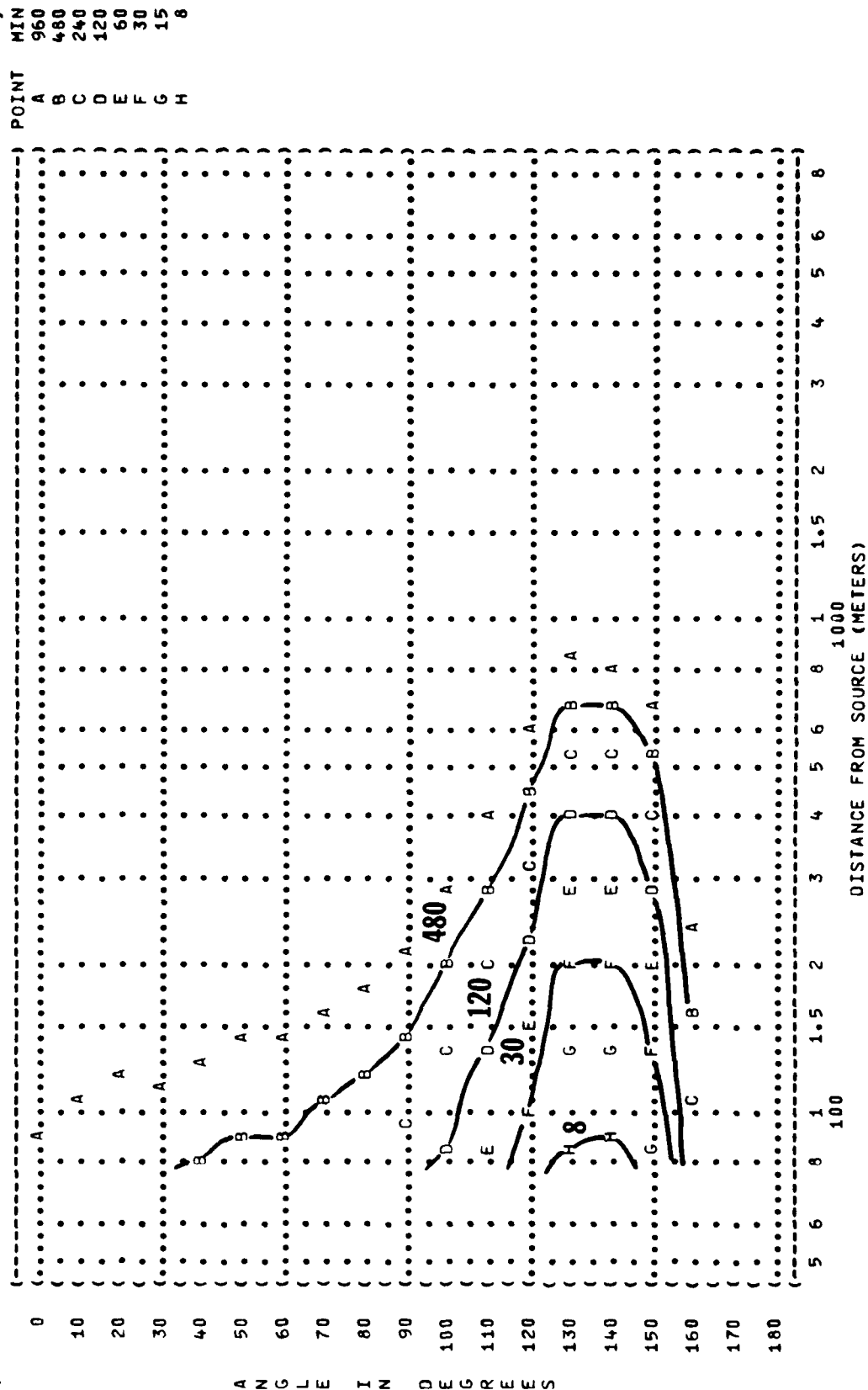


FIGURE: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)

IDENTIFICATION:

10 EQUAL TIME CONTOURS (MINUTES)

OMEGA 1.4

TEST 75-002-060

NOISE SOURCE/SUBJECT: (OPERATION:) METEOROLOGY:) RUN 03

F-1040 AIRCRAFT (AFTERBURNER POWER) TEMP = 15 C

J79-GE-7/A ENGINE (100% RPM) BAR PRESS = .760 M HG

FAR FIELD NOISE (DEFLECTED FLOW) REL HUMID = 70 %

24 JAN 79

PAGE 10

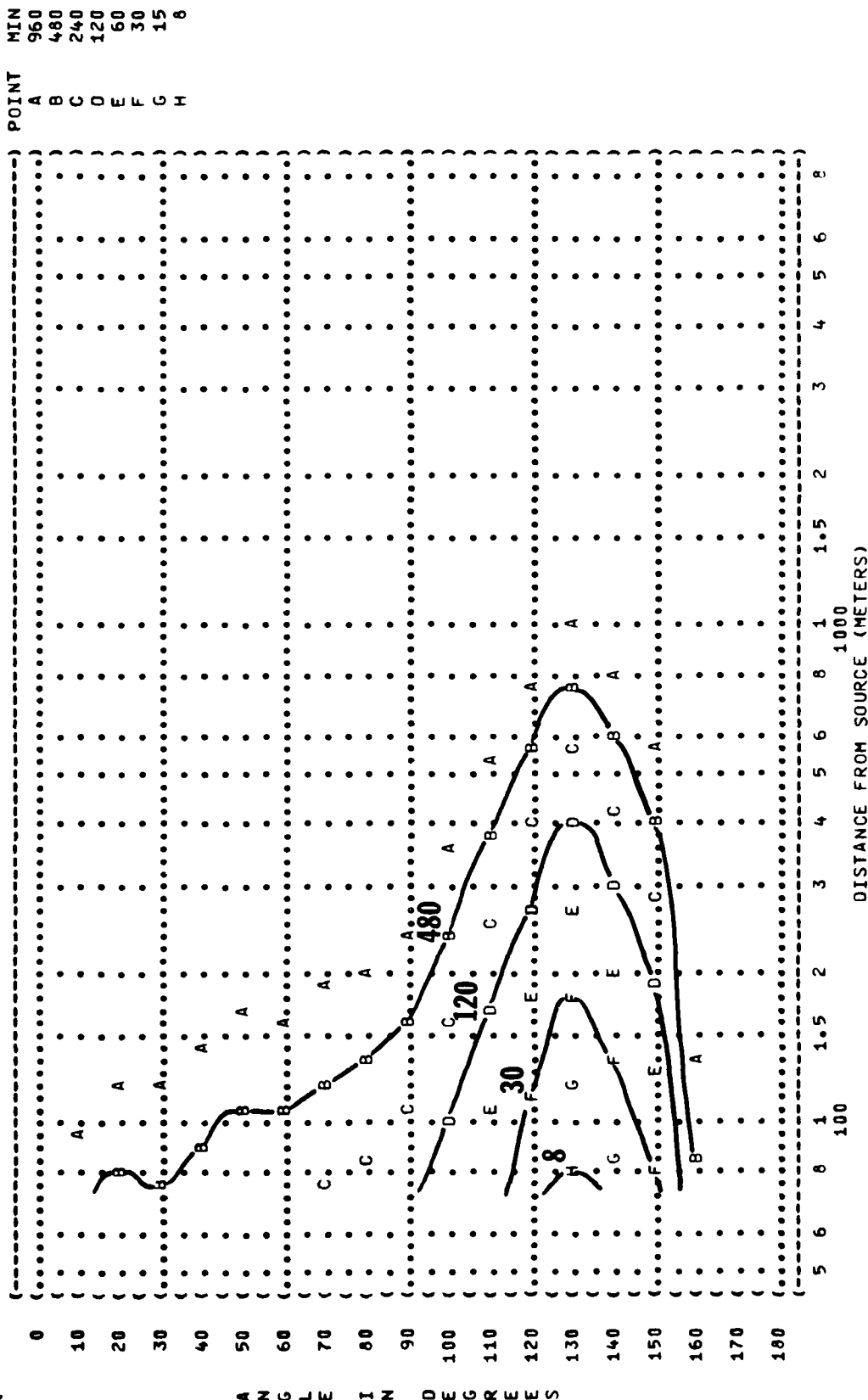
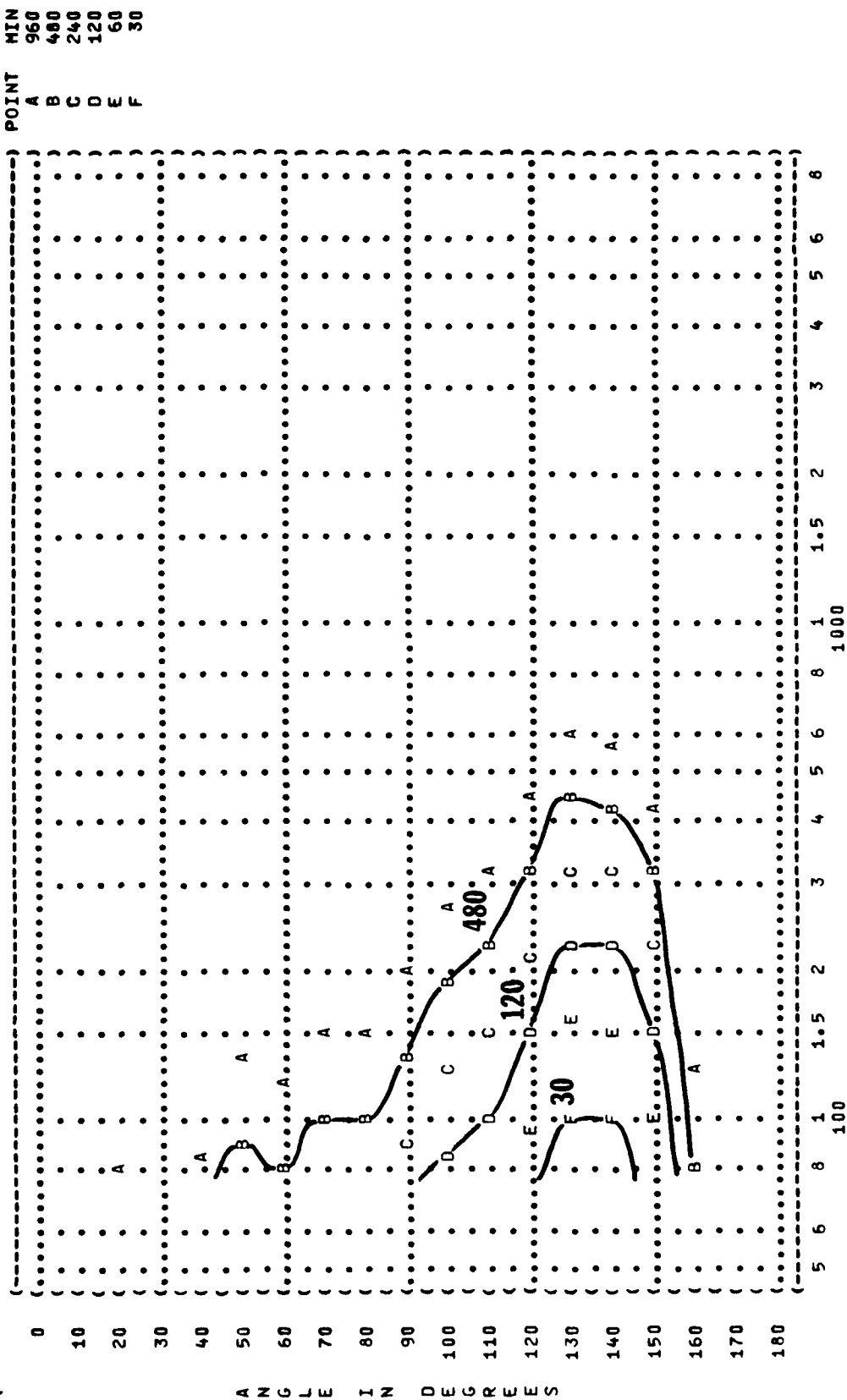
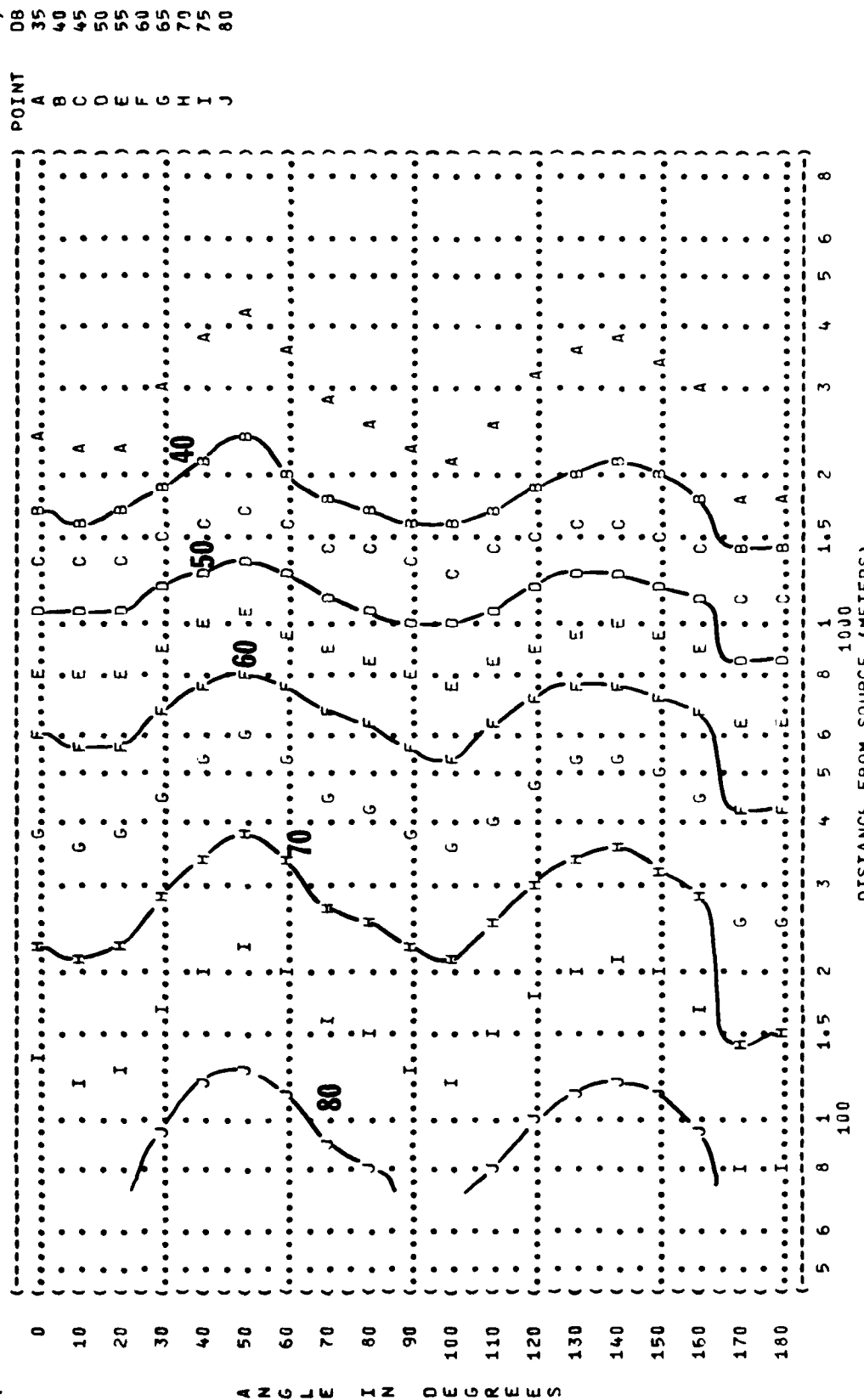


FIGURE: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73) IDENTIFICATION:
 10 EQUAL TIME CONTOURS (MINUTES) OMEGA 1.4
 H-133 GROUND COMMUNICATION UNIT TEST 75-002-060
 NOISE SOURCE/SUBJECT: (OPERATION:) METEOROLOGY:) RUN 03
 () TEMP = 15 C
 (F-1040 AIRCRAFT) AFTERBURNER POWER) BAR PRESS = .760 M HG
 (J79-GE-7/A ENGINE) 100% RPM) REL HUMID = 70 %
 (FAR FIELD NOISE) DEFLECTED FLOW) PAGE 12



(FIGURE: SOUND PRESSURE LEVEL (SPL)
 (11 EQUAL LEVEL CONTOURS (DB)
 (63 HZ OCTAVE BAND
 (NOISE SOURCE/SUBJECT: (OPERATION:
 (F-104D AIRCRAFT (IDLE POWER
 (J79-GE-7/A ENGINE (67% RPM
 (FAR FIELD NOISE (FREE FLOW
 (METEOROLOGY: (TEMP = 15 C
 (BAR PRESS = .760 M HG
 (REL HUMID = 70 %
 (IDENTIFICATION: (OMEGA 1.4
 (TEST 75-002-033
 (RUN 01
 (18 SEP 78
 (PAGE 19



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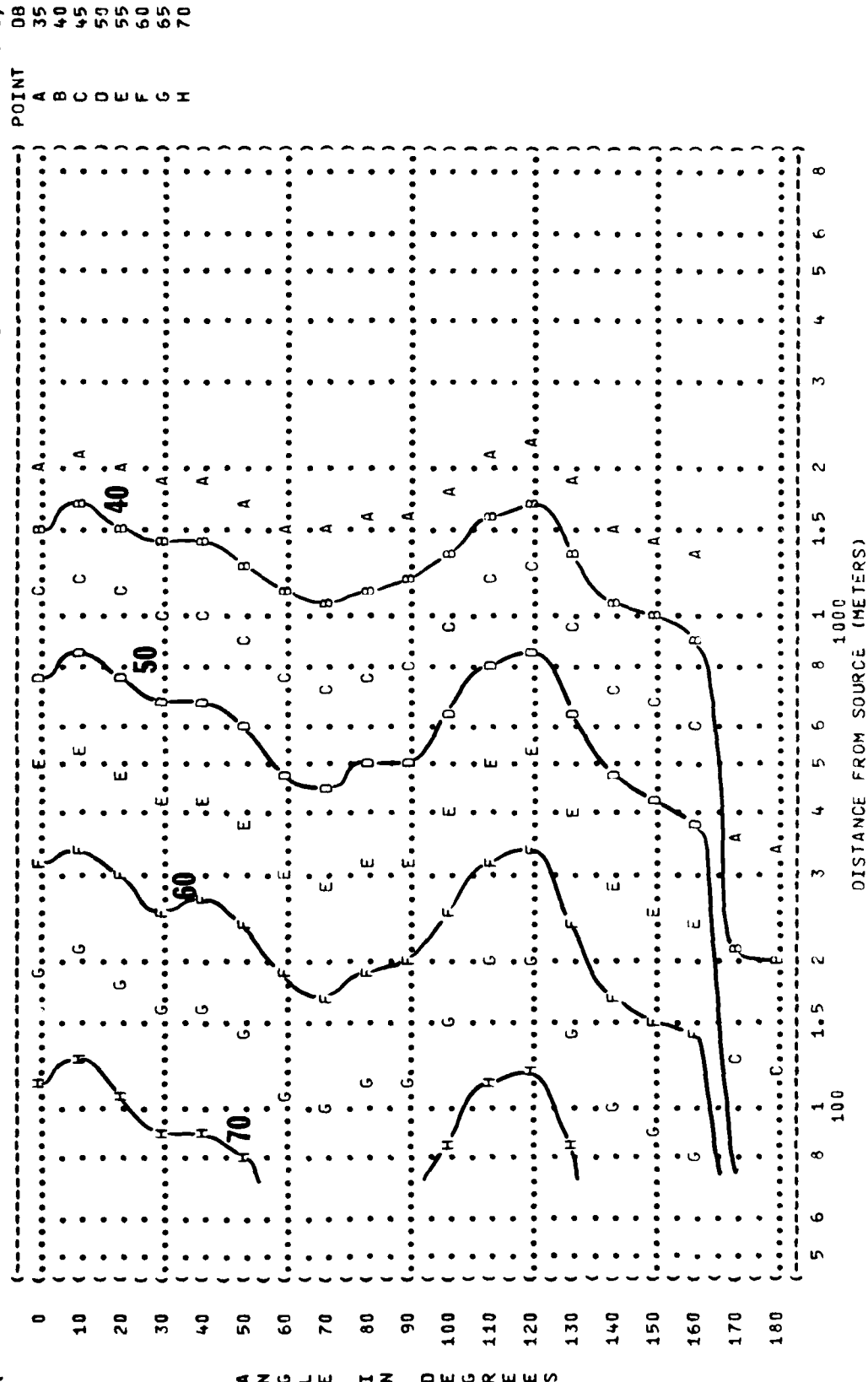


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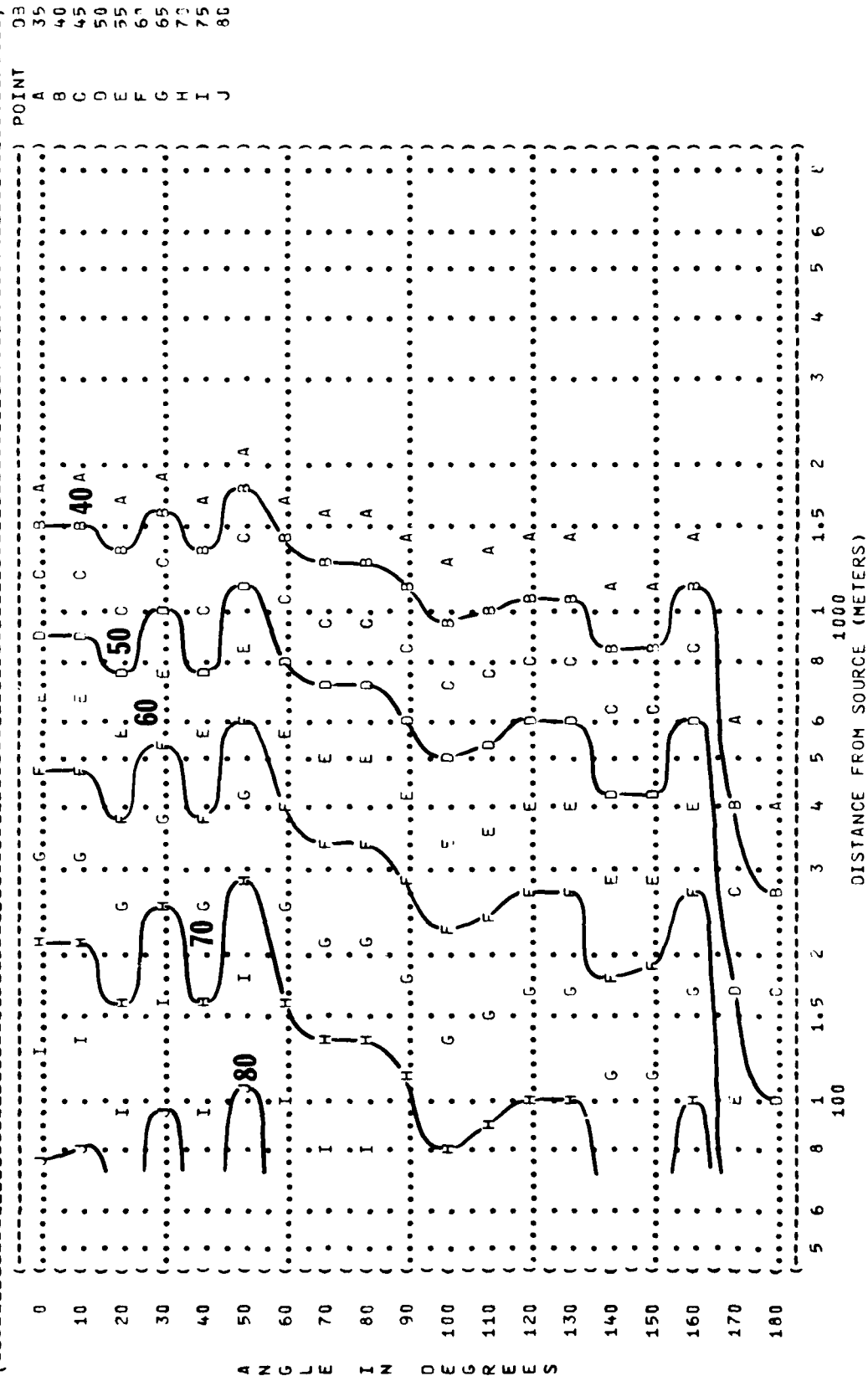

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( ( FIGURE: SOUND PRESSURE LEVEL (SPL) ) IDENTIFICATION: )
( ( EQUAL LEVEL CONTOURS (DB) ) )
( ( 11 ) OMEGA 1.4 )
( ( 1000 HZ OCTAVE BAND ) TEST 75-002-033 )
( ( NOISE SOURCE/SUBJECT: ) METEOROLOGY: )
( ( ) TEMP = 15 C )
( ( F-104D AIRCRAFT ) IDLE POWER ) BAR PRESS = .760 M HG )
( ( J79-GE-7/A ENGINE ) 67% RPM ) REL HUMID = 70 % )
( ( FAR FIELD NOISE ) FREE FLOW ) PAGE 23 )

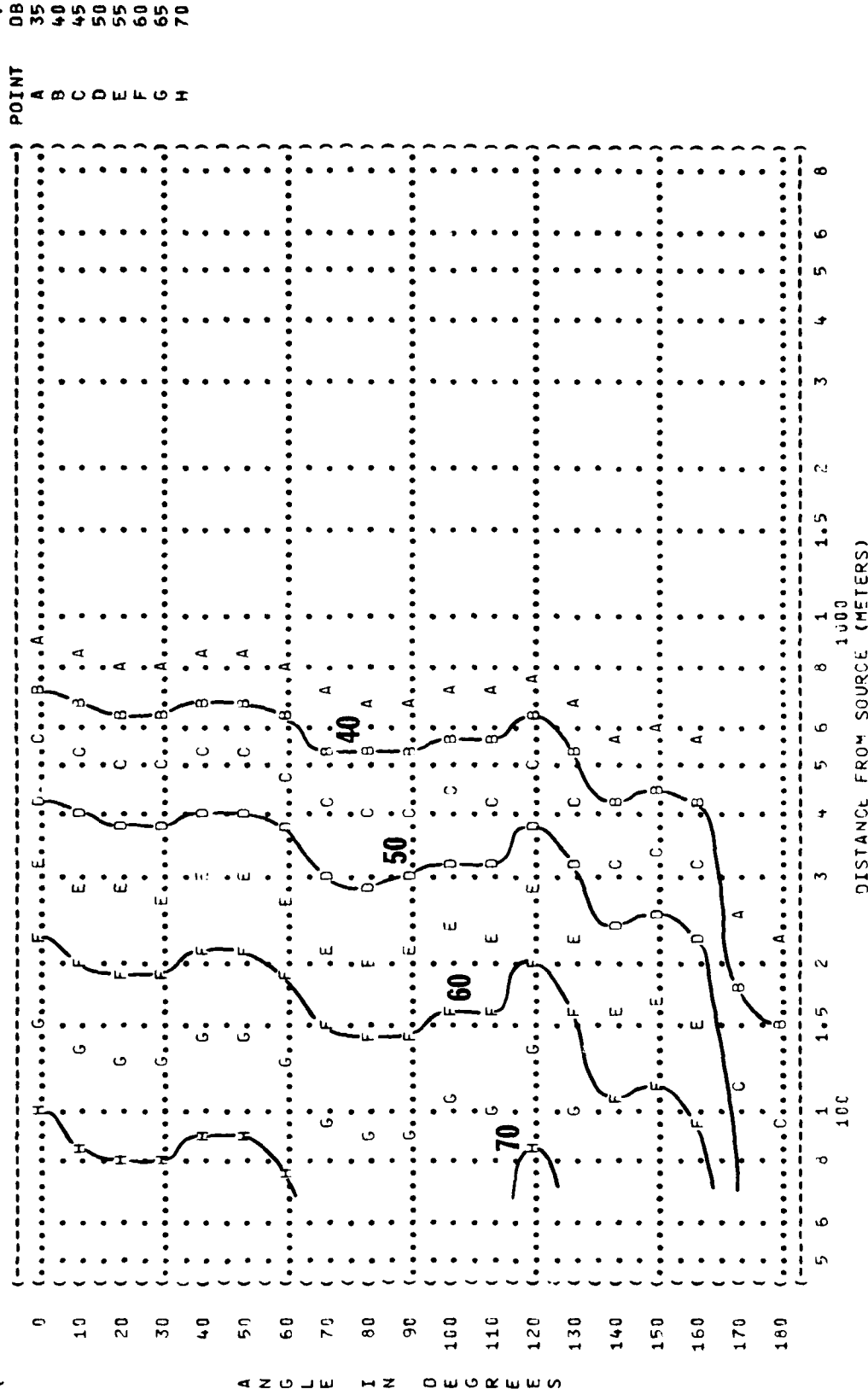
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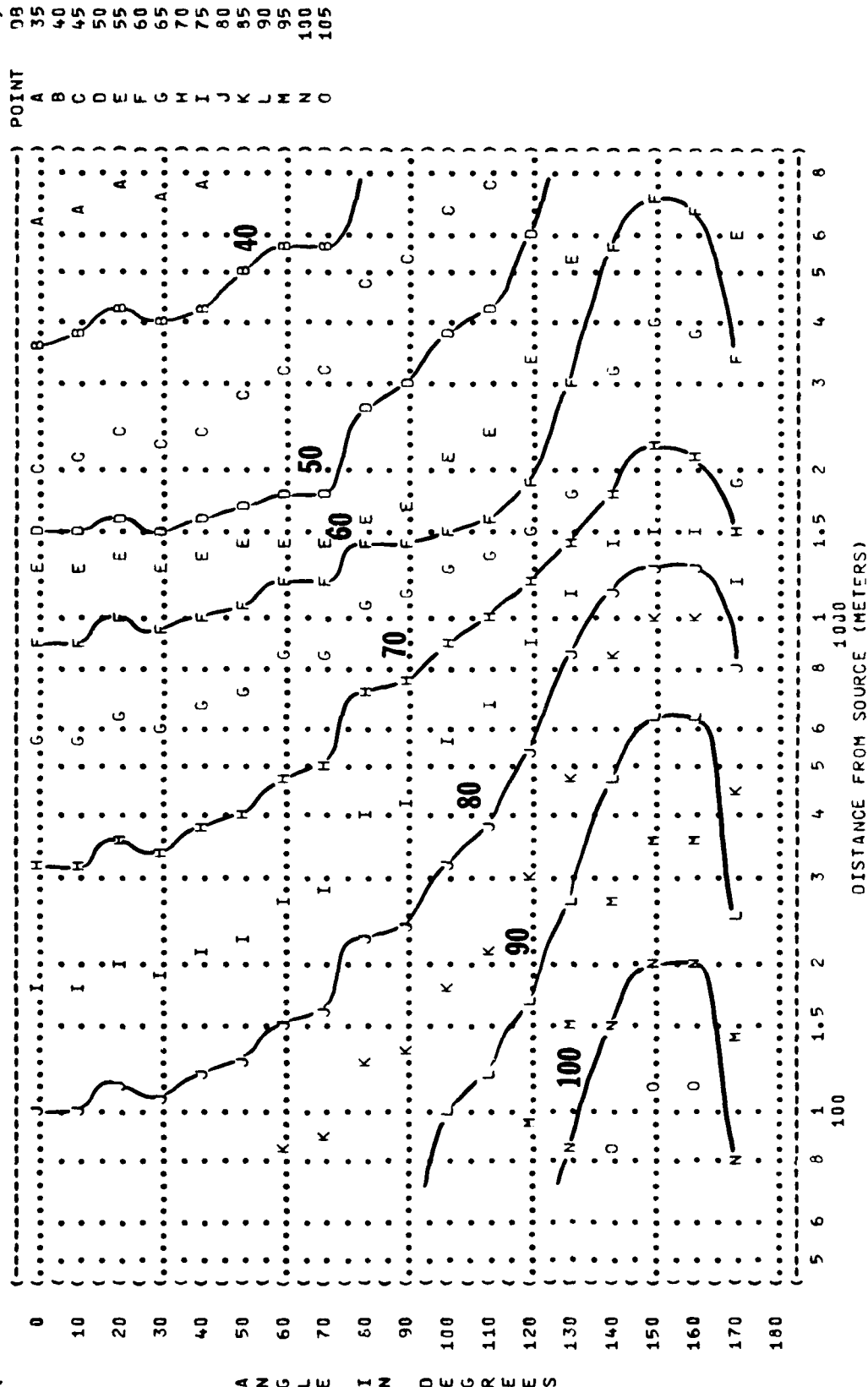
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 (11 EQUAL LEVEL CONTOURS (C3))
 (2000 HZ OCTAVE BAND)
 (NOISE SOURCE/SUBJECT:)
 (F-104D AIRCRAFT)
 (J79-GE-7/A ENGINE)
 (FAR FIELD NOISE)
 (OPERATION:)
 (IDLE POWER)
 (57% RPM)
 (FREE FLOW)
 (METEOROLOGY:)
 (TEMP = 15 C)
 (BAR PRESS = .760 M HG)
 (REL HUMID = 70 %)
 (RUN 01)
 (18 SEP 78)
 (PAGE 24)
 (IDENTIFICATION:)
 (0.56 1.4)
 (TE 75-002-633)



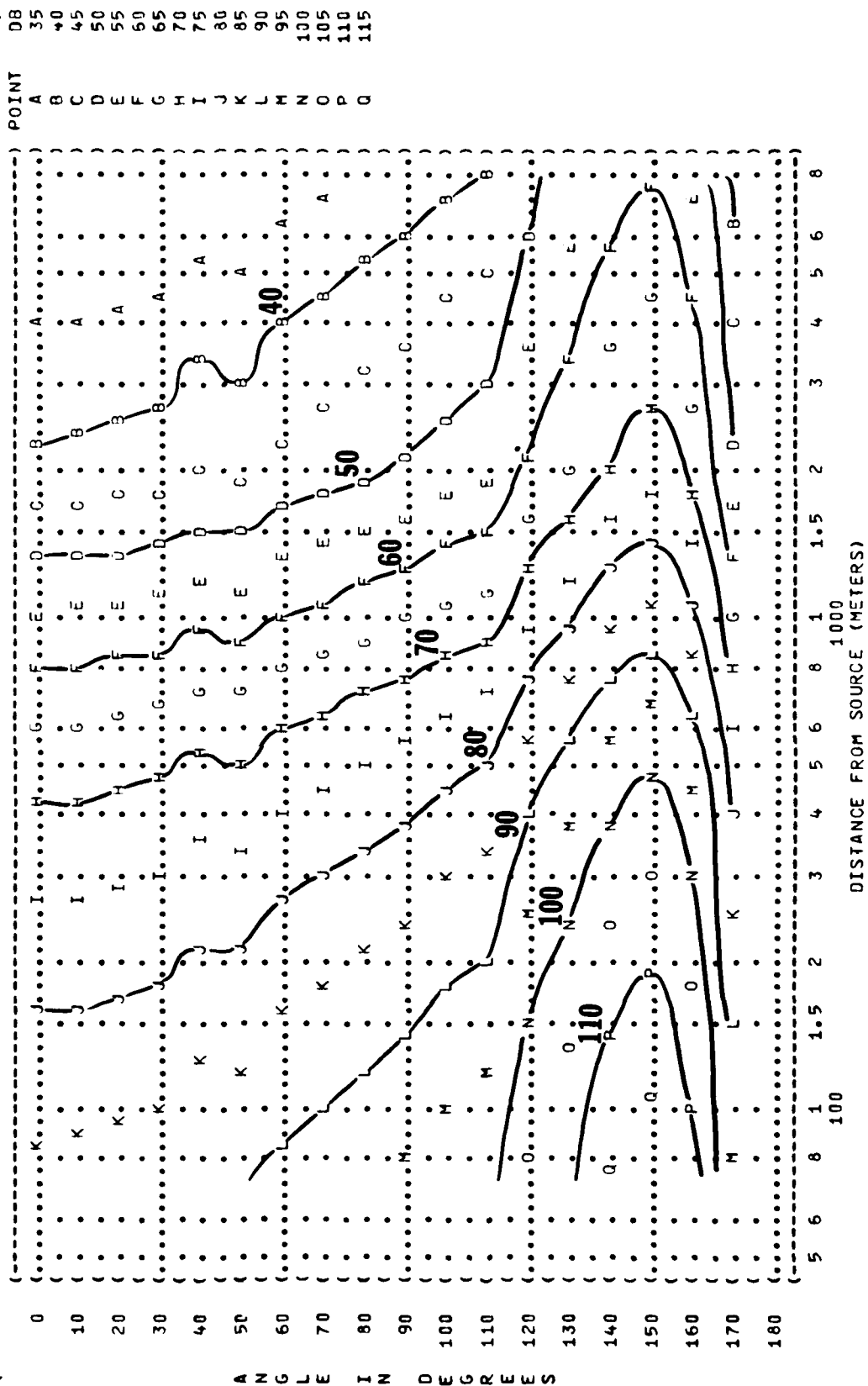
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 (EQUAL LEVEL CONTOURS (DB)
 (11 4000 HZ OCTAVE BAND
 (NOISE SOURCE/SUBJECT: (OPERATION: (METEOROLOGY: (POINT DB
 (F-104D AIRCRAFT (IDLE POWER (TEMP = 15 C A 35
 (J79-GE-7/A ENGINE (67% RPM (BAR PRESS = .760 M HG B 40
 (FAR FIELD NOISE (FREE FLOW (REL HUMID = 70 % C 45
 (((((RUN 01 D 50
 (((((TEST 75-002-033 E 55
 (((((PAGE 25 F 60
 (((((G 65
 (((((H 70



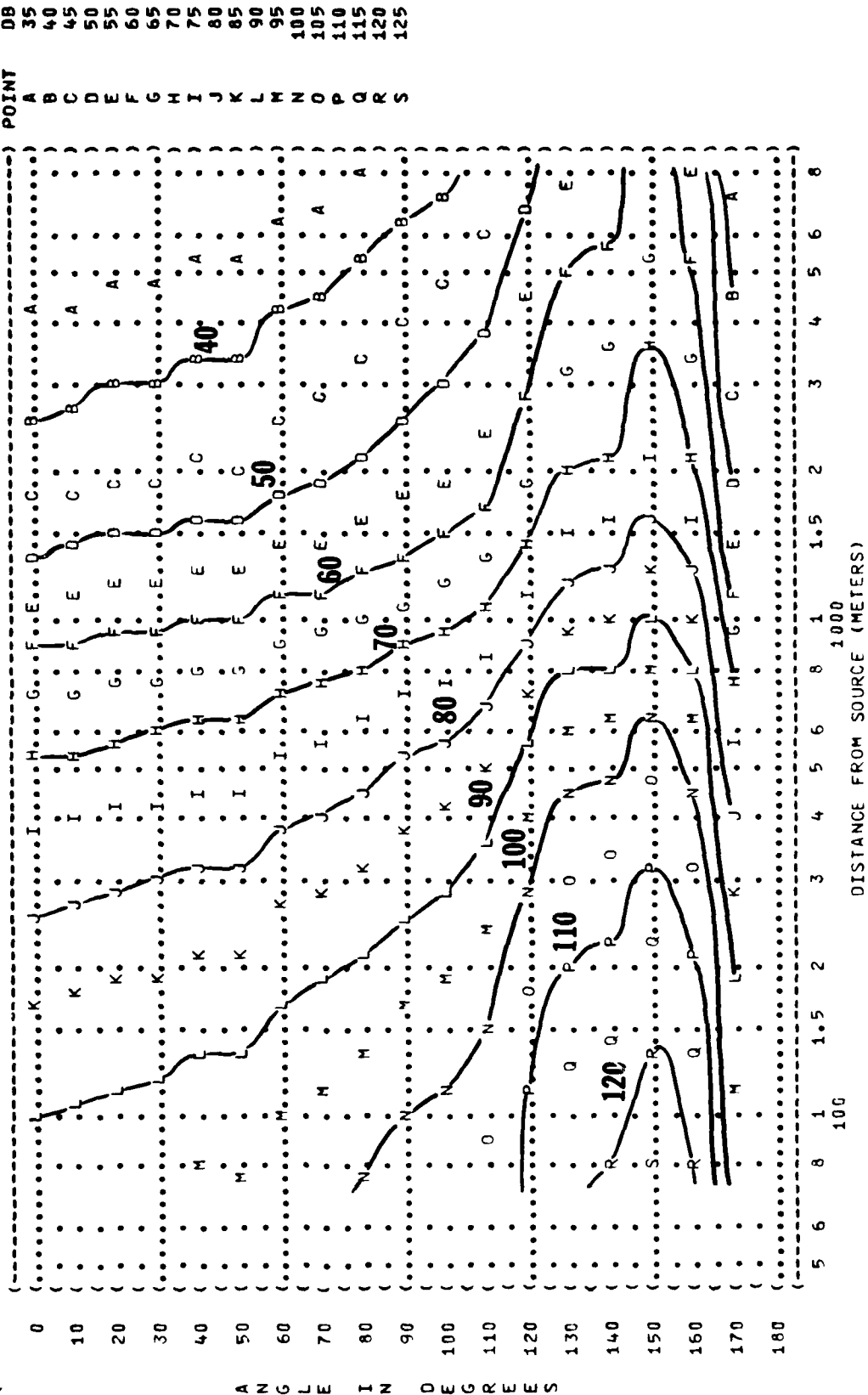
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 ((11 EQUAL LEVEL CONTOURS (CB)
 ((31.5 HZ OCTAVE BAND
 ((NOISE SOURCE/SUBJECT: (OPERATION:
 ((F-104D AIRCRAFT (MILITARY POWER
 ((J79-GE-7/A ENGINE (100% RPM
 ((FAR FIELD NOISE (FREE FLOW
 ((METEOROLOGY:
 ((TEMP = 15 C
 ((BAR PRESS = .760 M HG
 ((REL HUMID = 70 %
 ((IDENTIFICATION:
 ((OMEGA 1.4
 ((TEST 75-002-033
 ((RUN 03
 ((PAGE 18



((FIGURE: SOUND PRESSURE LEVEL (SPL)) IDENTIFICATION:)
 ((11 EQUAL LEVEL CONTOURS (CB)))
 ((63 HZ OCTAVE BAND))
 ((NOISE SOURCE/SUBJECT:) OPERATION:) METEOROLOGY:)
 ((F-1040 AIRCRAFT)) TEMP = 15 C)
 ((J79-GE-7/A ENGINE)) MILITARY POWER) BAR PRESS = .760 M HG)
 ((FAR FIELD NOISE)) 100% RPM) REL HUMID = 79 %)
 (()) RUN 03)
 (()) 18 SEP 78)
 (()) PAGE 19)



(FIGURE: SOUND PRESSURE LEVEL (SPL)
 (EQUAL LEVEL CONTOURS (DB)
 (11 125 HZ OCTAVE BAND
 (NOISE SOURCE/SUBJECT: (OPERATION:
 (F-104D AIRCRAFT (MILITARY POWER
 (J79-GE-7/A ENGINE (100% RPM
 (FAR FIELD NOISE (FREE FLOW
 (METEOROLOGY:
 (TEMP = 15 C
 (BAR PRESS = .760 M HG
 (REL HUMID = 70 %
 (IDENTIFICATION:
 (OMEGA 1.4
 (TEST 75-002-033
 (RUN 03
 (18 SEP 78
 (PAGE 20



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15 C
•760 M HG
70 %

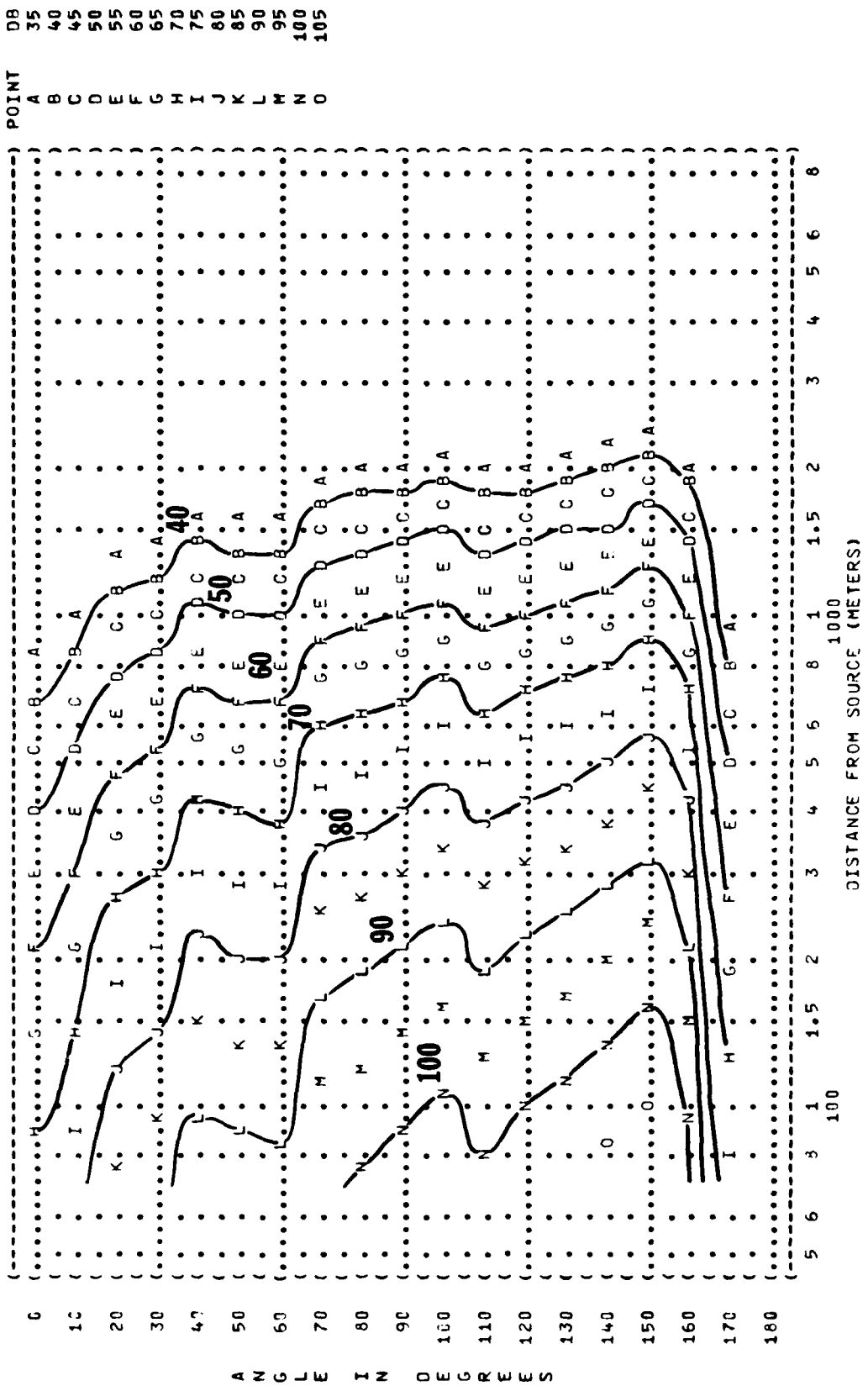
1000
DISTANCE FROM SOURCE (METERS)


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(-----)
( ) FIGURE: SOUND PRESSURE LEVEL {SPL} ) IDENTIFICATION: )
( ) EQUAL LEVEL CONTOURS (FB) ) )
( ) 11 ) OMEGA 1.4 )
( ) 1000 HZ OCTAVE BAND ) TEST 75-002-033 )
( ) NOISE SOURCE/SUBJECT: ) RUN 03 )
( ) METEOROLOGY: )
( ) TEMP = 15 C )
( ) MILITARY POWER ) 18 SEP 78 )
( ) J79-GE-7/A ENGINE ) BAR PRESS = .76C M HG )
( ) FAR FIELD NOISE ) 100% RPM ) REL HUMID = 70 % )
( ) FREE FLOW ) PAGE 23 )
(-----)
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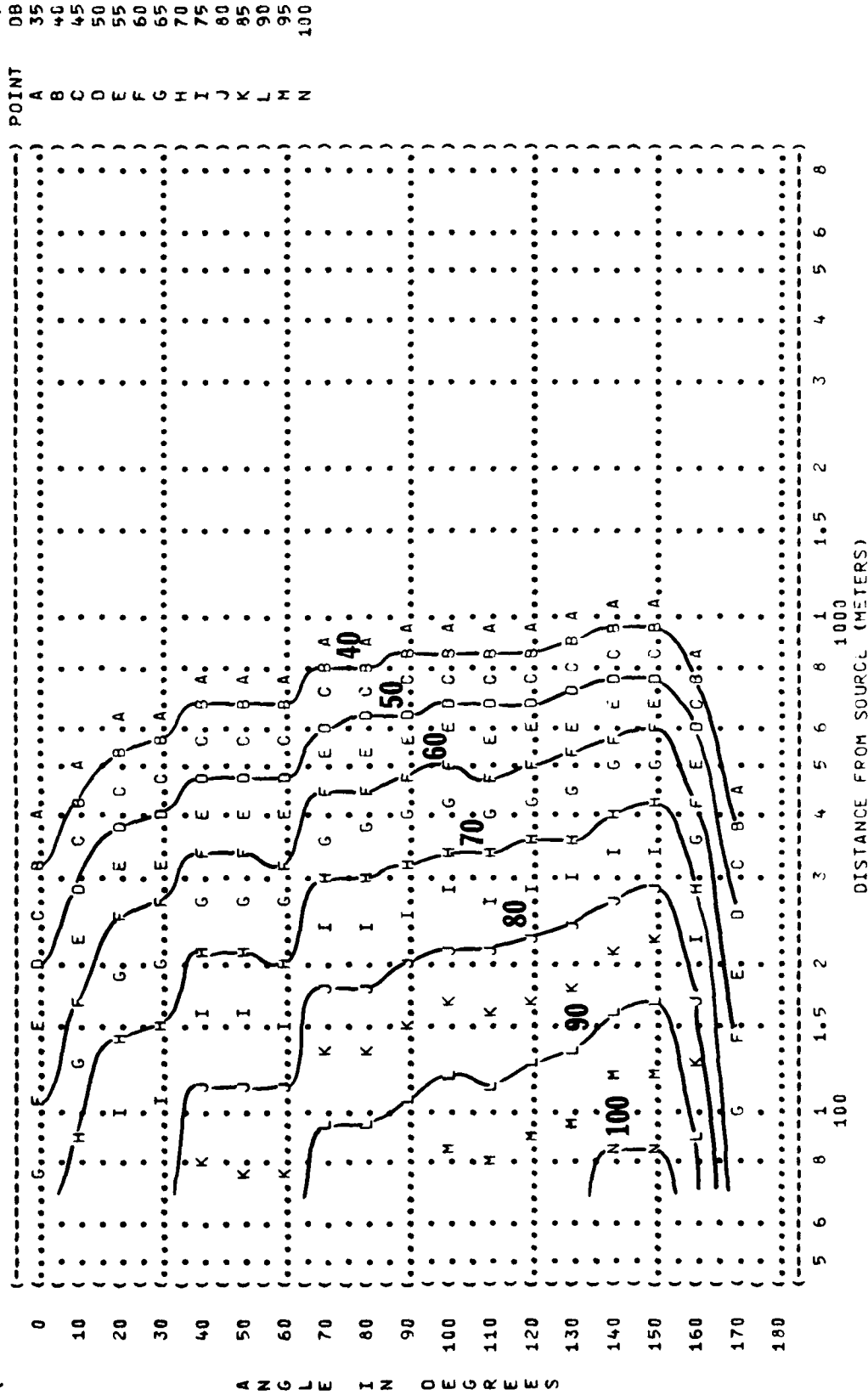
4ZU JW HZ OWGZWWN

PAGE 24

(FIGURE: SOUND PRESSURE LEVEL (SPL))
 (11 EQUAL LEVEL CONTOURS (dB))
 (400 HZ OCTAVE BAND)
 (NOISE SOURCE/SUBJECT:)
 (F-1040 AIRCRAFT)
 (J79-GE-7/A ENGINE)
 (FAR FIELD NOISE)
 (OPERATION:)
 (MILITARY POWER)
 (100% RPM)
 (FREE FLOW)
 (METEOROLOGY:)
 (TEMP = 15 C)
 (BAR PRESS = .760 M HG)
 (REL HUMID = 70 %)
 (IDENTIFICATION:)
 (OMEGA 1.4)
 (TEST 75-002-033)
 (RUN 03)
 (18 SEP 78)
 (PAGE 25)



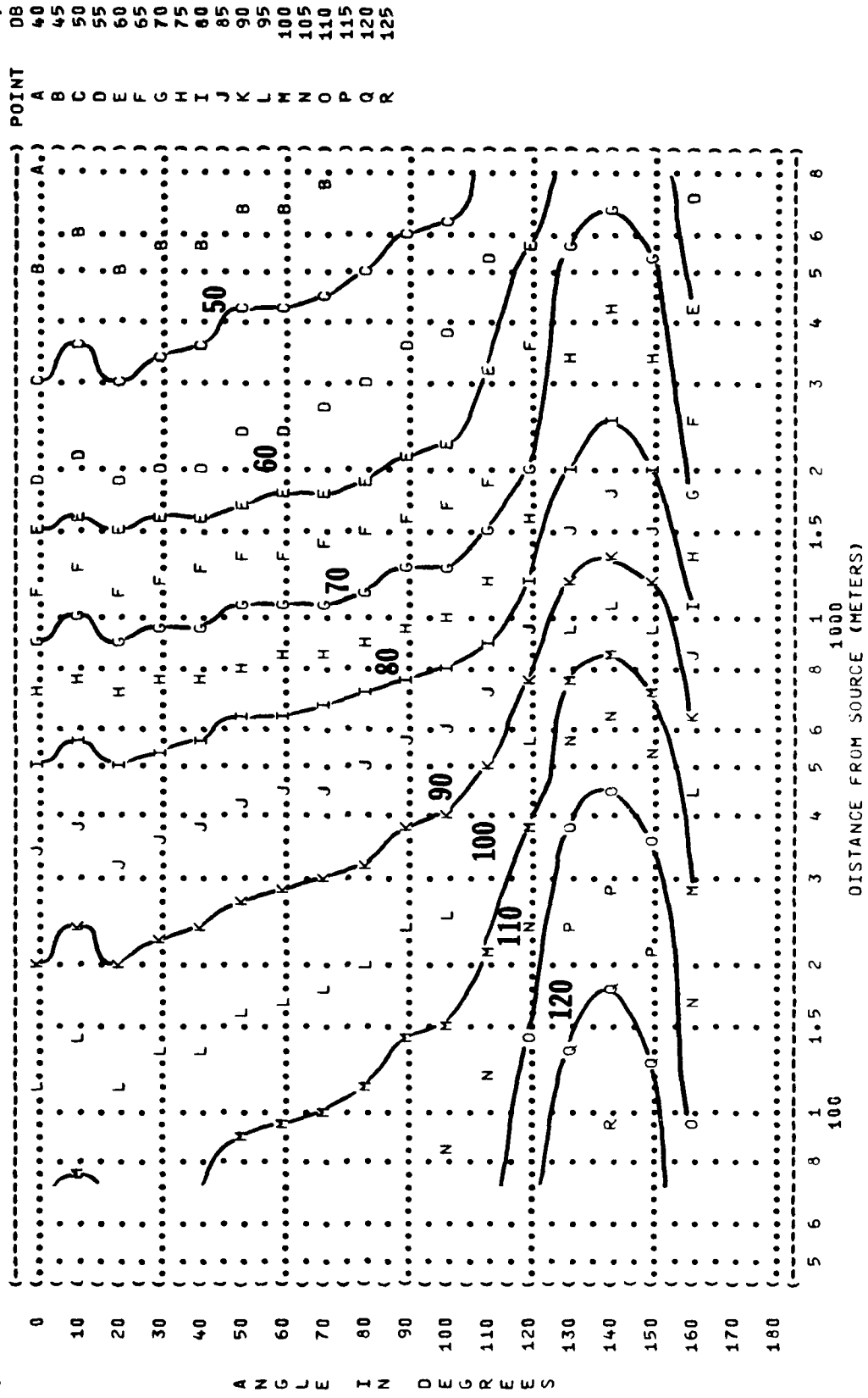
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 (11 EQUAL LEVEL CONTOURS (DB)
 (8000 HZ OCTAVE BAND
 (NOISE SOURCE/SUBJECT: (OPERATION:
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 (J79-GE-7/A ENGINE (100% RPM
 (FAR FIELD NOISE (FREE FLOW
 (METEOROLOGY:
 (TEMP = 15 C
 (BAR PRESS = .760 M HG
 (REL HUMID = 70 %
 (IDENTIFICATION:
 (OMEGA 1.4
 (TEST 75-002-033
 (RUN 03
 (18 SEP 78
 (PAGE 26



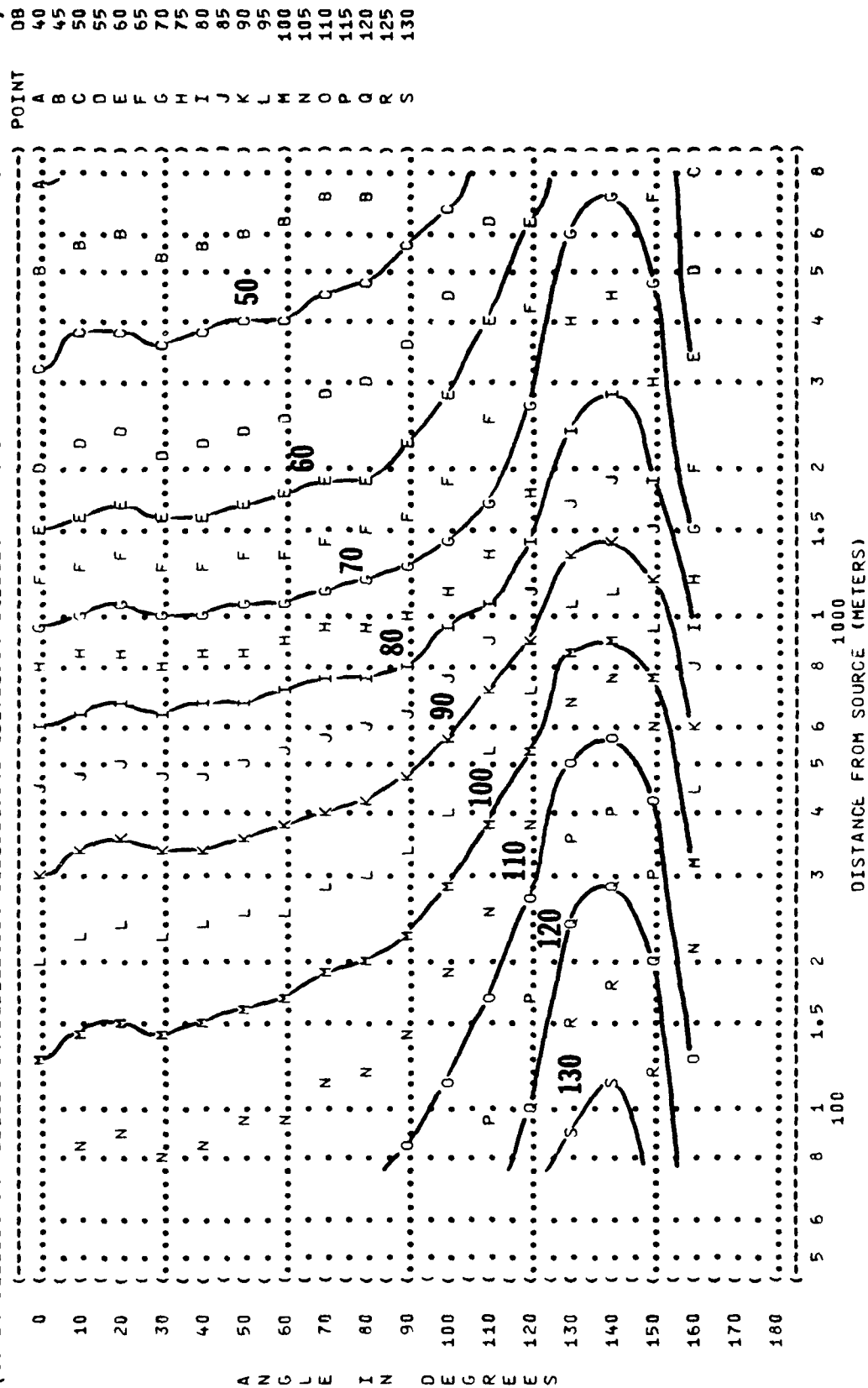
ISE SOURCE/SUBJECT:	OPERATION:
F-104D AIRCRAFT	AFTERBURST
J79-GE-7/A ENGINE	100% RPM
FAR FIELD NOISE	DEFLECTED



(FIGURE: SOUND PRESSURE LEVEL (SPL)
 (II EQUAL LEVEL CONTOURS (DB)
 (63 HZ OCTAVE BAND
 (NOISE SOURCE/SUBJECT: (OPERATION: (METEOROLOGY: (TEMP = 15 C
 (F-104D AIRCRAFT (AFTERBURNER POWER (BAR PRESS = .760 M HG
 (J79-GE-7/A ENGINE (100% RPM (REL HUMID = 70 %
 (FAR FIELD NOISE (DEFLECTED FLOW (PAGE 19)



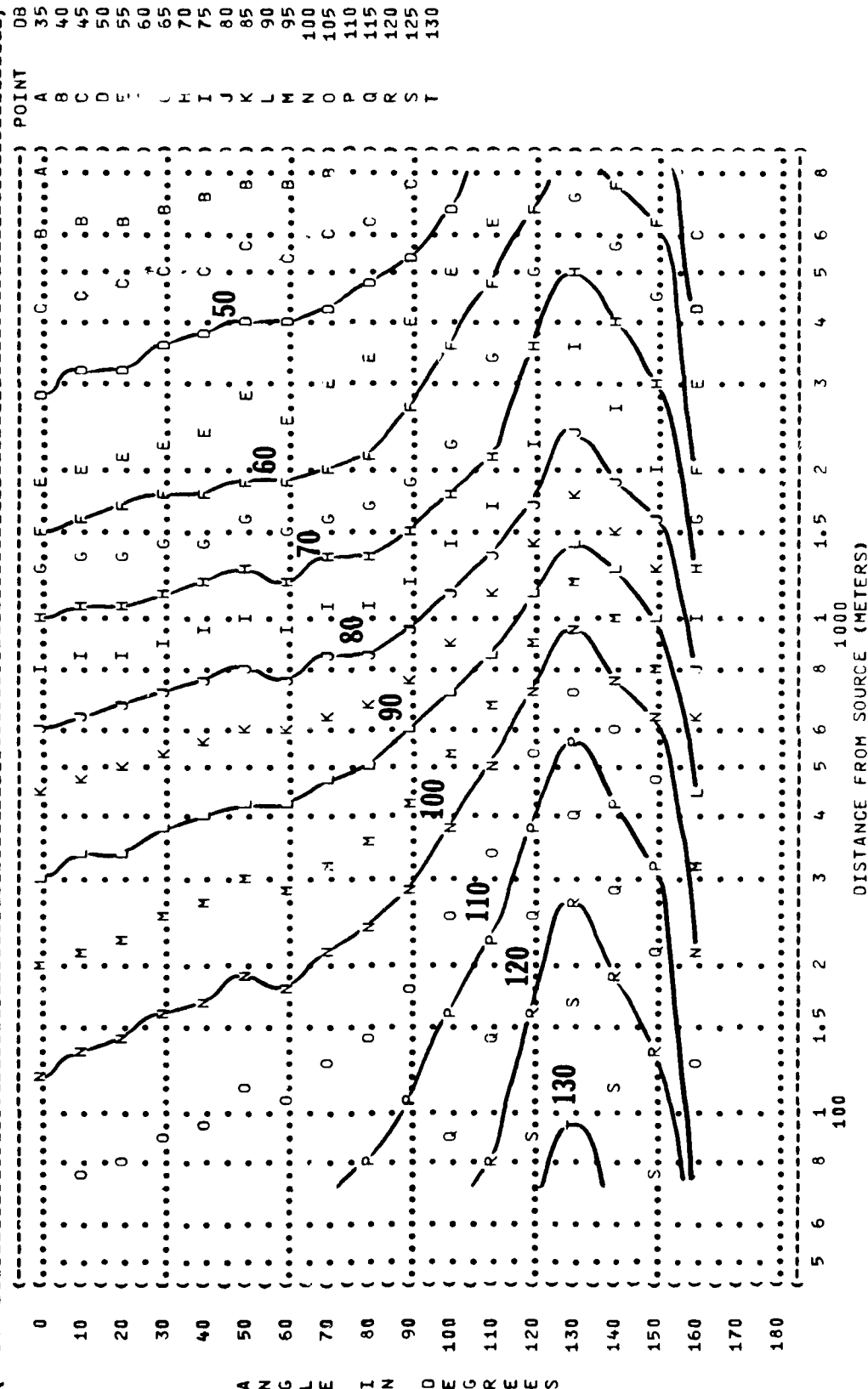
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(-----)
( FIGURE: SOUND PRESSURE LEVEL {SPL} ) IDENTIFICATION:
( EQUAL LEVEL CONTOURS (DB) ) )
( 11 ) OMEGA 1.4
( 125 HZ OCTAVE BAND ) TEST 75-002-060
( NOISE SOURCE/SUBJECT: ) ) RUN 03
( ) METEOROLOGY:
( ) TEMP = 15 C
( F-104D AIRCRAFT ) AFTERBURNER POWER ) BAR PRESS = .760 M HG
( J79-GE-7/A ENGINE ) 100% RPM ) REL HUMID = 70 %
( FAR FIELD NOISE ) DEFLECTED FLOW ) PAGE 20
(-----)
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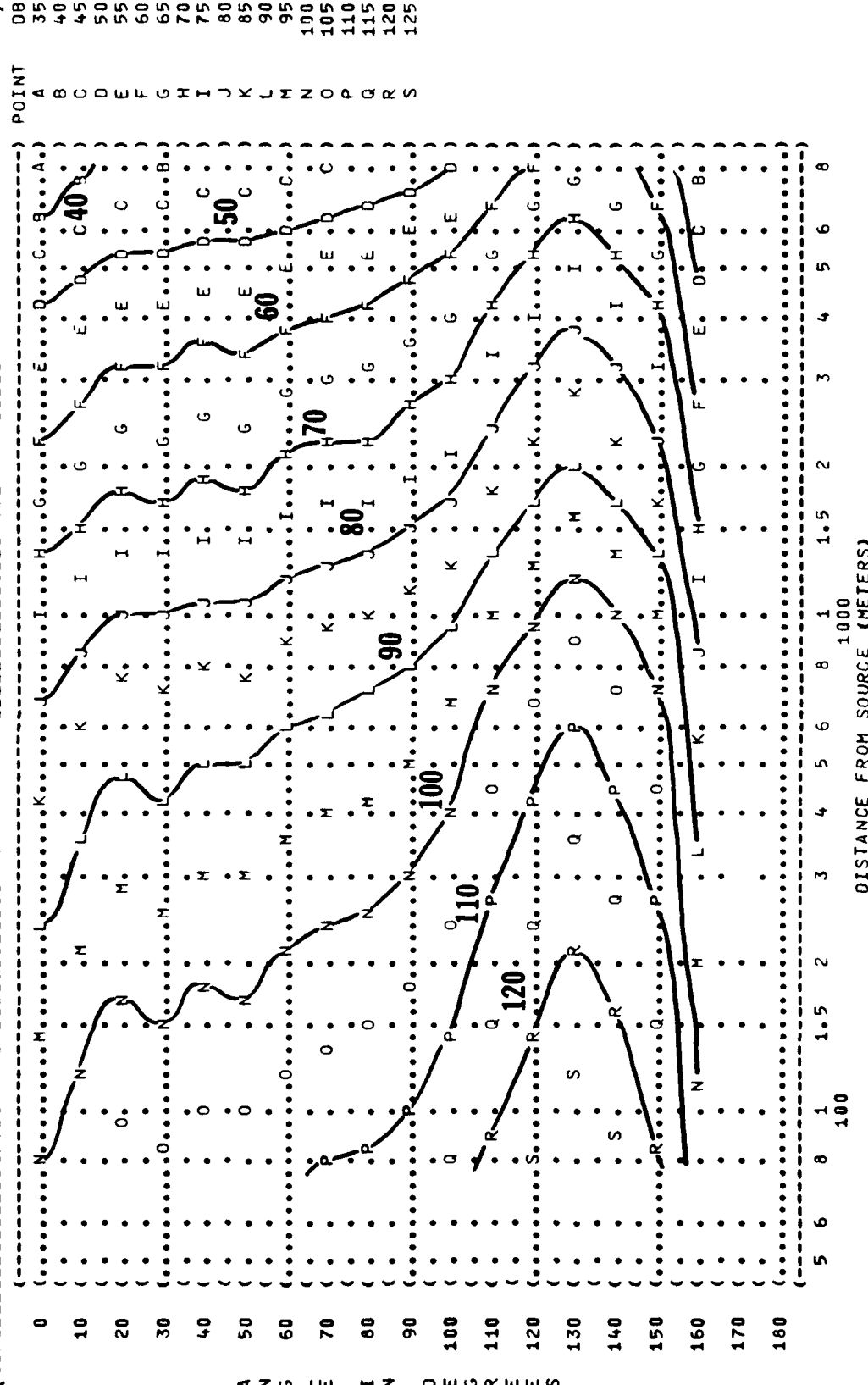
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( ( FIGURE: SOUND PRESSURE LEVEL (SPL) ) IDENTIFICATION: )
( ( EQUAL LEVEL CONTOURS (DB) ) )
( ( 11 ) OMEGA 1.4 )
( ( 250 HZ OCTAVE BAND ) TEST 75-002-060 )
( ( NOISE SOURCE/SUBJECT: ) OPERATION: ) METEOROLOGY: )
( ( ) ) TEMP = 15 C )
( ( F-104D AIRCRAFT ) AFTERBURNER POWER ) BAR PRESS = .760 M HG )
( ( J79-GE-7/A ENGINE ) 100% RPM ) REL HUMID = 70 % )
( ( FAR FIELD NOISE ) DEFLECTED FLOW ) PAGE 21 )

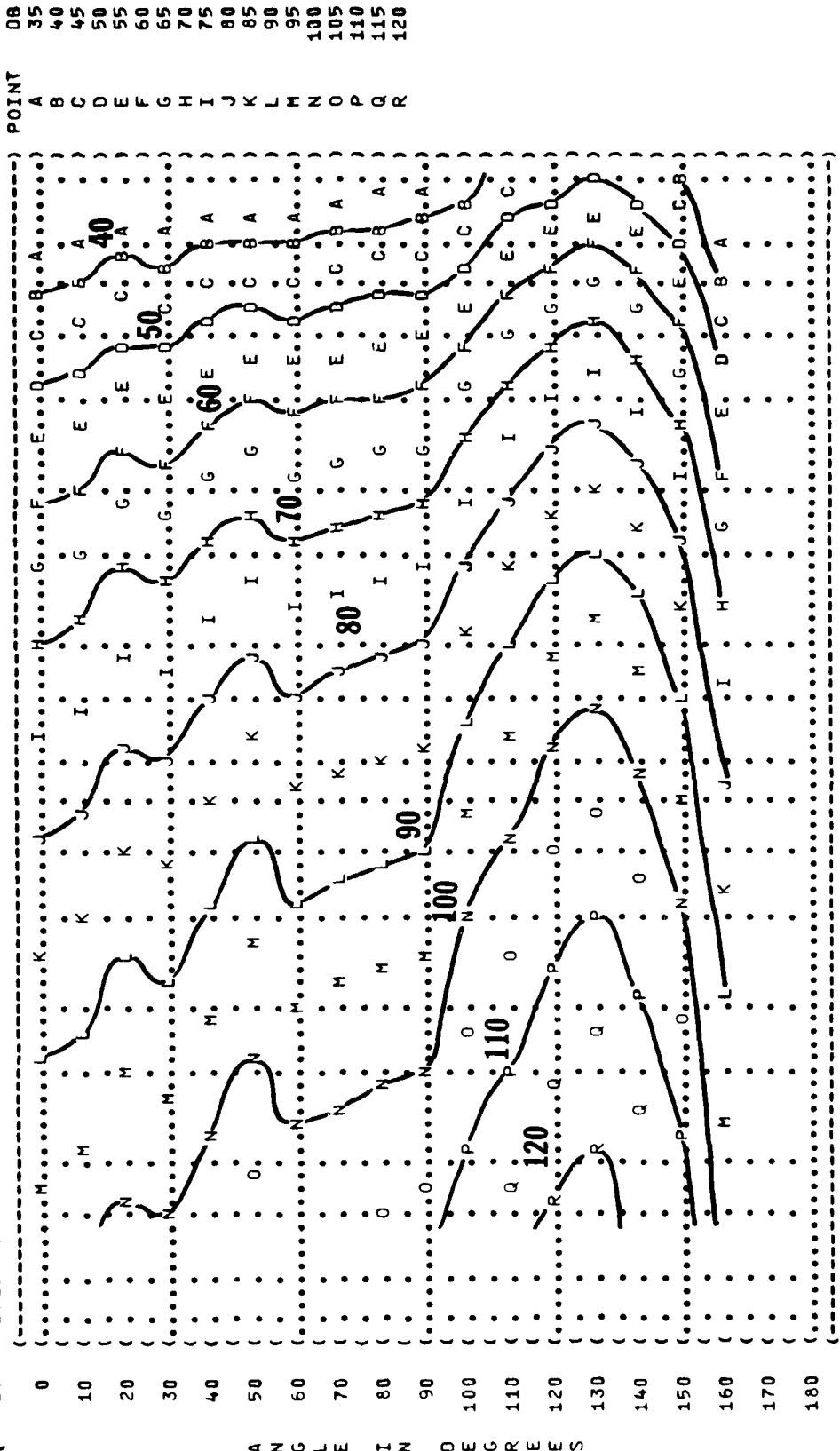
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(FIGURE: SOUND PRESSURE LEVEL (SPL))
 (11 EQUAL LEVEL CONTOURS (DB))
 (500 HZ OCTAVE BAND)
 (NOISE SOURCE/SUBJECT:)
 (F-104D AIRCRAFT)
 (J79-GE-7/A ENGINE)
 (FAR FIELD NOISE)
 (OPERATION:)
 (AFTERBURNER POWER)
 (100% RPM)
 (DEFLECTED FLOW)
 (METEOROLOGY:)
 (TEMP = 15 C)
 (BAR PRESS = .760 M HG)
 (REL HUMID = 70 %)
 (IDENTIFICATION:)
 (OMEGA 1.4)
 (TEST 75-002-060)
 (RUN 03)
 (24 JAN 79)
 (PAGE 22)

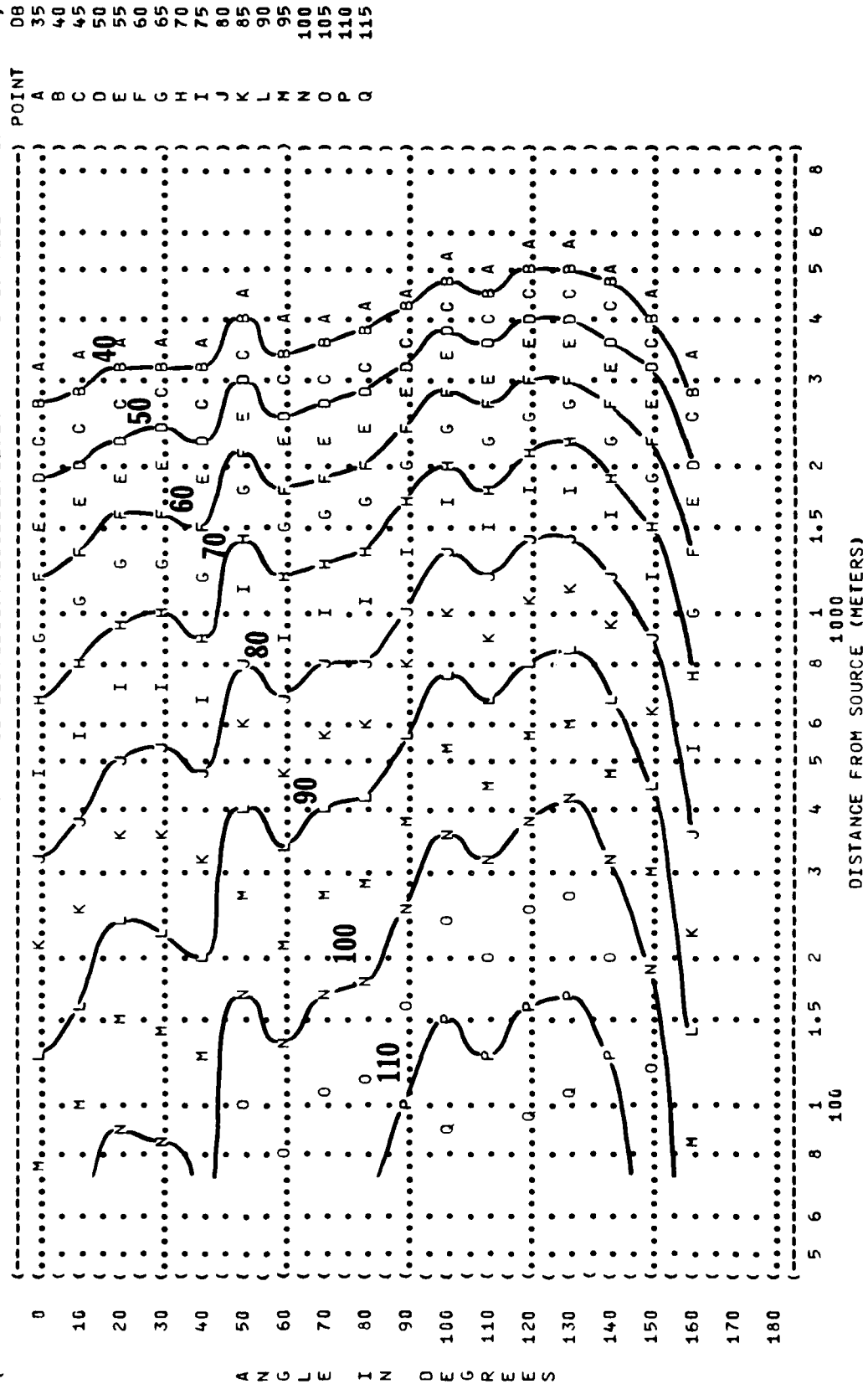


(FIGURE: SOUND PRESSURE LEVEL (SPL)
 (11 EQUAL LEVEL CONTOURS (DB)
 (1000 HZ OCTAVE BAND
 (NOISE SOURCE/SUBJECT: (OPERATION:
 (F-104D AIRCRAFT (AFTERBURNER POWER
 (J79-GE-7/A ENGINE (100% RPM
 (FAR FIELD NOISE (DEFLECTED FLOW
 (METEOROLOGY:
 (TEMP = 15 C
 (BAR PRESS = .760 M HG
 (REL HUMID = 70 %
 (IDENTIFICATION:
 (OMEGA 1.4
 (TEST 75-002-060
 (RUN 03
 (24 JAN 79
 (PAGE 23



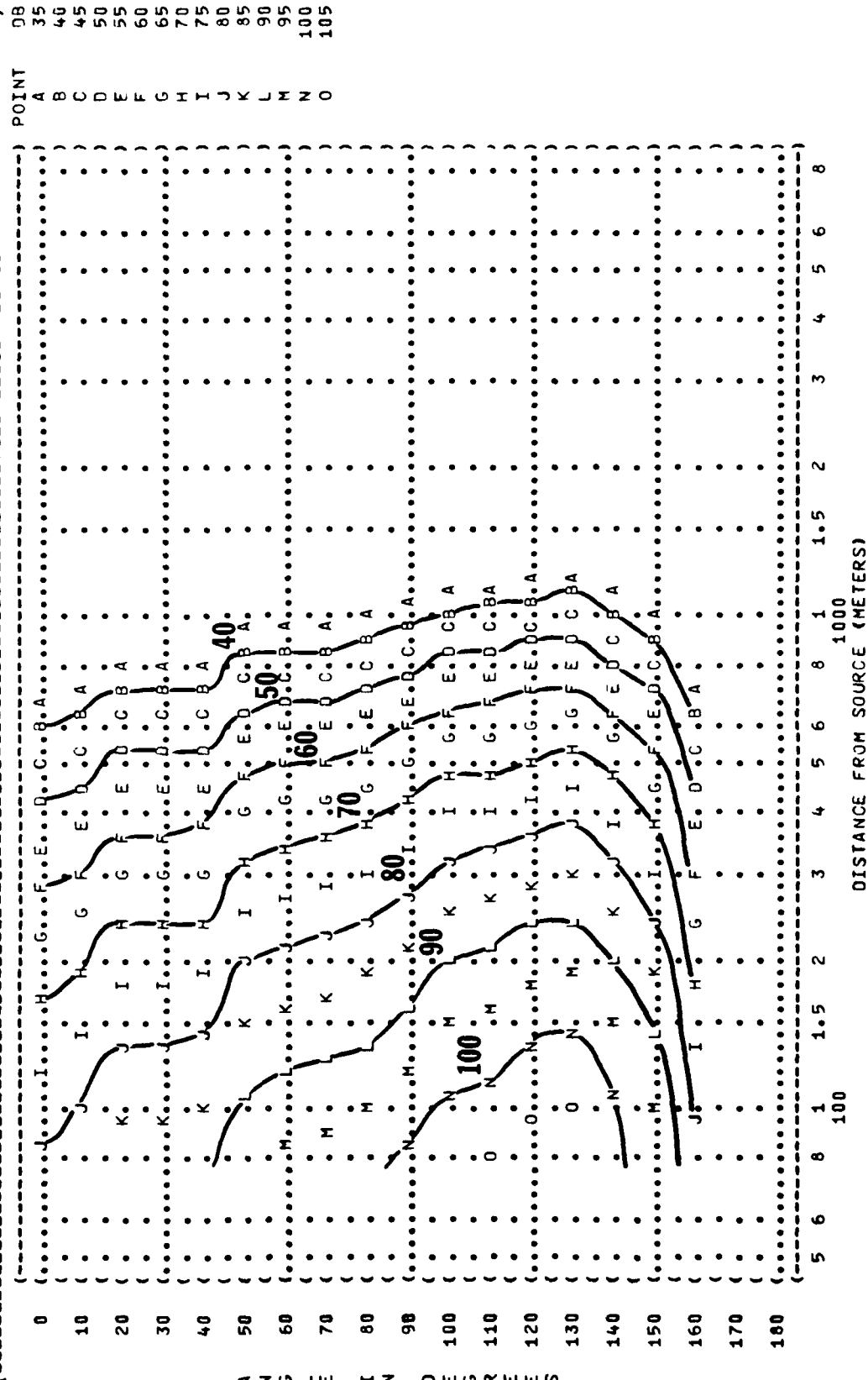
DISTANCE FROM SOURCE (METERS)

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(-----)
( ) FIGURE: SOUND PRESSURE LEVEL {SPL}          ) IDENTIFICATION:
( )      EQUAL LEVEL CONTOURS   (DB)              )
( )      11                     ) OMEGA 1.4        )
( )      2000 HZ OCTAVE BAND    ) TEST 75-002-C60 )
(-----)
( ) NOISE SOURCE/SUBJECT:         ) METEOROLOGY:
( )                               ) TEMP = 15 C       )
( ) F-104D AIRCRAFT               ) AFTERBURNER POWER )
( ) J79-GE-7/A ENGINE             ) 100% RPM          )
( ) FAR FIELD NOISE               ) DEFLECTED FLOW    )
(-----)
( ) PAGE 24
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ANGIE IN DEGREES

(FIGURE: SOUND PRESSURE LEVEL (SPL)
 (11 EQUAL LEVEL CONTOURS (DB)
 (8000 HZ OCTAVE BAND
 (NOISE SOURCE/SUBJECT: (OPERATION:
 (F-104D AIRCRAFT (AFTERBURNER POWER
 (J79-GE-7/A ENGINE (100% RPM
 (FAR FIELD NOISE (DEFLECTED FLOW
 (METEOROLOGY: TEMP = 15 C
 (BAR PRESS = .760 M HG
 (REL HUMID = 70 %
 (IDENTIFICATION: OMEGA 1.4
 (TEST 75-002-060
 (RUN 03
 (24 JAN 79
 (PAGE 26



A N G L E I N D E G R E E S