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REVISION OF CIVIL AIRCRAFT NOISE DATA FOR THE INTEGRATED NOISE MODEL (INM)

SEPTEMBER 1986

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16. Abstract

This report provides noise data for the Integrated Noise Model (INM) and is referred to as data base number nine.

Air-to-ground sound level versus distance data for civil (and some military) aircraft in a form useful for airport noise contour computations are provided over a distance range from 200 to 25,000 feet in terms of three noise measures: sound exposure level (SEL), effective perceived noise level (EPNL), and maximum A-weighted sound level (ALM). Data are included for all major civil transport and general aviation airplanes in widespread use in the USA, and for several military airplanes typical of those currently operated by the Air National Guard or Air Force Reserve. The sound level versus distance functions were generated by the procedures specified in Society of Automotive Engineers Aerospace Information Report 1845. The data from which these functions were developed are those used previously in the 1980 data base plus additional measured data on airplanes which have entered service in the past five years.

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1. INTRODUCTION

This report provides air-to-ground sound level versus distance data for a wide range of civil (and some military) aircraft in a form suitable for airport noise contour computations using the Integrated Noise Model (INM) [1]*. Air-to-ground noise data are provided over a distance range from 200 to 25,000 feet in terms of three noise measures: sound exposure level (SEL), effective perceived noise level (EPNL) and maximum A-level (ALM).

Data presented in this report are a revision and expansion of noise information provided earlier [2]. In this report, the data for civil aircraft have been revised to be in conformance with SAE Aerospace Information Report 1845 and ICAO recommendations [3 and 4]. Based on these recommendations, the noise data reflect the following calculation changes:

a) An "integrated" calculation procedure (involving time integration over the full spectrum time history) is employed for airplanes where adequate field data are available in calculating noise levels to a distance of 2500 ft**.

b) Where full spectrum time histories are not available, SEL and EPNL data are calculated using a duration adjustment of 7.5 dB per decade distance change rather than the 6 dB per decade change previously used.

c) Air attenuation coefficients from References 3 and 4 are used which provide for greater air attenuation at high frequencies compared to the attenuation for standard day conditions (59°F, 70% relative humidity) used previously [5].

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* References are listed together at the end of the report text.

**For distances greater than 2500 feet, a duration adjustment of 7.5 dB per decade distance change is used in conformance with Ref. [3] and [4].

The changes in calculation procedures generally result in small changes (of the order of 0 to $\pm$ 2 dB) in the tabulated noise data (see further discussion in Section 3.5).

In this report, noise data for several new aircraft have been added to the data file (BAe 146, Boeing 737-300, Canadair CL-600 and 601, and Saab 340, for example). In addition, for several newer aircraft, the noise tables are based upon analysis of newly-acquired field data rather than estimates (Boeing 757 and McDonnell Douglas MD-80, aircraft, for example).

In general, noise data are included for all major civil transport and general aviation aircraft in wide-spread use in this country and for several civil aircraft that are expected to be in wide-spread use in the future. Several military aircraft, typical of those currently used by the Air National Guard or for Air Force research activities at civil bases, are also included.*

The correlation of sound level data with aircraft operations, in terms of aircraft speed and engine operating parameters, varies in detail among the aircraft, from specific curves for different engine thrusts for major civil jet transport aircraft to generalized noise curves for broad categories of propeller aircraft. The sound level versus distance curves for the aircraft have been generated using consistent analytic models for projecting sound levels from noise information obtained at one or several reference distances and specified operating conditions. Although consistent analytic methods have been employed to generate the sound level versus distance curves, the basic reference information available per airplane varies from noise certification data, considered to be of highest accuracy, to data obtained from airport noise measurements where airplane performance data must be

* The data for jet military airplanes are unchanged from those presented earlier.

estimated from flight manual data. The class of data for each airplane is indicated later in this report.

Section 2 presents the noise data and provides an index to the appropriate noise tables and figures. Section 3 discusses the analytic approaches used in generating the sound level data, sources of sound level data, and the development of curves for specific aircraft. Definitions of the noise measures and the analytic methods used to develop the noise versus distance data are presented in Appendices A and B. Appendix C describes the computer program developed to implement the "integrated" procedures for computing sound level versus distance curves. Appendix D lists reference one-third octave frequency band sound pressure levels for each aircraft.

2. NOISE DATA PRESENTATION

This section presents the air-to-ground noise data for the civil and military aircraft. For each aircraft, separate tables are presented listing the level versus distance values for sound exposure level (SEL), effective perceived noise level (EPNL) and maximum A-level (ALM).* These measures are frequently used in describing the noise environment in the vicinity of the airport. Day-night Average Sound Level (DNL or L_{dn}) is the primary measure of the noise environment and utilizes SEL as the basic noise descriptor for moving aircraft [3, 6]. The Noise Exposure Forecast (NEF) descriptor of the airport noise environment uses EPNL as the basic aircraft noise measure [7]. Maximum A-level is not used in noise environment calculations but is frequently used to describe the maximum noise level due to individual aircraft events (takeoffs and landings for example).

The tables list the air-to-ground sound levels as a function of the distance between the aircraft and the ground observer.** These sound levels represent those heard by a ground observer directly underneath the aircraft. For estimating the sound levels at various distances and angles to the side of the aircraft, i.e., at positions not directly underneath the aircraft, the tabulated noise levels may need adjustments for:

a) Shielding effects due to specific airframe geometry.
b) Excess attenuation introduced by interference between direct and reflected sound rays at small angles over the earth's surface.
c) Attenuation due to the impedance of the ground terrain and observer height above the terrain.

*Brief definitions of these measures are given in Appendix A.

**The distance is the distance between the aircraft and the observer at the time of closest approach.

The INM computer program for calculating airport noise environments provides a means for adjusting for these factors.

In accordance with [3] and [4], the sound level versus distance curves were developed using the air absorption values listed in Table 1. These values represent moderately greater absorption than the "standard day" (sea level, and 59°F, and 70% relative humidity) values used earlier [5]. Table 1 compares the two sets of air absorption values.

Sound level data provided in this report are generally applicable for the range of temperatures and humidities encountered at many civil airports. In utilizing the data for computations at specific airports, additional adjustments may also be needed. For high altitude airports, acoustic impedance corrections may be needed for the noise data.* In addition, for high altitude (or high temperature) airports additional adjustments may be needed to reflect the changed noise output of the aircraft source.

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* For example, the INM computer program allows adjustment for airport altitude in terms of an acoustic impedance correction, $\Delta\rho c$:

$$\Delta_{\rho c} = 10 \log \frac{\rho c}{\rho_o c_o} = 10 \log \left(\frac{\rho}{\rho_o}\right) \sqrt{\frac{T}{T_o}}$$

where:

ρ = air density at airport altitude
c = speed of sound at airport altitude
T = absolute temperature at airport altitude

and subscript "o" refers to sea level standard day unless specially adjusted.

Table 1

Air Attenuation for Noise vs. Distance Computation

One-Third Octave band Frequency Hz	Atmospheric Attenuation dB/1000 ft (305m) Reference (1)	Standard Day (59°F, 70°R.H.)(2)
50	0.1	0.1
63	0.1	0.1
80	0.1	0.1
100	0.2	0.1
125	0.2	0.2
160	0.3	0.2
200	0.4	0.3
250	0.4	0.4
315	0.6	0.5
400	0.7	0.6
500	0.9	0.7
630	1.1	0.9
800	1.4	1.2
1000	1.8	1.5
1250	2.3	1.9
1600	3.0	2.4
2000	4.0	3.0
2500	5.2	4.0
3150	7.0	5.4
4000	9.5	7.6
5000	11.0	9.1
6300	16.0	12.7
8000	22.0	18.5
10000	30.0	27.4

(1) Used for current data [3,4]

(2) Used for earlier data [5,6]

Table 2 provides an index to the aircraft noise data contained in this report. In the first column, aircraft are listed by general category. Specific aircraft for which noise data are given are listed in the second column of the table. Other aircraft for which the noise data are generally applicable for most airport planning requirements are listed in the third column. The next two columns of the table list the applicable table or figure. The figures present SEL information in graphical form for each aircraft. The last column in Table 2 indicates the data type in accordance with the designations in SAE AIR 1845 [3]:

"Type 1. Measured noise and performance data where spectral data are available for the complete flyover time period of interest.

Type 2. Measured noise and performance data where spectral data are available only for the time of occurrence of the maximum sound level.

Type 3. Noise measurements obtained during normal airport operations where airplane position and performance data are not available as a function of time throughout the duration of a sound recording. Such data, although subject to considerable scatter and airport-specific influences are normally the only type of data available for airplanes manufactured prior to the requirement for noise certification.

Type 4. Noise and airplane/engine performance data derived from analytical estimates. This is normally the only type of data available for projected new type airplanes."

TABLE 2

INDEX TO AIRCRAFT NOISE DATA

Airplane Category	Reference Airplane	Other Airplanes	Table No.	Figure No.	SAE AIR 1845 Data Type
4-Engine Turbojet, Narrow Body Transport Aircraft	Boeing 707 and Douglas DC-8 Series Aircraft with Pratt & Whitney JT4A Series Engines with Noise Suppressors	Convair 880, VC-10, B720	3	1	3
4-Engine Turbofan, Narrow Body Transport Aircraft	Boeing 707 and Douglas DC-8 Series Aircraft with JT3D Series Engines, Untreated Nacelles	Convair 990, B720B	4	2	3
	**Douglas DC-8-60 Series Aircraft with JT3D Series Engines, Acoustically-lined Nacelles	Boeing 707 with JT3D Series Engines Acoustically-lined Nacelles	5	3	1
	Douglas DC-8-70 Series Aircraft with Retrofit CFM-56 Engines		6	4	1
	*British Aerospace BAe 146 Series Aircraft with ALF-502R Engines		7	5	3
4-Engine Turbofan, Wide Body Transport Aircraft	Boeing 747 Series Aircraft with JT9D Series Engines, Blow-in Door Nacelles		8	6	3

Note: Airplanes new to this data set are indicated with an asterisk (*). Airplanes included previously, but for which new data were used in this compilation are indicated with a double asterisk (**). Tables begin at page 17 of this report; figures begin at page 131.

TABLE 2 (CONTINUED)

Airplane Category	Reference Airplane	Other Airplanes	Table No.	Figure No.	SAE AIR 1845 Data Type
4-Engine Turbofan, Wide Body Transport Aircraft	Boeing 747 Series Aircraft with JT9D Series Engines, Fixed-lip Nacelles	Boeing 747 Series Aircraft with CF-6 or RB211 Engines	9	7	3
4-Engine Supersonic Transport Aircraft	Concorde SST with Olympus 593 Turbojet Afterburner Engines		10	8	2
3-Engine Turbofan, Narrow Body Transport Aircraft	Boeing 727 Series Aircraft with JT8D Series Engines, Untreated Nacelles		11	9	3
	**Boeing 727 Series Aircraft with JT8D Series Engines, Acoustically-lined Nacelles		12	10	3
3-Engine Turbofan, Wide Body Transport Aircraft	Douglas DC-10 Series Aircraft with CF6 Series Engines	DC-10 Series With JT9D Series Engines	13	11	3
	Lockheed L-1011 Series Aircraft, with RB211 Series Engines		14	12	3

TABLE 2 (CONTINUED)

Airplane Category	Reference Airplane	Other Airplanes	Table No.	Figure No.	SAE AIR 1845 Data Type
2-Engine Turbofan, Narrow Body Transport Aircraft	Boeing 737 and Douglas DC-9 Series Aircraft with JT8D Series Engines, Untreated Nacelles		15	13	3
	**Boeing 737 and Douglas DC-9 Series Aircraft with JT8D Series Engines, Acoustically-lined Nacelles		16	14	3
	Fokker-VFW F28-2000 Aircraft with RB183 MK555-15 Engines	BAC 111	17	15	2
2-Engine High Bypass Ratio Turbofan, Narrow Body Transport Aircraft	**Douglas MD-80 Series Aircraft with JT8D-209/217 Engines	Douglas MD-88 with JT8D-119 Engines	18	16	3
	*Boeing 737-300 Aircraft with CFM-56 Series Engines	Airbus A-320	19	17	3
	**Boeing 757-200 Aircraft with RB211-535 Engines		20	18	3
2-Engine High Bypass Ratio Turbofan, Wide Body Transport Aircraft	AirBus A300 and A310 Aircraft with CF6 Series Engines		21	19	2
	**Boeing 767-200 Aircraft with CF6-80A or JT9D-7R4 Engines		22	20	3

TABLE 2 (CONTINUED)

Airplane Category	Reference Airplane	Other Airplanes	Table No.	Figure No.	SAE AIR 1845 Data Type
General Aviation, Turbojet and Turbofan Aircraft	**Composite Business Jet Aircraft, 1985 fleet		23	21	1
2-Engine Turbojet Business Aircraft	Gates Learjet 24/25 Aircraft with CJ610 Series Engines	Sabreliner 40,60, 70, 75; Jetstar I; Lear 23; Gulfstream II, etc.	24	22	1
	**Gulfstream GIIB and GIII Aircraft with Spey MK511 Engines		25	23	1
2-Engine Turbofan Business Aircraft	Gates Learjet 35/36 Aircraft with TFE 731 Series Engines	Sabreliner 65; Falcon 10, 50, 200; Jetstar II; Citation 3; HS125-800, Lear 55 IAI1124 Westwind	26	24	1
	Rockwell Sabreliner 80 Aircraft with CF700 Series Engines	Dassault Breguet Falcon 20	27	25	1
	Cessna 500/501 Citation I and II Aircraft with JT15D Series Engines	Aerospatiale Corvette, Mitsubishi MU300	28	26	1
	*Mitsubishi MU300-10 Aircraft with JT15D-5 Engines	Cessna 550/551	29	27	1
	*Canadair CL-600 Challenger Aircraft with ALF502L Engines		30	28	1
	*Canadair CL-601 Challenger Aircraft with CF34 Series Engines		31	29	1

TABLE 2 (CONTINUED)

Airplane Category	Reference Airplane	Other Airplanes	Table No.	Figure No.	SAE AIR 1845 Data Type
2-Engine Turbofan Business Aircraft	*Israel Aircraft Industries Westwind 1125 Astra Aircraft with Garrett TFE 731 Series Engines		32	30	1
4-Engine Turboprop Transport Aircraft	Lockheed Electra and Hercules C-130E Aircraft with Allison T56-A-7 or 501-D13 Engines		33	31	3
	Lockheed Hercules 380 Series or C-130H Aircraft with Allison T56-A-15 Engines		34	32	1
4-Engine Turboprop Transport Aircraft, Gross Weight less than 50,000 lbs	De Havilland DH-7 (Dash 7) Aircraft with PT6A-50 Series Engines		35	33	1
2-Engine Turboprop Transport Aircraft, Gross Weight Greater Than 38,000 lbs	Convair 580 Aircraft with Allison 501-D13 Engines		36	34	3
	Hawker Siddeley HS 748 Aircraft with RR Dart MK532 Engines	Fokker F-27, NAMC YS11, Convair CV600/640 and Gulfstream G1	37	35	3
2-Engine Turboprop Transport Aircraft, Intermediate Weight	Shorts SD3-30 Aircraft with PT6A Series Engines	Nord 262, Mohawk 298	38	36	1
	*Saab 340 Aircraft with GE CT7 Series Engines	CASA Nurtanio CN-235	39	37	1

TABLE 2 (CONTINUED)

Airplane Category	Reference Airplane	Other Airplanes	Table No.	Figure No.	SAE AIR 1845 Data Type
2-Engine Turboprop Transport Aircraft, (Less Than 15,000 lbs Maximum Gross Takeoff Weight, Over 600 Eshp[1] Per Engine)	**De Havilland DH-6 Aircraft	Beech 99, Metro 2 and 3, Embraer Bandeirante	40	38	3
Small 2-Engie Turboprop Aircraft	**Cessna Conquest Aircraft	BAe Jetstream, Gulf-stream Commander, King Air, Piper Cheyenne	41	39	2
4-Engine Piston Transport Aircraft	Douglas DC-6 Series Aircraft	Constellation, Douglas DC-4 and DC-7	42	40	2
2-Engine Piston Transport Aircraft (Greater Than 12,500 lbs Maximum Gross Takeoff Weight)	Convair 340 Aircraft	Convair CV240 and 440, Douglas DC-3	43	41	2
2-Engine Piston Aircraft (Less Than 12,500 lbs Maximum Gross Takeoff Weight)	**Beech Baron Aircraft	Beech Duke, Cessna Crusader and Chancellor, Piper Navajo and Seneca	44	42	2
1-Engine Piston Aircraft (Composite)	Composite Aircraft, 1985 Fleet		45	43	2,3
1-Engine Piston Aircraft	**Composite Single-Engine Piston Aircraft with Variable Pitch Propeller (Equal or Greater than 200 hp) - Composite Aircraft	Beech Bonanza, Cessna Centurian and Stationaire, Piper Arrow, Mooney	46	44	2

[1]Equivalent shaft horsepower

TABLE 2 (CONTINUED)

Airplane Category	Reference Airplane	Other Airplanes	Table No.	Figure No.	SAE AIR 1845 Data Type
Small 1-Engine Piston Aircraft	**Composite Single-Engine Piston Aircraft with Fixed-Pitch Propeller (Less Than 200 hp) - Composite Aircraft	Cessna 150 and 172, Piper Archer and Tomahawk	47	45	2
4-Engine Turbojet Military Transport/ Tanker Aircraft	Boeing KC-135A/C135A Aircraft with J57 Series Turbojet Engines		48	46	unchanged
4-Engine Turboprop Military Transport Aircraft	C-130H Hercules Aircraft with Allison T56-A-15 Engines		34	32	1
2-Engine Afterburner Turbojet Military Fighter/Fighter-Bomber Aircraft	McDonnell Douglas F-4C, D, E, F Aircraft with J79 Series Turbojet Engines		49	47	unchanged
1-Engine Turbofan Military Attack Aircraft	*LTV A-7D, E Aircraft with TF-41 Series Turbofan Engine		50	48	unchanged

For many of the civil jet aircraft, sound levels are identified with a corrected net thrust per engine (F_n/δ), where δ is the ratio of the atmospheric pressure at aircraft altitude to the sea level atmospheric pressure.* This is consistent with the practice of most airframe manufacturers at the present time.**

For the larger civil jet aircraft, several sound level versus distance tables are provided for thrust values spanning the range of thrusts from takeoff to approach. Specific thrust values to use for a particular takeoff or landing profile, taking into account specific operating procedures, operating weights, air speeds, flap settings, etc., can be determined from aircraft operating profile information provided in the INM computer program or in Reference 8. For many of the smaller or older airplanes for which noise data are included in the report, noise data are tabulated for typical takeoff and approach power settings without reference to detailed thrust or power settings.

*For turbofan aircraft, airframe manufacturers often may reference their noise curves to the "corrected low pressure rotor speed", $N_1/\sqrt{\Theta}$, where Θ is the ratio of the absolute temperature at the aircraft altitude to the absolute temperature at sea level. N_1 is usually specified in terms of percent of a reference speed.

**The dependence of noise output with corrected net thrust (or corrected rotor speed) has not been fully established. Most controlled field noise measurements are taken at relatively low altitudes (between 400 and 2,000 feet), where the adjustments are relatively small. Thus, it is difficult to show conclusively the validity of the pressure and temperature adjustments from examination of such field data. It is probable that the actual variation of noise output, for complex engine designs, will not vary simply with any single parameter over the entire range of possible operating conditions. However, corrected net thrust appears to be the most useful simple parameter to use. The term "corrected" net thrust is used in AIR 1845; "referred" net thrust is often used to describe the same quantity.

All of the noise data are tabulated for a reference speed of 160 knots (kt) as specified in SAE AIR 1845. Additive corrections for other aircraft speeds should be applied to the SEL and EPNL data in terms of the adjustment, Δ_s where:

$$\Delta_s = 10 \log \frac{160}{V}$$

where V is the true airspeed in knots.

No adjustment is required for the A-level values.

For many of the larger aircraft, 160 kt is close to speeds encountered in typical takeoff and landing operations. However for many of the smaller aircraft, operating speeds are considerably lower, and the adjustments to SEL and EPNL data may be quite large. To aid in using the noise data for estimation purposes, typical operating speeds are given for some aircraft when they differ substantially from 160 kt.

For aircraft whose operating speeds during takeoff and landing differ substantially from 160 kt it should also be noted that actual operation of such aircraft at a speed of 160 kt would not necessarily produce the noise levels listed in the tables (i.e., large increases in the forward speed might produce changes in noise levels other than accounted for by the simple speed adjustment).

TABLE 3-1
AIR-TO-GROUND SEL VALUES
4-ENGINE TURBOJET, NARROW BODY TRANSPORT AIRCRAFT - BOEING 707 AND DOUGLAS DC-8 SERIES AIRCRAFT WITH PRATT & WHITNEY JT4A SERIES ENGINES WITH NOISE SUPPRESSORS

	SEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust*, lbs.	4,000	6,000	10,000	12,000	15,000
Distance, ft.					
200	110.8	112.7	117.4	120.0	125.5
250	109.2	111.0	115.9	118.7	124.3
315	107.4	109.3	114.2	117.0	122.7
400	105.4	107.3	112.4	115.2	120.8
500	103.5	105.3	110.7	113.4	119.3
630	101.2	103.3	108.7	111.6	117.6
800	99.3	101.2	106.7	109.5	115.5
1000	97.0	99.0	104.5	107.5	113.5
1250	94.5	96.9	102.3	105.2	111.3
1600	92.0	94.4	99.8	102.9	109.0
2000	89.6	91.8	97.4	100.6	106.9
2500	86.7	88.9	94.8	98.1	104.5
3150	83.9	86.1	92.1	95.3	102.0
4000	80.6	82.9	89.2	92.6	99.3
5000	77.5	79.8	86.4	89.7	96.4
6300	74.3	76.8	83.3	86.6	93.3
8000	71.3	73.8	80.1	83.5	89.9
10,000	68.6	71.1	76.9	80.3	86.6
12,500	64.9	67.5	73.3	76.6	82.9
16,000	60.9	63.6	69.4	72.6	78.7
20,000	57.0	59.8	65.6	68.8	74.7
25,000	52.7	55.7	61.5	64.7	70.6

* Corrected net thrust per engine.

TABLE 3-2
AIR-TO-GROUND EPNL VALUES
4-ENGINE TURBOJET, NARROW BODY TRANSPORT AIRCRAFT - BOEING 707 AND DOUGLAS DC-8 SERIES AIRCRAFT WITH PRATT & WHITNEY JT4A SERIES ENGINES WITH NOISE SUPPRESSORS

	EPNL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs.	4,000	6,000	10,000	12,000	15,000
Distance, ft.					
200	113.7	115.7	121.2	124.3	130.3
250	112.0	114.0	119.4	122.6	128.6
315	110.2	112.2	117.6	120.7	126.9
400	108.2	110.2	115.8	118.9	125.1
500	106.2	108.4	113.8	116.9	123.1
630	104.3	106.3	111.8	114.8	120.9
800	102.1	104.1	109.7	112.7	118.7
1000	100.0	102.0	107.5	110.5	116.5
1250	97.1	99.2	104.8	108.1	114.1
1600	94.2	96.4	101.9	105.2	111.3
2000	91.3	93.6	99.3	102.5	108.8
2500	87.8	90.0	96.1	99.8	106.3
3150	83.8	86.1	92.8	96.9	103.7
4000	79.4	81.7	89.5	94.0	100.9
5000	75.0	77.3	86.3	91.0	97.9
6300	70.5	72.8	82.9	88.0	95.0
8000	66.0	68.4	79.8	84.6	92.0
10,000	62.3	64.8	76.4	81.5	88.7
12,500	58.3	60.8	72.5	77.7	85.1
16,000	53.7	56.2	68.2	73.4	81.1
20,000	49.3	51.8	63.9	69.3	76.7
25,000	44.7	47.2	59.3	64.8	72.2

TABLE 3-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
4-ENGINE TURBOJET, NARROW BODY TRANSPORT AIRCRAFT - BOEING 707 AND DOUGLAS DC-8 SERIES AIRCRAFT WITH PRATT & WHITNEY JT4A SERIES ENGINES WITH NOISE SUPPRESSORS

	MAXIMUM A-LEVEL, dB				
Airspeed, kt Thrust, lbs.	160 4,000	160 6,000	160 10,000	160 12,000	160 15,000
Distance, ft.					
200	109.2	111.1	116.5	119.6	125.3
250	107.0	108.7	114.2	117.3	123.1
315	104.3	106.2	111.8	114.8	120.6
400	101.7	103.6	109.3	112.4	118.3
500	99.1	101.1	106.7	110.0	115.8
630	96.3	98.2	104.1	107.4	113.2
800	93.3	95.3	101.2	104.7	110.6
1000	90.5	92.5	98.5	102.0	108.0
1250	87.4	89.4	95.6	99.2	105.3
1600	84.0	86.0	92.5	96.0	102.0
2000	80.6	82.7	89.3	93.1	99.1
2500	76.9	79.1	85.8	89.7	95.8
3150	73.0	75.2	82.4	86.3	92.6
4000	69.0	71.2	79.0	82.9	89.2
5000	65.3	67.4	75.3	79.1	85.4
6300	61.7	63.7	71.6	75.3	81.5
8000	58.2	60.1	67.5	71.2	77.6
10,000	54.5	58.8	63.7	67.4	73.5
12,500	50.3	52.6	59.3	63.1	69.1
16,000	45.7	48.1	54.5	58.4	64.3
20,000	41.4	43.9	50.0	54.9	65.7
25,000	36.9	39.5	45.4	48.8	54.6

TABLE 4-1
AIR-TO-GROUND SEL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 707 AND
DOUGLAS DC-8 SERIES AIRCRAFT WITH JT3D SERIES ENGINES, UNTREATED NACELLES

	SEL, dB					
Airspeed, kt	160	160	160	160	160	160
Thrust, lbs.	4,000	6,000	8,000	10,000	12,000	15,000
Distance, ft.						
200	112.5	114.8	117.1	119.0	120.7	122.5
250	110.9	113.2	115.7	117.5	119.3	121.1
315	109.2	111.4	113.9	115.8	117.6	119.4
400	107.5	109.8	112.0	113.9	115.6	117.4
500	105.9	107.9	110.3	112.0	113.8	115.5
630	103.6	105.9	108.2	110.1	111.9	113.6
800	101.3	103.7	106.1	108.0	109.8	111.4
1000	99.0	101.5	104.0	106.0	107.7	109.5
1250	96.3	98.9	101.5	103.7	105.5	107.4
1600	93.0	95.8	98.7	101.1	103.1	105.2
2000	90.0	92.8	95.9	98.5	100.8	103.1
2500	86.3	89.3	92.7	95.8	98.3	101.0
3150	81.6	85.0	89.2	92.9	95.7	98.8
4000	78.3	81.8	85.9	90.0	92.6	96.4
5000	74.6	78.4	82.7	86.9	90.0	93.6
6300	71.2	75.2	79.6	83.7	87.1	90.8
8000	68.0	72.2	76.4	80.6	84.2	88.0
10,000	64.5	68.9	73.4	77.5	81.0	85.1
12,500	61.0	65.7	69.9	73.9	77.7	81.7
16,000	57.0	61.7	66.1	70.1	73.9	77.9
20,000	53.4	58.0	62.5	66.5	70.4	74.2
25,000	49.5	54.1	58.6	62.8	66.5	70.4

TABLE 4-2
AIR-TO-GROUND EPNL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 707 AND
DOUGLAS DC-8 SERIES AIRCRAFT WITH JT3D SERIES ENGINES, UNTREATED NACELLES

	EPNL, dB					
Airspeed, kt Thrust, lbs.	160 4,000	160 6,000	160 8,000	160 10,000	160 12,000	160 15,000
Distance, ft.						
200	119.3	121.8	124.4	126.6	172.4	128.2
250	117.8	120.3	122.9	125.1	125.9	126.6
315	116.1	118.6	121.2	123.4	124.2	125.0
400	114.3	116.8	119.3	121.5	122.3	123.4
500	112.5	115.0	117.6	119.7	120.5	121.6
630	110.4	112.9	115.4	117.5	118.3	119.3
800	108.0	110.5	113.0	115.1	115.9	116.9
1000	105.7	108.2	110.7	112.8	113.5	114.5
1250	103.0	105.5	108.0	110.1	110.8	111.8
1600	99.9	102.4	104.9	107.0	107.7	108.7
2000	96.8	99.3	101.8	103.9	104.5	105.6
2500	93.1	95.6	98.5	100.7	102.1	103.3
3150	88.8	91.5	89.2	97.9	99.7	101.4
4000	83.9	87.0	90.9	94.3	96.4	98.4
5000	78.6	82.0	86.5	90.7	93.6	95.7
6300	73.7	76.6	82.8	88.2	91.1	92.8
8000	68.8	73.5	78.8	83.6	87.5	89.6
10,000	64.7	69.8	75.2	80.1	84.4	86.6
12,500	60.9	65.6	71.2	76.5	81.0	83.4
16,000	56.5	61.3	67.0	72.3	77.1	79.7
20,000	52.7	57.6	63.1	68.3	73.0	75.5
25,000	48.4	53.6	59.1	64.2	69.0	71.6

TABLE 4-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 707 AND
DOUGLAS DC-8 SERIES AIRCRAFT WITH JT3D SERIES ENGINES, UNTREATED NACELLES

	MAXIMUM A-LEVEL, dB					
Airspeed, kt Thrust, lbs.	160 4,000	160 6,000	160 8,000	160 10,000	160 12,000	160 15,000
Distance, ft.						
200	111.8	114.0	115.9	117.5	118.2	119.7
250	109.4	111.8	113.7	115.4	116.0	117.6
315	106.9	109.5	111.4	113.1	113.8	115.3
400	104.5	106.8	109.0	110.8	111.5	113.0
500	101.6	104.2	106.4	108.1	109.0	110.6
630	98.9	101.5	103.7	105.6	106.4	107.9
800	95.9	98.4	100.8	102.8	103.7	105.2
1000	93.0	95.5	98.0	100.0	101.0	102.5
1250	89.7	92.2	94.8	97.0	98.2	99.7
1600	85.7	88.3	91.0	93.5	95.0	96.8
2000	81.8	84.6	87.6	90.4	92.1	94.0
2500	77.3	80.2	83.7	86.8	88.9	91.2
3150	72.6	75.8	79.7	83.2	85.3	88.1
4000	67.8	71.3	75.4	79.5	82.0	85.0
5000	63.3	67.2	71.4	75.6	78.2	81.6
6300	59.2	63.3	67.7	71.8	74.5	78.1
8000	55.0	59.4	63.7	67.7	70.8	74.1
10,000	50.9	55.3	59.8	63.8	66.8	70.3
12,500	46.4	51.1	55.5	59.6	62.9	66.3
16,000	41.8	46.4	51.1	55.2	58.6	62.0
20,000	37.2	41.7	46.5	50.7	54.1	58.8
25,000	32.9	37.2	42.1	46.5	49.7	53.5

TABLE 5-1
AIR-TO-GROUND SEL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS DC-8-60 SERIES
AIRCRAFT WITH JT3D SERIES ENGINES, ACOUSTICALLY LINED NACELLES

	SEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	3,000	5,000	11,000	15,500
Distance, ft.				
200	104.4	105.1	109.1	116.9
250	102.9	103.6	108.0	115.8
315	101.2	101.9	106.7	114.6
400	99.4	100.0	105.4	113.3
500	97.5	98.2	104.1	112.1
630	95.6	96.2	102.7	110.8
800	93.4	94.0	101.2	109.4
1000	91.4	91.9	99.8	108.1
1250	89.3	89.8	98.3	106.7
1600	86.9	87.5	96.6	105.1
2000	84.8	85.4	95.0	103.5
2500	82.6	83.3	93.3	101.9
3150	80.3	81.0	91.2	100.1
4000	77.8	78.4	88.9	98.1
5000	75.3	75.9	86.7	96.2
6300	72.6	73.2	84.2	94.1
8000	69.7	70.2	81.4	91.8
10,000	66.7	67.3	78.6	89.4
12,500	63.6	64.2	75.6	86.9
16,000	59.9	60.6	72.1	83.9
20,000	56.4	57.2	68.7	80.9
25,000	52.7	53.7	65.2	77.7

TABLE 5-2
AIR-TO-GROUND EPNL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS DC-8-60 SERIES
AIRCRAFT WITH JT3D SERIES ENGINES, ACOUSTICALLY LINED NACELLES

	EPNL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	3,000	5,000	11,000	15,500
Distance, ft.				
200	112.1	113.3	114.4	120.8
250	120.5	111.8	113.1	119.6
315	108.7	110.0	111.6	118.2
400	106.7	108.1	110.1	116.8
500	104.8	106.1	108.5	115.4
630	102.5	103.8	106.9	114.0
800	101.1	101.3	105.1	112.4
1000	97.6	98.7	103.4	110.8
1250	94.9	95.9	101.6	109.3
1600	91.8	92.6	99.6	107.5
2000	88.7	89.5	97.7	105.8
2500	85.6	86.4	95.8	104.1
3150	82.4	82.7	93.2	102.2
4000	78.9	80.1	90.6	100.2
5000	76.1	76.4	88.1	98.2
6300	71.8	73.5	85.3	96.1
8000	68.5	70.3	82.2	93.8
10,000	65.1	66.9	79.3	91.4
12,500	61.9	63.4	76.2	88.5
16,000	57.1	58.9	72.7	85.2
20,000	52.6	54.1	69.2	82.0
25,000	46.8	48.3	65.4	78.4

TABLE 5-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS DC-8-60 SERIES
AIRCRAFT WITH JT3D SERIES ENGINES, ACOUSTICALLY LINED NACELLES

	MAXIMUM A-LEVEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	3,000	5,000	11,000	15,500
Distance, ft.				
200	102.8	105.2	107.5	114.2
250	100.4	102.5	105.4	112.1
315	97.9	99.6	103.2	110.0
400	95.2	96.2	100.8	107.7
500	92.5	93.1	98.6	105.5
630	89.6	89.9	96.3	103.2
800	86.3	87.1	93.8	100.9
1000	83.1	84.4	91.4	98.7
1250	80.2	81.7	88.9	96.4
1600	77.2	78.6	86.1	93.8
2000	74.3	75.7	83.5	91.4
2500	71.4	72.7	80.9	88.9
3150	68.3	69.6	78.0	86.4
4000	65.0	66.2	75.0	83.7
5000	61.8	63.0	72.0	81.0
6300	58.4	59.5	68.7	78.2
8000	54.7	55.8	65.2	75.0
10,000	51.0	52.1	61.7	72.0
12,500	47.1	48.3	58.0	68.7
16,000	42.6	43.9	53.6	64.9
20,000	38.4	39.8	49.5	61.2
25,000	34.0	35.5	45.3	57.3

TABLE 6-1
AIR-TO-GROUND SEL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS DC-8-70 SERIES
AIRCRAFT WITH RETROFIT CFM-56 ENGINES

	SEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	5,000	10,000	15,500
Distance, ft.			
200	97.9	101.5	106.5
250	96.5	100.2	105.3
315	95.1	98.8	103.9
400	93.5	97.2	102.5
500	92.0	95.7	101.1
630	90.4	94.2	99.6
800	88.7	92.6	98.0
1000	87.1	91.0	96.5
1250	85.5	89.4	95.0
1600	83.6	87.6	93.2
2000	81.9	85.9	91.6
2500	80.1	84.2	89.9
3150	77.9	82.1	87.9
4000	75.6	79.8	85.7
5000	73.3	77.5	83.5
6300	70.7	75.0	81.0
8000	67.8	72.2	78.3
10,000	64.9	69.3	75.5
12,500	61.8	66.2	72.5
16,000	58.2	62.6	68.9
20,000	54.7	59.1	65.3
25,000	51.0	55.4	61.6

TABLE 6-2
AIR-TO-GROUND EPNL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS DC-8-70 SERIES
AIRCRAFT WITH RETROFIT CFM-56 ENGINES

	EPNL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	5,000	10,000	15,500
Distance, ft.			
200	102.9	106.3	111.1
250	101.4	104.8	109.7
315	98.8	102.7	108.2
400	98.0	101.5	106.5
500	96.2	99.8	104.8
630	94.2	97.8	102.9
800	91.9	95.6	100.9
1000	89.7	93.6	99.1
1250	87.5	91.5	97.2
1600	84.9	89.1	95.0
2000	82.7	87.0	93.1
2500	80.6	85.0	91.1
3150	77.8	82.6	89.3
4000	75.3	79.9	86.4
5000	72.8	77.5	84.0
6300	70.1	74.8	81.3
8000	67.1	71.8	78.5
10,000	64.1	68.8	75.5
12,500	60.9	65.6	72.3
16,000	56.8	61.6	68.4
20,000	52.4	57.4	64.4
25,000	46.4	52.2	60.4

TABLE 6-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS DC-8-70 SERIES
AIRCRAFT WITH RETROFIT CFM-56 ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	5,000	10,000	15,500
Distance, ft.			
200	96.4	100.5	106.1
250	94.3	98.5	104.3
315	92.1	96.3	102.0
400	89.8	94.0	99.5
500	87.5	91.6	97.2
630	85.2	89.2	94.8
800	82.7	86.7	92.3
1000	80.4	84.4	89.9
1250	77.9	81.9	87.5
1600	75.2	79.2	84.8
2000	72.6	76.7	82.3
2500	69.9	74.0	79.6
3150	67.1	71.2	76.9
4000	64.0	68.7	73.9
5000	60.9	65.2	71.0
6300	57.5	61.8	67.8
8000	53.9	58.3	64.3
10,000	50.3	54.7	60.8
12,500	46.5	51.0	57.1
16,000	42.1	46.5	52.6
20,000	37.8	42.3	48.4
25,000	33.4	37.8	43.9

TABLE 7
AIR-TO-GROUND VALUES
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BRITISH AEROSPACE BAe 146
SERIES AIRCRAFT WITH ALF-502R ENGINES

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed, kt	160	160	160	160	160	160
Thrust, Percent	30 (Approach)	100 (Takeoff)	30 (Approach)	100 (Takeoff)	30 (Approach)	100 (Takeoff)
Distance, ft.						
200	92.9	102.3	96.9	106.1	91.2	101.6
250	91.7	101.1	95.6	104.9	89.1	99.5
315	90.4	99.8	94.2	103.6	86.8	97.2
400	89.0	98.4	92.5	102.1	84.5	94.8
500	87.5	97.0	90.8	100.6	82.2	92.3
630	86.0	95.4	89.0	98.9	79.7	89.8
800	84.3	93.7	86.9	97.0	77.0	87.1
1000	82.7	92.1	84.7	95.2	74.5	84.6
1250	81.0	90.5	82.6	93.2	71.9	82.0
1600	79.1	88.5	80.1	91.0	69.0	79.0
2000	77.3	86.8	77.9	88.9	66.3	76.3
2500	75.3	85.0	75.5	86.7	63.4	73.5
3150	73.0	82.8	72.4	84.3	60.4	70.6
4000	70.4	80.4	69.5	81.7	57.0	67.5
5000	67.8	78.1	66.7	79.2	53.7	64.4
6300	65.0	75.6	63.7	76.6	50.1	61.2
8000	61.8	72.9	60.2	73.7	46.2	57.7
10,000	58.7	70.3	56.7	70.9	42.3	54.3
12,500	55.4	67.5	52.5	68.0	38.3	50.9
16,000	51.6	64.4	47.6	64.4	33.7	47.0
20,000	48.0	61.6	41.5	60.9	29.4	43.4
25,000	44.3	58.7	34.5	55.2	25.0	39.7

TABLE 8-1
AIR-TO-GROUND SEL VALUES
4-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - BOEING 747
SERIES AIRCRAFT WITH JT9D SERIES ENGINES, BLOW-IN DOOR NACELLES

	SEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	14,000	20,000	28,000	36,000
Distance, ft.					
200	108.2	113.2	116.6	118.7	120.2
250	106.7	111.7	115.1	117.2	118.7
315	105.1	110.1	113.5	115.6	117.1
400	103.5	108.5	111.8	113.9	115.4
500	101.7	106.7	110.0	112.1	113.6
630	99.9	104.9	108.1	110.2	111.7
800	98.0	103.0	106.1	108.2	109.7
1000	96.0	101.0	104.0	106.0	107.5
1250	93.8	98.8	101.7	103.7	105.2
1600	91.5	96.5	99.4	101.3	102.8
2000	89.1	94.1	96.9	98.8	100.3
2500	86.4	91.4	94.3	96.3	97.8
3150	83.6	88.6	91.7	93.7	95.2
4000	80.6	85.6	89.0	91.2	92.7
5000	77.5	82.5	86.2	88.5	90.0
6300	74.2	79.2	83.4	85.9	87.4
8000	70.9	75.9	80.4	83.0	84.5
10,000	67.6	72.6	77.3	80.0	81.5
12,500	64.3	69.3	74.1	76.9	78.4
16,000	60.9	65.9	70.7	73.5	75.0
20,000	57.4	62.4	67.2	70.0	71.5
25,000	53.7	58.7	63.4	66.2	67.7

TABLE 8-2
AIR-TO-GROUND EPNL VALUES
4-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - BOEING 747
SERIES AIRCRAFT WITH JT9D SERIES ENGINES, BLOW-IN DOOR NACELLES

	EPNL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	14,000	20,000	28,000	36,000
Distanct, ft.					
200	114.0	120.0	123.8	125.4	126.9
250	112.4	118.4	122.3	123.9	125.4
315	110.7	116.7	120.6	122.2	123.7
400	108.9	114.9	118.8	120.4	121.9
500	107.1	113.1	117.0	118.6	120.1
630	105.1	111.1	114.9	116.5	118.0
800	103.1	109.1	112.8	114.4	115.9
1000	101.0	107.0	110.5	112.0	113.5
1250	98.7	104.7	108.0	109.4	110.9
1600	96.3	102.3	105.3	106.6	108.1
2000	93.6	99.6	102.2	103.4	104.9
2500	90.8	96.8	98.9	100.0	101.5
3150	87.6	93.6	95.4	96.4	97.9
4000	84.2	90.2	92.6	93.8	95.3
5000	80.5	86.5	89.5	90.9	92.4
6300	76.3	82.3	86.4	88.1	89.6
8000	72.7	78.7	83.3	85.1	86.6
10,000	69.2	75.2	80.0	81.9	83.4
12,500	65.4	71.4	76.4	78.4	79.9
16,000	61.2	67.2	72.7	74.8	76.3
20,000	56.6	62.6	68.8	71.1	72.6
25,000	51.2	57.2	64.4	67.1	68.6

TABLE 8-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
4-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - BOEING 747
SERIES AIRCRAFT WITH JT9D SERIES ENGINES, BLOW-IN DOOR NACELLES

	MAXIMUM A-LEVEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	14,000	20,000	28,000	36,000
Distance, ft.					
200	106.5	111.0	114.3	116.4	117.9
250	104.2	108.7	112.0	114.1	115.6
315	101.9	106.4	109.7	111.8	113.3
400	99.5	104.0	107.2	109.3	110.8
500	97.0	101.5	104.7	106.8	108.3
630	94.5	99.0	102.1	104.2	105.7
800	91.8	96.3	99.4	101.4	102.9
1000	89.0	93.5	96.5	98.5	100.0
1250	86.1	90.6	93.5	95.4	96.9
1600	83.0	87.5	90.4	92.3	93.8
2000	79.8	84.3	87.1	89.0	90.5
2500	76.4	80.9	83.8	85.8	87.3
3150	72.9	77.4	80.4	82.4	83.9
4000	69.1	73.6	76.9	79.1	80.6
5000	65.2	69.7	73.5	75.8	77.3
6300	61.2	65.7	69.8	72.3	73.8
8000	57.2	61.7	66.1	68.8	70.3
10,000	53.2	57.7	62.3	65.0	66.5
12,500	49.1	53.6	58.3	61.1	62.6
16,000	44.9	49.4	54.2	57.0	58.5
20,000	40.7	45.2	49.9	52.7	54.2
25,000	36.3	40.8	45.4	48.2	49.7

TABLE 9-1
AIR-TO-GROUND SEL VALUES
4-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - BOEING 747 SERIES
AIRCRAFT WITH JT9D SERIES ENGINES, FIXED-LIP NACELLES

	SEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	16,000	24,000	32,000	40,000
Distance, ft.					
200	102.3	106.3	109.4	111.8	113.8
250	100.9	104.9	108.2	110.5	112.5
315	99.4	103.4	106.7	109.0	111.0
400	97.8	101.8	105.1	107.4	109.4
500	96.1	100.1	103.4	105.8	107.8
630	94.3	98.3	101.7	104.1	106.1
800	92.4	96.4	99.8	102.3	104.3
1000	90.5	94.5	98.0	100.5	102.5
1250	88.6	92.6	96.2	98.7	100.7
1600	86.4	90.4	94.1	96.7	98.7
2000	84.4	88.4	92.2	94.9	96.9
2500	82.4	86.4	90.3	93.1	95.1
3150	80.1	84.1	88.2	91.0	93.0
4000	77.7	81.7	85.8	88.7	90.7
5000	75.4	79.4	83.7	86.6	88.6
6300	72.9	76.9	81.2	84.2	86.2
8000	70.1	74.1	78.6	81.7	83.7
10,000	67.3	71.3	75.9	79.1	81.1
12,500	64.3	68.3	73.1	76.4	78.4
16,000	60.7	64.7	69.7	73.1	75.1
20,000	57.1	61.1	66.4	69.9	71.9
25,000	53.3	57.3	62.8	66.5	68.5

TABLE 9-2
AIR-TO-GROUND EPNL VALUES
4-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - BOEING 747 SERIES
AIRCRAFT WITH JT9D SERIES ENGINES, FIXED-LIP NACELLES

	EPNL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	16,000	24,000	32,000	40,000
Distance, ft.					
200	106.9	112.6	116.3	118.6	120.6
250	105.5	111.2	114.9	117.2	119.2
315	104.0	109.7	113.4	115.7	117.7
400	102.2	107.9	111.7	114.0	116.0
500	100.4	106.1	110.0	112.3	114.3
630	98.4	104.1	108.1	110.5	112.5
800	96.1	101.8	106.0	108.5	110.5
1000	93.8	99.5	103.9	106.5	108.5
1250	91.3	97.0	101.7	104.5	106.5
1600	88.3	94.0	99.1	102.0	104.0
2000	85.4	91.1	96.1	99.5	101.0
2500	82.8	88.5	94.0	97.1	99.1
3150	80.2	85.9	91.7	94.9	96.9
4000	77.4	83.1	89.2	92.5	94.5
5000	74.8	80.5	86.3	89.5	91.5
6300	71.9	77.6	83.7	87.1	89.1
8000	68.8	74.5	80.4	83.7	85.7
10,000	65.7	71.4	77.6	81.0	83.0
12,500	62.3	68.0	74.5	78.1	80.1
16,000	58.2	63.9	70.9	74.7	76.7
20,000	54.1	59.8	67.2	71.2	73.2
25,000	49.3	55.0	63.1	67.4	69.4

TABLE 9-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
4-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - BOEING 747 SERIES
AIRCRAFT WITH JT9D SERIES ENGINES, FIXED LIP NACELLES

	MAXIMUM A-LEVEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	16,000	24,000	32,000	40,000
Distance, ft.					
200	103.0	107.1	110.6	113.5	115.7
250	100.7	104.8	108.3	111.1	113.3
315	98.2	102.3	105.8	108.6	110.8
400	95.5	99.6	103.1	105.9	108.1
500	93.0	97.1	100.5	103.3	105.5
630	90.2	94.3	97.8	100.6	102.8
800	87.2	91.3	94.9	97.8	100.0
1000	84.3	88.4	92.1	95.1	97.3
1250	81.4	85.5	89.3	92.4	94.6
1600	78.1	82.2	86.1	89.3	91.5
2000	75.1	79.2	83.3	86.5	88.7
2500	72.2	76.3	80.5	83.8	86.0
3150	69.2	73.3	77.5	80.9	83.1
4000	66.0	70.1	74.5	77.9	80.1
5000	63.0	67.1	71.5	75.0	77.2
6300	59.7	63.8	68.3	71.9	74.1
8000	56.1	60.2	64.9	68.5	70.7
10,000	52.6	56.7	61.5	65.3	67.5
12,500	48.9	53.0	58.0	61.8	64.0
16,000	44.5	48.6	53.7	57.7	59.9
20,000	40.2	44.3	49.7	53.8	56.0
25,000	35.6	39.7	45.4	49.7	51.9

TABLE 10-1
AIR-TO-GROUND SEL VALUES
4-ENGINE SUPERSONIC TRANSPORT AIRCRAFT - CONCORDE SST
WITH OLYMPUS 593 TURBOJET AFTERBURNER ENGINES

	SEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	10,000	20,000	28,000	32,000 (Afterburner)
Distance, ft.				
200	117.7	130.3	136.4	138.4
250	116.4	128.8	134.7	136.7
315	114.9	127.2	133.1	135.0
400	113.4	125.5	131.3	133.2
500	111.9	123.8	129.5	131.3
630	110.3	122.0	127.6	129.4
800	108.6	120.2	125.8	127.5
1000	107.0	118.3	123.8	125.5
1250	105.3	116.5	121.9	123.6
1600	103.3	114.5	120.0	121.7
2000	101.5	112.6	118.0	119.6
2500	99.4	110.5	115.9	117.9
3150	97.2	108.4	113.7	115.3
4000	94.8	106.1	111.4	113.0
5000	92.3	103.6	108.9	110.5
6300	89.6	101.1	106.4	108.0
8000	86.7	98.3	103.6	105.2
10,000	83.5	95.3	100.6	102.2
12,500	80.1	92.0	97.3	98.9
16,000	76.5	88.3	93.7	95.3
20,000	72.5	84.4	89.8	91.4
25,000	68.3	80.3	85.7	87.4

TABLE 10-2
AIR-TO-GROUND EPNL VALUES
4-ENGINE SUPERSONIC TRANSPORT AIRCRAFT - CONCORDE SST
WITH OLYMPUS 593 TURBOJET AFTERBURNER ENGINES

	EPNL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	10,000	20,000	28,000	32,000 (Afterburner)
Distance, ft.				
200	121.1	133.9	140.5	142.4
250	120.0	132.4	138.9	140.7
315	118.5	130.7	137.2	139.0
400	116.9	128.9	135.3	137.1
500	114.8	127.0	133.4	135.1
630	113.0	124.9	131.2	133.0
800	111.1	122.9	129.1	130.8
1000	109.2	120.8	126.8	128.4
1250	107.1	118.8	124.7	126.3
1600	104.8	116.6	122.5	124.1
2000	102.7	114.4	120.3	121.8
2500	100.4	112.1	118.0	119.5
3150	98.2	109.6	115.4	116.9
4000	95.6	106.9	112.7	114.2
5000	92.8	104.0	109.8	111.3
6300	89.9	100.9	106.7	108.2
8000	87.2	97.6	103.4	104.9
10,000	86.7	94.5	106.3	101.8
12,500	83.1	91.3	97.1	98.7
16,000	76.4	87.7	93.5	95.1
20,000	72.2	84.1	90.0	91.6
25,000	67.4	79.5	85.7	87.4

TABLE 10-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
4-ENGINE SUPERSONIC TRANSPORT AIRCRAFT CONCORDE SST
WITH OLYMPUS 593 TURBOJET AFTERBURNER ENGINES

	MAXIMUM A-LEVEL, dB			
Airspeed, kt Thrust, lbs	160 10,000	160 20,000	160 28,000	160 32,000 (Afterburner)
Distance, ft.				
200	115.8	126.4	132.1	134.0
250	113.7	124.1	129.7	131.6
315	111.5	121.8	127.3	129.2
400	109.2	119.4	124.8	126.7
500	107.0	116.9	122.3	124.1
630	104.6	113.3	119.6	121.4
800	102.2	111.8	117.0	118.7
1000	99.8	109.2	114.3	116.0
1250	97.4	106.6	111.6	113.3
1600	94.8	103.9	108.9	110.5
2000	92.0	101.2	106.1	107.8
2500	89.2	98.4	103.3	104.9
3150	86.2	95.5	100.4	102.0
4000	83.2	92.4	97.3	98.9
5000	79.8	89.3	94.2	95.8
6300	76.5	85.9	90.8	92.4
8000	72.8	86.5	88.3	89.9
10,000	68.8	78.7	83.6	85.2
12,500	64.7	74.6	79.5	81.1
16,000	60.3	70.2	75.1	76.7
20,000	55.7	66.2	70.6	72.2
25,000	50.7	60.7	65.7	67.3

TABLE 11-1
AIR-TO-GROUND SEL VALUES
3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 727 SERIES AIRCRAFT
WITH JT8D SERIES ENGINES, UNTREATED NACELLES

	SEL, dB					
Airspeed, kt Thrust, lbs	160 3,000	160 6,000	160 8,000	160 10,000	160 12,000	160 14,000
Distance, ft.						
200	104.3	108.1	110.8	113.4	117.1	121.8
250	102.8	106.5	109.1	112.1	115.7	120.7
315	101.3	104.6	107.5	110.8	114.6	119.4
400	99.2	102.5	105.9	109.2	113.1	117.9
500	97.1	100.7	104.2	107.8	111.8	116.6
630	94.9	98.7	102.5	106.3	110.4	115.3
800	92.5	96.6	100.6	104.5	108.8	113.8
1000	90.5	95.0	98.8	103.1	107.5	112.5
1250	88.9	93.2	97.3	101.4	105.8	110.9
1600	86.7	91.2	95.4	99.4	103.8	109.0
2000	84.8	89.2	93.5	97.7	102.2	107.4
2500	82.7	87.5	91.8	96.0	100.5	105.6
3150	80.4	85.3	89.8	94.0	98.4	103.7
4000	77.6	82.9	87.7	91.5	96.3	101.7
5000	75.5	80.6	85.0	89.3	94.1	99.5
6300	72.9	78.1	82.5	87.0	91.9	97.3
8000	70.1	75.5	79.8	84.4	89.4	94.8
10,000	67.4	72.7	77.1	81.8	87.0	92.3
12,500	64.3	69.8	74.4	79.1	84.3	89.9
16,000	60.8	66.1	70.9	75.5	80.8	86.5
20,000	57.4	62.7	67.5	72.2	77.6	83.5
25,000	53.8	58.9	64.0	68.7	74.1	80.4

TABLE 11-2
AIR-TO-GROUND EPNL VALUES
3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 727 SERIES AIRCRAFT
WITH JT8D SERIES ENGINES, UNTREATED NACELLES

	EPNL, dB					
Airspeed, kt	160	160	160	160	160	160
Thrust, lbs	3,000	6,000	8,000	10,000	12,000	14,000
Distance, ft.						
200	109.0	112.3	114.9	117.7	121.3	125.9
250	107.5	110.9	113.4	116.4	120.0	124.7
315	106.0	109.4	111.9	115.1	118.6	123.4
400	104.4	107.8	110.4	113.5	117.2	121.9
500	102.9	106.2	108.7	111.9	115.8	120.6
630	100.7	104.1	106.7	110.0	114.0	119.1
800	98.5	102.0	104.8	108.1	112.3	117.2
1000	96.4	99.9	102.9	106.3	110.6	115.0
1250	94.0	97.9	100.5	104.2	108.7	113.9
1600	91.4	95.3	98.0	102.0	106.7	111.9
2000	89.0	93.0	96.0	100.0	104.8	110.0
2500	86.6	90.5	93.5	97.8	103.0	108.1
3150	83.9	87.9	91.0	95.3	100.6	105.8
4000	80.6	85.0	88.2	92.8	98.1	103.7
5000	78.0	82.3	85.5	90.5	96.2	101.5
6300	75.0	79.3	82.6	87.9	93.8	99.3
8000	71.7	76.1	79.7	85.1	91.1	97.2
10,000	68.4	73.0	76.7	82.3	88.5	94.9
12,500	65.3	69.7	73.6	79.3	86.0	89.6
16,000	61.0	65.3	69.6	75.8	82.5	89.5
20,000	56.7	61.4	65.9	72.2	79.4	86.3
25,000	51.4	56.1	61.3	68.1	75.5	83.1

TABLE 11-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 727 SERIES AIRCRAFT
WITH JT8D SERIES ENGINES, UNTREATED NACELLES

	MAXIMUM A-LEVEL, dB					
Airspeed, kt	160	160	160	160	160	160
Thrust, lbs	3,000	6,000	8,000	10,000	12,000	14,000
Distance, ft.						
200	104.6	107.4	110.6	113.6	117.9	122.8
250	102.1	104.6	108.2	111.2	115.8	120.5
315	99.2	101.9	105.4	108.5	113.3	118.2
400	96.6	98.9	102.7	106.3	110.9	115.4
500	93.5	96.3	100.1	103.8	108.6	113.7
630	90.6	93.5	97.6	101.5	106.3	111.4
800	87.5	90.7	95.3	99.1	103.7	108.9
1000	84.3	87.8	91.9	96.6	101.4	106.5
1250	81.6	85.2	89.4	93.9	98.6	103.9
1600	78.7	82.1	87.7	90.9	95.7	101.0
2000	75.8	79.2	83.8	88.3	93.1	98.4
2500	72.9	76.3	80.9	85.5	90.3	95.5
3150	69.8	73.5	78.0	82.6	87.4	92.8
4000	66.5	70.5	75.2	79.7	84.8	90.2
5000	63.2	67.3	71.8	76.8	81.7	87.3
6300	60.0	63.9	68.5	73.8	78.8	84.3
8000	56.3	60.6	65.2	70.3	75.4	81.0
10,000	53.0	57.1	61.9	66.9	72.1	77.8
12,500	49.1	53.5	58.2	63.5	68.7	74.7
16,000	44.8	49.1	54.0	59.2	64.8	70.6
20,000	40.6	44.8	49.8	55.1	60.9	66.8
25,000	36.4	40.5	45.8	50.9	56.6	62.9

TABLE 12-1
AIR-TO-GROUND SEL VALUES
3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 727 SERIES
AIRCRAFT WITH JT8D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

	SEL, dB					
Airspeed, kt Thrust, lbs	160 3,000	160 6,000	160 8,000	160 10,000	160 12,000	160 14,000
Distance, ft.						
200	96.6	101.8	106.3	111.0	115.8	121.1
250	95.4	100.6	105.1	109.8	114.6	119.9
315	94.2	99.4	103.9	108.6	113.4	118.7
400	92.8	98.0	102.6	107.2	112.1	117.4
500	91.4	96.6	101.2	105.9	110.7	116.1
630	89.9	95.1	99.7	104.5	109.4	114.8
800	88.3	93.5	98.1	102.9	107.8	113.4
1000	86.8	92.0	96.7	101.5	106.5	112.0
1250	85.3	90.5	95.2	100.0	105.0	110.5
1600	83.5	88.7	93.4	98.2	103.2	108.7
2000	81.8	87.0	91.7	96.6	101.6	107.1
2500	80.0	85.3	90.0	94.9	99.9	105.4
3150	78.0	83.2	88.0	92.8	97.9	103.5
4000	75.4	80.9	85.7	90.6	95.8	101.4
5000	73.5	78.7	83.5	88.5	93.6	99.3
6300	71.0	76.2	81.1	86.1	91.3	97.0
8000	68.3	73.5	78.4	83.5	88.7	94.5
10,000	65.6	70.8	75.8	81.0	86.2	92.1
12,500	62.7	67.9	73.0	78.2	83.6	89.5
16,000	59.2	64.4	69.6	74.9	80.4	86.4
20,000	55.8	61.0	66.3	71.7	77.3	83.5
25,000	52.2	57.4	62.8	68.3	74.1	80.4

TABLE 12-2
AIR-TO-GROUND EPNL VALUES
3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 727 SERIES
AIRCRAFT WITH JT8D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

	EPNL, dB					
Airspeed, kt Thrust, lbs	160 3,000	160 6,000	160 8,000	160 10,000	160 12,000	160 14,000
Distance, ft.						
200	100.6	106.4	110.7	115.2	119.4	124.8
250	99.3	105.1	109.4	114.0	118.6	123.6
315	97.9	103.7	108.0	112.6	117.2	122.3
400	96.4	102.2	106.5	111.2	115.8	120.9
500	94.9	100.7	105.1	109.7	114.4	119.5
630	93.1	98.9	103.3	108.0	112.7	117.9
800	91.3	97.1	101.5	106.2	111.0	116.2
1000	89.4	95.2	99.7	104.5	109.3	114.6
1250	87.4	93.2	97.8	102.6	107.5	112.9
1600	85.3	91.1	95.7	100.6	105.6	111.0
2000	83.4	89.2	93.8	98.8	103.7	109.2
2500	81.3	87.1	91.8	96.8	101.9	107.4
3150	79.0	84.8	89.5	94.6	99.6	105.2
4000	76.4	82.2	87.1	92.2	97.4	103.1
5000	73.9	79.7	84.7	90.0	95.3	101.1
6300	71.1	76.9	82.0	87.5	93.0	99.0
8000	68.1	73.9	79.2	84.8	90.5	96.7
10,000	65.0	70.8	76.3	82.1	88.0	94.4
12,500	61.7	67.5	73.2	79.2	85.3	92.0
16,000	57.5	63.3	69.3	75.6	82.0	89.0
20,000	53.7	59.5	65.6	72.2	78.7	85.9
25,000	48.8	54.6	61.1	68.0	75.0	82.6

TABLE 12-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 727 SERIES
AIRCRAFT WITH JT8D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

	MAXIMUM A-LEVEL, dB					
Airspeed, kt Thrust, lbs	160 3,000	160 6,000	160 8,000	160 10,000	160 12,000	160 14,000
Distance, ft.						
200	96.9	101.1	106.1	111.2	116.6	122.1
250	94.8	99.0	104.0	109.1	114.5	120.0
315	92.5	96.7	101.7	106.8	112.2	117.8
400	90.2	94.4	99.4	104.5	109.9	115.4
500	87.9	92.1	97.1	102.2	107.6	113.2
630	85.6	89.8	94.8	99.9	105.3	110.8
800	83.1	87.3	92.3	97.5	102.8	108.4
1000	80.6	84.8	89.8	95.0	100.4	106.0
1250	78.2	82.4	87.4	92.6	97.9	103.5
1600	75.4	79.6	84.6	89.8	95.1	100.7
2000	72.8	77.0	82.0	87.2	92.5	98.1
2500	70.2	74.4	79.4	84.5	89.9	95.4
3150	67.3	71.5	76.5	81.7	87.1	92.7
4000	64.3	68.5	73.6	78.8	84.3	89.9
5000	61.3	65.5	70.6	75.9	81.4	87.1
6300	58.1	62.3	67.5	72.8	78.4	84.1
8000	54.6	58.8	64.0	69.4	75.0	80.8
10,000	51.2	55.4	60.6	66.1	71.7	77.6
12,500	47.5	51.7	57.0	62.6	68.3	74.3
16,000	43.3	47.5	52.9	58.5	64.4	70.4
20,000	39.1	43.3	48.9	54.6	60.6	66.8
25,000	34.8	39.0	44.6	50.5	56.6	62.9

TABLE 13-1
AIR-TO-GROUND SEL VALUES
3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - DOUGLAS
DC-10 SERIES AIRCRAFT WITH CF6 SERIES ENGINES

	SEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	14,000	20,000	28,000	36,000
Distance, ft.					
200	100.7	104.4	106.8	109.3	110.9
250	99.1	102.8	105.3	107.8	109.4
315	97.3	101.2	103.8	106.4	108.1
400	95.5	99.5	102.2	104.8	106.6
500	93.6	97.7	100.4	103.1	104.9
630	91.7	95.9	98.7	101.4	103.3
800	89.5	93.9	96.8	99.7	101.6
1000	87.5	92.0	95.0	98.0	100.0
1250	85.5	90.1	93.2	96.3	98.1
1600	83.2	87.8	90.9	94.0	96.1
2000	81.1	85.9	89.0	92.2	94.3
2500	78.8	83.6	86.8	90.1	92.2
3150	76.5	81.4	84.6	87.8	90.0
4000	74.0	79.0	82.3	85.6	87.8
5000	71.5	76.5	79.8	83.2	85.4
6300	68.8	73.9	77.3	80.7	83.0
8000	65.8	71.0	74.4	77.9	80.2
10,000	63.0	68.3	71.8	75.3	77.6
12,500	59.8	65.1	68.7	72.2	74.6
16,000	56.3	61.7	65.4	69.0	71.4
20,000	53.0	58.5	62.2	65.9	68.3
25,000	49.7	55.2	58.9	62.6	65.1

TABLE 13-2
AIR-TO-GROUND EPNL VALUES
3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - DOUGLAS
DC-10 SERIES AIRCRAFT WITH CF6 SERIES ENGINES

	EPNL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	14,000	20,000	28,000	36,000
Distance, ft.					
200	105.5	110.0	112.1	114.1	116.2
250	103.9	108.5	110.6	112.6	114.7
315	102.1	106.8	108.9	111.1	113.2
400	100.1	105.0	107.2	109.4	111.6
500	98.1	103.1	105.3	107.6	109.8
630	95.8	100.9	103.3	105.6	107.9
800	93.6	98.9	101.2	103.6	106.0
1000	91.0	96.5	99.0	101.5	104.0
1250	88.2	94.0	96.6	99.3	101.9
1600	85.0	91.1	94.0	96.7	99.5
2000	82.1	88.5	91.5	94.4	97.3
2500	79.8	86.2	89.2	92.1	95.0
3150	76.7	83.4	86.4	89.5	92.5
4000	73.7	80.6	83.8	87.0	90.1
5000	70.7	77.9	81.1	84.4	87.6
6300	67.7	75.0	78.4	81.7	85.0
8000	64.4	71.9	75.2	78.6	82.0
10,000	61.0	68.7	72.3	75.8	79.3
12,500	56.9	65.1	68.8	72.5	76.2
16,000	52.2	60.9	64.8	68.8	72.7
20,000	47.3	56.6	60.8	65.0	69.2
25,000	43.3	52.6	56.8	61.1	65.3

TABLE 13-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - DOUGLAS
DC-10 SERIES AIRCRAFT WITH CF6 SERIES ENGINES

	MAXIMUM A-LEVEL, dB				
Airspeed, kt Thrust, lbs	160 8,000	160 14,000	160 20,000	160 28,000	160 36,000
Distance, ft.					
200	99.2	102.1	104.5	106.2	107.8
250	97.0	99.9	102.4	104.0	105.7
315	94.4	97.4	100.0	101.8	103.5
400	92.0	95.0	97.6	99.4	101.1
500	89.3	92.5	95.2	97.1	98.9
630	86.6	89.9	92.7	94.6	96.5
800	83.8	87.2	90.1	92.0	93.9
1000	81.0	84.5	87.5	89.5	91.5
1250	78.2	81.8	85.0	87.0	89.1
1600	75.1	78.8	82.0	84.2	86.3
2000	72.1	76.0	79.3	81.5	83.7
2500	69.3	72.3	76.5	78.7	80.9
3150	66.1	70.0	73.4	75.7	77.9
4000	63.0	67.0	70.4	72.6	74.9
5000	59.9	63.9	67.4	69.7	72.0
6300	56.5	60.6	64.1	66.4	68.7
8000	52.8	56.9	60.4	62.8	65.1
10,000	49.1	53.3	56.9	59.3	61.7
12,500	45.2	49.5	53.1	55.6	58.0
16,000	40.8	45.1	48.9	51.3	53.8
20,000	36.6	41.1	45.0	47.5	50.1
25,000	32.5	37.1	41.0	43.6	46.2

TABLE 14-1
AIR-TO-GROUND SEL VALUES
3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - LOCKHEED
L-1011 SERIES AIRCRAFT WITH RB211 SERIES ENGINES

	SEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	14,000	20,000	28,000	36,000
Distance, ft.					
200	100.7	104.8	107.3	109.8	111.4
250	99.1	103.3	105.8	108.2	109.9
315	97.3	101.7	104.3	106.9	108.6
400	95.5	100.0	102.6	105.3	107.1
500	93.6	98.1	100.9	103.6	105.4
630	91.7	96.4	99.1	101.9	103.8
800	89.5	94.4	97.3	100.2	102.1
1000	87.5	92.5	95.5	98.5	100.5
1250	85.5	90.5	93.6	96.6	98.6
1600	83.0	88.2	91.4	94.5	96.6
2000	81.1	86.4	89.5	92.7	94.8
2500	78.8	84.2	87.4	90.6	92.7
3150	76.5	81.9	85.1	88.4	90.5
4000	74.0	79.5	82.8	86.1	88.3
5000	71.5	77.0	80.4	83.7	85.9
6300	68.8	74.5	77.8	81.2	83.5
8000	65.8	71.5	75.0	78.4	80.7
10,000	63.0	68.8	72.3	75.8	78.1
12,500	59.8	65.7	69.2	72.7	75.1
16,000	56.3	62.3	65.8	69.5	71.9
20,000	53.0	59.1	62.7	66.4	68.8
25,000	49.7	55.8	59.5	63.2	65.6

TABLE 14-2
AIR-TO-GROUND EPNL VALUES
3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - LOCKHEED
L-1011 SERIES AIRCRAFT WITH RB211 SERIES ENGINES

	EPNL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	8,000	14,000	20,000	28,000	36,000
Distance, ft.					
200	104.0	108.6	110.6	113.0	115.2
250	102.4	107.0	109.1	111.4	113.7
315	100.6	105.3	107.5	109.9	112.2
400	98.6	103.5	105.7	108.2	110.6
500	96.6	101.6	103.8	106.4	108.8
630	94.3	99.4	101.8	104.4	106.9
800	92.1	97.4	99.8	102.4	105.0
1000	89.5	95.0	97.5	100.3	103.0
1250	86.7	92.5	95.1	98.1	100.9
1600	83.5	89.6	92.4	95.5	98.5
2000	80.6	87.0	90.0	93.2	96.3
2500	78.3	84.7	87.6	90.9	94.0
3150	75.2	81.8	84.9	88.2	91.5
4000	72.2	79.1	82.2	85.7	89.1
5000	69.2	76.3	79.5	83.1	86.6
6300	66.2	73.5	76.8	80.4	84.0
8000	62.9	70.3	73.6	77.4	81.0
10,000	59.5	67.2	70.7	74.5	78.3
12,500	55.4	63.2	67.1	71.2	75.2
16,000	50.7	59.3	63.2	67.5	71.7
20,000	45.8	54.9	59.1	63.7	68.2
25,000	41.8	51.0	55.1	59.8	64.3

TABLE 14-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - LOCKHEED
L-1011 SERIES AIRCRAFT WITH RB211 SERIES ENGINES

	MAXIMUM A-LEVEL, dB				
Airspeed, kt Thrust, lbs	160 8,000	160 14,000	160 20,000	160 28,000	160 36,000
Distance, ft.					
200	99.2	102.8	104.8	106.7	108.3
250	97.0	100.6	102.7	104.5	106.2
315	94.4	98.2	100.3	102.3	104.0
400	92.0	95.8	97.4	99.9	101.6
500	89.3	93.3	95.5	97.6	99.4
630	86.6	90.7	93.0	95.1	97.0
800	83.8	87.9	90.4	92.5	94.4
1000	81.0	85.3	87.8	90.0	92.0
1250	78.2	82.7	85.3	87.5	89.6
1600	75.1	79.7	82.3	84.7	86.8
2000	72.1	76.8	79.6	82.0	84.2
2500	69.3	74.0	76.8	79.2	81.4
3150	66.1	70.9	73.7	76.2	78.4
4000	63.0	67.9	70.7	73.2	75.4
5000	59.9	64.8	67.7	70.2	72.5
6300	56.5	61.5	64.4	66.9	69.2
8000	52.8	57.8	60.7	63.3	65.6
10,000	49.1	54.2	57.2	59.8	62.2
12,500	45.2	50.4	53.4	56.1	58.5
16,000	40.8	46.1	49.2	51.9	54.3
20,000	36.6	42.1	45.3	48.1	50.6
25,000	32.5	38.1	38.1	44.1	46.7

TABLE 15-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 737
AND DOUGLAS DC-9 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, UNTREATED NACELLES

	SEL, dB					
Airspeed, kt	160	160	160	160	160	160
Thrust, lbs	3,000	6,000	8,000	10,000	12,000	14,000
Distance, ft.						
200	102.3	106.1	108.8	111.4	115.1	119.8
250	100.8	104.5	107.1	110.1	113.7	118.7
315	99.3	102.6	105.5	108.8	112.6	117.4
400	97.2	100.5	103.9	107.2	111.1	115.9
500	95.1	98.7	102.2	105.8	109.8	114.6
630	92.9	96.7	100.5	104.3	108.4	113.3
800	90.5	94.6	98.6	102.5	106.8	111.8
1000	88.5	93.0	96.8	101.1	105.5	110.5
1250	86.9	91.2	95.3	99.4	103.8	108.9
1600	84.7	89.2	93.4	97.4	101.8	107.0
2000	82.8	87.2	91.5	95.7	100.2	105.4
2500	80.7	85.5	89.8	94.0	98.5	103.6
3150	78.4	83.3	87.8	92.0	96.4	101.7
4000	75.6	80.9	85.7	89.5	94.3	99.7
5000	73.5	78.6	83.0	87.3	92.1	97.5
6300	70.9	76.1	80.5	85.0	89.9	95.3
8000	68.1	73.5	77.8	82.4	87.4	92.8
10,000	65.4	70.7	75.1	79.8	85.0	90.3
12,500	62.3	67.8	72.4	77.1	82.3	87.9
16,000	58.8	64.1	68.9	73.5	78.8	84.5
20,000	55.4	60.7	65.5	70.2	75.6	81.5
25,000	51.8	56.9	62.0	66.7	72.1	78.4

TABLE 15-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 737
AND DOUGLAS DC-9 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, UNTREATED NACELLES

	EPNL, dB					
Airspeed, kt Thrust, lbs	160 3,000	160 6,000	160 8,000	160 10,000	160 12,000	160 14,000
Distance, ft.						
200	107.0	110.3	112.9	115.7	119.3	123.9
250	105.5	108.9	111.4	114.4	118.0	122.7
315	104.0	107.4	109.9	113.1	116.6	121.4
400	102.4	105.8	108.4	111.5	115.2	119.9
500	100.9	104.2	106.7	109.9	113.8	118.6
630	98.7	102.1	104.7	108.0	112.0	117.1
800	96.5	100.0	102.8	106.1	110.3	115.2
1000	94.4	97.9	100.9	104.3	108.6	113.0
1250	92.0	95.9	98.5	102.2	106.7	111.9
1600	89.4	93.3	96.0	100.0	104.7	109.9
2000	87.0	91.0	94.0	98.0	102.8	108.0
2500	84.6	88.5	91.5	95.8	101.0	106.1
3150	81.9	85.9	89.0	93.3	98.6	103.8
4000	78.6	83.0	86.2	90.8	96.1	101.7
5000	76.0	80.3	83.5	88.5	94.2	99.5
6300	73.0	77.3	80.6	85.9	91.8	97.3
8000	69.7	74.1	77.7	83.1	89.1	95.2
10,000	66.4	71.0	74.7	80.3	86.5	92.9
12,500	63.3	67.7	71.6	77.3	84.0	87.6
16,000	59.0	63.3	67.6	73.8	80.5	87.5
20,000	54.7	59.4	63.9	70.2	77.4	84.3
25,000	49.4	54.1	59.3	66.1	73.5	81.1

TABLE 15-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 737
AND DOUGLAS DC-9 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, UNTREATED NACELLES

	MAXIMUM A-LEVEL, dB					
Airspeed, kt	160	160	160	160	160	160
Thrust, lbs	3,000	6,000	8,000	10,000	12,000	14,000
Distance, ft.						
200	102.6	105.4	108.6	111.6	115.9	120.8
250	100.1	102.6	106.2	109.2	113.8	118.5
315	97.2	99.9	103.4	106.5	111.3	116.2
400	94.6	97.9	100.7	104.3	108.9	113.4
500	91.5	94.3	98.1	101.8	106.6	111.7
630	88.6	91.5	95.6	99.5	104.3	109.4
800	85.5	88.7	93.3	97.1	101.7	106.9
1000	82.3	85.8	89.9	94.6	99.4	104.5
1250	79.6	83.2	87.4	91.9	96.6	101.8
1600	77.7	80.1	85.7	88.9	93.7	99.0
2000	73.8	77.2	81.8	86.3	91.1	96.4
2500	70.9	74.3	78.9	83.3	88.3	93.5
3150	67.8	71.5	76.0	81.6	85.4	90.8
4000	64.5	68.5	73.2	77.7	82.8	88.2
5000	61.2	65.3	69.8	74.8	79.7	85.3
6300	58.0	61.9	66.5	71.8	76.8	82.3
8000	54.3	58.6	63.2	68.3	73.4	79.0
10,000	51.0	55.1	59.9	64.9	70.1	75.8
12,500	47.1	51.5	56.2	61.5	66.7	72.7
16,000	42.8	47.1	52.0	57.2	62.8	68.6
20,000	38.6	42.8	47.8	53.1	58.9	64.8
25,000	34.4	38.5	43.8	48.9	54.6	60.9

TABLE 16-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 737 AND DOUGLAS DC-9 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, ACOUSTICALLY LINED NACELLES

	SEL, dB					
Airspeed, kt Thrust, lbs	160 3,000	160 6,000	160 8,000	160 10,000	160 12,000	160 14,000
Distance, ft.						
200	94.6	99.8	104.3	109.0	113.8	119.1
250	93.4	98.6	103.1	107.8	112.6	117.9
315	92.2	97.4	101.9	106.6	111.4	116.7
400	90.8	96.0	100.6	105.2	110.1	115.4
500	89.4	94.6	99.2	103.9	108.7	114.1
630	87.9	93.1	97.7	102.5	107.4	112.8
800	86.3	91.5	96.1	100.9	105.8	111.4
1000	84.8	90.0	94.7	99.5	104.5	110.0
1250	83.3	88.5	93.2	98.0	103.0	108.5
1600	81.5	86.7	91.4	96.2	101.2	106.7
2000	79 8	85.0	89.7	94.6	99.6	105.1
2500	78.0	83.3	88.0	92.9	97.9	103.4
3150	76.0	81.2	86.0	90.8	95.9	101.5
4000	73.4	78.9	83.7	88.6	93.8	99.4
5000	71.5	76.7	81.5	86.5	91.6	97.3
6300	69.0	74.2	79.1	84.1	89.3	95.0
8000	66.3	71.5	76.4	81.5	86.7	92.5
10,000	63.6	68.8	73.8	79.0	84.2	90.1
12,500	60.7	65.9	71.0	76.2	81.6	87.5
16,000	57.2	62.4	67.6	72.9	78.4	84.4
20,000	53.8	59.0	64.3	69.7	75.3	81.5
25,000	50.2	55.4	60.8	66.3	72.1	78.4

TABLE 16-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT-BOEING 737 AND DOUGLAS DC-9 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

	EPNL, dB					
Airspeed, kt Thrust, lbs	160 3,000	160 6,000	160 8,000	160 10,000	160 12,000	160 14,000
Distance, ft.						
200	98.6	104.4	108.7	113.2	117.8	122.8
250	97.3	103.1	107.4	112.0	116.6	121.6
315	95.9	101.7	106.0	110.6	115.2	120.3
400	94.4	100.2	104.5	109.2	113.8	118.9
500	92.9	98.7	103.1	107.7	112.4	117.5
630	91.1	96.9	101.3	106.0	110.7	115.9
800	89.3	95.1	99.5	104.2	109.0	114.2
1000	87.4	93.2	97.7	102.5	107.3	112.6
1250	85.4	91.2	95.8	100.6	105.5	110.9
1600	83.3	89.1	93.7	98.6	103.6	109.0
2000	81.4	87.2	91.8	96.6	101.7	107.2
2500	79.3	85.1	89.8	94.8	99.9	105.4
3150	77.0	82.8	87.5	92.6	97.6	103.2
4000	74.4	80.2	85.1	90.2	95.4	101.1
5000	71.9	77.7	82.7	88.0	93.3	99.1
6300	69.1	74.9	80.0	85.5	91.0	97.0
8000	66.1	71.9	77.2	82.8	88.5	94.7
10,000	63.0	68.8	74.3	80.1	86.0	92.4
12,500	59.7	65.5	71.2	77.2	83.3	90.0
16,000	55.5	61.3	67.3	73.6	80.0	87.0
20,000	51.7	57.5	63.6	70.2	76.7	83.9
25,000	46.8	52.6	59.1	66.0	73.0	80.6

TABLE 16-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT-BOEING 737 AND DOUGLAS DC-9 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

	MAXIMUM A-LEVEL, dB					
Airspeed, kt	160	160	160	160	160	160
Thrust, lbs	3,000	6,000	8,000	10,000	12,000	14,000
Distance, ft.						
200	94.9	99.1	104.1	109.2	114.6	120.1
250	92.8	97.0	102.0	107.1	112.5	118.0
315	90.5	94.7	199.7	104.8	110.2	115.8
400	88.2	92.4	97.4	102.5	107.9	113.4
500	85.9	90.1	95.1	100.2	107.9	113.4
630	83.6	87.8	93.8	97.9	103.3	108.8
800	81.1	85.3	90.3	95.5	100.8	106.4
1000	78.6	82.8	87.8	98.4	104.0	104.0
1250	76.2	80.4	85.4	90.6	95.9	101.5
1600	73.4	77.6	82.6	87.8	93.1	98.7
2000	70.8	75.0	80.0	85.2	90.5	96.1
2500	68.2	72.4	77.4	82.5	87.9	93.4
3150	65.3	69.5	74.5	79.7	85.1	90.7
4000	62.3	66.5	71.6	76.8	82.3	87.9
5000	59.3	63.5	68.6	73.9	79.4	85.1
6300	56.1	60.3	65.5	70.8	76.4	82.1
8000	52.6	56.8	62.0	67.4	73.0	78.8
10,000	49.2	53.4	58.6	64.1	69.7	75.6
12,500	45.5	49.7	55.0	60.6	66.3	72.3
16,000	41.3	45.5	50.9	56.5	62.4	68.4
20,000	37.1	41.3	46.9	52.6	58.6	64.8
25,000	32.8	37.0	42.6	48.5	54.6	60.9

TABLE 17-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - FOKKER-VFW F28-2000
AIRCRAFT WITH RB183 MK555-15 ENGINES

	SEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	2,000	4,000	6,000	8,000	10,000
Distance, ft.					
200	99.2	103.2	110.4	115.5	120.5
250	97.8	101.8	109.0	114.1	119.1
315	96.3	100.3	107.6	112.7	117.6
400	94.8	98.8	106.2	111.2	116.1
500	93.3	97.3	104.7	109.7	114.6
630	91.7	95.7	103.2	108.1	113.0
800	90.0	94.0	101.6	106.5	111.3
1000	88.3	92.3	100.0	104.8	109.5
1250	86.5	90.5	98.3	103.1	107.7
1600	84.6	88.6	96.5	101.2	105.7
2000	82.6	86.6	94.7	99.2	103.7
2500	80.6	84.6	92.8	97.2	101.5
3150	78.3	82.3	90.7	95.0	99.1
4000	76.0	80.0	88.6	92.6	96.6
5000	73.5	77.5	86.3	90.2	93.9
6300	70.8	74.8	84.0	87.6	91.1
8000	67.9	71.9	81.5	84.9	88.1
10,000	64.9	68.9	78.8	81.9	84.9
12,500	61.6	65.6	75.9	78.8	81.5
16,000	58.1	62.1	72.8	75.5	77.9
20,000	54.4	58.4	69.5	71.8	74.0
25,000	50.5	54.5	65.8	67.8	69.8

TABLE 17-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - FOKKER-VFW F28-2000
AIRCRAFT WITH RB183 MK555-15 ENGINES

	EPNL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	2,000	4,000	6,000	8,000	10,000
Distance, ft.					
200	102.4	107.4	111.4	116.6	121.8
250	100.8	105.8	109.9	115.1	120.3
315	99.2	104.2	108.5	113.6	118.7
400	97.5	102.5	107.0	112.0	117.0
500	95.7	100.7	105.4	110.4	115.3
630	93.8	98.8	103.8	108.7	113.4
800	91.7	96.7	102.2	107.0	111.5
1000	89.8	94.8	100.4	105.2	109.5
1250	87.9	92.9	98.7	103.4	107.6
1600	85.8	90.8	96.8	101.5	105.5
2000	83.6	88.6	94.9	99.5	103.4
2500	81.3	86.3	92.9	97.4	101.3
3150	78.9	83.9	90.7	95.2	99.0
4000	76.4	81.4	88.7	92.9	96.6
5000	73.7	78.7	86.5	90.6	94.2
6300	70.9	75.9	84.0	88.1	91.6
8000	67.7	72.7	81.4	85.5	88.8
10,000	64.4	69.4	78.5	82.5	85.8
12,500	60.7	65.7	75.2	79.1	82.5
16,000	56.7	61.7	71.5	75.4	78.8
20,000	51.8	56.8	67.4	71.2	74.5
25,000	45.8	50.8	62.6	66.5	69.9

TABLE 17-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - FOKKER-VFW F28-2000
AIRCRAFT WITH RB183 MK555-15 ENGINES

	MAXIMUM A-LEVEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	2,000	4,000	6,000	8,000	10,000
Distance, ft.					
200	97.4	100.4	107.1	113.3	117.7
250	95.2	98.2	104.9	111.2	115.5
315	93.0	96.0	102.8	109.0	113.3
400	90.8	93.8	100.6	106.8	111.1
500	88.5	91.5	98.4	104.5	109.8
630	86.2	89.2	96.1	102.2	106.4
800	83.8	86.8	93.8	99.9	104.0
1000	81.3	84.3	91.4	97.4	101.5
1250	78.7	81.7	89.0	94.9	98.9
1600	76.1	79.1	86.5	92.3	96.2
2000	73.4	76.4	83.9	89.6	93.4
2500	70.5	73.5	81.2	85.7	90.4
3150	67.6	70.6	77.4	83.8	87.3
4000	64.5	67.5	75.5	80.7	84.1
5000	61.2	64.2	72.5	77.5	80.6
6300	57.8	60.8	69.4	74.2	77.1
8000	54.2	57.2	66.2	70.7	73.3
10,000	50.4	53.4	62.7	67.0	69.4
12,500	46.3	49.3	59.1	63.2	65.2
16,000	42.1	45.1	55.3	59.1	60.9
20,000	37.7	40.7	51.1	54.6	56.2
25,000	33.0	36.0	46.7	49.9	51.2

TABLE 18-1
AIR-TO-GROUND SEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
DOUGLAS MD-80 SERIES AIRCRAFT WITH JT8D-209/217 ENGINES

	SEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	4,000	8,000	12,000	16,000
Distance, ft.				
200	91.0	97.5	102.2	106.9
250	89.7	96.2	101.1	105.8
315	88.4	94.9	99.9	104.6
400	87.0	93.5	98.7	103.4
500	85.7	92.2	97.4	102.1
630	84.4	90.9	96.1	100.8
800	82.9	89.4	94.7	99.4
1000	81.5	88.0	93.3	98.0
1250	80.1	86.6	91.9	96.6
1600	78.5	85.0	90.2	94.9
2000	76.9	83.4	88.5	93.2
2500	75.2	81.7	86.8	91.5
3150	73.3	79.8	84.7	89.4
4000	71.1	77.6	82.5	87.2
5000	68.9	75.4	80.2	84.9
6300	66.4	72.9	77.7	82.4
8000	63.7	70.2	74.9	79.6
10,000	60.9	67.4	72.1	76.8
12,500	57.8	64.3	69.2	73.9
16,000	54.2	60.7	65.6	70.3
20,000	50.6	57.1	62.1	66.8
25,000	46.7	53.2	58.4	63.1

TABLE 18-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
DOUGLAS MD-80 SERIES AIRCRAFT WITH JT8D-209/217 ENGINES

	EPNL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	4,000	8,000	12,000	16,000
Distance, ft.				
200	95.5	102.1	105.4	109.9
250	94.0	100.6	104.2	108.7
315	92.4	99.0	102.9	107.1
400	90.8	97.4	101.5	106.0
500	89.2	95.8	100.1	104.6
630	87.5	94.1	98.7	103.5
800	85.7	92.3	97.0	101.5
1000	84.0	90.6	95.5	100.0
1250	82.2	88.8	93.9	98.4
1600	80.2	86.8	92.0	96.5
2000	78.3	84.9	90.2	94.7
2500	76.4	83.0	88.3	92.8
3150	74.0	80.6	86.1	90.6
4000	71.6	78.6	83.7	88.2
5000	69.2	75.8	81.3	85.8
6300	66.5	73.1	78.6	83.1
8000	63.6	70.2	75.7	80.2
10,000	59.9	66.5	72.8	77.3
12,500	57.0	63.6	69.4	73.9
16,000	52.7	59.3	65.4	69.9
20,000	47.7	54.3	61.3	65.8
25,000	41.4	48.0	57.2	61.7

TABLE 18-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
DOUGLAS MD-80 SERIES AIRCRAFT WITH JT8D-209/217 ENGINES

	MAXIMUM A-LEVEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	4,000	8,000	12,000	16,000
Distance, ft.				
200	89.7	96.8	103.0	108.0
250	87.6	94.7	100.9	105.9
315	85.5	92.6	98.8	103.8
400	83.2	90.3	96.5	101.5
500	81.1	88.2	94.4	99.4
630	78.9	86.0	92.1	97.1
800	76.5	83.6	89.7	94.7
1000	74.3	81.4	87.4	92.4
1250	72.0	79.1	85.0	90.0
1600	69.4	76.5	82.3	87.3
2000	66.9	74.0	79.7	84.7
2500	64.4	71.5	77.1	82.1
3150	61.7	68.8	74.3	79.3
4000	58.7	65.8	71.2	76.2
5000	55.8	62.9	68.2	73.2
6300	52.6	59.7	64.9	69.9
8000	49.1	56.2	61.4	66.4
10,000	45.6	52.7	57.4	62.9
12,500	41.8	48.9	54.2	59.2
16,000	37.3	44.4	49.8	54.8
20,000	33.0	40.1	45.6	50.6
25,000	28.4	35.5	41.1	46.1

TABLE 19-1
AIR-TO-GROUND SEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
BOEING 737-300 AIRCRAFT WITH CFM-56 SERIES ENGINES

	SEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	4,000	10,000	16,000
Distance, ft.			
200	96.6	99.5	103.7
250	95.4	98.3	102.5
315	94.2	97.1	101.2
400	92.8	95.7	99.8
500	91.5	94.3	98.4
630	90.1	92.9	96.9
800	88.5	91.3	95.3
1000	87.0	89.9	93.8
1250	85.4	88.2	92.2
1600	83.6	86.4	90.4
2000	81.9	84.7	88.7
2500	80.0	82.9	87.0
3150	77.9	80.8	84.9
4000	75.5	78.4	82.6
5000	73.1	76.1	80.3
6300	70.4	73.6	77.8
8000	67.4	70.6	74.9
10,000	64.2	67.5	72.0
12,500	60.9	64.2	68.9
16,000	56.8	60.0	65.1
20;000	53.0	56.5	61.6
25,000	48.9	52.6	57.9

TABLE 19-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
BOEING 737-300 AIRCRAFT WITH CFM-56 SERIES ENGINES

	EPNL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	4,000	10,000	16,000
Distance, ft.			
200	101.0	103.8	107.6
250	99.7	102.5	106.3
315	98.3	101.1	104.9
400	96.7	99.5	103.3
500	95.1	98.0	101.8
630	93.4	96.3	100.1
800	91.4	94.3	98.2
1000	89.6	92.5	96.4
1250	87.7	90.6	94.4
1600	85.4	88.3	92.2
2000	83.3	86.2	90.2
2500	81.0	83.9	87.7
3150	78.5	81.4	85.3
4000	75.7	78.7	82.8
5000	72.9	76.1	80.3
6300	69.8	73.1	77.5
8000	66.3	69.8	74.5
10,000	62.9	66.6	71.6
12,500	59.1	63.1	68.5
16,000	54.1	58.2	64.7
20,000	48.7	53.8	60.8
25,000	41.8	48.0	56.3

TABLE 19-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
BOEING 737-300 AIRCRAFT WITH CFM-56 SERIES ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt Thrust, lbs	160 4,000	160 10,000	160 16,000
Distance, ft.			
200	97.0	99.5	102.9
250	95.0	97.5	100.8
315	92.7	95.2	98.7
400	90.4	92.9	96.4
500	88.1	90.7	94.2
630	85.7	88.3	91.9
800	83.2	85.9	89.5
1000	80.8	83.5	87.2
1250	78.4	81.1	84.9
1600	75.6	78.4	82.2
2000	73.0	75.8	79.7
2500	70.3	73.2	77.1
3150	67.4	70.3	74.2
4000	64.2	67.2	71.2
5000	61.1	64.1	68.2
6300	57.6	60.7	64.9
8000	53.8	56.9	61.2
10,000	50.0	53.2	57.6
12,500	45.9	49.2	53.7
16,000	41.0	44.5	49.2
20,000	36.3	40.0	44.9
25,000	31.7	35.4	40.5

TABLE 20-1
AIR-TO-GROUND SEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
BOEING 757-200 AIRCRAFT WITH RB211-535 ENGINES

	SEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	5,000	10,000	20,000	30,000
Distance, ft.				
200	97.4	99.4	102.8	106.7
250	95.9	97.9	101.5	105.5
315	94.3	96.3	100.1	104.2
400	92.5	94.5	98.5	102.8
500	90.8	92.8	97.0	101.5
630	88.9	90.9	95.4	100.0
800	86.9	88.9	93.7	98.5
1000	85.0	87.0	92.0	97.0
1250	83.0	85.0	90.2	95.4
1600	80.8	82.8	88.3	93.6
2000	78.8	80.8	86.4	91.9
2500	76.9	78.9	84.7	90.2
3150	74.5	76.5	82.4	88.0
4000	72.1	74.1	80.0	85.6
5000	69.8	71.8	77.7	83.4
6300	67.2	69.2	75.2	80.9
8000	64.5	66.5	72.6	78.3
10,000	61.7	63.7	69.9	75.8
12,500	58.7	60.7	67.0	73.0
16,000	55.2	57.2	63.7	69.8
20,000	51.8	53.8	60.5	66.7
25,000	48.2	50.2	57.0	63.3

TABLE 20-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
BOEING 757-200 AIRCRAFT WITH RB211-535 ENGINES

	EPNL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	5,000	10,000	20,000	30,000
Distance, ft.				
200	103.7	105.7	109.1	112.9
250	102.2	104.2	107.7	111.5
315	100.5	102.5	106.1	110.1
400	98.6	100.6	104.4	108.5
500	96.8	98.8	102.7	106.8
630	94.7	96.7	100.8	105.1
800	92.4	94.4	98.8	103.2
1000	90.0	92.0	96.7	101.4
1250	87.5	89.5	94.6	99.5
1600	84.5	86.5	92.1	97.5
2000	81.7	83.7	89.8	95.5
2500	78.9	80.9	87.5	93.6
3150	75.1	77.1	84.2	90.6
4000	72.5	74.5	81.7	88.1
5000	68.5	70.5	78.6	85.6
6300	65.5	67.5	75.8	83.0
8000	62.2	64.2	72.8	80.2
10,000	58.9	60.9	69.8	77.4
12.500	55.4	57.4	66.6	74.4
16,000	50.9	52.9	62.5	70.7
20,000	46.8	48.8	58.8	67.2
25,000	40.8	42.8	54.0	63.2

TABLE 20-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT -
BOEING 757-200 AIRCRAFT WITH RB211-535 ENGINES

	MAXIMUM A-LEVEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	5,000	10,000	20,000	30,000
Distance, ft.				
200	97.0	99.0	103.2	107.6
250	94.7	96.7	101.0	105.5
315	92.3	94.3	98.6	103.2
400	89.7	91.7	96.2	100.8
500	87.2	89.2	93.8	98.5
630	84.5	86.5	91.5	96.1
800	81.6	83.6	88.5	93.5
1000	78.8	80.8	85.9	91.0
1250	76.0	78.0	83.2	88.4
1600	72.8	74.8	80.2	85.5
2000	69.9	71.9	77.4	82.8
2500	67.0	69.0	74.6	80.0
3150	64.0	66.0	71.6	77.0
4000	60.8	62.8	68.4	73.9
5000	57.7	59.7	65.4	70.9
6300	54.5	56.5	62.2	67.8
8000	50.9	52.9	58.8	64.4
10,000	47.4	49.4	55.4	61.1
12,500	43.7	45.7	51.8	57.6
16,000	39.4	41.4	47.7	53.6
20,000	35.3	37.3	43.7	49.7
25,000	30.9	32.9	39.5	45.7

TABLE 21-1
AIR-TO-GROUND SEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT -
AIRBUS A300 AND A310 AIRCRAFT WITH CF6 SERIES ENGINES

	SEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	10,000	25,000	40,000
Distance, ft.			
200	99.9	103.7	106.8
250	98.4	102.3	105.6
315	96.8	100.9	104.3
400	95.0	99.3	102.9
500	93.3	97.8	101.6
630	91.4	96.1	100.1
800	89.4	94.4	98.6
1000	87.5	92.7	97.1
1250	85.5	90.5	95.5
1600	83.3	89.1	93.7
2000	81.3	87.1	92.0
2500	79.2	85.2	90.3
3150	77.0	83.0	88.1
4000	74.6	80.6	85.8
5000	72.3	78.4	83.5
6300	69.7	75.8	81.0
8000	67.0	73.2	78.4
10,000	64.2	70.5	75.9
12,500	61.2	67.6	73.1
16,000	57.7	64.3	69.9
20,000	54.3	61.0	66.8
25,000	50.7	57.5	63.4

TABLE 21-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT -
AIRBUS A300 AND A310 AIRCRAFT WITH CF6 SERIES ENGINES

	EPNL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	10,000	25,000	40,000
Distance, ft.			
200	106.2	109.8	113.0
250	104.7	108.4	111.6
315	103.0	106.8	110.2
400	101.1	105.1	108.6
500	99.3	103.4	106.9
630	97.2	101.5	105.2
800	94.9	99.4	103.3
1000	92.5	97.3	101.5
1250	90.0	95.1	99.6
1600	87.0	92.7	97.6
2000	84.2	90.3	95.6
2500	81.4	88.0	93.7
3150	77.6	84.6	90.7
4000	75.0	82.0	88.2
5000	71.0	78.8	85.7
6300	68.0	76.0	83.1
8000	64.7	73.0	80.3
10,000	61.4	70.0	77.5
12,500	57.9	66.7	74.5
16,000	53.4	62.7	70.8
20,000	49.3	58.9	67.3
25,000	43.3	53.9	63.3

TABLE 21-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT -
AIRBUS A300 AND A310 AIRCRAFT WITH CF6 SERIES ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	10,000	25,000	40,000
Distance, ft.			
200	99.2	105.3	109.1
250	96.9	103.2	107.0
315	94.5	100.8	104.7
400	91.9	98.3	102.3
500	89.4	95.9	100.0
630	86.7	93.4	97.6
800	83.8	90.6	95.0
1000	81.0	88.0	92.5
1250	78.2	85.3	89.9
1600	75.0	82.3	87.0
2000	72.1	79.5	84.3
2500	69.2	76.6	81.5
3150	66.2	73.6	78.5
4000	63.0	70.5	75.4
5000	59.9	67.4	72.4
6300	56.7	64.3	69.3
8000	53.1	60.8	65.9
10,000	49.6	57.4	62.6
12,500	45.9	53.8	59.1
16,000	41.6	49.7	55.1
20,000	37.5	45.7	51.2
25,000	33.1	41.5	47.2

TABLE 22-1
AIR-TO-GROUND SEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT -
BOEING 767-200 AIRCRAFT WITH CF6-80A OR JT9D-7R4 ENGINES

	SEL, dB		
Airspeed, kt Thrust, lbs	160 10,000	160 25,000	160 38,000
Distance, ft.			
200	100.4	103.6	106.4
250	98.9	102.2	105.2
315	97.3	100.8	103.9
400	95.5	99.2	102.5
500	93.8	97.7	101.2
630	91.9	96.0	99.7
800	89.9	94.3	98.2
1000	88.0	92.6	96.7
1250	86.0	90.4	95.1
1600	83.8	89.0	93.3
2000	81.8	87.0	91.6
2500	79.7	85.1	89.9
3150	77.5	82.9	87.7
4000	75.1	80.5	85.3
5000	72.8	78.3	83.1
6300	70.2	75.7	80.6
8000	67.5	73.1	78.0
10,000	64.7	70.4	75.5
12,500	61.7	67.5	72.7
16,000	58.2	64.2	69.5
20,000	54.8	60.9	66.4
25,000	51.2	57.4	63.0

TABLE 22-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT -
BOEING 767-200 AIRCRAFT WITH CF6-80A OR JT9D-7R4 ENGINES

	EPNL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	10,000	25,000	38,000
Distance, ft.			
200	106.7	109.8	112.6
250	105.2	108.4	111.2
315	103.5	106.8	109.8
400	101.6	105.1	108.2
500	99.8	103.4	106.5
630	97.7	101.5	104.8
800	95.4	99.4	102.9
1000	93.0	97.3	101.1
1250	90.5	95.1	99.2
1600	87.5	92.7	97.2
2000	84.7	90.3	95.2
2500	81.9	88.0	93.3
3150	78.1	84.6	90.3
4000	75.5	82.0	87.8
5000	71.5	78.8	85.3
6300	68.5	76.0	82.7
8000	65.2	73.0	79.9
10,000	61.9	70.0	77.1
12,500	58.4	66.7	74.1
16,000	53.9	62.7	70.4
20,000	49.8	58.9	66.9
25,000	43.8	53.9	62.9

TABLE 22-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT -
BOEING 767-200 AIRCRAFT WITH CF6-80A OR JT9D-7R4 ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	10,000	25,000	38,000
Distance, ft.			
200	99.4	103.6	107.3
250	97.1	101.5	105.2
315	94.7	99.1	102.9
400	92.1	96.6	100.5
500	89.6	94.2	98.2
630	86.9	91.7	95.8
800	84.0	88.9	93.2
1000	81.2	86.3	90.7
1250	78.4	83.6	88.1
1600	75.2	80.6	85.2
2000	72.3	77.8	82.5
2500	69.4	74.9	79.7
3150	66.4	71.9	76.7
4000	63.2	68.8	73.6
5000	60.1	65.7	70.6
6300	56.9	62.6	67.5
8000	53.3	59.1	64.1
10,000	49.8	55.7	60.8
12,500	46.1	52.1	57.3
16,000	41.8	48.0	53.3
20,000	37.7	44.0	49.4
25,000	33.3	39.8	45.4

TABLE 23-1
AIR-TO-GROUND SEL VALUES
GENERAL AVIATION TURBOJET AND TURBOFAN AIRCRAFT -
COMPOSITE BUSINESS JET AIRCRAFT, 1985 FLEET

	SEL, dB		
Airspeed,* kt	160	160	160
Thrust, Percent	30	60	100
Distance, ft.	(Approach)	(Cutback)	(Takeoff)
200	95.8	109.5	119.0
250	94.9	108.0	117.4
315	93.4	106.6	115.7
400	91.8	105.0	114.0
500	90.3	103.4	112.2
630	88.6	101.8	110.3
800	86.9	100.0	108.3
1000	85.1	98.3	106.3
1250	83.2	96.4	104.2
1600	81.3	94.3	101.9
2000	79.2	92.2	99.6
2500	77.1	89.9	97.1
3150	74.7	87.5	94.5
4000	72.3	84.9	91.8
5000	69.6	82.0	88.8
6300	67.0	79.2	85.6
8000	64.0	75.8	82.1
10,000	60.9	72.3	78.5
12,500	57.6	68.6	74.5
16,000	54.2	64.5	70.1
20,000	50.6	60.2	65.5
25,000	46.9	55.6	60.6

*Typical takeoff climb speed is 150 kt (+0.3 dB)
Typical approach speed is 135 kt (+0.7 dB)

TABLE 23-2
AIR-TO-GROUND EPNL VALUES
GENERAL AVIATION TURBOJET AND TURBOFAN AIRCRAFT -
COMPOSITE BUSINESS JET AIRCRAFT, 1985 FLEET

	EPNL, dB		
Airspeed,* kt Thrust, Percent Distance, ft.	160 30 (Approach)	160 60 (Cutback)	160 100 (Takeoff)
200	99.2	111.4	122.0
250	97.7	110.4	120.2
315	96.0	108.8	118.3
400	94.3	107.0	116.3
500	92.5	105.2	114.2
630	90.5	103.2	112.1
800	88.5	101.1	109.6
1000	86.4	99.0	107.1
1250	84.2	96.7	104.3
1600	81.8	94.4	101.4
2000	79.2	91.9	98.6
2500	76.5	89.4	96.0
3150	73.9	86.8	93.3
4000	71.0	84.1	90.3
5000	68.1	81.2	87.3
6300	65.0	78.1	84.1
8000	61.6	74.8	80.6
10,000	57.9	71.1	76.9
12,500	54.1	67.2	72.8
16,000	50.0	62.9	68.3
20,000	45.3	58.4	63.6
25,000	39.7	53.2	58.4

*Typical takeoff climb speed is 150 kt (+0.3 dB)
Typical approach speed is 135 kt (+0.7 dB)

TABLE 23-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
GENERAL AVIATION TURBOJET AND TURBOFAN AIRCRAFT -
COMPOSITE BUSINESS JET AIRCRAFT, 1985 FLEET

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
Thrust, Percent	30	60	100
Distance, ft.	(Approach)	(Cutback)	(Takeoff)
200	93.9	107.2	116.5
250	91.7	105.1	114.2
315	89.5	102.8	111.7
400	87.2	100.5	109.2
500	84.9	98.1	106.6
630	82.5	95.8	104.0
800	80.1	93.3	101.3
1000	77.5	90.7	98.5
1250	74.9	88.1	95.6
1600	72.2	85.3	92.6
2000	69.4	82.4	89.5
2500	66.4	79.4	86.4
3150	63.4	76.2	83.1
4000	60.2	72.7	79.6
5000	56.8	69.3	75.8
6300	53.3	65.5	72.0
8000	49.6	61.6	67.7
10,000	45.8	57.3	63.2
12,500	41.7	52.7	58.5
16,000	37.6	47.9	53.4
20,000	33.2	42.8	48.0
25,000	28.8	37.5	42.4

TABLE 24-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOJET BUSINESS AIRCRAFT - GATES LEARJET 24/25
AIRCRAFT WITH CJ610 SERIES ENGINES

	SEL, dB		
Airspeed*, kt	160	160	160
Thrust, lbs	700	1800	2600
Distance, ft.			
200	100.8	119.3	124.7
250	99.4	117.8	123.1
315	97.9	116.4	121.4
400	96.4	114.8	119.7
500	94.9	113.2	117.9
630	93.3	111.6	116.0
800	91.6	109.8	114.0
1000	89.9	108.0	112.0
1250	88.0	106.1	109.9
1600	86.1	104.0	107.6
2000	84.0	101.9	105.3
2500	81.9	99.6	102.8
3150	79.5	97.1	100.2
4000	77.0	94.5	97.5
5000	74.3	91.6	94.5
6300	71.5	88.6	91.3
8000	68.4	85.2	87.8
10,000	65.1	81.6	84.1
12,500	61.5	77.7	80.1
16,000	57.8	73.4	75.7
20,000	53.8	68.9	71.0
25,000	49.6	63.9	66.1

*Typical Takeoff climb speed is 155 kt (+0.1 dB).
Typical approach speed is 150 kt (+0.3 dB).

TABLE 24-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOJET BUSINESS AIRCRAFT - GATES LEARJET 24/25
AIRCRAFT WITH CJ610 SERIES ENGINES

	EPNL ,dB		
Airspeed*, kt	160	160	160
Thrust, lbs	700	1800	2600
Distance, ft.			
200	102.9	121.7	127.6
250	101.4	120.1	125.8
315	99.8	118.5	123.9
400	98.1	116.7	121.9
500	96.4	114.9	119.8
630	94.5	112.9	117.7
800	92.6	110.8	115.3
1000	90.6	108.7	112.8
1250	88.5	106.4	110.0
1600	86.2	104.0	107.1
2000	83.7	101.6	104.2
2500	81.0	99.1	101.6
3150	78.4	96.5	98.9
4000	75.5	93.8	96.0
5000	72.6	91.0	93.0
6300	69.5	87.9	89.9
8000	66.1	84.6	86.3
10,000	62.5	80.9	82.6
12,500	58.7	76.9	78.5
16,000	54.6	72.6	74.0
20,000	50.0	68.1	69.4
25,000	44.6	63.0	64.2

*Typical takeoff climb speed is 155 kt (+0.1 dB).
Typical approach speed is 150 kt (+0.3 dB).

TABLE 24-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOJET BUSINESS AIRCRAFT - GATES LEARJET 24/25
AIRCRAFT WITH CJ610 SERIES ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	700	1800	2600
Distance, ft.			
200	98.5	117.1	122.2
250	96.3	114.9	119.9
315	94.1	112.6	117.5
400	91.9	110.3	115.0
500	89.6	108.0	112.4
630	87.3	105.6	109.8
800	84.9	103.1	107.1
1000	82.4	100.5	104.3
1250	79.8	97.8	101.4
1600	77.1	95.1	98.4
2000	74.3	92.2	95.3
2500	71.3	89.1	92.1
3150	68.3	85.9	88.8
4000	65.0	82.5	85.3
5000	61.6	78.9	81.5
6300	58.0	75.1	77.6
8000	54.1	71.0	73.4
10,000	50.1	66.7	68.9
12,500	45.8	62.0	64.1
16,000	41.3	57.0	59.0
20,000	36.5	51.6	53.6
25,000	31.6	46.0	47.9

TABLE 25-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOJET BUSINESS AIRCRAFT - GULFSTREAM GIIB AND GIII
AIRCRAFT WITH SPEY MK511 ENGINES

	SEL, dB				
Airspeed*, kt	160	160	160	160	160
Thrust, lbs	2,000	4,000	6,000	8,000	10,000
Distance, ft.					
200	94.1	102.4	112.5	119.5	124.7
250	92.7	101.0	111.1	118.1	123.3
315	91.2	99.5	109.7	116.7	121.8
400	89.7	98.0	108.3	115.2	120.3
500	88.2	96.5	106.8	113.7	118.8
630	86.6	94.9	105.3	112.1	117.2
800	84.9	93.2	103.7	110.5	115.5
1000	83.2	91.5	102.1	108.8	113.7
1250	81.4	89.7	100.4	107.1	111.9
1600	79.5	87.8	98.6	105.2	109.9
2000	77.5	85.8	96.8	103.2	107.9
2500	75.5	83.8	94.9	101.2	105.7
3150	73.2	81.5	92.8	99.0	103.3
4000	70.9	79.2	90.7	96.6	100.8
5000	68.4	76.7	88.4	94.2	98.1
6300	65.9	74.0	86.1	91.6	95.3
8000	62.8	71.1	83.6	88.9	92.3
10,000	59.8	68.1	80.9	85.9	89.1
12,500	56.5	64.8	78.0	82.8	85.7
16,000	53.0	61.3	74.9	79.5	82.1
20,000	49.3	57.6	71.6	75.8	78.2
25,000	45.4	53.7	67.9	71.8	74.0

*Typical takeoff climb speed is 155 kt (+0.1 dB)
Typical approach speed is 115 kt (+1.4 dB)

TABLE 25-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOJET BUSINESS AIRCRAFT - GULFSTREAM GIIB AND GIII
AIRCRAFT WITH SPEY MK511 ENGINES

	EPNL, dB				
Airspeed*, kt	160	160	160	160	160
Thrust, lbs	2,000	4,000	6,000	8,000	10,000
Distance, ft.					
200	96.4	106.6	113.4	120.6	126.0
250	94.8	105.0	111.9	119.1	124.5
315	93.2	103.4	110.5	117.6	122.9
400	91.5	101.7	109.0	116.0	121.2
500	89.7	99.9	107.4	114.4	119.5
630	87.8	98.0	105.8	112.7	117.6
800	85.7	95.9	104.2	111.0	115.7
1000	83.8	94.0	102.4	109.2	113.7
1250	81.9	92.1	100.7	107.4	111.8
1600	79.8	90.0	98.8	105.5	109.7
2000	77.6	87.8	96.9	103.5	107.6
2500	75.3	85.5	94.9	101.4	105.5
3150	72.9	83.1	92.7	99.2	103.2
4000	70.4	80.6	90.7	96.9	100.8
5000	67.7	77.9	88.5	94.6	98.4
6300	64.9	75.1	86.0	92.1	95.8
8000	61.7	71.9	83.4	89.5	93.0
10,000	58.4	68.6	80.5	86.5	90.0
12,500	54.7	64.9	77.2	83.1	86.7
16,000	50.7	60.9	73.5	79.4	83.0
20,000	45.8	56.0	69.4	75.2	78.7
25,000	39.8	50.0	64.6	70.5	74.1

*Typical takeoff climb speed is 155 kt (+0.1 dB)

TABLE 25-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOJET BUSINESS AIRCRAFT - GULFSTREAM GIIB AND GIII
AIRCRAFT WITH SPEY MK511 ENGINES

	MAXIMUM A-LEVEL, dB				
Airspeed, kt Thrust, lbs	160 2,000	160 4,000	160 6,000	160 8,000	160 10,000
Distance, ft.					
200	91.6	99.6	109.5	115.3	120.9
250	89.4	97.4	107.3	113.2	118.7
315	87.2	95.2	105.2	111.0	116.5
400	85.0	93.0	103.0	108.8	114.3
500	82.7	90.7	100.8	106.5	112.0
630	80.4	88.4	98.5	104.2	109.6
800	78.0	86.0	96.2	101.9	107.2
1000	75.5	83.5	93.8	99.4	104.7
1250	72.9	80.9	91.4	96.9	102.1
1600	70.3	78.3	88.9	94.3	99.4
2000	67.6	75.6	86.3	91.6	96.6
2500	64.7	72.7	83.6	87.7	93.6
3150	61.8	69.8	80.8	85.8	90.5
4000	58.7	66.7	77.9	82.7	87.3
5000	55.4	63.4	74.9	79.5	83.8
6300	52.0	60.0	71.8	76.2	80.3
8000	48.4	56.4	68.6	72.7	76.5
10,000	44.6	52.6	65.1	69.0	72.6
12,500	40.5	48.5	61.5	65.2	68.4
16,000	36.3	44.3	57.7	61.1	64.1
20,000	31.9	39.9	53.5	56.6	59.4
25,000	27.2	35.2	49.1	51.9	54.4

TABLE 26-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - GATES LEARJET 35/36
AIRCRAFT WITH TFE 731 SERIES ENGINES

	SEL, dB		
Airspeed,* kt	160	160	160
Thrust, lbs	1,000	1,500	2,650
Distance, ft.			
200	93.7	99.3	110.5
250	92.2	97.9	108.7
315	90.7	96.3	106.9
400	89.0	94.8	105.0
500	87.3	93.1	103.1
630	85.6	91.4	101.1
800	83.7	89.7	99.1
1000	81.8	87.8	97.1
1250	79.8	85.9	95.0
1600	77.8	83.9	92.8
2000	75.6	81.8	90.6
2500	73.5	79.6	88.2
3150	71.2	77.3	85.7
4000	68.9	74.9	83.0
5000	66.5	72.4	80.2
6300	64.1	69.7	77.1
8000	61.5	67.0	73.8
10,000	58.8	64.0	70.3
12,500	56.0	60.9	66.6
16,000	53.1	57.6	62.5
20,000	50.1	54.2	58.3
25,000	46.9	50.6	53.8

*Typical takeoff climb speed is 160 kt (+0.0 dB).
Typical approach speed is 150 kt (+0.3 dB).

TABLE 26-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - GATES LEARJET 35/36
AIRCRAFT WITH TFE 731 SERIES ENGINES

	EPNL, dB		
Airspeed,* kt	160	160	160
Thrust, lbs	1,000	1,500	2,650
Distance, ft.			
200	98.1	103.6	124.8
250	96.5	102.0	112.8
315	94.8	100.3	110.9
400	92.9	98.5	108.9
500	91.0	96.7	106.7
630	88.9	94.8	104.3
800	86.6	92.7	101.7
1000	84.4	90.5	99.0
1250	82.0	88.1	96.3
1600	79.4	85.6	93.4
2000	76.5	82.9	90.9
2500	73.8	80.3	88.2
3150	71.2	77.8	85.5
4000	68.3	75.1	82.3
5000	65.3	72.3	79.0
6300	62.1	69.3	75.5
8000	55.0	62.6	67.6
10,000	55.0	62.6	67.6
12,500	51.1	59.0	63.7
16,000	47.0	54.7	59.4
20,000	42.3	50.0	54.2
25,000	36.2	44.9	47.8

*Typical takeoff climb speed is 160 kt (+0.0 dB).
Typical approach speed is 150 kt (+0.3 dB).

TABLE 26-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - GATES LEARJET 35/36
AIRCRAFT WITH TFE 731 SERIES ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	1,000	1,500	2,650
Distance, ft.			
200	91.1	96.1	107.5
250	88.9	93.9	105.0
315	86.5	91.6	102.4
400	84.2	89.3	99.8
500	81.7	86.9	97.1
630	79.2	84.4	94.4
800	76.6	81.9	91.6
1000	73.9	79.3	88.9
1250	71.2	78.6	86.0
1600	68.4	73.8	83.1
2000	65.5	71.0	80.1
2500	62.6	68.1	77.0
3150	59.6	65.0	73.7
4000	56.6	61.9	70.3
5000	53.4	58.6	66.7
6300	50.2	55.2	63.9
8000	46.9	52.7	58.8
10,000	43.5	48.0	54.6
12,500	39.9	44.2	50.1
16,000	36.3	40.1	45.3
20,000	32.5	36.0	40.5
25,000	28.6	31.6	35.0

TABLE 27-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ROCKWELL SABRELINER 80 AIRCRAFT
WITH CF700 SERIES ENGINES

	SEL, dB			
Airspeed,* kt	160	160	160	160
Thrust, lbs	850	1,500	2,500	3,750
Distance, ft.				
200	100.7	102.8	104.2	111.3
250	99.0	101.2	102.7	109.7
315	97.2	99.5	101.1	108.1
400	95.3	97.8	99.5	106.4
500	93.3	96.0	97.8	104.6
630	91.2	94.1	96.1	102.8
800	88.9	91.9	94.3	100.9
1000	86.4	90.0	92.5	99.0
1250	83.9	88.0	90.6	97.0
1600	81.3	85.6	88.7	94.9
2000	78.7	83.4	86.7	92.6
2500	76.2	81.0	84.6	90.3
3150	73.8	78.6	82.3	87.8
4000	71.4	75.9	79.9	85.1
5000	68.8	73.1	77.4	82.3
6300	66.2	70.1	74.7	79.2
8000	63.4	67.0	71.9	76.0
10,000	60.5	63.7	68.9	72.7
12,500	57.7	60.6	65.7	69.1
16,000	54.4	57.2	62.3	65.4
20,000	51.0	53.5	58.8	61.5
25,000	47.4	50.0	55.1	57.4

*Typical takeoff climb speed is 150 kt (+0.3 dB).
Typical approach speed is 145 kt (+0.4 dB).

TABLE 27-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ROCKWELL SABRELINER 80 AIRCRAFT
WITH CF700 SERIES ENGINES

	EPNL, dB			
Airspeed,* kt	160	160	160	160
Thrust, lbs	850	1,500	2,500	3,750
Distance, ft.				
200	106.9	109.0	109.5	115.3
250	105.2	107.3	107.8	113.6
315	103.4	105.6	106.1	111.8
400	101.5	103.7	104.2	109.9
500	99.5	101.8	102.3	107.9
630	97.2	99.8	100.3	105.8
800	94.8	97.7	98.2	103.5
1000	92.0	95.5	96.0	101.0
1250	89.0	92.9	93.6	98.3
1600	85.6	90.0	91.1	95.4
2000	81.9	87.0	88.8	92.9
2500	78.0	84.0	86.4	90.4
3150	75.2	80.8	84.0	87.7
4000	72.4	77.4	81.4	85.0
5000	69.5	74.2	78.7	82.2
6300	66.5	70.8	76.0	79.2
8000	63.0	67.2	73.1	76.0
10,000	60.0	63.6	69.9	72.6
12,500	56.4	59.9	66.6	68.9
16,000	52.6	55.2	62.9	64.8
20,000	47.9	50.8	58.7	60.1
25,000	41.8	46.1	53.7	54.1

*Typical takeoff climb speed is 150 kt (+0.3 dB).
Typical approach speed is 145 kt (+0.4 dB).

TABLE 27-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ROCKWELL SABRELINER 80 AIRCRAFT
WITH CF700 SERIES ENGINES

	MAXIMUM A-LEVEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	850	1,500	2,500	3,750
Distance, ft.				
200	98.2	100.5	101.0	108.6
250	95.8	98.2	98.7	106.2
315	93.2	95.8	96.3	103.8
400	90.6	93.5	94.0	101.4
500	87.8	91.0	91.5	98.9
630	84.9	89.6	89.1	96.3
800	81.9	86.0	86.5	93.7
1000	78.7	83.5	84.0	91.0
1250	75.4	80.8	81.3	88.3
1600	72.0	77.6	78.7	85.4
2000	68.7	74.6	75.9	82.4
2500	65.5	71.6	73.0	79.3
3150	62.3	68.3	70.0	76.1
4000	59.1	64.9	66.9	72.6
5000	55.8	61.3	64.6	69.0
6300	52.4	57.6	60.2	65.3
8000	48.9	53.7	56.6	61.3
10,000	45.3	49.7	52.8	57.2
12,500	41.5	45.8	48.9	52.9
16,000	37.6	41.7	44.8	48.4
20,000	33.5	37.2	40.5	43.8
25,000	29.2	33.0	36.1	38.9

TABLE 28-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CESSNA 500/501 CITATION I AND II
AIRCRAFT WITH JT15D SERIES ENGINES

	SEL, dB			
Airspeed*, kt	160	160	160	160
Thrust, lbs	300	600	1,200	1,550
Distance, ft.				
200	85.6	86.8	96.4	98.0
250	84.1	85.3	94.9	96.6
315	82.6	83.8	93.3	95.1
400	81.0	82.2	91.7	93.6
500	79.4	80.6	90.0	92
630	77.7	78.9	88.2	90.4
800	76.0	77.2	86.4	88.7
1000	74.2	75.4	84.5	87.0
1250	72.4	73.6	82.5	85.2
1600	70.5	71.7	80.5	83.3
2000	68.5	69.7	78.3	81.4
2500	66.5	67.7	76.1	79.3
3150	64.4	65.6	73.8	77.1
4000	62.3	63.5	71.4	74.8
5000	60.0	61.2	68.9	72.3
6300	57.6	58.8	66.3	69.7
8000	55.0	56.2	63.5	66.9
10,000	52.3	53.5	60.6	63.9
12,500	49.3	50.5	57.5	60.6
16,000	46.2	47.4	54.2	57.1
20,000	42.8	44.0	50.8	53.4
25,000	39.2	40.4	47.1	49.5

*Typical takeoff climb speed is 125 kt (+1.1 dB).
Typical approach speed is 115 kt (+1.4 dB).

TABLE 28-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CESSNA 500/501 CITATION I AND II
AIRCRAFT WITH JT15D SERIES ENGINES

	EPNL, dB			
Airspeed*, kt	160	160	160	160
Thrust, lbs	300	600	1,200	1,550
Distance, ft.				
200	89.8	91.0	101.4	102.4
250	88.2	89.4	99.8	100.8
315	86.5	87.7	98.1	99.2
400	84.7	85.9	96.3	97.4
500	82.7	83.9	94.4	95.6
630	80.7	81.9	92.4	93.6
800	78.5	79.7	90.1	91.5
1000	76.3	77.5	87.7	89.5
1250	74.3	75.5	85.1	87.4
1600	72.1	73.3	82.4	85.3
2000	69.8	71.0	79.9	83.0
2500	67.4	68.6	77.4	80.7
3150	65.0	66.2	74.8	78.2
4000	62.2	63.4	72.1	75.4
5000	59.2	60.4	69.3	72.5
6300	55.9	57.1	66.3	69.4
8000	52.3	53.5	63.1	65.9
10,000	48.2	49.4	59.8	62.3
12,500	43.8	45.0	56.0	58.7
16,000	38.4	39.6	51.7	54.2
20,000	31.5	32.7	46.6	49.1
25,000	19.5	20.7	40.4	43.2

*Typical takeoff climb speed is 120 kt (+1.1 dB).
Typical approach speed is 115 kt (+1.4 dB).

TABLE 28-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CESSNA 500/501 CITATION I AND II
AIRCRAFT WITH JT15D SERIES ENGINES

	MAXIMUM A-LEVEL, dB			
Airspeed, kt	160	160	160	160
Thrust, lbs	300	600	1,200	1,550
Distance, ft.				
200	83.2	85.7	93.2	95.3
250	80.9	83.4	90.9	93.1
315	78.6	81.1	88.6	90.8
400	76.3	78.8	86.2	88.6
500	73.9	76.4	83.8	86.2
630	71.5	74.0	81.3	83.9
800	69.0	71.5	78.7	81.5
1000	66.5	69.0	76.0	79.0
1250	63.9	66.4	73.3	76.5
1600	61.3	63.8	70.6	73.8
2000	58.6	61.1	67.6	71.1
2500	55.8	58.3	64.6	68.3
3150	53.0	55.5	61.6	65.4
4000	50.1	52.6	58.4	62.3
5000	47.0	49.5	55.2	59.1
6300	43.9	46.4	51.8	55.7
8000	40.6	43.1	48.3	52.1
10,000	37.1	39.6	44.6	48.4
12,500	33.4	35.9	40.8	44.4
16,000	29.5	32.0	36.7	40.1
20,000	25.4	27.9	32.5	35.7
25,000	21.0	23.5	28.1	31.0

TABLE 29-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - MITSUBISHI MU300-10 AIRCRAFT
WITH JT15D-5 ENGINES

	SEL, dB		
Airspeed*, kt	160	160	160
Thrust, lbs	670	1,500	2,100
Distance, ft.			
200	90.2	104.1	106.0
250	88.8	102.8	104.9
315	87.2	101.3	103.7
400	85.6	99.8	102.4
500	83.9	98.4	101.1
630	82.2	96.8	99.7
800	80.2	95.1	98.2
1000	78.4	93.4	96.8
1250	76.5	91.6	95.2
1600	74.3	89.4	93.4
2000	72.3	87.3	91.6
2500	70.2	85.1	89.6
3150	67.8	83.2	87.8
4000	65.3	81.1	85.7
5000	62.8	79.0	83.6
6300	60.3	76.6	81.2
8000	57.5	74.0	78.6
10,000	54.7	71.3	75.9
12,500	51.8	68.3	72.9
16,000	48.4	64.8	69.3
20,000	45.1	61.2	65.8
25,000	41.4	57.4	61.8

*Typical takeoff climb speed is 145 kt (+0.4 dB)
Typical approach speed is 130 kt (+0.9 dB)

TABLE 29-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - MITSUBISHI MU300-10 AIRCRAFT
WITH JT15D-5 ENGINES

	EPNL, dB		
Airspeed,* kt	160	160	160
Thrust, lbs	670	1,500	2,100
Distance, ft.			
200	95.4	107.9	108.6
250	93.9	106.3	107.4
315	92.2	104.5	106.1
400	90.4	102.7	105.0
500	88.6	101.0	103.3
630	86.6	99.2	101.7
800	84.3	97.1	100.1
1000	82.0	95.2	98.4
1250	79.5	93.2	96.7
1600	76.7	90.9	94.8
2000	74.0	88.5	92.8
2500	71.3	86.2	90.6
3150	68.5	82.9	88.4
4000	65.7	80.7	86.2
5000	62.8	78.5	83.9
6300	59.6	76.1	81.4
8000	56.1	73.2	78.7
10,000	52.4	70.4	75.7
12,500	48.2	67.2	72.6
16,000	43.8	63.3	68.6
20,000	37.8	59.2	64.5
25,000	31.5	54.5	59.7

*Typical takeoff climb speed is 145 kt (+0.4 dB)
Typical approach speed is 130 kt (+0.9 dB)

TABLE 29-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - MITSUBISHI MU300-10 AIRCRAFT
WITH JT15D-5 ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
Thrust, lbs	670	1,500	2,100
Distance, ft.			
200	90.2	101.3	103.7
250	87.9	99.1	101.6
315	85.4	96.8	99.4
400	82.7	94.4	97.2
500	80.0	92.1	95.0
630	77.2	89.6	92.6
800	74.2	87.0	90.2
1000	71.2	84.4	87.8
1250	68.2	81.8	85.4
1600	64.8	78.7	82.7
2000	61.7	75.8	80.1
2500	58.5	72.7	77.5
3150	55.4	70.1	74.8
4000	52.0	67.2	72.0
5000	48.9	64.4	69.1
6300	45.5	61.3	66.0
8000	42.0	57.8	62.6
10,000	38.5	54.4	59.2
12,500	34.9	50.7	55.5
16,000	30.7	46.4	51.1
20,000	26.6	42.1	46.8
25,000	21.2	37.5	42.2

TABLE 30
AIR-TO-GROUND VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CANADAIR CL-600 CHALLENGER AIRCRAFT
WITH ALF502L ENGINES

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt	160	160	160	160	160	160
Thrust, lbs	1,900	5,000	1,900	5,000	1,900	5,000
Distance, ft.						
200	90.2	101.1	93.8	103.8	88.4	98.0
250	88.7	99.7	92.3	102.3	86.2	95.9
315	87.1	98.3	90.6	100.8	83.9	93.7
400	85.5	96.8	88.8	99.3	81.5	91.5
500	83.9	95.3	87.0	97.7	79.1	89.2
630	82.1	93.8	85.0	96.0	76.6	86.9
800	80.2	92.2	82.8	94.2	74.0	84.6
1000	78.3	90.5	80.5	92.3	71.3	82.2
1250	76.3	88.8	78.0	90.3	68.5	79.7
1600	74.2	86.9	75.4	88.1	65.7	77.1
2000	72.0	85.0	72.5	85.5	62.7	74.4
2500	69.6	83.0	69.4	83.6	59.6	71.6
3150	67.2	80.8	66.1	81.3	56.5	68.8
4000	64.7	78.6	63.3	78.8	53.2	65.8
5000	62.1	76.2	60.3	76.2	49.9	62.7
6300	59.4	73.8	57.1	73.6	46.4	59.4
8000	56.6	71.2	53.5	70.7	42.8	56.1
10,000	53.6	68.4	49.5	67.4	39.1	52.6
12,500	50.6	65.6	45.1	64.0	35.3	49.0
16,000	47.4	62.5	40.5	60.4	31.4	45.1
20,000	44.1	59.2	34.2	56.5	27.4	41.1
25,000	40.7	55.6	26.7	51.5	23.2	36.8

*Typical takeoff climb speed is 155 kt (+0.1 dB).
Typical approach speed is 135 kt (+0.7 dB).

TABLE 31-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CANADAIR CL-601 CHALLENGER AIRCRAFT
WITH CF34 SERIES ENGINES

	SEL, dB				
Airspeed*, kt	160	160	160	160	160
Thrust, lbs	2,000	3,000	4,000	5,000	6,000
Distance, ft.					
200	90.9	94.3	96.3	97.7	99.7
250	89.4	92.9	94.8	96.2	98.2
315	87.9	91.4	93.3	94.7	96.7
400	86.7	89.8	91.8	93.2	95.2
500	84.9	88.2	90.2	91.6	93.6
630	83.3	86.5	88.5	90.0	92.0
800	81.6	84.8	86.8	88.3	90.3
1000	79.9	82.9	85.0	86.5	88.5
1250	78.0	81.0	83.1	84.7	86.7
1600	76.1	79.0	81.2	82.7	84.7
2000	74.1	76.9	79.1	80.8	82.8
2500	71.9	74.7	77.0	78.7	80.7
3150	69.7	72.4	74.8	76.6	78.6
4000	67.4	70.0	72.5	74.3	76.3
5000	65.0	67.4	70.1	72.0	74.0
6300	62.4	64.8	67.5	69.5	71.5
8000	59.7	62.1	64.8	66.9	68.9
10,000	56.9	59.2	61.9	64.1	66.1
12,500	53.9	56.1	58.9	61.1	63.1
16,000	50.7	52.9	55.6	57.9	59.9
20,000	47.4	49.6	52.2	54.4	56.4
25,000	43.9	46.0	48.6	50.7	52.7

*Typical takeoff climb speed is 155 kt (+0.1 dB)
Typical approach speed is 135 kt (+0.7 dB)

TABLE 31-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CANADAIR CL-601 CHALLENGER AIRCRAFT
WITH CF34 SERIES ENGINES

	EPNL, dB				
Airspeed*, kt	160	160	160	160	160
Thrust, lbs	2,000	3,000	4,000	5,000	6,000
Distance, ft.					
200	94.1	98.1	100.8	102.1	104.0
250	92.6	96.5	99.2	100.6	102.5
315	91.1	94.9	97.5	98.9	100.8
400	89.4	93.2	95.7	97.2	99.1
500	87.7	91.3	93.9	95.4	97.3
630	85.9	89.4	92.0	93.4	95.3
800	84.0	87.4	90.0	91.3	93.2
1000	82.0	85.3	87.8	89.1	91.0
1250	79.8	84.0	85.4	86.7	88.6
1600	77.4	80.6	83.0	84.6	86.5
2000	74.9	79.0	80.7	82.4	84.3
2500	72.0	75.1	78.4	80.1	82.0
3150	69.5	72.1	75.9	77.7	79.6
4000	66.9	69.4	73.4	75.2	77.1
5000	64.0	66.5	70.7	72.5	74.4
6300	60.9	63.5	67.8	69.7	71.6
8000	57.5	60.2	64.8	66.5	68.4
10,000	53.5	56.3	61.4	63.3	65.2
12,500	49.9	51.9	57.7	59.9	61.8
16,000	44.5	47.4	53.3	56.2	58.1
20,000	37.9	42.0	48.2	51.4	53.3
25,000	30.6	34.2	42.0	46.1	48.0

*Typical takeoff climb speed is 155 kt (+0.1 dB)
Typical approach speed is 135 kt (+0.7 dB)

TABLE 31-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CANADAIR CL-601 CHALLENGER AIRCRAFT
WITH CF34 SERIES ENGINES

	MAXIMUM A-LEVEL, dB				
Airspeed, kt	160	160	160	160	160
Thrust, lbs	2,000	3,000	4,000	5,000	6,000
Distance, ft.					
200	87.3	90.6	93.1	95.0	97.2
250	85.1	88.4	90.9	92.8	95.4
315	82.9	86.1	88.6	90.6	93.2
400	80.7	83.8	86.3	88.3	90.9
500	78.4	81.4	84.0	85.9	88.5
630	76.0	80.0	81.5	83.5	86.1
800	73.6	76.5	79.1	81.1	83.7
1000	71.1	73.9	76.5	78.6	81.2
1250	68.5	71.2	73.9	76.0	78.6
1600	65.8	68.5	71.2	73.3	75.9
2000	63.0	65.6	68.4	70.6	73.2
2500	60.2	62.7	65.6	67.8	70.4
3150	57.2	59.6	62.6	64.9	67.5
4000	54.1	56.5	59.6	61.9	64.5
5000	50.9	53.2	56.4	58.8	61.4
6300	47.6	49.8	53.1	55.6	58.2
8000	44.2	46.3	49.6	52.2	54.8
10,000	40.6	42.7	46.0	48.7	51.5
12,500	36.9	38.9	42.2	44.9	47.5
16,000	33.0	34.9	38.2	40.9	43.5
20,000	28.9	30.8	34.0	36.7	39.3
25,000	24.6	26.5	29.6	32.3	34.9

TABLE 32-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ISRAEL AIRCRAFT INDUSTRIES
WESTWIND 1125 ASTRA AIRCRAFT WITH GARRETT TFE 731 SERIES ENGINES

	SEL, dB		
Airspeed*, kt	160	160	160
Thrust, Percent	69.2 (Approach)	86.6 (Cutback)	95.5 (Takeoff)
Distance, ft.			
200	87.1	95.9	103.4
250	85.8	94.7	102.1
315	84.4	93.4	100.8
400	82.9	92.0	99.4
500	81.4	90.7	98.1
630	79.8	89.3	96.4
800	78.1	87.8	95.3
1000	76.4	86.3	93.8
1250	74.7	84.8	92.2
1600	72.7	83.0	90.5
2000	70.8	81.3	88.8
2500	68.9	79.5	87.0
3150	66.7	77.6	85.0
4000	64.3	75.4	82.9
5000	61.9	73.2	80.7
6300	59.3	70.8	78.3
8000	56.6	68.0	75.5
10,000	53.8	65.1	72.7
12,500	51.0	62.0	69.6
16,000	47.6	58.1	65.9
20,000	44.4	54.3	62.2
25,000	41.0	50.2	58.3

*Typical takeoff climb speed is 150 kt (+0.3 dB)
Typical approach speed is 140 kt (+0.6 dB)

TABLE 32-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ISRAEL AIRCRAFT INDUSTRIES
WESTWIND 1125 ASTRA AIRCRAFT WITH GARRETT TFE 731 SERIES ENGINES

	EPNL, dB		
Airspeed, kt	160	160	160
Thrust, Percent	69.2 (Approach)	86.6 (Cutback)	95.5 (Takeoff)
Distance, ft.			
200	94.2	100.2	107.8
250	92.8	98.8	106.4
315	91.1	97.4	104.9
400	89.3	95.8	103.4
500	87.5	94.3	101.8
630	85.5	92.6	100.1
800	83.2	90.8	98.3
1000	80.9	89.1	96.5
1250	78.5	87.3	94.6
1600	75.8	85.3	92.5
2000	73.4	83.2	90.4
2500	70.9	80.9	88.2
3150	68.4	78.6	85.6
4000	65.6	76.1	83.2
5000	62.7	73.6	80.7
6300	59.6	70.9	77.4
8000	56.1	67.7	74.3
10,000	52.4	64.4	71.9
12,500	48.4	61.2	68.8
16,000	42.6	57.2	64.7
20,000	37.2	53.0	60.5
25,000	28.9	47.8	55.2

*Typical takeoff climb speed is 150 kt (+0.3 dB)
Typical approach speed is 140 kt (+0.6 dB)

TABLE 32-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ISRAEL AIRCRAFT INDUSTRIES
WESTWIND 1125 ASTRA AIRCRAFT WITH GARRETT TFE 731 SERIES ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
Thrust, Percent	69.2 (Approach)	86.6 (Cutback)	95.5 (Takeoff)
Distance, ft.			
200	85.8	95.2	101.0
250	83.6	93.1	98.9
315	81.2	90.9	96.7
400	78.6	88.6	94.4
500	76.1	86.4	92.2
630	73.4	84.1	89.8
800	70.6	81.6	87.4
1000	67.9	79.3	85.0
1250	65.1	76.9	82.6
1600	62.0	74.2	79.9
2000	59.1	71.7	77.4
2500	56.1	69.0	74.7
3150	53.2	66.3	72.0
4000	50.0	63.4	69.1
5000	46.9	60.5	66.2
6300	43.6	57.3	63.0
8000	40.0	53.7	59.5
10,000	36.6	50.1	55.9
12,500	33.0	46.2	52.1
16,000	28.8	41.6	47.6
20,000	24.8	37.0	43.2
25,000	20.7	32.2	38.6

TABLE 33

AIR-TO-GROUND VALUES

4-ENGINE TURBOPROP TRANSPORT AIRCRAFT - LOCKHEED ELECTRA AND HERCULES C-130E AIRCRAFT WITH ALLISON T56-A-7 OR 501-D13 ENGINES

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt Thrust, Percent	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)
Distance, ft.						
200	98.0	100.1	102.1	107.2	96.0	99.8
250	96.6	98.7	100.6	105.8	93.8	97.7
315	95.2	97.3	99.1	104.3	91.6	95.5
400	93.7	95.8	97.5	102.9	89.4	93.3
500	92.2	94.4	95.8	101.4	87.1	91.1
630	90.6	92.9	94.1	99.8	84.8	88.9
800	89.0	91.4	92.2	98.2	82.4	86.6
1000	87.2	89.8	90.3	96.6	79.9	84.3
1250	85.4	88.2	88.2	94.9	77.4	82.0
1600	83.5	86.6	86.1	93.2	74.7	79.6
2000	81.4	85.0	83.8	91.4	71.9	77.3
2500	79.2	83.4	81.3	89.5	68.9	74.9
3150	76.8	81.7	78.7	87.6	65.7	72.5
4000	74.2	80.0	75.9	85.7	62.4	70.0
5000	71.3	78.3	72.7	83.7	58.8	67.6
6300	68.3	76.6	70.0	81.4	55.0	65.1
8000	65.0	74.8	67.0	79.1	51.0	62.6
10,000	61.8	72.9	63.7	76.6	47.0	60.0
12,500	58.6	71.0	60.2	74.0	43.0	57.3
16,000	55.5	69.0	56.3	71.2	39.2	54.5
20,000	52.5	66.8	51.1	68.2	35.5	51.5
25,000	49.4	64.4	45.7	65.0	31.6	48.4

*Typical takeoff climb speed is 145 kt (+0.4 dB).
Typical approach speed is 140 kt (+0.6 dB).

TABLE 34

AIR-TO-GROUND VALUES

4-ENGINE TURBOPROP TRANSPORT AIRCRAFT - LOCKHEED HERCULES 380 SERIES OR C-130H AIRCRAFT WITH ALLISON T56-A-15 ENGINES

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt Thrust, Percent	160 28 (Approach)	160 100 (Takeoff)	160 28 (Approach)	160 100 (Takeoff)	160 28 (Approach)	160 100 (Takroff)
Distance, ft.						
200	98.7	106.8	102.9	112.7	96.4	105.4
250	97.2	105.4	101.3	111.2	94.2	103.3
315	95.7	104.0	99.7	109.7	92.0	101.1
400	94.2	102.6	98.0	108.1	89.7	98.9
500	92.7	101.1	96.3	106.4	87.4	96.7
630	91.1	99.5	94.4	104.7	85.1	94.4
800	89.4	97.9	92.4	103.1	82.7	92.0
1000	87.7	96.3	90.3	101.3	80.2	89.6
1250	85.9	94.6	88.1	99.5	77.7	87.2
1600	84.1	92.8	86.0	97.6	75.1	84.6
2000	82.1	90.8	83.9	95.6	72.4	82.0
2500	80.1	88.9	81.6	93.6	69.6	79.3
3150	78.0	86.9	79.2	91.5	66.7	76.5
4000	75.7	84.7	76.6	89.0	63.7	73.5
5000	73.3	82.4	73.8	86.2	60.6	70.5
6300	70.8	80.0	71.0	83.3	57.3	67.4
8000	68.2	77.5	67.9	80.3	54.4	64.1
10,000	65.5	74.9	64.7	77.1	50.5	60.8
12,500	62.6	72.3	61.6	74.3	46.9	57.4
16,000	59.7	69.6	58.0	71.2	43.2	53.9
20,000	56.6	66.8	54.1	67.9	39.4	50.4
25,000	53.4	63.9	49.1	64.3	35.4	46.7

*Typical takeoff climb speed is 145 kt (+0.4 dB).
Typical approach speed is 140 kt (+0.6 dB).

TABLE 35
AIR-TO-GROUND VALUES
4-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT LESS THAN 50,000 LBS -
De HAVILLAND DH-7 (DASH 7) AIRCRAFT WITH PT6A-50 SERIES ENGINES

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt Thrust, Percent	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)
Distance, ft.						
200	95.4	93.6	99.0	99.8	87.8	85.6
250	93.9	92.3	97.5	98.4	85.6	83.4
315	92.3	90.9	95.8	97.0	83.3	81.3
400	90.7	89.4	94.1	95.5	80.9	79.1
500	89.1	88.0	92.3	93.9	78.5	76.9
630	87.4	86.5	90.4	92.2	76.1	74.7
800	85.6	85.0	88.3	90.5	73.5	72.4
1000	83.7	83.4	86.1	88.8	70.9	70.1
1250	81.7	81.8	83.8	87.0	68.2	67.7
1600	79.6	80.1	81.3	85.0	65.3	65.3
2000	77.4	78.4	78.6	83.0	62.4	62.9
2500	75.1	76.7	75.8	80.9	59.3	60.4
3150	72.7	74.9	72.8	78.7	56.2	57.8
4000	70.2	73.0	70.1	76.7	52.9	55.2
5000	67.6	71.1	67.2	74.1	49.6	52.6
6300	65.0	69.2	64.2	71.6	46.2	49.9
8000	62.3	67.1	60.9	68.8	42.7	47.1
10,000	59.6	65.0	57.3	66.0	39.3	44.2
12,500	56.9	62.9	53.3	62.9	35.9	41.3
16,000	54.3	60.6	49.0	59.6	32.5	38.3
20,000	51.6	58.1	44.0	55.2	29.1	35.1
25,000	48.9	55.6	37.2	50.0	25.6	31.8

*Typical takeoff climb speed is 95 kt (+2.3 dB).
Typical approach speed is 100 kt (+2.0 dB).

TABLE 36

AIR-TO-GROUND VALUES

2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT GREATER THAN 38,000 LBS - CONVAIR 580 AIRCRAFT WITH ALLISON 501-D13 ENGINES

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt Thrust, Percent	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)
Distance, ft.						
200	95.0	97.1	99.1	104.2	93.0	96.8
250	93.6	95.7	97.6	102.8	90.8	94.7
315	92.2	94.3	96.1	101.3	88.6	92.5
400	90.7	92.8	94.5	99.9	86.4	90.3
500	89.2	91.4	92.8	98.4	84.1	88.1
630	87.6	89.9	91.1	96.8	81.8	85.9
800	86.0	88.4	89.2	95.2	79.4	83.6
1000	84.2	86.8	87.3	93.6	76.9	81.3
1250	82.4	85.2	85.2	91.9	74.4	79.0
1600	80.5	83.6	83.1	90.2	71.7	76.6
2000	78.4	82.0	80.8	88.4	68.9	74.3
2500	76.2	80.4	78.3	86.5	65.9	71.9
3150	73.8	78.7	75.7	84.6	62.7	69.5
4000	71.2	77.0	72.9	82.7	59.4	67.0
5000	68.3	75.3	69.7	80.7	55.8	64.6
6300	65.3	73.6	67.0	78.4	52.0	62.1
8000	62.0	71.8	64.0	76.1	48.0	59.6
10,000	58.8	69.9	60.7	73.6	44.0	57.0
12,500	55.6	68.0	57.2	71.0	40.0	54.3
16,000	52.5	66.0	53.3	68.2	36.2	51.5
20,000	49.5	63.8	48.1	65.2	32.5	48.5
25,000	46.4	61.4	42.7	62.0	28.6	45.4

*Typical takeoff climb speed is 145 kt (+0.4 dB).
Typical approach speed is 140 kt (+0.6 dB).

TABLE 37-1

AIR-TO-GROUND SEL VALUES

2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT GREATER THAN 38,000 LBS - HAWKER SIDDELEY HS 748 AIRCRAFT WITH RR DART MK532 ENGINES

	SEL, dB		
Airspeed*, kt Thrust, Percent	160 32 (Approach)	160 73 (Cutback)	160 100 (Takeoff)
Distance, ft.			
200	98.9	100.2	101.3
250	97.2	98.7	100.0
315	95.4	97.1	98.6
400	93.5	95.4	97.2
500	91.4	93.7	95.8
630	89.1	92.0	94.3
800	86.6	90.2	92.9
1000	84.0	88,4	91.4
1250	81.1	86.6	89.8
1600	78.2	84.9	88.3
2000	75.3	83.1	86.7
2500	72.5	81.3	85.0
3150	69.9	79.5	83.3
4000	67.3	77.7	81.4
5000	64.7	75.8	79.5
6300	62.0	73.8	77.5
8000	59.3	71.7	75.2
10,000	56.5	69.5	72.8
12,500	53.7	67.1	70.2
16,000	50.8	64.5	67.3
20,000	47.8	61.6	64.1
25,000	44.6	58.5	60.6

*Typical takeoff climb speed is 140 kt (+0.6 dB).
Typical approach speed is 120 kt (+1.2 dB).

TABLE 37-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT GREATER THAN 38,000 LBS -
HAWKER SIDDELEY HS 748 AIRCRAFT WITH RR DART MK532 ENGINES

	EPNL, dB		
Airspeed*, kt	160	160	160
Thrust, Percent	32	73	100
	(Approach)	(Cutback)	(Takeoff)
Distance, ft.			
200	106.5	107.3	107.7
250	104.9	105.7	106.3
315	103.1	104.0	104.8
400	101.2	102.2	103.3
500	99.1	100.2	101.8
630	96.8	98.1	100.2
800	94.3	96.3	98.5
1000	91.5	94.5	96.8
1250	88.4	92.6	95.0
1600	85.0	90.6	93.2
2000	81.1	88.5	91.2
2500	76.9	86.4	88.1
3150	73.2	84.1	87.0
4000	69.6	81.3	84.7
5000	65.9	78.5	82.4
6300	61.9	75.5	79.9
8000	57.9	72.5	77.1
10,000	53.8	69.2	74.2
12,500	50.2	66.1	71.2
16,000	45.7	62.9	67.8
20,000	40.8	59.1	64.1
25,000	34.2	54.6	59.2

*Typical takeoff climb speed is 140 kt (+0.6 dB).
Typical approach speed is 120 kt (+1.2 dB).

TABLE 37-3

AIR-TO-GROUND MAXIMUM A-LEVEL VALUES

2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT GREATER THAN 38,000 LBS - HAWKER SIDDELEY HS 748 AIRCRAFT WITH RR DART MK532 ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt Thrust, Percent	160 32 (Approach)	160 73 (Cutback)	160 100 (Takeoff)
Distance, ft.			
200	96.4	98.2	98.6
250	94.0	95.9	96.5
315	91.4	93.5	94.3
400	88.7	91.1	92.2
500	85.9	88.7	90.0
630	82.9	86.2	87.8
800	79.7	83.7	85.6
1000	76.2	81.2	83.4
1250	72.6	78.6	81.1
1600	69.0	76.1	78.8
2000	65.3	73.6	76.4
2500	61.8	71.1	74.0
3150	58.4	68.5	71.5
4000	55.1	65.9	68.9
5000	51.7	63.3	66.2
6300	48.3	60.5	63.4
8000	44.8	57.7	60.5
10,000	41.3	54.7	57.3
12,500	37.7	51.5	53.9
16,000	34.1	48.2	50.3
20,000	30.3	44.6	46.3
25,000	26.4	40.7	42.0

TABLE 38-1

AIR-TO-GROUND SEL VALUES

2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE WEIGHT - SHORTS SD3-30

AIRCRAFT WITH PT6A SERIES ENGINES

Airspeed*, kt Thrust, Percent	SEL, dB 160 35 (Approach)	 160 65 (Cutback)	 160 100 (Takeoff)
Distance, ft.			
200	88.0	88.5	95.1
250	86.7	87.2	93.8
315	85.4	85.8	92.5
400	84.0	84.4	91.1
500	82.7	83.0	89.7
630	81.3	81.5	88.4
800	79.9	80.0	86.9
1000	78.5	78.5	85.5
1250	77.0	76.9	84.0
1600	75.6	75.4	82.5
2000	74.0	73.7	81.0
2500	72.5	72.0	79.4
3150	70.9	70.3	77.8
4000	69.2	68.5	76.1
5000	67.5	66.7	74.3
6300	65.6	64.8	72.4
8000	63.7	62.9	70.5
10,000	61.6	60.9	68.4
12,500	59.4	58.9	66.2
16,000	57.0	56.8	63.8
20,000	54.4	54.5	61.2
25,000	51.6	52.0	58.4

*Typical takeoff climb speed is 110 kt (+1.6 dB)
Typical approach speed is 105 kt (+1.8 dB)

TABLE 38-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE WEIGHT - SHORTS SD3-30
AIRCRAFT WITH PT6A SERIES ENGINES

	EPNL, dB		
Airspeed*, kt Thrust, Percent	160 35 (Approach)	160 65 (Cutback)	160 100 (Takeoff)
Distance, ft.			
200	94.4	93.9	101.2
250	93.0	92.6	99.9
315	91.6	91.2	98.5
400	90.1	89.7	97.0
500	88.6	88.2	95.6
630	87.1	86.7	94.1
800	85.5	85.1	92.6
1000	83.9	83.5	91.0
1250	82.1	81.8	89.4
1600	80.2	80.0	87.7
2000	78.3	78.0	85.9
2500	76.2	75.9	84.1
3150	74.2	73.8	82.2
4000	71.6	71.2	79.6
5000	68.9	68.4	76.8
6300	66.1	64.6	73.9
8000	63.2	62.6	70.9
10,000	60.1	59.6	67.7
12,500	57.3	56.7	64.9
16,000	54.1	53.7	61.8
20,000	50.7	50.2	58.5
25,000	46.2	46.3	54.7

*Typical takeoff climb speed is 110 kt (+1.6 dB)
Typical approach speed is 105 kt (+1.8 dB)

TABLE 38-3

AIR-TO-GROUND MAXIMUM A-LEVEL VALUES

2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE WEIGHT - SHORTS SD3-30 AIRCRAFT WITH PT6A SERIES ENGINES

Airspeed, kt Thrust, Percent Distance, ft.	MAXIMUM A-LEVEL, dB 160 35 (Approach)	 160 65 (Cutback)	 160 100 (Takeoff)
200	87.2	87.8	94.9
250	85.1	85.7	92.8
315	83.1	83.5	90.7
400	81.0	81.4	88.6
500	78.9	79.2	86.5
630	76.7	77.0	84.4
800	74.6	74.8	82.2
1000	72.4	72.5	80.0
1250	70.2	70.2	77.8
1600	68.0	67.8	75.5
2000	63.4	63.0	70.9
2500	61.1	60.5	68.5
3150	58.6	58.0	66.1
4000	56.1	55.4	63.6
5000	53.6	52.8	61.0
6300	50.9	50.1	58.3
8000	48.0	47.4	55.4
10,000	48.0	47.4	55.4
12,500	45.1	44.6	52.5
16,000	41.9	41.7	49.4
20,000	38.6	38.7	46.0
25,000	35.1	35.5	42.4

TABLE 39-1
AIR-TO-GROUND SEL VALUES
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE WEIGHT -
SAAB 340 AIRCRAFT WITH GE CT7 SERIES ENGINES

	SEL, dB		
Airspeed*, kt Thrust, Percent Distance, ft.	160 30 (Approach)	160 75 (Cutback)	160 100 (Takeoff)
200	87.5	89.0	97.0
250	86.2	87.7	95.7
315	84.8	86.5	94.3
400	83.4	85.1	92.8
500	82.0	83.8	91.5
630	80.5	82.5	90.1
800	79.0	81.0	88.6
1000	77.5	79.5	87.3
1250	76.0	78.3	85.9
1600	74.3	76.6	84.3
2000	72.7	75.1	82.9
2500	71.1	73.5	81.4
3150	69.3	71.8	79.7
4000	67.4	69.9	77.8
5000	65.6	68.1	76.0
6300	63.6	66.2	74.0
8000	61.3	64.1	71.8
10,000	59.1	62.0	69.5
12,500	56.6	59.8	67.1
16,000	53.6	57.2	64.1
20,000	50.6	54.6	61.1
25,000	47.3	51.8	57.8

*Typical takeoff climb speed is 125 kt (+1.1 dB).
Typical approach speed is 120 kt (+1.2 dB).

TABLE 39-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE WEIGHT -
SAAB 340 AIRCRAFT WITH GE CT7 SERIES ENGINES

	EPNL, dB		
Airspeed*, kt Thrust, Percent	160 30 (Approach)	160 75 (Cutback)	160 100 (Takeoff)
Distance, ft.			
200	94.0	94.8	102.8
250	92.7	93.5	101.4
315	91.2	92.1	100.0
400	89.6	90.6	98.4
500	88.1	89.2	96.9
630	86.5	87.6	95.3
800	84.6	86.0	93.7
1000	82.9	84.3	92.0
1250	81.2	82.6	90.3
1600	79.1	80.6	88.2
2000	77.2	78.7	86.4
2500	75.3	76.8	84.5
3150	73.0	74.8	82.4
4000	70.6	72.5	80.1
5000	68.2	70.3	77.9
6300	65.6	67.9	75.4
8000	62.8	65.2	72.7
10,000	59.9	62.5	70.0
12,500	56.7	59.6	67.1
16,000	52.9	56.2	63.5
20,000	46.3	50.3	58.2
25,000	41.0	45.6	53.4

*Typical takeoff climb speed is 125 kt (+1.1 dB).
Typical approach speed is 120 kt (+1.2 dB).

TABLE 39-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2 ENGINE TURBOPROP TRANSPORT AIRCRAFT, INERMEDIATE WEIGHT -
SAAB 340 AIRCRAFT WITH GE CT7 SERIES ENGINES

Airspeed, kt Thrust, Percent	MAXIMUM A-LEVEL, dB		
	160 30 (Approach)	160 75 (Cutback)	160 100 (Takeoff)
Distance, ft.			
200	86.9	88.1	95.2
250	84.9	86.0	93.2
315	82.7	83.9	91.1
400	80.5	81.7	88.9
500	78.3	79.6	86.9
630	76.1	77.4	84.7
800	73.8	75.1	82.5
1000	71.6	73.0	80.3
1250	69.3	70.8	78.1
1600	66.8	68.3	75.7
2000	64.5	66.0	73.4
2500	62.1	63.6	71.1
3150	59.6	61.2	68.7
4000	57.0	58.5	66.1
5000	54.4	56.0	63.5
6300	51.6	53.3	60.8
8000	48.6	50.4	57.8
10,000	45.6	47.6	54.8
12,500	42.5	44.7	51.6
16,000	38.6	41.3	47.9
20,000	34.9	38.0	44.1
25,000	30.9	34.5	40.1

TABLE 40
AIR-TO-GROUND VALUES
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, (LESS THAN 15,000 LBS MAXIMUM GROSS TAKEOFF WEIGHT, OVER 600 ESHP** PER ENGINE) - De HAVILLAND DH-6 AIRCRAFT

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt	160	160	160	160	160	160
Thrust, Percent	30 (Approach)	100 (Takeoff)	30 (Approach)	100 (Takeoff)	30 (Approach)	100 (Takeoff)
Distance, ft.						
200	91.3	95.9	94.4	99.2	90.9	95.6
250	89.9	94.6	93.0	97.8	88.8	93.6
315	88.6	93.3	91.5	96.4	86.8	91.5
400	87.2	92.0	90.0	95.0	84.6	89.5
500	85.8	90.6	88.5	93.6	82.5	87.4
630	84.4	89.3	86.9	92.1	80.4	85.3
800	83.0	87.9	85.2	90.6	78.2	83.2
1000	81.6	86.5	83.5	89.1	76.0	81.0
1250	80.1	85.1	81.8	87.5	73.7	78.8
1600	78.5	83.6	79.9	85.9	71.4	76.6
2000	76.9	82.0	78.0	84.3	69.1	74.3
2500	75.2	80.4	76.0	82.5	66.7	71.9
3150	73.5	78.7	73.9	80.7	64.2	69.5
4000	71.7	77.0	71.6	78.8	61.6	67.0
5000	69.7	75.1	69.3	76.7	58.9	64.3
6300	67.6	73.1	66.8	74.4	56.0	61.6
8000	65.4	70.9	64.0	71.9	53.0	58.7
10,000	62.9	68.6	61.0	69.3	49.8	55.6
12,500	60.2	66.2	57.7	66.4	46.4	52.4
16,000	57.2	63.5	54.0	63.2	42.6	49.0
20,000	53.8	60.6	51.2	59.5	38.5	45.3
25,000	50.0	57.4	44.9	55.4	34.0	41.4

*Typical takeoff climb speed for DH-6 is 70 kt (+3.6 db). Typical approach speed is 65 kt (+3.9 dB). For other airplanes use takeoff speed of 130 kt (+0.9 dB) and approach speed of 110 kt (+1.5 db).

**Equivalent shaft horsepower

TABLE 41

AIR-TO-GROUND VALUES

SMALL 2-ENGINE TURBOPROP AIRCRAFT* - CESSNA CONQUEST AIRCRAFT

Airspeed**, kt Thrust, Percent	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)
Distance, ft.						
200	84.3	88.5	87.4	92.2	83.9	88.4
250	82.9	87.2	86.0	90.9	81.8	86.4
315	81.6	85.9	84.5	89.5	79.8	84.4
400	80.2	84.6	83.0	88.1	77.6	82.3
500	78.8	83.3	81.5	86.7	75.5	80.3
630	77.4	82.0	79.9	85.3	73.4	78.2
800	76.0	80.7	78.2	83.8	71.2	76.1
1000	74.6	79.3	76.5	82.3	69.0	74.0
1250	73.1	77.9	74.8	80.8	66.7	71.8
1600	71.5	76.5	72.9	79.2	64.4	69.7
2000	69.9	75.0	71.0	77.5	62.1	67.5
2500	68.2	73.5	69.0	75.6	59.7	65.2
3150	66.5	72.0	66.9	73.6	57.2	62.9
4000	64.7	70.3	64.6	71.5	54.6	60.5
5000	62.7	68.6	62.3	69.3	51.9	58.0
6300	60.6	66.7	59.8	67.0	49.0	55.4
8000	58.4	64.8	57.0	64.6	46.0	52.7
10,000	55.9	62.7	54.0	62.1	42.8	49.8
12,500	53.2	60.4	50.7	59.4	39.4	46.8
16,000	50.2	57.9	47.0	56.4	35.6	43.5
20,000	46.8	55.1	43.2	53.0	31.5	40.1
25,000	43.0	52.2	37.0	49.1	27.0	36.4

* Less than 600 ESHP per engine, or takeoff engine rpm of 1900 or less

**Typical takeoff climb speed is 125 kt (+1.1 dB).
Typical approach speed is 110 kt (+1.6 dB).

TABLE 42
AIR-TO-GROUND VALUES
4-ENGINE PISTON TRANSPORT AIRCRAFT - DOUGLAS DC-6 SERIES AIRCRAFT

Airspeed*, kt Thrust, Percent Distance, ft.	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)
200	99.9	110.5	102.6	115.9	95.6	106.5
250	98.5	109.0	101.1	114.4	93.5	104.4
315	97.1	107.5	99.7	112.8	91.3	102.3
400	95.7	106.0	98.2	111.3	89.1	100.2
500	94.2	104.5	96.7	109.7	86.9	98.0
630	92.7	102.9	95.1	108.2	84.7	95.9
800	91.1	101.3	93.5	106.3	82.4	93.6
1000	89.5	99.6	91.8	104.5	80.0	91.4
1250	87.9	97.9	90.0	102.7	77.6	89.1
1600	86.1	96.1	88.2	100.7	75.1	86.7
2000	84.3	94.3	86.2	98.8	72.5	84.3
2500	82.4	92.4	84.1	96.7	69.8	81.8
3150	80.4	90.5	81.9	94.6	67.1	79.3
4000	78.3	88.4	79.4	91.9	64.3	76.6
5000	76.2	86.3	76.8	89.2	61.4	73.9
6300	74.0	84.0	74.0	86.3	58.5	71.0
8000	71.3	81.7	71.1	83.4	55.6	68.0
10,000	69.6	79.2	68.0	80.2	52.6	64.9
12,500	67.3	76.5	64.9	77.2	49.5	61.7
16,000	64.9	73.7	61.6	74.1	46.4	58.3
20,000	62.3	70.7	57.9	70.7	43.1	54.7
25,000	59.6	67.5	53.2	67.0	39.6	50.9

*Typical takeoff climb speed is 145 kt (+0.6 dB).
Typical approach speed is 120 kt (+1.2 dB).

TABLE 43

AIR-TO-GROUND VALUES

2-ENGINE PISTON TRANSPORT AIRCRAFT, (GREATER THAN 12,500 LBS MAXIMUM GROSS TAKEOFF WEIGHT) - CONVAIR 340 AIRCRAFT

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt Thrust, Percent	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)
Distance, ft.						
200	96.9	107.5	99.6	112.9	92.6	103.5
250	95.5	106.0	98.1	111.4	90.5	101.4
315	94.1	104.5	96.7	109.8	88.3	99.3
400	92.7	103.0	95.2	108.3	86.1	97.2
500	91.2	101.5	93.7	106.7	83.9	95.0
630	89.7	99.9	92.1	105.2	81.7	92.9
800	88.1	98.3	90.5	103.3	79.4	90.6
1000	86.5	96.6	88.8	101.5	77.0	88.4
1250	84.9	94.9	87.0	99.7	74.6	86.1
1600	83.1	93.1	85.2	97.7	72.1	83.7
2000	81.3	91.3	83.2	95.8	69.5	81.3
2500	79.4	89.4	81.1	93.7	66.8	78.8
3150	77.4	87.5	78.9	91.6	64.1	76.3
4000	75.3	85.4	76.4	88.9	61.3	73.6
5000	73.2	83.3	73.8	86.2	58.4	70.9
6300	71.0	81.0	71.0	83.3	55.5	68.0
8000	68.8	78.7	68.1	80.4	52.6	65.0
10,000	66.6	76.2	65.0	77.2	49.6	61.9
12,500	64.3	73.5	61.9	74.2	46.5	58.7
16,000	61.9	70.7	58.6	71.1	43.4	55.3
20,000	59.3	67.7	54.9	67.7	40.1	51.7
25,000	56.6	64.5	50.2	64.0	36.6	47.9

*Typical takeoff climb speed is 140 kt (+0.6 dB).
Typical approach speed is 120 kt (+1.2 dB).

TABLE 44
AIR-TO-GROUND VALUES
2-ENGINE PISTON AIRCRAFT (LESS THAN 12,500 LBS MAXIMUM GROSS TAKEOFF WEIGHT) - BEECH BARON AIRCRAFT

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt Thrust, Percent	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)
Distance, ft.						
200	84.6	97.6	90.3	102.4	83.1	95.4
250	83.3	96.3	88.9	101.0	81.0	93.3
315	82.0	95.0	87.5	99.6	79.0	91.2
400	80.6	93.6	86.0	98.2	76.9	89.1
500	79.3	92.3	84.5	96.7	74.8	87.0
630	77.9	90.9	83.0	95.2	72.6	84.9
800	76.5	89.5	81.4	93.6	70.5	82.7
1000	75.1	88.0	79.8	92.0	68.3	80.5
1250	73.6	86.5	77.9	90.2	66.1	78.3
1600	72.1	85.0	76.0	88.3	63.8	76.0
2000	70.5	83.4	74.1	86.4	61.5	73.7
2500	68.8	81.8	72.1	84.4	59.1	71.3
3150	67.1	80.1	70.0	82.2	56.6	68.8
4000	65.3	78.3	67.8	80.1	53.1	66.3
5000	63.4	76.4	65.5	77.8	51.4	63.7
6300	61.4	74.4	63.2	75.4	48.7	60.9
8000	59.3	72.3	60.7	72.9	45.8	58.1
10,000	57.1	70.1	57.3	70.2	42.8	55.1
12,500	54.7	67.8	55.0	67.3	39.7	52.1
16,000	52.2	65.3	51.9	64.1	36.4	48.8
20,000	49.6	62.7	48.0	60.6	33.0	45.5
25,000	46.8	59.9	43.4	55.9	29.5	42.0

*Typical takeoff climb speed is 110 kt (+1.6 dB).
Typical approach speed is 90 kt (+2.5 dB).

TABLE 45
AIR-TO-GROUND VALUES
1-ENGINE PISTON AIRCRAFT - COMPOSITE AIRCRAFT, 1985 FLEET

Airspeed*, kt Thrust, Percent Distance, ft.	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)	160 30 (Approach)	160 100 (Takeoff)
200	77.0	89.9	83.8	94.2	75.5	87.7
250	75.6	88.6	82.0	92.8	73.4	85.6
315	74.3	87.3	80.3	91.4	71.3	83.5
400	72.9	85.9	78.5	90.0	69.2	81.4
500	71.5	84.6	76.6	88.5	67.0	79.3
630	70.1	83.2	74.7	87.0	64.9	77.2
800	68.6	81.8	72.8	85.4	62.7	75.0
1000	67.2	80.3	70.8	83.8	60.5	72.8
1250	65.7	78.8	68.8	82.0	58.2	70.6
1600	64.1	77.3	66.7	80.1	55.9	68.3
2000	62.6	75.7	64.3	78.2	53.6	66.0
2500	60.9	74.1	62.0	76.2	51.2	63.6
3150	59.3	72.4	59.5	74.0	48.8	61.1
4000	57.6	70.6	56.5	71.9	46.4	58.6
5000	55.8	68.7	53.1	69.6	43.8	56.0
6300	54.0	66.7	49.4	67.2	41.3	53.2
8000	52.1	64.6	45.8	64.7	38.6	50.4
10,000	50.2	62.4	41.7	62.0	36.0	47.4
12,500	48.1	60.1	35.4	59.1	33.2	44.4
16,000	46.0	57.6	30.4	55.9	30.3	41.1
20,000	43.8	55.0	24.6	52.4	27.3	37.8
25,000	41.4	52.2	18.8	47.7	24.2	34.3

*Typical takeoff climb speed is 90 kt (+2.5 dB).
Typical approach speed is 70 kt (+3.6 dB).

TABLE 46
AIR-TO-GROUND VALUES
1-ENGINE PISTON AIRCRAFT - COMPOSITE SINGLE-ENGINE PISTON AIRCRAFT WITH VARIABLE PITCH PROPELLER (EQUAL OR GREATER THAN 200HP) - COMPOSITE AIRCRAFT

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed*, kt	160	160	160	160	160	160
Thrust, Percent	30 (Approach)	100 (Takeoff)	30 (Approach)	100 (Takeoff)	30 (Approach)	100 (Takeoff)
Distance, ft.						
200	81.7	94.6	88.0	98.9	80.2	92.4
250	80.3	93.3	86.2	97.5	78.1	90.3
315	79.0	92.0	84.5	96.1	76.0	88.2
400	77.6	90.6	82.7	94.7	73.9	86.1
500	76.2	89.3	80.8	93.2	71.7	84.0
630	74.8	87.9	78.9	91.7	69.6	81.9
800	73.3	86.5	77.0	90.1	67.4	79.7
1000	71.9	85.0	75.0	88.5	65.2	77.5
1250	70.4	83.5	73.0	86.7	62.9	75.3
1600	68.8	82.0	70.9	84.8	60.6	73.0
2000	67.3	80.4	68.5	82.9	58.3	70.7
2500	65.6	78.7	66.2	80.9	55.9	68.3
3150	64.0	77.1	63.7	78.7	53.5	65.8
4000	62.3	75.3	60.7	76.6	51.1	63.3
5000	60.5	73.4	57.3	74.3	48.5	60.7
6300	58.7	71.4	53.6	71.9	46.0	57.9
8000	56.8	69.3	50.0	69.4	43.3	55.1
10,000	54.9	67.1	45.9	66.7	40.7	52.1
12,500	52.8	64.8	39.6	63.8	37.9	49.1
16,000	50.7	62.3	34.6	60.6	35.0	45.8
20,000	48.5	59.7	28.8	57.1	32.0	42.5
25,000	46.1	56.9	23.0	52.4	28.9	39.0

*Typical takeoff climb speed is 100 kt (+2.0 dB).
Typical approach speed is 80 kt (+3.0 dB).

TABLE 47
AIR-TO-GROUND VALUES
SMALL 1-ENGINE PISTON AIRCRAFT -
COMPOSITE SINGLE-ENGINE PISTON AIRCRAFT WITH
FIXED PITCH PROPELLER (LESS THAN 200 HP) - COMPOSITE AIRCRAFT

Airspeed*, kt Thrust, Percent Distance, ft.	SEL, dB 160 30 (Approach)	SEL, dB 160 100 (Takeoff)	EPNL, dB 160 30 (Approach)	EPNL, dB 160 100 (Takeoff)	XIMUM A-LEVEL, dB MA 60 130 roach) (App	XIMUM A-LEVEL, dB 160 100 (Takeoff)
200	74.2	87.1	81.5	91.4	2.2 70.1	84.9 82.8
250	72.8	85.8	79.7	90.0	78.0	80.7
315	71.5	84.5	78.0	88.6	65.9	78.6
400	70.1	83.1	76.2	87.2	63.7	76.5
500	68.7	81.8	74.3	85.7	61.6	74.4
630	67.3	80.4	72.4	84.2	69.4	72.2
800	65.8	79.0	70.5	82.6	5 7.2	70.0
1000	64.4	77.5	68.5	81.0	54.9	67.8
1250	62.9	76.0	66.5	79.2	52.6	65.5
1600	61.3	74.5	64.4	77.3	50.3	63.2
2000	59.8	72.9	62.0	75.4	57.9	60.8
2500	58.1	71.3	59.7	73.4	45.5	58.3
3150	56.5	69.6	57.2	71.2	43.1	55.8
4000	54.8	67.8	54.2	69.1	40.5	53.2
5000	53.0	65.9	50.8	66.8	48.0	50.4
6300	51.2	63.9	47.1	64.4	35.3	47.5
8000	49.3	61.8	43.5	61.9	3 2.7	44.6
10,000	47.4	59.6	39.4	59.2	39.9	41.6
12,500	45.3	57.3	33.1	56.3	27.0	38.3
16,000	43.2	54.8	28.1	53.1	24.0	35.0
20,000	41.0	52.2	22.3	49.6	20.9	31.5
25,000	38.6	49.4	16.5	44.9	2	

*Typical takeoff climb speed is 75 kt (+3.3 dB).
Typical approach speed is 65 kt (+3.9 dB).

TABLE 48-1
AIR-TO-GROUND SEL VALUES
4-ENGINE TURBOJET, MILITARY TRANSPORT/TANKER AIRCRAFT - BOEING KC-135A/
C-135A AIRCRAFT WITH J57 SERIES TURBOJET ENGINES

	SEL, dB		
Airspeed, kt EPR*	160 1.75 (Approach)	160 2.45 (Dry Takeoff)	160 2.85 (Wet Takeoff)
Distance, ft.			
200	117.0	130.9	132.0
250	115.4	129.2	130.1
315	113.8	127.4	128.2
400	112.1	125.6	126.3
500	110.4	123.8	124.5
630	108.6	122.0	122.6
800	106.8	120.1	120.7
1000	104.9	118.2	118.8
1250	103.0	116.2	116.8
1600	100.9	114.2	114.7
2000	98.9	112.1	112.6
2500	96.7	109.9	110.3
3150	94.4	107.6	108.0
4000	92.0	105.1	105.4
5000	89.4	102.6	102.8
6300	86.7	99.9	100.0
8000	83.9	97.0	96.9
10,000	80.8	93.9	93.7
12,500	77.6	90.6	90.3
16,000	74.1	87.1	86.6
20,000	70.3	83.3	82.7
25,000	66.4	79.3	78.5

*Engine Pressure Ratio

TABLE 48-2
AIR-TO-GROUND EPNL VALUES
4-ENGINE TURBOJET MILITARY TRANSPORT/TANKER AIRCRAFT - BOEING KC-135A/
C-135A AIRCRAFT WITH J57 SERIES TURBOJET ENGINES

	EPNL, dB		
Airspeed, kt	160	160	160
EPR	1.75 (Approach)	2.45 (Dry Takeoff)	2.85 (Wet Takeoff)
Distance, ft.			
200	122.7	134.8	136.1
250	121.1	133.0	134.2
315	119.3	131.2	132.2
400	117.5	129.2	130.0
500	115.6	127.3	127.9
630	113.6	125.2	125.6
800	111.6	123.0	123.3
1000	109.4	120.7	121.0
1250	107.1	118.3	118.7
1600	104.6	116.1	116.4
2000	102.0	113.8	114.0
2500	99.5	111.4	111.5
3150	97.0	108.9	109.0
4000	94.1	106.1	106.2
5000	91.1	103.3	103.4
6300	87.9	100.3	100.5
8000	84.6	97.1	97.4
10,000	81.1	93.7	94.1
12,500	77.6	90.2	90.8
16,000	73.9	86.7	87.2
20,000	69.7	83.0	83.1
25,000	65.1	79.0	78.4

TABLE 48-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
4-ENGINE TURBOJET MILITARY TRANSPORT/TANKER AIRCRAFT - BOEING KC-135A/
C-135A AIRCRAFT WITH J57 SERIES TURBOJET ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt	160	160	160
EPR	1.75 (Approach)	2.45 (Dry Takeoff)	2.85 (Wet Takeoff)
Distance, ft.			
200	113.1	126.3	126.1
250	110.8	123.9	123.6
315	108.6	121.6	121.1
400	106.3	119.2	118.6
500	104.0	116.7	116.2
630	101.6	114.3	113.7
800	99.2	111.9	111.2
1000	96.7	109.4	108.7
1250	94.2	106.8	106.1
1600	91.6	104.2	103.4
2000	88.9	101.5	100.7
2500	86.1	98.7	97.8
3150	83.2	95.7	94.9
4000	80.2	92.7	91.8
5000	77.1	89.5	88.5
6300	73.8	86.2	85.1
8000	70.3	82.7	81.5
10,000	66.7	79.0	77.6
12,500	62.8	75.1	73.6
16,000	58.7	71.0	69.4
20,000	54.4	66.6	64.9
25,000	49.8	62.0	60.1

TABLE 49-1
AIR-TO-GROUND SEL VALUES
2-ENGINE AFTERBURNER TURBOJET MILITARY FIGHTER/FIGHTER-BOMBER AIRCRAFT -
McDONNELL DOUGLAS F-4C, D, E, F AIRCRAFT WITH J79 SERIES TURBOJET ENGINES

	SEL, dB		
Airspeed, kt RPM*, Percent	160 87 (Approach)	160 100 (Takeoff)	160 104 (Afterburner)
Distance, ft.			
200	117.9	133.6	138.2
250	116.3	131.6	135.9
315	114.7	129.4	133.5
400	113.1	127.2	131.0
500	111.4	125.0	128.4
630	109.7	122.8	126.0
800	107.9	120.6	123.6
1000	106.0	118.4	121.4
1250	104.1	116.2	119.3
1600	102.0	114.0	117.2
2000	99.9	111.7	115.0
2500	97.7	109.4	112.8
3150	95.4	106.9	110.5
4000	92.9	104.3	108.1
5000	90.3	101.5	105.6
6300	87.5	98.4	102.9
8000	84.6	95.2	100.1
10,000	81.5	91.6	97.1
12,500	78.2	87.7	93.9
16,000	74.7	83.5	90.5
20,000	71.0	79.0	86.9
25,000	67.0	74.2	83.1

*Revolutions per minute

TABLE 49-2
AIR-TO-GROUND EPNL VALUES
2-ENGINE AFTERBURNER TURBOJET MILITARY FIGHTER/FIGHTER-BOMBER AIRCRAFT -
McDONNELL DOUGLAS F-4C, D, E, F AIRCRAFT WITH J79 SERIES TURBOJET ENGINES

	EPNL, dB		
Airspeed, kt	160	160	160
RPM, Percent	87 (Approach)	100 (Takeoff)	104 (Afterburner)
Distance, ft.			
200	121.8	137.1	142.2
250	120.1	134.9	140.0
315	118.4	132.6	137.6
400	116.7	130.6	135.0
500	114.8	128.5	132.3
630	112.9	126.4	129.8
800	110.8	124.0	127.5
1000	108.7	121.5	125.0
1250	106.4	118.8	122.5
1600	104.0	115.9	119.8
2000	101.5	113.0	116.9
2500	98.8	110.0	114.1
3150	96.0	106.8	111.5
4000	93.1	103.7	108.7
5000	90.2	100.5	105.8
6300	87.1	97.0	102.8
8000	83.9	93.4	99.7
10,000	80.6	89.6	96.5
12,500	77.2	85.6	93.3
16,000	73.6	81.2	90.2
20,000	69.6	77.0	86.8
25,000	65.3	72.4	83.1

TABLE 49-3
AIR-TO-GROUND MAXIMUM A-LEVEL VALUES
2-ENGINE AFTERBURNER TURBOJET MILITARY FIGHTER/FIGHTER-BOMBER AIRCRAFT -
McDONNELL DOUGLAS F-4C, D, E, F AIRCRAFT WITH J79 SERIES TURBOJET ENGINES

	MAXIMUM A-LEVEL, dB		
Airspeed, kt RPM, Percent	160 87 (Approach)	160 100 (Takeoff)	160 104 (Afterburner)
Distance, ft.			
200	113.6	129.5	135.2
250	111.4	126.8	132.3
315	109.2	124.1	132.3
400	107.0	121.3	126.1
500	104.7	118.5	123.0
630	102.4	115.6	119.9
800	100.0	112.8	117.0
1000	97.6	110.1	114.2
1250	95.0	107.3	111.4
1600	92.3	104.5	108.7
2000	89.6	101.6	106.0
2500	86.7	98.7	103.1
3150	83.7	95.6	100.3
4000	80.5	92.3	97.3
5000	77.2	88.9	94.1
6300	73.7	85.3	90.9
8000	70.1	81.5	87.5
10,000	66.3	77.3	83.9
12,500	62.4	72.8	80.1
16,000	58.3	68.0	76.1
20,000	54.2	62.8	71.9
25,000	49.8	57.5	67.4

TABLE 50
AIR-TO-GROUND VALUES
1-ENGINE TURBOFAN MILITARY ATTACK AIRCRAFT - LTV A-7D,E AIRCRAFT
WITH TF-41 SERIES TURBOFAN ENGINE

	SEL, dB		EPNL, dB		MAXIMUM A-LEVEL, dB	
Airspeed, kt RPM, Percent	160 82 (Approach)	160 96 (Takeoff)	160 82 (Approach)	160 96 (Takeoff)	160 82 (Approach)	160 96 (Takeoff)
Distance, ft.						
200	107.1	127.6	112.2	131.3	104.6	125.7
250	105.5	125.7	110.4	129.4	102.3	123.2
315	103.9	123.8	108.7	127.4	100.1	120.7
400	102.2	121.9	106.8	125.4	97.8	118.2
500	100.5	120.0	104.8	123.1	95.5	115.6
630	98.7	118.0	102.8	120.7	93.1	113.1
800	96.8	116.0	100.8	118.2	90.6	110.5
1000	94.9	114.0	98.6	115.8	88.1	107.9
1250	92.9	111.9	96.3	113.4	85.6	105.2
1600	90.9	109.7	93.7	110.8	82.9	102.4
2000	88.8	107.5	91.0	108.2	80.2	99.5
2500	86.6	105.0	88.1	105.4	77.4	96.5
3150	84.3	102.5	85.5	102.5	74.6	93.3
4000	82.0	99.7	82.6	99.1	71.6	90.0
5000	79.5	96.8	79.6	95.5	68.5	86.4
6300	76.9	93.5	76.6	91.6	65.3	82.5
8000	74.1	89.8	73.3	87.4	62.0	78.3
10,000	71.2	85.7	69.9	82.8	58.4	73.5
12,500	68.0	81.0	66.4	77.9	54.6	68.2
16,000	64.6	75.6	62.5	72.3	50.6	62.2
20,000	60.9	69.4	58.4	66.3	46.4	55.4
25,000	57.0	62.4	53.9	59.6	41.8	47.9

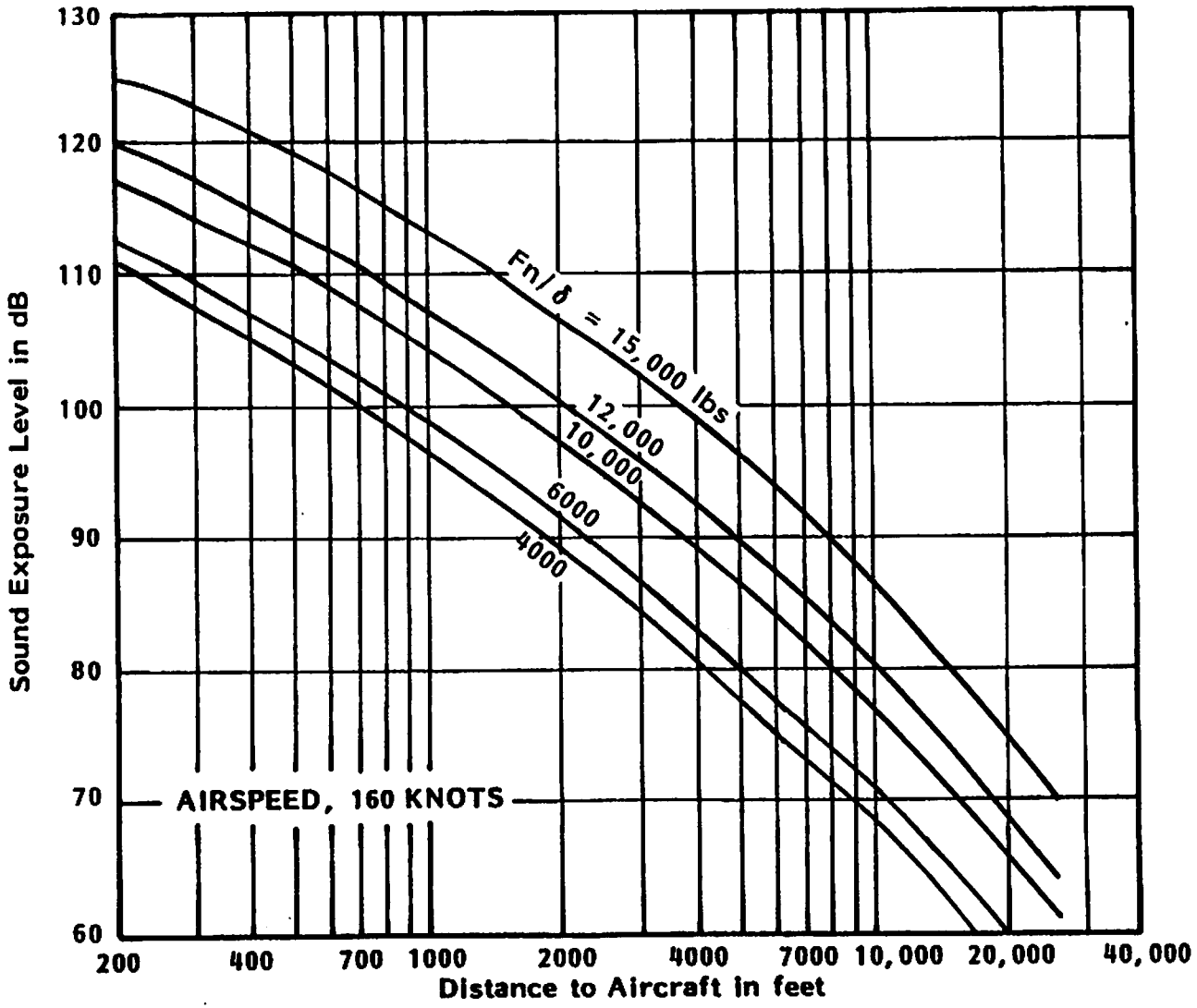

FIGURE 1. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOJET, NARROW BODY TRANSPORT AIRCRAFT - BOEING 707 AND DOUGLAS DC-8 SERIES AIRCRAFT WITH PRATT & WHITNEY JT4A SERIES ENGINES WITH NOISE SUPPRESSORS

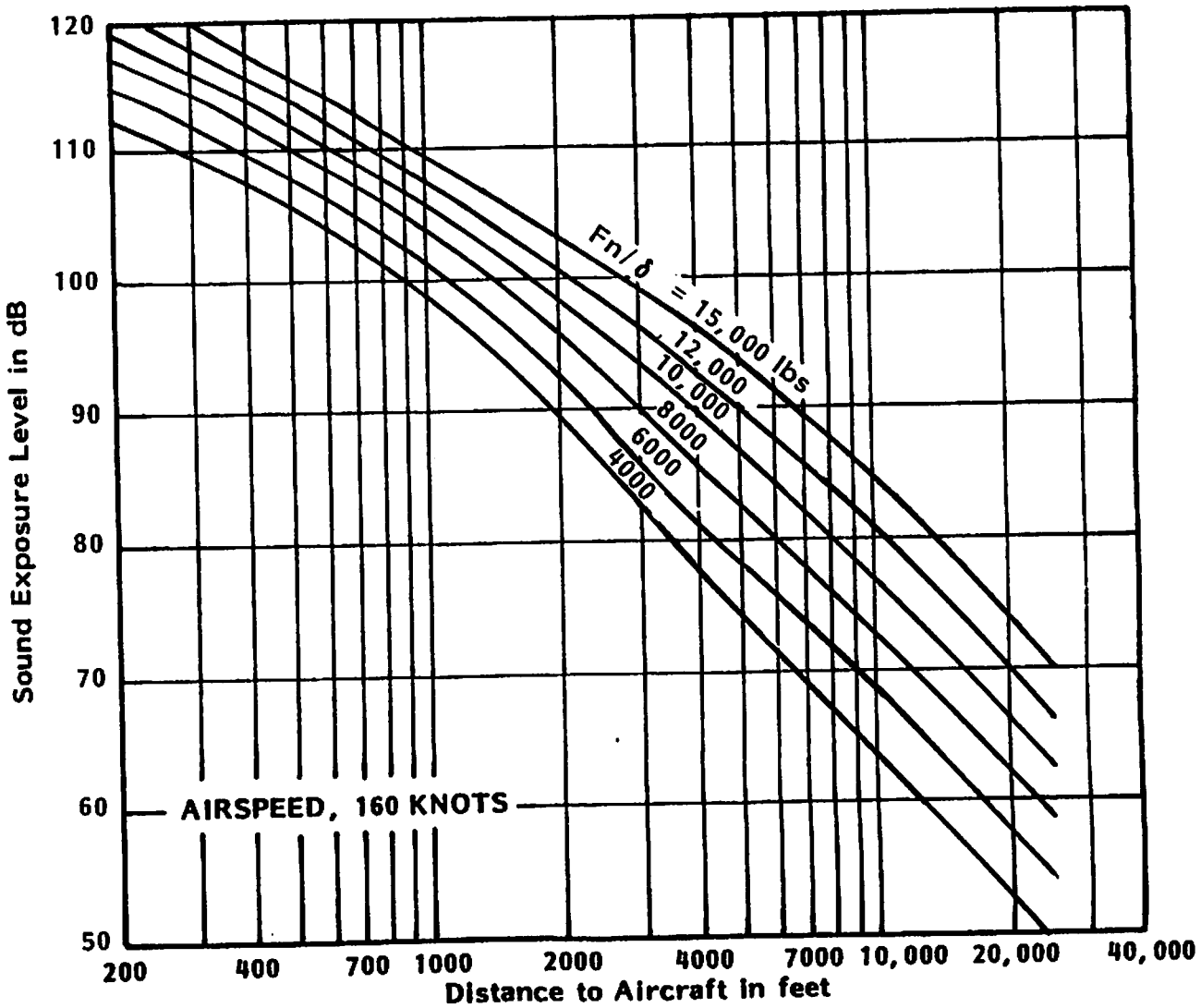

FIGURE 2. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 707 AND DOUGLAS DC-8 SERIES AIRCRAFT WITH JT3D ENGINES, UNTREATED NACELLES

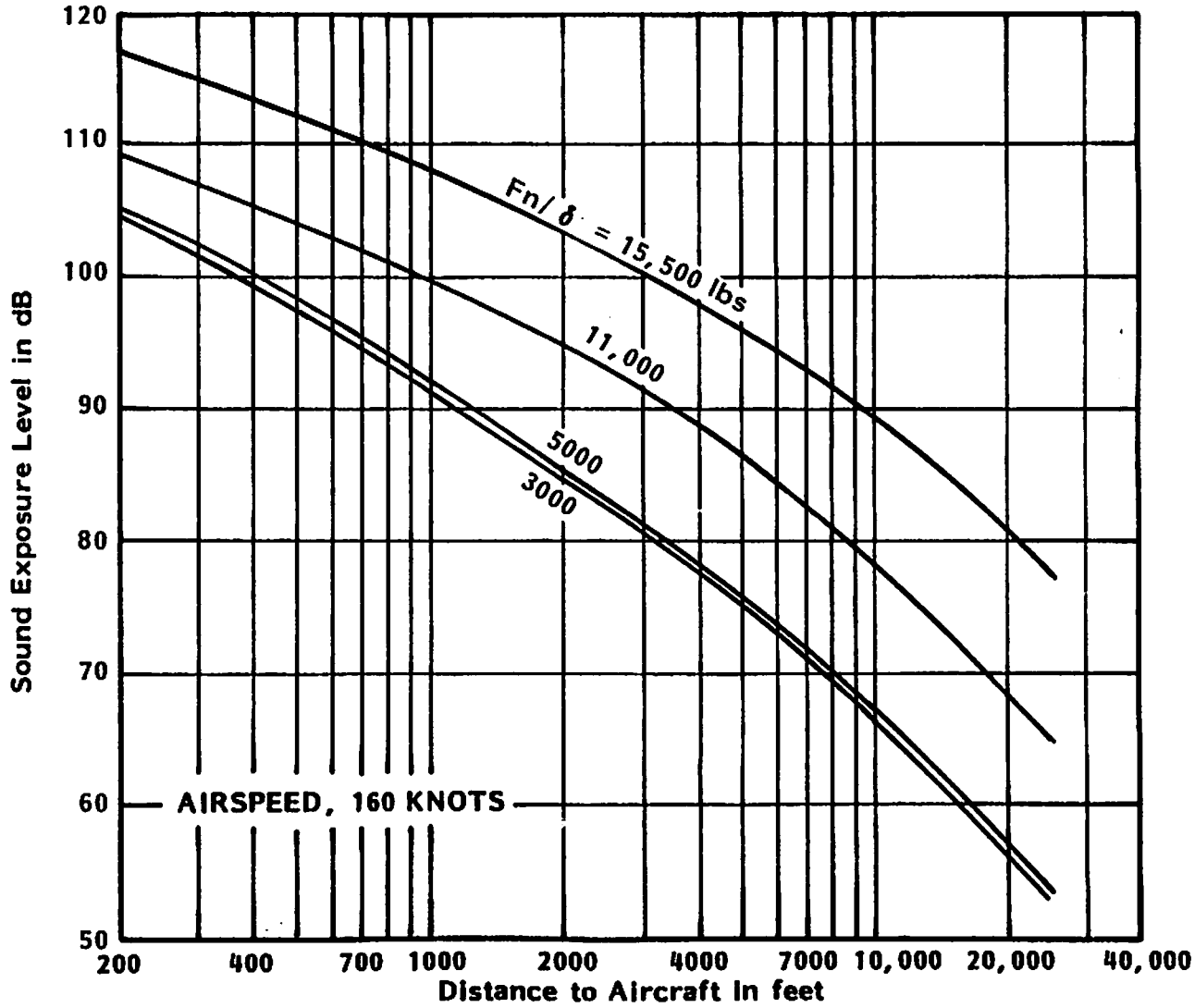

FIGURE 3. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS DC-8-60 SERIES AIRCRAFT WITH JT3D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

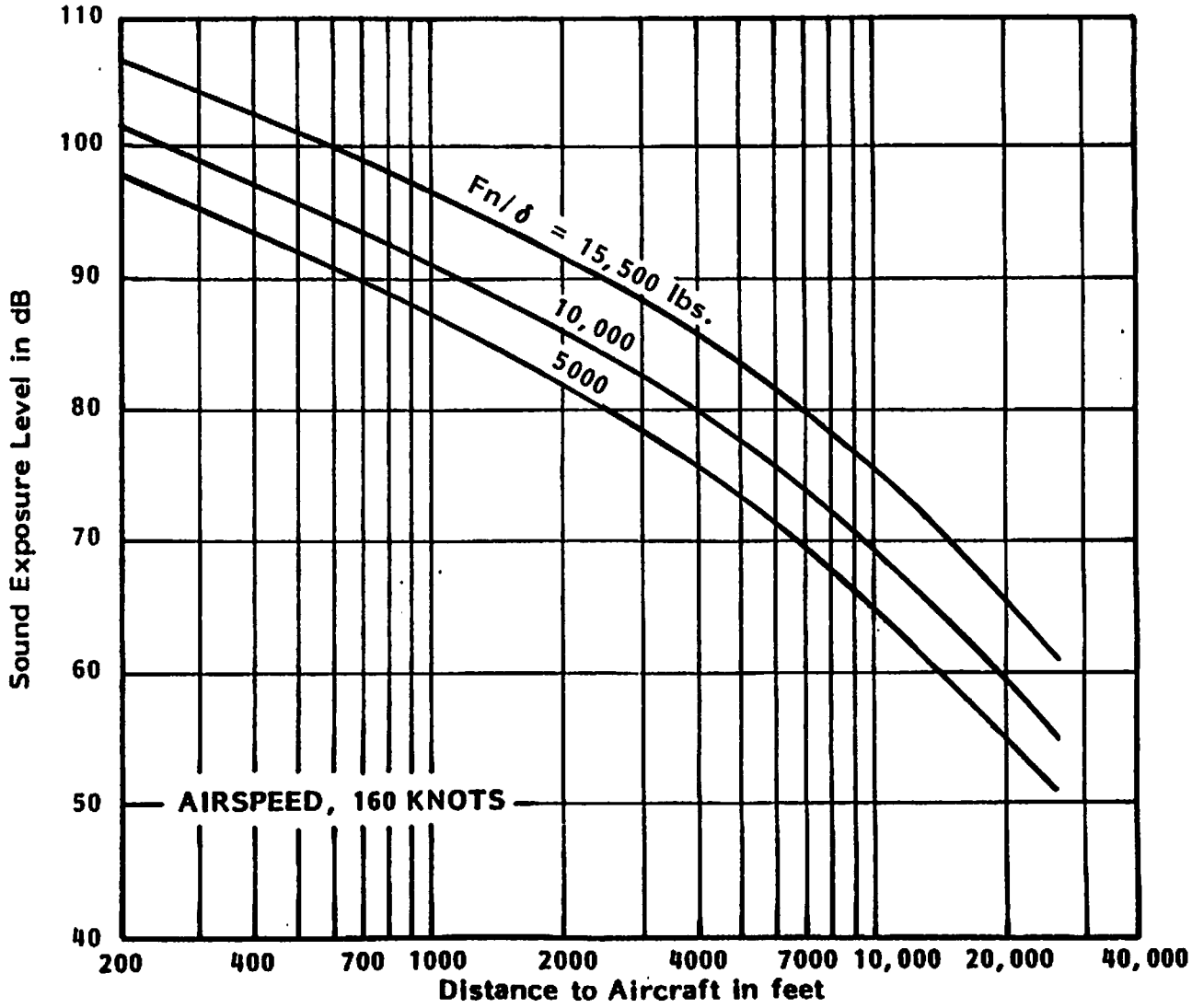

FIGURE 4. AIR-TO-GROUND SOUND EXPOSURE LEVEL - 4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS DC-8-70 SERIES AIRCRAFT WITH RETROFIT CFM-56 ENGINES

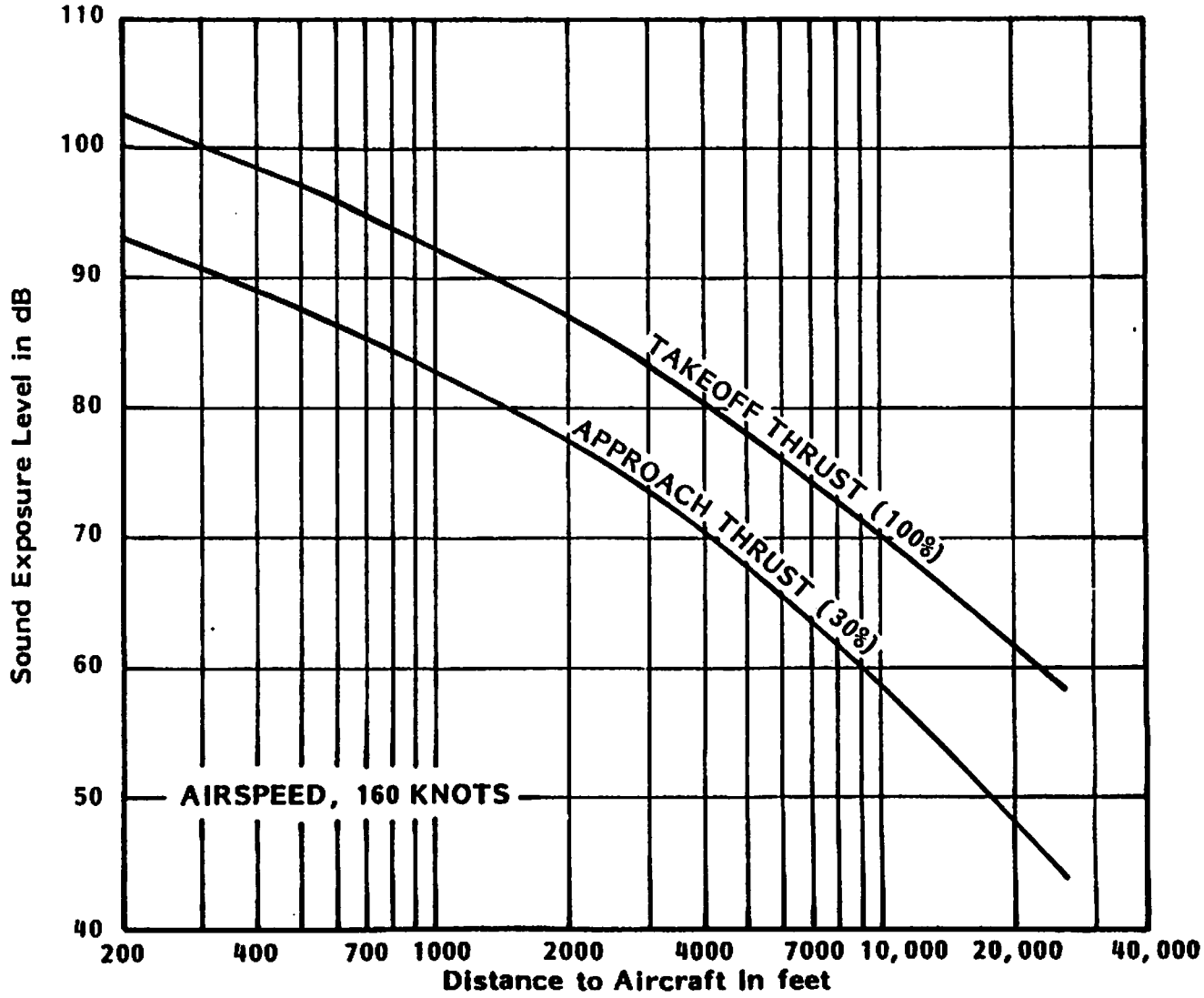

FIGURE 5. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BRITISH AEROSPACE BAe 146 SERIES AIRCRAFT WITH ALF-502R ENGINES

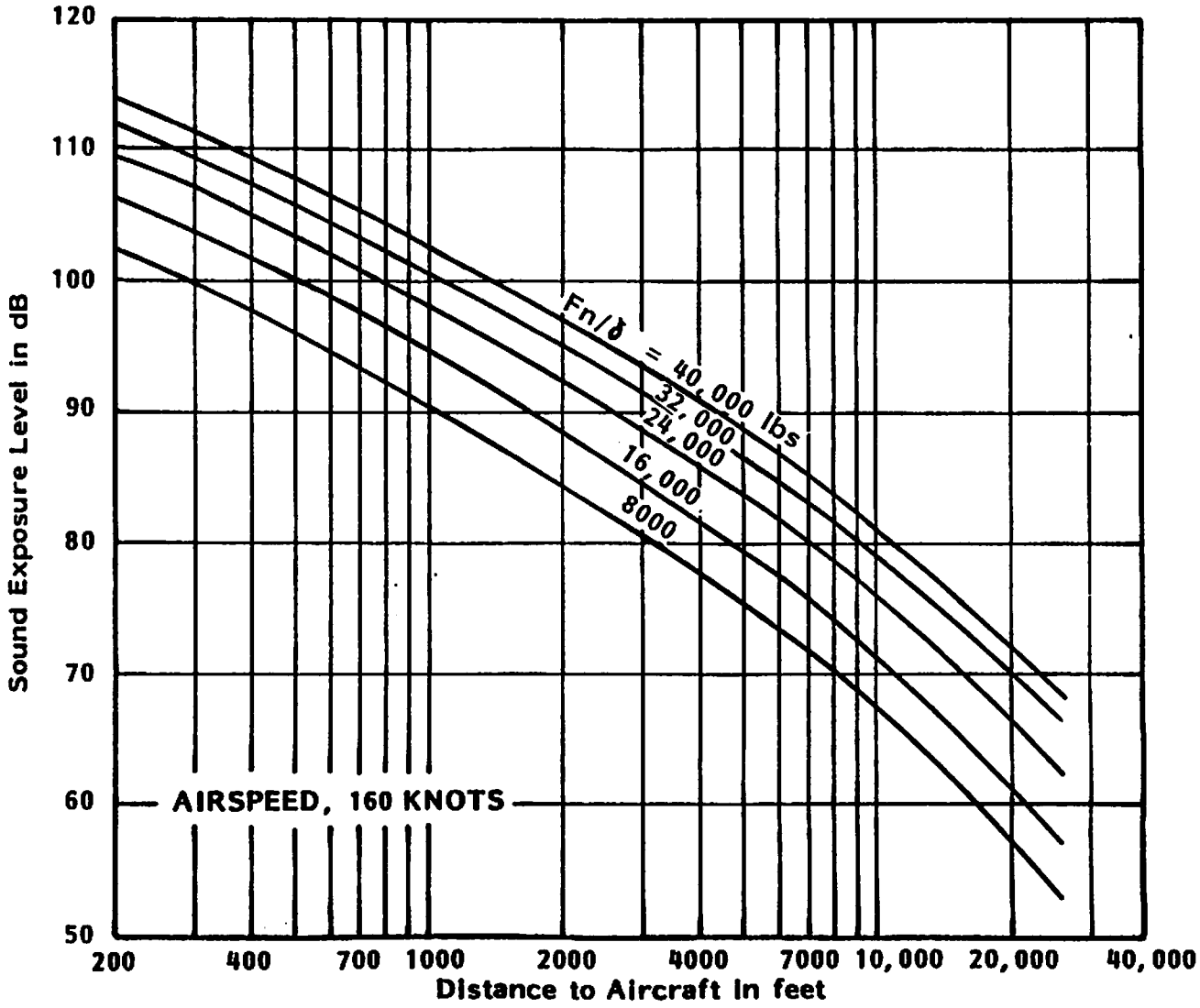

FIGURE 7. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOFAN WIDE BODY TRANSPORT AIRCRAFT - BOEING 747 SERIES AIRCRAFT WITH JT9D SERIES ENGINES, FIXED-LIP NACELLES

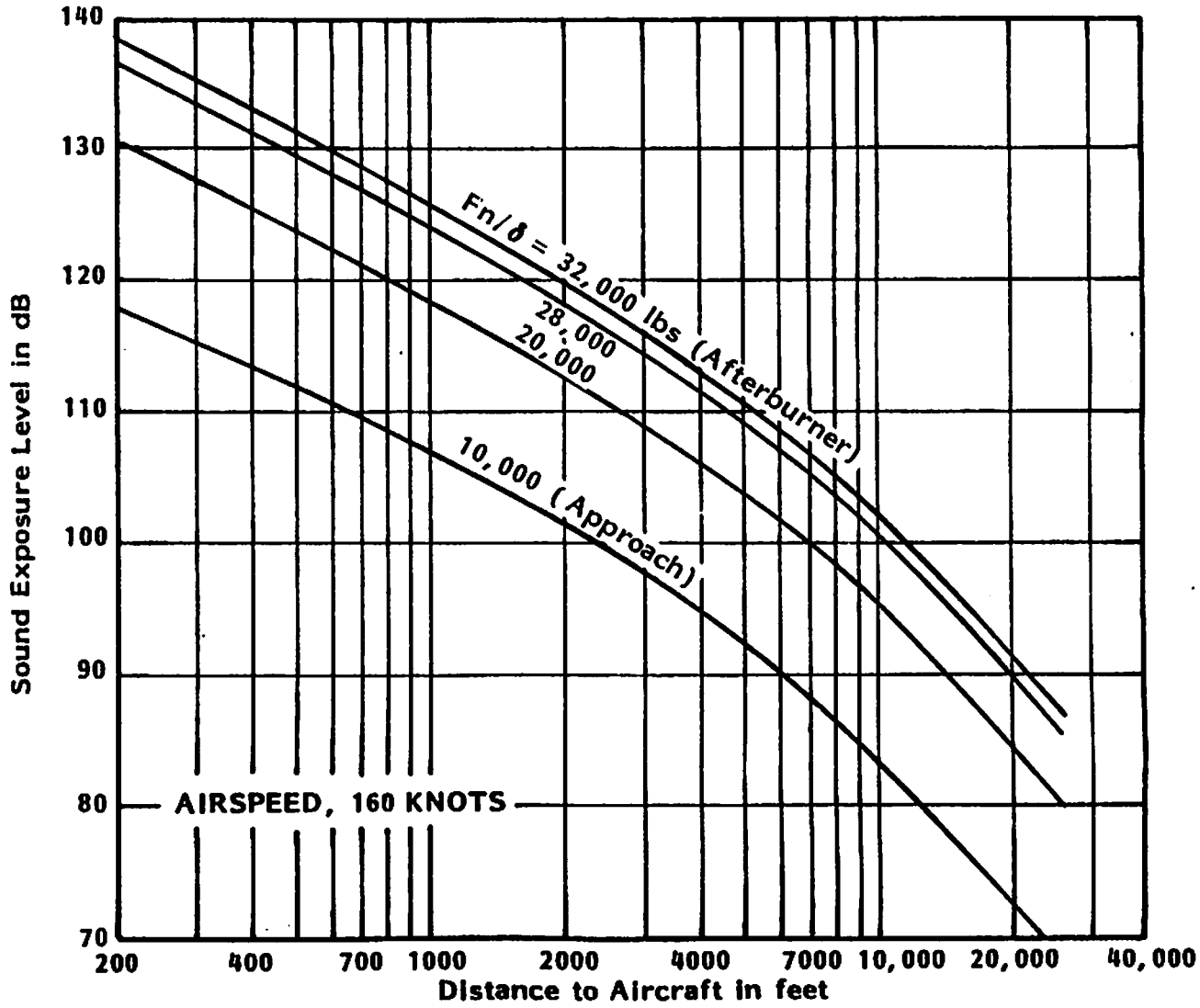

FIGURE 8. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE SUPERSONIC TRANSPORT AIRCRAFT - CONCORDE SST WITH OLYMPUS 593 TURBOJET AFTERBURNER ENGINES

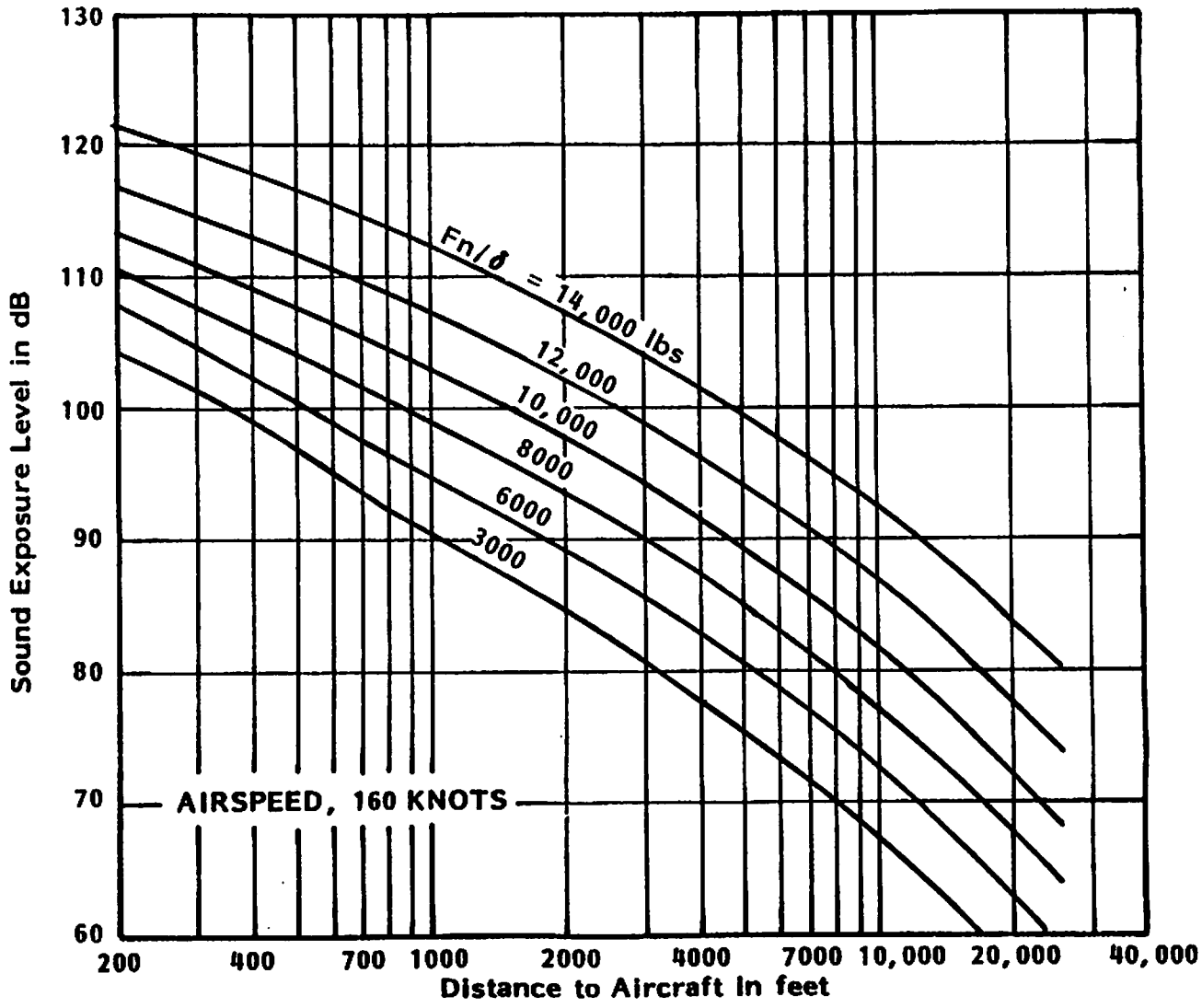

FIGURE 9. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 727 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, UNTREATED NACELLES

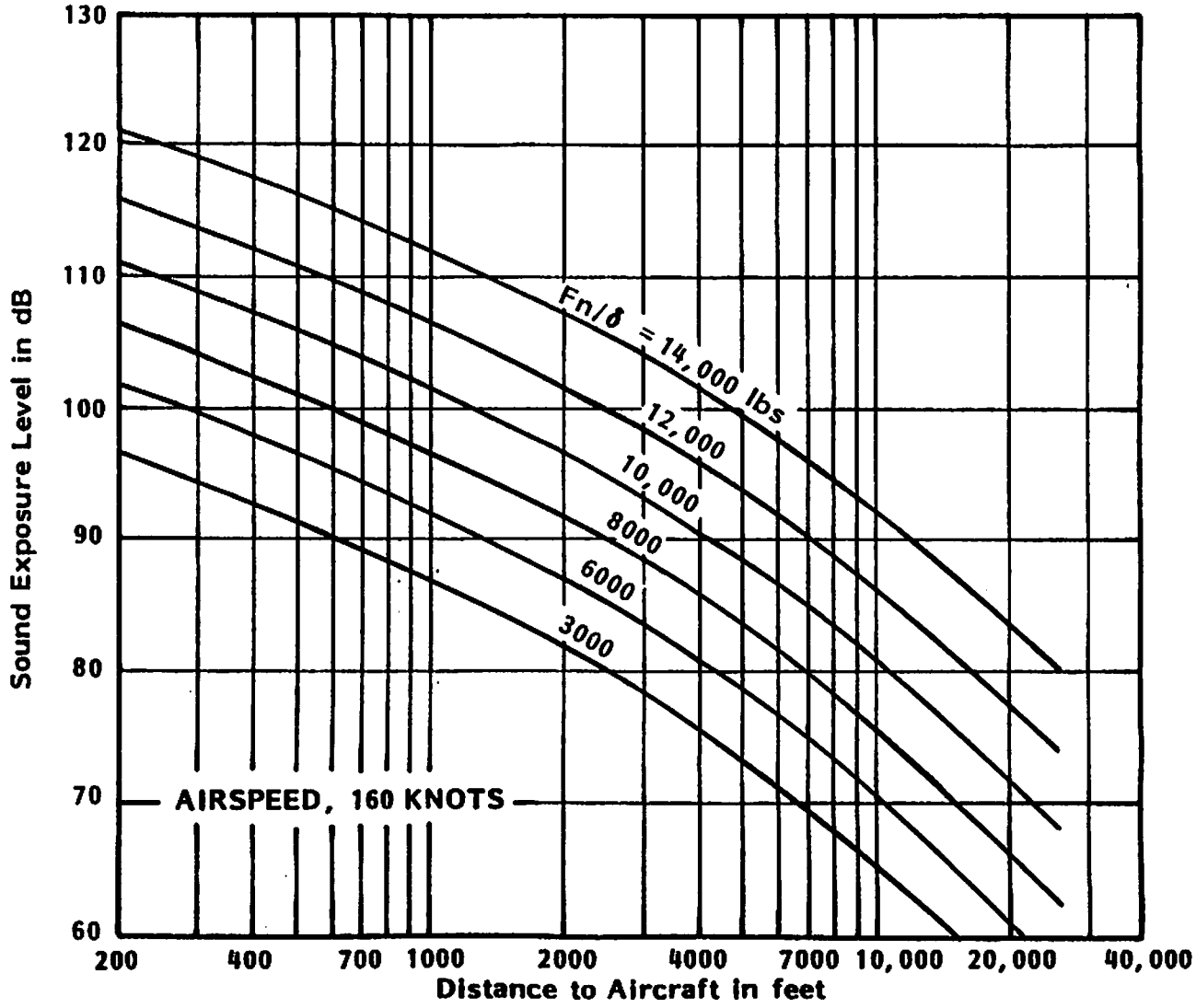

FIGURE 10. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 727 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

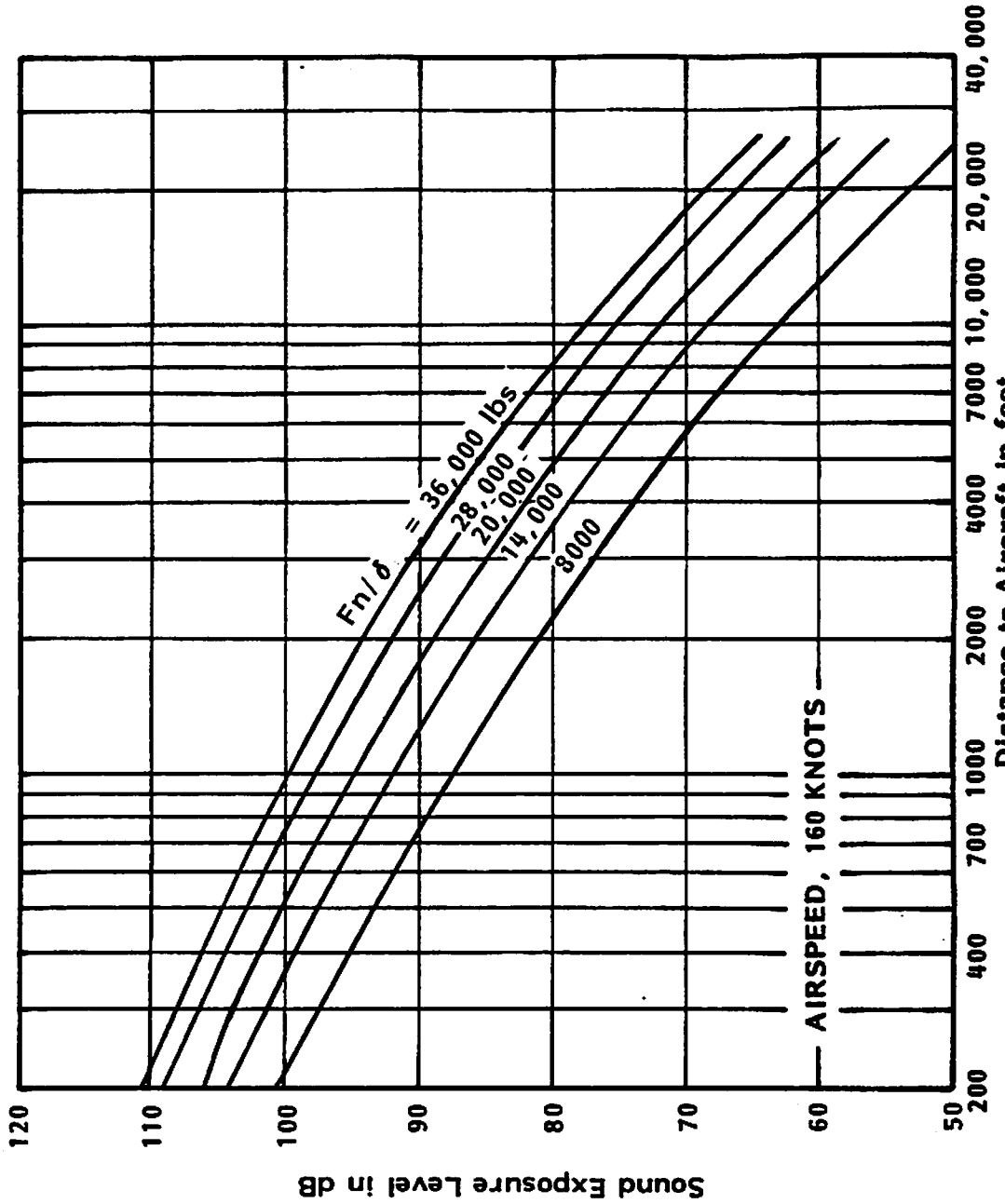

FIGURE 11. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - DOUGLAS DC-10 SERIES AIRCRAFT WITH CF6 SERIES ENGINES

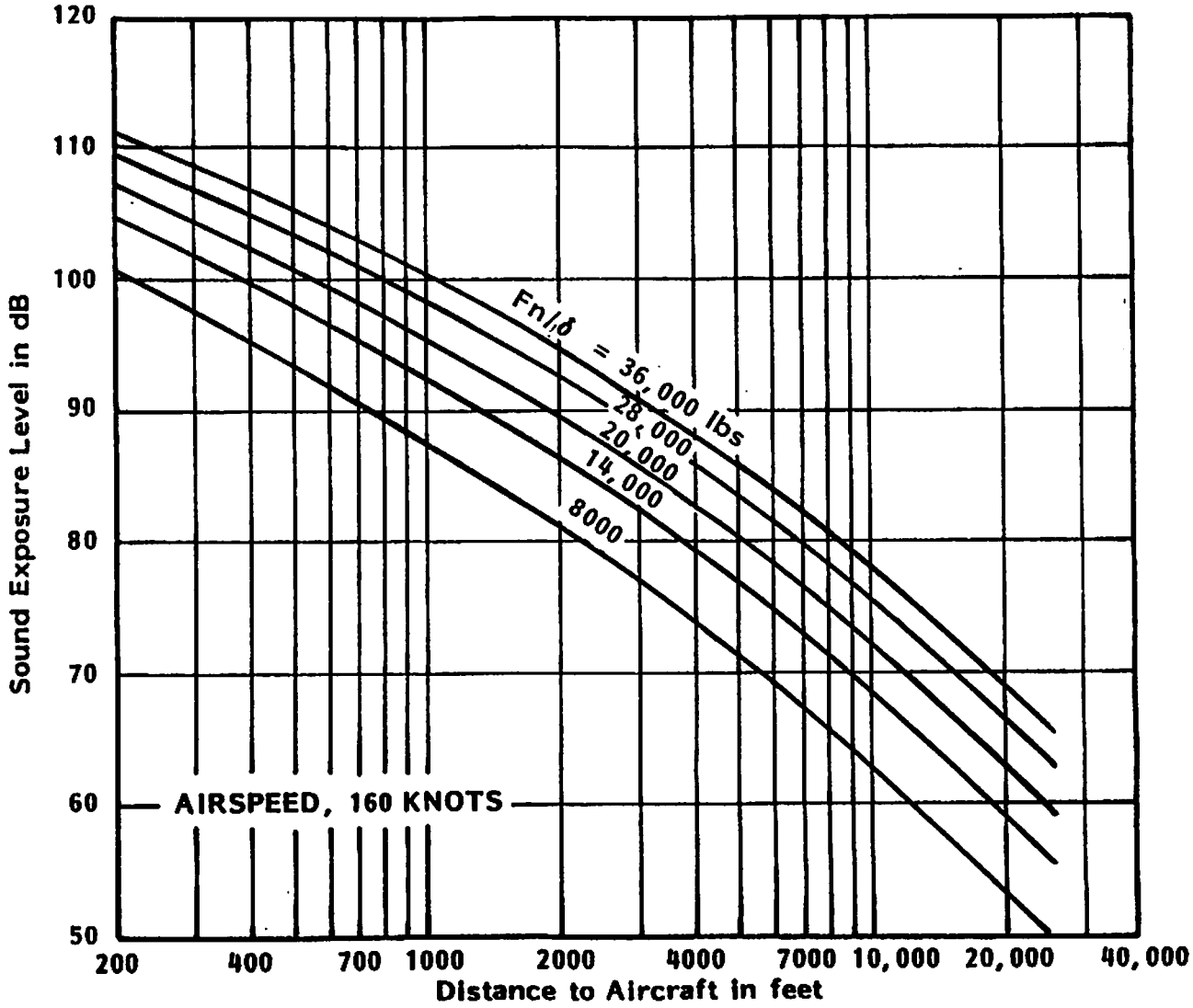

FIGURE 12. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - LOCKHEED L-1011 SERIES AIRCRAFT WITH RB211 SERIES ENGINES

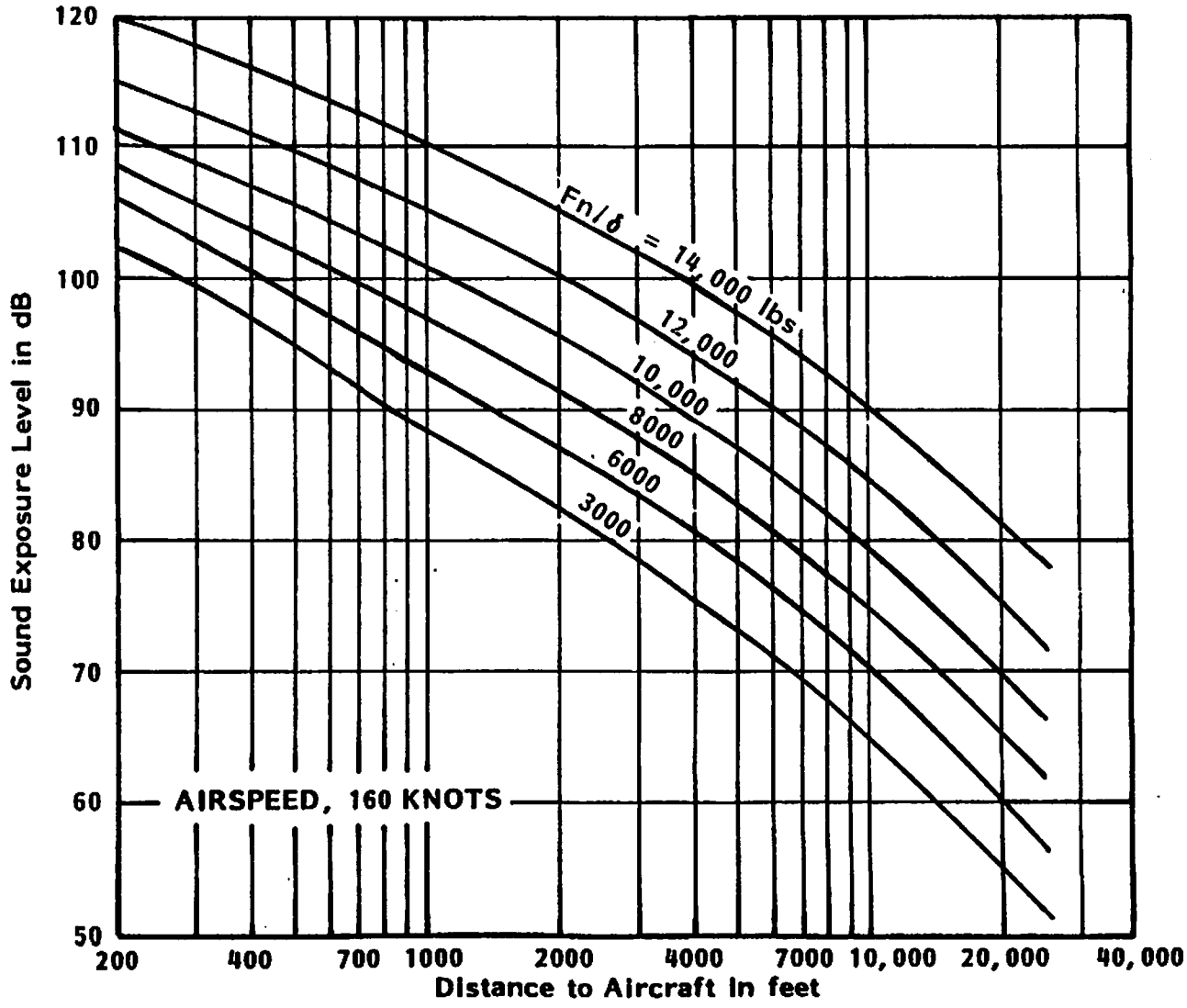

FIGURE 13. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 737 AND DOUGLAS DC-9 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, UNTREATED NACELLES

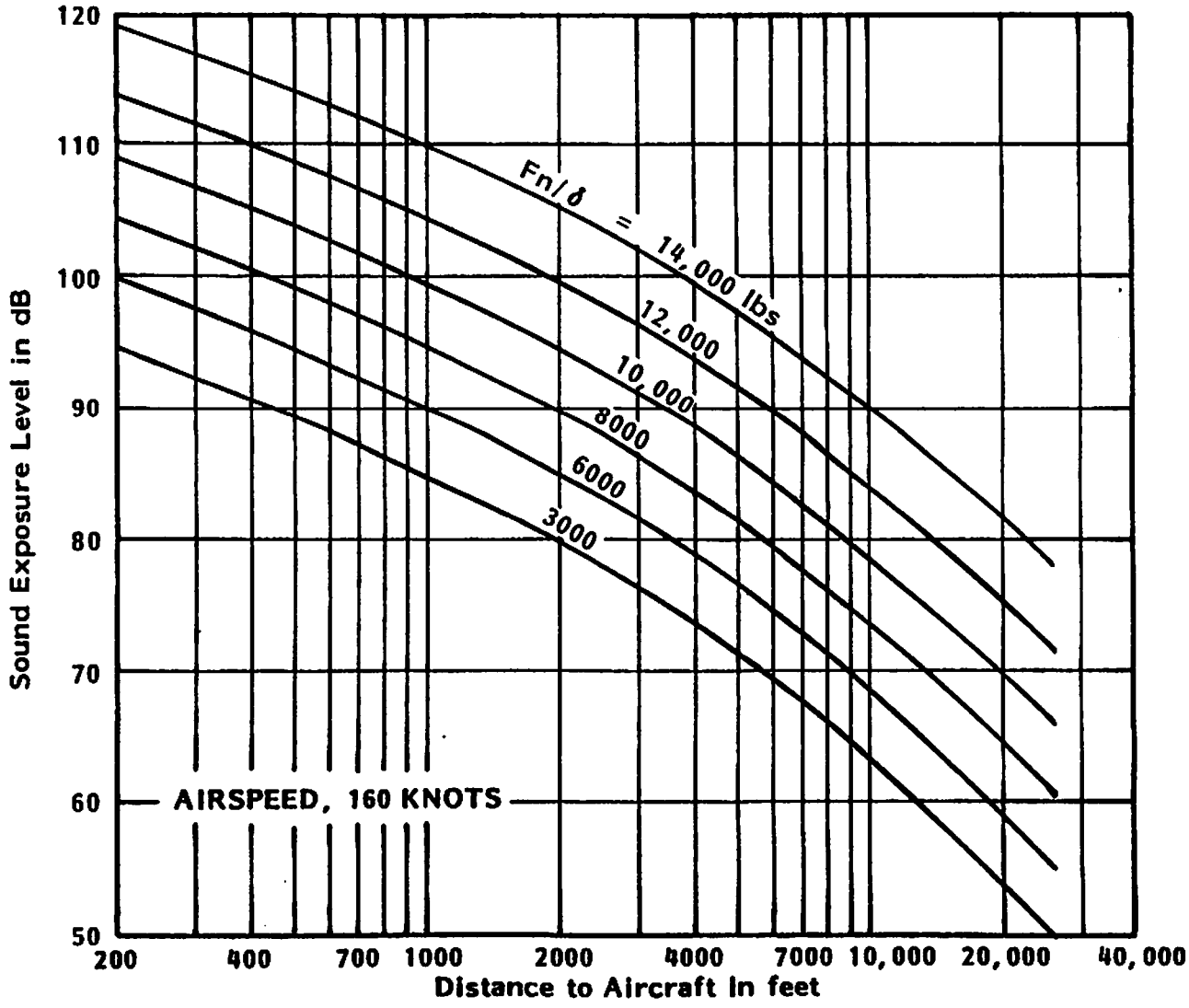

FIGURE 14. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 737 AND DOUGLAS DC-9 SERIES AIRCRAFT WITH JT8D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

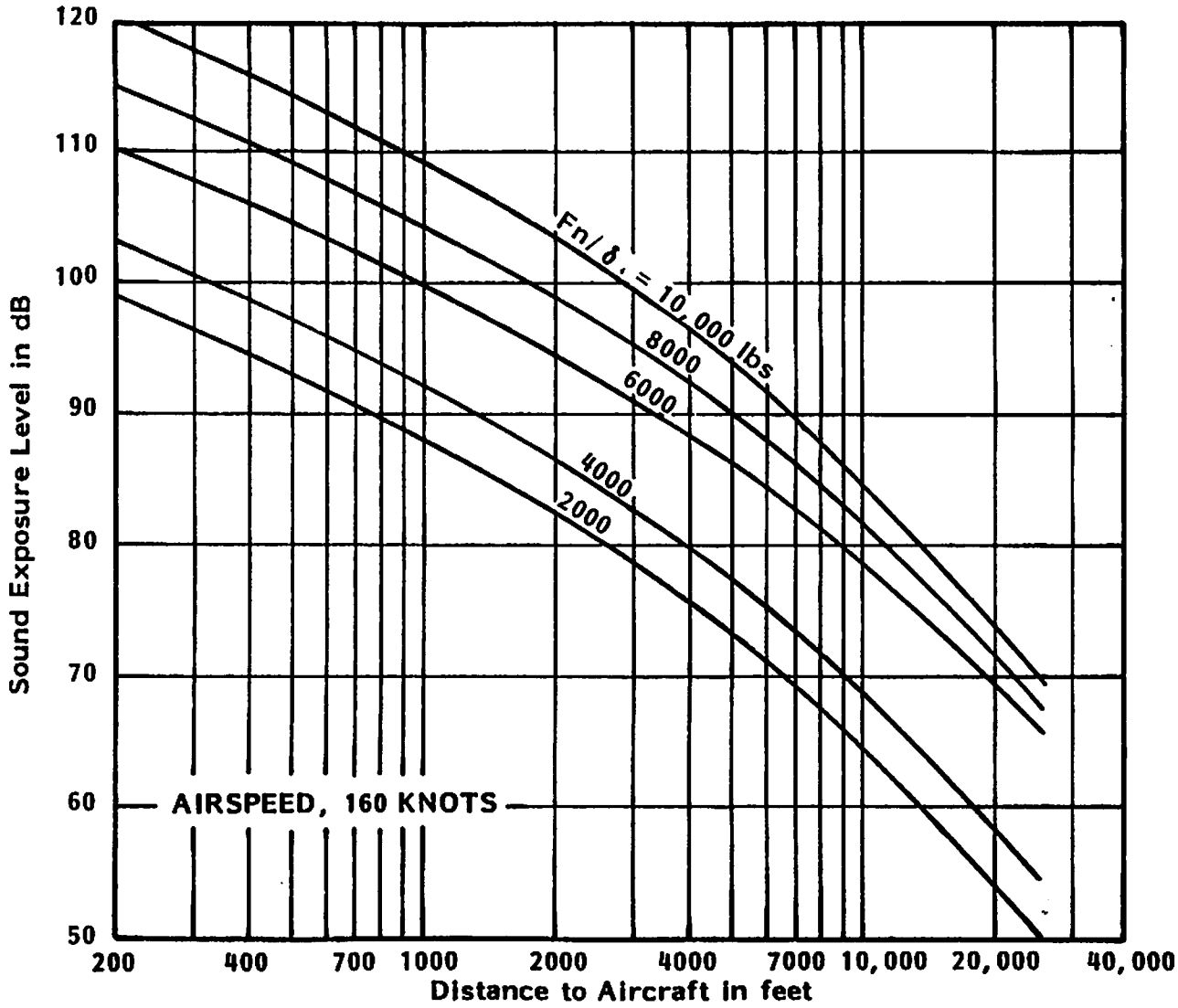

FIGURE 15. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - FOKKER-VFW F28-2000 AIRCRAFT WITH RB183 MK555-15 ENGINES

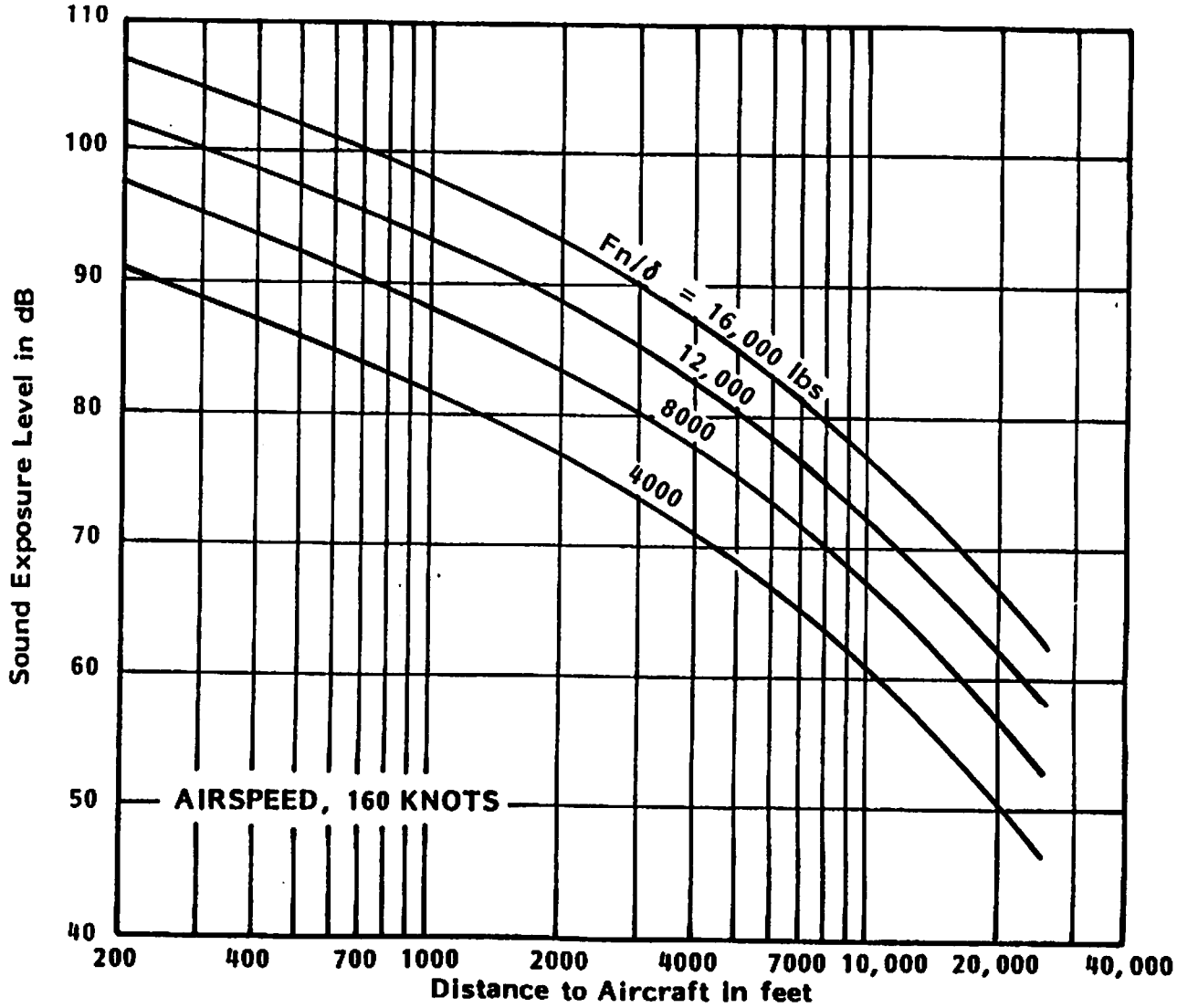

FIGURE 16. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - DOUGLAS MD-80 SERIES AIRCRAFT WITH JT8D-209/217 ENGINES

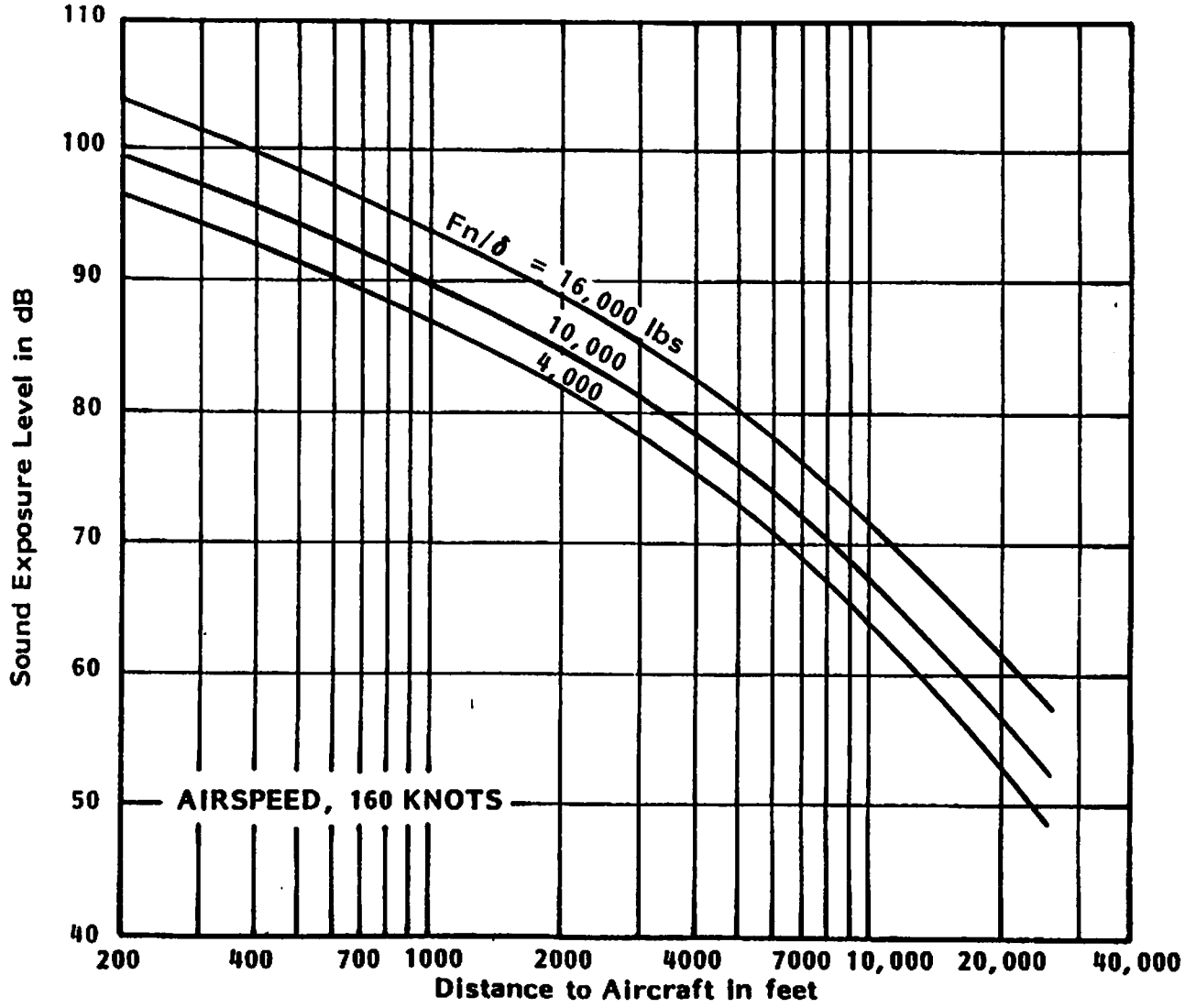

FIGURE 17. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 737-300 AIRCRAFT WITH CFM-56 SERIES ENGINES

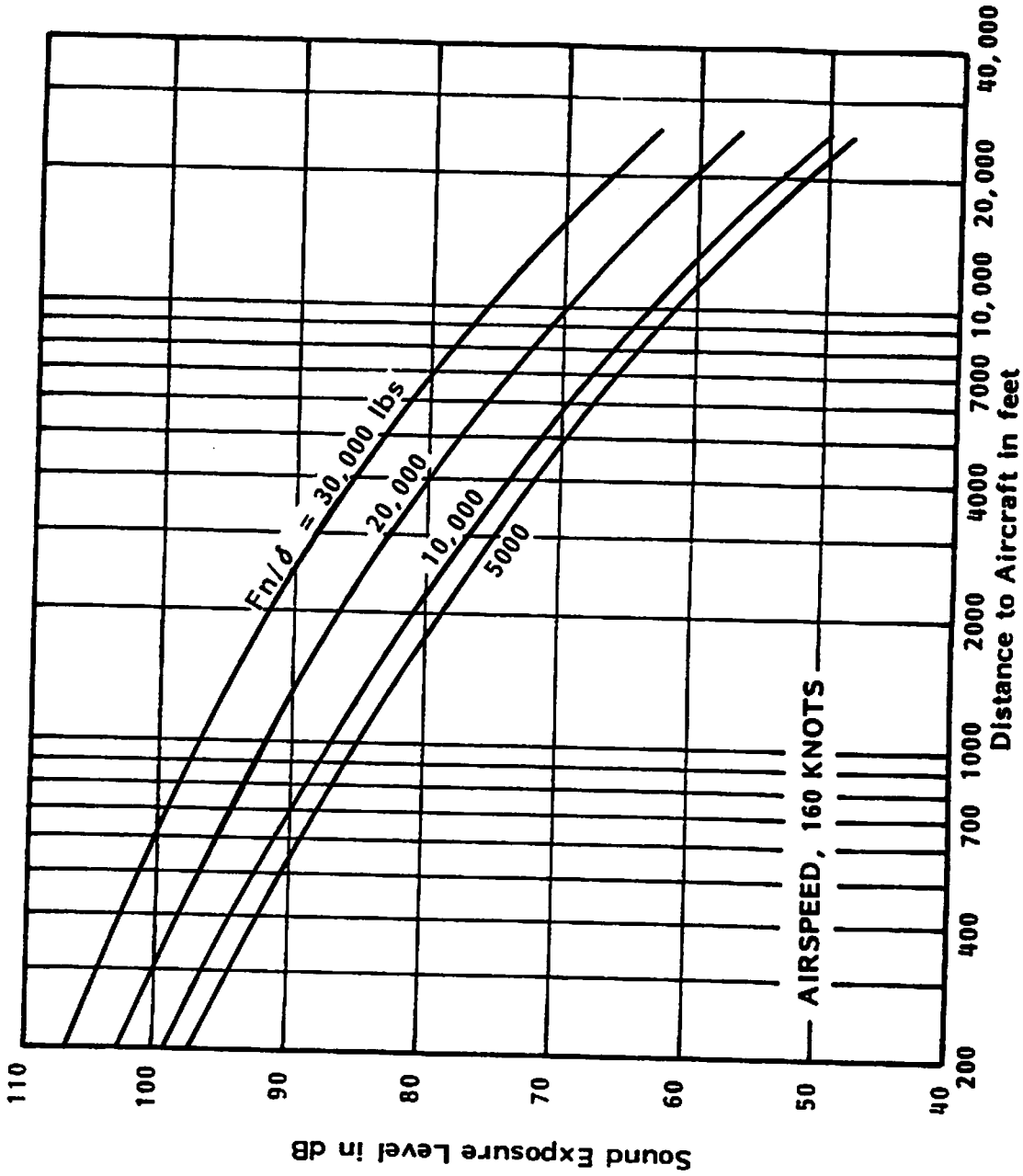

FIGURE 18. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT - BOEING 757-200 AIRCRAFT WITH RB211-535 ENGINES

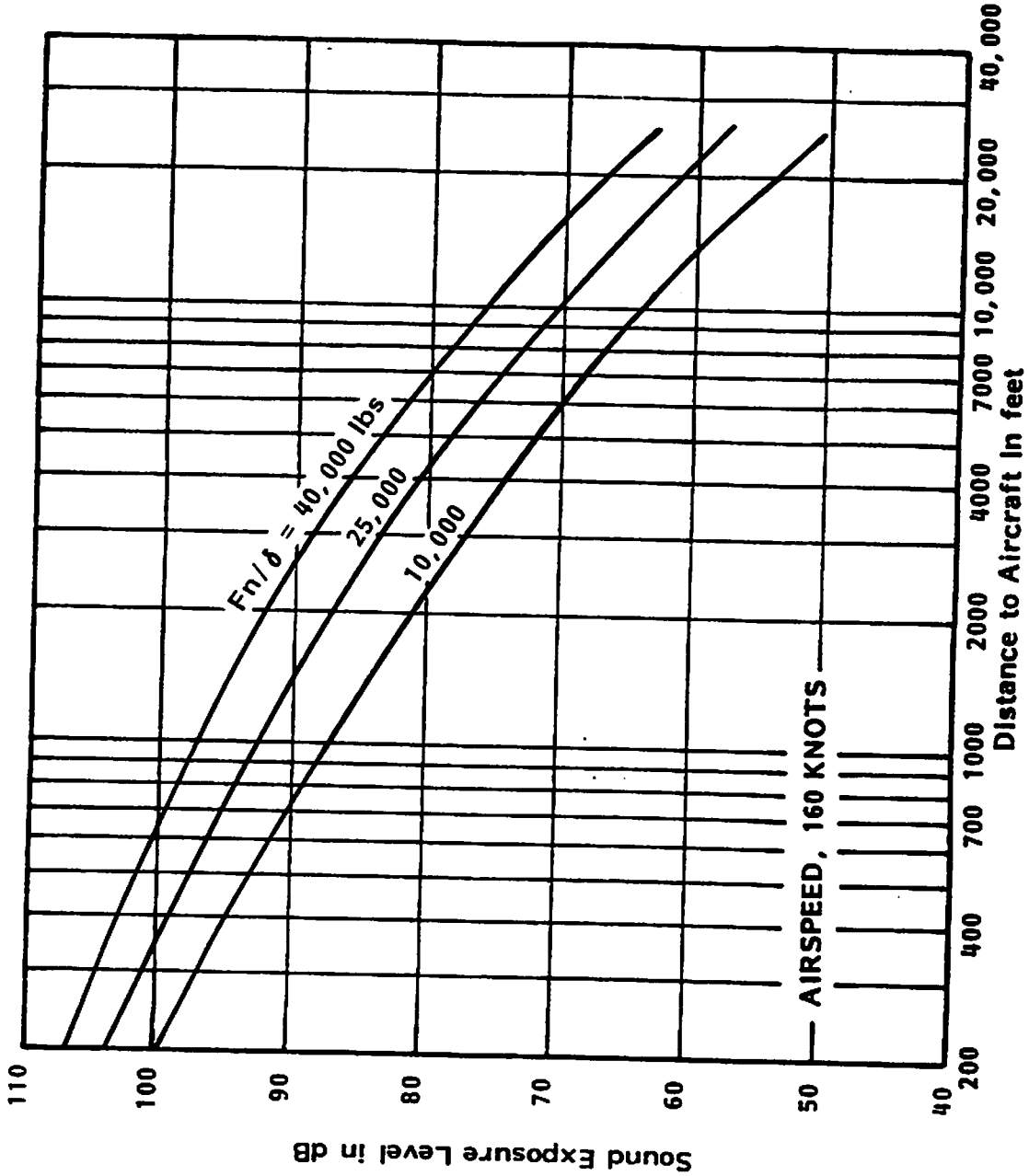

FIGURE 19. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - AIRBUS A300 AND A310 AIRCRAFT WITH CF6 SERIES ENGINES

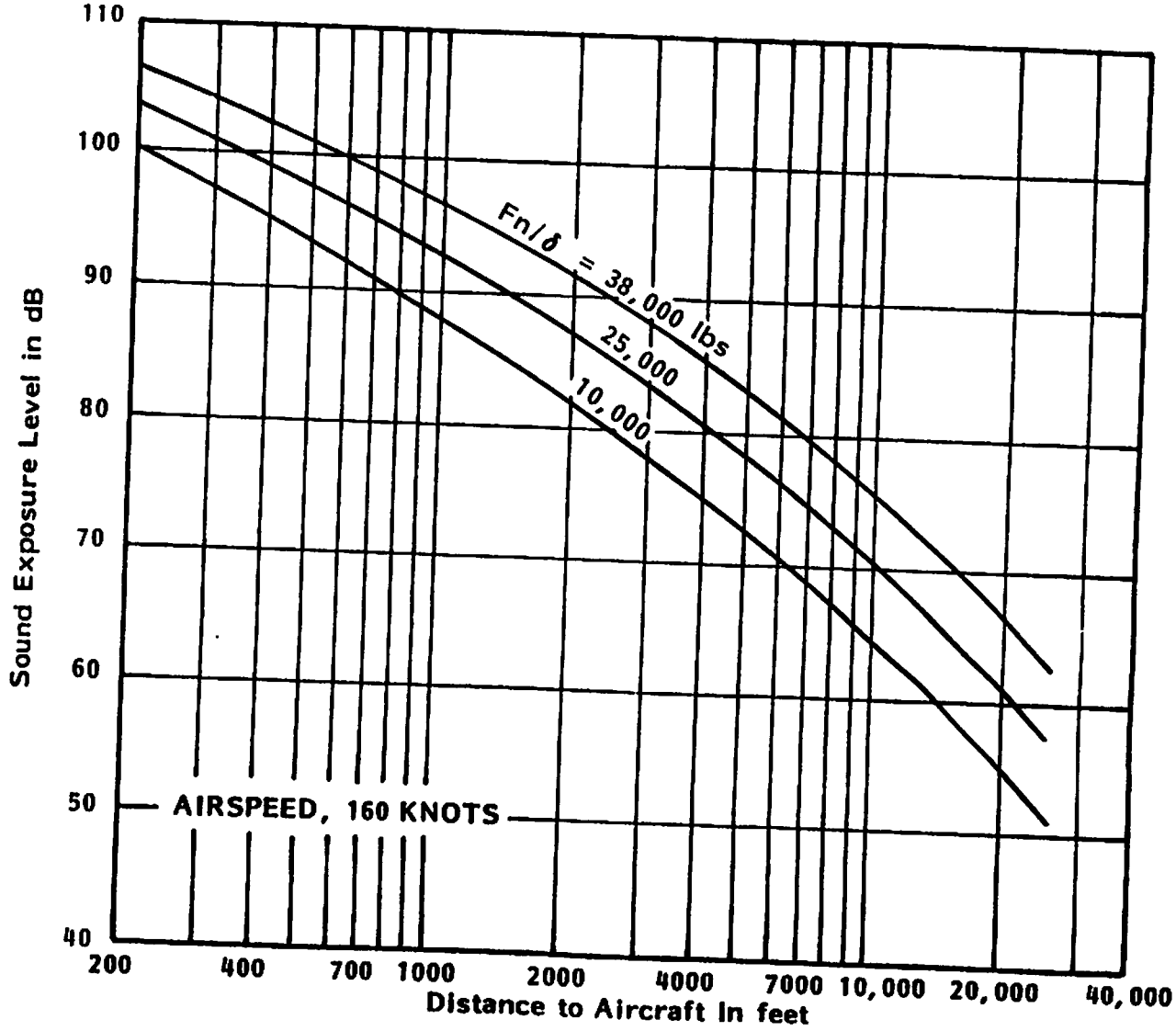

FIGURE 20. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT - BOEING 767-200 AIRCRAFT WITH CF6-80A OR JT9D-7R4 ENGINES

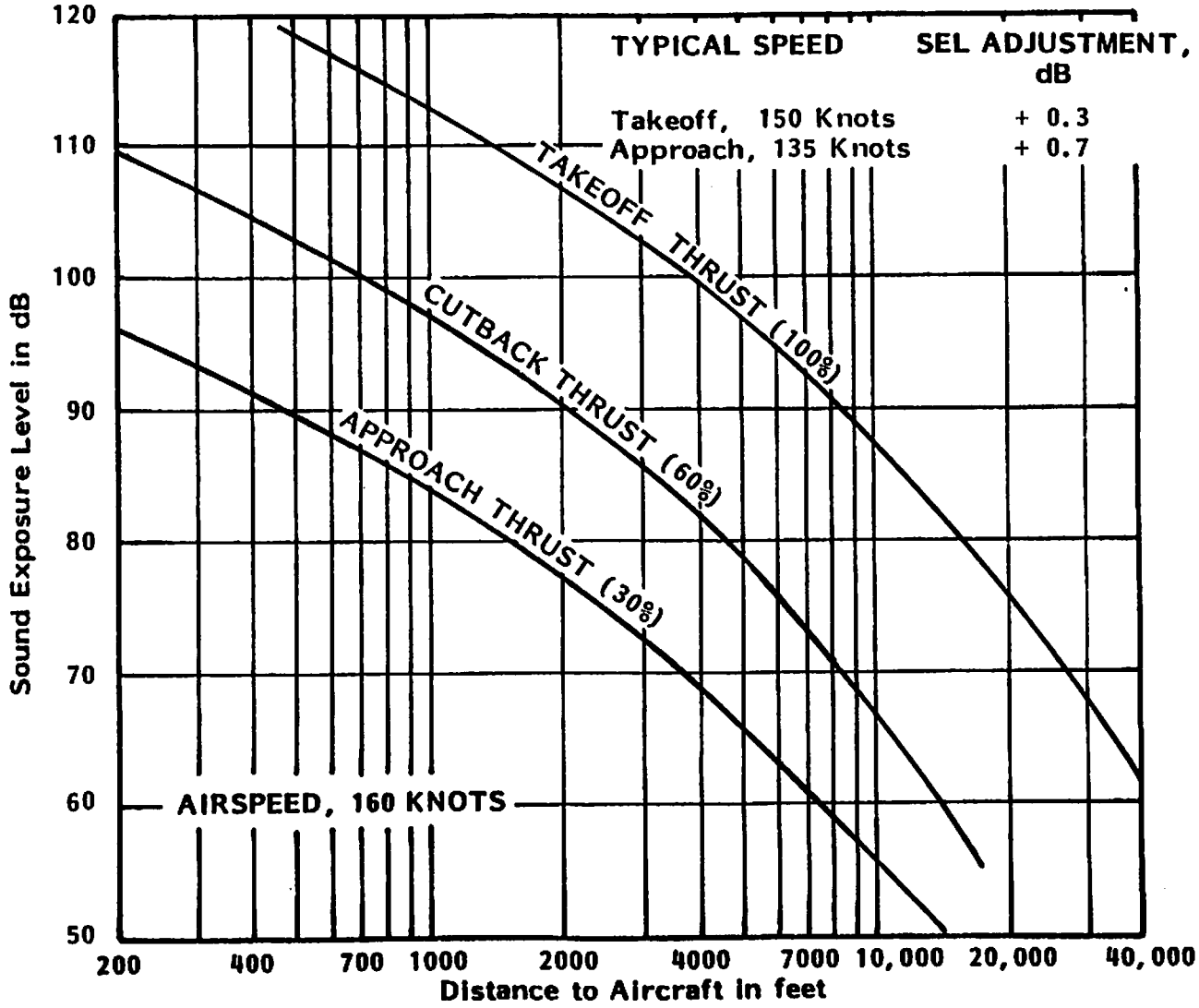

FIGURE 21. AIR-TO-GROUND SOUND EXPOSURE LEVELS - GENERAL AVIATION TURBOJET AND TURBOFAN AIRCRAFT - COMPOSITE BUSINESS JET AIRCRAFT, 1985 FLEET

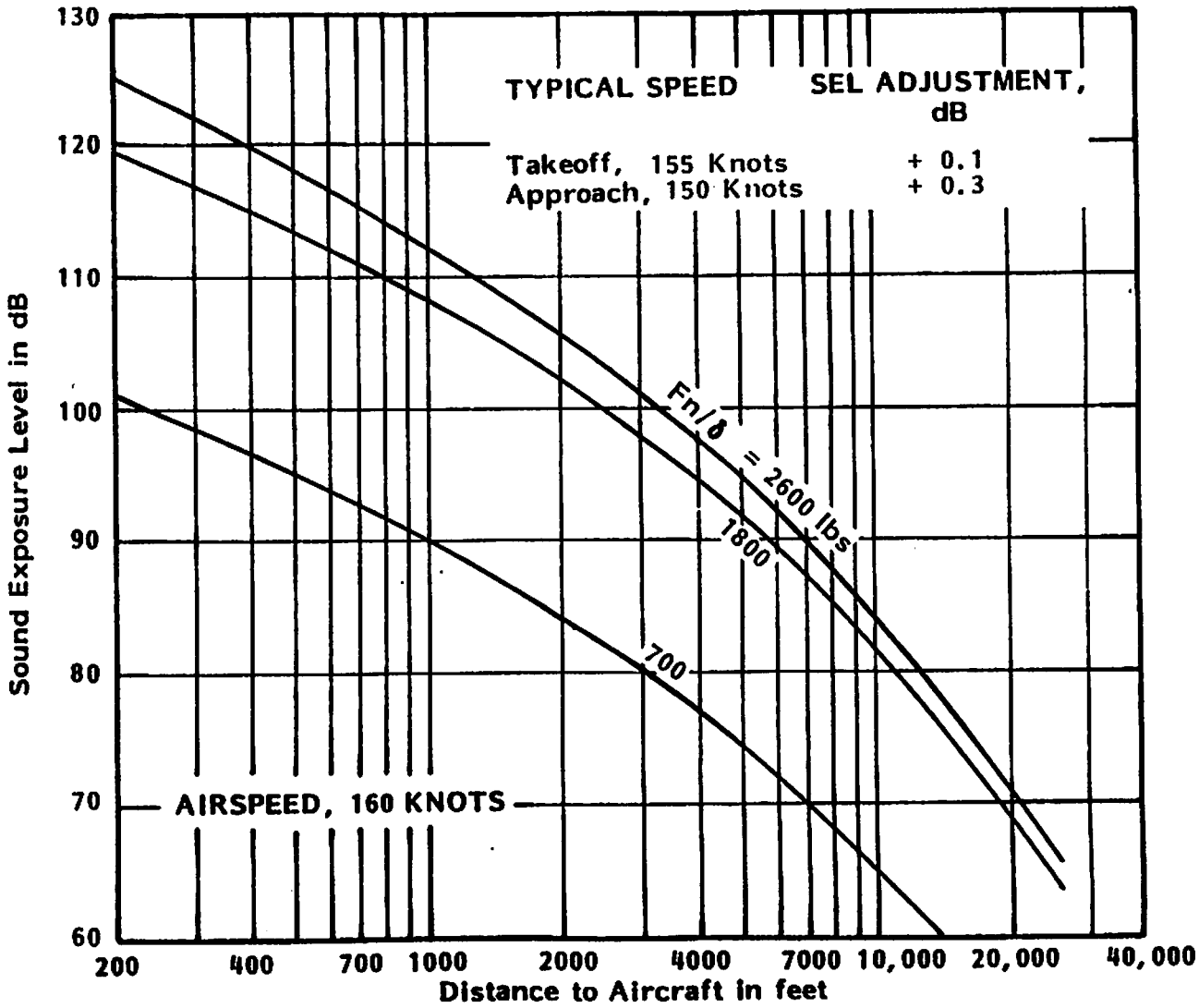

FIGURE 22. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOJET BUSINESS AIRCRAFT - GATES LEARJET 24/25 AIRCRAFT WITH CJ610 SERIES ENGINES

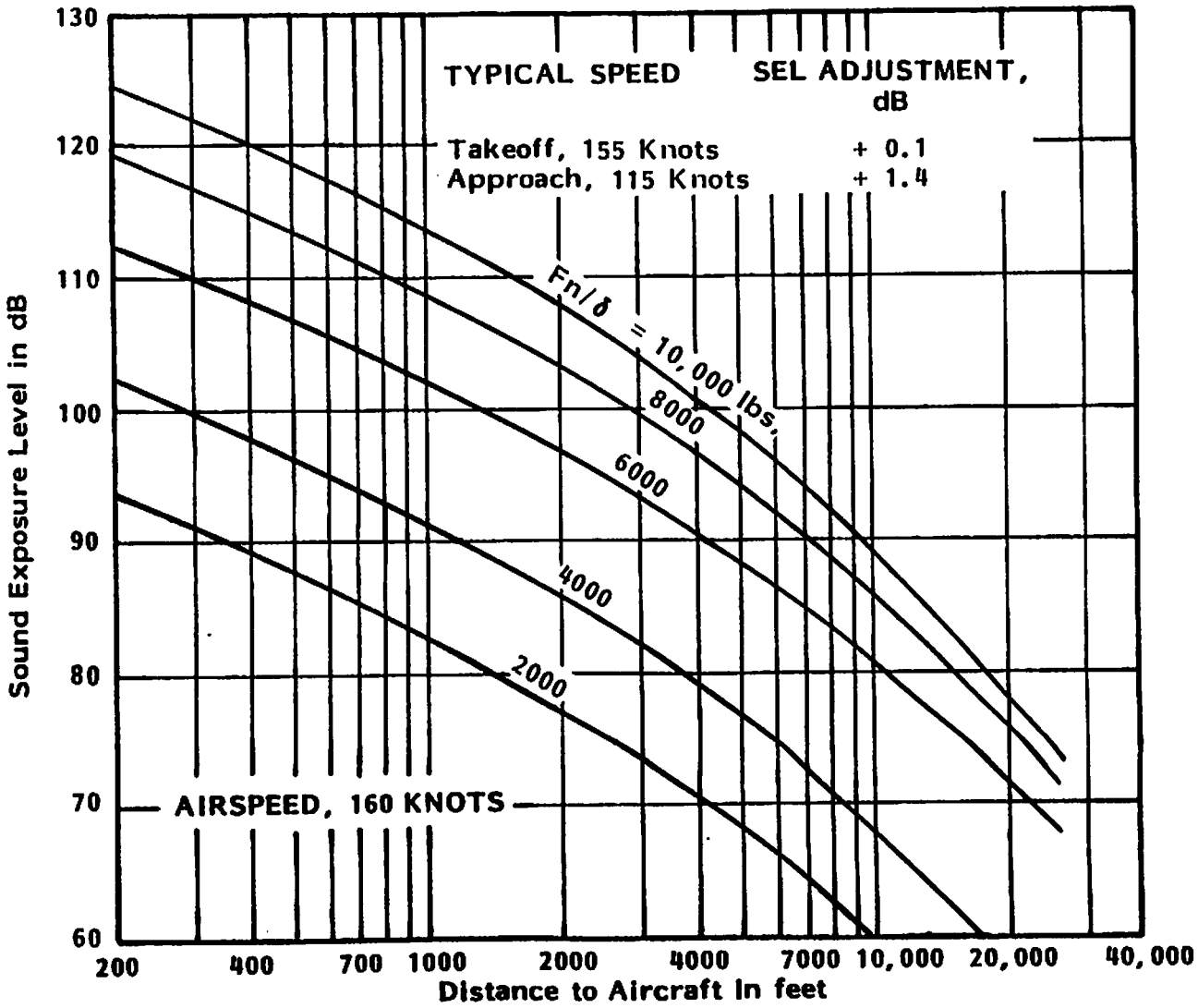

FIGURE 23. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOJET BUSINESS AIRCRAFT - GULFSTREAM GIIB AND GIII AIRCRAFT WITH SPEY MK511 ENGINES

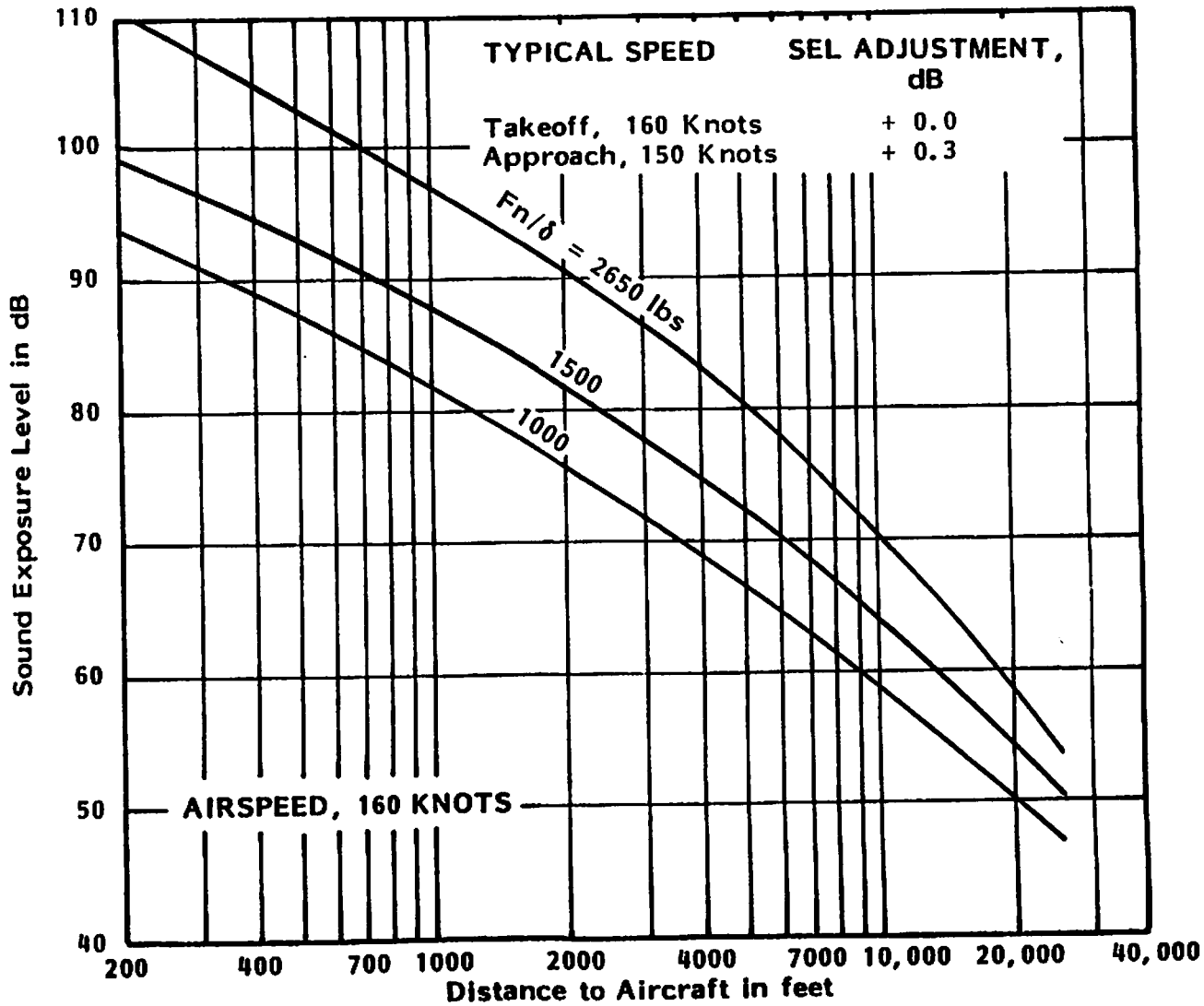

FIGURE 24. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN BUSINESS AIRCRAFT - GATES LEARJET 35/36 AIRCRAFT WITH TFE 731 SERIES ENGINES

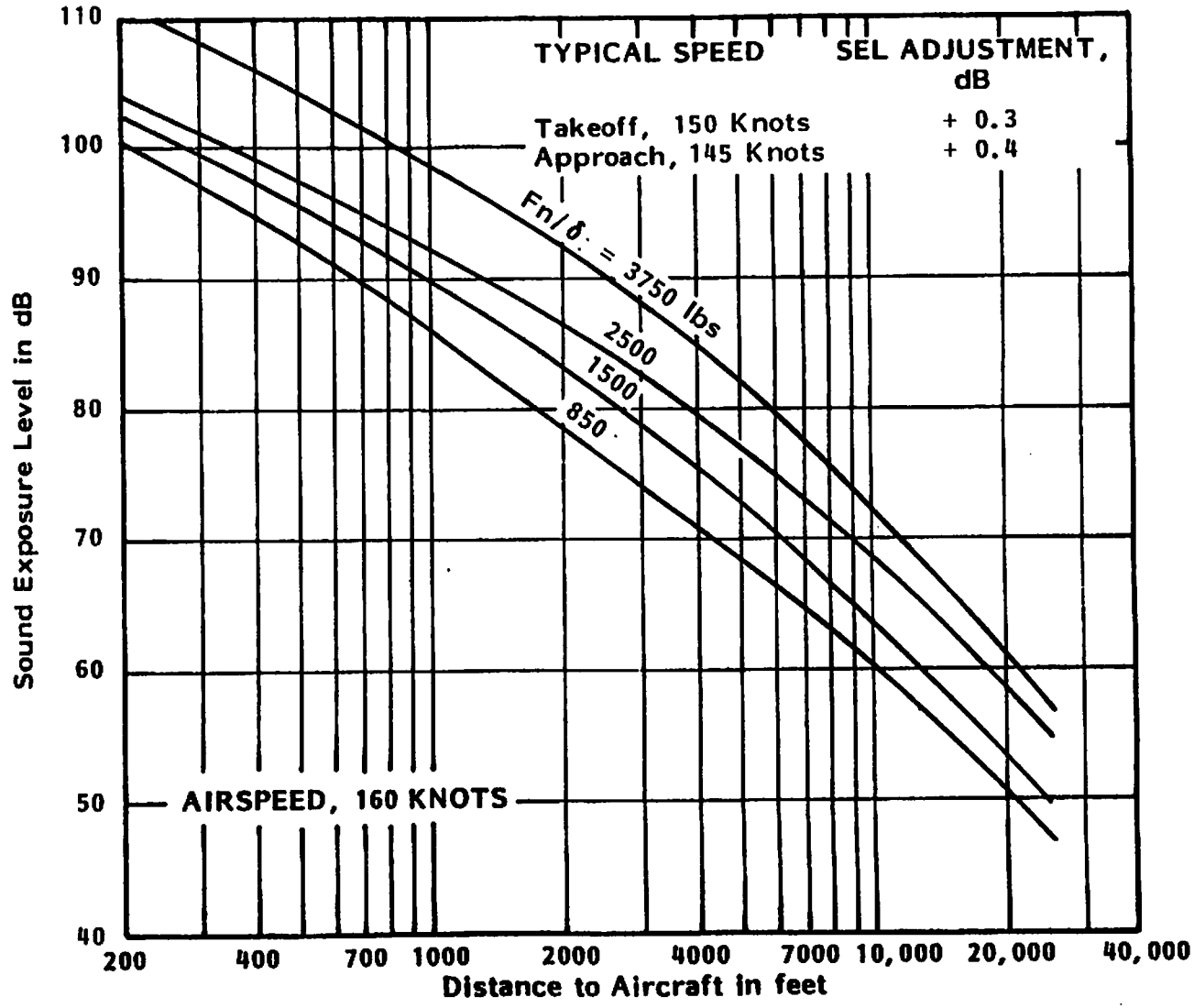

FIGURE 25. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ROCKWELL SABRELINER 80 AIRCRAFT WITH CF700 SERIES ENGINES

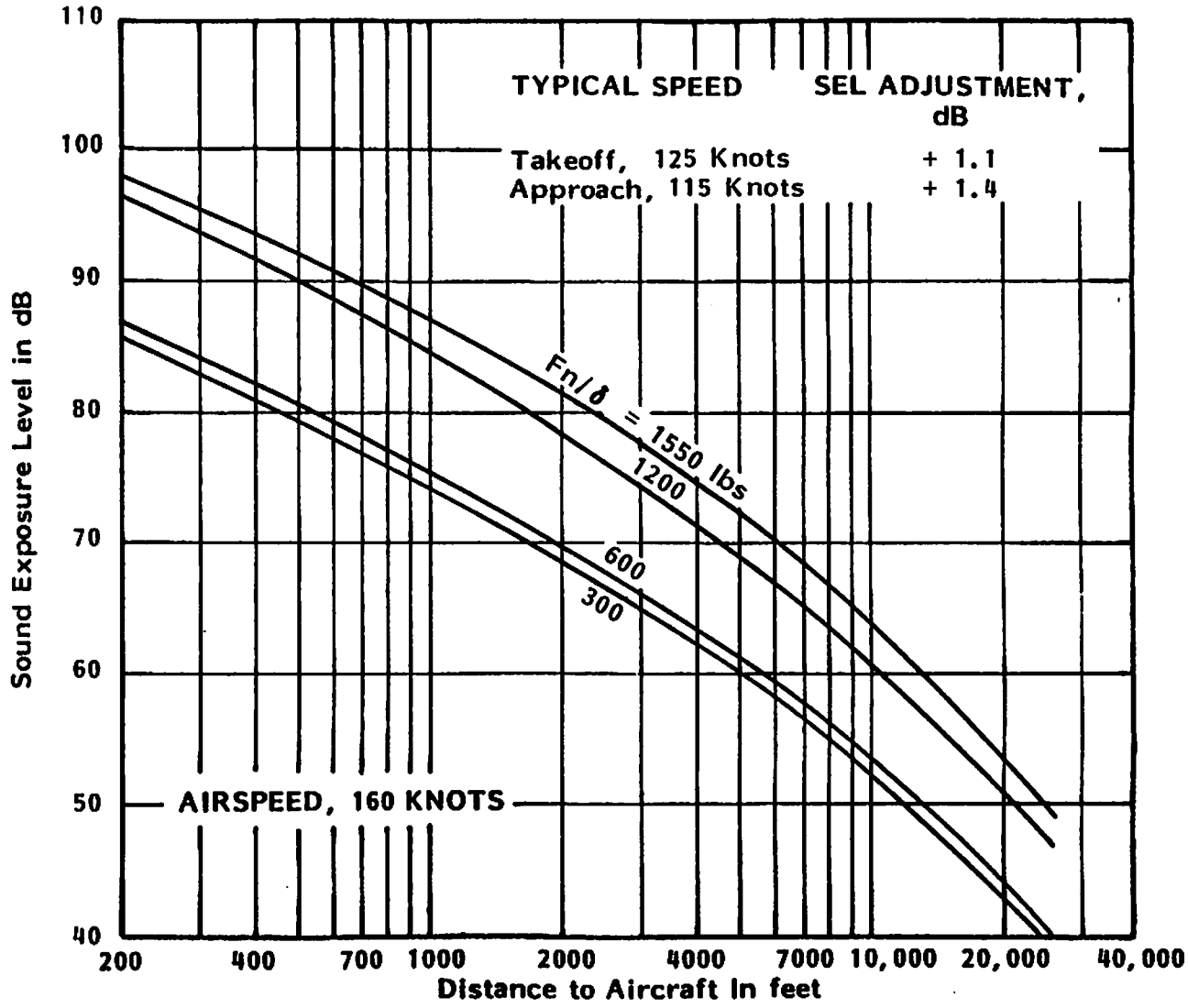

FIGURE 26. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CESSNA 500/501 CITATION I AND II AIRCRAFT WITH JT15D SERIES ENGINES

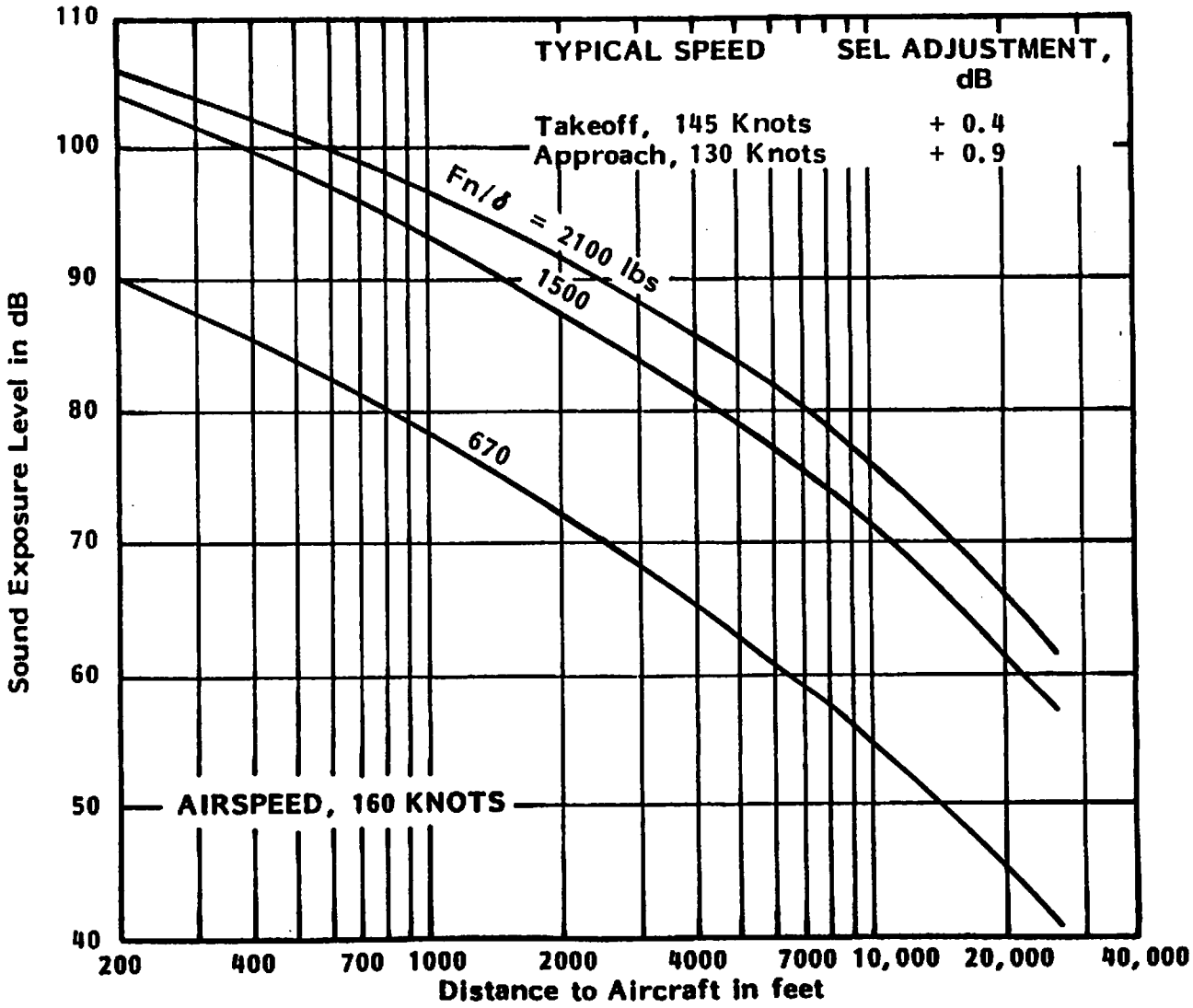

FIGURE 27. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN BUSINESS AIRCRAFT - MITSUBISHI MU300-10 AIRCRAFT WITH JT15D-5 ENGINES

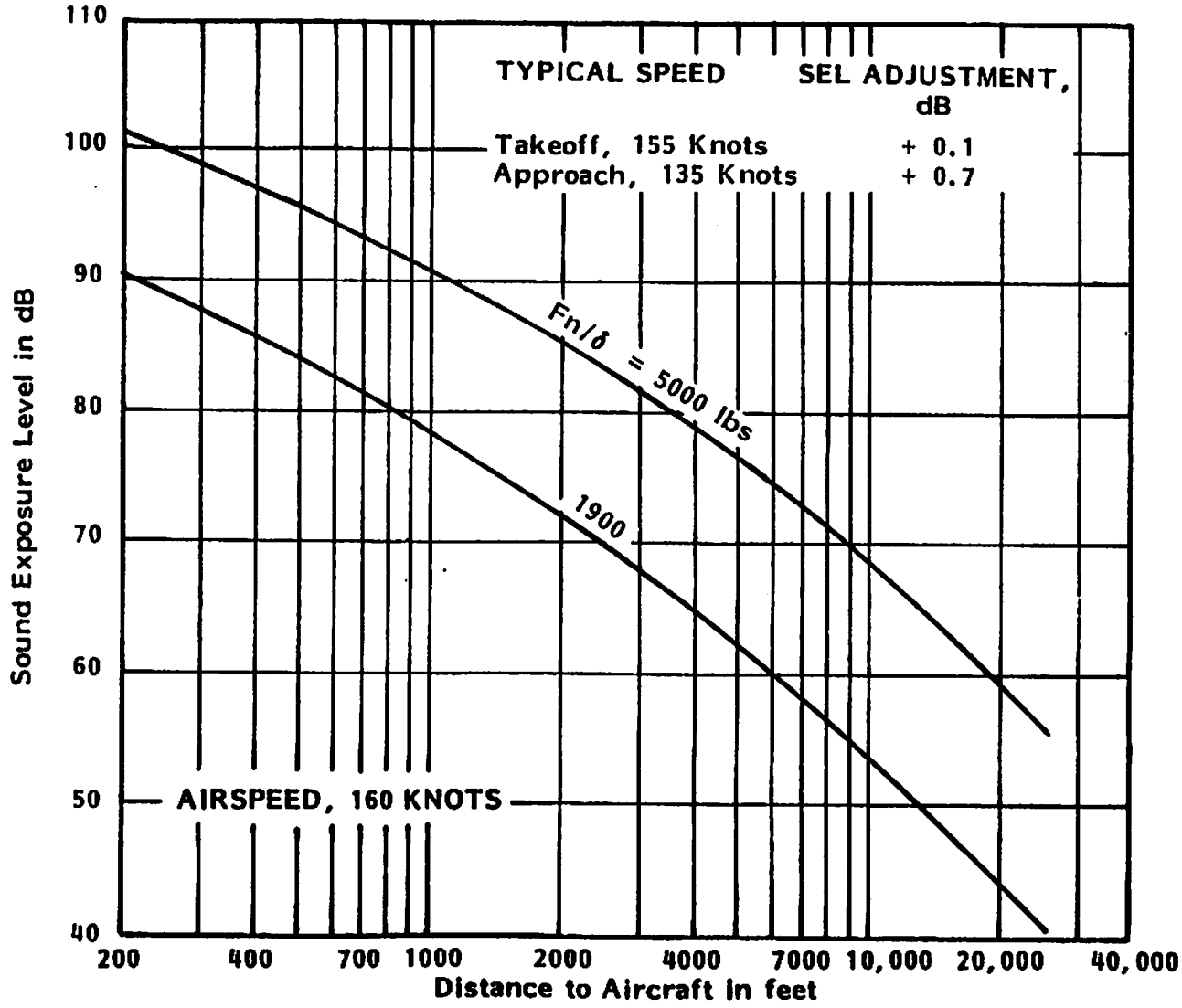

FIGURE 28. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CANADAIR CL-600 CHALLENGER AIRCRAFT WITH ALF502L ENGINES

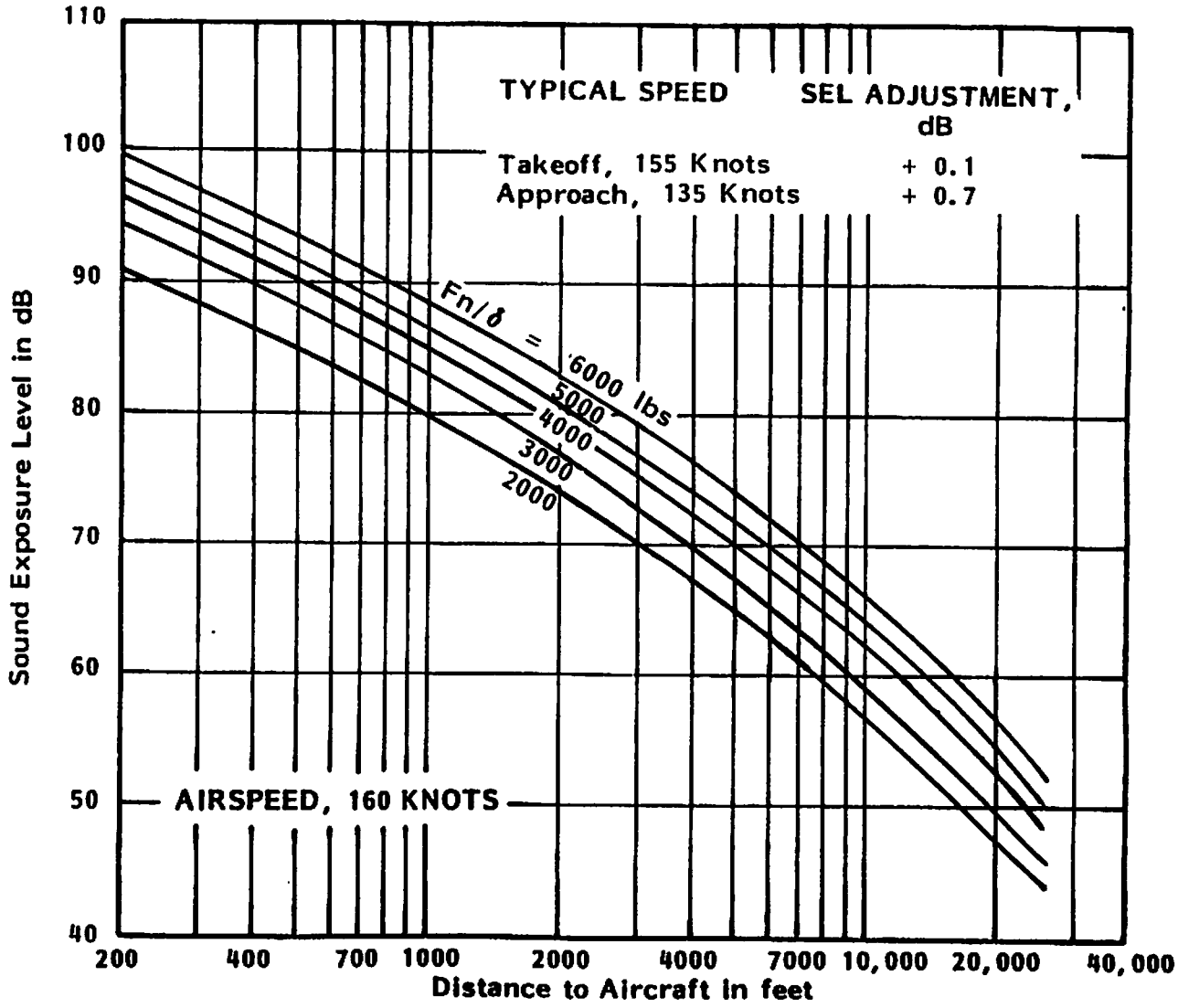

FIGURE 29. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CANADAIR CL-601 CHALLENGER AIRCRAFT WITH CF34 SERIES ENGINES

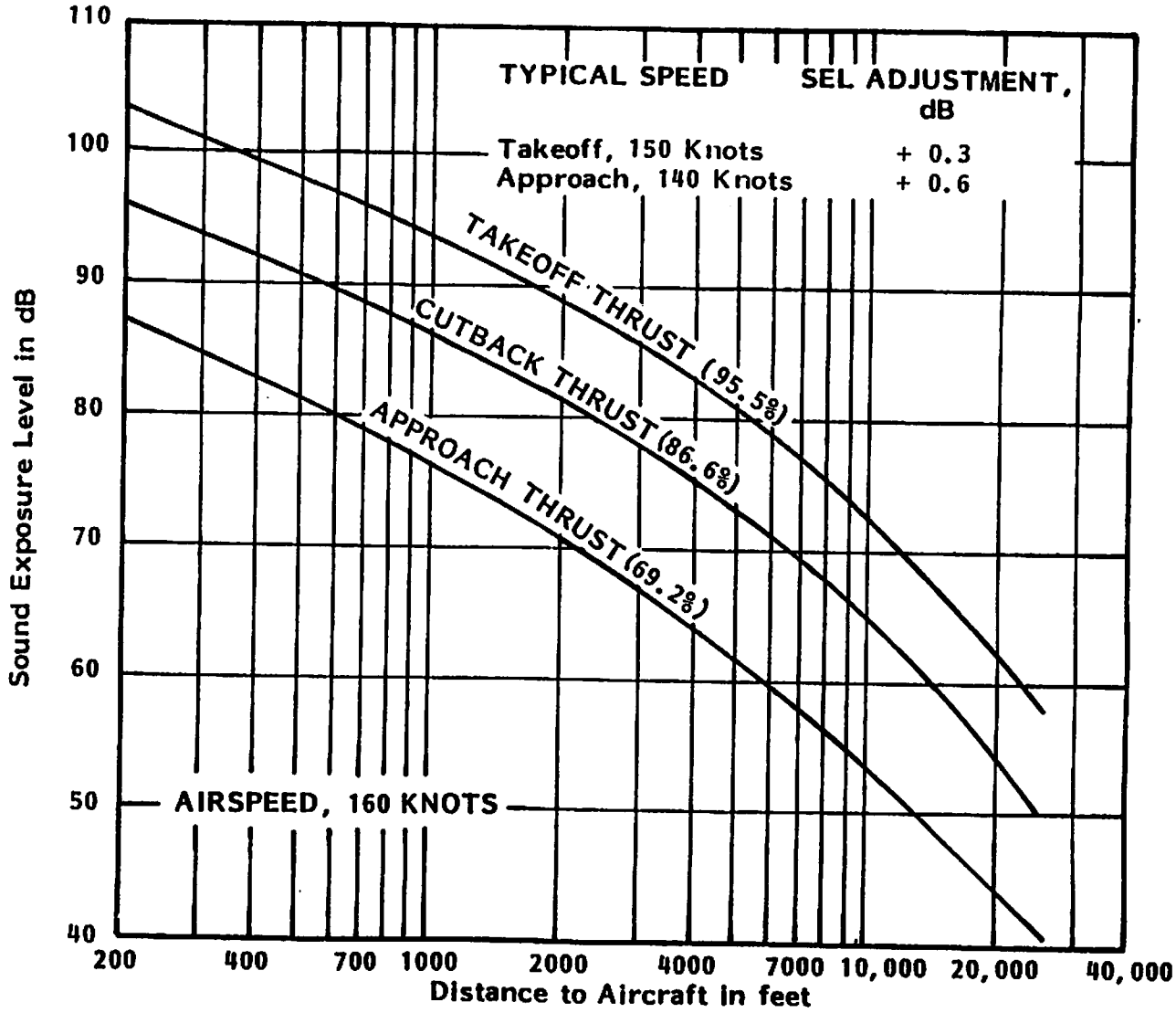

FIGURE 30. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ISRAEL AIRCRAFT INDUSTRIES WESTWIND 1125 ASTRA AIRCRAFT WITH GARRETT TFE 731 SERIES ENGINES

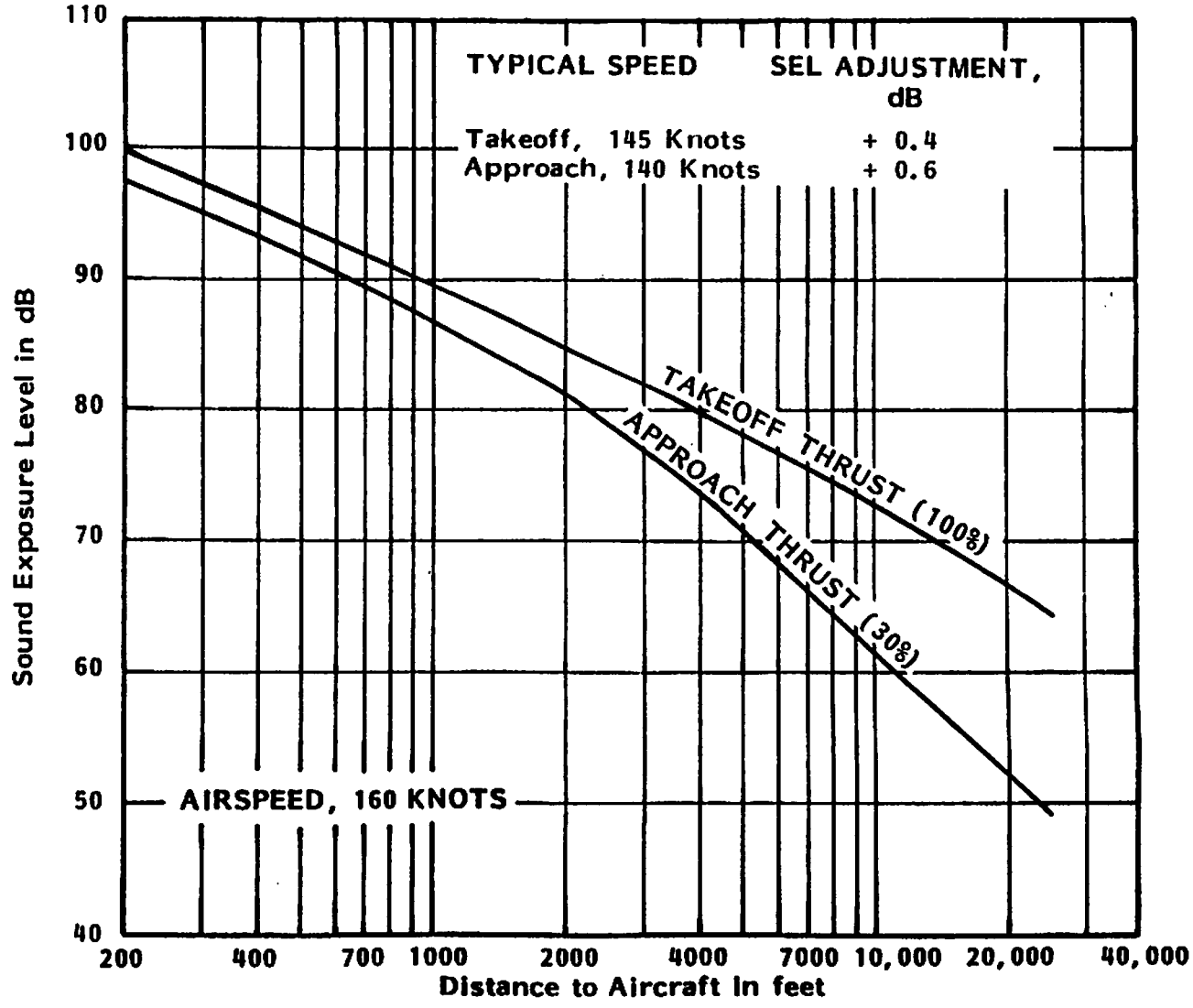

FIGURE 31. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOPROP TRANSPORT AIRCRAFT - LOCKHEED ELECTRA AND HERCULES C-130E AIRCRAFT WITH ALLISON T56-A-7 OR 501-D13 ENGINES

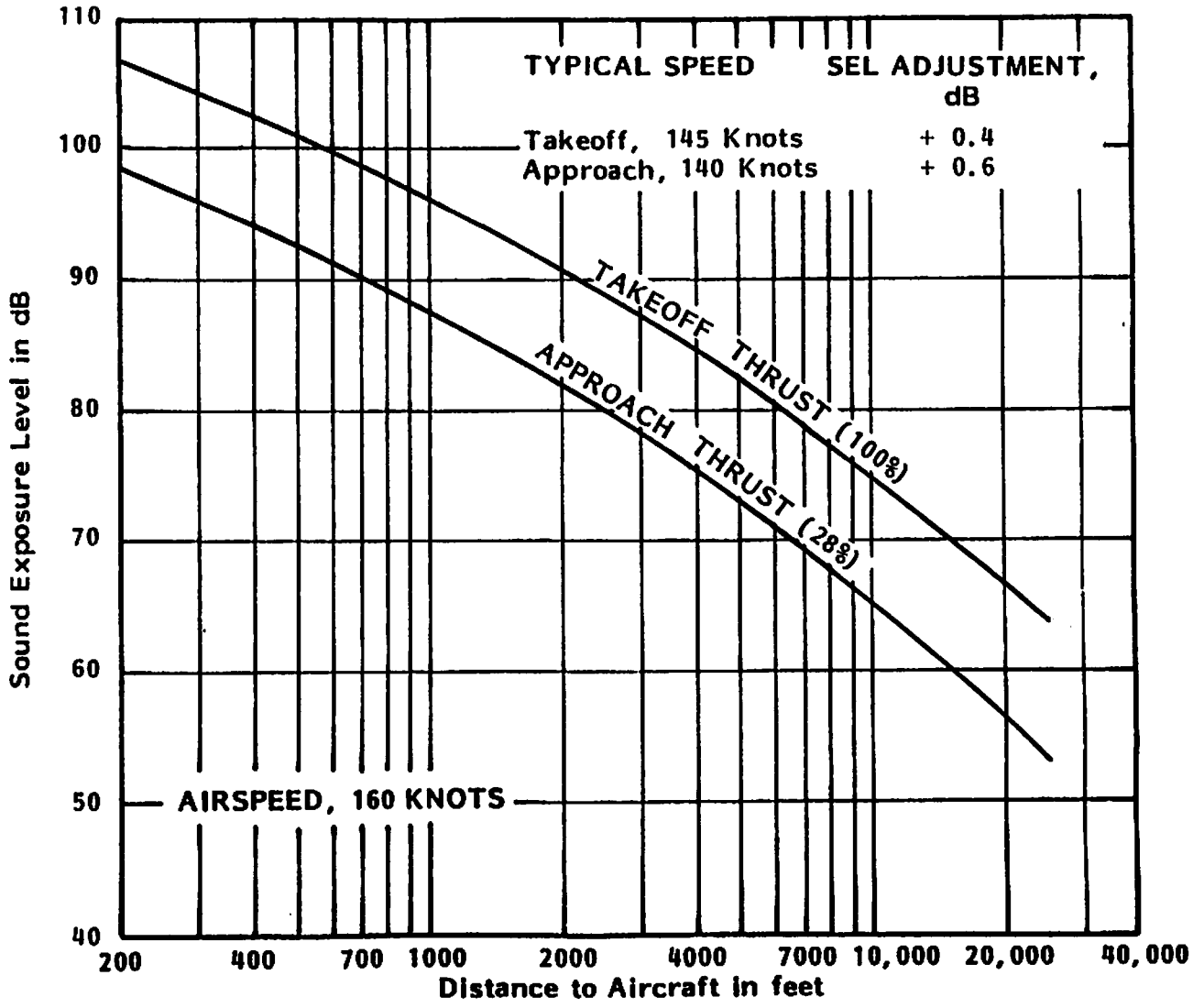

FIGURE 32. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOPROP TRANSPORT AIRCRAFT - LOCKHEED HERCULES 380 SERIES, OR C-130H AIRCRAFT WITH ALLISON T56-A-15 ENGINES

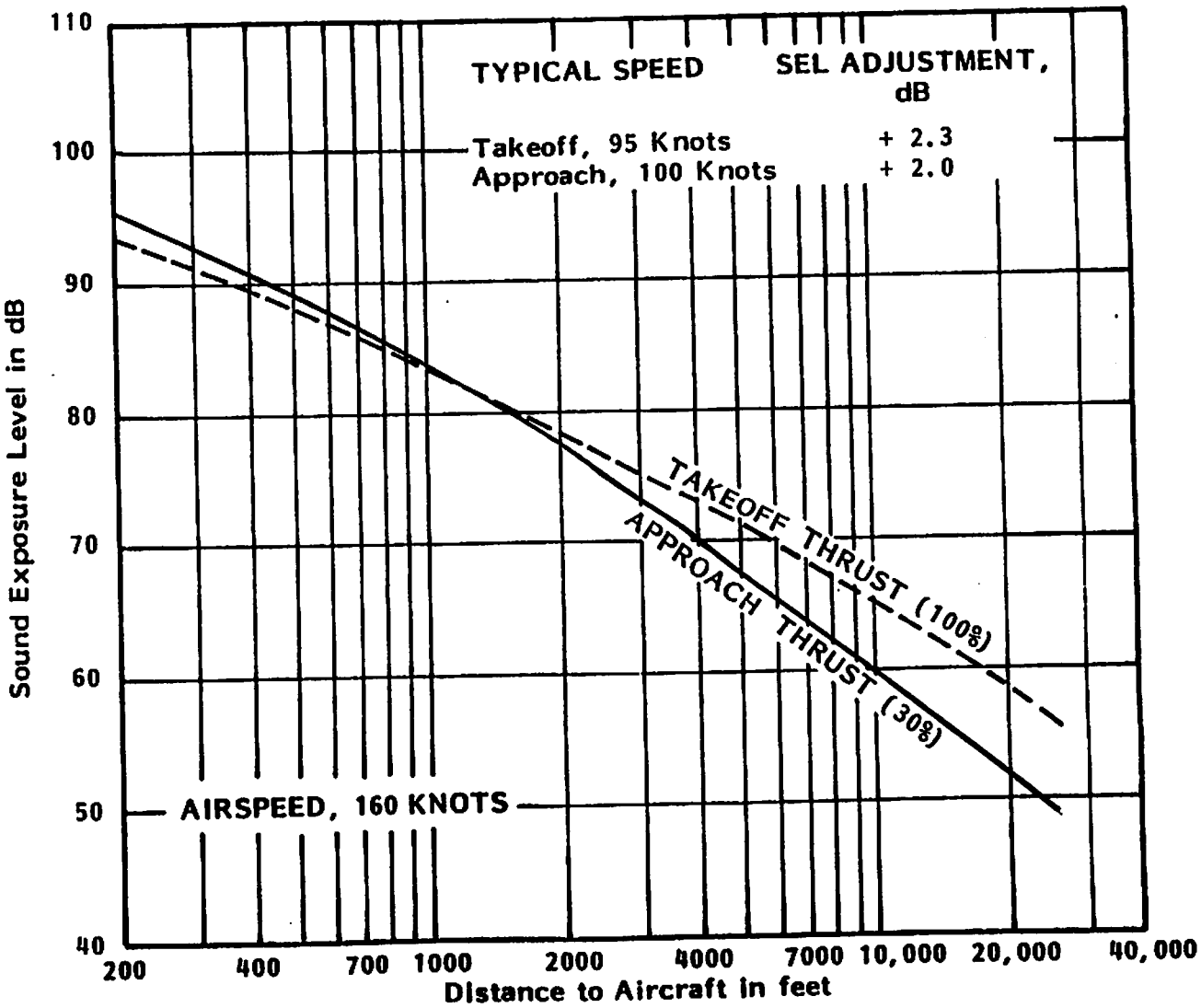

FIGURE 33. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT LESS THAN 50,000 LBS - DE HAVILLAND DH-7 (DASH 7) AIRCRAFT WITH PT6A -50 SERIES ENGINES

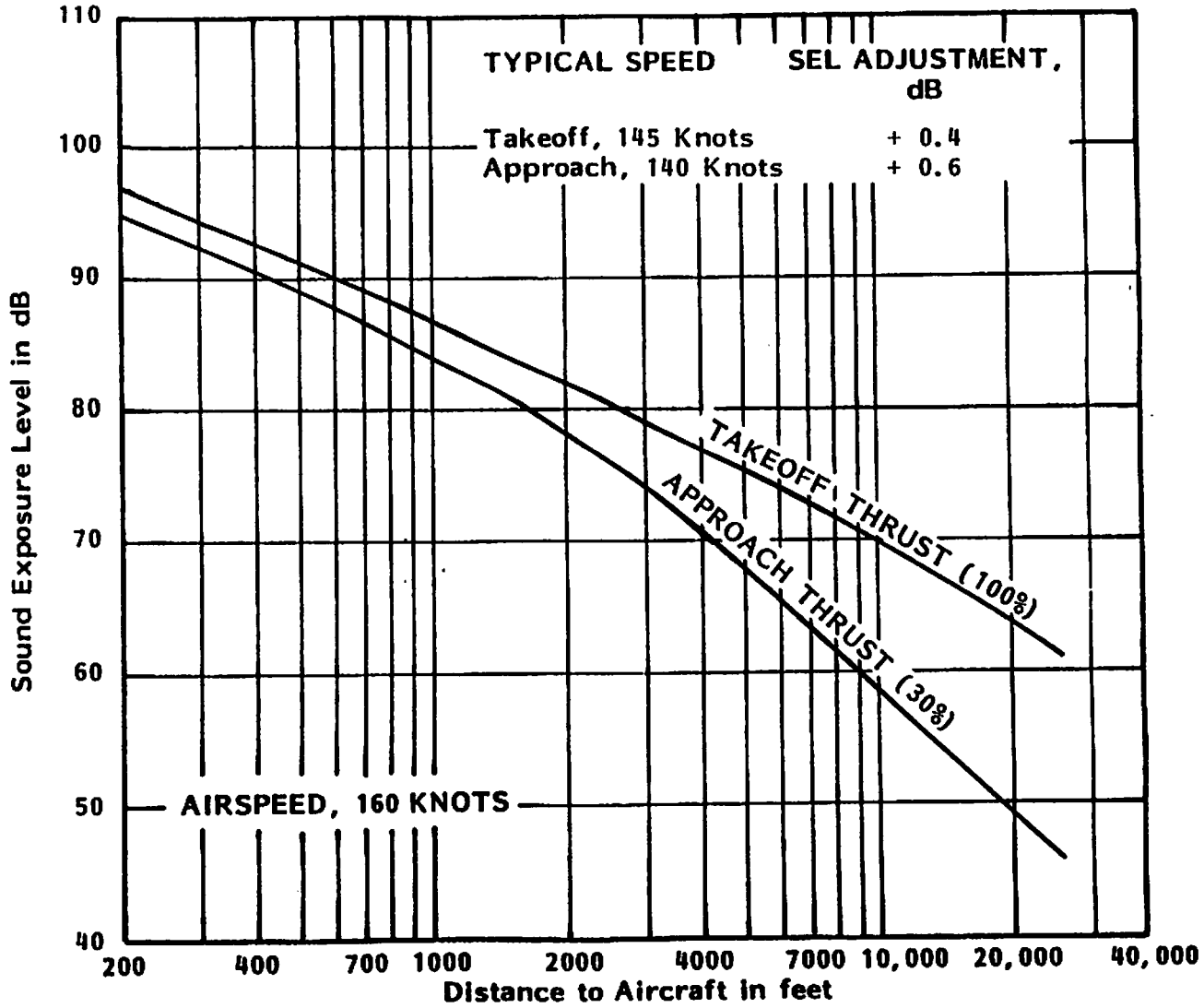

FIGURE 34. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT GREATER THAN 38,000 LBS - CONVAIR 580 AIRCRAFT WITH ALLISON 501-D13 ENGINES

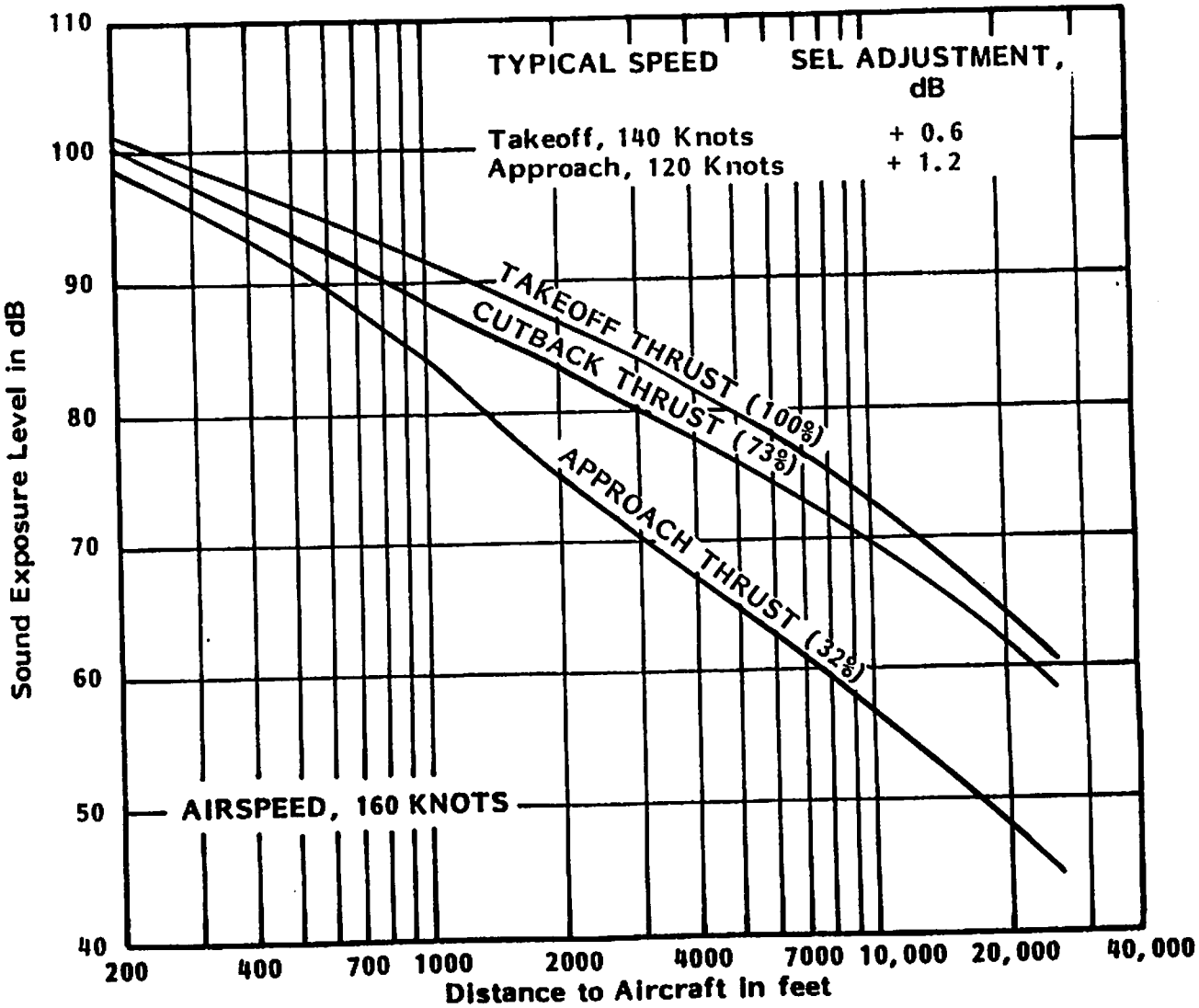

FIGURE 35. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT GREATER THAN 38,000 LBS - HAWKER SIDDELEY HS 748 AIRCRAFT WITH RR DART MK532 ENGINES

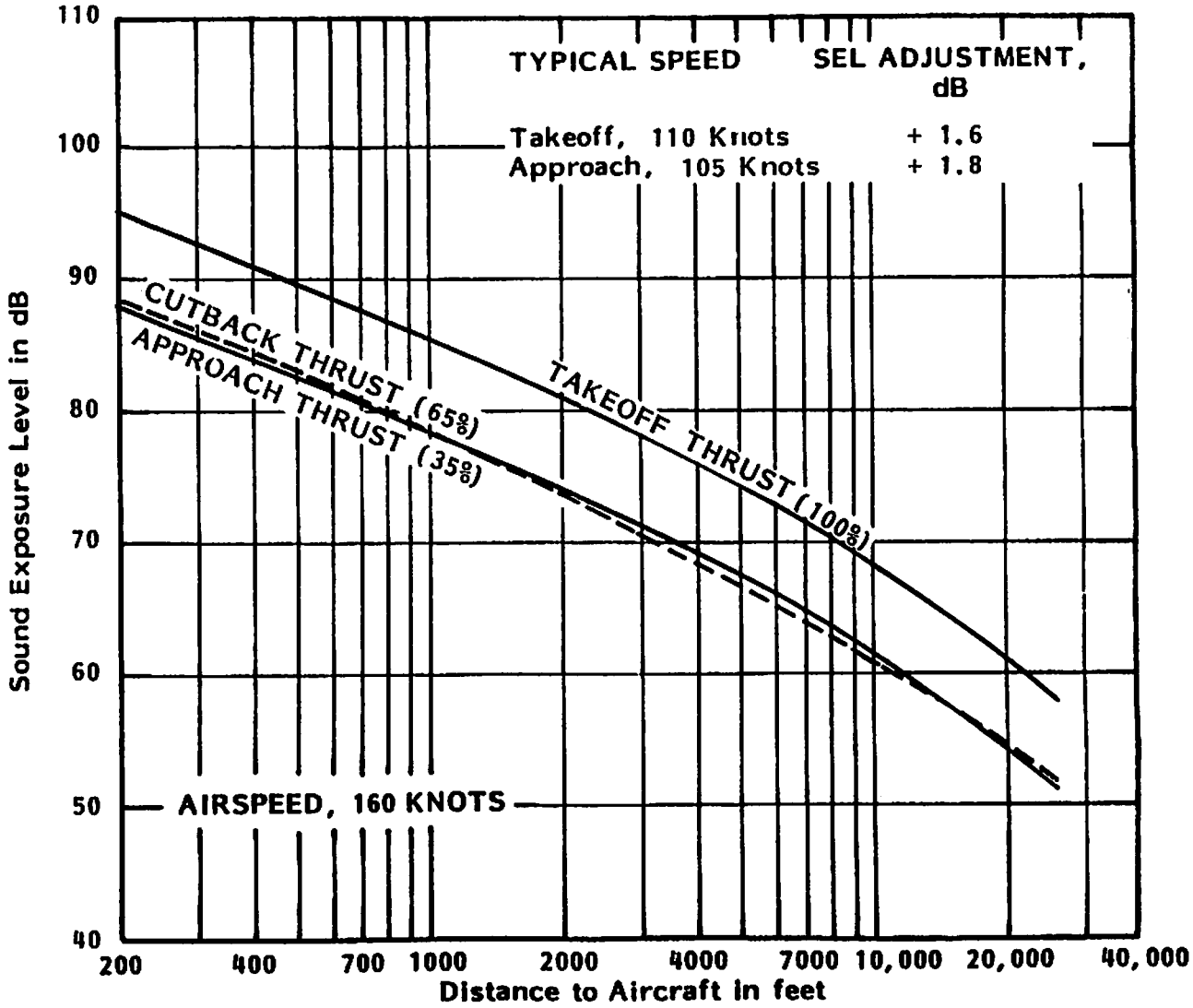

FIGURE 36. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE WEIGHT - SHORTS SD3-30 AIRCRAFT WITH PT6A SERIES ENGINES

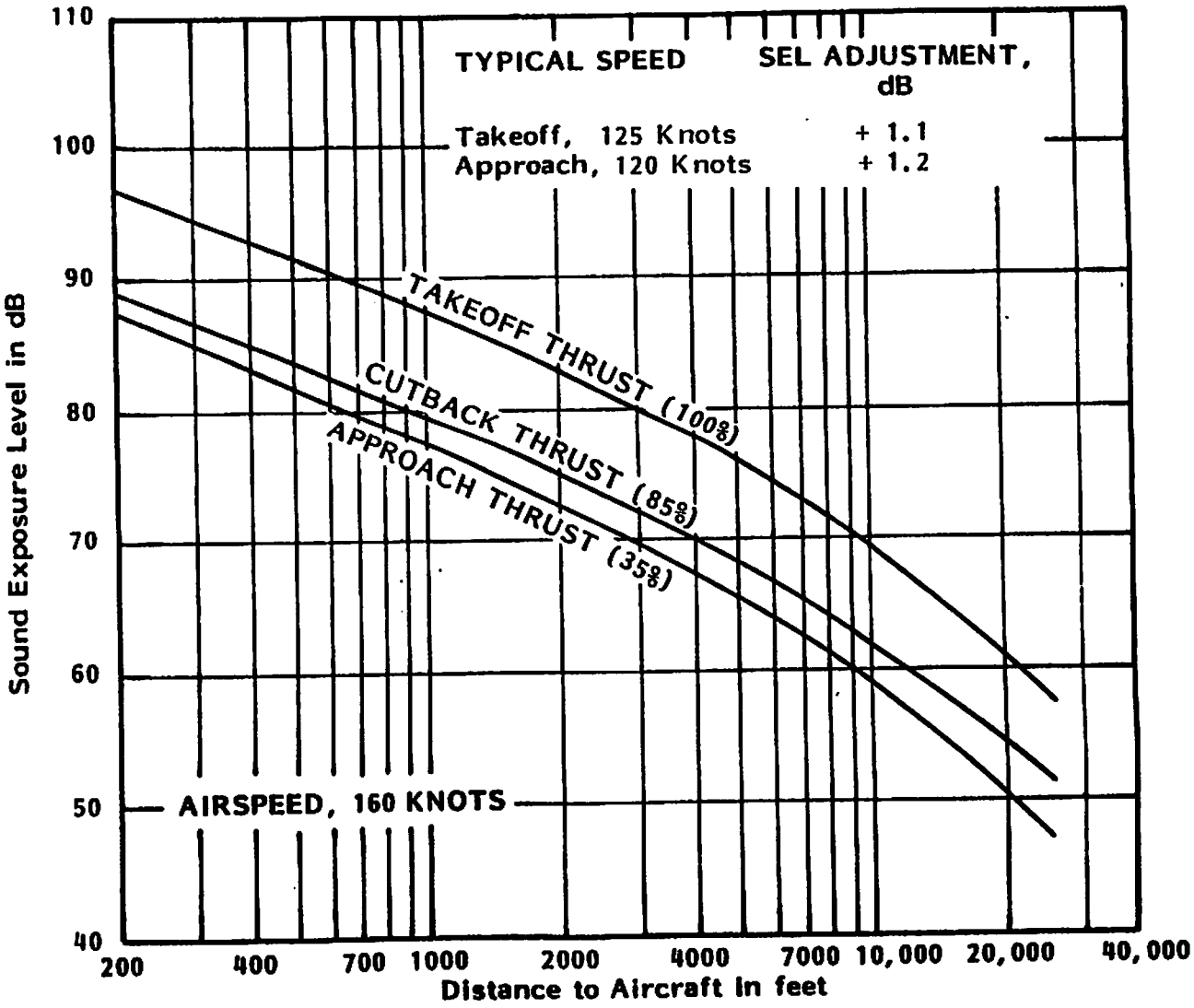

FIGURE 37. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE WEIGHT - SAAB 340 AIRCRAFT WITH GE CT7 SERIES ENGINES

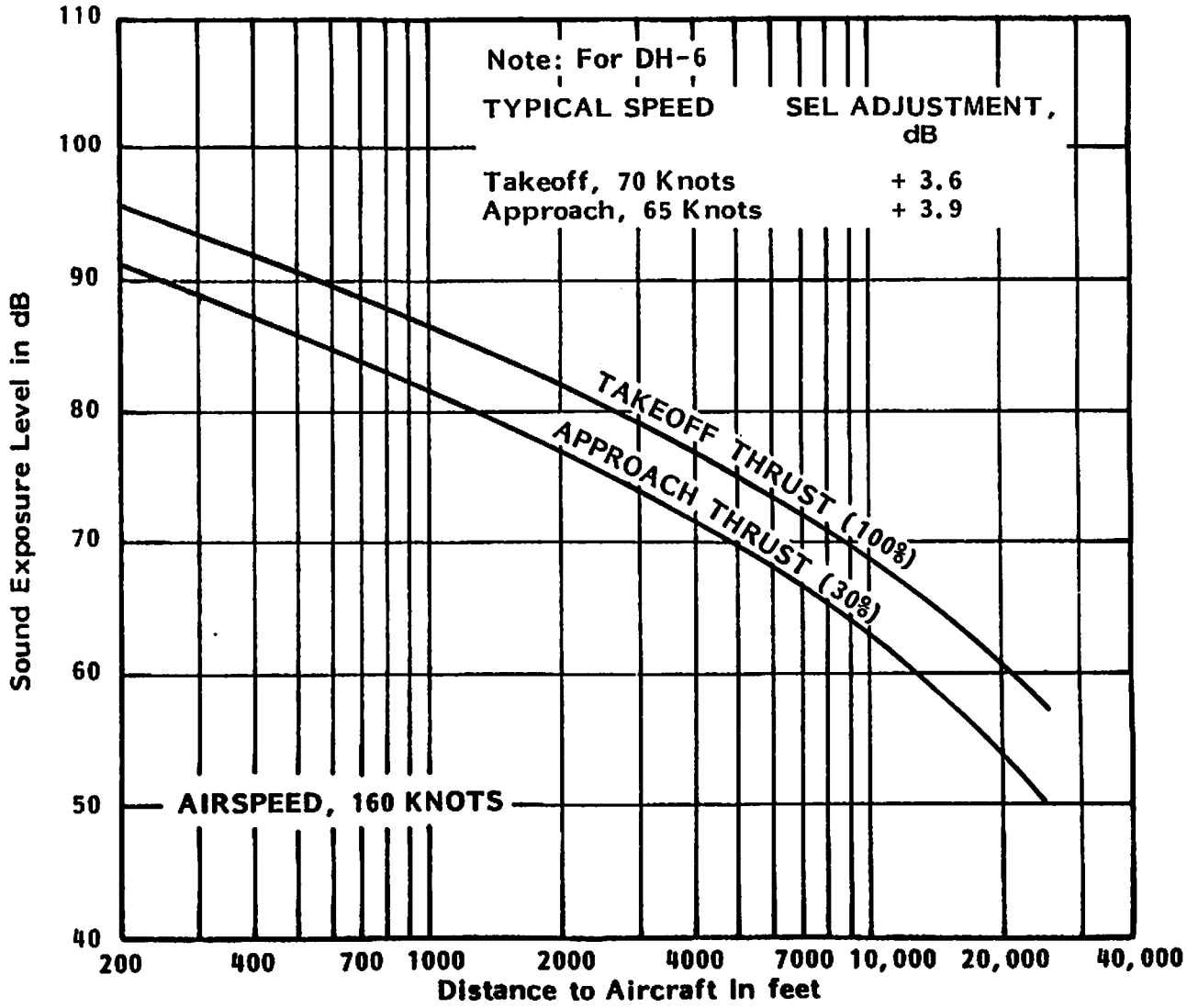

FIGURE 38. AIR-TO-GROUND SOUND EXPOSURE LEVELS - TWO ENGINE TURBOPROP TRANSPORT AIRCRAFT, (LESS THAN 15,000 LBS MAXIMUM GROSS TAKEOFF WEIGHT, OVER 600 ESHP* PER ENGINE) - DE HAVILLAND DH-6 AIRCRAFT

* EQUIVALENT SHAFT HORSEPOWER

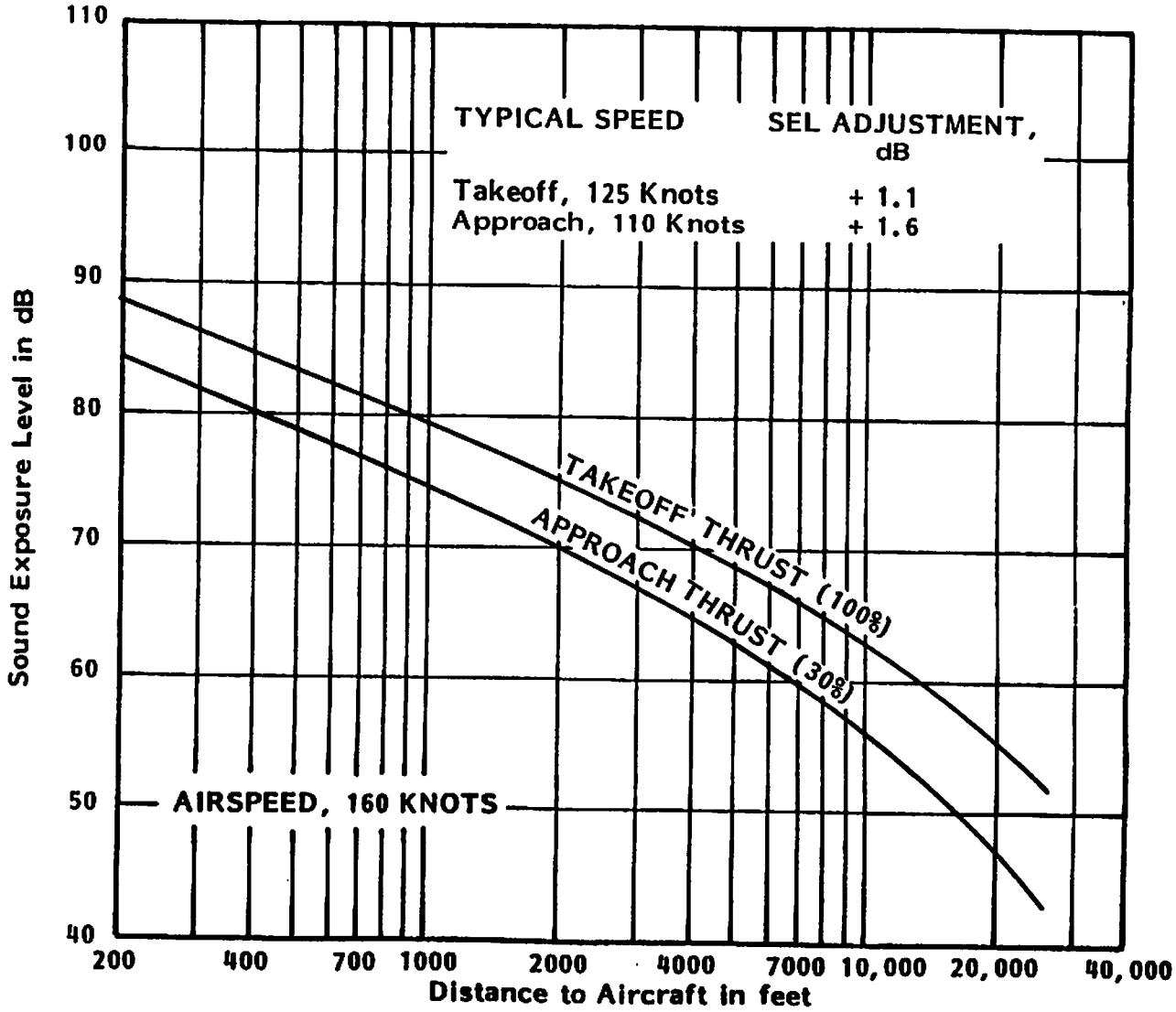

FIGURE 39. AIR-TO-GROUND SOUND EXPOSURE LEVELS - SMALL 2-ENGINE TURBOPROP AIRCRAFT- CESSNA CONQUEST AIRCRAFT

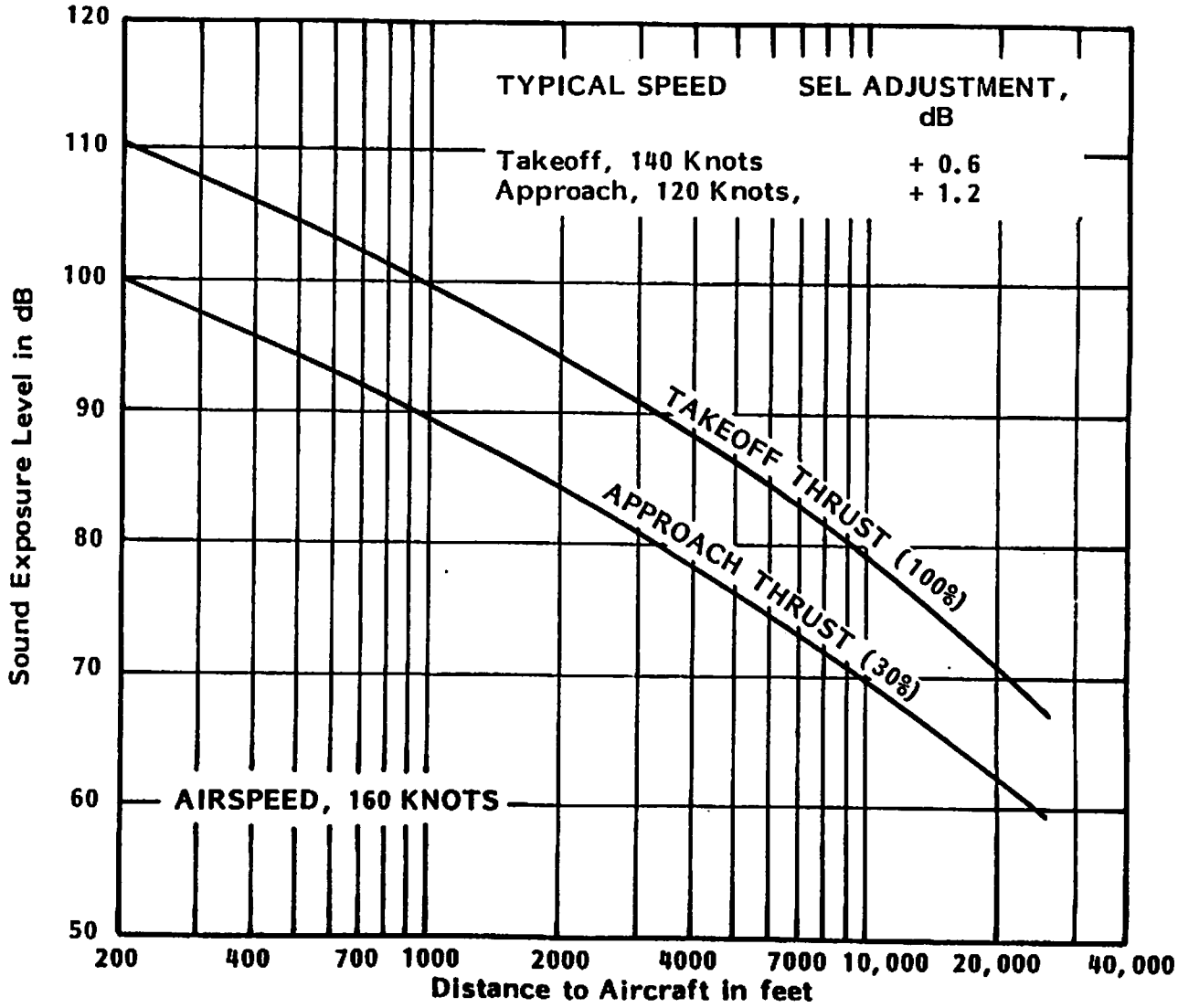

FIGURE 40. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE PISTON TRANSPORT AIRCRAFT - DOUGLAS DC-6 SERIES AIRCRAFT

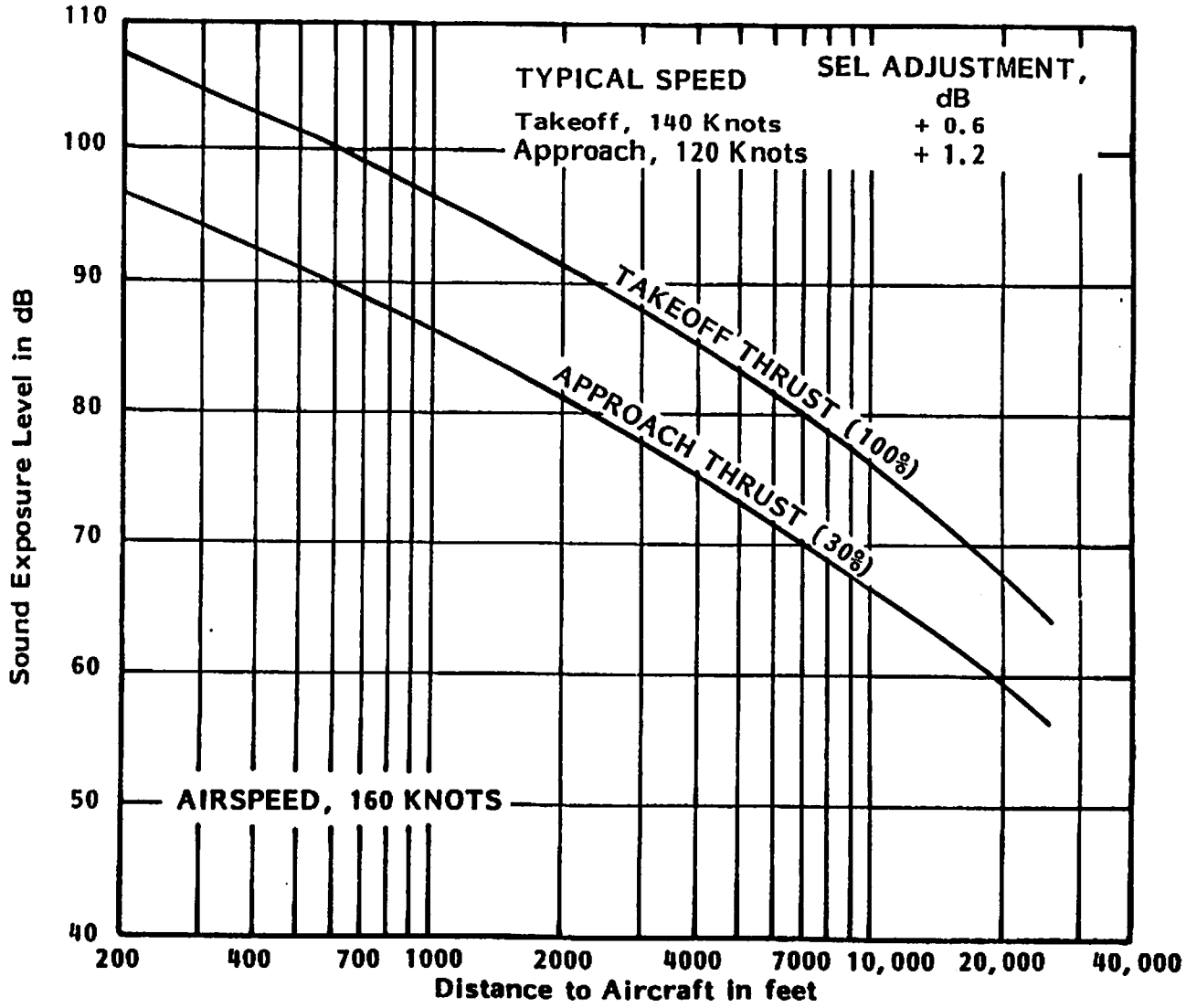

FIGURE 41. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE PISTON TRANSPORT AIRCRAFT (GREATER THAN 12,500 LBS MAXIMUM GROSS TAKEOFF WEIGHT) - CONVAIR 340 AIRCRAFT

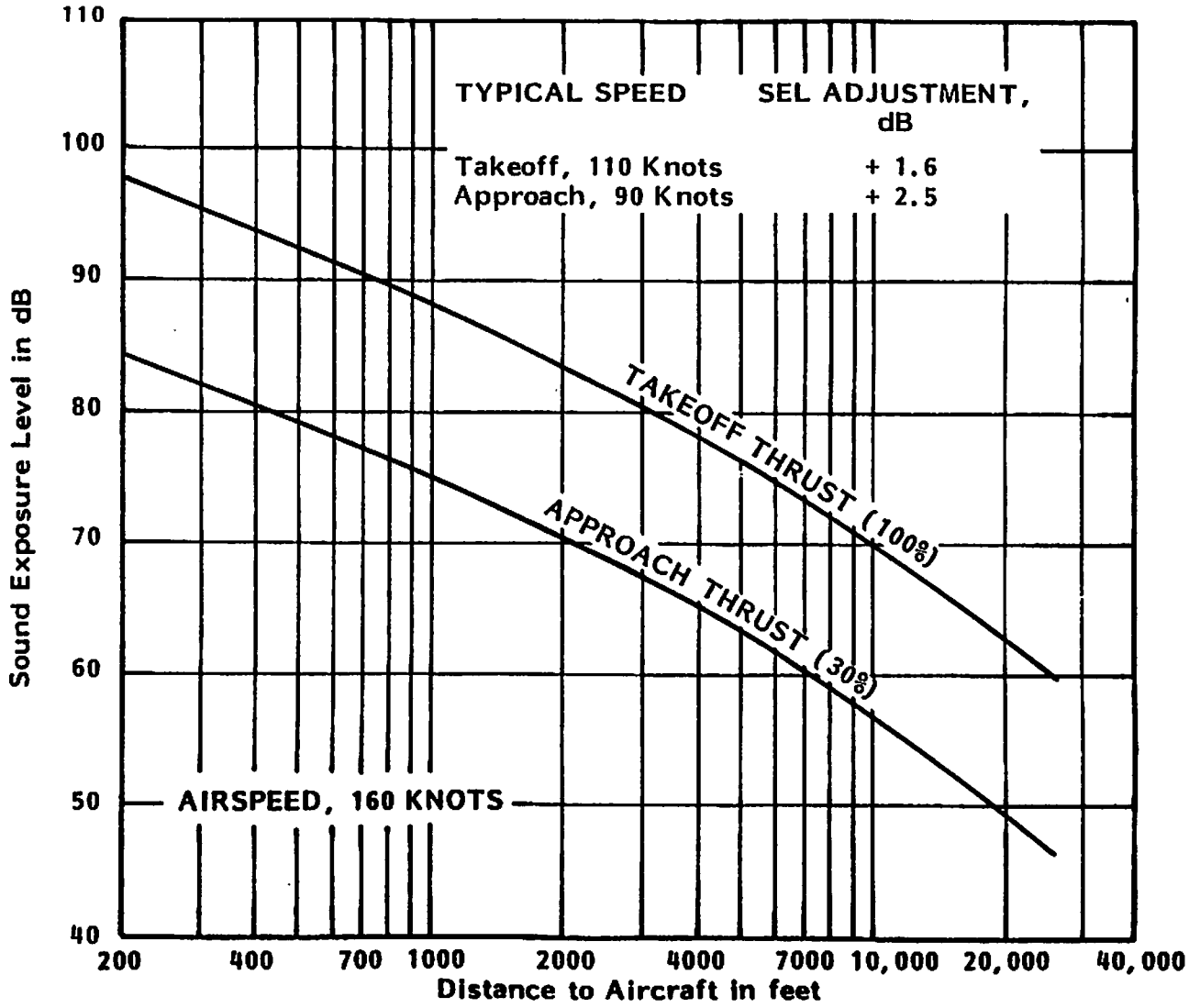

FIGURE 42. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE PISTON AIRCRAFT (LESS THAN 12,500 LBS MAXIMUM GROSS TAKEOFF WEIGHT) - BEECH BARON AIRCRAFT

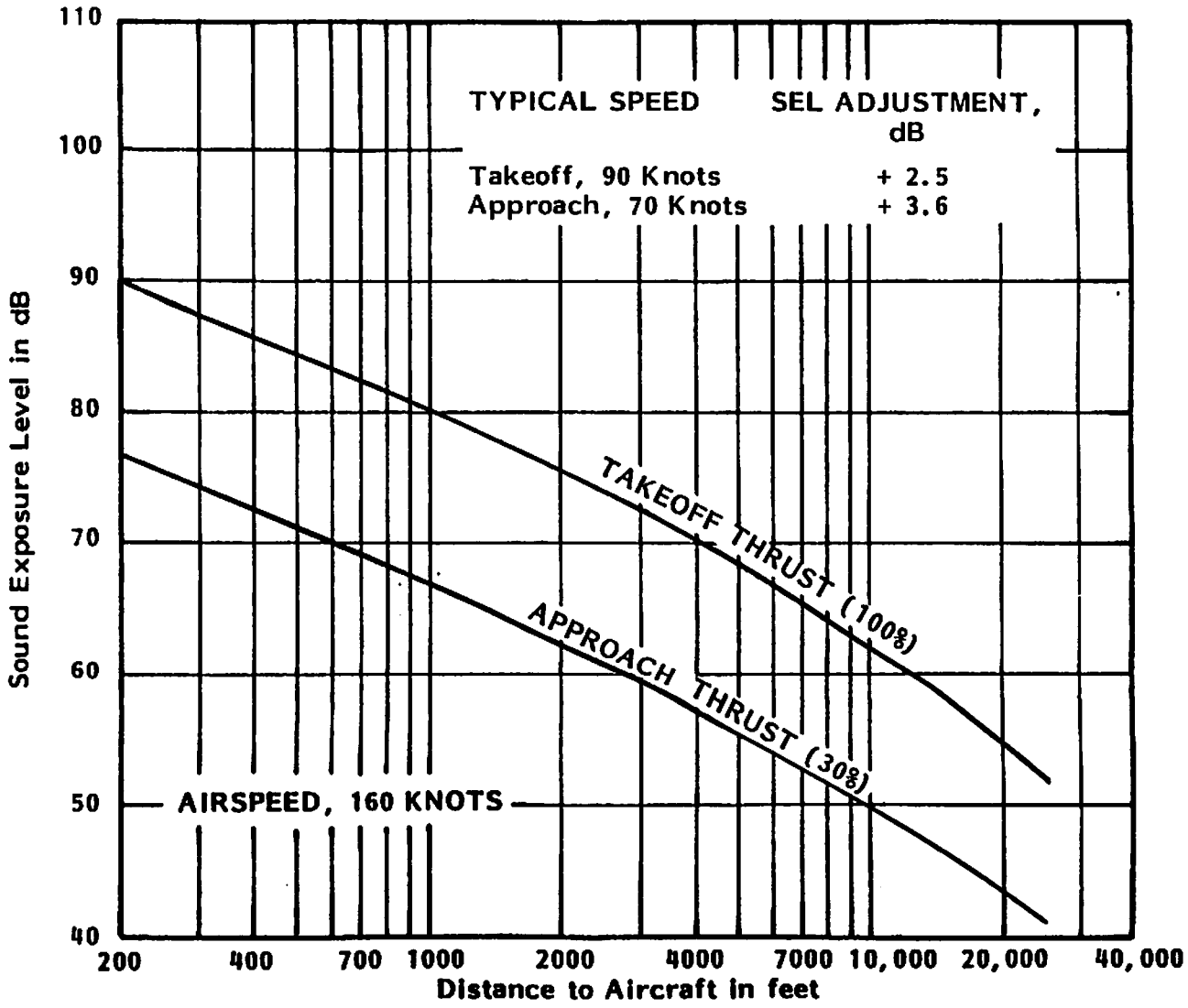

FIGURE 43. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 1-ENGINE PISTON AIRCRAFT - COMPOSITE AIRCRAFT, 1985 FLEET

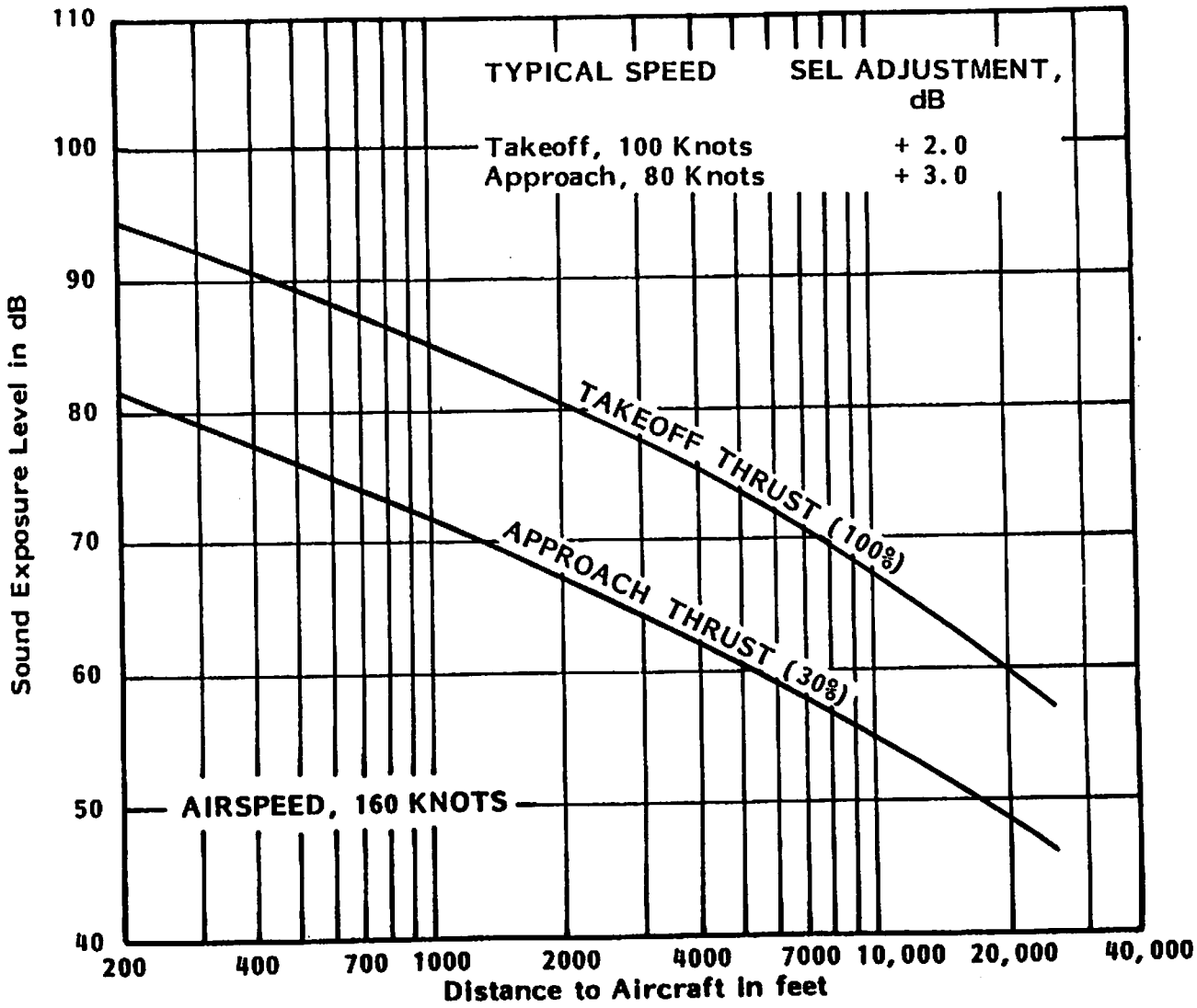

FIGURE 44. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 1-ENGINE PISTON AIRCRAFT - COMPOSITE SINGLE-ENGINE PISTON AIRCRAFT WITH VARIABLE PITCH PROPELLER (EQUAL OR GREATER THAN 200 HP) - COMPOSITE AIRCRAFT

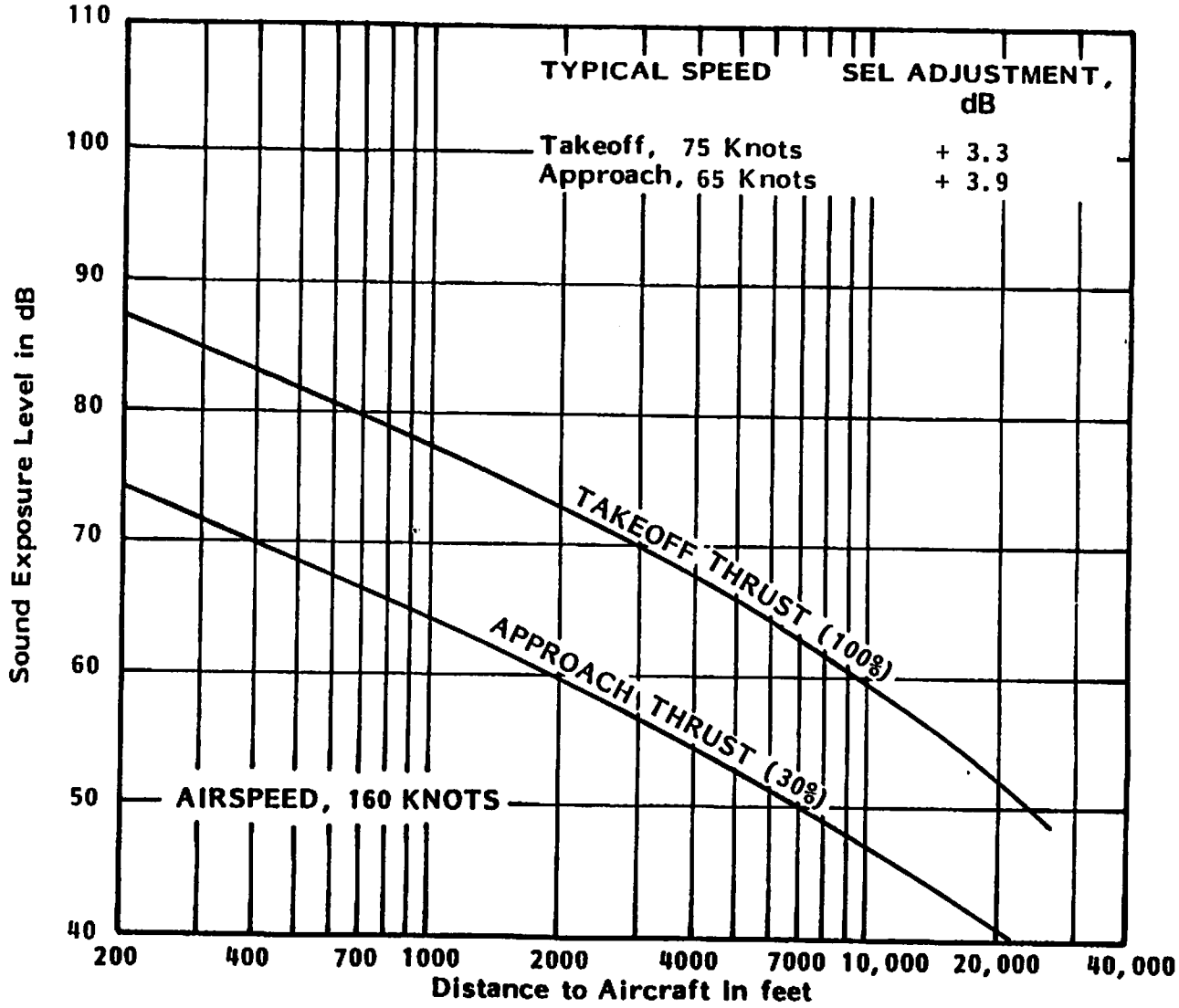

FIGURE 45. AIR-TO-GROUND SOUND EXPOSURE LEVELS - SMALL 1-ENGINE PISTON AIRCRAFT - COMPOSITE SINGLE-ENGINE PISTON AIRCRAFT WITH FIXED PITCH PROPELLER (LESS THAN 200 HP) - COMPOSITE AIRCRAFT

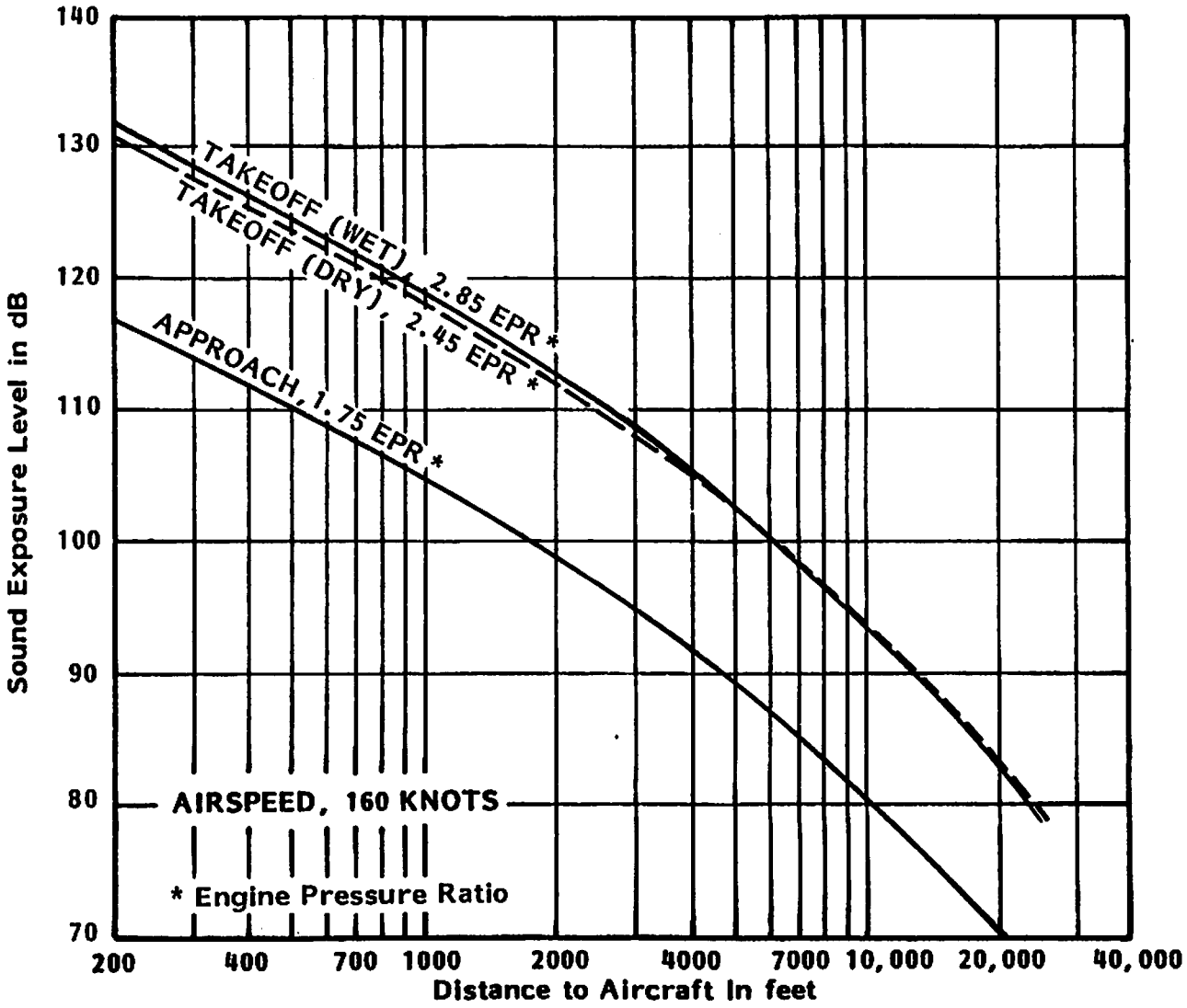

FIGURE 46. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 4-ENGINE TURBOJET MILITARY TRANSPORT/TANKER AIRCRAFT - BOEING KC135A/C135A AIRCRAFT WITH J57 SERIES TURBOJET ENGINES

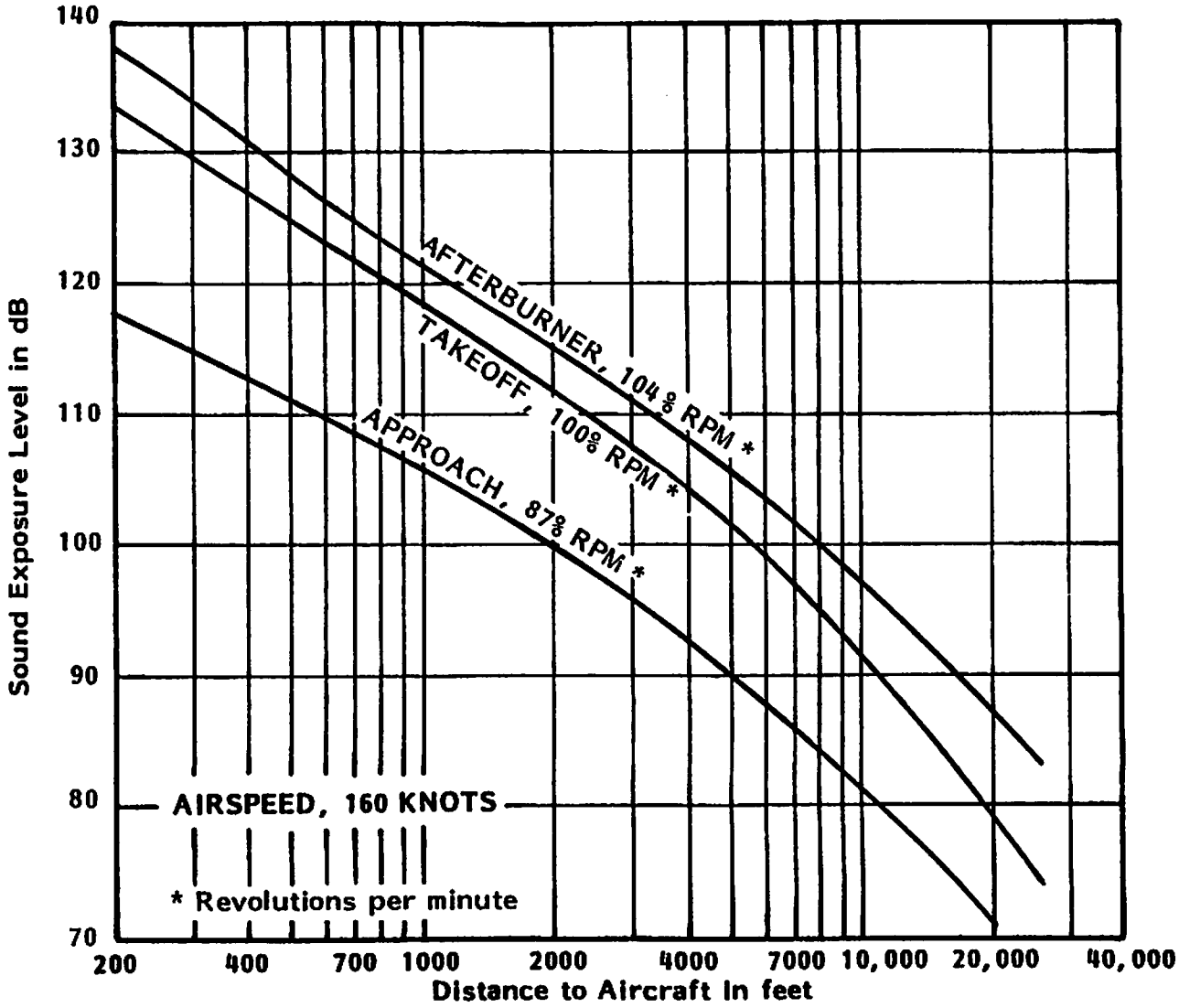

FIGURE 47. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 2-ENGINE AFTERBURNER TURBOJET MILITARY FIGHTER/FIGHTER-BOMBER AIRCRAFT - McDONNELL DOUGLAS F-4 C,D,E,F AIRCRAFT WITH J79 SERIES TURBOJET ENGINES

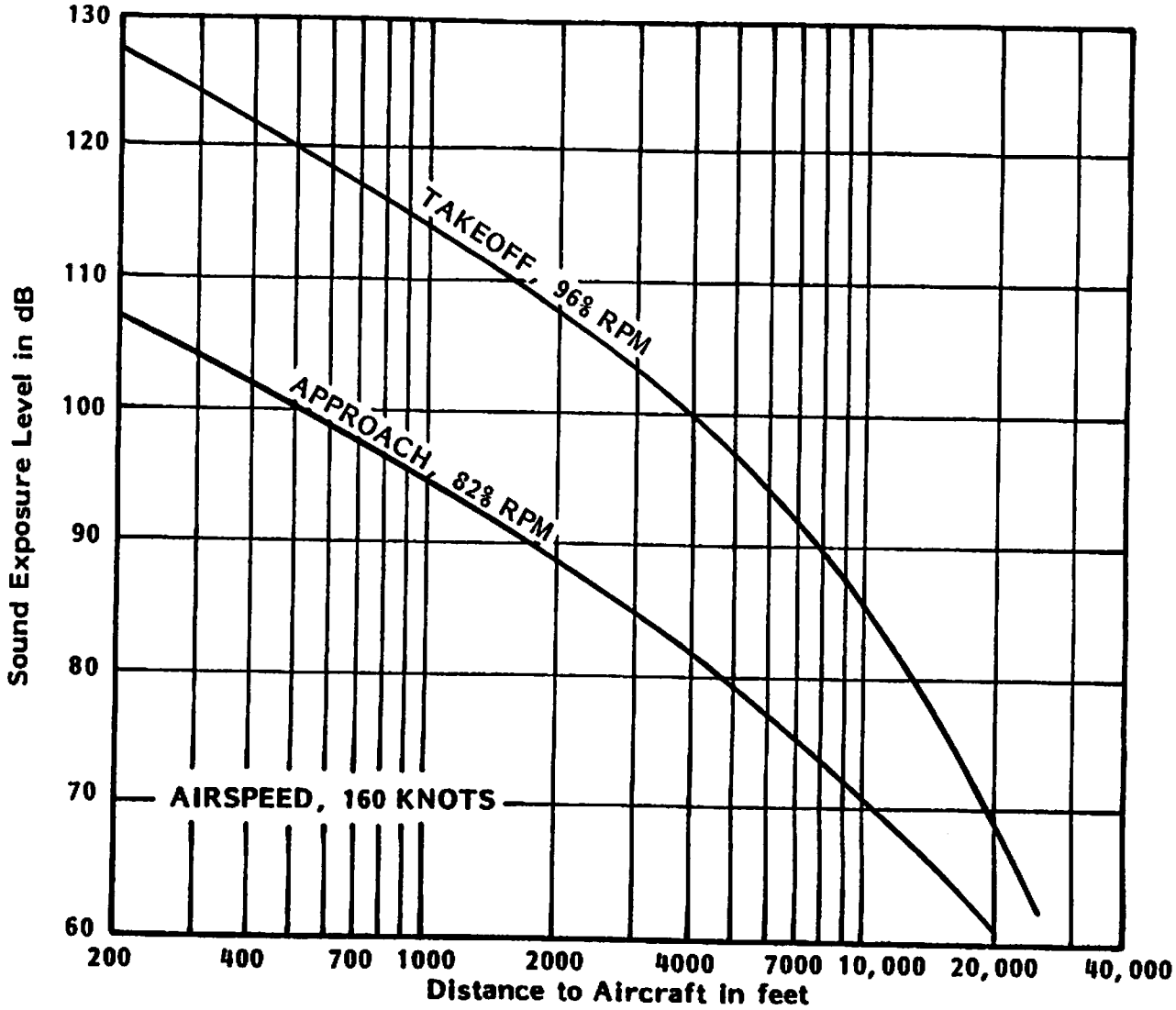

FIGURE 48. AIR-TO-GROUND SOUND EXPOSURE LEVELS - 1- ENGINE TURBOFAN MILITARY ATTACK AIRCRAFT - LTV A-7D, E AIRCRAFT WITH TF-41 SERIES TURBOFAN ENGINE

3.0 TECHNICAL DISCUSSION

3.1 Background

As stated in the introduction, the purpose of this report is:

1. to update the 1980 civil aircraft data base for INM to be consistent with the procedures specified in SAE AIR 1845 [3];

2. to add noise data for new airplanes where data were available; and

3. to provide sound level distance functions from measured data for some airplanes in the 1980 data base that were derived from estimated sound levels.

All sound level/distance functions in the 1980 data base were derived by the "simplified" procedure from the sound level spectrum and effective duration at the time of maximum sound level. In the current data set the combination of "integrated" and "simplified" procedures described in SAE AIR 1845 were used wherever complete sound level time history data were available. The SAE method uses the integrated procedure to extrapolate measured data to distances up to 800 meters (2624 ft), and the simplified procedure for distances greater than 800 meters. The integrated procedure extrapolates each 0.5 sec sound level spectrum whose sound level is within 10 decibels of the maximum from test distances to other distances instead of only the spectrum at the 0.5 sec time interval containing the maximum sound level.

The simplified procedure used for the 1980 data base differs from the SAE procedure in only two respects:

a) Sound absorption coefficients in the SAE method are slightly

greater than the standard day sound absorption used previously. The differences are not large, and occur only for higher frequencies, as shown in Table 1 on page 6.

b) Extrapolation of effective duration for SEL and EPNL in the SAE procedure is scaled as 7.5 times the logarithm of the ratio of distances; the 1980 procedure used a coefficient of 6. If all other factors were equal, this change would increase the sound levels for a distance ratio of 10 by 1.5 decibels over those in the 1980 data base.

One of the difficulties in using the integrated procedure is to insure that sound pressure levels near the beginning and ends of the data sample are sufficiently free from background noise. It is usually necessary, for these data, to adjust the measured sound pressure levels in the highest frequency bands downward to avoid anomalous extrapolation effects. Frequency bands as low as 2500 Hz will often need such adjustment. This process is discussed in Appendix C.

3.2 Sources of Noise Data

As described in Reference 2, the test data used in the 1980 civil airplane data set were derived from two primary sources:

a) Noise certification tests of turbine-powered and transport aircraft conducted in accordance with FAA FAR 36 or ICAO requirements.

b) Jet and propeller aircraft measurements at a number of civil airports including Los Angeles International Airport, San Jose Municipal Airport, John Wayne Airport, Ontario International Airport, Burbank Airport, Lindbergh Field, San Diego, Anchorage, Alaska, Torrance Municipal Airport, and Santa Monica Municipal Airport, among others.

Except for business jets, turboprops, and some propeller-driven small airplanes, the bulk of the data were derived from measurements at airports.

The sources of data with reference to the general type of measurement condition can be classified as (a) controlled test and (b) airport tests (uncontrolled). The use of the word "controlled" implies control and/or knowledge of the aircraft performance and engine operating parameters. The quality of the noise data in terms of accuracy of the acoustic measurements often is not significantly different between controlled or airport tests, but the aircraft operating information is much less detailed in the latter.

Noise spectra from airport measurements serves well in obtaining typical shapes of noise level versus distance curves. However, to develop noise levels as a function of known engine parameters, the controlled tests are most useful.* But the results of most controlled tests reported in the open literature do not include spectral information nor information on the sound exposure level. Hence, in general, aircraft noise information available in the open literature does not provide sufficient information to develop the needed noise versus distance curves.

It should be noted that reported aircraft certification data whether for turbine or small propeller aircraft are generally

*Even where controlled test information is available, the airport data serves as a check upon controlled tests where data may not always have been obtained during realistic aircraft operating conditions.

not very useful in developing noise versus distance curves because of several factors:

a) Lack of any spectral or SEL information.

b) Lack of knowledge of the operational conditions, or distances, for many of the measurements.

c) Unrepresentative operating conditions.

The data used in the current data set reported here were the basic sound level data used to derive the 1980 data base, supplemented by new data available or acquired for this project. Data from noise certifications completed by BBN subsequent to 1980 were used to add new turboprop and business jets to the data base. In addition, approximately 350 new measurements of individual airplane noise events were acquired at Los Angeles, John Wayne, and Burbank airports. Particular emphasis was made to acquire data for newer airplanes such as the McDonnell Douglas MD-80, Boeing 737-300 and 767 airplanes for which only preliminary data or estimates were available in 1980.

Changes in composition of the business jet fleet between 1980 and 1985 were incorporated in the "composite" business jet data. A census of airplanes operated by members of the National Business Aviation Association as of 31 December 1985 was supplied by M. Haupt of NBAA. The 2185 airplanes of this fleet were then segregated into three noise classes: turbojets, small turbofans, intermediate turbofans. This segregation indicates 28 percent turbojets, 22 percent small turbofans (i.e., JT15D) and 50 percent intermediate turbofans. These numbers were further modified to 25 percent turbojets, 25 percent small turbofans, 50 percent

intermediate turbofans to reflect the gradual transition away from turbojets. The "composite" business jet sound level/ distance functions represent a mean square average of the sound level data for these three types of airplanes, weighted by the above fleet proportions.

Both turboprop and piston-engined smaller airplanes were further refined into several subclasses based on additional data. Data from BBN measurements and spectral analyses of data acquired during FAA measurement programs at Dulles Airport [9] were used in these analyses. Data assembled by FAA from numerous certification-like tests on small airplanes [10] were also used extensively in development of the revised data base.

The levels for the composite single-engine aircraft are based on a mean-square average for a fleet composed of 20% variable-pitch propeller aircraft and 80% fixed-pitch propeller aircraft.

3.3 General Approach in Development of Noise Data

Because of the large differences in the completeness of noise level information for individual aircraft, no one method of analysis could be consistently followed. However, the general approach was as follows:

a) Where recorded noise data and spectral information was available for a range of power settings, typical noise level versus distance curves were developed for several representative thrust settings--takeoff, cutback and approach, in order to span the range of spectral changes with engine thrust. Where spectral information was available from a number of sources (airport field measurements, airframe manufacturer's information, etc.), noise versus distance curves were developed for more than one set of data and, if differences in curve shape were significant, an average curve was developed.

b) SEL, EPNL and A-levels were established at a reference distance of 1000 ft or, for approach, at 400 ft. For most larger aircraft, values of EPNL, A-level and SEL were plotted as a function of thrust at a reference distance of 1000 ft. Noise data from different sources, including airframe manufacturer's information, were utilized after adjustments to 1000 ft.

Because of the general lack of SEL data in published reports, special effort was given to develop relationships between EPNL or A-level values and SEL values, based upon field measurements of aircraft made at civil airports. These relationships were used to estimate SEL values from other EPNL or A-level information. A smooth curve showing the variation in noise level with thrust was then drawn for the reference distance of 1000 feet. This curve was sometimes supplemented by similar curves at 400, 4000, and 10,000 feet.

c) The noise level versus thrust curves were then approximated by broken-line segments and the level versus distance curves, developed in Step (a), were adjusted upwards or downwards to match the reported SEL, EPNL and A-level values.

3.4 Comparison of SEL Values for 1985 Data with 1980 Data

Changes in sound levels between the 1980 data set and the 1985 data are, for most airplanes, quite small. A representative sample is shown in Table 51 where old and new SEL values are listed, for takeoff power, at distances of 1000 and 4000 ft. Values at 1000 ft are typically marginally lower at 1000 ft, usually less than a decibel. Values at 4000 ft are marginally higher because of the change in duration coefficient multiplying the logarithm of distance ratios from 6 to 7.5. The effect of

TABLE 51
COMPARISON OF SEL FOR REPRESENTATIVE AIRPLANES
AT 1000 AND 4000 FT - TAKEOFF POWER - 160 KNOTS

Airplane	Engine	Thrust Per Engine, lb	SEL, dB 1000 ft 1980	1985		4000 ft 1980	1985	
B707/DC-8	JT3D, Lined	15,000	108.4	107.2	-1.2	95.5	97.1	1.6
B727-200	JT3D, Lined	12,000	107.3	106.5	-0.8	95.5	95.8	0.3
B737-200	JT8D, Lined	12,000	105.3	104.5	-0.8	93.5	93.8	0.3
B747-200	JT9D, Lined	35,000	101.4	101.2	-0.2	88.7	89.4	0.7
DC-9	JT8D, Lined	12,000	105.3	104.5	-0.8	93.5	93.8	0.3
DC-9-80	JT8D-209	16,000	99.5	98.0	-1.5	87.5	87.2	0.2
DC-10	CF-6	36,000	100.0	100.0	0.0	87.6	87.8	0.2
Composite Business Jet		Takeoff	108.8	106.3	-2.5	94.4	91.8	-2.6
SD-330	PT6A	Takeoff	85.5	85.5	0.0	75.5	76.1	0.6
2 Eng. Piston <12,500 lbs	--	Takeoff	83.2	88.0	4.7	72.7	78.3	5.6
1 Eng. Piston	—	Takeoff	79.7	80.3	0.6	69.2	70.6	1.4

the change in absorption coefficients is essentially lost since so many high frequency bands have to be smoothed to eliminate background noise at longer distances.

The 2.5 dB reduction in SEL values at 1000 feet for the composite business jet reflects the change in fleet composition with a reduction in the percentage of turbojets and increases in the percentages of the quieter turbofans.

The increase in levels of the small two-engine piston aircraft shown in Table 51 reflects the availability of new data for a wider variety of newer aircraft [9, 10]. The levels are approximately 3 dB higher than the levels for the one-engine piston aircraft with variable pitch propellers.

3.5 Some Comparisons of Results of Assumptions in Analyses

The use of an "integrated" extrapolation procedure is the preferred method for developing sound level/distance functions in SAE AIR 1845, [3]. Its use is generally restricted to certification-like measurements where airplane parameter information is available that is synchronized in time with noise data. For data measured at airports only a distance of closest approach is measured to relate to the noise data. Engine power setting, airspeed, and the sound emission angle at the time of maximum sound level must be assumed for the analysis.

For measurements during airplane takeoffs these assumptions are not really restrictive. It is often possible to identify, for transport airplanes, the airline and flight number, from which weight can be obtained, allowing accurate estimation of takeoff airspeed and thrust settings (from operating manuals). An assumption of emission angle at maximum sound level must be made, but this is not very critical. Figure 49 shows the results of

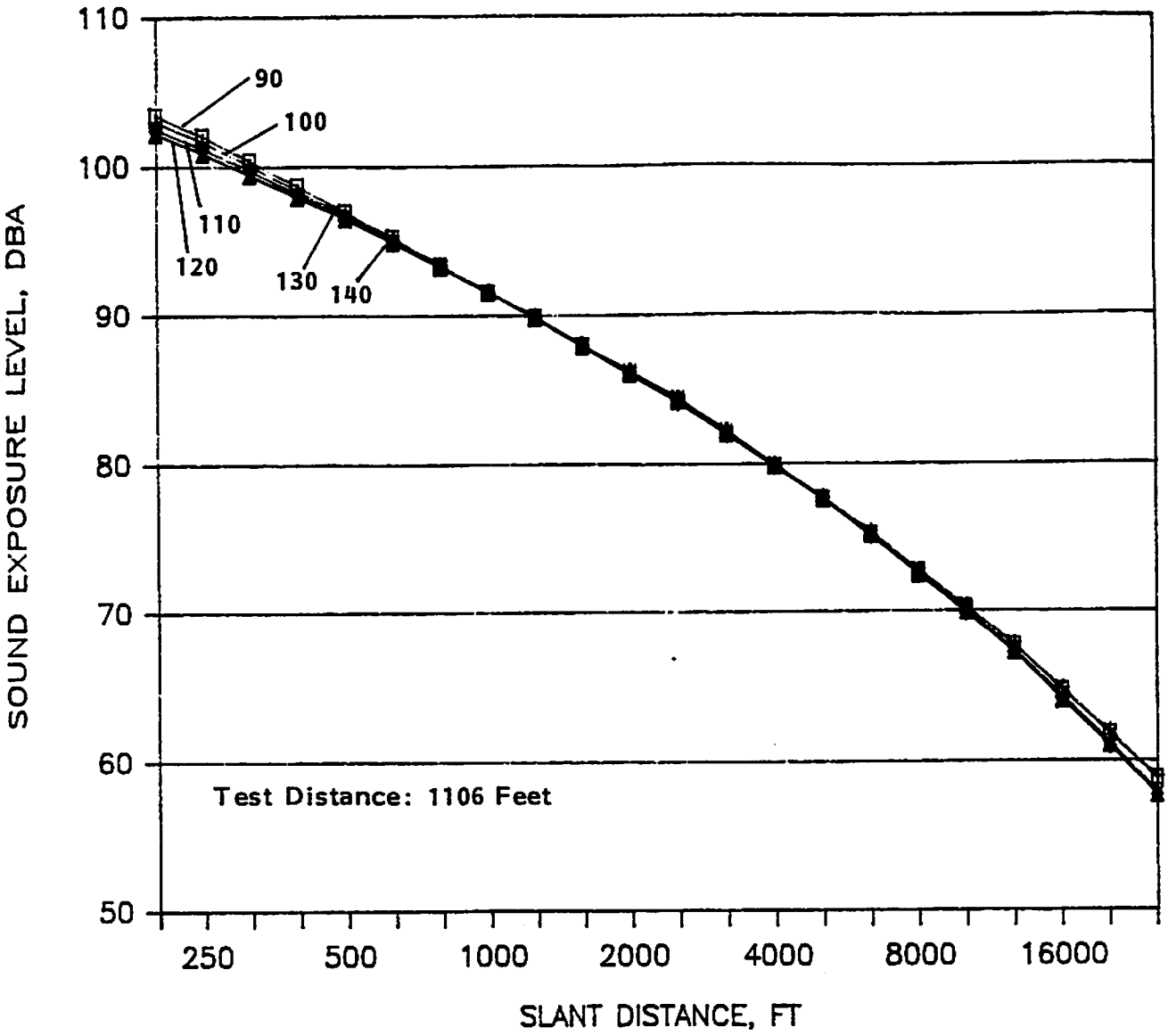

FIGURE 49. EFFECT OF ASSUMED MAXIMUM SOUND LEVEL EMISSION ANGLE ON SEL-B767

SEL/distance extrapolations, by the integrated/simplified procedures for a B767 during takeoff, with test distance of 1106 ft, in which the assumed emission angle is varied from 90 to 140 degrees. Except for very short distances, and very long distances, i.e., within the distances usually of interest, SEL is essentially independent of assumed emission angle. In essence, integration smoothes out the significance.

Another comparison of interest is the difference in SEL/distance functions between the integrated/simplified procedure and the simplified procedure by itself.

Figure 50 shows SEL and ALM extrapolations from measurements of a Saab 340 at a test height of 1020 ft, takeoff power, where the data were obtained during noise certification. For this airplane, the two procedures provide essentially identical results for ALM and differences of a few tenths of a decibel at some distances for SEL. The one-third octave sound pressure levels at 200 and 2500 ft extrapolated from the sound pressure levels at the time of the maximum sound level at the test height of 1020 ft are shown in Figure 51. The results are essentially identical for the two procedures.

Similar comparisons for MD-80 data measured in an "uncontrolled" operation at an airport are shown in Figures 52 and 53. These data again show essentially identical results for ALM. The expected small differences in SEL are more apparent in these calculations where the differences between the integrated and simplified procedures for extrapolating duration are small, but significant. Note that the integrated procedure produces a higher SEL at 2500 ft than the simplified procedure, as it should. At distances greater than 2500 ft, this difference remains constant since the simplified procedure is used for both cases.

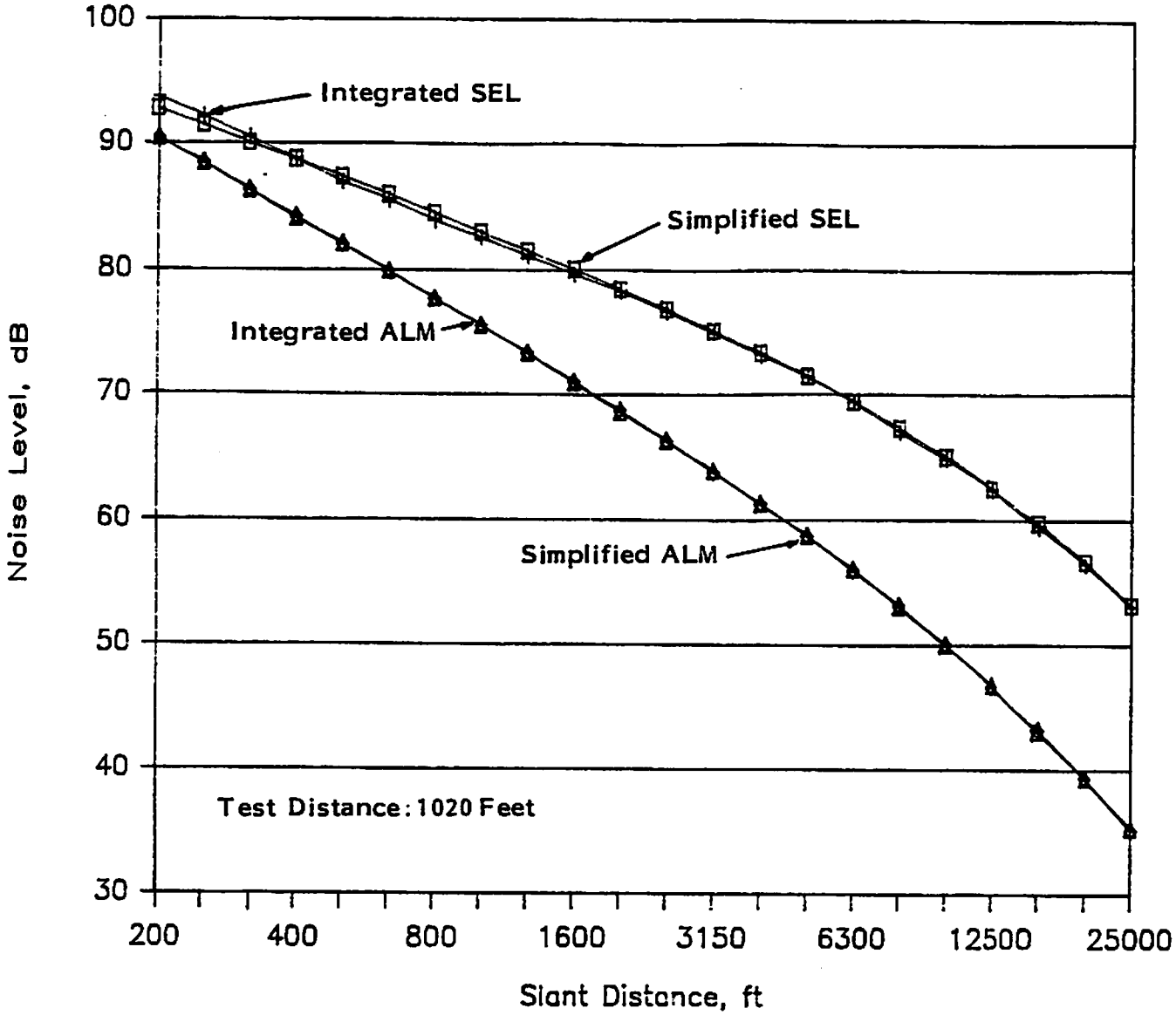

FIGURE 50. COMPARISON OF INTEGRATED AND SIMPLIFIED PROCEDURES FOR EXTRAPOLATING TEST DATA FOR SEL AND ALM - SAAB 340

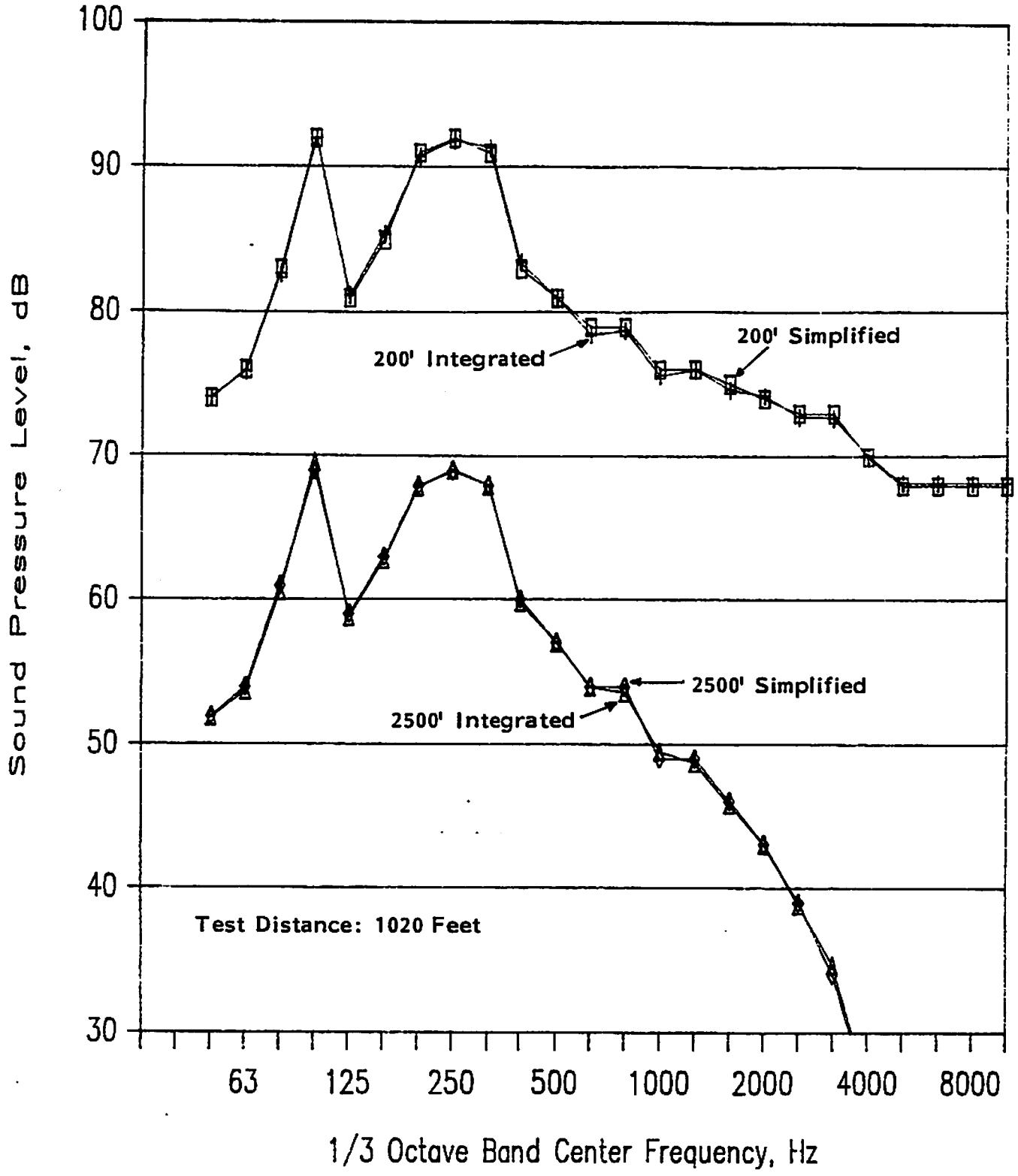

FIGURE 51. COMPARISONS OF SPECTRA EXTRAPOLATED FROM TEST DATA FOR SAAB 340 BY INTEGRATED AND SIMPLIFIED PROCEDURES

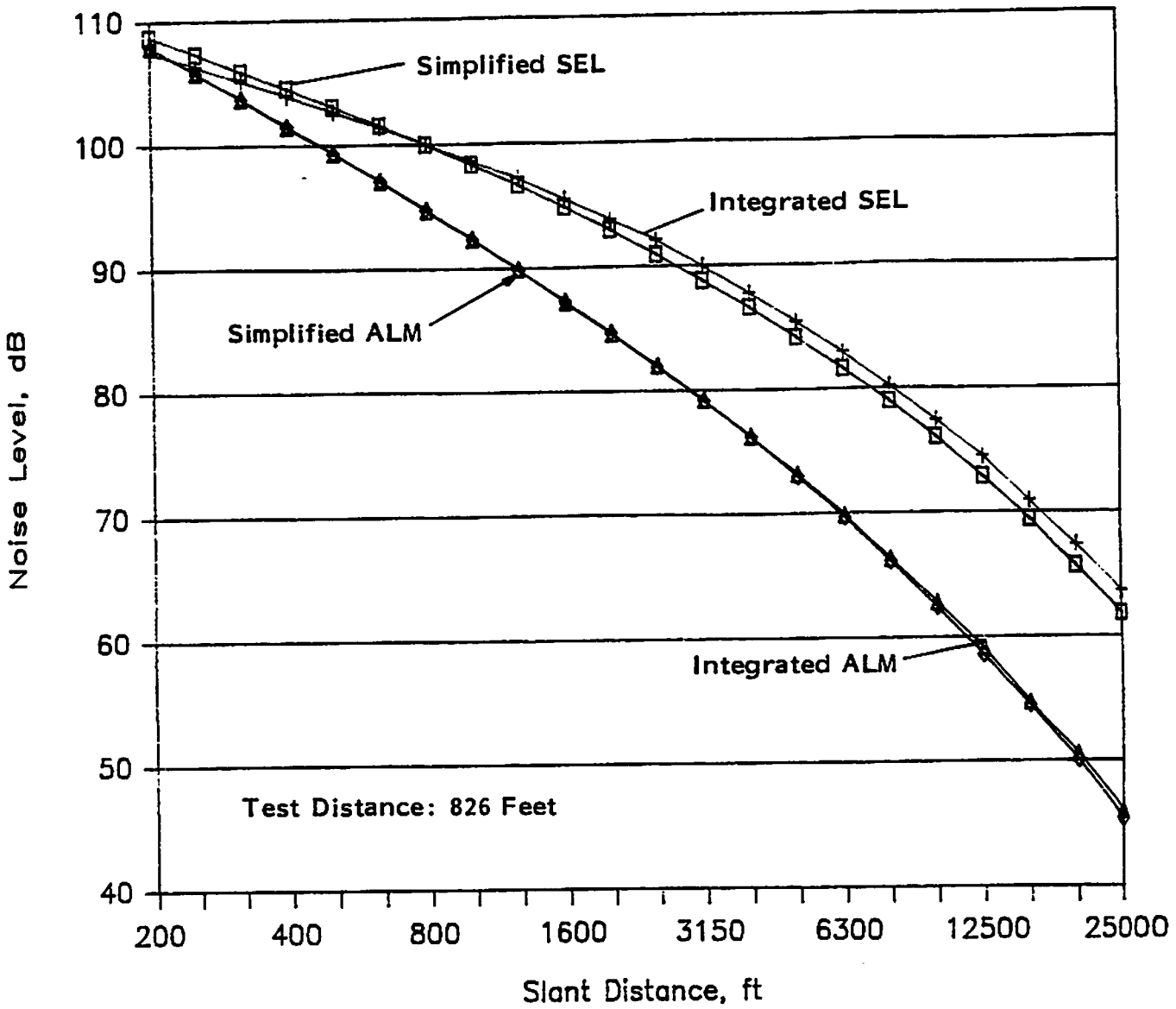

FIGURE 52. COMPARISON OF INTEGRATED AND SIMPLIFIED PROCEDURES FOR EXTRAPOLATING TEST DATA FOR SEL AND ALM-MD-80

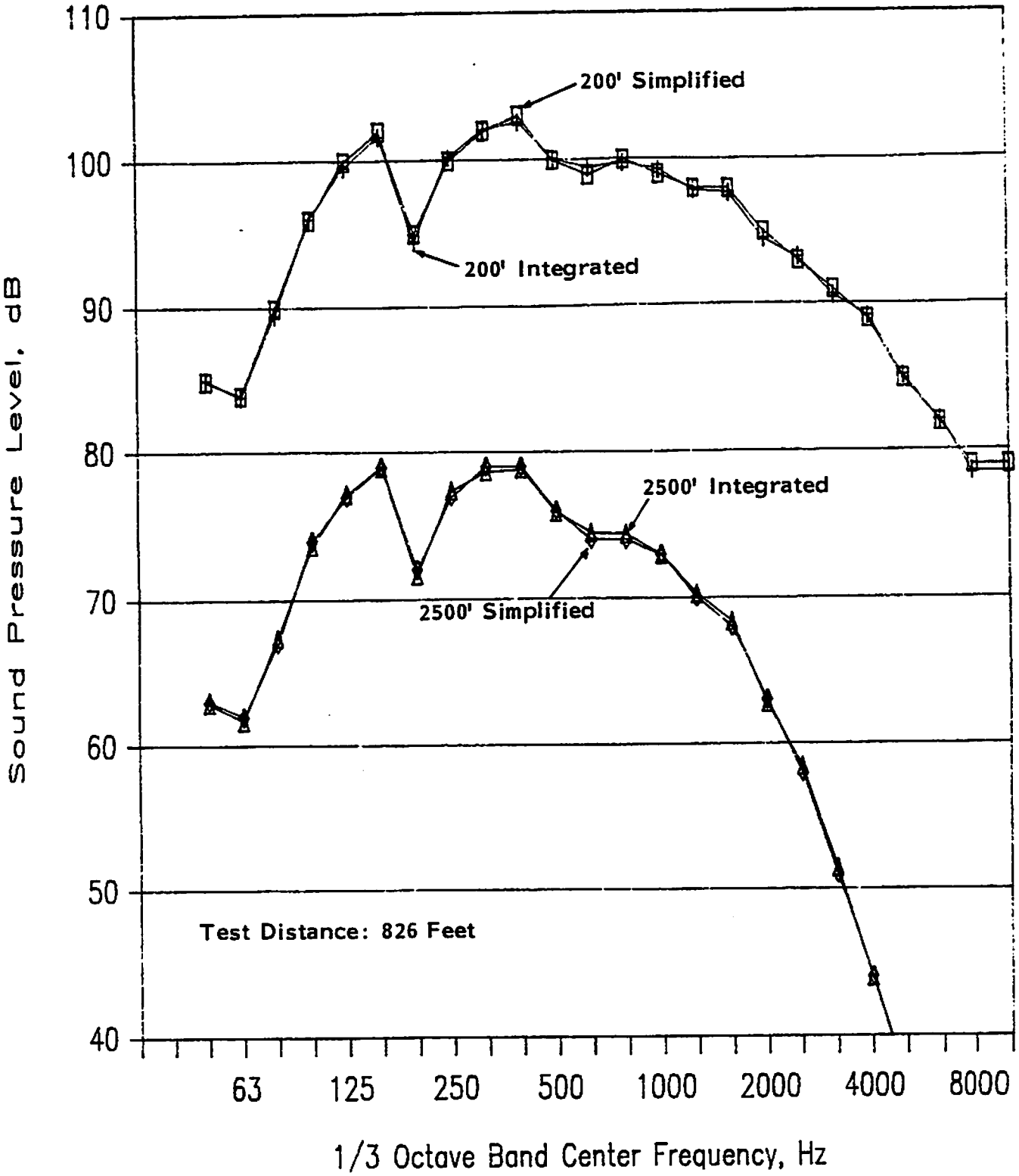

FIGURE 53. COMPARISONS OF SPECTRA EXTRAPOLATED FROM TEST DATA FOR MD-80 BY INTEGRATED AND SIMPLIFIED PROCEDURE

REFERENCES

1. CACI Inc-Federal "INM-Integrated Noise Model Version 3 User's Guide," FAA Report FAA-EE-81-17, October 1982.

2. Bishop, D.E., Beckmann, J.M., "Civil Aircraft Noise Data for Computation of Aircraft Noise Contours," BBN Report 4440 (Draft), November 1980.

3. Society of Automotive Engineers Aerospace Information Report (AIR) 1845, "Procedure for the Calculation of Airplane Noise in the Vicinity of Airports," March 1986.

4. Draft Appendix E, "Recommended Method for Computing Noise Contours Around Civil Airports", Working Group 1 Report to ICAO Committee on Aircraft Environmental Protection, August 1985.

5. Society of Automotive Engineers Aerospace Recommended Practice (ARP) 866A, "Standard Values of Atmospheric Absorption as a Function of Temperature and Humidity," Revised 1975.

6. EPA Report 550/9-74-004, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," March 1974.

7. Bishop, D.E., Horonjeff, R.D., "Procedures for Developing Noise Exposure Forecast Areas for Aircraft Flight Operations," FAA Report FAA DS-67-10, August 1967.

8. Potter, R.C., Mills, J.F., "Aircraft Flight Profiles for Use in Aircraft Noise Prediction Models," BBN Report 4594 (Draft), January 1981.

9. Wilby, J.F., Wilby, E.G., "A Comparison of Measured Takeoff and Flyover Sound Levels for Several General Aviation Propeller-Driven Aircraft," BBN Report 5450, November 1983.

10. International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP) Working Group II, Chapter "X" Noise Level Measurements for Light Propeller-Driven Aeroplanes (LPDA) Background Information Paper BIP/1-WG II/3, Revision 4, March 1985.

APPENDIX A
DESCRIPTION OF SOUND LEVEL MEASURES

A.1 Test Data

All sound level measures used in this report are based on test data recorded during a flyover and subsequently analyzed to obtain one-third octave sound pressure levels for each of the 24 one-third octave frequency bands whose band center frequencies range from 50 to 10,000 Hz. Analyses are obtained for each 0.5 sec sample of the recording during which the signal exceeds the background noise level of the test site.

All measured sound pressure levels are adjusted for recorder/reproducer frequency response to provide data equivalent to that which would have been obtained with a system having uniform frequency response between the lower edge of the 50 Hz band and the upper edge of the 10,000 Hz band. Measurement and analysis systems meet or exceed the specifications for equipment used for noise certification under FAR Part 36 and ICAO Annex 16.

A.2 Maximum A-Weighted Sound Level (ALM)

A-weighted sound levels are computed from the one-third octave sound pressure levels for each 0.5 sec data sample by applying the A-weighting defined in References A-1 and A-2. Maximum A-weighted sound level is the highest value obtained from the different 0.5 sec data samples.

In the integrated extrapolation procedure of AIR 1845 one-third octave sound pressure levels are projected from 0.5 sec sample test data at test distances to other distances. The equivalent sample duration is thus lesser or greater than 0.5 sec in proportion to the ratio of extrapolated to test distance.

A.3 Sound Exposure Level (SEL)

Sound exposure level, in dB, is the level of the integration over time of the mean square A-weighted sound pressure for an event, with a refernce time of one second. For aircraft flyovers, the A-weighted sound pressure is calculated from the one-third octave sound pressure levels as specified in A.2, and the integration is performed only over the upper 10 dB of the noise event. Because of the discrete time intervals for which data are available, the time integral is approximated by a numerical summation. Thus:

$$L_{AE} = 10 \log \left[(1/t_o) \sum_{i=t_1}^{t_2} (10^{0.1 L_A(i)})(\Delta t_i) \right]$$

where L_{AE} is the symbol for SEL, t_o is 1 second, $L_A(i)$ is the A-weighted sound level in the i-th time interval, Δt_i. The limits to the summation, t_1 and t_2, are for the first and last data samples that are within 10 dB of the maximum level for the event.

A.4 Effective Perceived Noise Level (EPNL)

Effective perceived noise level is computed analogously to SEL with the exception that the one-third octave sound pressure levels for each time sample are used to compute tone-corrected perceived noise level, PNLT, with symbol L_{PNT}, by the procedures in Reference A-3. The reference time, t_o, is 10 sec, and the summation limits t_1 and t_2 are again for time intervals in which PNLT is within 10 decibels of the maximum PNLT. Thus:

$$L_{EPN} = 10 \log \left[(1/t_o) \sum_{i=t_1}^{t_2} (10^{0.1 L_{TPN}(i)})(\Delta t_i) \right]$$

Again, Δt_i is usually 0.5 sec for measured data, but will vary when used in the integrated procedure. Note that, at a fixed distance of closest approach, Δt_i will vary for each time interval.

APPENDIX A REFERENCES

A-1. "Sound Level Meters" IEC Standard, Publication 651, International Electrotechnical Commission, Geneva, Switzerland (First Edition 1979).

A-2. "American National Specification for Sound Level Meters," ANSI S1.4-1983, Standards Secretariat, Acoustical Society of America, New York, NY.

A-3. "Noise Standards: Aircraft Type and Airworthiness Certification," Part 36 of the Federal Aviation Regulations.

APPENDIX B
COMPUTATION OF SOUND LEVEL DISTANCE FUNCTIONS

Analytic procedures for extrapolating test data to other distances are described in detail in Appendix B of SAE AIR 1845 and are not repeated here. A brief narrative description is provided below.

B.1 Simplified Procedure

Record/playback system corrected one-third octave sound pressure levels (SPL) are obtained for each 0.5 sec sample of the flyover sound recording. A-weighting or PNL weighting is applied to each 0.5 sec set of SPL's and the weighted SPL's are summed on a mean square basis to obtain an A-weighted sound level or PNLT for each 0.5 sec. The 0.5 sec time interval which contains the maximum sound level is then identified.

Sound exposure level can be related to maximum A-weighted sound level by the equation $L_{AE} = L_{AM} + D$, where L_{AE} symbolizes SEL, L_{AM} symbolizes ALM and D is the effective duration. In practice, D is determined by subtracting ALM from SEL for the test data. Effective duration for EPNL is analogous.

Distance of closest approach of the airplane during the flyover noise measurement is obtained usually from photographic scaling if tracking data are not available. Finally, the angle of maximum sound radiation must be identified from time synchronization of airplane tracking with the sound recording, by other timing means, or by estimation from other data.

The reference data for extrapolating from test distances to other distances are thus the one-third octave SPL's for the 0.5 sec time

interval containing ALM, SEL, D, test distance, and sound emission angle. Scaling EPNL is analogous. Sound levels at other than test distances are obtained by scaling the one-third octave SPL's of the single 0.5 sec containing maximum sound level by inverse square ratios of distance and air absorption as in AIR 1845. For each new distance, the new one-third octave SPL's are used to compute ALM or PNLTM.

For ALM extrapolation, the process is finished at this point. For SEL or EPNL, an effective duration at the extrapolated distance is obtained from the ratio of extrapolated to test distance. The new value for D is determined by the scaling parameter in AIR 1845.

B.2 Integrated Procedure

The integrated procedure extrapolates the one-third octave SPL's for each 0.5 sec of data from test distances to extrapolated distances exactly as in the simplified procedure except that the radiation angle varies with each 0.5 sec data sample. SEL and EPNL for extrapolated distances are now computed by summing each time sample in the extrapolation as described in Appendix A.

APPENDIX C
DISCUSSION OF "PROJECT" COMPUTER PROGRAM FOR CALCULATING SOUND LEVEL VS DISTANCE CURVES

The PROJECT computer program reads measured sound pressure level data caused by an aircraft flyover event, corrects the data for test day weather conditions and background noise, and projects each one-third octave band level recorded during each 0.5 sec sample of the flyover time history to a point on the reference flight path at a standard set of reference distances. Output from the program are noise level vs. distance functions for EPNL, SEL, and ALM (maximum A-level) calculated from the resultant spectral data. The method of Appendix B of AIR 1845 [C-1], was followed to project the test day data to reference flight paths.

PROGRAM FLOW

A flowchart of the PROJECT program is shown in Figure C-1. The first step in the program flow is to read the aircraft test flight identifier data (on Unit 5).

The program then reads a magnetic tape containing digitized one-third octave band sound pressure levels from 50 to 10,000 Hz for each 0.5 sec sample of the aircraft flyover. A permanent file containing an average background noise spectrum (also including recording system noise) is also read. The background spectrum is subtracted logarithmically from the flyover signal at each 0.5 sec and, unless the background level is within 3 db (of equal importance) or less of the flyover level. If this is the case, a zero value is placed in that band for that 0.5 sec sample. Note that a good quality flyover recording with high signal-to- noise ratio will result in very few zeros created by the above means.

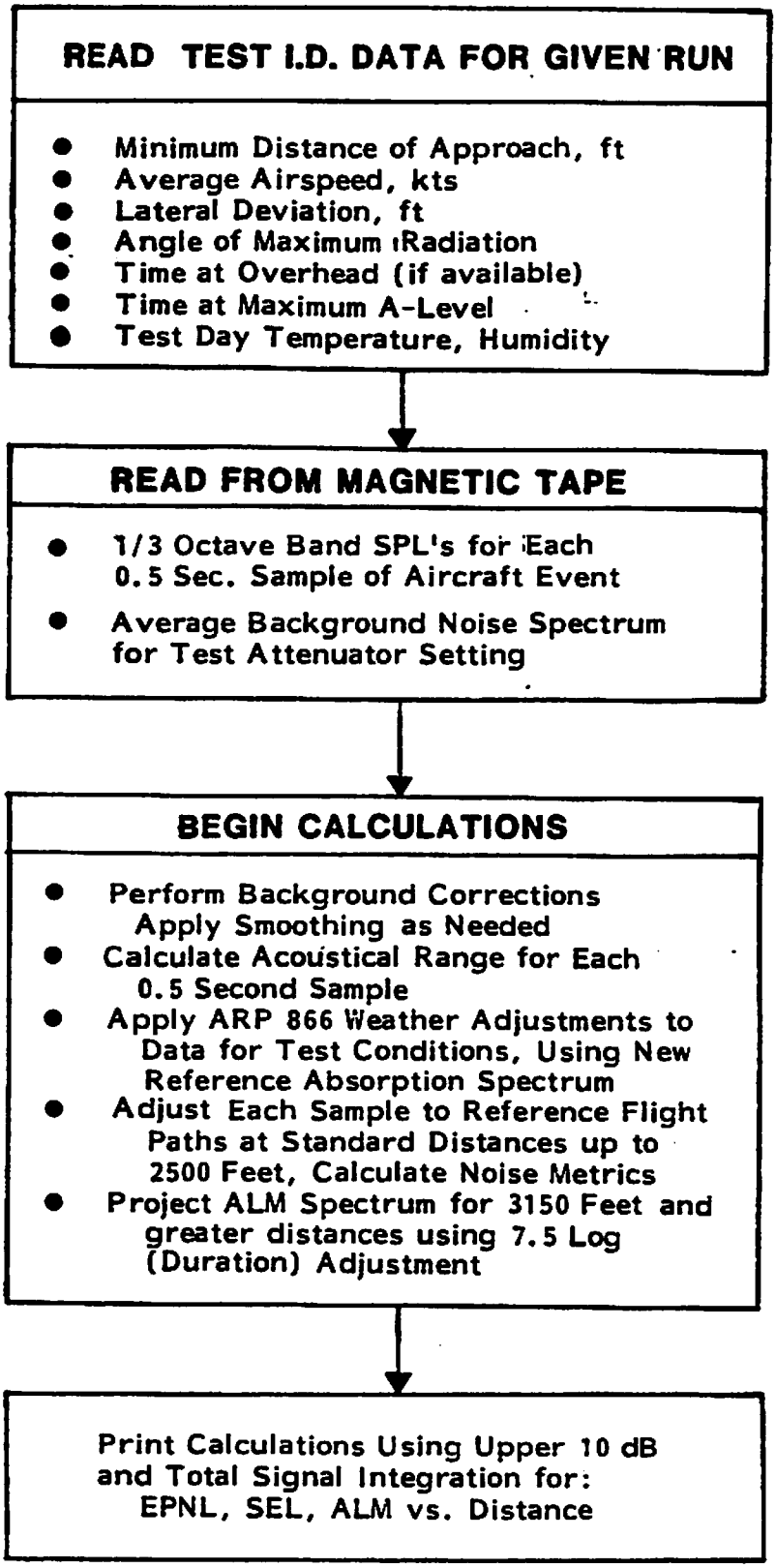

FIGURE C-1. "PROJECT" PROGRAM FLOW CHART

The background level is within 3 dB of the signal most often in the high frequency bands (above 3150 Hz), and occasionally in the low and mid-frequency bands. In order to calculate integrated noise levels as accurately as possible it is necessary to include as many time samples and frequency bands as possible in the analysis of a flyover event. Therefore, smoothing was applied to the spectra in which some data loss occurred. For low and mid-frequency zeros in which no adjacent bands were affected, simple linear interpolation was performed. If adjacent bands were missing, linear interpolation was performed between 50 Hz and 2000 Hz. If the 50 Hz band was a zero, the first non-zero band SPL was used in the first few bands as needed. In the case of high frequency zeros (2500 Hz or above), the succeeding bands were rolled off at the same rate as the last two good band levels, or at 5 dB per one-third octave band, whichever was greater.

An additional problem existed for much of the flyover data analyzed with the PROJECT program. Newer aircraft, such as the MD-80 or the B757, have very little high frequency content (above 5000 Hz) when measured at typical distances such as 1000 ft. System noise in this range in the recorded data can result in erroneous results when the weather and distance adjustments are made. Therefore, a program warning flag was used to note the first band (i.e., 6300 or 8000 Hz) in which the dynamic range over the flyover signal history in that band is less than 8 dB. (The range in a "good" recording is 15-20 dB.)

The background-corrected and smoothed spectral levels are now ready for processing. Following the procedures of SAE ARP 1845 [C-1], the sound propagation distance for each 0.5 sec sample is calculated. The test day sound absorption spectra for each sample are then calculated using SAE ARP 866 [C-2]. The new reference absorption spectra are used to adjust the data along

each 0.5 sec acoustical path to give weather-corrected sound pressure levels for the test flight path. Each 0.5 sec sample is then projected to a reference flight path determined by a standard set of minimum distances (200, 250, 315 feet, etc.) up to 2500 feet. Beyond the 2500 feet distance, the simplified duration adjustment of 7.5 log (distance) is applied to the maximum A-level spectrum up to 25,000 feet.

At this point in the program flow, the need for further screening of high frequency spectral levels exists. Because of the large acoustical range values near the beginning and the end of the flyover signal, large adjustments are made to the data in the high frequency bands. When the adjustment is from a 1000-foot test distance to the 200 foot reference distance, for example, large positive corrections are made, resulting in a strong increase in level with band number above 5000 Hz. This erroneous result affects the maximum A-level and PNLT calculation and was eliminated by forcing such spectra to be "flat" (non-increasing) in level at or above the 5000 Hz band. In this way, the true maximum spectral levels are calculated from a 0.5 sec sample in the middle of the flyover and not from one at the "skirts".

APPENDIX C REFERENCES

C-1. Society of Automotive Engineers Aerospace Information Report (AIR) 1845, "Procedure for the Calculation of Airplane Noise in the Vicinity of Airports", March 1986.

C-2. Society of Automotive Engineers Aerospace Recommended Practice (ARP) 866A, "Standard Values of Atmospheric Absorption as a Function of Temperature and Humidity", Revised 1975.

APPENDIX D
AIRCRAFT REFERENCE ONE-THIRD OCTAVE BAND SOUND PRESSURE LEVELS

This appendix provides one-third octave band spectrum levels at distances of 1000 ft (305 m) for the aircraft listed in the body of the report. The tabulated levels represent the one-third octave band levels at the time that the maximum A-levels are attained*. In some cases, levels at higher one-third octave band frequencies are not reported, since they could not be determined due to signal-to-noise limitations.

The numbering of the tables in this appendix begin with table D-3, to match the numbering of the aircraft tables in the body of the report. There is no Table D-23, since noise spectra were not computed for the composite business jet aircraft.

*Maximum A-levels and maximum tone corrected perceived noise levels may occur at differing times during a flyover, hence the corresponding noise spectra may differ.

TABLE D-3

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOJET, NARROW BODY TRANSPORT AIRCRAFT
BOEING 707 AND DOUGLAS DC-8 SERIES AIRCRAFT WITH
PRATT & WHITNEY JT4A SERIES ENGINES WITH
NOISE SUPPRESSORS

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 4000	15,000
50	70.6	85.8
63	67.6	84.8
80	68.6	83.8
100	66.6	87.8
125	68.6	83.8
160	74.6	97.8
200	76.6	95.8
250	73.6	92.8
315	75.6	96.8
400	77.6	94.8
500	75.6	95.8
630	74.6	95.8
800	75.6	95.8
1000	74.6	96.8
1250	74.6	95.8
1600	74.6	93.8
2000	77.6	92.8
2500	85.6	90.8
3150	75.6	87.8
4000	70.6	83.8
5000	73.6	78.8
6300	66.6	71.8
8000	58.6	63.8
10,000	45.6	53.8

TABLE D-4

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
BOEING 707 AND DOUGLAS DC-8 SERIES AIRCRAFT
WITH JT3D SERIES ENGINES, UNTREATED NACELLES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 4000	15,000
50	66.7	85.7
63	66.7	83.7
80	63.7	82.7
100	65.7	90.7
125	71.7	95.7
160	74.7	96.7
200	72.7	94.7
250	68.7	90.7
315	74.7	95.7
400	70.7	91.7
500	71.7	93.7
630	69.7	93.7
800	68.7	92.7
1000	71.7	91.7
1250	73.7	91.7
1600	71.7	90.7
2000	79.7	88.7
2500	88.7	88.7
3150	73.7	95.7
4000	67.7	89.7
5000	69.7	78.7
6300	57.7	75.7
8000	51.7	69.7
10,000	39.7	62.7

TABLE D-5

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
DOUGLAS DC-8-60 SERIES AIRCRAFT
WITH JT3D SERIES ENGINES,
ACOUSTICALLY-LINED NACELLES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 3000	5000	11,000	15,500
50	66.4	70.2	77.0	90.5
63	64.1	64.4	67.9	88.9
80	60.7	64.5	72.4	82.6
100	64.9	72.1	80.6	91.3
125	72.9	77.3	86.8	98.8
160	76.4	76.9	86.8	101.0
200	72.8	72.3	83.9	99.1
250	67.5	72.9	80.1	91.0
315	71.7	73.8	85.2	96.4
400	70.3	75.9	82.7	92.6
500	71.9	74.2	85.6	94.6
630	69.9	74.1	83.4	90.5
800	68.8	74.1	82.7	88.5
1000	69.1	75.0	79.5	85.6
1250	69.6	74.2	78.8	83.7
1600	69.3	72.6	79.3	82.2
2000	67.2	70.3	78.3	79.0
2500	78.5	74.2	74.9	76.4
3150	73.3	72.5	72.9	72.8
4000	60.8	63.1	72.5	68.4
5000	59.9	62.4	65.2	61.8
6300	55.1	59.7	57.2	54.3
8000	48.6	57.3	50.9	50.3
10,000	36.9	47.4	45.5	50.3

TABLE D-6

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
DOUGLAS DC-8-70 SERIES AIRCRAFT
WITH RETROFIT CFM-56 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 5000	15,500
50	64.6	69.5
63	68.3	66.4
80	66.0	78.5
100	63.6	84.6
125	63.7	84.0
160	64.5	81.8
200	72.5	79.3
250	76.6	84.4
315	73.7	81.7
400	68.6	86.5
500	73.3	85.2
630	72.5	83.7
800	74.1	80.3
1000	70.6	79.5
1250	71.0	78.2
1600	67.1	76.8
2000	62.8	74.7
2500	62.3	72.0
3150	63.9	71.6
4000	58.9	71.8
5000	58.6	70.5
6300	53.1	66.3
8000	49.6	61.0
10,000	35.1	53.4

TABLE D-7

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
BRITISH AEROSPACE BAe 146 SERIES AIRCRAFT
WITH ALF-502R ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	30	100
50	60.3	72.7
63	60.3	72.7
80	60.3	72.7
100	61.3	78.7
125	67.6	87.3
160	67.8	74.4
200	64.5	74.1
250	60.5	78.5
315	67.2	76.5
400	63.8	77.2
500	66.7	77.6
630	66.4	75.4
800	67.5	77.6
1000	67.8	76.5
1250	66.3	74.8
1600	64.5	74.0
2000	61.6	71.9
2500	60.2	70.1
3150	59.8	70.4
4000	58.0	71.3
5000	57.6	68.6
6300	52.1	65.8
8000	49.5	61.1
10,000	46.1	53.8

TABLE D-8

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT
BOEING 747 SERIES AIRCRAFT WITH JT9D SERIES ENGINES,
BLOW-IN DOOR NACELLES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 8000	14,000	28,000	36,000
50	62.2	67.2	73.7	75.2
63	61.2	66.2	79.7	81.2
80	62.2	67.2	88.7	90.2
100	71.2	76.2	92.7	94.2
125	73.2	78.2	93.7	95.2
160	72.2	77.2	92.7	94.2
200	71.2	76.2	91.7	93.2
250	71.2	76.2	91.7	93.2
315	71.2	76.2	91.7	93.2
400	71.2	76.2	91.7	93.2
500	72.2	77.2	90.7	92.2
630	71.2	76.2	89.7	91.2
800	71.2	76.2	89.7	91.2
1000	72.2	77.2	87.7	89.2
1250	74.2	79.2	86.7	88.2
1600	79.2	84.2	87.7	89.2
2000	74.2	79.2	88.7	90.2
2500	74.2	79.2	93.7	95.2
3150	72.2	77.2	83.7	85.2
4000	68.2	73.2	77.7	79.2
5000	65.2	70.2	72.7	74.2
6300	59.2	64.2	64.7	66.2
8000	51.2	56.2	55.7	57.2
10,000	40.2	45.2	45.7	47.2

TABLE D-9

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT
BOEING 747 SERIES AIRCRAFT
WITH JT9D SERIES ENGINES,
FIXED-LIP NACELLES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 8000	16,000	32,000	40,000
50	70.4	75.8	73.5	75.5
63	64.5	69.9	77.4	79.4
80	66.1	71.5	83.1	85.1
100	67.5	72.9	88.1	90.1
125	73.8	79.2	89.8	91.8
160	77.8	83.2	84.7	86.7
200	75.2	80.6	87.6	89.6
250	71.8	77.2	91.6	93.6
315	79.7	85.1	86.4	88.4
400	75.7	81.1	87.9	89.9
500	76.9	82.3	87.0	89.0
630	74.6	80.0	85.5	87.5
800	73.9	79.3	84.1	86.1
1000	73.4	78.8	82.5	84.5
1250	72.1	77.5	81.2	83.2
1600	70.5	75.9	80.5	82.5
2000	70.9	76.3	80.7	82.7
2500	72.8	78.2	85.1	87.1
3150	74.5	79.9	79.7	81.7
4000	75.9	81.3	79.6	81.6
5000	69.1	74.5	79.6	81.6
6300	62.7	68.1	73.1	75.1
8000	55.6	61.0	68.8	70.8
10,000	49.0	54.4	58.8	60.8

TABLE D-10

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE SUPERSONIC TRANSPORT AIRCRAFT
CONCORDE SST WITH OLYMPUS 593 TURBOJET
AFTERBURNER ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 10,000	32,000
50	78.6	108.7
63	84.6	113.7
80	83.6	115.7
100	83.6	116.7
125	91.6	115.7
160	89.6	114.7
200	93.6	109.7
250	92.6	114.7
315	96.6	116.7
400	95.6	120.7
500	96.6	116.7
630	92.6	111.7
800	90.6	116.7
1000	88.6	110.7
1250	86.6	111.7
1600	86.6	110.7
2000	84.6	109.7
2500	81.6	110.7
3150	79.6	109.7
4000	75.6	106.7
5000	73.6	105.7
6300	67.6	103.7
8000	60.6	96.7
10,000	--	46.7

TABLE D-11

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
BOEING 727 SERIES AIRCRAFT WITH JT8D SERIES ENGINES,
UNTREATED NACELLES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 3000	6,000	14,000
50	67.6	72.0	86.7
63	68.2	72.7	88.4
80	68.9	73.4	89.2
100	69.4	73.9	99.7
125	75.7	80.2	107.8
160	80.3	84.6	105.4
200	77.5	82.0	99.1
250	73.4	77.9	102.9
315	79.3	83.8	103.0
400	75.2	79.7	100.6
500	77.1	81.6	98.6
630	76.3	80.8	98.5
800	73.6	78.1	99.2
1000	72.7	77.2	97.0
1250	71.9	76.4	95.2
1600	70.5	75.0	93.4
2000	69.2	73.7	90.8
2500	70.7	75.2	88.0
3150	65.7	70.2	85.3
4000	62.7	67.2	81.6
5000	60.3	64.8	77.6
6300	59.0	63.5	72.4
8000	57.3	61.8	70.9
10,000	48.5	53.0	68.3

TABLE D-12

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
3-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
BOEING 727 SERIES AIRCRAFT WITH JT8D SERIES ENGINES,
ACOUSTICALLY-LINED NACELLES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 3000	6000	14,000
50	63.8	69.0	86.2
63	64.5	69.7	87.9
80	65.2	70.4	88.7
100	65.7	70.9	99.2
125	72.0	77.2	107.3
160	76.6	81.8	104.9
200	73.8	79.0	98.6
250	69.7	74.9	102.4
315	76.5	80.8	102.5
400	71.5	76.7	100.1
500	73.4	78.6	98.1
630	72.6	77.8	98.0
800	69.9	75.1	98.7
1000	69.0	74.2	96.5
1250	68.2	73.4	94.7
1600	66.8	72.0	92.9
2000	65.5	70.7	90.3
2500	67.0	72.2	87.5
3150	62.0	67.2	84.8
4000	59.0	64.2	81.1
5000	56.6	61.8	77.1
6300	55.3	60.5	71.9
8000	53.6	58.8	70.4
10,000	44.8	50.0	67.8

TABLE D-13

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT
DOUGLAS DC-10 SERIES AIRCRAFT
WITH CF6 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 8000	36,000
50	62.5	67.4
63	60.5	75.4
80	66.5	82.4
100	70.5	89.4
125	73.5	91.4
160	70.5	88.4
200	65.5	86.4
250	69.5	86.4
315	69.5	85.4
400	71.5	85.4
500	69.5	85.4
630	69.5	84.4
800	69.5	84.4
1000	68.5	81.4
1250	67.5	81.4
1600	66.5	81.4
2000	65.5	80.4
2500	65.5	78.4
3150	67.5	73.4
4000	68.5	69.4
5000	66.5	66.4
6300	57.5	61.4
8000	50.5	55.4
10,000	42.5	47.4

TABLE D-14

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
3-ENGINE TURBOFAN, WIDE BODY TRANSPORT AIRCRAFT
LOCKHEED L-1011 SERIES AIRCRAFT,
WITH RB211 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 8000	36,000
50	62.5	67.9
63	60.5	75.9
80	66.5	82.9
100	70.5	89.9
125	73.5	91.9
160	70.5	88.9
200	65.5	86.9
250	69.5	86.9
315	69.5	85.9
400	71.5	85.9
500	69.5	85.9
630	69.5	84.9
800	69.5	84.9
1000	68.5	81.9
1250	67.5	81.9
1600	66.5	81.9
2000	65.5	80.9
2500	65.5	78.9
3150	67.5	73.9
4000	68.5	69.9
5000	66.5	66.9
6300	57.5	61.9
8000	50.5	55.9
10,000	42.5	47.9

TABLE D-15

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
BOEING 737 AND DOUGLAS DC-9 SERIES AIRCRAFT
WITH JT8D SERIES ENGINES, UNTREATED NACELLES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 3000	6000	14,000
50	65.5	70.0	84.7
63	66.2	70.7	86.4
80	66.9	71.4	87.2
100	67.4	71.9	97.7
125	73.7	78.2	105.8
160	78.3	82.8	103.4
200	75.5	80.0	97.1
250	71.4	75.9	100.9
315	77.3	81.8	101.0
400	73.2	77.7	98.6
500	75.1	79.6	96.6
630	74.3	78.8	96.5
800	71.6	76.1	97.2
1000	70.7	75.2	95.0
1250	69.9	74.4	93.2
1600	68.5	73.0	91.4
2000	67.2	71.7	88.8
2500	68.7	73.2	86.0
3150	63.7	68.2	83.3
4000	60.7	65.2	79.6
5000	58.3	62.8	75.6
6300	57.0	61.5	70.4
8000	55.3	59.8	68.9
10,000	46.5	51.0	66.3

TABLE D-16

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
BOEING 737 AND DOUGLAS DC-9 SERIES AIRCRAFT WITH
JT8D SERIES ENGINES, ACOUSTICALLY-LINED NACELLES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 3000	6000	14,000
50	61.8	67.0	84.2
63	62.5	67.7	85.9
80	63.2	68.4	86.7
100	63.7	68.9	97.2
125	70.0	75.2	105.3
160	74.6	79.8	102.9
200	71.8	77.0	96.6
250	67.7	72.9	100.4
315	73.6	78.8	100.5
400	69.5	74.7	98.1
500	71.4	76.6	96.1
630	70.6	75.8	96.0
800	67.9	73.1	96.7
1000	67.0	72.2	94.5
1250	66.2	71.4	92.7
1600	64.8	70.0	90.9
2000	63.5	68.7	88.3
2500	65.0	70.2	85.5
3150	60.0	65.2	82.8
4000	57.0	62.2	79.1
5000	54.6	59.8	75.1
6300	53.3	58.5	69.9
8000	51.6	56.8	68.4
10,000	42.8	48.0	65.8

TABLE D-17

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN, NARROW BODY TRANSPORT AIRCRAFT
FOKKER-VFW F28-2000 AIRCRAFT WITH RB183 MK555-15 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs				
	2000	4000	6000	8000	10,000
50	69.2	73.2	87.2	93.9	85.7
63	72.2	76.2	89.2	85.9	87.7
80	73.2	77.2	90.2	94.9	85.7
100	73.2	77.2	92.2	86.9	87.7
125	73.2	77.2	90.2	90.9	94.7
160	76.2	80.2	92.2	95.9	100.7
200	76.2	80.2	95.2	97.9	101.7
250	75.2	79.2	91.2	94.9	96.7
315	75.2	79.2	89.2	93.9	99.7
400	75.2	79.2	89.2	92.9	98.7
500	74.2	78.2	86.2	91.9	95.7
630	73.2	77.2	86.2	90.9	97.7
800	73.2	77.2	85.2	90.9	98.7
1000	72.2	76.2	84.2	89.9	96.7
1250	70.2	74.2	83.2	89.9	94.7
1600	68.2	72.2	81.2	86.9	92.7
2000	66.2	70.2	77.2	83.9	90.7
2500	64.2	68.2	72.2	79.9	85.7
3150	61.2	65.2	69.2	73.9	79.7
4000	56.2	60.2	64.2	71.9	77.7
5000	50.2	54.2	52.2	64.9	71.7
6300	42.2	46.2	46.2	58.9	64.7
8000	31.2	35.2	55.2	47.9	53.7
10000	19.2	23.2	22.2	24.9	37.7

TABLE D-18

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 FT (305m) DISTANCE FOR
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY
TRANSPORT AIRCRAFT - DOUGLAS MD-80 SERIES AIRCRAFT
WITH JT8D-209/217 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 4000	8000	12,000	16,000
50	53.7	60.2	65.7	70.4
63	52.0	58.5	64.5	69.2
80	54.3	60.8	70.2	74.9
100	62.9	69.4	76.7	81.4
125	67.7	74.2	80.1	84.8
160	68.6	75.1	82.2	86.9
200	64.0	68.5	74.9	79.6
250	67.2	73.7	80.7	85.4
315	69.7	76.2	82.3	87.0
400	70.5	77.0	82.7	87.4
500	68.5	75.0	80.0	84.7
630	67.0	73.5	78.9	83.6
800	67.0	73.5	79.3	84.0
1000	64.9	71.4	78.5	83.2
1250	61.2	67.7	76.7	81.4
1600	58.5	65.0	75.9	80.6
2000	54.8	61.3	71.9	76.6
2500	52.4	58.9	69.5	74.2
3150	49.7	56.2	65.3	70.0
4000	49.1	55.6	61.8	66.5
5000	49.1	55.6	56.5	61.2
6300	35.4	41.9	49.2	53.9
8000	27.9	34.4	40.5	45.2
10,000	73.9	80.4	37.6	42.3

TABLE D-19

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE HIGH BYPASS RATIO TURBOFAN, NARROW BODY
TRANSPORT AIRCRAFT - BOEING 737-300 AIRCRAFT
WITH CFM-56 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 5000	30,000
50	68.3	67.3
63	68.3	67.6
80	68.3	76.1
100	68.2	80.6
125	68.3	81.4
160	70.7	78.0
200	73.1	75.2
250	67.1	79.0
315	72.4	76.3
400	72.3	80.4
500	71.9	80.8
630	75.2	80.6
800	75.2	80.5
1000	69.8	77.6
1250	68.7	75.6
1600	68.1	74.9
2000	65.6	69.9
2500	64.5	69.0
3150	63.3	65.6
4000	61.9	66.4
5000	60.0	66.3
6300	57.6	54.3
8000	48.4	51.8
10,000	38.6	51.7

TABLE D-20

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE HIGH BYPASS RATIO TURBOFAN,
NARROW BODY TRANSPORT AIRCRAFT
BOEING 757-200 AIRCRAFT WITH RB211-535 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 5000	10,000	30,000
50	64.4	66.4	67.6
63	66.8	68.8	77.0
80	66.4	68.4	81.0
100	65.9	67.9	83.7
125	65.5	67.5	87.5
160	70.8	72.8	83.9
200	72.8	74.8	85.4
250	70.0	72.0	87.9
315	67.8	69.8	86.2
400	70.8	72.8	83.1
500	69.7	71.7	83.1
630	69.9	71.9	82.1
800	68.1	70.1	81.1
1000	66.4	68.4	80.9
1250	67.1	69.1	80.5
1600	63.7	65.7	82.0
2000	63.9	65.9	81.5
2500	68.0	70.0	78.0
3150	66.3	68.3	74.3
4000	69.0	71.0	74.4
5000	59.8	61.8	69.1
6300	52.2	54.2	62.4
8000	45.5	47.5	53.2
10,000	34.2	36.2	48.6

TABLE D-21

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT
AIRCRAFT - AIRBUS A300 AND A310 AIRCRAFT
WITH CF6 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 10,000	40,000
50	66.9	67.7
63	69.3	77.1
80	68.9	81.1
100	68.4	83.8
125	68.0	85.6
160	73.3	84.0
200	75.3	85.5
250	72.5	88.0
315	70.3	86.3
400	73.3	83.2
500	72.2	83.2
630	72.4	82.2
800	70.6	81.2
1000	68.9	81.0
1250	69.6	80.6
1600	66.2	82.1
2000	66.4	81.6
2500	70.5	78.1
3150	68.8	74.4
4000	71.5	74.5
5000	62.3	69.2
6300	54.7	62.5
8000	48.0	54.3
10,000	36.7	48.7

TABLE D-22

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE HIGH BYPASS RATIO TURBOFAN, WIDE BODY TRANSPORT
AIRCRAFT - BOEING 767-200 AIRCRAFT WITH CF6-80A
OR JT9D-7R4 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 10,000	38,000
50	67.4	67.3
63	69.8	76.7
80	69.4	80.7
100	68.9	83.4
125	68.5	87.2
160	73.8	83.6
200	75.8	85.1
250	73.0	87.6
315	70.8	85.9
400	73.8	82.8
500	72.7	82.8
630	72.9	81.8
800	71.1	80.8
1000	69.4	80.6
1250	70.1	80.2
1600	66.7	81.7
2000	66.9	81.2
2500	71.0	77.7
3150	87.3	74.0
4000	72.0	74.1
5000	62.8	68.8
6300	55.2	62.1
8000	48.5	53.9
10,000	37.2	48.3

TABLE D-24

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOJET BUSINESS AIRCRAFT - GATES LEARJET 24/25
AIRCRAFT WITH CJ610 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 700	1800	2600
50	60.4	67	65.3
63	59.4	67	72.3
80	60.4	73	75.3
100	67.4	78	83.3
125	71.4	85	89.3
160	67.4	84	90.3
200	67.4	82	91.3
250	73.4	90	94.3
315	70.4	89	95.3
400	73.4	92	97.3
500	73.4	93	97.3
630	74.4	92	97.3
800	73.4	92	97.3
1000	73.4	91	96.3
1250	72.4	90	96.3
1600	71.4	89	94.3
2000	69.4	87	93.3
2500	67.4	84	92.3
3150	63.4	80	89.3
4000	59.4	76	87.3
5000	54.4	69	83.3
6300	46.4	62	76.3
8000	35.4	53	64.3
10,000	23.4	--	49.3

TABLE D-25

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOJET BUSINESS AIRCRAFT - GULFSTREAM GIIB
AND GIII AIRCRAFT WITH SPEY MK511 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust/Eng, lbs 2000	4000	6000	8000	10,000
50	63.4	72.4	89.3	87.9	89.9
63	66.4	75.4	91.3	89.9	91.9
80	67.4	76.4	92.3	88.9	89.9
100	67.4	76.4	94.3	90.9	91.9
125	67.4	76.4	92.3	94.9	98.9
160	70.4	79.4	94.3	99.9	104.9
200	70.4	79.4	97.3	101.9	105.9
250	69.4	78.4	93.3	98.9	100.9
315	69.4	78.4	91.3	97.9	103.9
400	69.4	78.4	91.3	96.9	102.9
500	68.4	77.4	88.3	96.9	99.9
630	67.4	76.4	88.3	94.9	101.9
800	67.4	76.4	87.3	94.9	102.9
1000	66.4	75.4	86.3	93.9	100.9
1250	64.4	73.4	85.3	93.9	98.9
1600	62.4	71.4	83.3	90.9	96.9
2000	60.4	69.4	79.3	87.9	94.9
2500	58.4	67.4	74.3	83.9	89.9
3150	55.4	64.4	71.3	77.9	83.9
4000	50.4	59.4	66.3	75.9	81.9
5000	44.4	53.4	54.3	68.9	75.9
6300	36.4	45.4	48.3	62.9	68.9
8000	25.4	34.4	57.3	51.9	57.9
10,000	13.4	22.4	24.3	28.9	41.9

TABLE D-26

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - GATES LEARJET 35/36
AIRCRAFT WITH TFE 731 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust/Eng, lbs 1000	1500	2650
50	60.5	62.2	67.1
63	55.5	60.2	63.2
80	59.5	62.2	67.1
100	69.5	68.2	74.1
125	73.5	77.2	79.1
160	67.5	75.2	81.1
200	62.5	72.2	77.1
250	69.5	73.2	81.1
315	64.5	73.2	83.1
400	66.5	72.2	82.1
500	65.5	72.2	82.1
630	64.5	72.2	82.1
800	64.5	72.2	81.1
1000	64.5	69.2	81.1
1250	63.5	69.2	79.1
1600	63.5	69.2	78.1
2000	63.5	69.2	77.1
2500	62.5	67.2	74.1
3150	60.5	63.2	73.1
4000	60.5	63.2	70.1
5000	55.5	55.2	69.1
6300	49.5	46.2	65.1
8000	41.5	35.2	56.1
10,000	28.5	--	45.1

TABLE D-27

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ROCKWELL
SABRELINER 80 AIRCRAFT WITH CF700 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, lbs 850	2500	3750
50	60.6	66.1	64.1
63	56.6	65.1	65.1
80	58.6	71.1	76.1
100	66.6	76.1	81.1
125	69.6	78.1	83.1
160	69.6	74.1	78.1
200	67.6	75.1	81.1
250	74.6	80.1	84.1
315	71.6	76.1	82.1
400	66.6	77.1	82.1
500	67.6	76.1	82.1
630	69.6	77.1	82.1
800	71.6	77.1	82.1
1000	69.6	77.1	82.1
1250	67.6	75.1	81.1
1600	68.6	72.1	78.1
2000	67.6	71.1	76.1
2500	67.6	70.1	76.1
3150	66.6	67.1	73.1
4000	74.6	66.1	70.1
5000	69.6	67.1	66.1
6300	58.6	64.1	61.1
8000	51.6	53.1	55.1
10,000	35.6	30.1	38.1

TABLE D-28

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CESSNA 500/501
CITATION I AND II AIRCRAFT WITH JT15D SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust/Eng, lbs			
	300	600	1200	1550
50	50.5	51.7	58.7	58.5
63	47.5	48.7	57.7	59.5
80	45.5	46.7	64.7	61.5
100	54.5	55.7	67.7	67.5
125	60.5	61.7	70.7	72.5
160	62.5	63.7	68.7	72.5
200	58.5	59.7	65.7	70.5
250	56.5	57.7	71.7	71.5
315	58.5	59.7	66.7	71.5
400	61.5	62.7	69.7	71.5
500	56.5	57.7	67.7	71.5
630	55.5	56.7	66.7	69.5
800	54.5	55.7	66.7	68.5
1000	53.5	54.7	65.7	66.5
1250	53.5	54.7	65.7	65.5
1600	52.5	53.7	64.7	64.5
2000	51.5	52.7	63.7	62.5
2500	50.5	51.7	63.7	60.5
3150	49.5	50.7	62.7	57.5
4000	46.5	47.7	58.7	52.5
5000	41.5	42.7	52.7	46.5
6300	40.5	41.7	50.7	46.5
8000	31.5	32.7	37.7	38.5
10,000	24.5	25.7	--	26.5

TABLE D-29

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - MITSUBISHI MU300-10
AIRCRAFT WITH JT15D-5 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust/Eng, lbs 670	1500	2100
50	51.5	64.0	69.7
63	49.5	66.7	70.1
80	49.1	65.6	72.1
100	54.9	65.7	68.8
125	61.0	75.3	70.4
160	61.3	79.3	81.4
200	56.6	79.0	84.5
250	63.5	73.4	82.0
315	61.7	80.8	77.4
400	62.4	79.5	83.4
500	60.1	79.9	85.1
630	58.7	77.1	80.3
800	58.3	76.7	80.8
1000	57.2	74.4	78.3
1250	59.8	73.1	75.1
1600	59.6	69.6	70.5
2000	59.7	65.7	67.9
2500	59.0	61.5	61.3
3150	60.9	56.3	54.7
4000	59.4	53.4	48.3
5000	56.1	47.8	39.7
6300	51.2	33.6	31.1
8000	41.8	28.2	31.1
10,000	33.5	28.2	31.1

TABLE D-30

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CANADAIR CL-600
CHALLENGER AIRCRAFT WITH ALF502L ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust/Eng, lbs 1900	5000
50	60.6	69
63	53.6	65
80	54.6	63
100	59.6	74
125	64.6	77
160	65.6	79
200	59.6	74
250	60.6	76
315	61.6	77
400	60.6	75
500	60.6	74
630	59.6	73
800	60.6	72
1000	61.6	72
1250	61.6	73
1600	58.6	73
2000	59.6	67
2500	59.6	65
3150	58.6	63
4000	54.6	57
5000	51.6	59
6300	44.6	38
8000	33.6	30
10,000	21.6	20

TABLE D-31

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - CANADAIR CL-601
CHALLENGER WITH CF34 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust/Eng, lbs 2000	3000	4000	5000	6000
50	63.5	66.7	65.8	65.2	67.2
63	56.5	64.7	66.8	62.2	64.2
80	57.5	62.7	62.8	65.2	67.2
100	63.5	63.7	66.8	72.2	74.2
125	64.5	66.7	70.8	74.2	76.2
160	68.5	68.7	70.8	75.2	77.2
200	60.5	66.7	69.8	68.2	70.2
250	63.5	64.7	66.8	75.2	77.2
315	64.5	66.7	72.8	74.2	76.2
400	64.5	65.7	72.8	75.2	77.2
500	62.5	64.7	72.8	69.2	71.2
630	63.5	64.7	68.8	71.2	73.2
800	62.5	64.7	67.8	70.2	72.2
1000	61.5	64.7	67.8	69.2	71.2
1250	60.5	63.7	66.8	68.2	70.2
1600	59.5	63.7	64.8	67.2	69.2
2000	62.5	64.7	63.8	64.2	66.2
2500	58.5	60.7	63.8	66.2	68.2
3150	54.5	60.7	60.8	65.2	67.2
4000	48.5	56.7	59.8	59.2	61.2
5000	42.5	51.7	56.8	52.2	54.2
6300	35.5	42.7	48.8	44.2	47.2
8000	27.5	36.7	43.8	37.2	39.2
10,000	18.5	24.7	31.8	25.2	27.2

TABLE D-32

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOFAN BUSINESS AIRCRAFT - ISRAEL AIRCRAFT
INDUSTRIES WESTWIND 1125 ASTRA AIRCRAFT
WITH GARRETT TFE 731 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust/Eng, Percent		
	Approach 69.2	Cutback 86.6	Takeoff 95.5
50	58.0	59.5	64.3
63	45.6	56.9	60.1
80	50.9	50.6	64.8
100	59.9	62.1	71.3
125	62.3	71.1	78.8
160	62.3	72.2	79.7
200	57.4	70.5	76.0
250	62.5	67.8	75.3
315	59.9	74.7	80.5
400	59.5	72.7	79.2
500	59.2	76.0	81.0
630	60.2	74.1	79.4
800	57.9	69.0	77.0
1000	57.8	67.4	73.2
1250	58.6	66.1	71.5
1600	58.0	64.2	70.5
2000	56.0	61.8	67.1
2500	54.8	62.3	67.9
3150	54.7	59.8	64.5
4000	56.6	55.0	59.8
5000	47.9	55.0	59.8
6300	41.9	45.5	51.4
8000	33.4	40.7	51.0
10,000	22.0	40.7	51.0

TABLE D-33

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOPROP TRANSPORT AIRCRAFT -
LOCKHEED ELECTRA AND HERCULES
C-130E AIRCRAFT WITH ALLISON
T56-A-7 OR 501-D13 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	66.3	72.9
63	74.3	93.9
80	66.3	90.9
100	63.3	73.9
125	72.3	94.9
160	75.3	88.9
200	67.3	74.9
250	64.3	76.9
315	67.3	73.9
400	65.3	73.9
500	65.3	73.0
630	64.3	72.9
800	65.3	70.9
1000	74.5	68.9
1250	72.3	69.9
1600	66.3	70.9
2000	64.3	69.9
2500	61.3	68.9
3150	57.3	64.9
4000	54.3	62.9
5000	52.3	58.9
6300	50.3	52.9
8000	40.3	44.9
10,000	32.3	38.9

TABLE D-36

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT
GREATER THAN 38,000 LBS - CONVAIR 580 AIRCRAFT
WITH ALLISON 501-D13 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	63.3	69.9
63	71.3	90.9
80	63.3	87.9
100	60.3	70.9
125	69.3	91.9
160	72.3	85.9
200	64.3	71.9
250	61.3	73.9
315	64.3	70.9
400	62.3	70.9
500	62.3	70.9
630	61.3	69.9
800	62.3	67.9
1000	71.3	65.9
1250	69.3	66.9
1600	63.3	67.9
2000	61.3	66.9
2500	58.3	65.9
3150	54.3	61.9
4000	51.3	59.9
5000	49.3	55.9
6300	47.3	49.9
8000	37.3	41.9
10,000	29.3	35.9

TABLE D-37

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, GROSS WEIGHT
GREATER THAN 38,000 LBS - HAWKER SIDDELEY HS 748
AIRCRAFT WITH RR DART MK532 ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent		
	Approach 32	Cutback 73	Takeoff 100
50	59.2	62.9	71.2
63	55.2	62.9	65.2
80	66.2	79.9	80.2
100	58.2	83.9	86.2
125	60.2	70.9	74.2
160	71.2	81.9	79.2
200	61.2	83.9	85.2
250	62.2	74.9	83.2
315	60.2	75.9	83.2
400	59.2	74.9	83.2
500	58.2	70.9	76.2
630	64.2	67.9	74.2
800	60.2	68.9	71.2
1000	57.2	64.9	68.2
1250	64.2	64.9	67.2
1600	62.2	67.9	69.2
2000	59.2	64.9	66.2
2500	57.2	64.9	65.2
3150	58.2	62.9	62.2
4000	70.2	63.9	61.2
5000	62.2	66.9	61.2
6300	44.2	58.9	54.2
8000	41.2	42.9	43.2
10,000	32.2	35.9	--

TABLE D-38

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE
WEIGHT - SHORTS SD3-30 AIRCRAFT
WITH PT6A SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent		
	Approach 35	Cutback 65	Takeoff 100
50	54.9	61.1	62.5
63	57.9	57.1	65.5
80	56.9	58.1	63.5
100	59.9	72.1	66.5
125	78.9	81.1	83.5
160	77.9	64.1	88.5
200	47.9	58.1	65.5
250	68.9	68.1	71.5
315	69.9	58.1	76.5
400	63.9	62.1	71.5
500	61.9	62.1	64.5
630	59.9	60.1	68.5
800	56.9	61.1	66.5
1000	54.9	60.1	65.5
1250	52.9	57.1	62.5
1600	50.9	54.1	61.5
2000	49.9	54.1	60.5
2500	51.9	54.1	59.5
3150	45.9	49.1	55.5
4000	41.9	46.1	51.5
5000	38.9	42.1	46.5
6300	33.9	41.1	43.5
8000	26.9	--	--
10,000	19.9	--	--

TABLE D-39

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT, INTERMEDIATE
WEIGHT - SAAB 340 AIRCRAFT WITH GE CT7 SERIES ENGINES

One-Third Octave band Frequency Hz	Corrected Net Percent		
	Approach 85	Cutback 85	Takeoff 100
50	56.4	57.7	64.2
63	49.6	58.3	66.1
80	60.0	55.3	72.9
100	74.5	61.0	82.0
125	60.2	66.3	71.2
160	63.9	80.9	75.4
200	74.6	64.7	80.6
250	64.5	66.4	81.8
315	72.0	66.6	81.1
400	63.1	65.6	73.0
500	60.3	63.2	70.5
630	60.2	63.6	67.9
800	56.5	62.2	67.9
1000	55.0	58.4	64.4
1250	56.0	58.4	64.4
1600	55.0	56.0	62.4
2000	54.0	54.4	61.2
2500	52.6	52.5	58.9
3150	52.7	50.8	57.3
4000	49.7	47.7	52.7
5000	45.5	42.6	49.5
6300	38.4	37.6	48.8
8000	31.1	37.6	48.8
10,000	25.5	31.6	48.8

TABLE D-40

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE TURBOPROP TRANSPORT AIRCRAFT
(LESS THAN 15,000 LBS MAXIMUM GROSS TAKEOFF WEIGHT,
OVER 600 ESHP* PER ENGINE) - DE HAVILLAND DHC-6 AIRCRAFT

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	56.8	60
63	61.8	63
80	56.8	70
100	63.8	88
125	68.8	75
160	59.8	68
200	69.8	88
250	76.8	73
315	77.8	73
400	70.8	72
500	64.8	76
630	67.8	75
800	62.8	71
1000	61.8	64
1250	59.8	56
1600	59.8	54
2000	56.8	52
2500	54.8	49
3150	51.8	47
4000	47.8	45
5000	44.8	44
6300	43.8	38
8000	33.8	31
10,000	19.8	23

*Equivalent shaft horsepower

TABLE D-41

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
SMALL 2-ENGINE TURBOPROP AIRCRAFT* -
CESSNA CONQUEST AIRCRAFT

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	49.8	59.4
63	54.8	57.4
80	49.8	71.4
100	56.8	84.4
125	61.8	63.4
160	52.8	66.4
200	62.8	78.4
250	69.8	70.4
315	70.8	75.4
400	63.8	61.4
500	57.8	60.4
630	60.8	60.4
800	55.8	56.4
1000	54.8	51.4
1250	52.8	49.4
1600	62.8	45.4
2000	49.8	43.4
2500	47.8	39.4
3150	44.8	38.4
4000	40.8	34.4
5000	37.8	29.4
6300	36.8	24.4
8000	26.8	19.4
10,000	12.8	14.4

*Less than 600 ESHP per engine, or takeoff engine rpm of 1900 or less.

TABLE D-42

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE PISTON TRANSPORT AIRCRAFT -
DOUGLAS DC-6, SERIES AIRCRAFT

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	64.7	88.3
63	73.7	88.3
80	76.7	88.3
100	71.7	88.3
125	82.7	88.3
160	83.7	88.3
200	67.7	88.3
250	71.7	88.3
315	70.7	86.3
400	69.7	85.3
500	69.7	84.3
630	68.7	82.3
800	67.7	81.3
1000	70.7	80.3
1250	69.7	78.3
1600	67.7	76.3
2000	64.7	74.3
2500	60.7	72.3
3150	57.7	70.3
4000	54.7	68.3
5000	49.7	64.3
6300	42.7	57.3
8000	32.7	50.3
10,000	20.7	39.3

TABLE D-43

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE PISTON TRANSPORT AIRCRAFT (GREATER THAN 12,500 LBS
MAXIMUM GROSS TAKEOFF WEIGHT) - CONVAIR 340 AIRCRAFT

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	61.7	85.3
63	70.7	85.3
80	73.7	85.3
100	68.7	85.3
125	79.7	85.3
160	80.7	85.3
200	64.7	85.3
250	68.7	85.3
315	67.7	83.3
400	66.7	82.3
500	66.7	81.3
630	65.7	79.3
800	64.7	78.3
1000	67.7	77.3
1250	66.7	75.3
1600	64.7	73.3
2000	61.7	71.3
2500	57.7	69.3
3150	54.7	67.3
4000	51.7	65.3
5000	46.7	61.3
6300	39.7	54.3
8000	29.7	47.3
10,000	17.7	36.3

TABLE D-44

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE PISTON TRANSPORT AIRCRAFT
(LESS THAN 12,500 LBS MAXIMUM GROSS TAKEOFF WEIGHT) -
BEECH BARON AIRCRAFT

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	43.7	53.5
63	49.7	53.5
80	54.7	57.5
100	58.7	69.5
125	73.7	89.5
160	61.7	75.5
200	59.7	69.5
250	64.7	80.5
315	59.7	73.5
400	60.7	77.5
500	61.7	75.5
630	57.7	72.5
800	55.7	68.5
1000	51.7	63.5
1250	47.7	68.5
1600	45.7	61.5
2000	42.7	58.5
2500	41.7	57.5
3150	38.7	57.5
4000	35.7	51.5
5000	32.7	47.5
6300	29.7	40.5
8000	23.7	32.5
10,000	10.7	23.5

TABLE D-45

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
1-ENGINE PISTON AIRCRAFT - COMPOSITE AIRCRAFT, 1985 FLEET

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	56.6	45.8
63	71.6	45.8
80	56.6	49.8
100	52.6	61.8
125	64.6	81.8
160	53.6	67.8
200	58.6	61.8
250	49.6	72.8
315	48.6	65.8
400	46.6	69.8
500	45.6	67.8
630	46.6	64.8
800	44.6	60.8
1000	43.6	55.8
1250	41.6	60.8
1600	39.6	53.8
2000	38.6	50.8
2500	37.6	49.8
3150	33.6	49.8
4000	30.6	43.8
5000	26.6	39.8
6300	22.6	32.8
8000	16.6	24.8
10,000	5.6	15.8

TABLE D-46

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
1-ENGINE PISTON AIRCRAFT -
COMPOSITE SINGLE-ENGINE PISTON AIRCRAFT WITH
VARIABLE PITCH PROPELLER (EQUAL OR GREATER THAN 200 HP)
COMPOSITE AIRCRAFT

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	61.3	50.5
63	76.3	50.5
80	61.3	54.5
100	57.3	66.5
125	69.3	86.5
160	58.3	72.5
200	63.3	66.5
250	54.3	77.5
315	53.3	70.5
400	51.3	74.5
500	50.3	72.5
630	51.3	69.5
800	49.3	65.5
1000	48.3	60.5
1250	46.3	65.5
1600	44.3	58.5
2000	43.3	55.5
2500	42.3	54.5
3150	38.3	54.5
4000	35.3	48.5
5000	31.3	44.5
6300	27.3	37.5
8000	21.3	29.5
10,000	10.3	20.5

TABLE D-47

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR SMALL
1-ENGINE PISTON AIRCRAFT - COMPOSITE SINGLE-ENGINE PISTON
AIRCRAFT WITH FIXED-PITCH PROPELLER (LESS THAN 200 HP)
COMPOSITE AIRCRAFT

One-Third Octave band Frequency Hz	Corrected Net Thrust, Percent	
	Approach 30	Takeoff 100
50	53.8	43
63	68.8	43
80	53.8	47
100	49.8	59
125	61.8	79
160	50.8	65
200	55.8	59
250	46.8	70
315	45.8	63
400	43.8	67
500	42.8	65
630	43.8	62
800	41.8	58
1000	40.8	53
1250	38.8	58
1600	36.8	51
2000	35.8	48
2500	34.8	47
3150	30.8	47
4000	27.8	41
5000	23.8	37
6300	19.8	30
8000	13.8	22
10,000	--	13

TABLE D-48

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
4-ENGINE TURBOJET, MILITARY TRANSPORT/TANKER AIRCRAFT
BOEING KC-135A/C135A AIRCRAFT WITH J57 SERIES
TURBOJET ENGINES

One-Third Octave band Frequency Hz	EPR* Approach 1.75	Dry T/O 2.45	Wet T/O 2.85
50	75	88	90
63	71	87	92
80	72	85	87
100	80	91	90
125	87	99	101
160	89	104	105
200	86	102	106
250	88	101	101
315	88	101	104
400	91	104	103
500	90	101	103
630	90	102	102
800	89	100	100
1000	88	100	99
1250	87	99	98
1600	87	98	97
2000	86	96	95
2500	85	95	93
3150	83	93	91
4000	81	91	89
5000	78	87	84
6300	74	84	81
8000	73	81	77
10,000	59	77	71

*Engine Pressure Ratio

TABLE D-49

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
2-ENGINE AFTERBURNER TURBOJET, MILITARY
FIGHTER/FIGHTER-BOMBER AIRCRAFT -
MC DONNELL DOUGLAS F-4C, D, E, F
AIRCRAFT WITH J79 SERIES TURBOJET ENGINES

One-Third Octave band Frequency Hz	RPM*, Percent		
	Approach 87	Takeoff 100	Afterburner 104
50	74	77	91
63	72	75	87
80	71	74	88
100	75	85	99
125	86	91	105
160	89	94	107
200	90	91	103
250	86	92	105
315	87	96	106
400	88	94	106
500	86	98	106
630	89	102	106
800	88	102	105
1000	87	101	103
1250	89	99	102
1600	88	99	102
2000	85	98	102
2500	83	97	101
3150	81	97	100
4000	78	96	99
5000	74	94	97
6300	68	93	97
8000	62	93	98
10,000	52	90	97

*Revolutions per minute

TABLE D-50

REFERENCE ONE-THIRD OCTAVE BAND SPECTRUM
AT 1000 ft (305m) DISTANCE FOR
1-ENGINE TURBOFAN, MILITARY ATTACK AIRCRAFT - LTV
A-7D, E AIRCRAFT WITH TF-41 SERIES TURBOFAN ENGINE

One-Third Octave band Frequency Hz	RPM, Percent 82	96
50	70	67
63	67	67
80	64	67
100	75	74
125	81	81
160	81	83
200	75	78
250	80	84
315	82	86
400	82	90
500	83	100
630	82	104
800	80	100
1000	79	96
1250	78	97
1600	77	96
2000	76	95
2500	78	94
3150	76	92
4000	75	90
5000	71	87
6300	66	83
8000	61	80
10,000	50	73