



# **777-200/300**

## **Airplane Characteristics for Airport Planning**




**Boeing Commercial Airplanes**

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777 AIRPLANE CHARACTERISTICS  
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## **1.0 SCOPE AND INTRODUCTION**

### **1.1 Scope**

### **1.2 Introduction**

### **1.3 A Brief Description of the 777 Family of Airplanes**

## **1.0 SCOPE AND INTRODUCTION**

### **1.1 Scope**

This document provides, in a standardized format, airplane characteristics data for general airport planning. Since operational practices vary among airlines, specific data should be coordinated with the using airlines prior to facility design. Boeing Commercial Airplanes should be contacted for any additional information required.

Content of the document reflects the results of a coordinated effort by representatives from the following organizations:

- Aerospace Industries Association
- Airports Council International - North America
- International Industry Working Group
- International Air Transport Association

The airport planner may also want to consider the information presented in the "Commercial Aircraft Design Characteristics – Trends and Growth Projections," for long range planning needs and can be accessed via the following web site:

<http://www.boeing.com/airports>

The document is updated periodically and represents the coordinated efforts of the following organizations regarding future aircraft growth trends:

- International Civil Aviation Organization
- International Coordinating Council of Aerospace Industries Associations
- Airports Council International - North American and World Organizations
- International Industry Working Group
- International Air Transport Association



## **1.2 Introduction**

This document conforms to NAS 3601. It provides characteristics of the Boeing Model 777 family of airplanes for airport planners and operators, airlines, architectural and engineering consultant organizations, and other interested industry agencies. Airplane changes and available options may alter model characteristics; the data presented herein reflect typical airplanes in each model category.

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### **1.3 A Brief Description of the 777 Family of Airplanes**

#### **777-200 Airplane**

The 777-200 is a twin-engine airplane designed for medium to long range flights. It is powered by advanced high bypass ratio engines. Characteristics unique to the 777 include:

- Two-crew cockpit with digital avionics
- Circular cross-section
- Lightweight aluminum and composite alloys
- Structural carbon brakes
- Six-wheel main landing gears
- Main gear aft axle steering
- High bypass ratio engines
- Fly-by-wire system

#### **777-300 Airplane**

The 777-300 is a second-generation derivative of the 777-200. Two body sections are added to the fuselage to provide additional passenger seating and cargo capacity.

#### **Main Gear Aft Axle Steering**

The main gear axle steering is automatically engaged based on the nose gear steering angle. This allows for less tire scrubbing and easier maneuvering into gates with limited parking clearances.

## High Bypass Ratio Engines

The 777 airplane is powered by two high bypass ratio engines. The following table shows the available engine options.

ENGINE MFR	MODEL	THRUST	MAX TAXI WEIGHT (LBS)	
			777-200	777-300
GENERAL ELECTRIC	GE 90-B3/-B4	74,500 LB	537,000	
	GE 90-B5	76,400 LB	537,000	
	GE 90-B1	84,100 LB	634,000	
	GE 90-B4	84,700 LB	634,000	
	GE 90-92B	90,500 LB		662,000
	GE 90-98B	98,000 LB		662,000
PRATT & WHITNEY	PW 4073/4073A	73,500 LB	537,000	
	PW 4077	77,200 LB	537,000	
	PW 4082	82,200 LB	634,000	
	PW 4084	84,600 LB	634,000	
	PW 4090	90,500 LB		662,000
	PW 4098	98,000 LB		662,000
ROLLS ROYCE	TRENT 870/871	71,200 LB	537,000	
	TRENT 877	74,900 LB	537,000	
	TRENT 882	82,200 LB	634,000	
	TRENT 884	84,300 LB	634,000	
	TRENT 890	90,000 LB		662,000
	TRENT 898	98,000 LB		662,000

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## **2.0 AIRPLANE DESCRIPTION**

### **2.1 General Characteristics**

### **2.2 General Dimensions**

### **2.3 Ground Clearances**

### **2.4 Interior Arrangements**

### **2.5 Cabin Cross Sections**

### **2.6 Lower Cargo Compartments**

### **2.7 Door Clearances**

## **2.0 AIRPLANE DESCRIPTION**

### **2.1 General Characteristics**

Maximum Design Taxi Weight (MTW). Maximum weight for ground maneuver as limited by aircraft strength and airworthiness requirements. (It includes weight of taxi and run-up fuel.)

Maximum Design Landing Weight (MLW). Maximum weight for landing as limited by aircraft strength and airworthiness requirements.

Maximum Design Takeoff Weight (MTOW). Maximum weight for takeoff as limited by aircraft strength and airworthiness requirements. (This is the maximum weight at start of the takeoff run.)

Operating Empty Weight (OEW). Weight of structure, powerplant, furnishing systems, unusable fuel and other unusable propulsion agents, and other items of equipment that are considered an integral part of a particular airplane configuration. Also included are certain standard items, personnel, equipment, and supplies necessary for full operations, excluding usable fuel and payload.

Maximum Design Zero Fuel Weight (MZFW). Maximum weight allowed before usable fuel and other specified usable agents must be loaded in defined sections of the aircraft as limited by strength and airworthiness requirements.

Maximum Payload. Maximum design zero fuel weight minus operational empty weight.

Maximum Seating Capacity. The maximum number of passengers specifically certificated or anticipated for certification.

Maximum Cargo Volume. The maximum space available for cargo.

Usable Fuel. Fuel available for aircraft propulsion.

CHARACTERISTICS	UNITS	BASELINE AIRPLANE			HIGH GROSS WEIGHT OPTION		
MAX DESIGN TAXI WEIGHT	POUNDS	508,000	517,000	537,000	582,000	592,000	634,500
	KILOGRAMS	230,450	234,500	243,500	263,640	268,480	287,800
MAX DESIGN TAKEOFF WEIGHT	POUNDS	506,000	515,000	535,000	580,000	590,000	632,500
	KILOGRAMS	229,500	233,600	242,630	263,030	267,500	286,900
MAX DESIGN LANDING WEIGHT	POUNDS	441,000	445,000	445,000	460,000	460,000	460,000
	KILOGRAMS	200,050	201,800	201,800	208,700	208,700	208,700
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	420,000	420,000	420,000	430,000	430,000	430,000
	KILOGRAMS	190,470	190,470	190,470	195,000	195,000	195,000
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	298,900	298,900	299,550	304,500	304,500	304,500
	KILOGRAMS	135,550	135,550	135,850	138,100	138,100	138,100
MAX STRUCTURAL PAYLOAD	POUNDS	121,100	121,100	120,450	125,550	125,550	125,550
	KILOGRAMS	54,920	54,920	54,620	56,940	56,940	56,940
SEATING CAPACITY (1)	TWO-CLASS	375 - 30 FIRST + 345 ECONOMY					
	THREE-CLASS	305 - 24 FIRST + 54 BUSINESS + 227 ECONOMY					
MAX CARGO - LOWER DECK	CUBIC FEET	5,656(2)	5,656(2)	5,656(2)	5,656(2)	5,656( )	5,656(2)
	CUBIC METERS	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)
USABLE FUEL	US GALLONS	31,000	31,000	31,000	45,220	45,220	45,220
	LITERS	117,300	117,300	117,300	171,100	171,100	171,100
	POUNDS	207,700	207,700	207,700	302,270	302,270	302,270
	KILOGRAMS	94,240	94,240	94,240	137,460	137,460	137,460

NOTES: (1) SPEC WEIGHT FOR BASELINE CONFIGURATION OF 375 PASSENGERS.  
CONSULT WITH AIRLINE FOR SPECIFIC WEIGHTS AND CONFIGURATIONS.

(2) FWD CARGO = 18 LD3'S AT 158 CU FT EACH.  
AFT CARGO = 14 LD3'S AT 158 CU FT EACH.  
BULK CARGO = 600 CU FT

## 2.1.1 GENERAL CHARACTERISTICS

MODEL 777-200 (GENERAL ELECTRIC ENGINES)

CHARACTERISTICS	UNITS	BASELINE AIRPLANE			HIGH GROSS WEIGHT OPTION		
MAX DESIGN TAXI WEIGHT	POUNDS	508,000	517,000	537,000	582,000	592,000	634,500
	KILOGRAMS	230,450	234,500	243,500	263,640	268,480	287,800
MAX DESIGN TAKEOFF WEIGHT	POUNDS	506,000	515,000	535,000	580,000	590,000	632,500
	KILOGRAMS	229,500	233,600	242,630	263,030	267,500	286,900
MAX DESIGN LANDING WEIGHT	POUNDS	441,000	445,000	445,000	450,000	455,000	455,000
	KILOGRAMS	200,050	201,800	201,800	204,080	206,350	206,350
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	420,000	420,000	420,000	430,000	430,000	430,000
	KILOGRAMS	190,470	190,470	190,470	195,000	195,000	195,000
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	296,600	296,600	297,250	302,200	302,200	302,200
	KILOGRAMS	134,500	134,500	134,800	137,050	137,050	137,050
MAX STRUCTURAL PAYLOAD	POUNDS	123,400	123,400	122,750	127,800	127,800	127,800
	KILOGRAMS	55,970	55,970	55,670	57,980	57,980	57,980
SEATING CAPACITY (1)	TWO-CLASS	375 - 30 FIRST + 345 ECONOMY					
	THREE-CLASS	305 - 24 FIRST + 54 BUSINESS + 227 ECONOMY					
MAX CARGO - LOWER DECK	CUBIC FEET	5,656 (2)	5,656 (2)	5,656 (2)	5,656 (2)	5,656 (2)	5,656 (2)
	CUBIC METERS	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)
USABLE FUEL	US GALLONS	31,000	31,000	31,000	45,220	45,220	45,220
	LITERS	117,300	117,300	117,300	171,100	171,100	171,100
	POUNDS	207,700	207,700	207,700	302,270	302,270	302,270
	KILOGRAMS	94,240	94,240	94,240	137,460	137,460	137,460

NOTES: (1) SPEC WEIGHT FOR BASELINE CONFIGURATION OF 375 PASSENGERS.  
CONSULT WITH AIRLINE FOR SPECIFIC WEIGHTS AND CONFIGURATIONS.

(2) FWD CARGO = 18 LD3'S AT 158 CU FT EACH.  
AFT CARGO = 14 LD3'S AT 158 CU FT EACH.  
BULK CARGO = 600 CU FT

## 2.1.2 GENERAL CHARACTERISTICS

MODEL 777-200 (PRATT & WHITNEY ENGINES)

D6-58329



CHARACTERISTICS	UNITS	BASELINE AIRPLANE			HIGH GROSS WEIGHT OPTION		
MAX DESIGN TAXI WEIGHT	POUNDS	508,000	517,000	537,000	582,000	592,000	634,500
	KILOGRAMS	230,450	234,500	243,500	263,640	268,480	287,800
MAX DESIGN TAKEOFF WEIGHT	POUNDS	506,000	515,000	535,000	580,000	590,000	632,500
	KILOGRAMS	229,500	233,600	242,630	263,030	267,500	286,900
MAX DESIGN LANDING WEIGHT	POUNDS	441,000	445,000	445,000	450,000	455,000	455,000
	KILOGRAMS	200,050	201,800	201,800	204,080	206,350	206,350
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	420,000	420,000	420,000	430,000	430,000	430,000
	KILOGRAMS	190,470	190,470	190,470	195,000	195,000	195,000
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	293,400	293,400	294,050	299,000	299,000	299,000
	KILOGRAMS	133,060	133,060	133,350	135,600	135,600	135,600
MAX STRUCTURAL PAYLOAD	POUNDS	126,600	126,600	125,950	131,000	131,000	131,000
	KILOGRAMS	57,410	57,410	57,120	59,430	59,430	59,430
SEATING CAPACITY (1)	TWO-CLASS	375 - 30 FIRST + 345 ECONOMY					
	THREE-CLASS	305 - 24 FIRST + 54 BUSINESS + 227 ECONOMY					
MAX CARGO - LOWER DECK	CUBIC FEET	5,656 (2)	5,656 (2)	5,656 (2)	5,656 (2)	5,656 (2)	5,656 (2)
	CUBIC METERS	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)
USABLE FUEL	US GALLONS	31,000	31,000	31,000	45,220	45,220	45,220
	LITERS	117,300	117,300	117,300	171,100	171,100	171,100
	POUNDS	207,700	207,700	207,700	302,270	302,270	302,270
	KILOGRAMS	94,240	94,240	94,240	137,460	137,460	137,460

NOTES: (1) SPEC WEIGHT FOR BASELINE CONFIGURATION OF 375 PASSENGERS.  
CONSULT WITH AIRLINE FOR SPECIFIC WEIGHTS AND CONFIGURATIONS.

(2) FWD CARGO = 18 LD3'S AT 158 CU FT EACH.  
AFT CARGO = 14 LD3'S AT 158 CU FT EACH.  
BULK CARGO = 600 CU FT

### 2.1.3 GENERAL CHARACTERISTICS

MODEL 777-200 (ROLLS-ROYCE ENGINES)

CHARACTERISTICS	UNITS	BASELINE AIRPLANE			
MAX DESIGN TAXI WEIGHT	POUNDS	582,000	592,000	634,500	662,000
	KILOGRAMS	263,990	268,530	287,800	300,280
MAX DESIGN TAKEOFF WEIGHT	POUNDS	580,000	590,000	632,500	660,000
	KILOGRAMS	263,080	267,620	286,900	299,370
MAX DESIGN LANDING WEIGHT	POUNDS	524,000	524,000	524,000	524,000
	KILOGRAMS	237,680	237,680	237,680	237,680
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	495,000	495,000	495,000	495,000
	KILOGRAMS	224,530	224,530	224,530	224,530
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	353,800	353,800	353,800	353,800
	KILOGRAMS	160,530	160,530	160,530	160,530
MAX STRUCTURAL PAYLOAD	POUNDS	141,200	141,200	141,200	141,200
	KILOGRAMS	64,000	64,000	64,000	64,000
SEATING CAPACITY (1)	TWO-CLASS	451 - 40 FIRST + 411 ECONOMY			
	THREE-CLASS	368 - 30 FIRST + 84 BUSINESS + 254 ECONOMY			
MAX CARGO - LOWER DECK	CUBIC FEET	7,552 (2)	7,552 (2)	7,552 (2)	7,552 (2)
	CUBIC METERS	213.9 (2)	213.9 (2)	213.9 (2)	213.9 (2)
USABLE FUEL	US GALLONS	44,700	44,700	44,700	44,700
	LITERS	169,210	169,210	169,210	169,210
	POUNDS	299,490	299,490	299,490	299,490
	KILOGRAMS	135,880	135,880	135,880	135,880

NOTES: (1) SPEC WEIGHT FOR BASELINE CONFIGURATION OF 451 PASSENGERS.  
CONSULT WITH AIRLINE FOR SPECIFIC WEIGHTS AND CONFIGURATIONS.

(2) FWD CARGO = 24 LD3'S AT 158 CU FT EACH.  
AFT CARGO = 20 LD3'S AT 158 CU FT EACH.  
BULK CARGO = 600 CU FT

#### 2.1.4 GENERAL CHARACTERISTICS

MODEL 777-300 (GENERAL ELECTRIC ENGINES)

D6-58329

CHARACTERISTICS	UNITS	BASELINE AIRPLANE			
MAX DESIGN TAXI WEIGHT	POUNDS	582,000	592,000	634,500	662,000
	KILOGRAMS	263,990	268,530	287,800	300,280
MAX DESIGN TAKEOFF WEIGHT	POUNDS	580,000	590,000	632,500	660,000
	KILOGRAMS	263,080	267,620	286,900	299,370
MAX DESIGN LANDING WEIGHT	POUNDS	524,000	524,000	524,000	524,000
	KILOGRAMS	237,680	237,680	237,680	237,680
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	495,000	495,000	495,000	495,000
	KILOGRAMS	224,530	224,530	224,530	224,530
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	351,700	351,700	351,700	351,700
	KILOGRAMS	159,570	159,570	159,570	159,570
MAX STRUCTURAL PAYLOAD	POUNDS	143,300	143,300	143,300	143,300
	KILOGRAMS	64,960	64,960	64,960	64,960
SEATING CAPACITY (1)	TWO-CLASS	451 - 40 FIRST + 411 ECONOMY			
	THREE-CLASS	368 - 30 FIRST + 84 BUSINESS + 254 ECONOMY			
MAX CARGO - LOWER DECK	CUBIC FEET	7,552 (2)	7,552 (2)	7,552 (2)	7,552 (2)
	CUBIC METERS	213.9 (2)	213.9 (2)	213.9 (2)	213.9 (2)
USABLE FUEL	US GALLONS	44,700	44,700	44,700	44,700
	LITERS	169,210	169,210	169,210	169,210
	POUNDS	299,490	299,490	299,490	299,490
	KILOGRAMS	135,880	135,880	135,880	135,880

NOTES: (1) SPEC WEIGHT FOR BASELINE CONFIGURATION OF 451 PASSENGERS.  
CONSULT WITH AIRLINE FOR SPECIFIC WEIGHTS AND CONFIGURATIONS.

(2) FWD CARGO = 24 LD3'S AT 158 CU FT EACH.  
AFT CARGO = 20 LD3'S AT 158 CU FT EACH.  
BULK CARGO = 600 CU FT

### 2.1.5 GENERAL CHARACTERISTICS

MODEL 777-300 (PRATT & WHITNEY ENGINES)

CHARACTERISTICS	UNITS	BASELINE AIRPLANE			
MAX DESIGN TAXI WEIGHT	POUNDS	582,000	592,000	634,500	662,000
	KILOGRAMS	263,990	268,530	287,800	300,280
MAX DESIGN TAKEOFF WEIGHT	POUNDS	580,000	590,000	632,500	660,000
	KILOGRAMS	263,080	267,620	286,900	299,370
MAX DESIGN LANDING WEIGHT	POUNDS	524,000	524,000	524,000	524,000
	KILOGRAMS	237,680	237,680	237,680	237,680
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	495,000	495,000	495,000	495,000
	KILOGRAMS	224,530	224,530	224,530	224,530
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	347,800	347,800	347,800	347,800
	KILOGRAMS	157,800	157,800	157,800	157,800
MAX STRUCTURAL PAYLOAD	POUNDS	147,200	147,200	147,200	147,200
	KILOGRAMS	66,730	66,730	66,730	66,730
SEATING CAPACITY (1)	TWO-CLASS	451 - 40 FIRST + 411 ECONOMY			
	THREE-CLASS	368 - 30 FIRST + 84 BUSINESS + 254 ECONOMY			
MAX CARGO - LOWER DECK	CUBIC FEET	7,552 (2)	7,552 (2)	7,552 (2)	7,552 (2)
	CUBIC METERS	213.9 (2)	213.9 (2)	213.9 (2)	213.9 (2)
USABLE FUEL	US GALLONS	44,700	44,700	44,700	44,700
	LITERS	169,210	169,210	169,210	169,210
	POUNDS	299,490	299,490	299,490	299,490
	KILOGRAMS	135,880	135,880	135,880	135,880

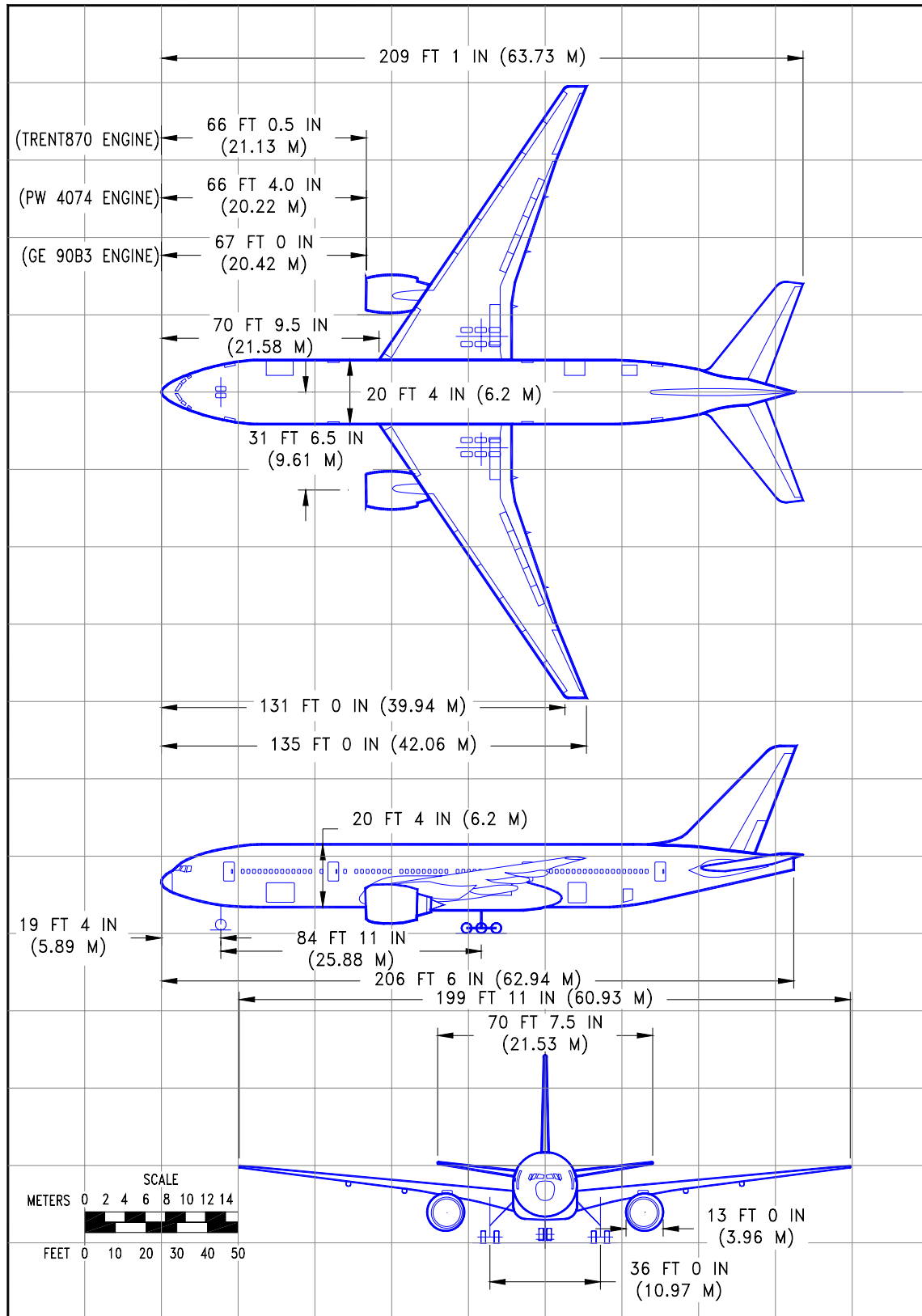
NOTES: (1) SPEC WEIGHT FOR BASELINE CONFIGURATION OF 451 PASSENGERS.  
CONSULT WITH AIRLINE FOR SPECIFIC WEIGHTS AND CONFIGURATIONS.

(2) FWD CARGO = 24 LD3'S AT 158 CU FT EACH.  
AFT CARGO = 20 LD3'S AT 158 CU FT EACH.  
BULK CARGO = 600 CU FT

## 2.1.6 GENERAL CHARACTERISTICS

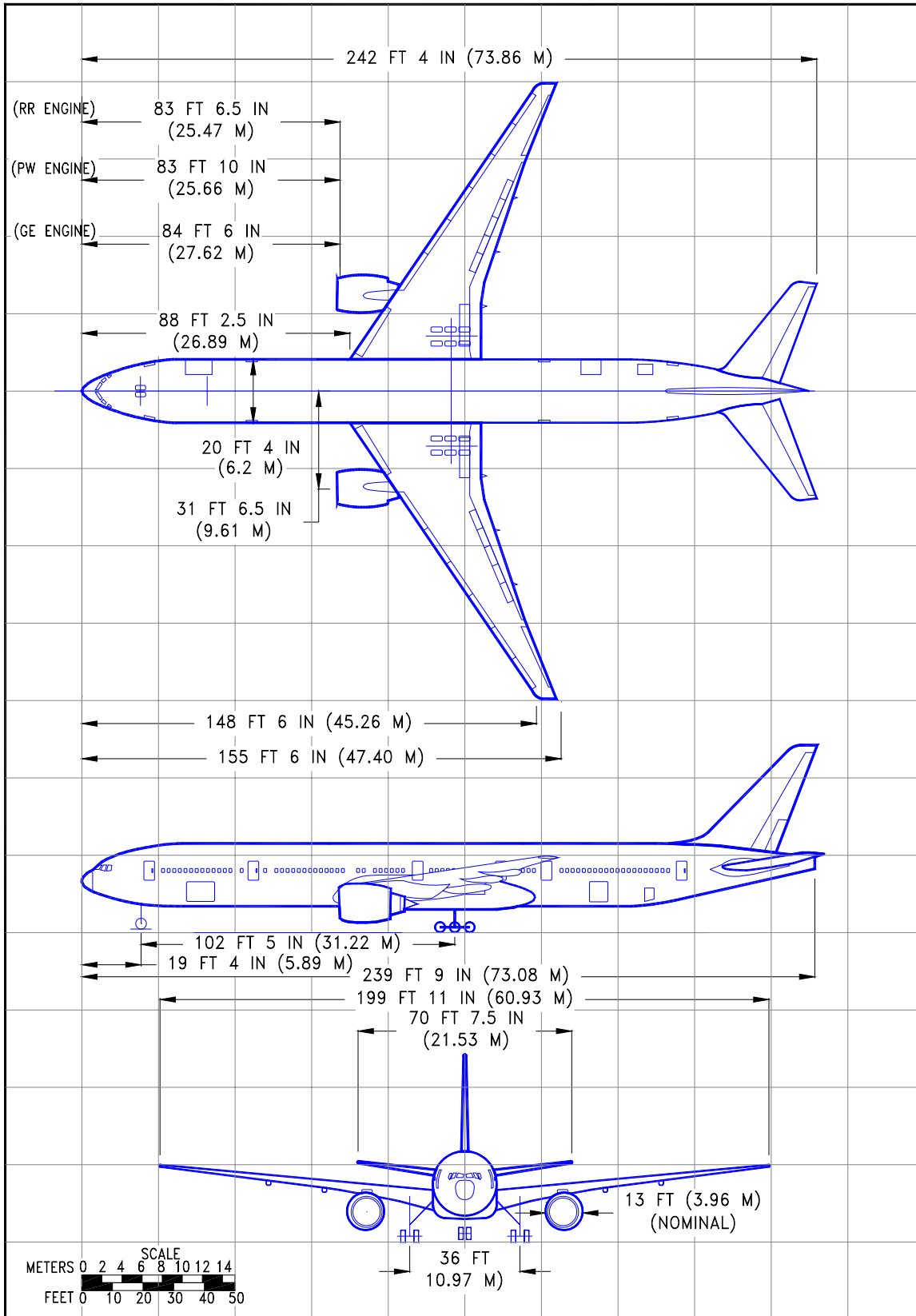
MODEL 777-300 (ROLLS-ROYCE ENGINES)

D6-58329



## 2.2.1 GENERAL DIMENSIONS

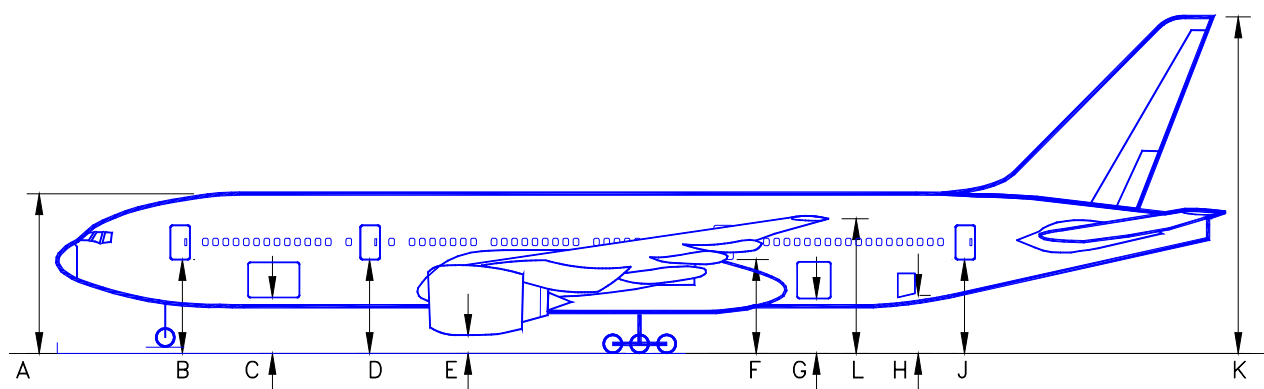
MODEL 777-200



## 2.2.2 GENERAL DIMENSIONS

MODEL 777-300

D6-58329



	MINIMUM*		MAXIMUM*	
	FEET - INCHES	METERS	FEET - INCHES	METERS
A	27 - 6	8.39	28 - 6	8.68
B	15 - 5	4.71	16 - 5	5.00
C	9 - 3	2.81	10 - 0	3.05
D	16 - 0	4.88	16 - 7	5.07
E (PW)	3 - 2	0.96	3 - 5	1.04
E (GE)	2 - 10	0.85	3 - 1	0.93
E (RR)	3 - 7	1.09	3 - 10	1.17
F	16 - 10	5.14	17 - 4	5.28
G(LARGE DOOR)	10 - 7	3.23	11 - 2	3.41
G(SMALL DOOR)	10 - 6	3.22	11 - 2	3.40
H	10 - 7	3.23	11 - 5	3.48
J	17 - 4	5.28	18 - 2	5.54
K	60 - 5	18.42	61 - 6	18.76
L	23 - 6	7.16	24 - 6	7.49

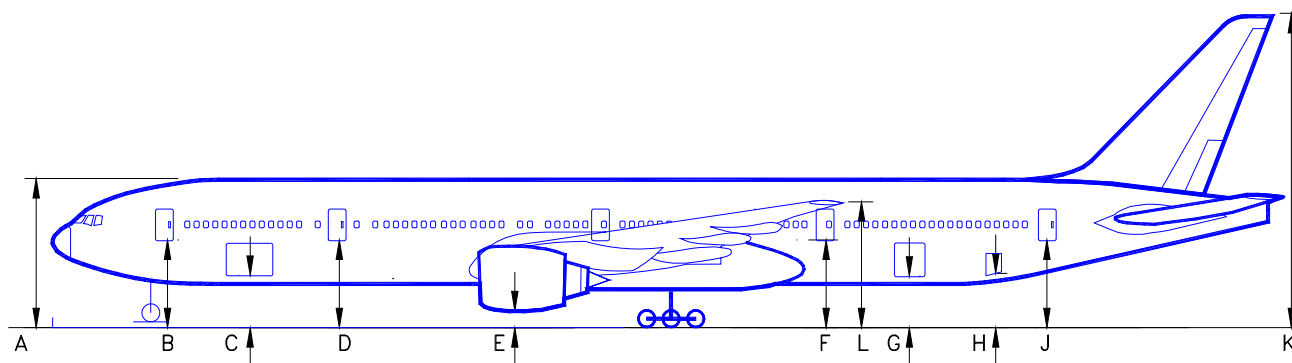
NOTES: VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING AND UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN.

DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

\* NOMINAL DIMENSIONS

### 2.3.1 GROUND CLEARANCES

MODEL 777-200.



	MINIMUM*		MAXIMUM*	
	FEET - INCHES	METERS	FEET - INCHES	METERS
A	27 - 6	8.39	28 - 6	8.68
B	15 - 5	4.71	16 - 5	5.00
C	9 - 3	2.81	10 - 0	3.05
D	16 - 0	4.88	16 - 7	5.07
E (PW)	3 - 2	0.96	3 - 5	1.04
E (GE)	2 - 10	0.85	3 - 1	0.93
E (RR)	3 - 7	1.09	3 - 10	1.17
F	16 - 10	5.14	17 - 4	5.28
G(LARGE DOOR)	10 - 7	3.23	11 - 2	3.41
G(SMALL DOOR)	10 - 6	3.22	11 - 2	3.40
H	10 - 7	3.23	11 - 5	3.48
J	17 - 4	5.28	18 - 2	5.54
K	60 - 5	18.42	61 - 6	18.76
L	23 - 6	7.16	24 - 6	7.49

NOTES: VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING AND UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN.

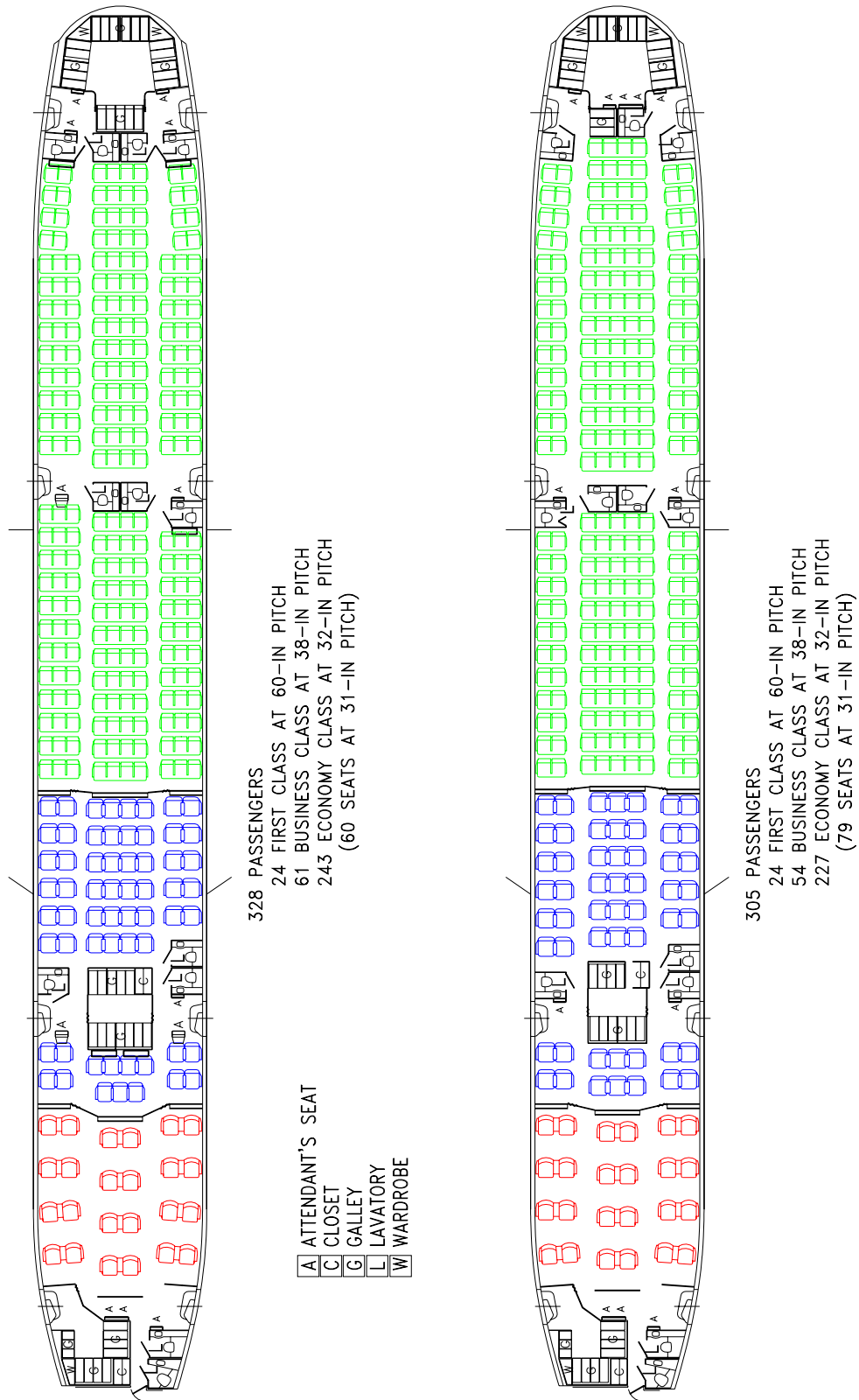
DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

\* NOMINAL DIMENSIONS

### 2.3.2 GROUND CLEARANCES

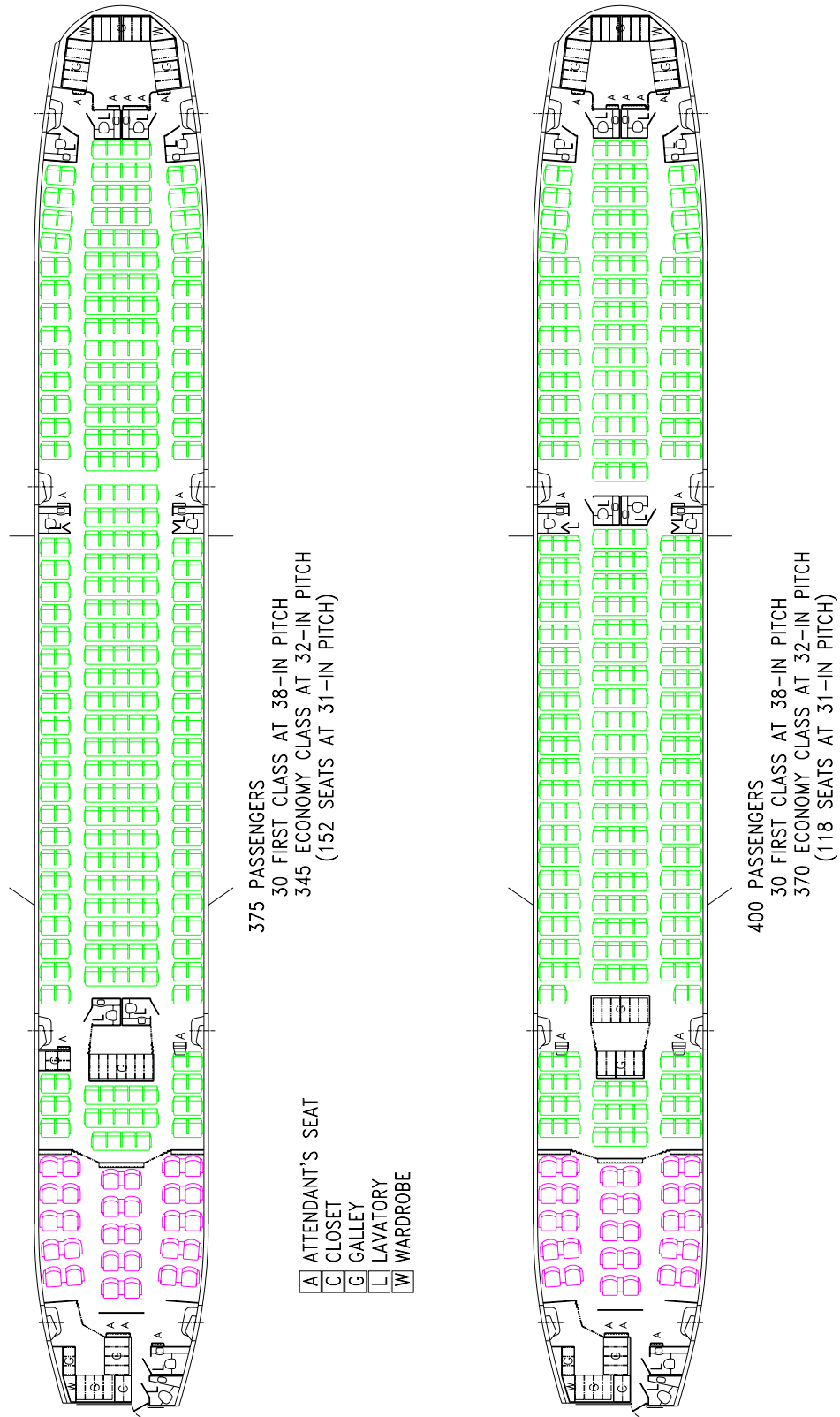
MODEL 777-300.





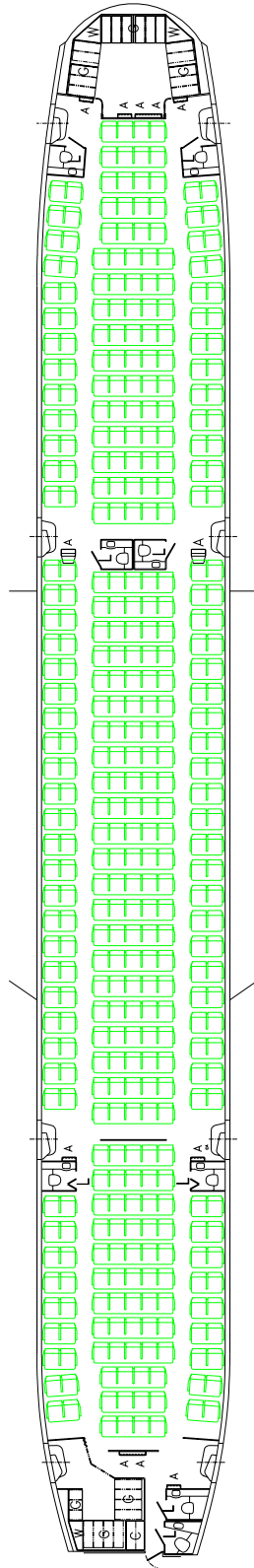
## 2.4.1 INTERIOR ARRANGEMENTS - TRI-CLASS CONFIGURATION

MODEL 777-200



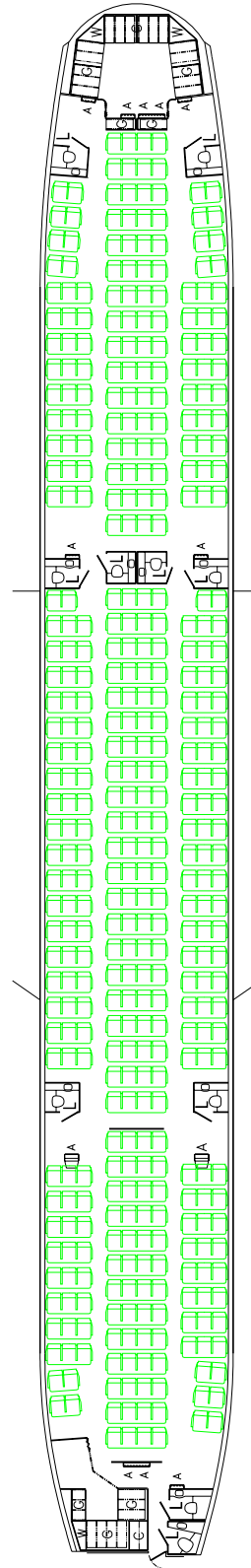
## 2.4.2 INTERIOR ARRANGEMENTS - TWO-CLASS CONFIGURATION

MODEL 777-200



418 PASSENGERS  
 309 ECONOMY CLASS AT 32-IN PITCH  
 109 ECONOMY CLASS AT 31-IN PITCH

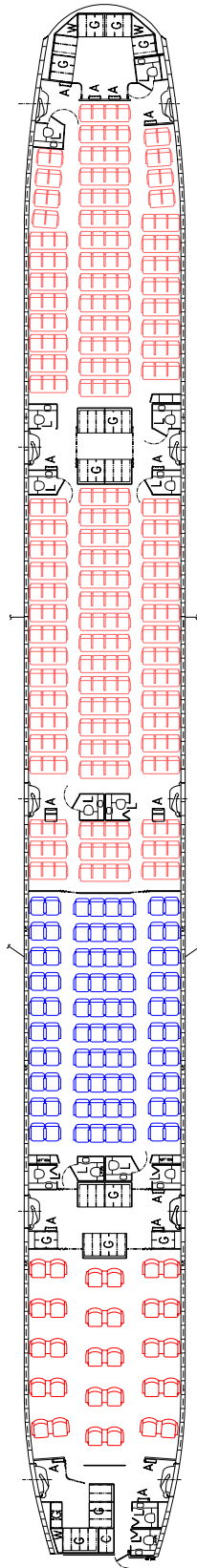
A ATTENDANT'S SEAT  
 C CLOSET  
 G GALLEY  
 L LAVATORY  
 W WARDROBE



440 PASSENGERS  
 328 ECONOMY CLASS AT 32-IN PITCH  
 112 ECONOMY CLASS AT 31-IN PITCH

## 2.4.3 INTERIOR ARRANGEMENTS - ALL-ECONOMY CONFIGURATION

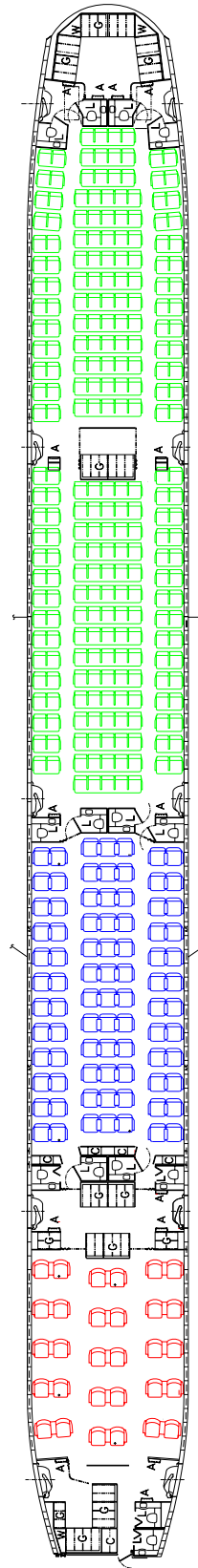
MODEL 777-200



#### 394 PASSENGERS

30 FIRST CLASS SEATS AT 60-IN PITCH  
80 BUSINESS CLASS SEATS AT 38-IN PITCH  
284 ECONOMY SEATS AT 32-IN PITCH

A ATTENDANT'S SEAT  
C CLOSET  
G GALLEY  
L LAVATORY  
W WARDROBE  
S/W STORAGE/WARDROBE

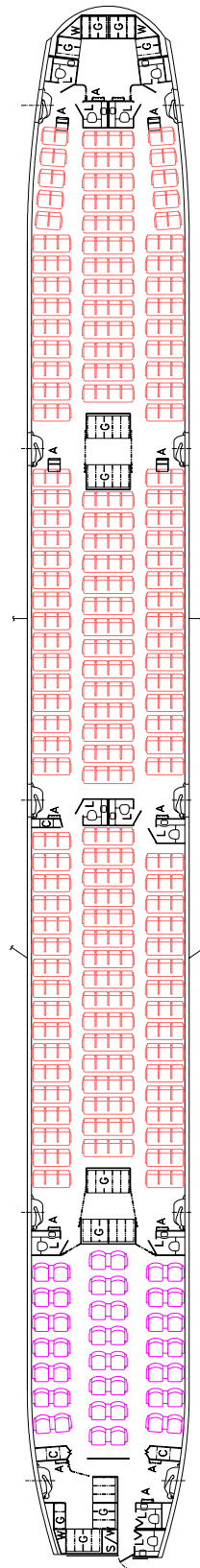


#### 368 PASSENGERS

30 FIRST CLASS SEATS AT 60-IN PITCH  
84 BUSINESS CLASS SEATS AT 38-IN PITCH  
172 ECONOMY CLASS SEATS AT 32-IN PITCH  
82 ECONOMY CLASS SEATS AT 31-IN PITCH

## 2.4.4 INTERIOR ARRANGEMENTS - TRI-CLASS CONFIGURATION

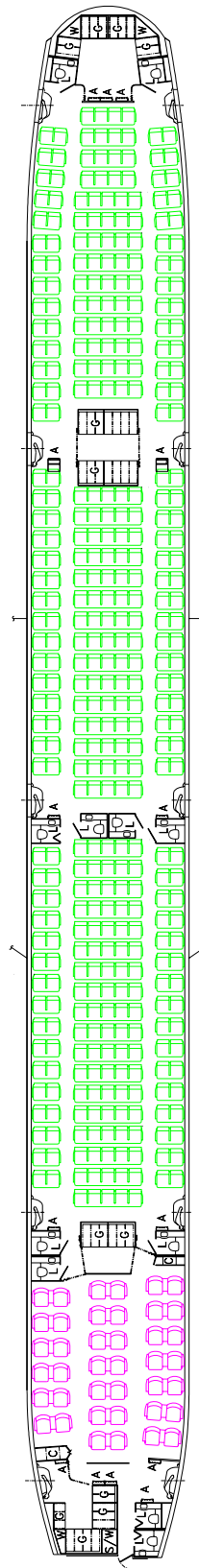
MODEL 777-300



479 PASSENGERS

44 FIRST CLASS SEATS AT 38-IN PITCH  
337 ECONOMY SEATS AT 32-IN PITCH  
98 ECONOMY SEATS AT 31-IN PITCH

A ATTENDANT'S SEAT  
C CLOSET  
G GALLEY  
L LAVATORY  
W WARDROBE  
S/W STORAGE/WARDROBE

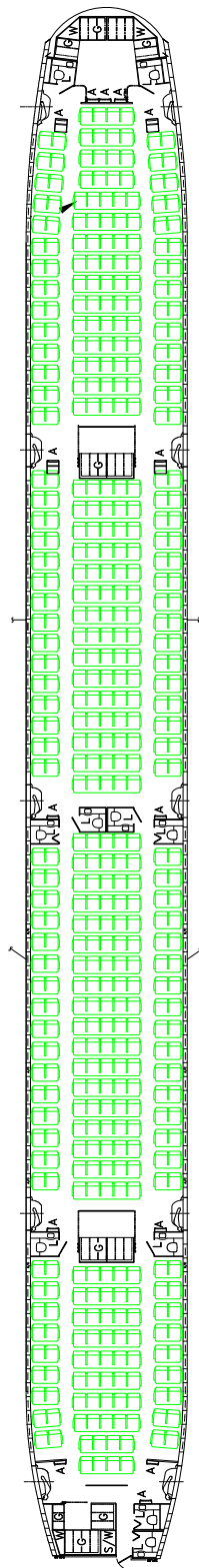


451 PASSENGERS

40 FIRST CLASS SEATS AT 38-IN PITCH  
272 ECONOMY CLASS SEATS AT 32-IN PITCH  
139 ECONOMY CLASS SEATS AT 31-IN PITCH

## 2.4.5 INTERIOR ARRANGEMENTS - TWO-CLASS CONFIGURATION

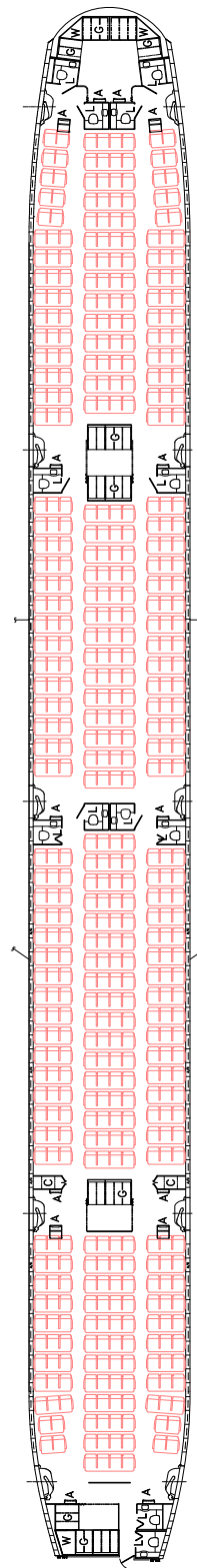
MODEL 777-300



500 PASSENGERS

336 ECONOMY SEATS AT 32-IN PITCH  
164 ECONOMY SEATS AT 31-IN PITCH

A ATTENDANT'S SEAT  
C CLOSET  
G GALLEY  
L LAVATORY  
W WARDROBE  
S/W STOWAGE/WARDROBE

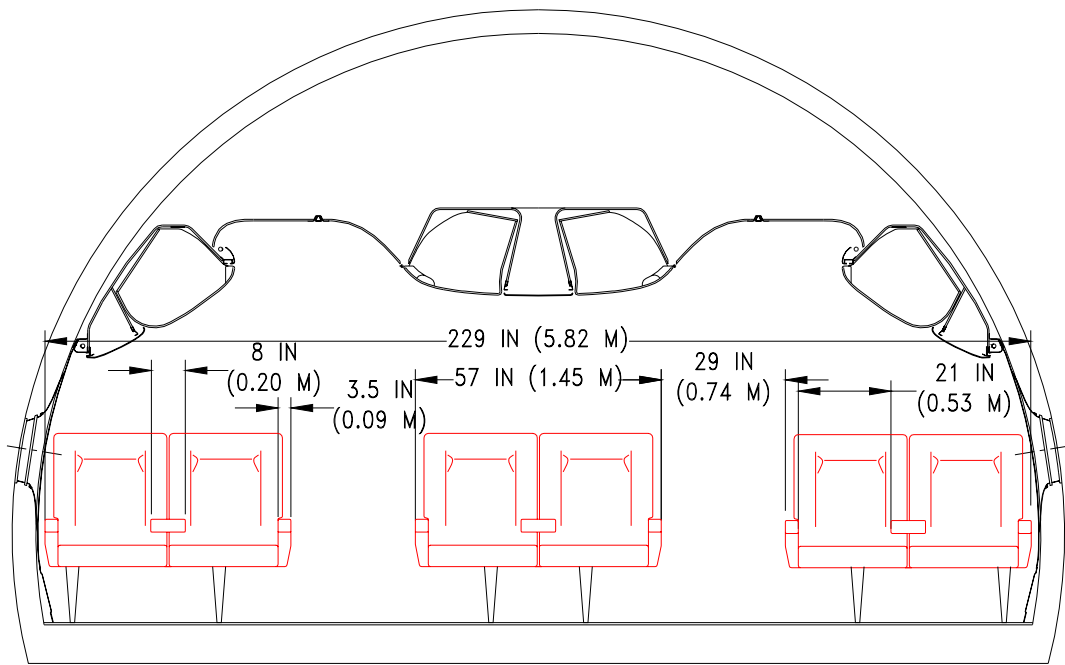


550 PASSENGERS

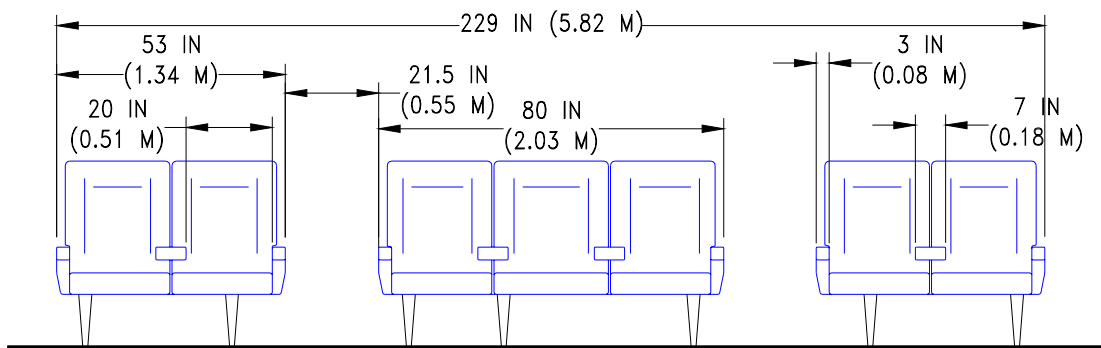
550 ECONOMY SEATS AT 30-IN PITCH

## 2.4.6 INTERIOR ARRANGEMENTS - ALL-ECONOMY CONFIGURATION

MODEL 777-300



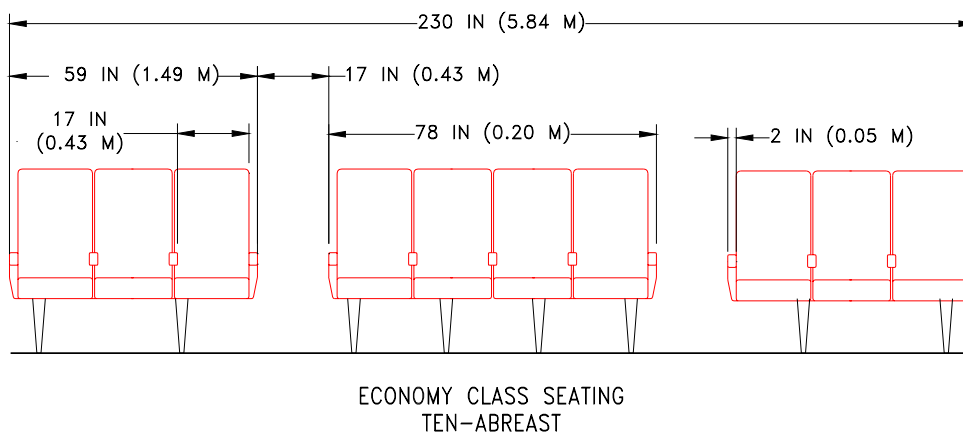
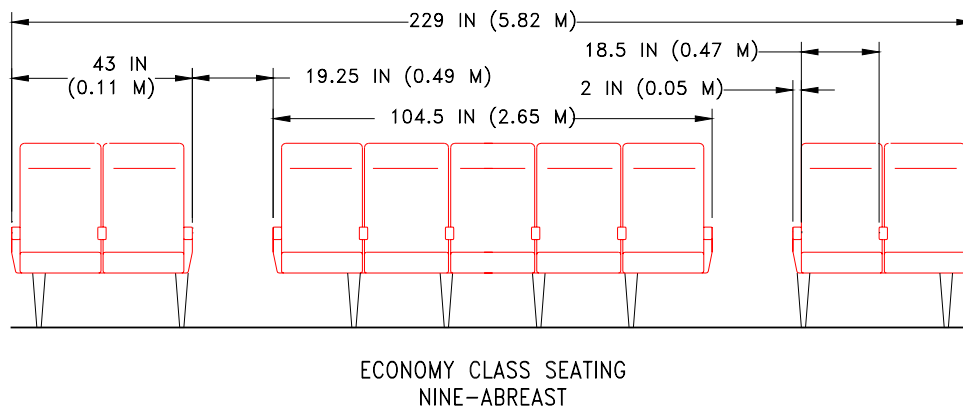
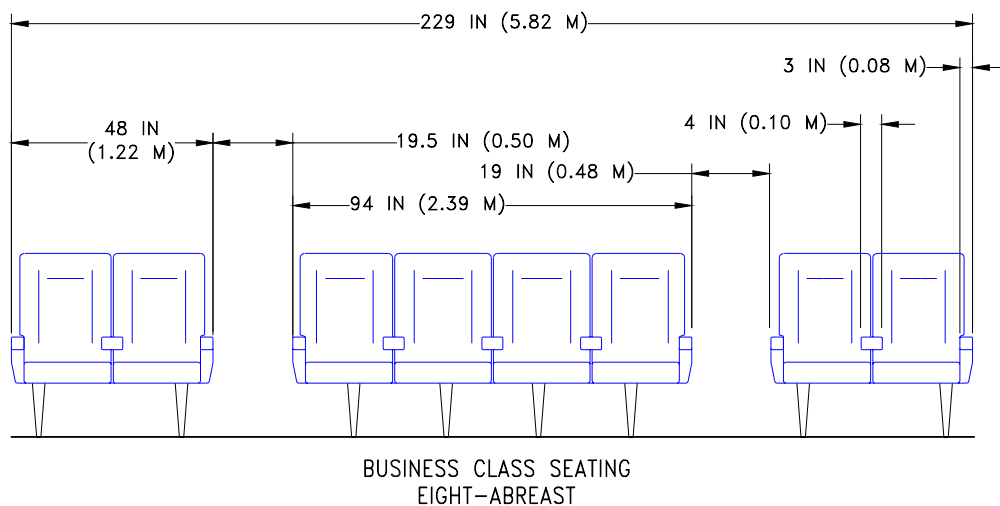
FIRST CLASS SEATING  
SIX ABREAST



BUSINESS CLASS SEATING  
SEVEN-ABREAST

## 2.5.1 CABIN CROSS-SECTIONS - FIRST AND BUSINESS CLASS SEATS

MODEL 777-200, -300

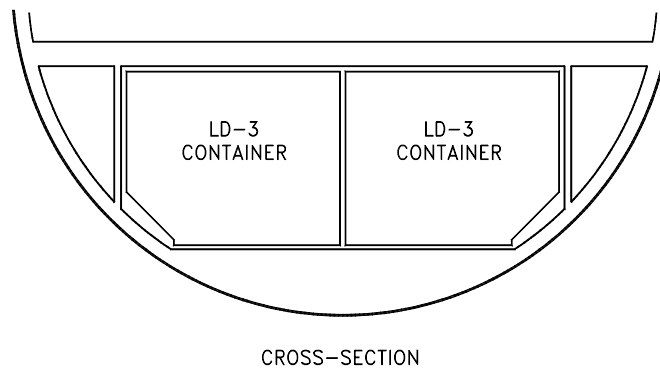
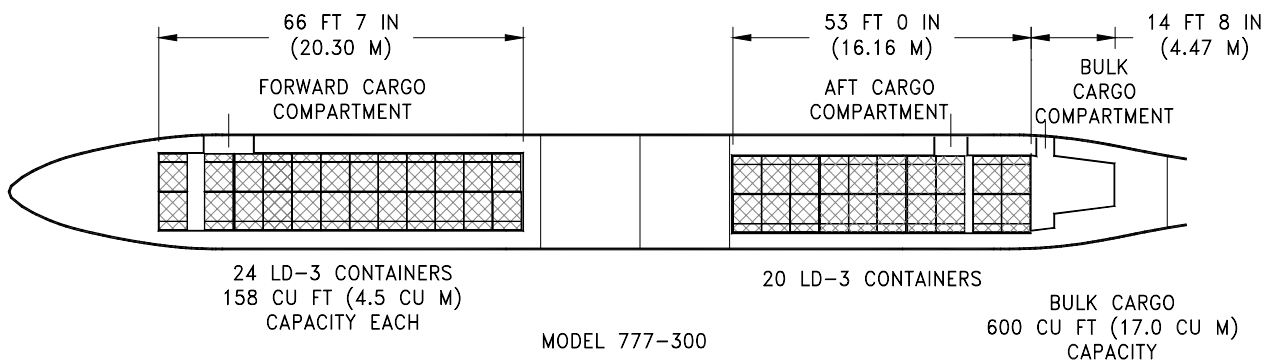
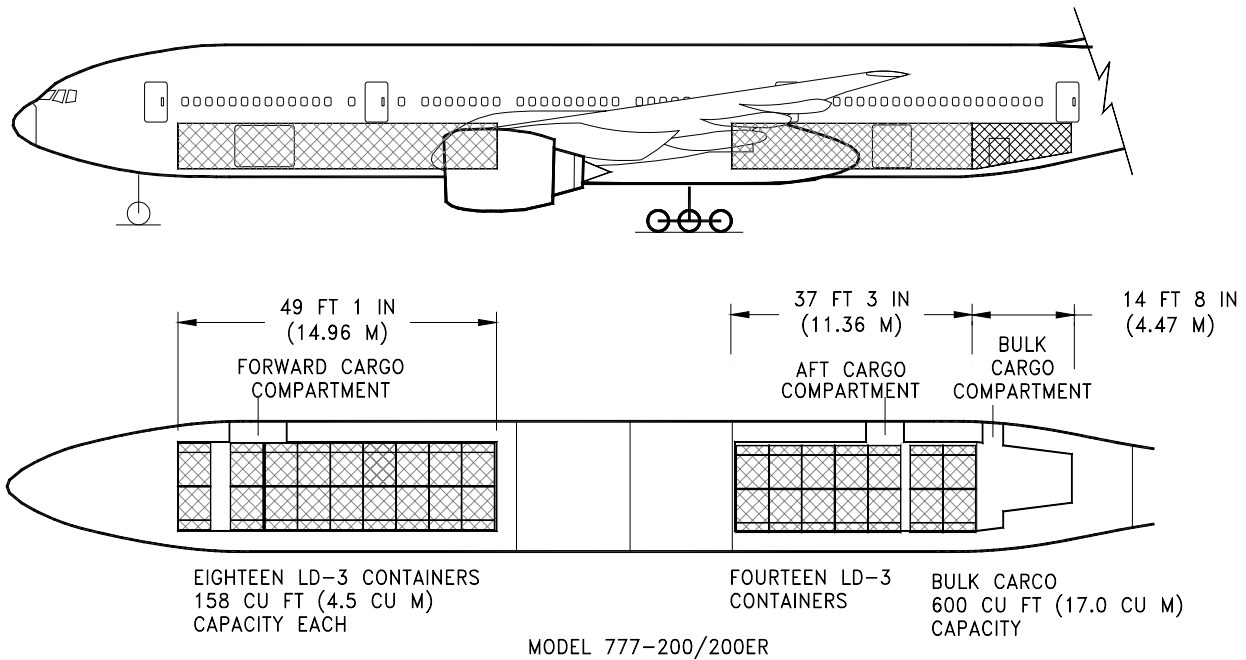


## 2.5.2 CABIN CROSS-SECTIONS - BUSINESS AND ECONOMY CLASS SEATS

MODEL 777-200, -300

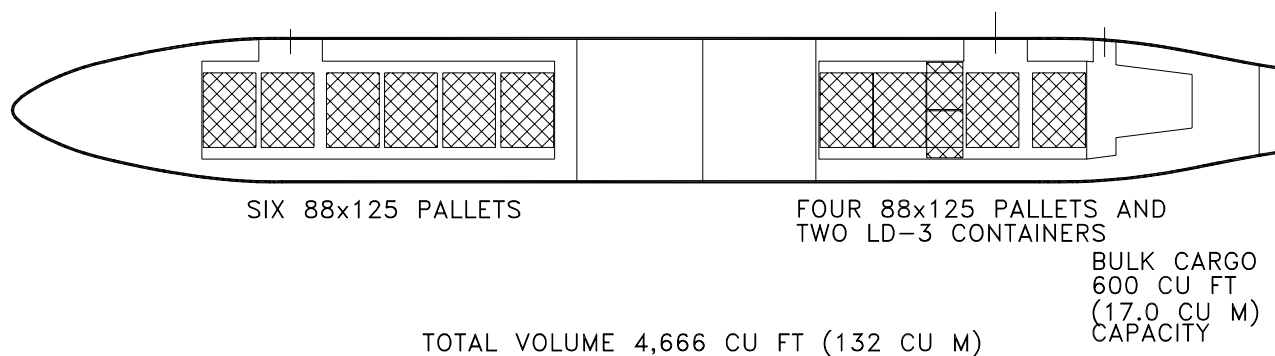
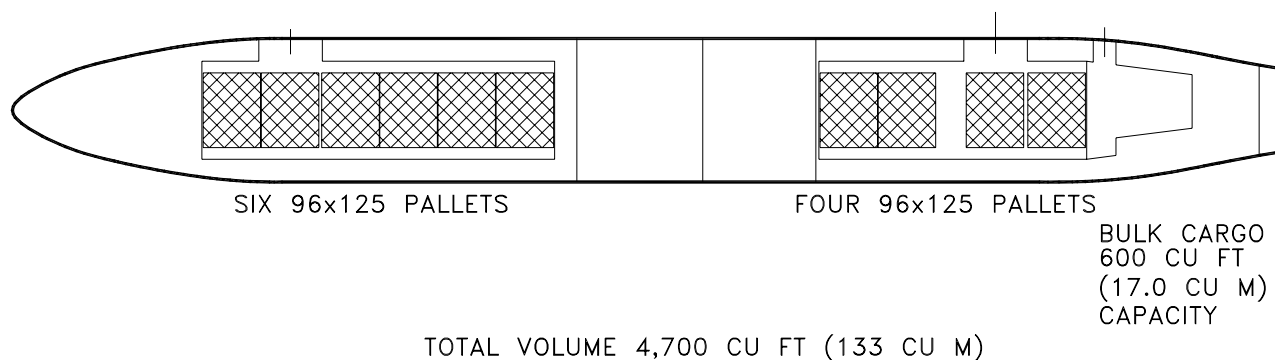
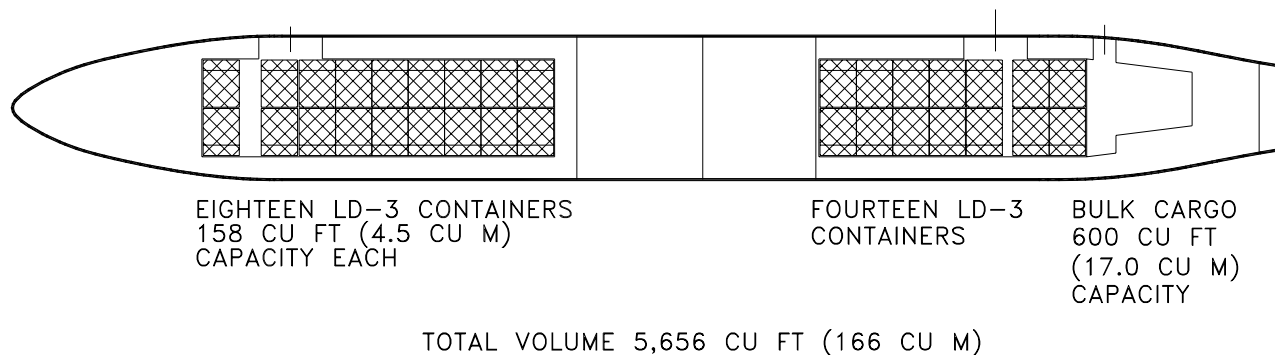
D6-58329





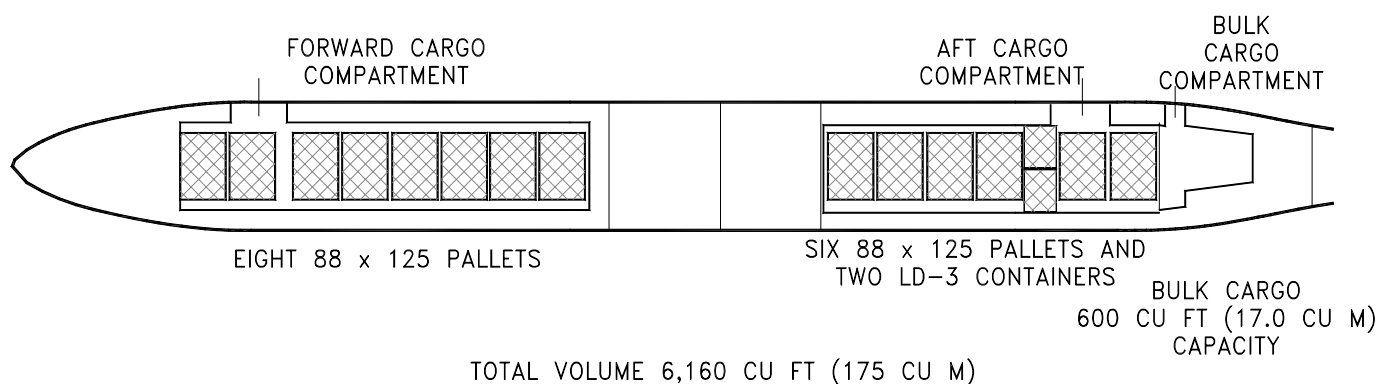
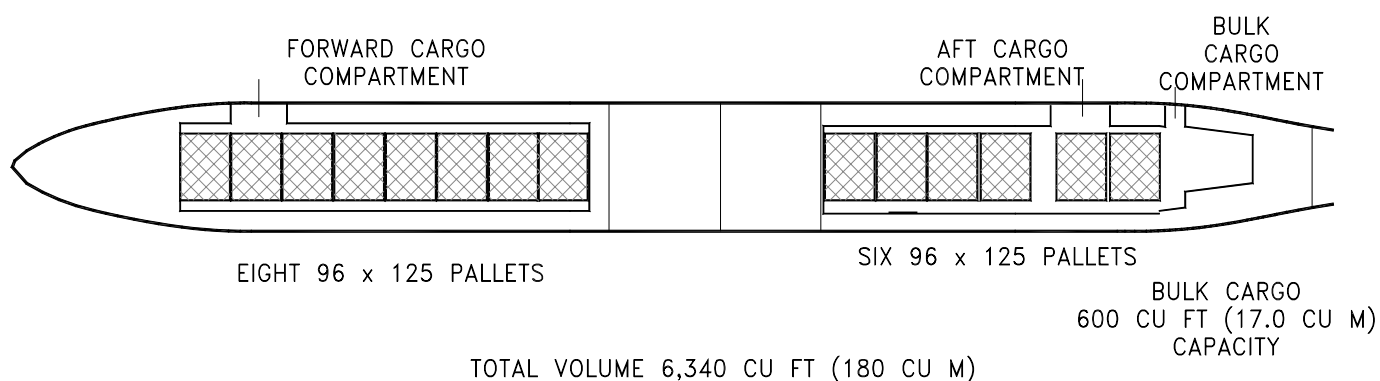
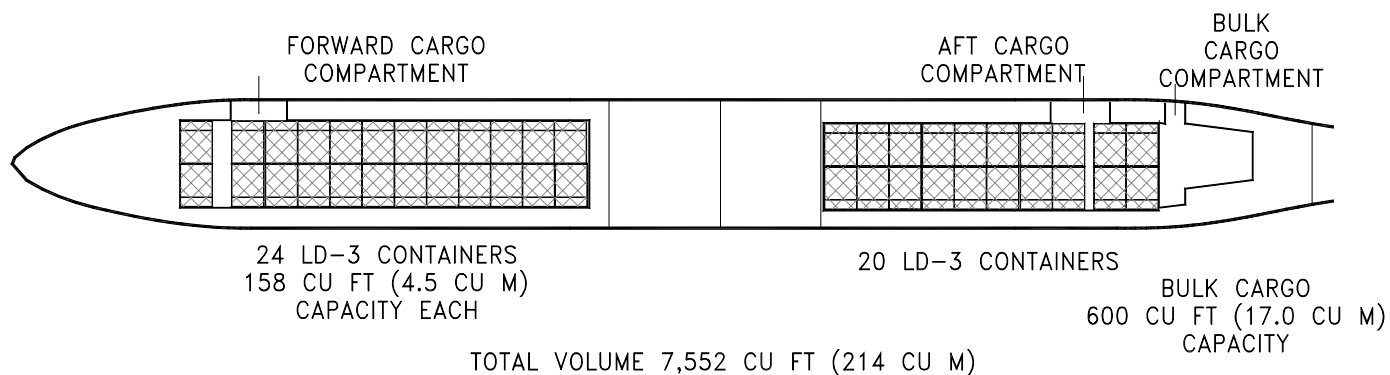
## 2.6.1 LOWER CARGO COMPARTMENTS - CONTAINERS AND BULK CARGO

MODEL 777-200, -300



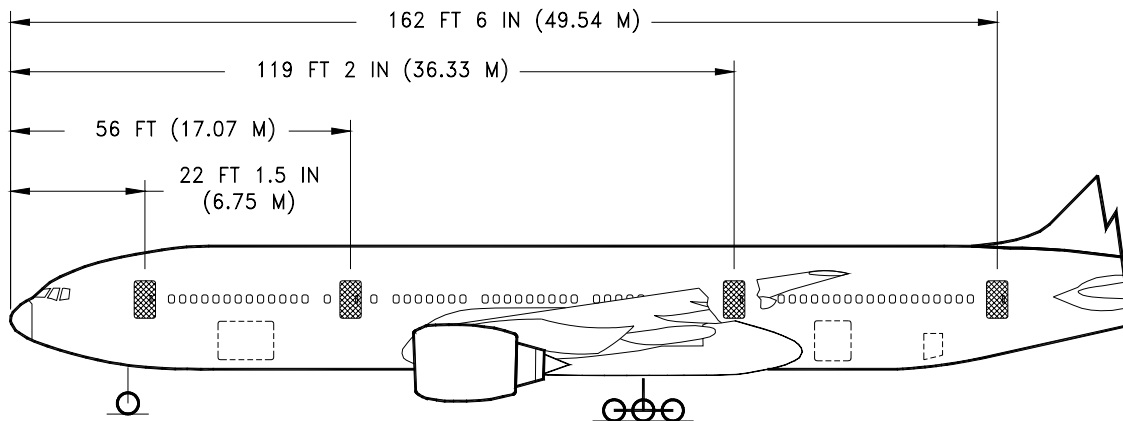
## 2.6.2 LOWER CARGO COMPARTMENTS - OPTIONAL AFT LARGE CARGO DOOR

MODEL 777-200

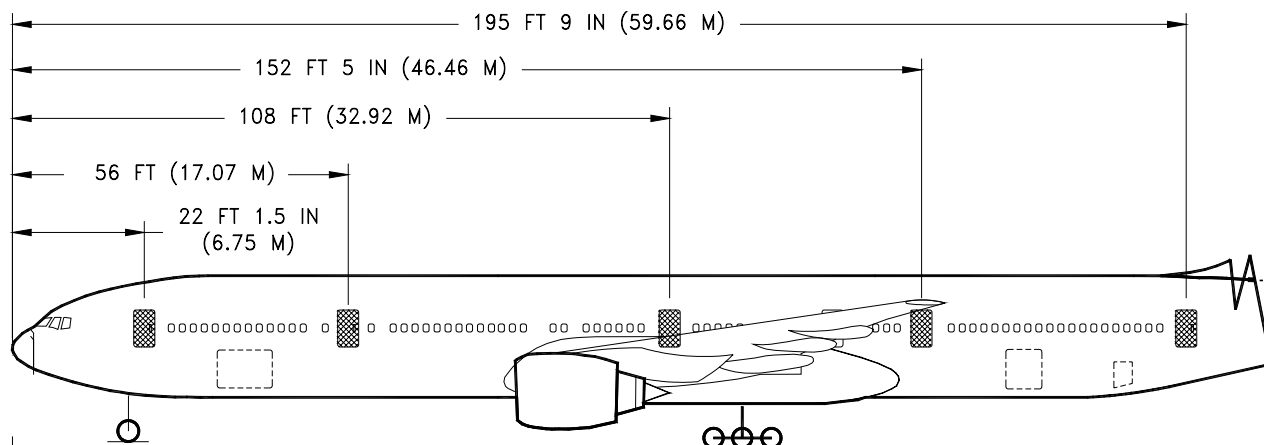


## 2.6.3 LOWER CARGO COMPARTMENTS - OPTIONAL AFT LARGE CARGO DOOR

MODEL 777-300



MODEL 777-200/200ER



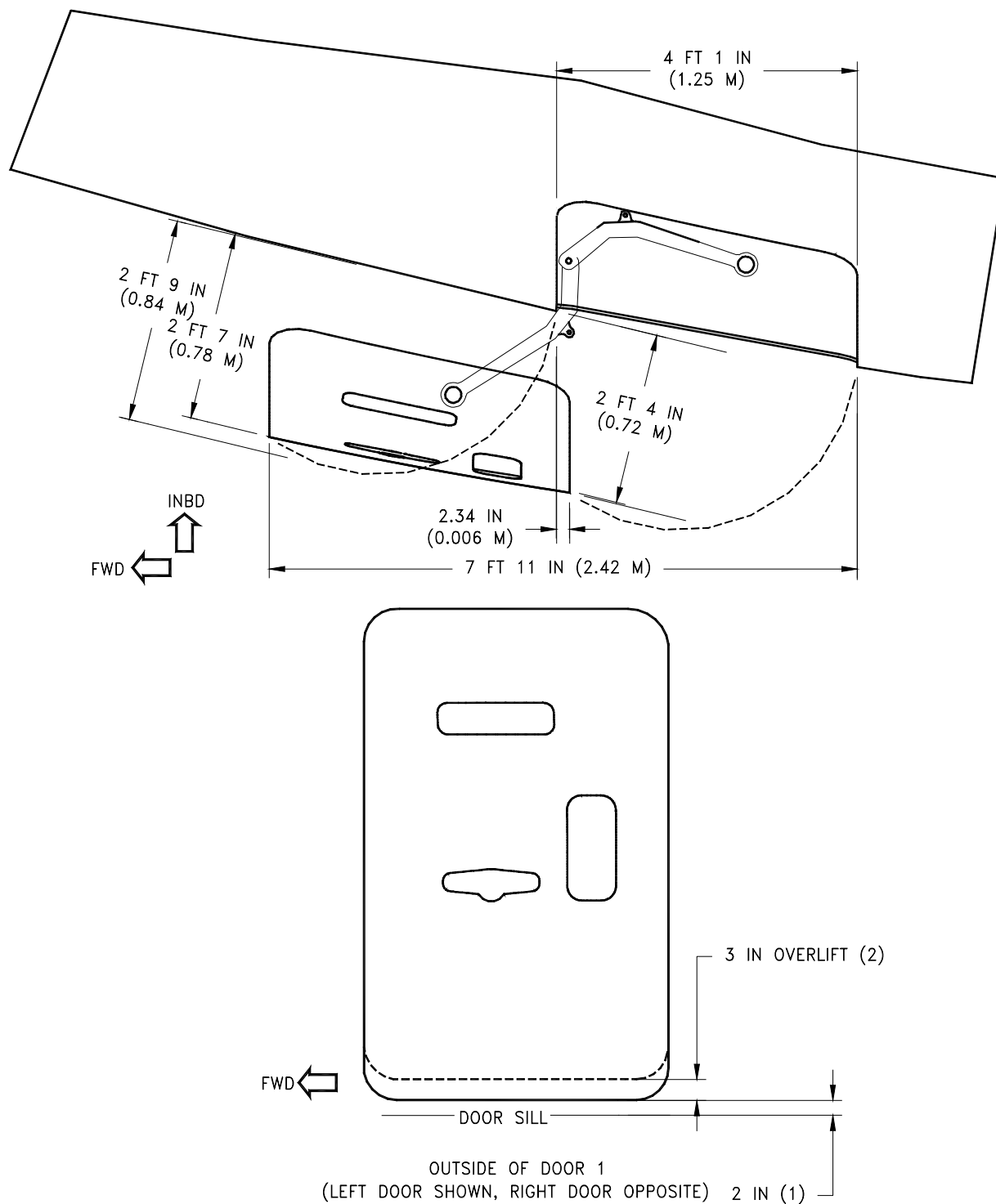
MODEL 777-300

NOTES:

1. MODEL 777-200/200ER – EIGHT PASSENGER DOORS, 4 ON EACH SIDE  
DOOR OPENING SIZE = 42 BY 74 IN (1.07 BY 1.88 M)  
DOOR SIZE = 42 BY 74 IN (1.07 BY 1.88 M)
2. MODEL 777-300 – TEN PASSENGER DOORS, 5 ON EACH SIDE  
DOOR OPENING AND SIZE SAME AS IN 777-200/200ER
3. DOORS ARE TRANSLATING TYPE A DOORS.
4. SEE SECTION 2.3 FOR DOOR SILL HEIGHTS

## 2.7.1 DOOR CLEARANCES - MAIN ENTRY DOOR LOCATIONS

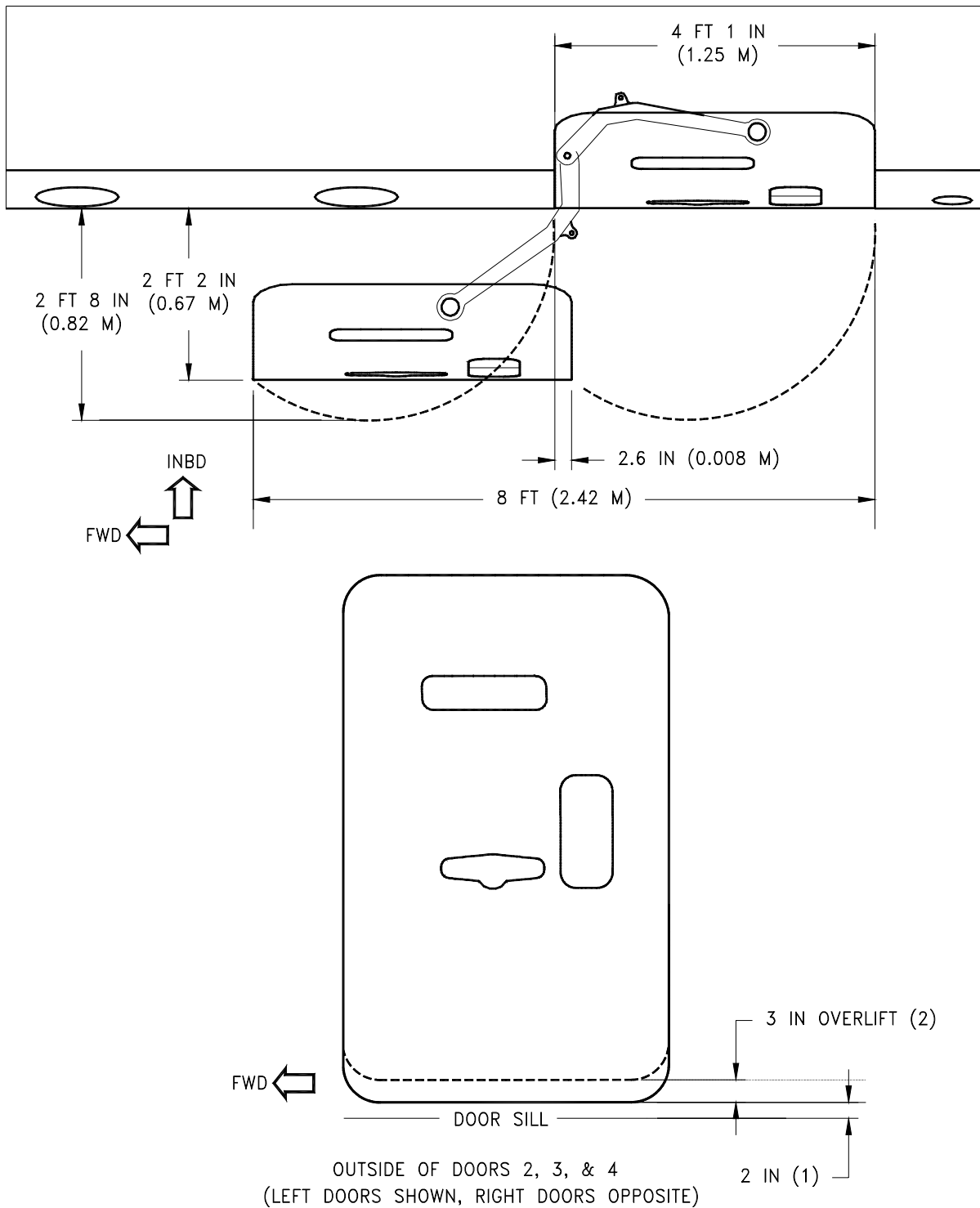
MODEL 777-200, -300



NOTES:

- (1) DOOR MOVES UPWARD 2 IN. AND INWARD 0.4 IN. TO CLEAR STOPS BEFORE OPENING OUTWARD
- (2) DOOR CAPABLE OF MOVING AN ADDITIONAL 3 IN VERTICALLY (OVERLIFT) TO PRECLUDE DAMAGE FROM CONTACT WITH LOADING BRIDGE

**2.7.2 DOOR CLEARANCES - MAIN ENTRY DOOR NO 1**  
MODEL 777-200, -300

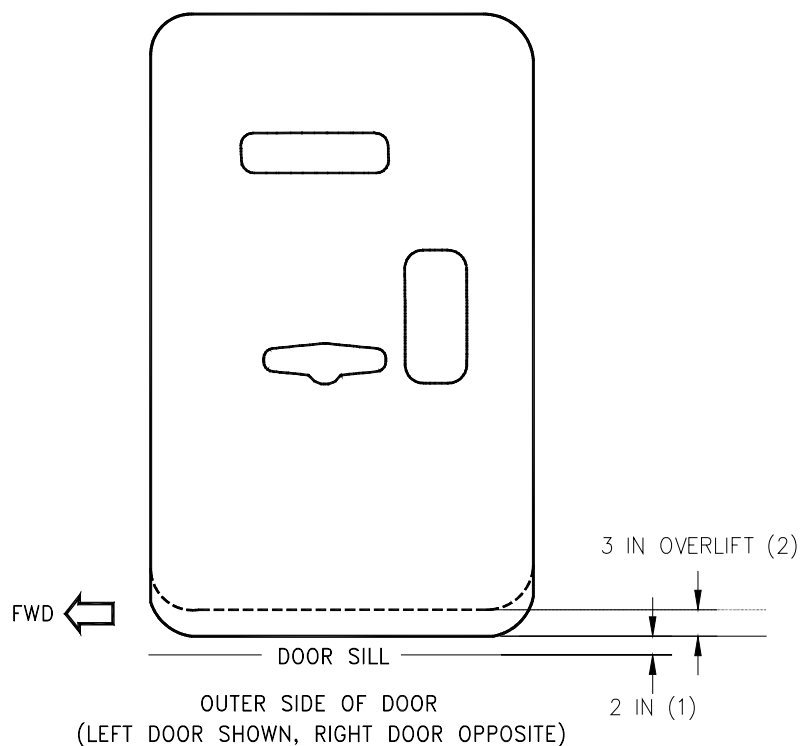
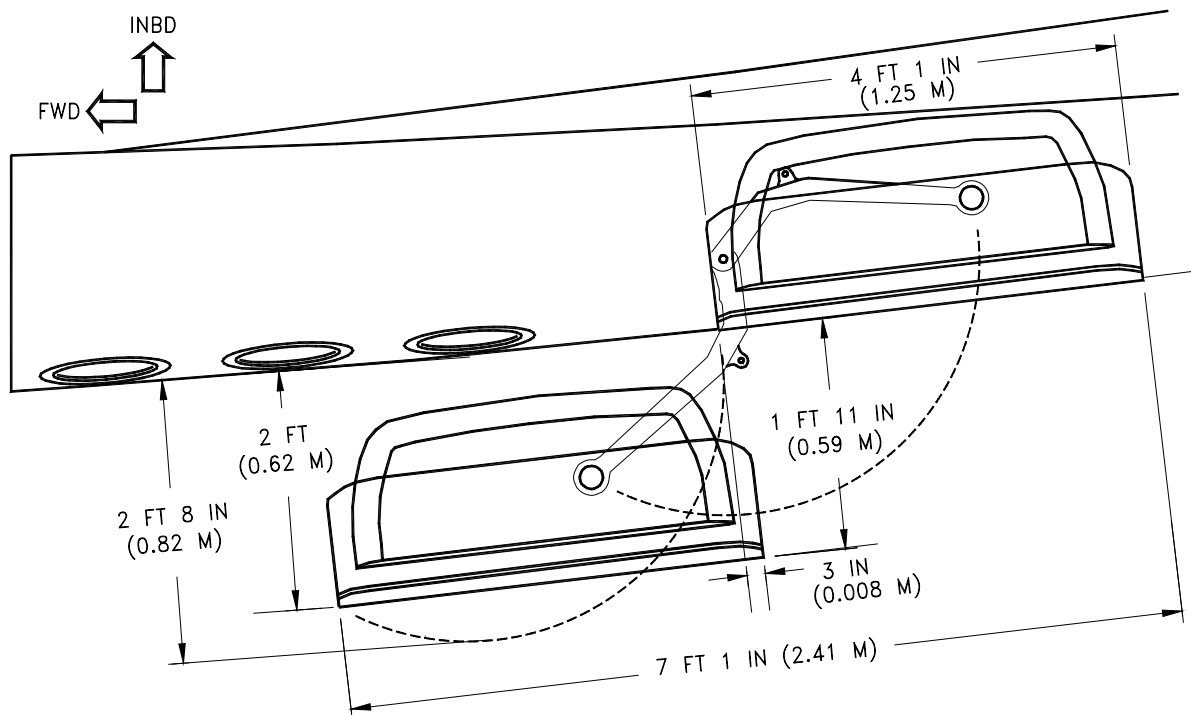


NOTES:

- (1) DOOR MOVES UPWARD 2 IN. AND INWARD 0.4 IN TO CLEAR STOPS BEFORE OPENING OUTWARD
- (2) DOOR CAPABLE OF MOVING AN ADDITIONAL 3 IN VERTICALLY (OVERLIFT) TO PRECLUDE DAMAGE FROM CONTACT WITH LOADING BRIDGE

**2.7.3 DOOR CLEARANCES - MAIN ENTRY DOOR NO 2 , NO 3, AND NO 4**  
MODEL 777-200, -300

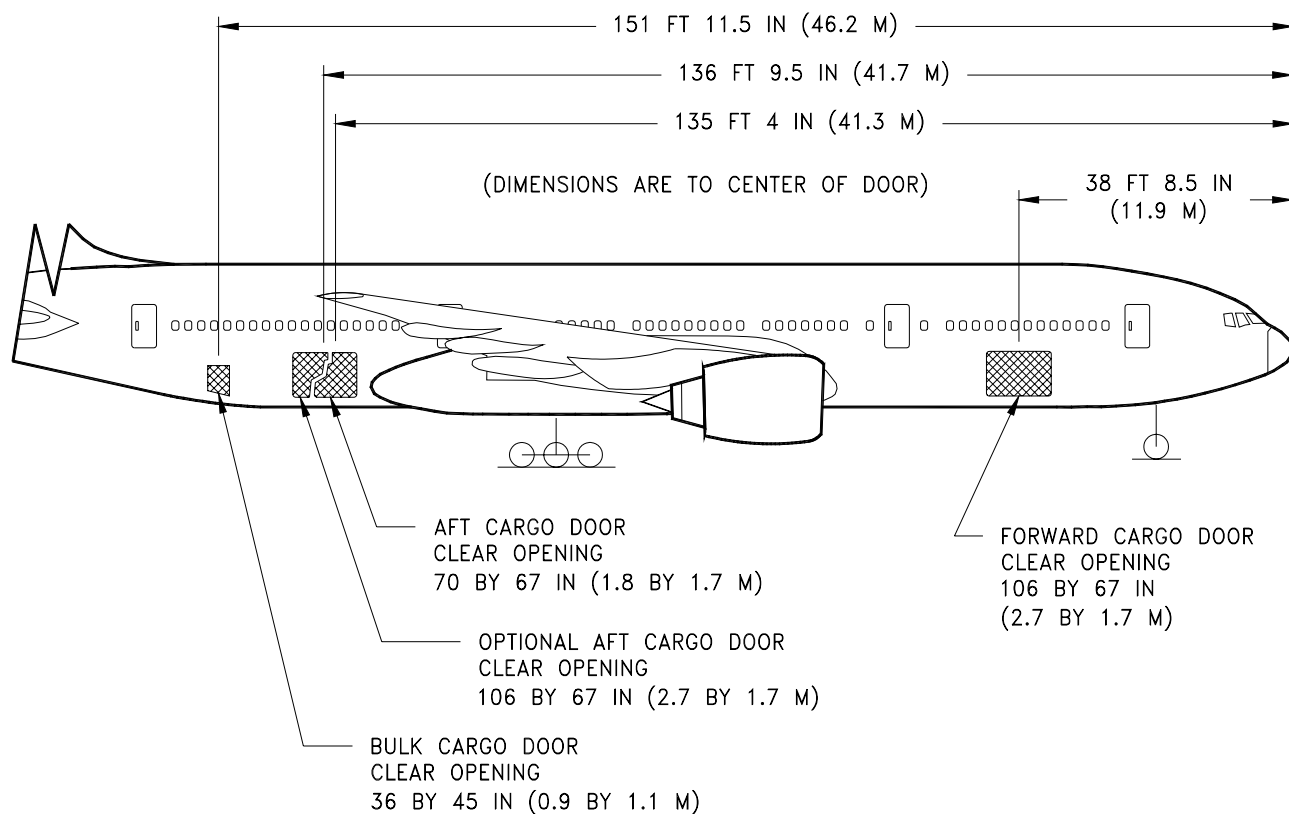
D6-58329



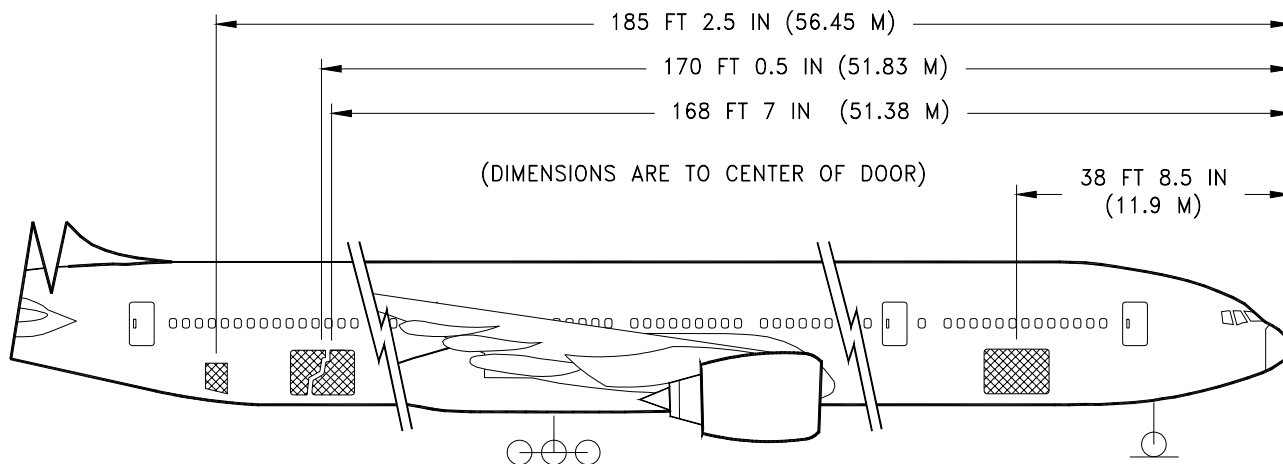
NOTES:

- (1) DOOR MOVES UPWARD 2 IN. AND INWARD 0.4 IN. TO CLEAR STOPS BEFORE OPENING OUTWARD
- (2) DOOR CAPABLE OF MOVING AN ADDITIONAL 3 IN VERTICALLY (OVERLIFT) TO PRECLUDE DAMAGE FROM CONTACT WITH LOADING BRIDGE
- (3) DOOR NO 4 ON 777-200/200ER, DOOR NO 5 ON 777-300

**2.7.4 DOOR CLEARANCES - MAIN ENTRY DOOR NO 4 OR NO 5**  
MODEL 777-200, -300



MODEL 777-200/-200ER\*\*\*



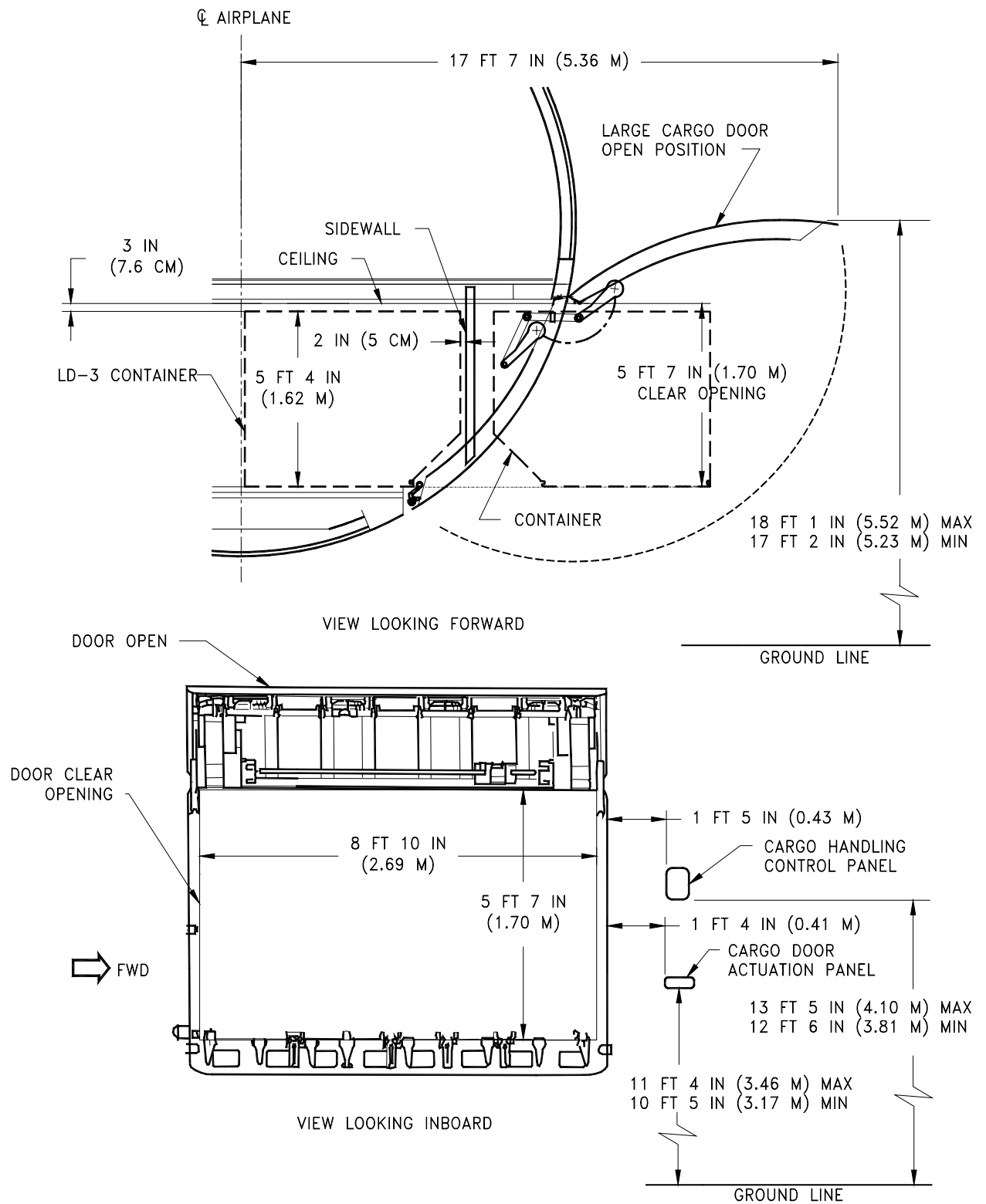
MODEL 777-300

(NOTE: DOOR DIMENSIONS SAME AS FOR 777-200/200ER)

## 2.7.5 DOOR CLEARANCES - CARGO DOOR LOCATIONS

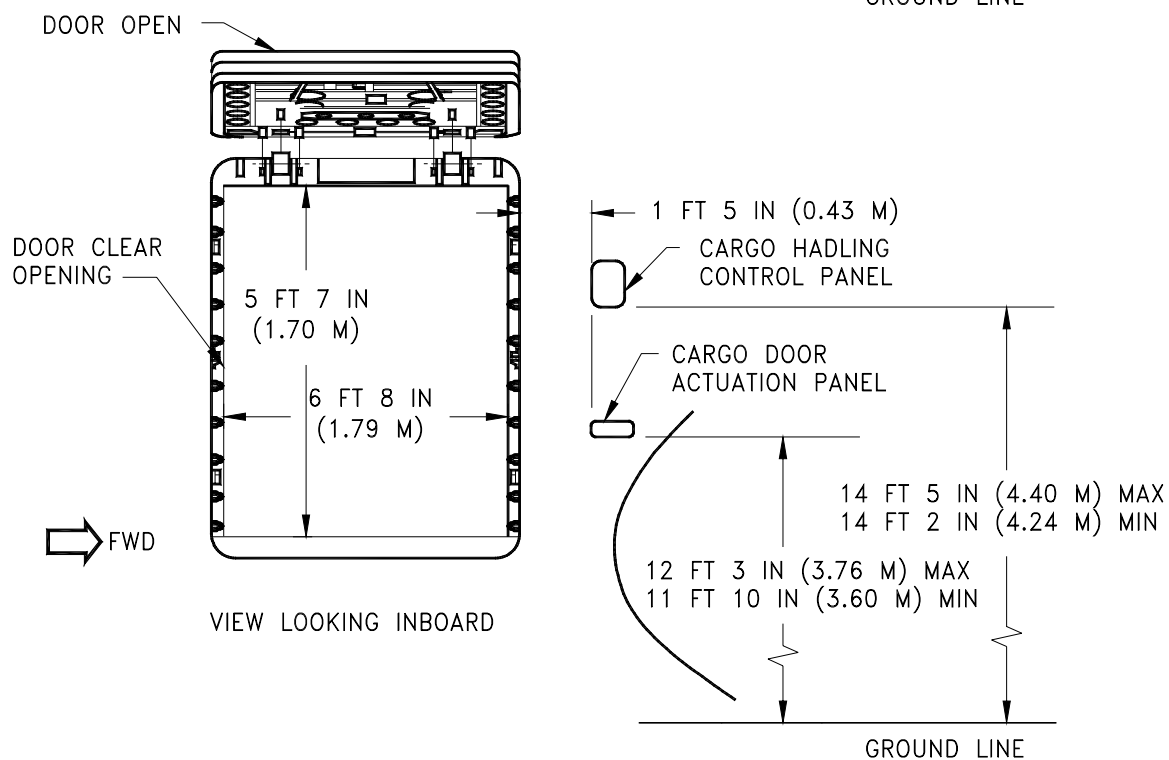
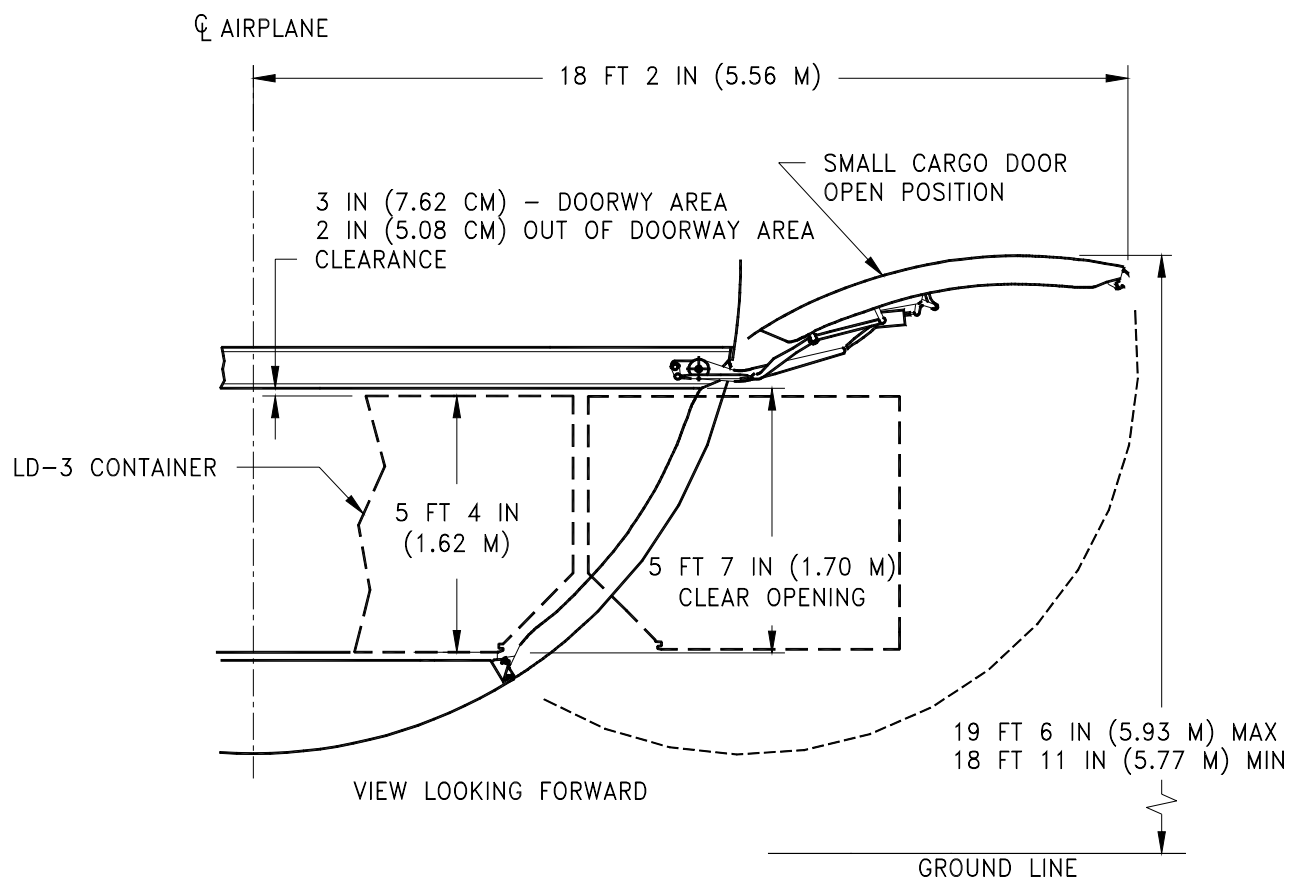
MODEL 777-300





## 2.7.6 DOOR CLEARANCES - FORWARD CARGO DOOR

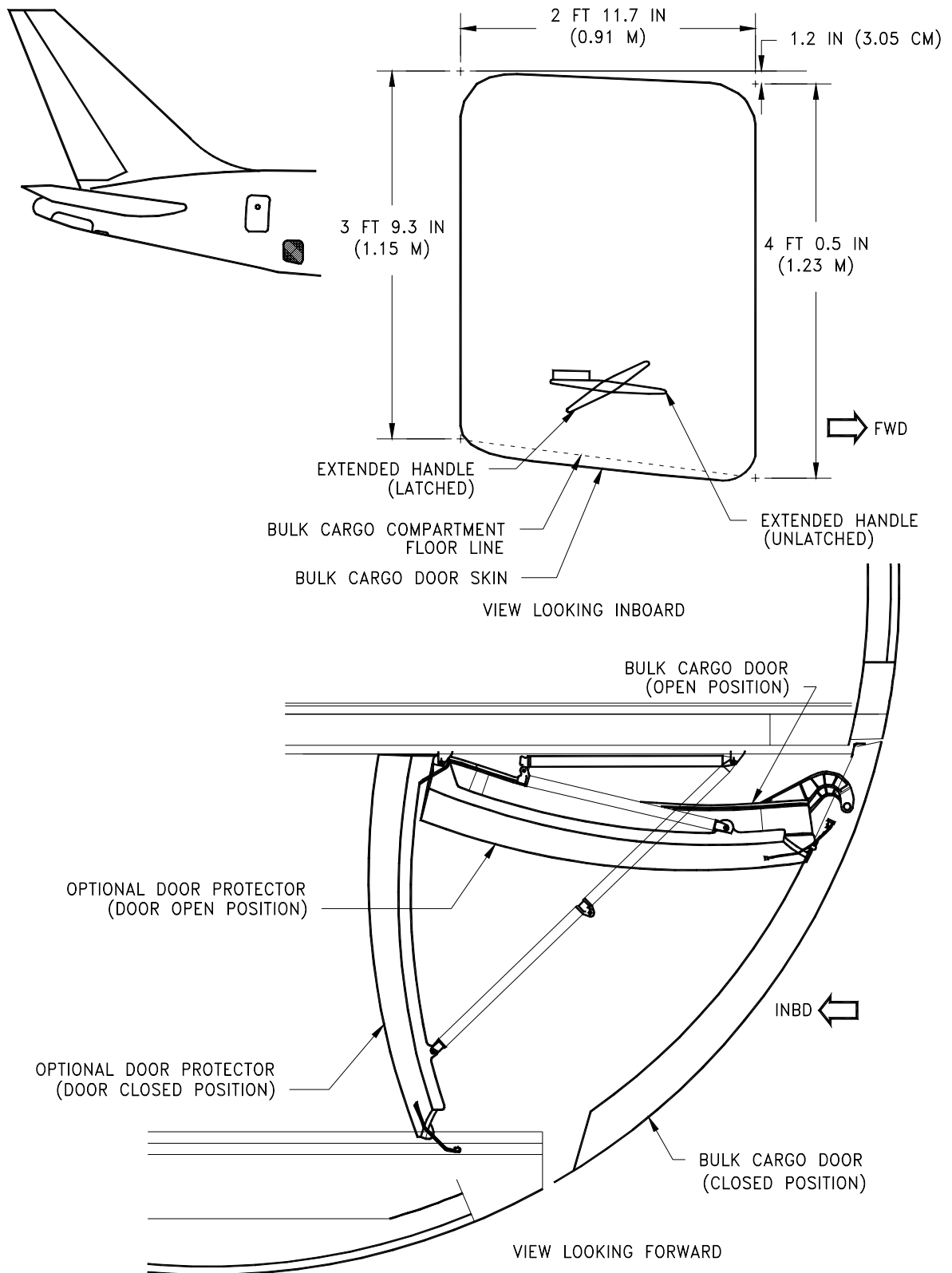
MODEL 777-200, -300



## 2.7.7 DOOR CLEARANCES - AFT CARGO DOOR

MODEL 777-200, -300

D6-58329



## 2.7.8 DOOR CLEARANCES - BULK CARGO DOOR

MODEL 777-200, -300

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### **3.0 AIRPLANE PERFORMANCE**

#### **3.1 General Information**

#### **3.2 Payload/Range for 0.84 Mach Cruise**

#### **3.3 F.A.R. Takeoff Runway Length Requirements**

#### **3.4 F.A.R. Landing Runway Length Requirements**

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### 3.0 AIRPLANE PERFORMANCE

#### 3.1 General Information

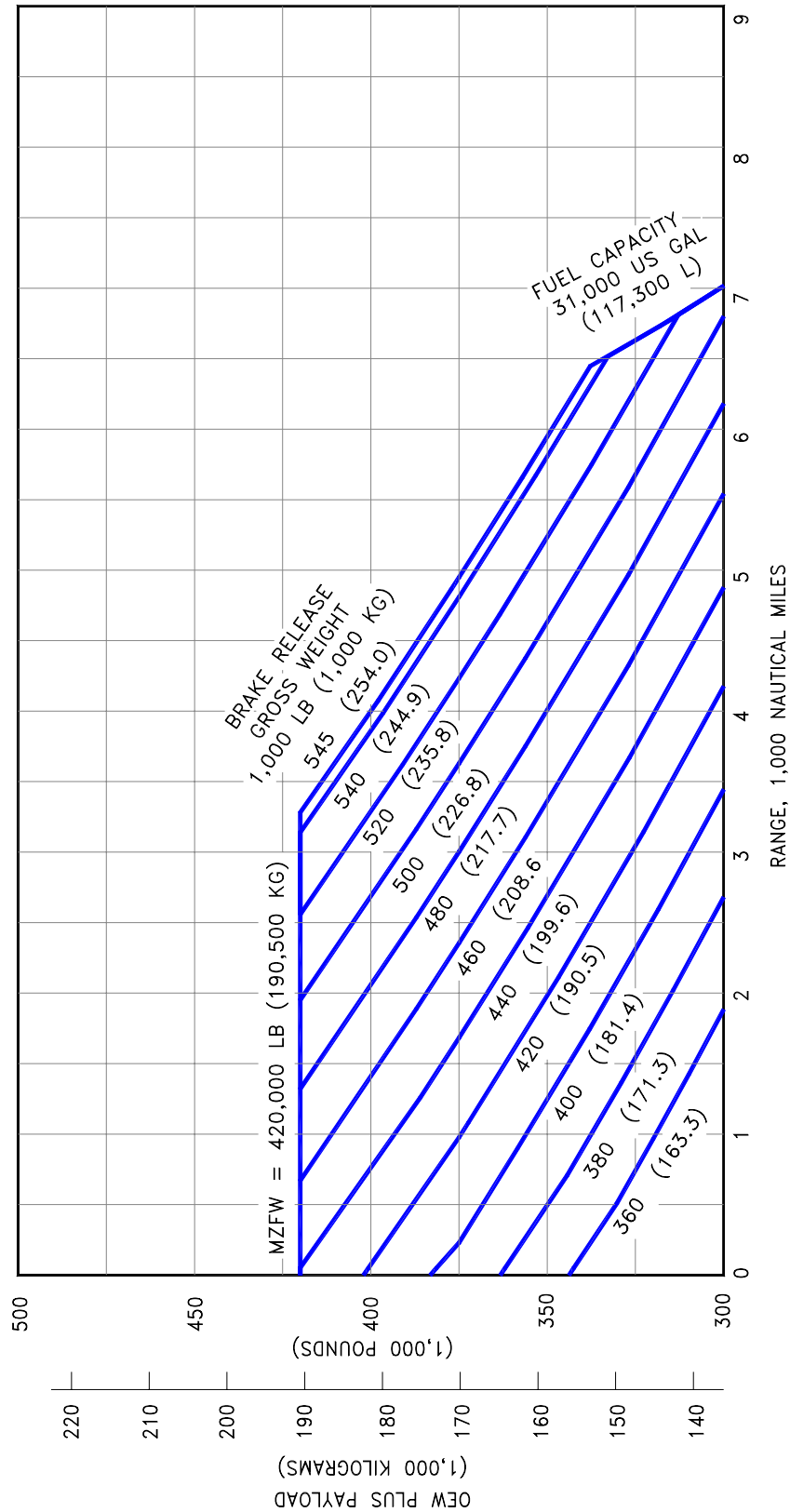
The graphs in Section 3.2 provide information on operational empty weight (OEW) and payload, trip range, brake release gross weight, and fuel limits for airplane models with the different engine options. To use these graphs, if the trip range and zero fuel weight (OEW + payload) are known, the approximate brake release weight can be found.

The graphs in Section 3.3 provide information on F.A.R. takeoff runway length requirements with the different engines at different pressure altitudes. Maximum takeoff weights shown on the graphs are the heaviest for the particular airplane models with the corresponding engines. Standard day temperatures for pressure altitudes shown on the F.A.R. takeoff graphs are given below:

PRESSURE ALTITUDE		STANDARD DAY TEMP	
FEET	METERS	°F	°C
0	0	59.0	15.00
2,000	609	51.9	11.04
4,000	1,219	44.7	7.06
6,000	1,828	37.6	3.11
8,000	2,438	30.5	-0.85
9,000	2,743	26.9	-2.83

The graphs in Section 3.4 provide information on landing runway length requirements for different airplane weights and airport altitudes. The maximum landing weights shown are the heaviest for the particular airplane model.

- NOTES:
- \* STANDARD DAY, ZERO WIND
  - \* 0.84 MACH STEP CRUISE
  - \* TYPICAL MISSION RULES
  - \* NORMAL POWER EXTRACTION AND AIR CONDITIONING BLEED
  - \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE AND OEW PRIOR TO FACILITY DESIGN



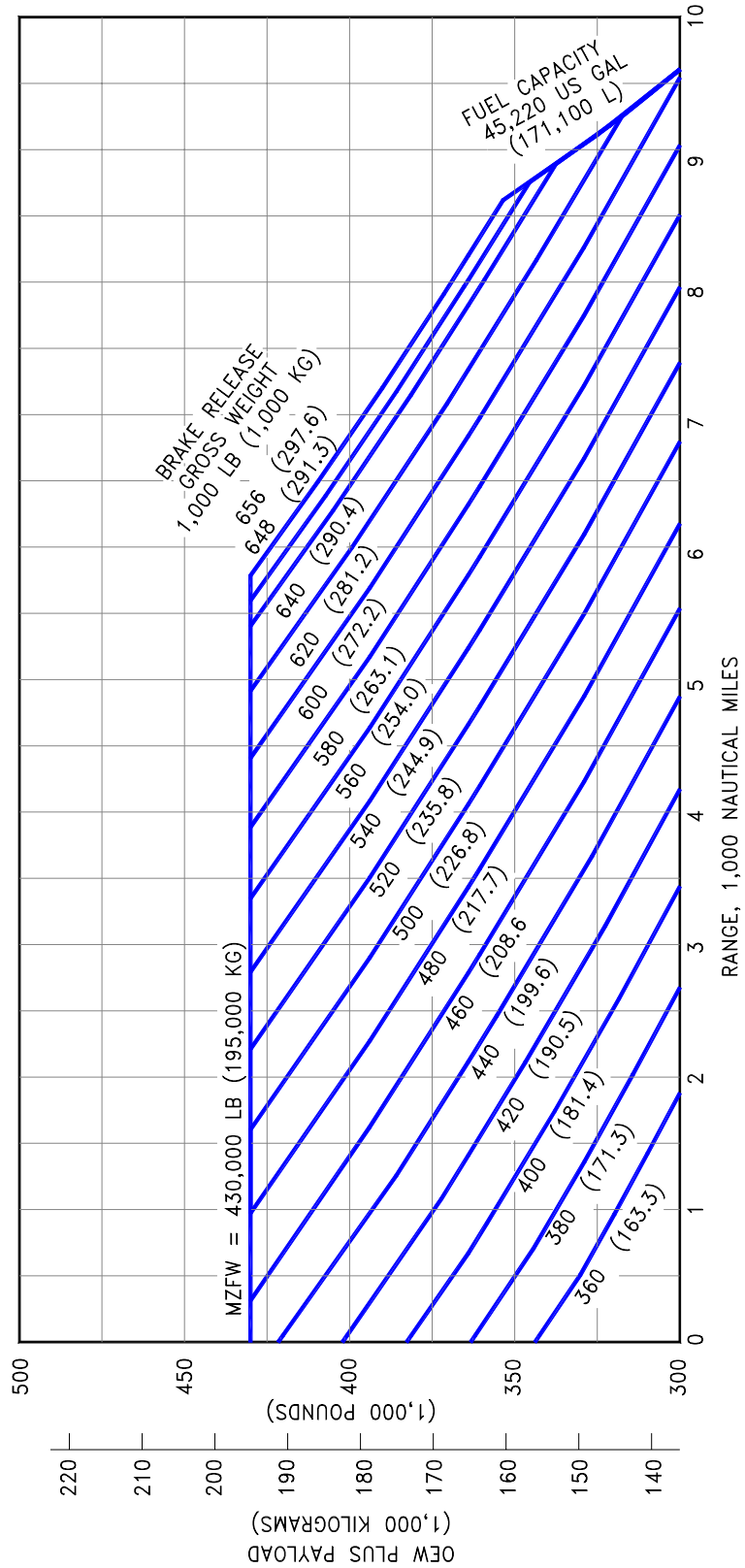
### 3.2.1 PAYLOAD/RANGE FOR 0.84 MACH CRUISE

MODEL 777-200 (BASELINE AIRPLANE)



NOTES:

- \* STANDARD DAY, ZERO WIND
- \* 0.84 MACH STEP CRUISE
- \* TYPICAL MISSION RULES
- \* NORMAL POWER EXTRACTION AND AIR CONDITIONING BLEED
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE AND OEW PRIOR TO FACILITY DESIGN

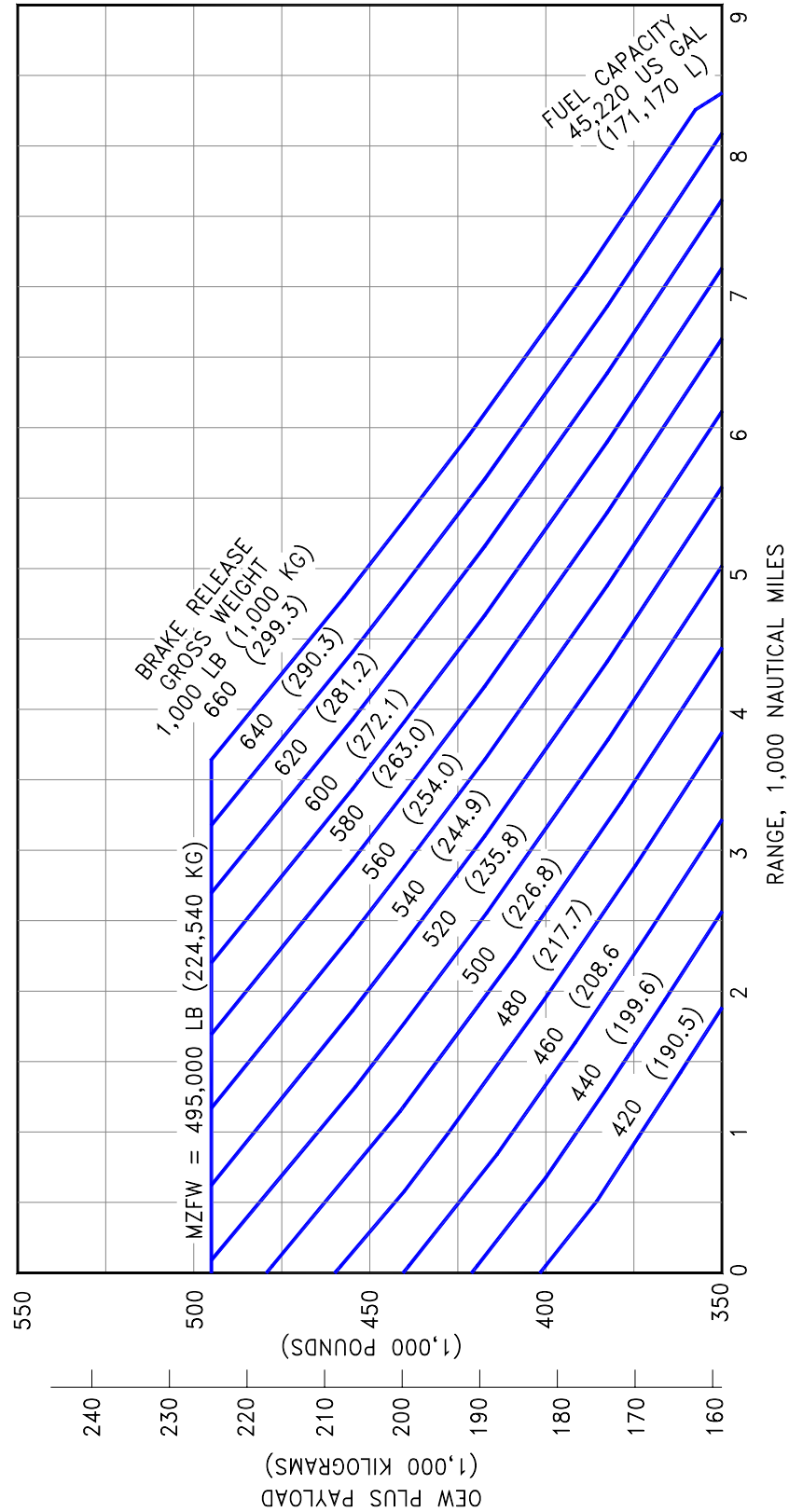


### 3.2.2 PAYLOAD/RANGE FOR 0.84 MACH CRUISE

MODEL 777-200 (HIGH GROSS WEIGHT AIRPLANE)

NOTES:

- \* STANDARD DAY, ZERO WIND
- \* 0.84 MACH STEP CRUISE
- \* TYPICAL MISSION RULES
- \* NORMAL POWER EXTRACTION AND AIR CONDITIONING BLEED
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE AND OEI PRIOR TO FACILITY DESIGN

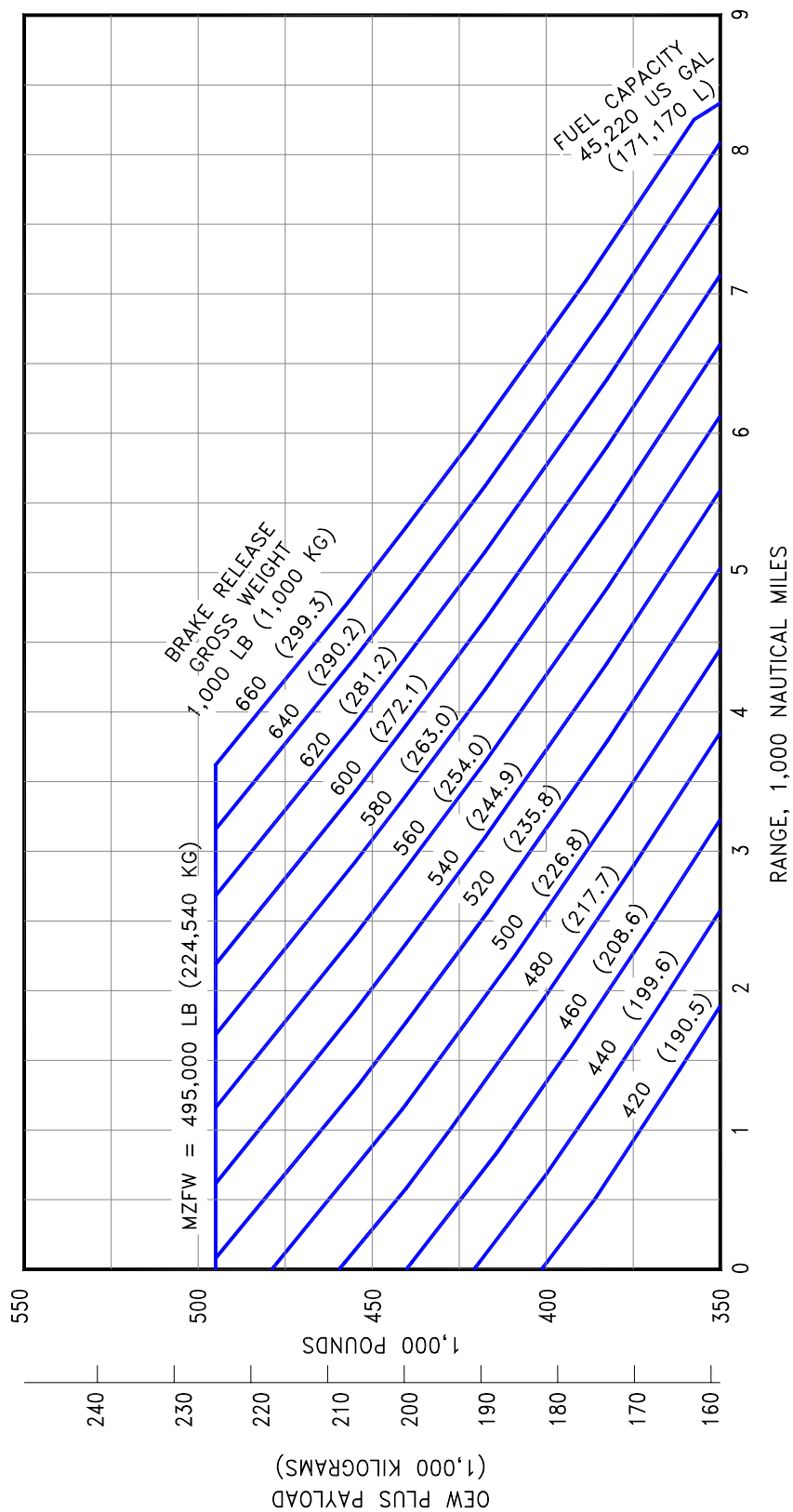


### 3.2.3 PAYLOAD/RANGE FOR 0.84 MACH CRUISE

MODEL 777-300 (TYPICAL 90K ENGINE)

D6-58329

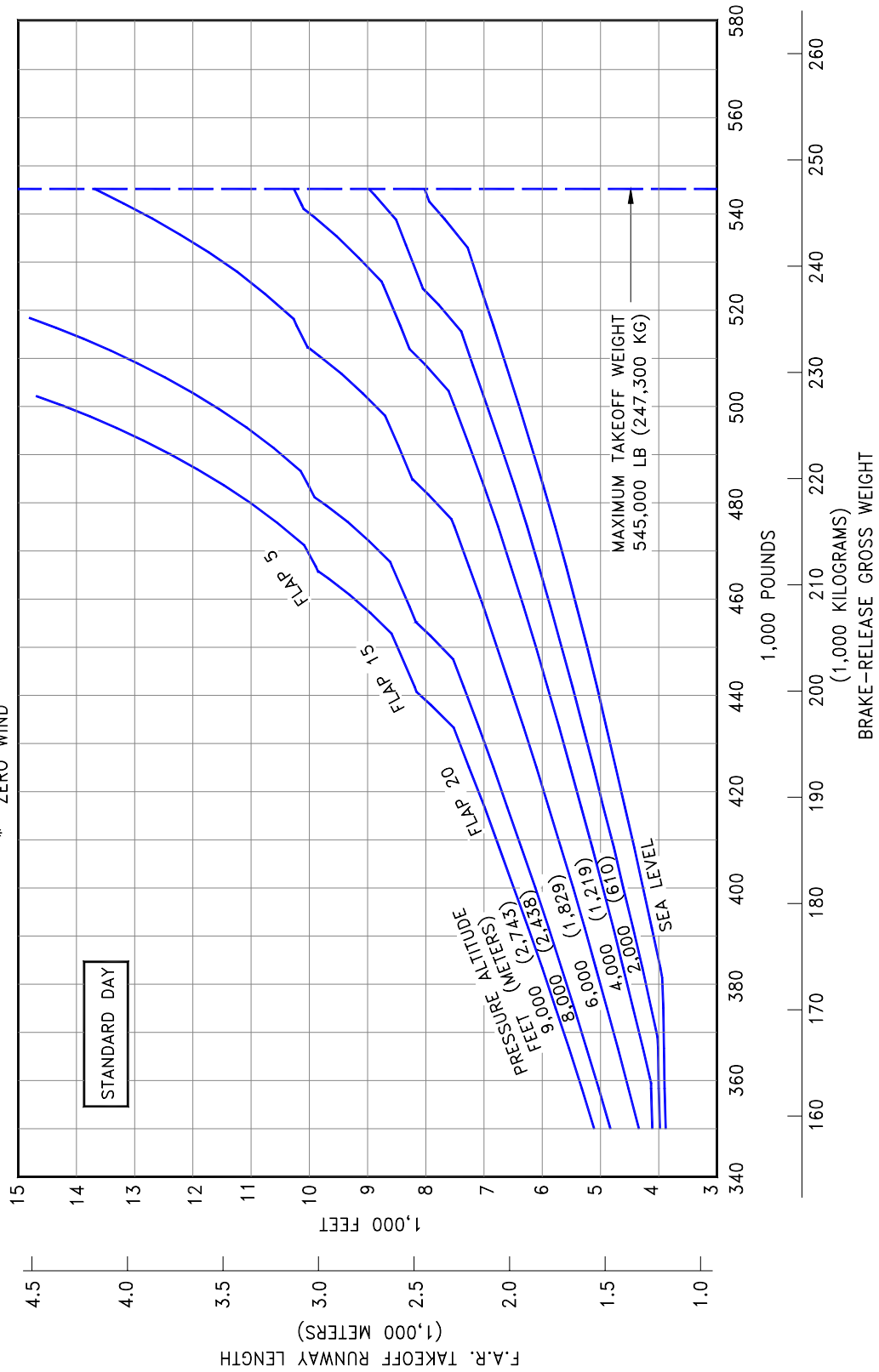
- NOTES:
- \* STANDARD DAY, ZERO WIND
  - \* 0.84 MACH STEP CRUISE
  - \* TYPICAL MISSION RULES
  - \* NORMAL POWER EXTRACTION AND AIR CONDITIONING BLEED
  - \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE AND OEI PRIOR TO FACILITY DESIGN



### 3.2.4 PAYLOAD/RANGE FOR 0.84 MACH CRUISE

MODEL 777-300 (TYPICAL 98K ENGINE)

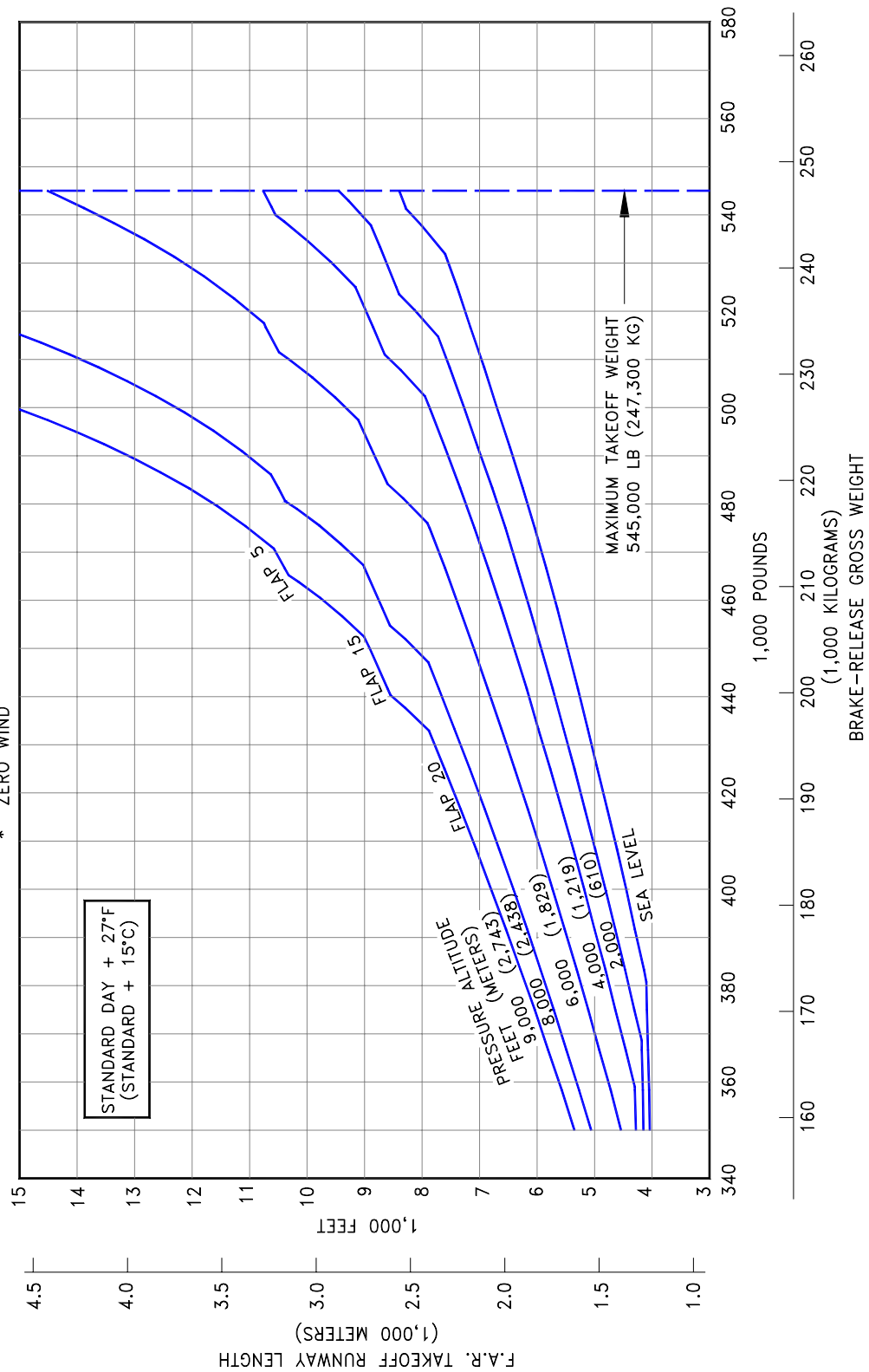
- NOTES:
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN
  - \* AIR CONDITIONING OFF
  - \* ZERO RUNWAY GRADIENT
  - \* ZERO WIND



### 3.3.1 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 777-200 (BASELINE AIRPLANE)

- NOTES:
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN
  - \* AIR CONDITIONING OFF
  - \* ZERO RUNWAY GRADIENT
  - \* ZERO WIND

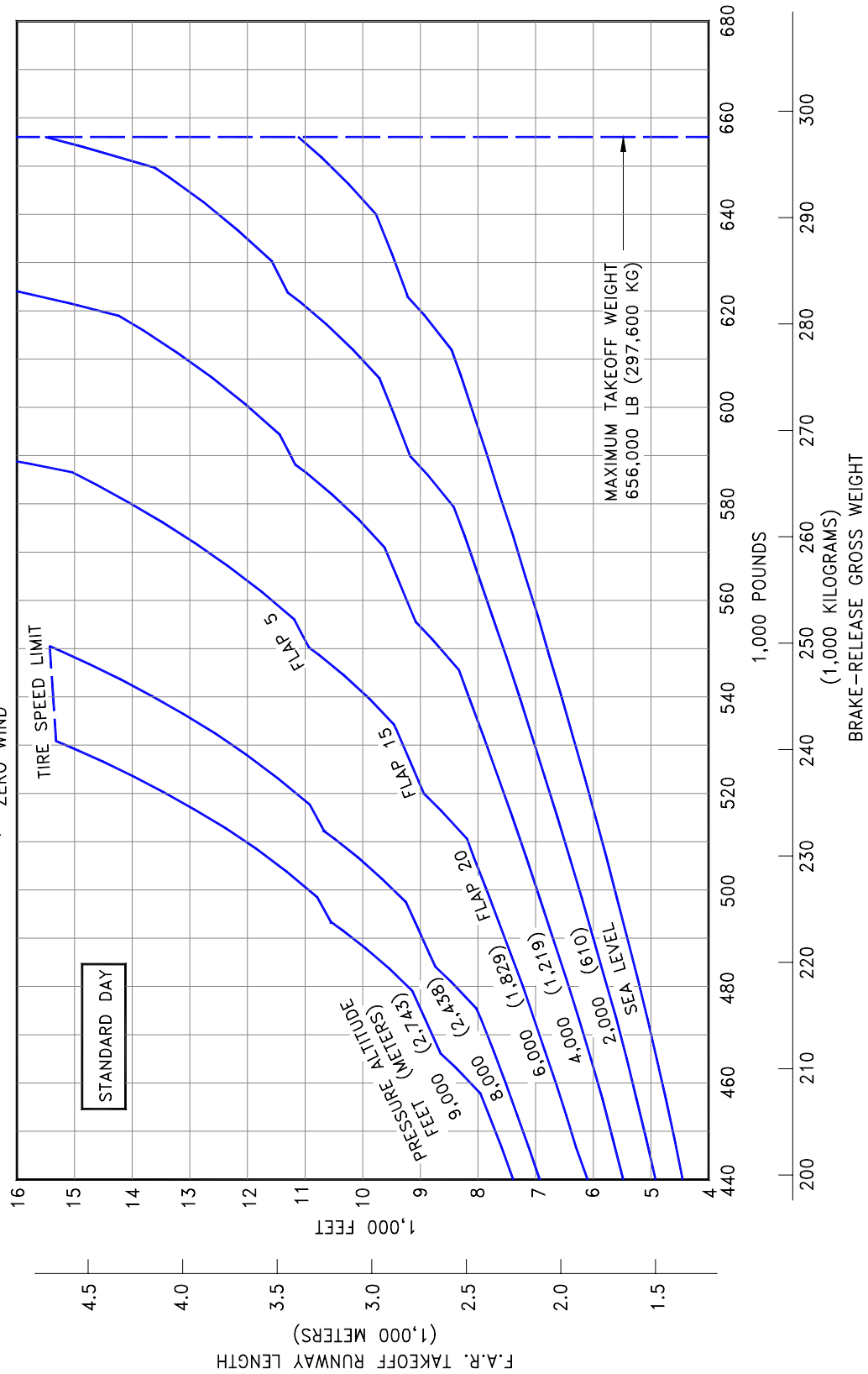


### 3.3.2 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS

STANDARD DAY +27°F (STD + 15°C)

MODEL 777-200 (BASELINE AIRPLANE)

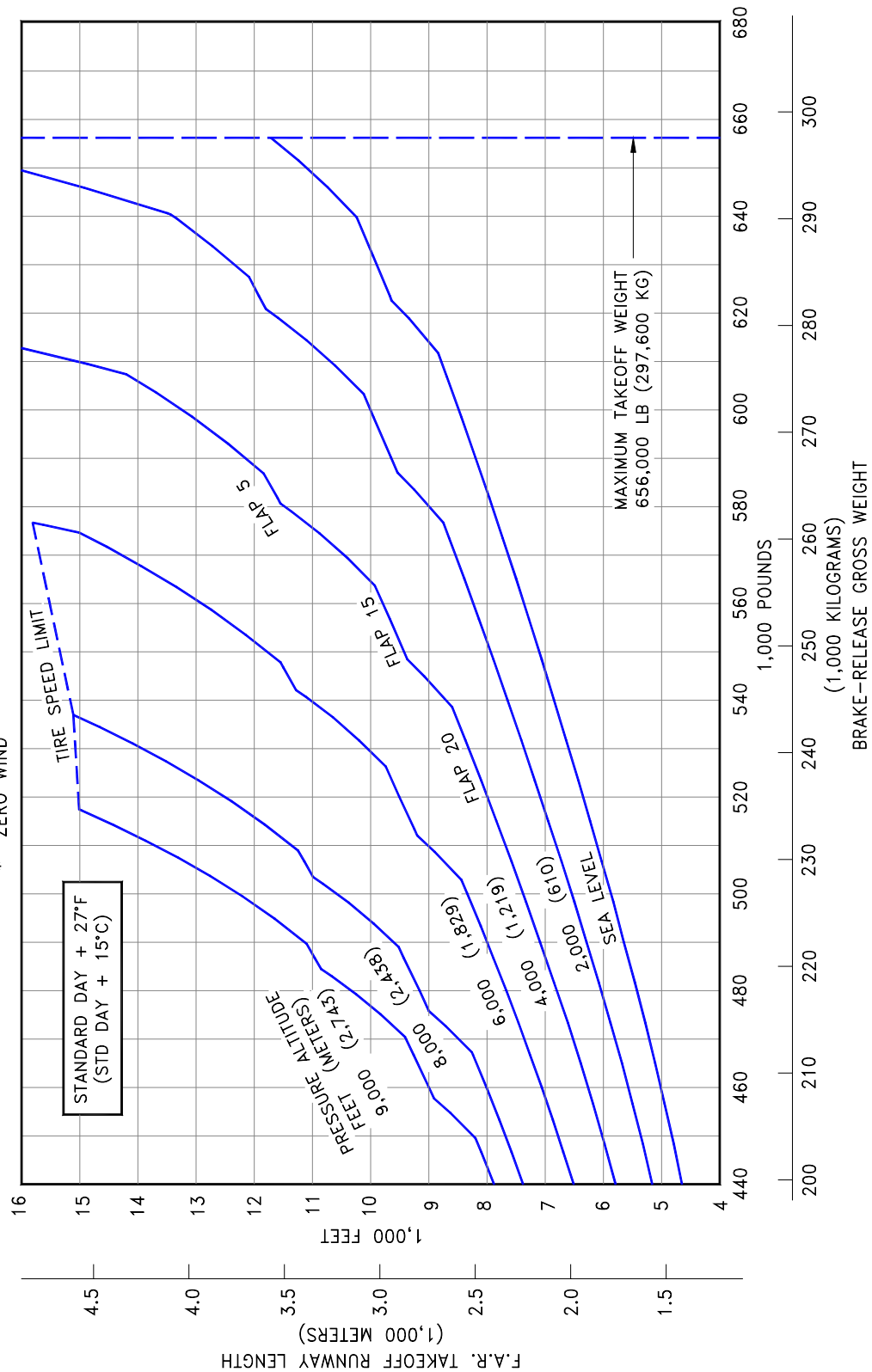
NOTES:  
 \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING  
 PROCEDURE PRIOR TO FACILITY DESIGN  
 \* AIR CONDITIONING OFF  
 \* ZERO RUNWAY GRADIENT  
 \* ZERO WIND



### 3.3.3 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 777-200 (HIGH GROSS WEIGHT AIRPLANE)

- NOTES:
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN
  - \* AIR CONDITIONING OFF
  - \* ZERO RUNWAY GRADIENT
  - \* ZERO WIND

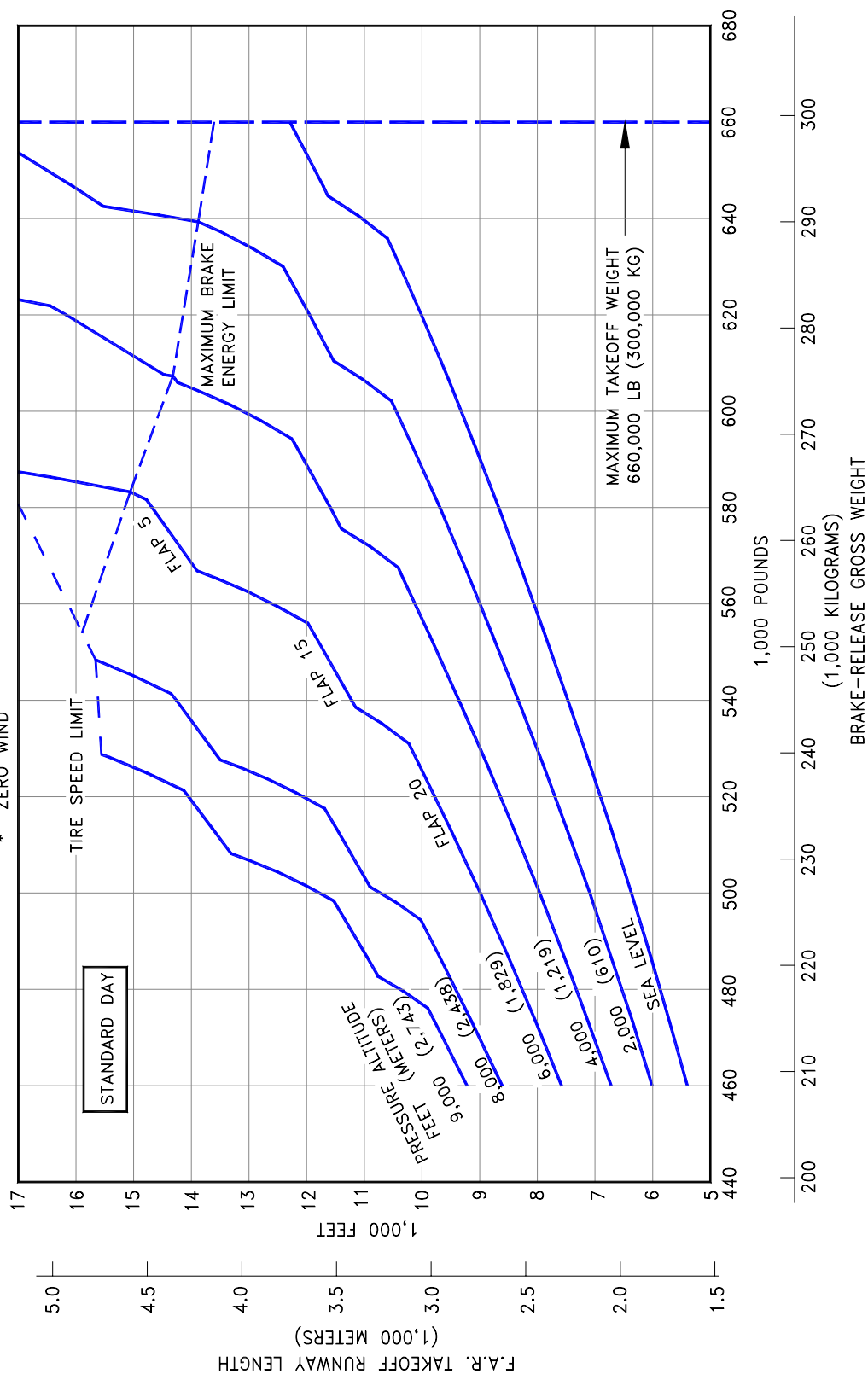


### 3.3.4 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS

**STANDARD DAY +27°F (STD + 15°C)**

*MODEL 777-200 (HIGH GROSS WEIGHT AIRPLANE)*

- NOTES:
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN
  - \* AIR CONDITIONING OFF
  - \* ZERO RUNWAY GRADIENT
  - \* ZERO WIND

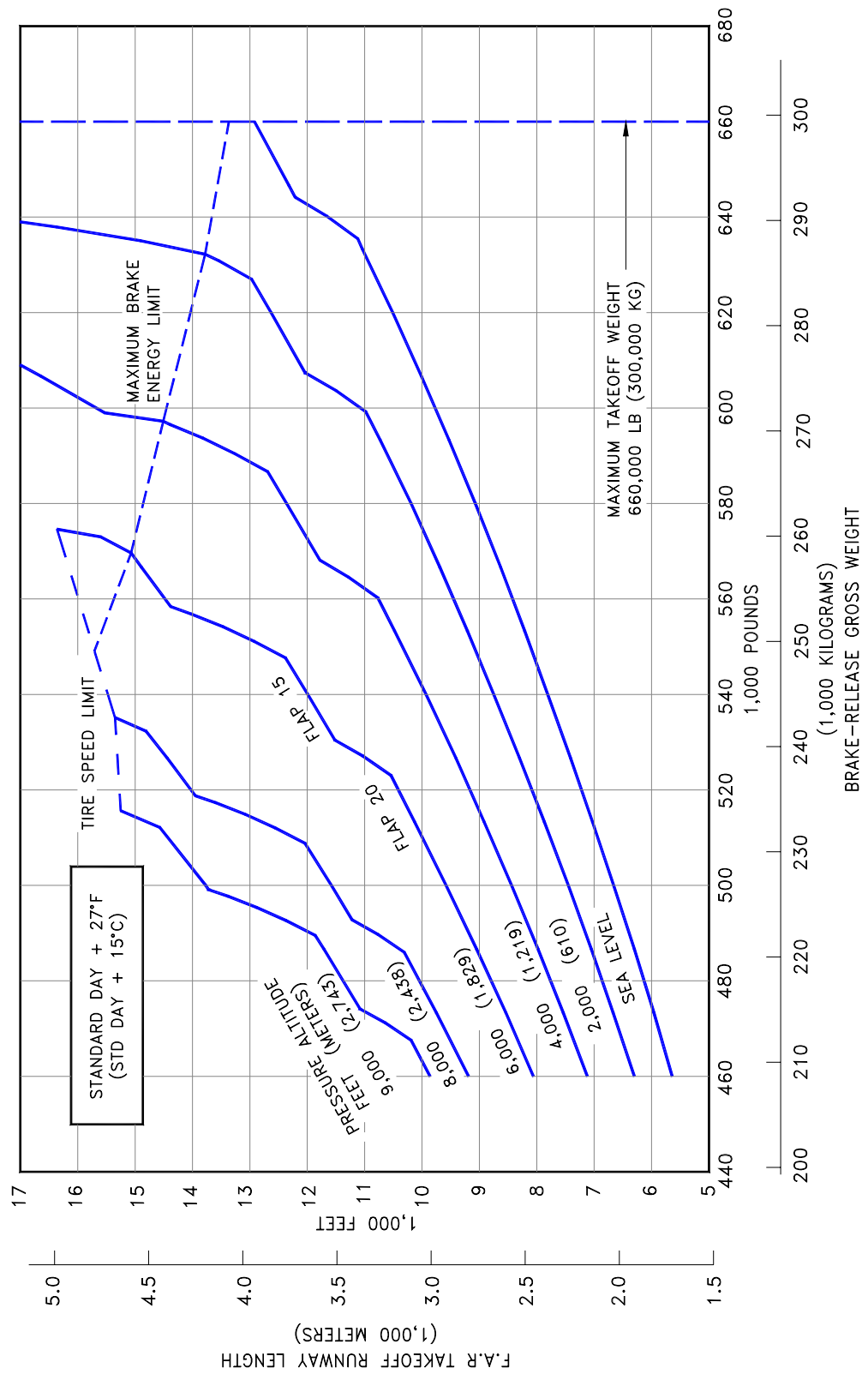


### 3.3.5 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 777-300 (TYPICAL 90K ENGINE)



- NOTES:
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN
  - \* AIR CONDITIONING OFF
  - \* ZERO RUNWAY GRADIENT
  - \* ZERO WIND

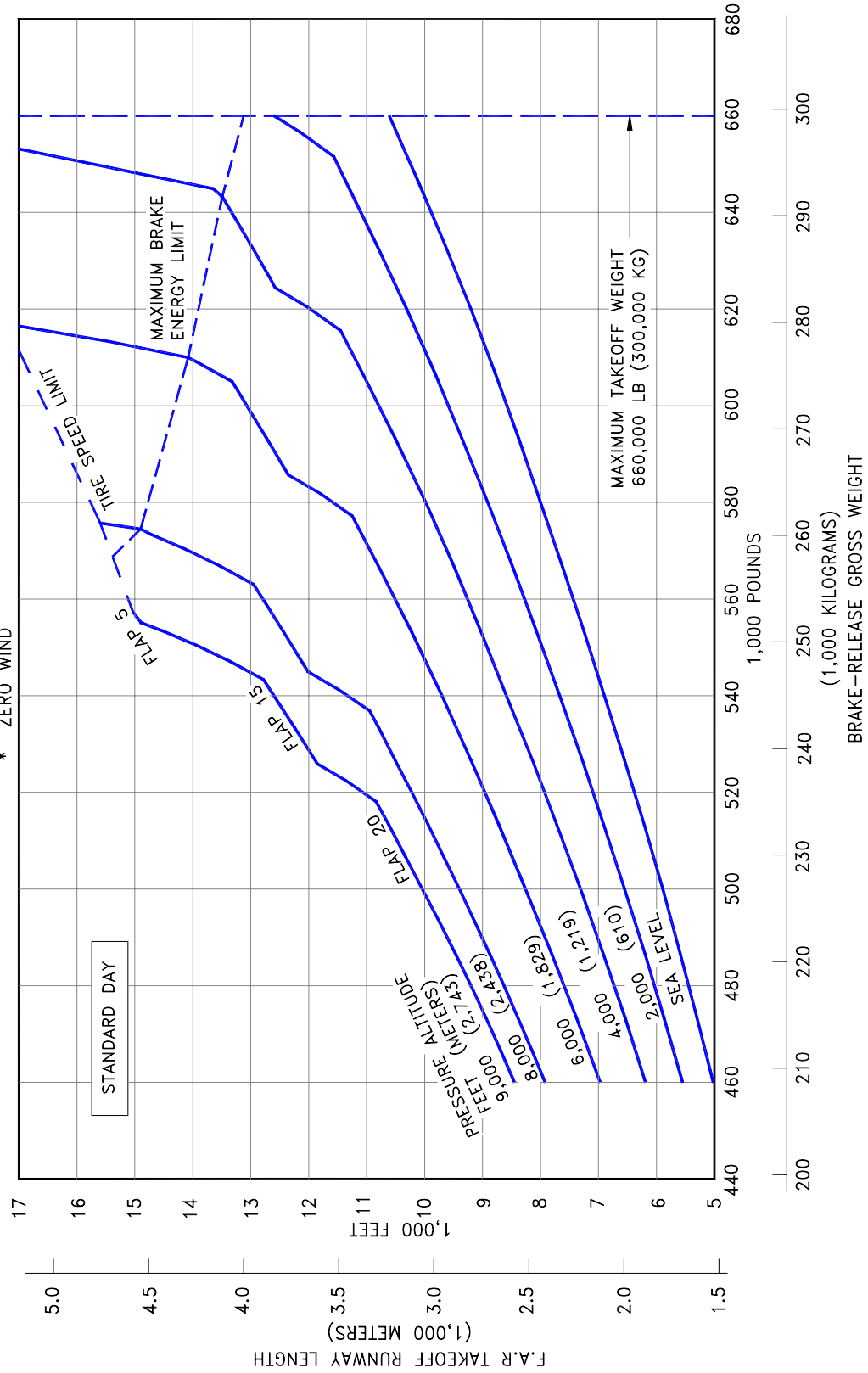


### 3.3.6 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS

**STANDARD DAY +27°F (STD + 15°C)**

MODEL 777-300 (TYPICAL 90K ENGINE)

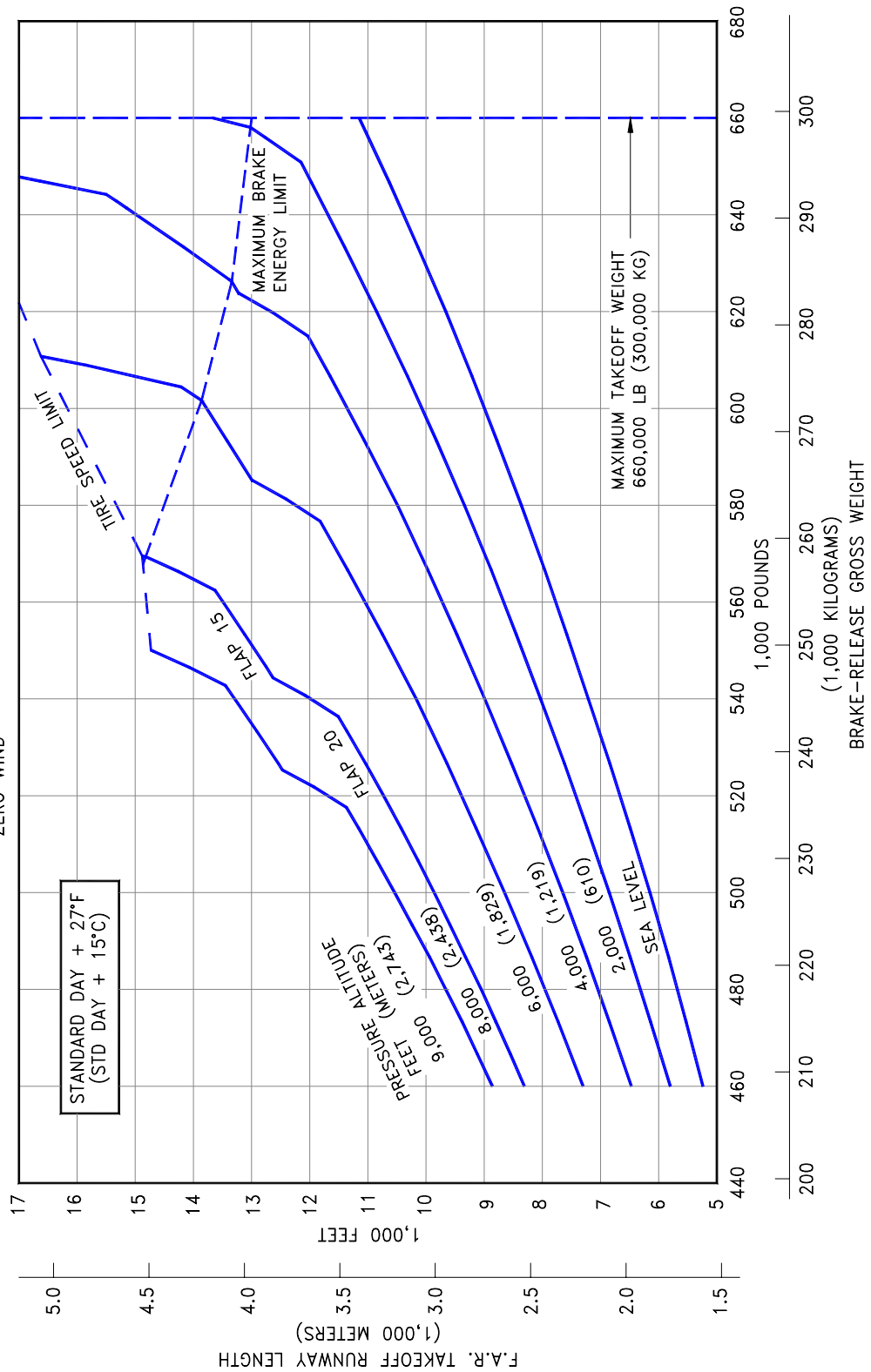
- NOTES:
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN
  - \* AIR CONDITIONING OFF
  - \* ZERO RUNWAY GRADIENT
  - \* ZERO WIND



### 3.3.7 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 777-300 (TYPICAL 98K ENGINE)

- NOTES:
- \* CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN
  - \* AIR CONDITIONING OFF
  - \* ZERO RUNWAY GRADIENT
  - \* ZERO WIND

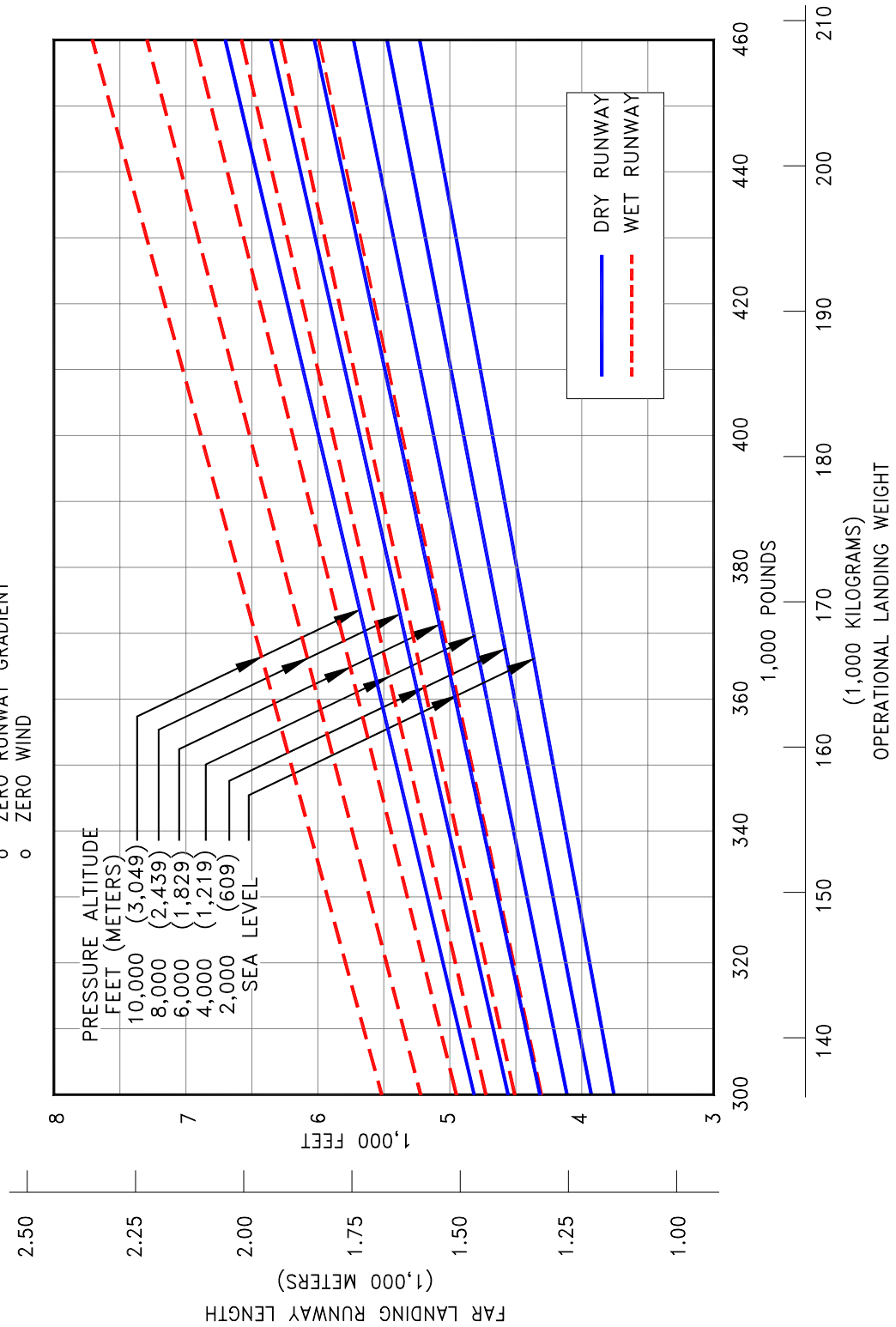


### 3.3.8 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS

**STANDARD DAY +27°F (STD + 15°C)**

*MODEL 777-300 (TYPICAL 98K ENGINE)*

- NOTES:
- o CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN
  - o ZERO RUNWAY GRADIENT
  - o ZERO WIND

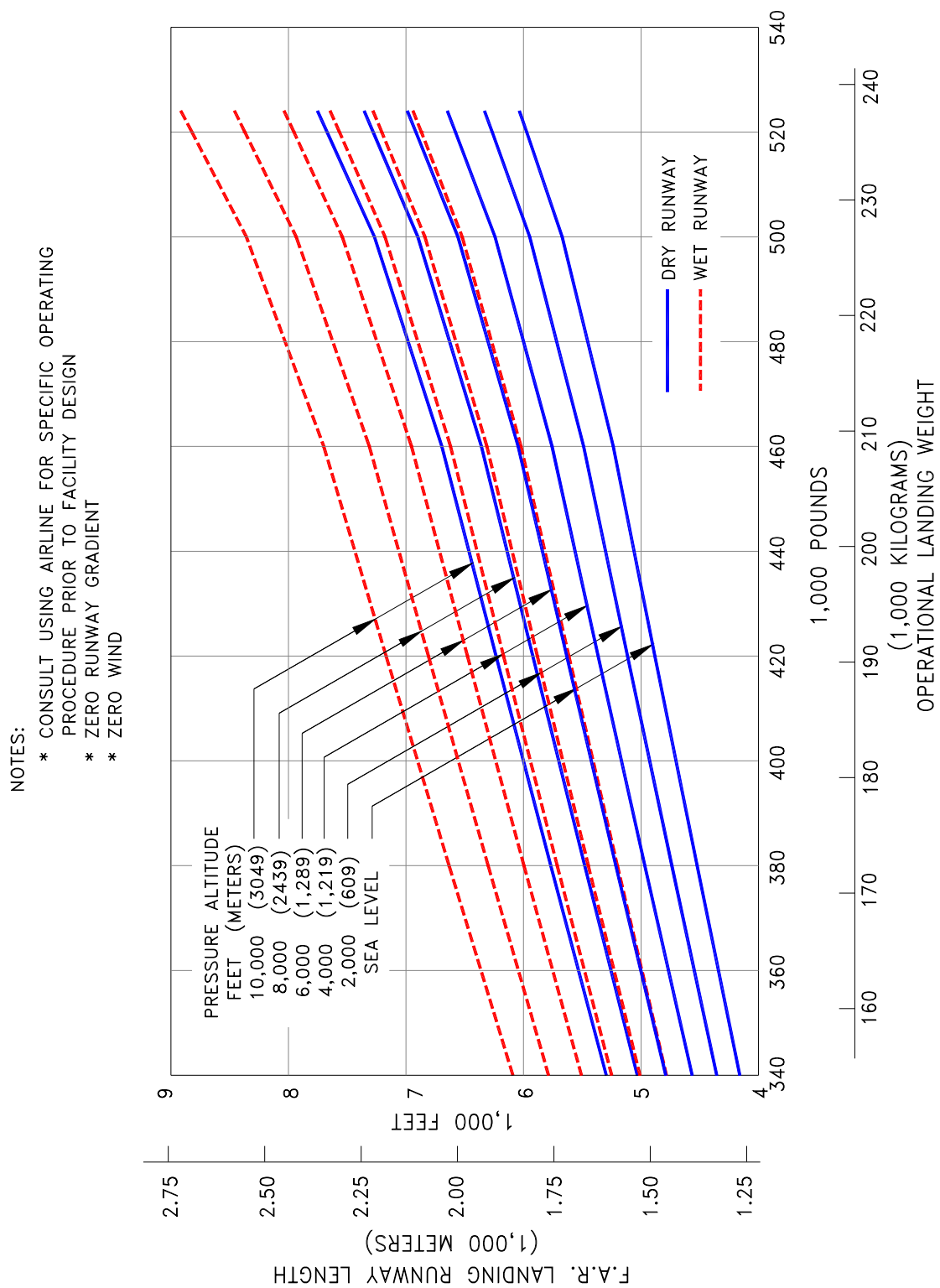


### 3.4.1 F.A.R. LANDING RUNWAY LENGTH REQUIREMENTS

MODEL 777-200

### 3.4.2 F.A.R. LANDING RUNWAY LENGTH REQUIREMENTS

MODEL 777-300



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## **4.0 GROUND MANEUVERING**

### **4.1 General Information**

### **4.2 Turning Radii**

### **4.3 Clearance Radii**

### **4.4 Visibility From Cockpit in Static Position**

### **4.5 Runway and Taxiway Turn Paths**

### **4.6 Runway Holding Bay**

## **4.0 GROUND MANEUVERING**

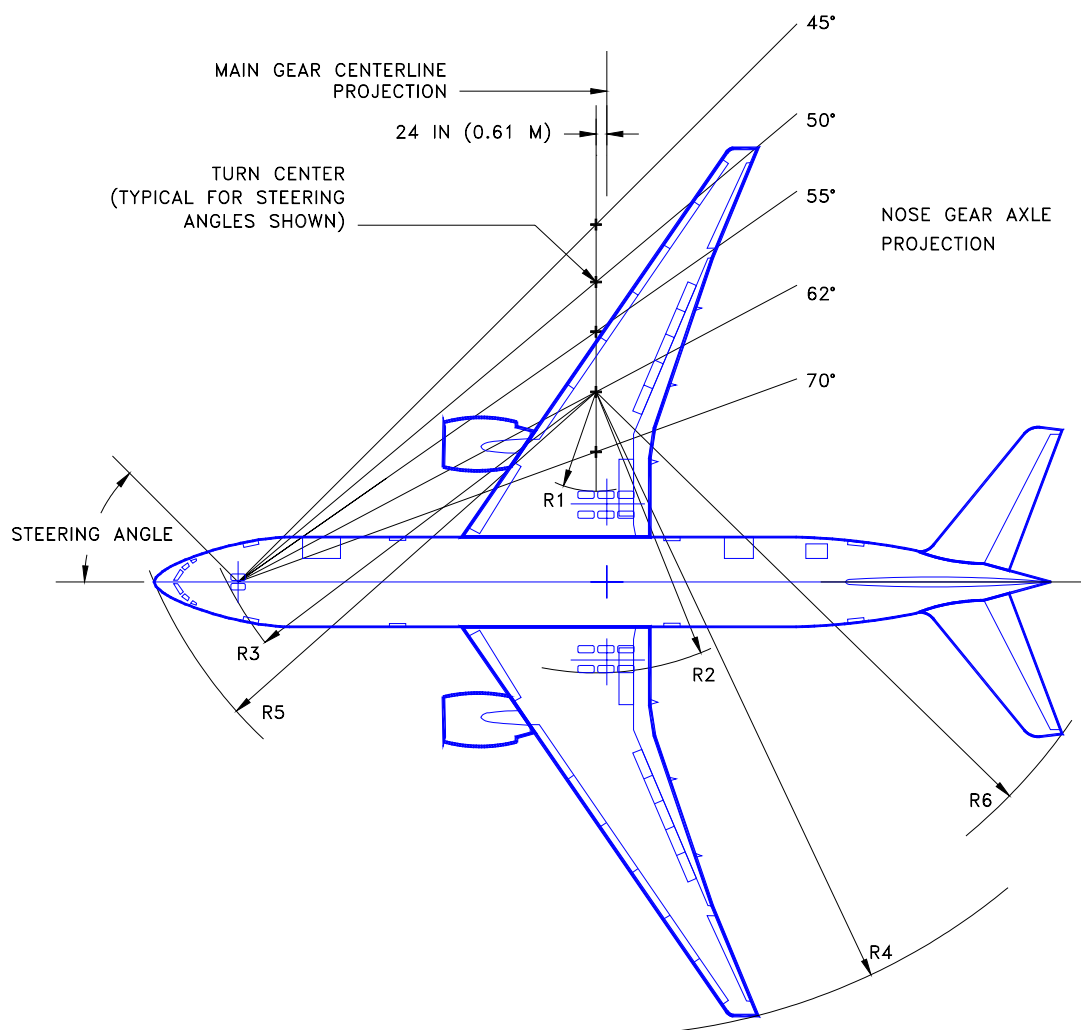
### **4.1 General Information**

The 777 main landing gear consists of two main struts, each strut with six wheels. The steering system incorporates aft axle steering of the main landing gear in addition to the nose gear steering. The aft axle steering system is hydraulically actuated and programmed to provide steering ratios proportionate to the nose gear steering angles. During takeoff and landing, the aft axle steering system is centered, mechanically locked, and depressurized.

The turning radii and turning curves shown in this section are derived from airplane geometry. Other factors that could influence the geometry of the turn include:

1. Engine power settings
2. Center of gravity location
3. Airplane weight
4. Pavement surface conditions
5. Amount of differential braking
6. Ground speed



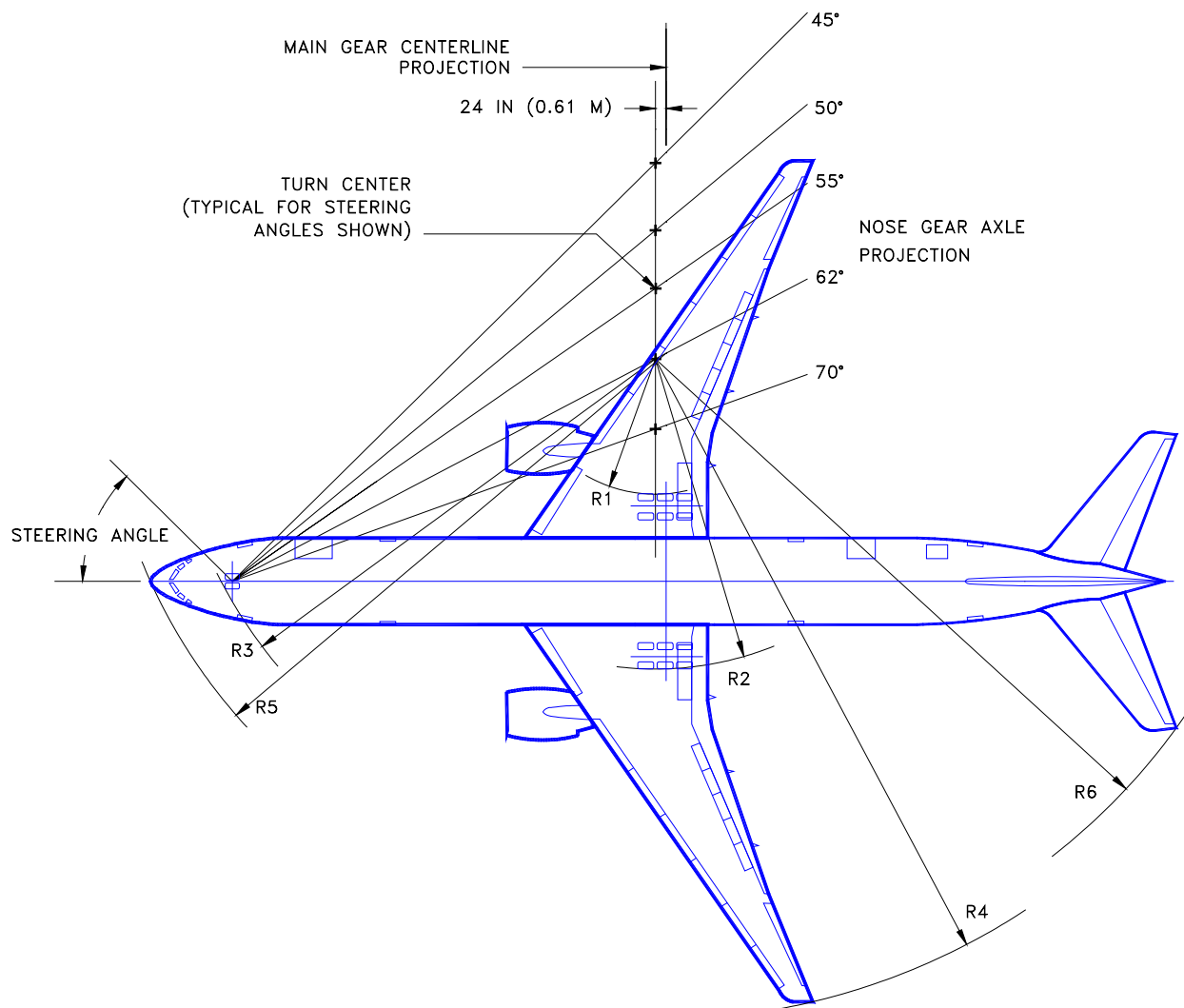


NOTES: \*DATA SHOWN FOR AIRPLANE WITH AFT AXLE STEERING  
 \*ACTUAL OPERATING TURNING RADII MAY BE GREATER THAN SHOWN.  
 \* CONSULT WITH AIRLINE FOR SPECIFIC OPERATING PROCEDURE  
 \* DIMENSIONS ROUNDED TO NEAREST FOOT AND 0.1 METER.

STEERING ANGLE	R1 INNER GEAR		R2 OUTER GEAR		R3 NOSE GEAR		R4 WING TIP		R5 NOSE		R6 TAIL	
(DEG)	FT	M	FT	M	FT	M	FT	M	FT	M	FT	M
30	123	37.5	165	50.3	168	51.3	247	75.3	177	53.8	209	63.6
35	98	29.7	140	42.6	147	44.8	222	67.6	157	47.8	187	57.1
40	78	23.7	120	36.6	131	40.0	202	61.7	142	43.4	171	52.2
45	62	18.9	104	31.7	120	36.4	187	56.9	132	40.2	159	48.5
50	49	14.8	91	27.7	111	33.7	174	52.9	124	37.7	150	45.6
55	37	11.2	79	24.1	103	31.5	162	49.5	118	35.8	142	43.2
60	27	8.1	69	21.0	98	29.9	152	46.5	113	34.4	135	41.2
65	17	5.3	60	18.2	94	28.6	143	43.7	109	33.3	130	39.5
70 (MAX)	9	2.7	51	15.6	90	27.6	135	41.2	107	32.5	125	38.1

#### 4.2 TURNING RADII - NO SLIP ANGLE

MODEL 777-200

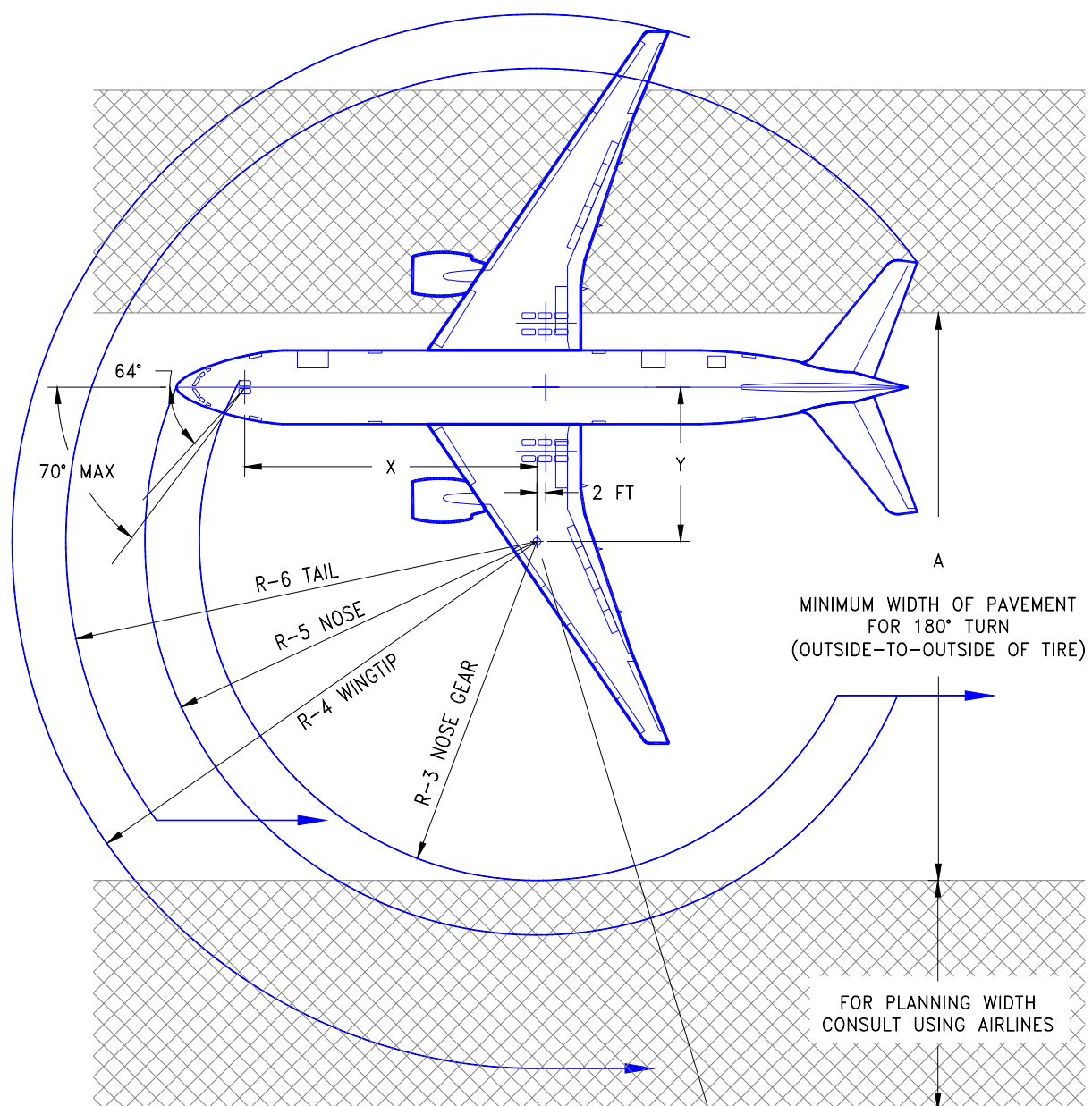


NOTES: \*DATA SHOWN FOR AIRPLANE WITH AFT AXLE STEERING  
 \*ACTUAL OPERATING TURNING RADII MAY BE GREATER THAN SHOWN.  
 \* CONSULT WITH AIRLINE FOR SPECIFIC OPERATING PROCEDURE  
 \* DIMENSIONS ROUNDED TO NEAREST FOOT AND 0.1 METER.

STEERING ANGLE (DEG)	R1 INNER GEAR		R2 OUTER GEAR		R3 NOSE GEAR		R4 WING TIP		R5 NOSE		R6 TAIL	
	FT	M	FT	M	FT	M	FT	M	FT	M	FT	M
30	153	46.6	195	59.4	203	61.8	276	84.2	211	64.3	243	73.9
35	122	37.3	165	50.1	177	53.9	246	75.0	188	56.9	217	66.1
40	99	30.0	141	42.9	158	48.2	223	67.8	169	51.6	198	60.2
45	79	24.2	122	37.0	144	43.9	204	62.0	156	47.6	183	55.7
50	63	19.2	105	32.1	133	40.5	188	57.2	146	44.6	171	52.2
55	49	15.0	91	27.9	125	37.9	174	53.0	139	42.3	162	49.3
60	37	11.2	79	24.1	118	35.9	162	49.4	133	40.5	154	47.0
65	26	7.8	68	20.7	113	34.3	151	46.0	129	39.2	148	45.0
70 (MAX)	15	4.7	58	17.6	109	33.1	132	43.0	125	38.1	142	43.3

#### 4.3 TURNING RADII - NO SLIP ANGLE MODEL 777-300

D6-58329



NOTES:

1. 6° TIRE SLIP ANGLE APPROXIMATE FOR 64° TURN ANGLE.
2. CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE.
3. DIMENSIONS ARE ROUNDED TO THE NEAREST 0.1 FOOT AND 0.1 METER.

THEORETICAL CENTER OF TURN FOR MINIMUM TURNING RADIUS. SLOW CONTINUOUS TURN DIFFERENTIAL THRUST NO DIFFERENTIAL BRAKING

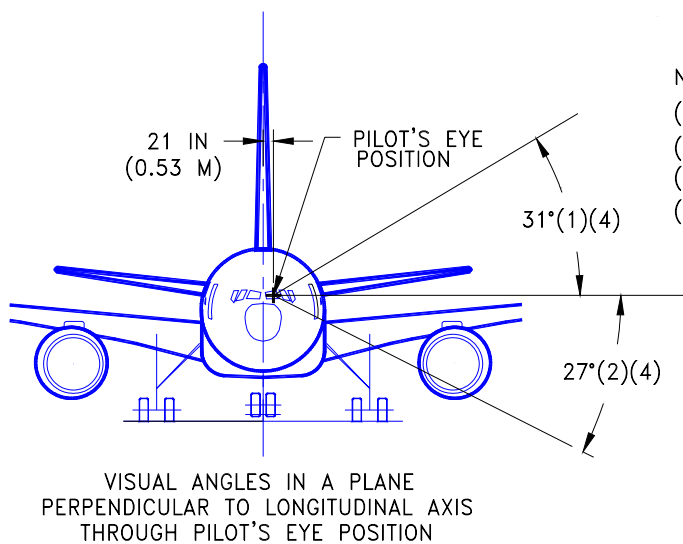
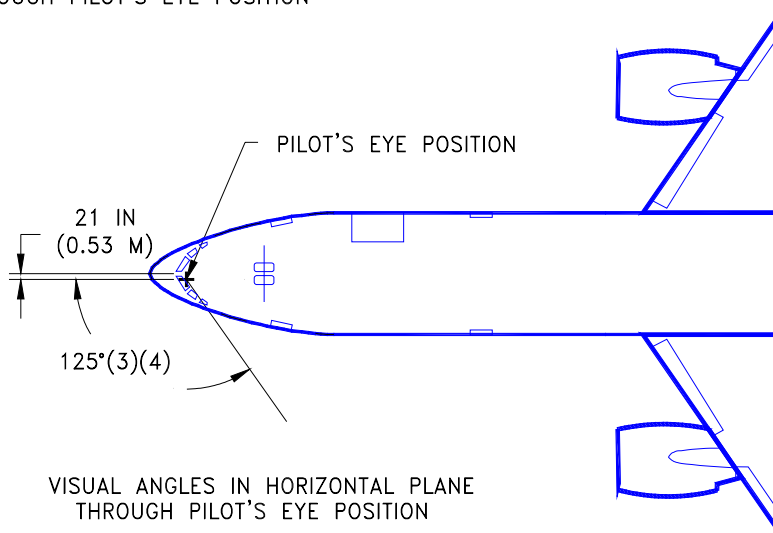
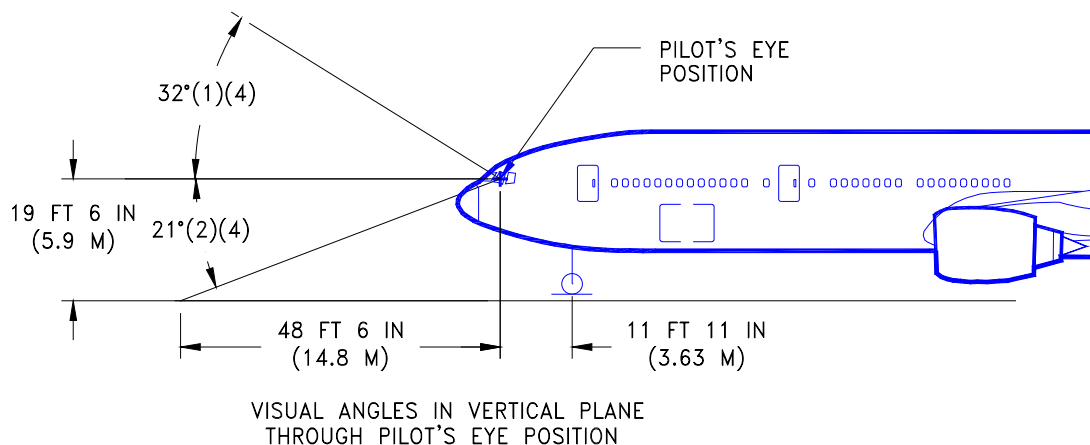
AIRPLANE MODEL	EFFECTIVE STEERING ANGLE (DEG)	X		Y		A		R3		R4		R5		R6	
		FT	M	FT	M	FT	M	FT	M	FT	M	FT	M	FT	M
777-200	64	82.9	25.3	40.4	12.3	155.8	47.5	94.3	28.7	144.9	44.2	110.0	33.5	131.0	39.9
777-300	64	100.4	30.6	49.0	14.9	183.8	56.0	113.7	34.7	152.5	46.7	129.4	39.4	148.8	45.3

### 4.3 CLEARANCE RADII

MODEL 777-200, -300

NOT TO SCALE

NOT TO BE USED FOR  
LANDING APPROACH  
VISIBILITY



NOTES:

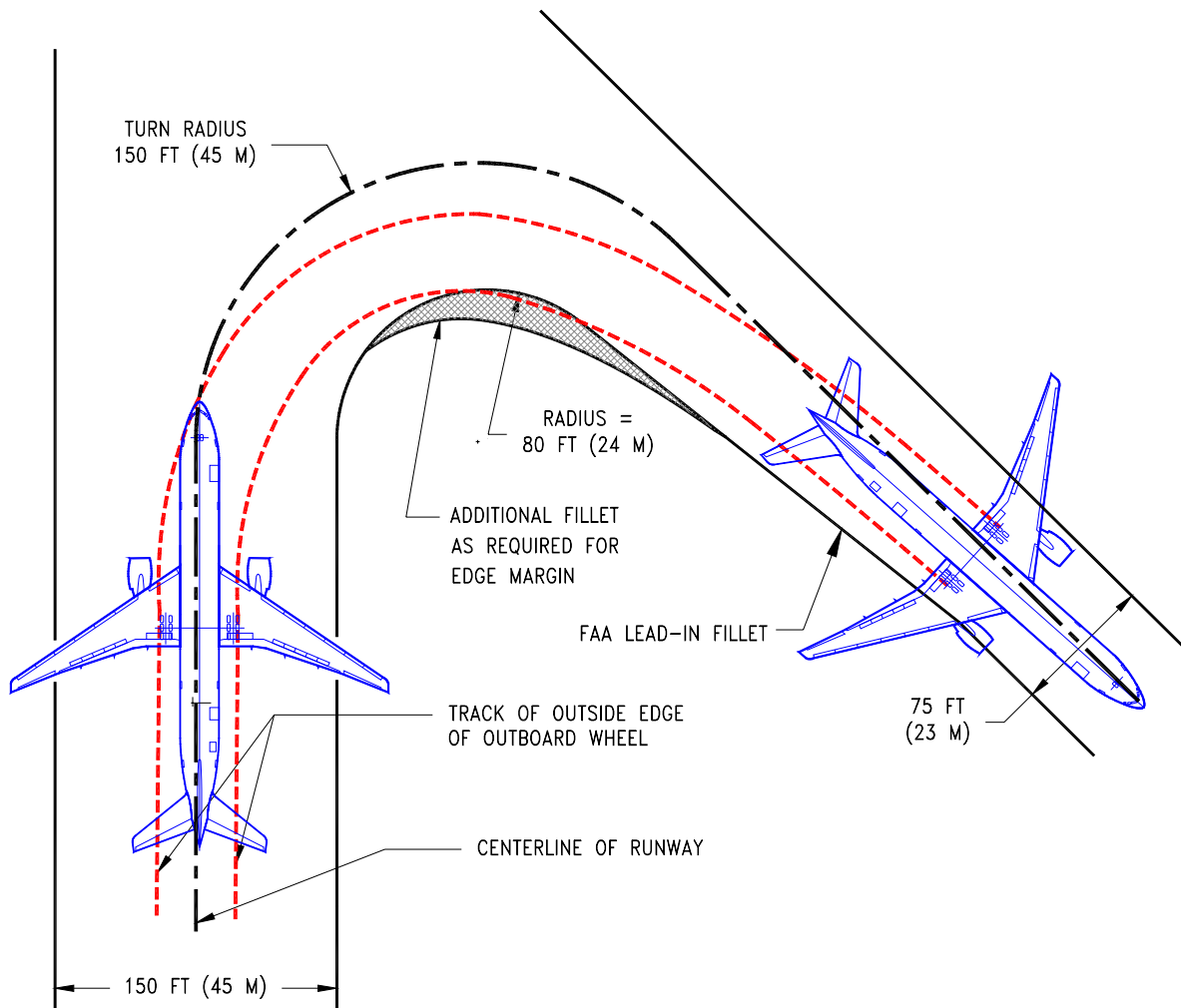
- (1) UPWARD THROUGH MAIN WINDOW
- (2) DOWNWARD THROUGH MAIN WINDOW
- (3) VISION THROUGH SIDE WINDOW
- (4) HEAD ROTATED ABOUT POINT 3.3 IN (0.08 M) AFT OF PILOT'S REFERENCE EYE POSITION.

#### 4.4 VISIBILITY FROM COCKPIT IN STATIC POSITION

MODEL 777-200, -300

NOTES:

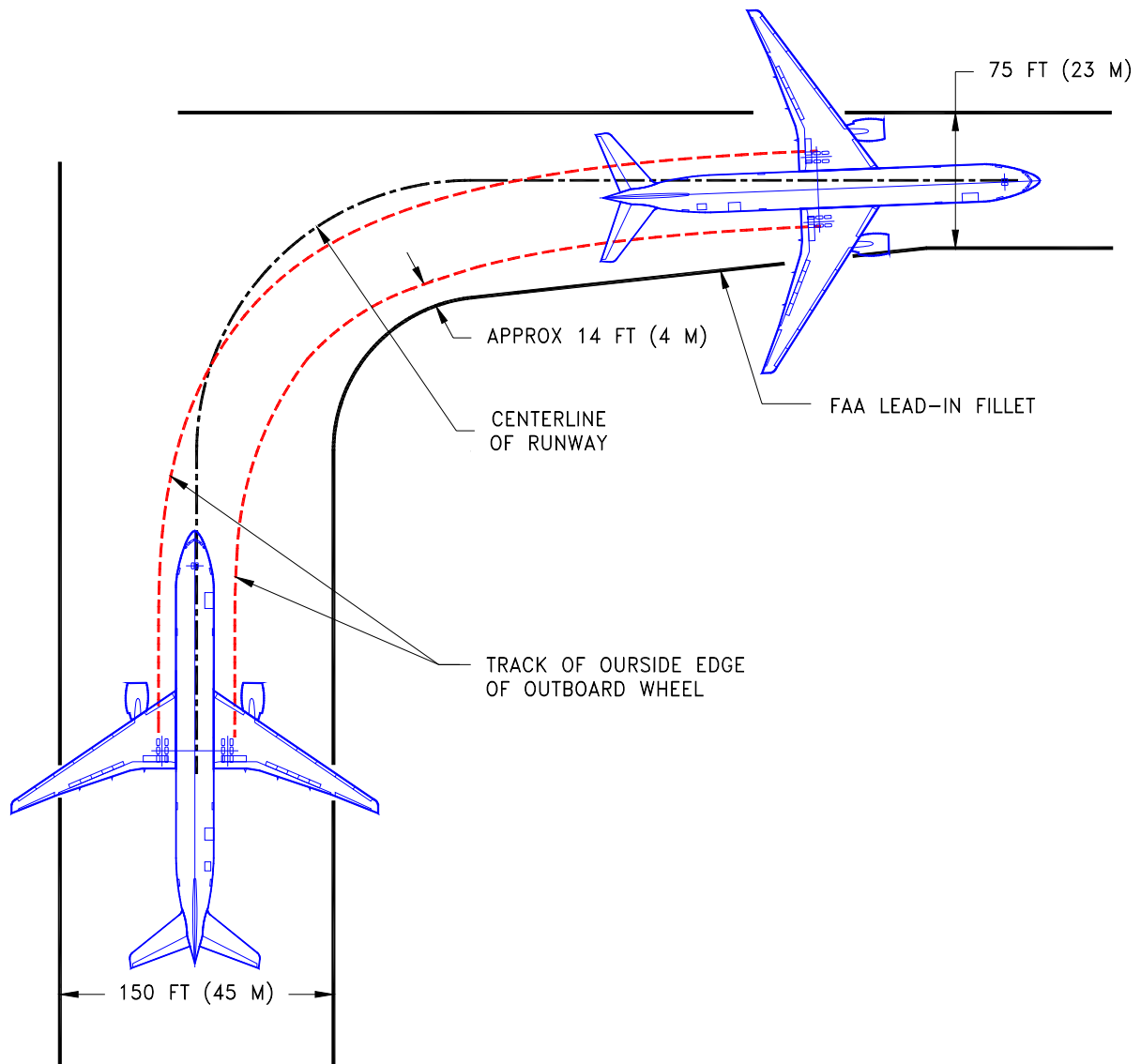
- BEFORE DETERMINING THE SIZE OF THE INTERSECTION FILLET, CHECK WITH THE AIRLINES REGARDING THE OPERATING PROCEDURES THAT THEY USE AND THE AIRCRAFT TYPES THEY ARE EXPECTED TO USE AT THE AIRPORT
- 777-300 DATA SHOWN. 777-200 DATA WOULD BE LESS STRINGENT.



**4.5.1 RUNWAY AND TAXIWAY TURNPATHS - RUNWAY-TO-TAXIWAY,  
MORE THAN 90 DEGREES**  
MODEL 777-200, -300

NOTES:

- BEFORE DETERMINING THE SIZE OF THE INTERSECTION FILLET, CHECK WITH THE AIRLINES REGARDING THE OPERATING PROCEDURES THAT THEY USE AND THE AIRCRAFT TYPES THEY ARE EXPECTED TO USE AT THE AIRPORT
- 777-300 DATA SHOWN. CALCULATED EDGE MARGIN FOR THE 777-200 WOULD BE APPROXIMATELY 20 FT (6 M) INSTEAD OF 14 FT AS SHOWN.

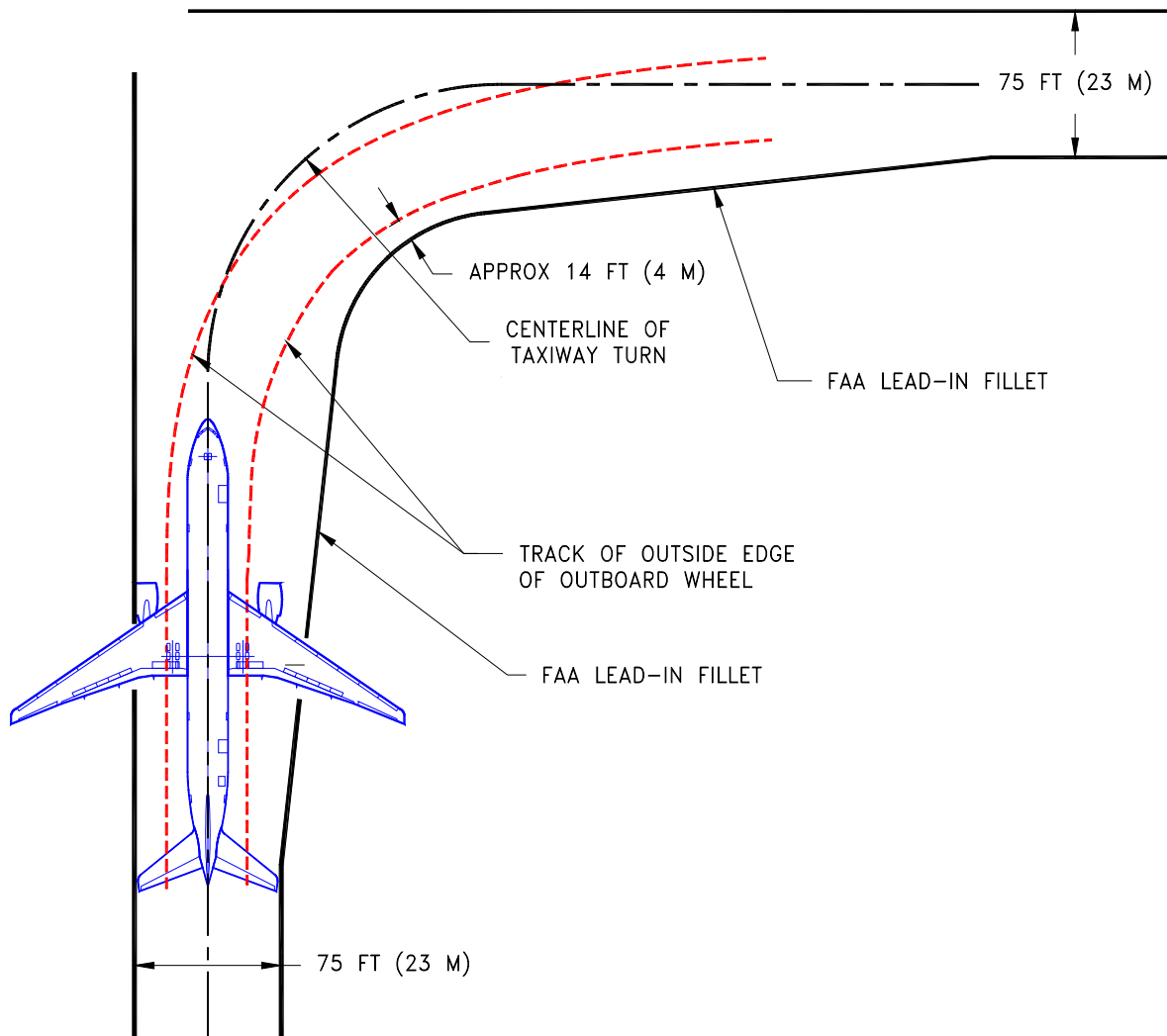


#### 4.5.2 RUNWAY AND TAXIWAY TURNPATHS - RUNWAY-TO-TAXIWAY, 90 DEGREES

MODEL 777-200, -300

NOTES:

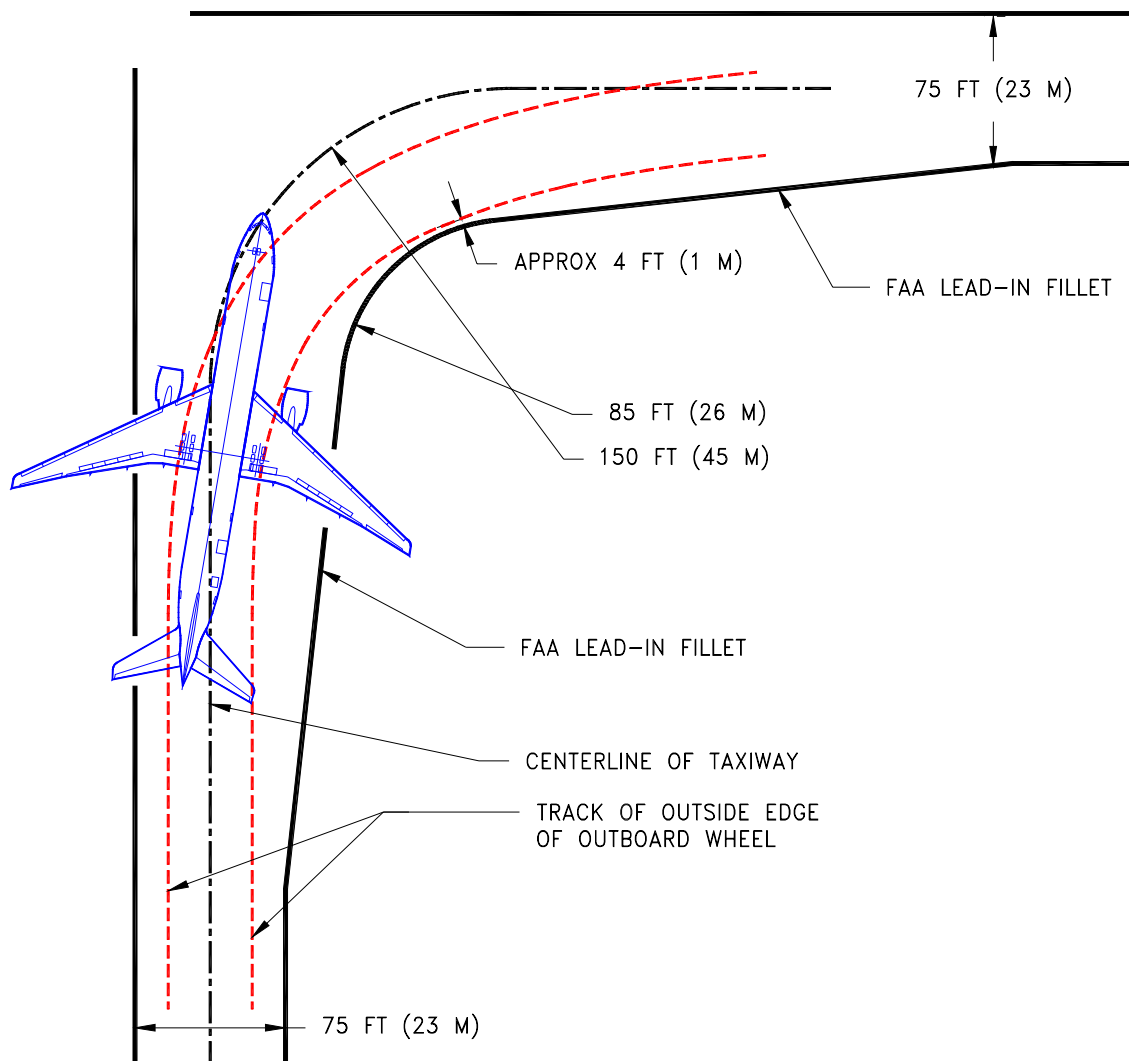
- BEFORE DETERMINING THE SIZE OF THE INTERSECTION FILLET, CHECK WITH THE AIRLINES REGARDING THE OPERATING PROCEDURES THAT THEY USE AND THE AIRCRAFT TYPES THEY ARE EXPECTED TO USE AT THE AIRPORT
- 777-300 DATA SHOWN. CALCULATED EDGE MARGIN FOR THE 777-200 WOULD BE APPROXIMATELY 22 FT (6.7 M) INSTEAD OF 14 FT AS SHOWN.



**4.5.3 RUNWAY AND TAXIWAY TURNPATHS - TAXIWAY-TO-TAXIWAY,  
90 DEGREES, NOSE GEAR TRACKS CENTERLINE  
MODEL 777-200, -300**

NOTES:

- BEFORE DETERMINING THE SIZE OF THE INTERSECTION FILLET, CHECK WITH THE AIRLINES REGARDING THE OPERATING PROCEDURES THAT THEY USE AND THE AIRCRAFT TYPES THEY ARE EXPECTED TO USE AT THE AIRPORT
- 777-300 DATA SHOWN. CALCULATED EDGE MARGIN FOR THE 777-200 WOULD BE APPROXIMATELY 17 FT (5.2 M) INSTEAD OF 4 FT AS SHOWN.

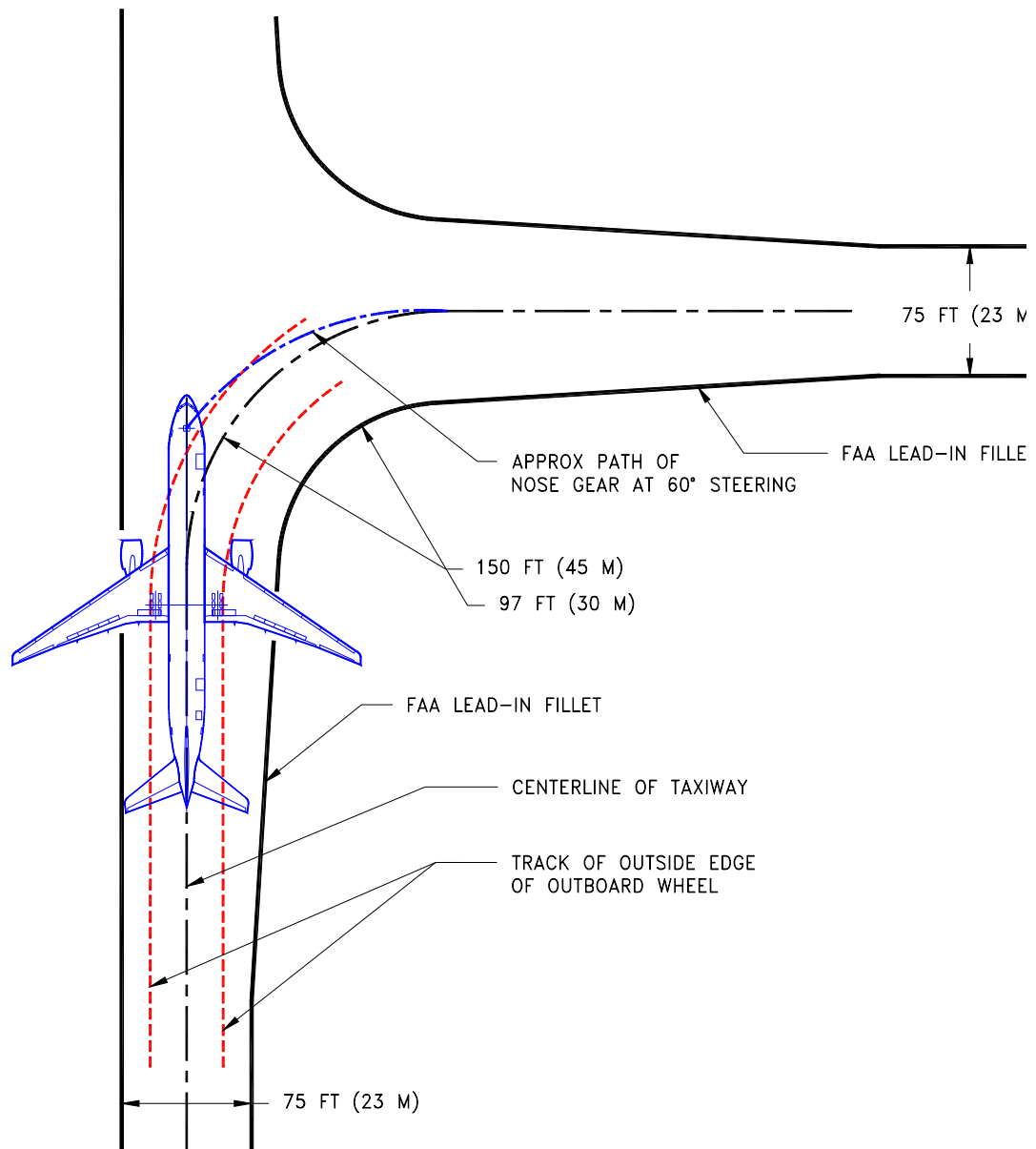


**4.5.4 RUNWAY AND TAXIWAY TURNPATHS - TAXIWAY-TO-TAXIWAY,  
90 DEGREES, COCKPIT TRACKS CENTERLINE**  
*MODEL 777-200, -300*

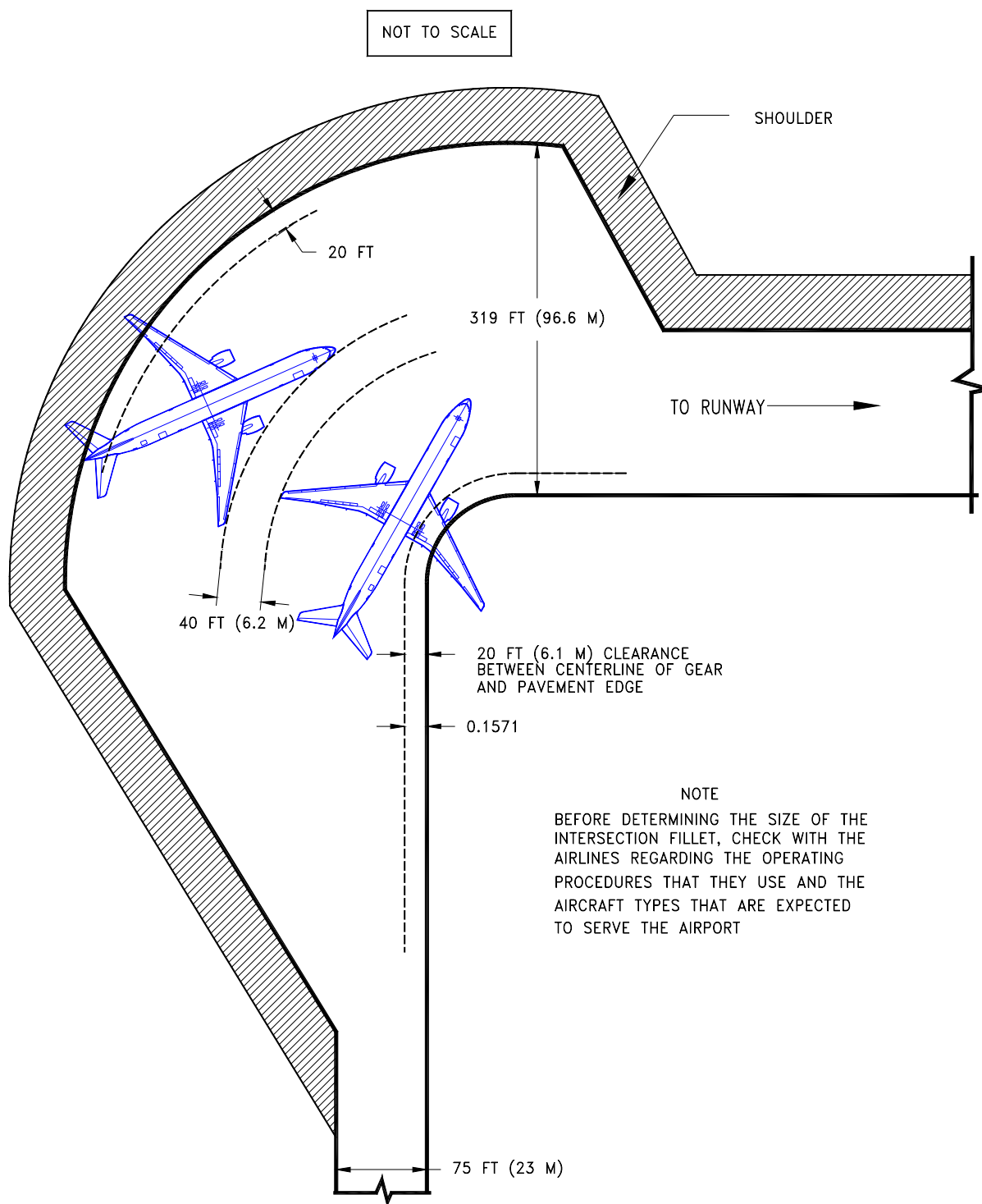


NOTES:

- BEFORE DETERMINING THE SIZE OF THE INTERSECTION FILLET, CHECK WITH THE AIRLINES REGARDING THE OPERATING PROCEDURES THAT THEY USE AND THE AIRCRAFT TYPES THEY ARE EXPECTED TO USE AT THE AIRPORT
- **777-300 DATA SHOWN. 777-200 DATA WOULD BE LESS STRINGENT**



**4.5.5 RUNWAY AND TAXIWAY TURNPATHS - TAXIWAY-TO-TAXIWAY, 90 DEGREES, JUDGMENTAL OVERSTEERING**  
*MODEL 777-200, -300*



#### 4.6 RUNWAY HOLDING BAY

MODEL 777-200, -300

D6-58329

## **5.0 TERMINAL SERVICING**

- 5.1 Airplane Servicing Arrangement - Typical Turnaround**
- 5.2 Terminal Operations - Turnaround Station**
- 5.3 Terminal Operations - En Route Station**
- 5.4 Ground Servicing Connections**
- 5.5 Engine Starting Pneumatic Requirements**
- 5.6 Ground Pneumatic Power Requirements**
- 5.7 Conditioned Air Requirements**
- 5.8 Ground Towing Requirements**

## 5.0 TERMINAL SERVICING

During turnaround at the terminal, certain services must be performed on the aircraft, usually within a given time, to meet flight schedules. This section shows service vehicle arrangements, schedules, locations of service points, and typical service requirements. The data presented in this section reflect ideal conditions for a single airplane. Service requirements may vary according to airplane condition and airline procedure.

Section 5.1 shows typical arrangements of ground support equipment during turnaround. As noted, if the auxiliary power unit (APU) is used, the electrical, air start, and air-conditioning service vehicles would not be required. Passenger loading bridges or portable passenger stairs could be used to load or unload passengers.

Sections 5.2 and 5.3 show typical service times at the terminal. These charts give typical schedules for performing service on the airplane within a given time. Service times could be rearranged to suit availability of personnel, airplane configuration, and degree of service required.

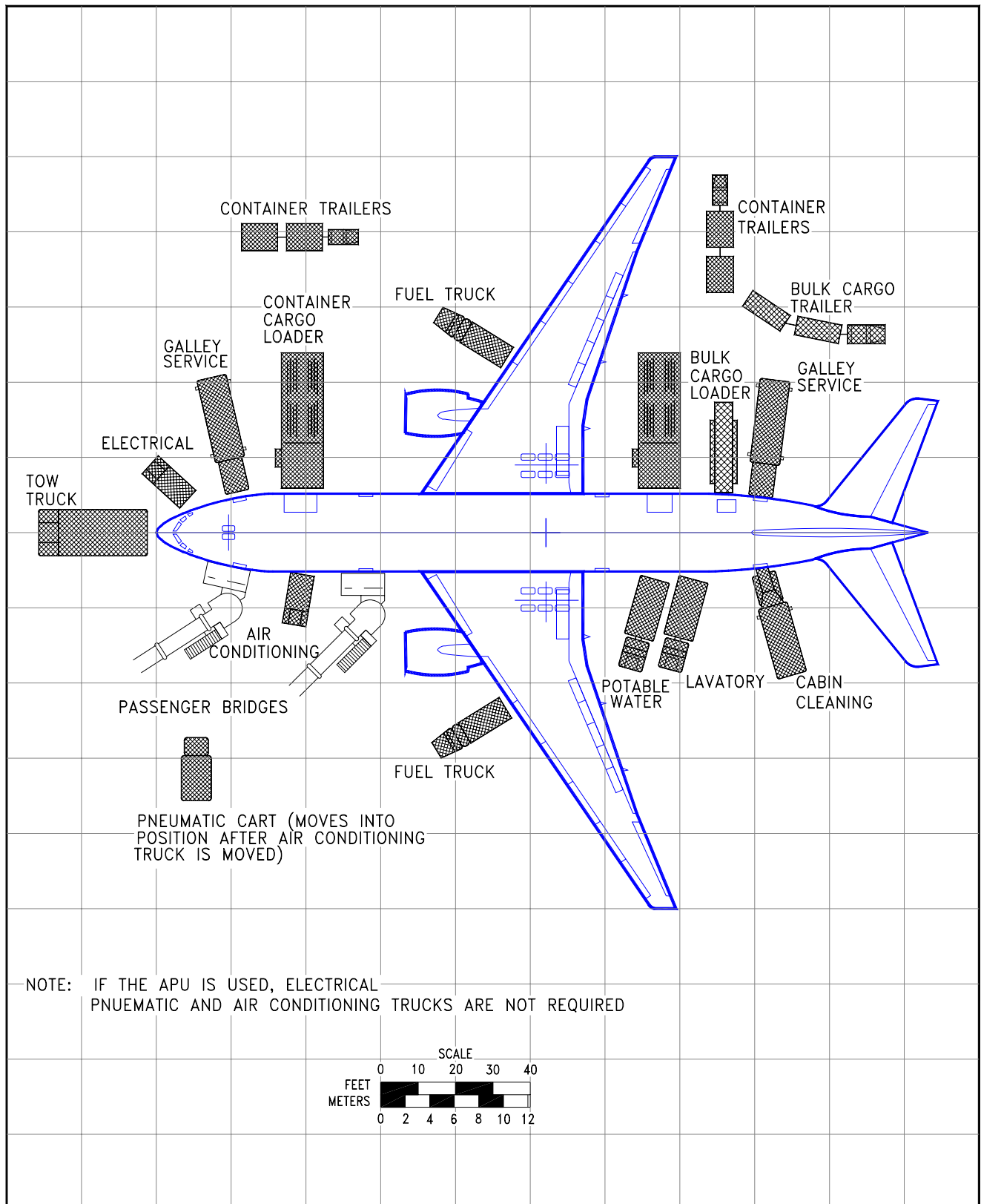
Section 5.4 shows the locations of ground service connections in graphic and in tabular forms. Typical capacities and service requirements are shown in the tables. Services with requirements that vary with conditions are described in subsequent sections.

Section 5.5 shows typical sea level air pressure and flow requirements for starting different engines. The curves are based on an engine start time of 90 seconds.

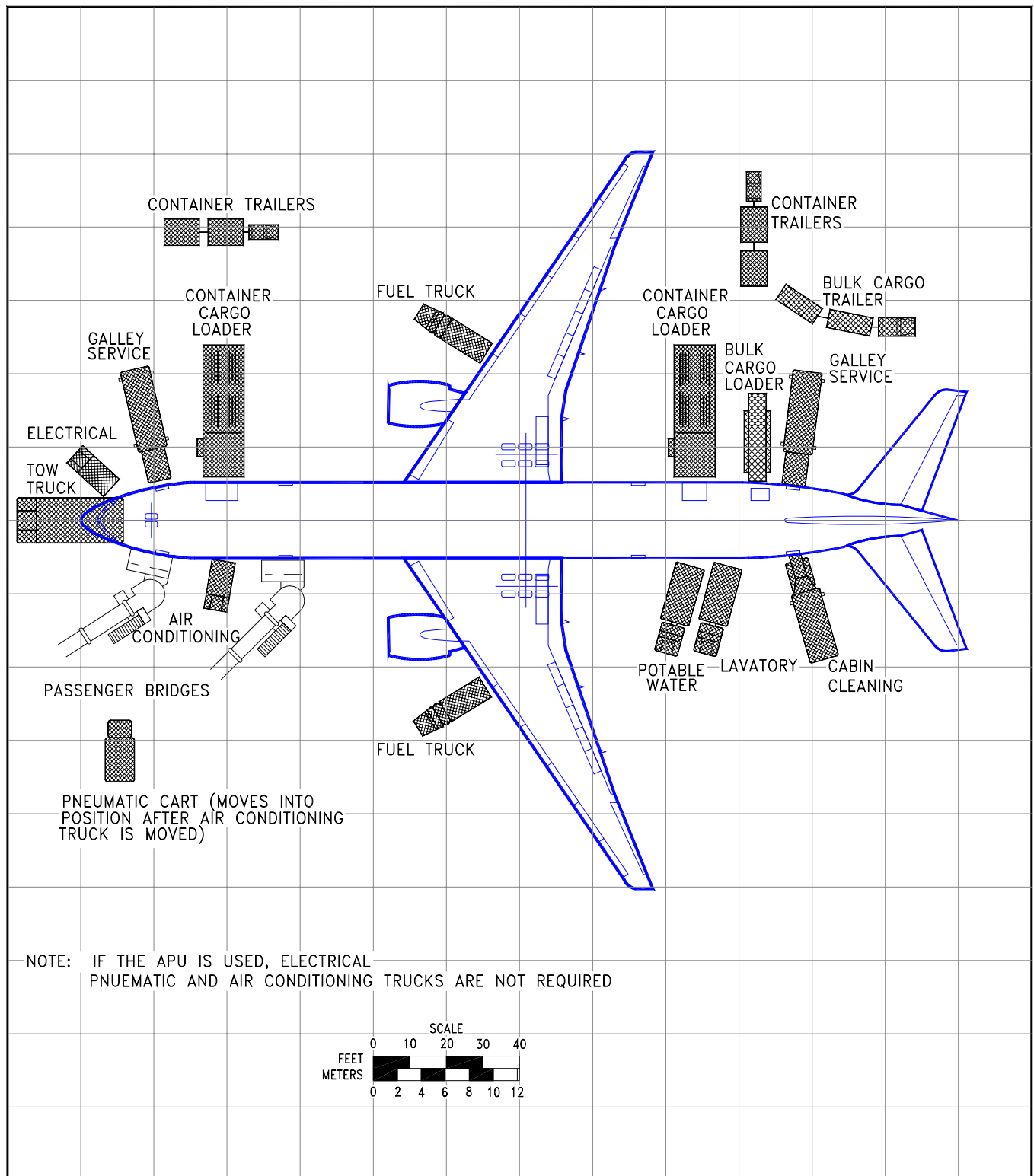
Section 5.6 shows air conditioning requirements for heating and cooling (pull-down and pull-up) using ground conditioned air. The curves show airflow requirements to heat or cool the airplane within a given time at ambient conditions.

Section 5.7 shows air conditioning requirements for heating and cooling to maintain a constant cabin air temperature using low pressure conditioned air. This conditioned air is supplied through an 8-in ground air connection (GAC) directly to the passenger cabin, bypassing the air cycle machines.

Section 5.8 shows ground towing requirements for various ground surface conditions.



**5.1.1 AIRPLANE SERVICING ARRANGEMENT - TYPICAL TURNAROUND**  
 MODEL 777-200



### 5.1.2 AIRPLANE SERVICING ARRANGEMENT - TYPICAL TURNAROUND MODEL 777-300

D6-58329

MODEL 777-200

JULY 1998 73



 POSITION/REMOVE EQUIPMENT

WITH SIX PALLETS, LOAD OR UNLOAD TIME IS ESTIMATED TO BE 12 MINUTES  
LOWER LOBE 14 LD3 CONTAINERS AFT AND 18 FWD

3375 PASSENGERS DEPLANE AND BOARD VIA LEFT DOORS NO 1 NO 2

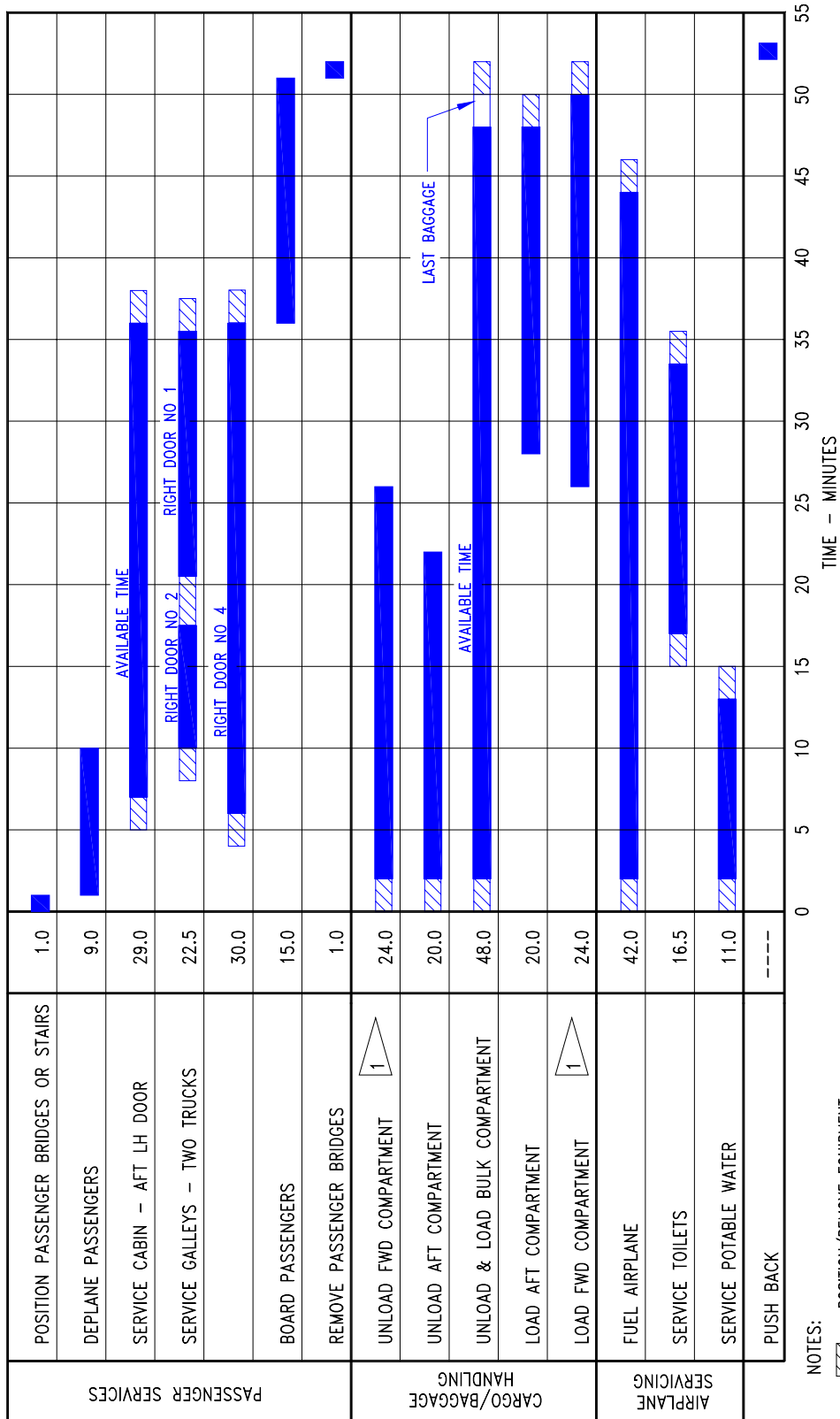
100 % PASSENGER EXCHANGE

100 % PASSENGER EXCHANGE  
DEPLANE AND BOARDING TIMES BASED ON RATES OF  
50 AND 30 PASSENGERS PER MINUTE RESPECTIVELY

FUELING WITH FOUR NOZZLES AT 50 PSIG  
TOTAL AIRCRAFT FUEL = 31,600 U.S. GAL (119,600 L)  
REFUELING FROM RESERVE LEVEL OF 3,700 GAS IN MAIN TANKS  
FUELING AND CARGO OPERATIONS SEQUENCED TO MAINTAIN  
FAVORABLE WEIGHT AND BALANCE CONDITION

## 5.2.2. TERMINAL OPERATIONS - TURNAROUND STATION

MODEL 777-300



NOTES:

POSITION/REMOVE EQUIPMENT

WITH EIGHT PALLETS, LOAD OR UNLOAD TIME IS ESTIMATED TO BE 16 MINUTES

LOWER LOBE: 20 LD3 CONTAINERS AFT AND 24 FWD

451 PASSENGERS DEPLANE AND BOARD VIA LEFT DOORS NO 1 NO 2

100 % PASSENGER EXCHANGE

DEPLANE AND BOARDING TIMES BASED ON RATES OF

50 AND 30 PASSENGERS PER MINUTE RESPECTIVELY

FUELING WITH FOUR NOZZLES AT 50 PSIG

TOTAL AIRCRAFT FUEL = 45,220 U.S. GAL (171,170 L)

REFUELING FROM RESERVE LEVEL OF 3,700 GAS IN MAIN TANKS



MODEL 777-200

JULY 1998 75

NOTES:

POSITION/REMOVE EQUIPMENT

1 NO POTABLE OR WATER SERVICE

50 % PASSENGER EXCHANGE - 188 PASSENGERS  
PASSENGERS BOARD VIA LEFT DOOR NO 1

DEPLANE AND BOARDING TIMES BASED ON RATES OF  
40 AND 25 PASSENGERS PER MINUTE RESPECTIVELY

FUELING WITH TWO NOZZLES AT 50 PSIG  
APPROXIMATELY 14,000 U.S. GAL (53,000 L) ADDED

LOWER LOBE 8 ULD3'S AFT

MODEL 777-300

D6-58329

[illegible]

NOTES:

 POSITION/REMOVE EQUIPMENT

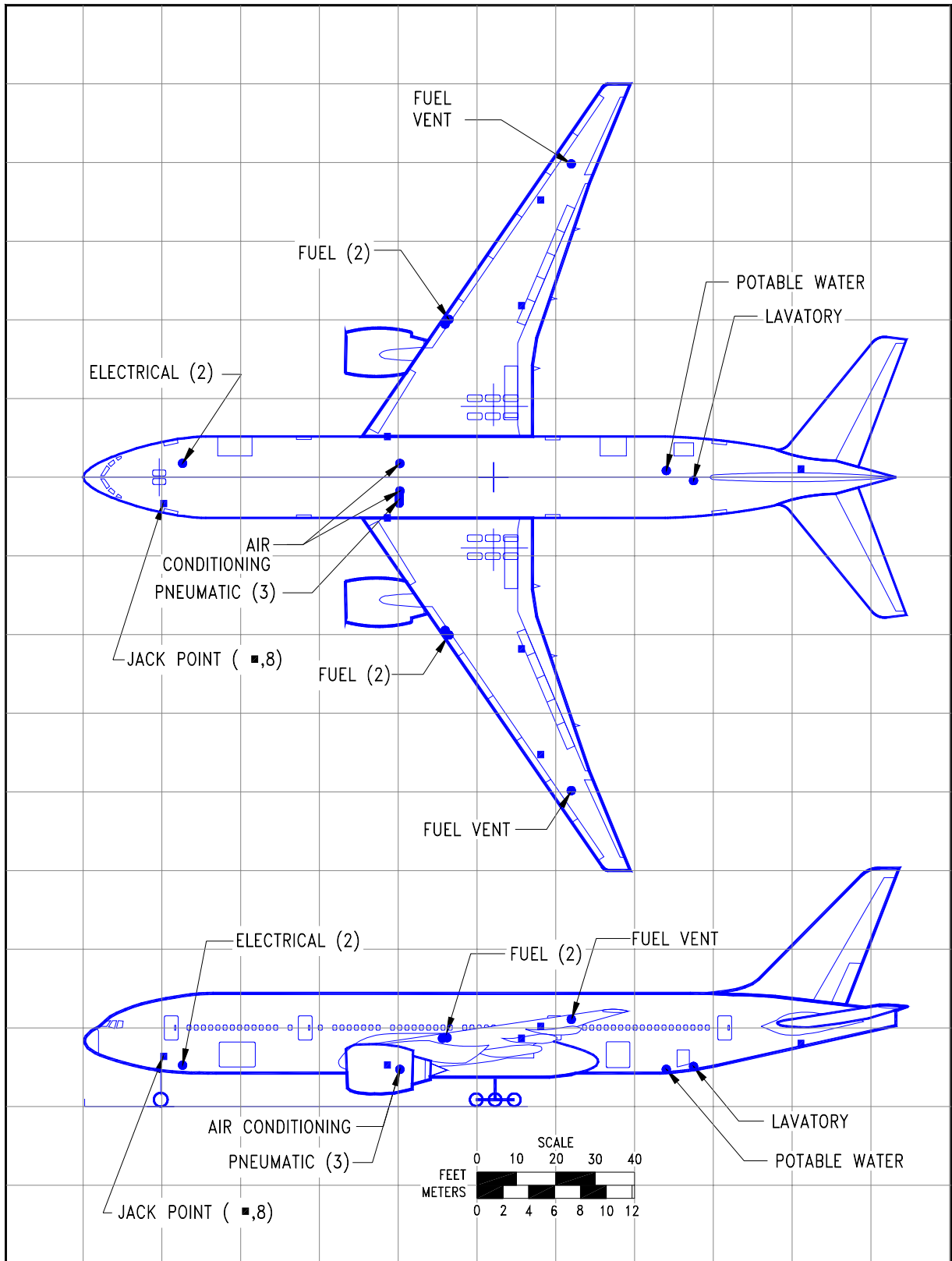
1 NO POTABLE WATER OR LAVATORY SERVICE

50 % PASSENGER EXCHANGE - 226 PASSENGERS  
PASSENGERS BOARD VIA LEFT DOOR NO 1

DEPLANE AND BOARDING TIMES BASED ON RATES OF 40 AND 25 PASSENGERS PER MINUTE RESPECTIVELY

FUELING WITH FOUR NOZZLES AT 50 PSIG  
APPROXIMATELY 17,000 U.S. GAL (64,350 L) ADDED

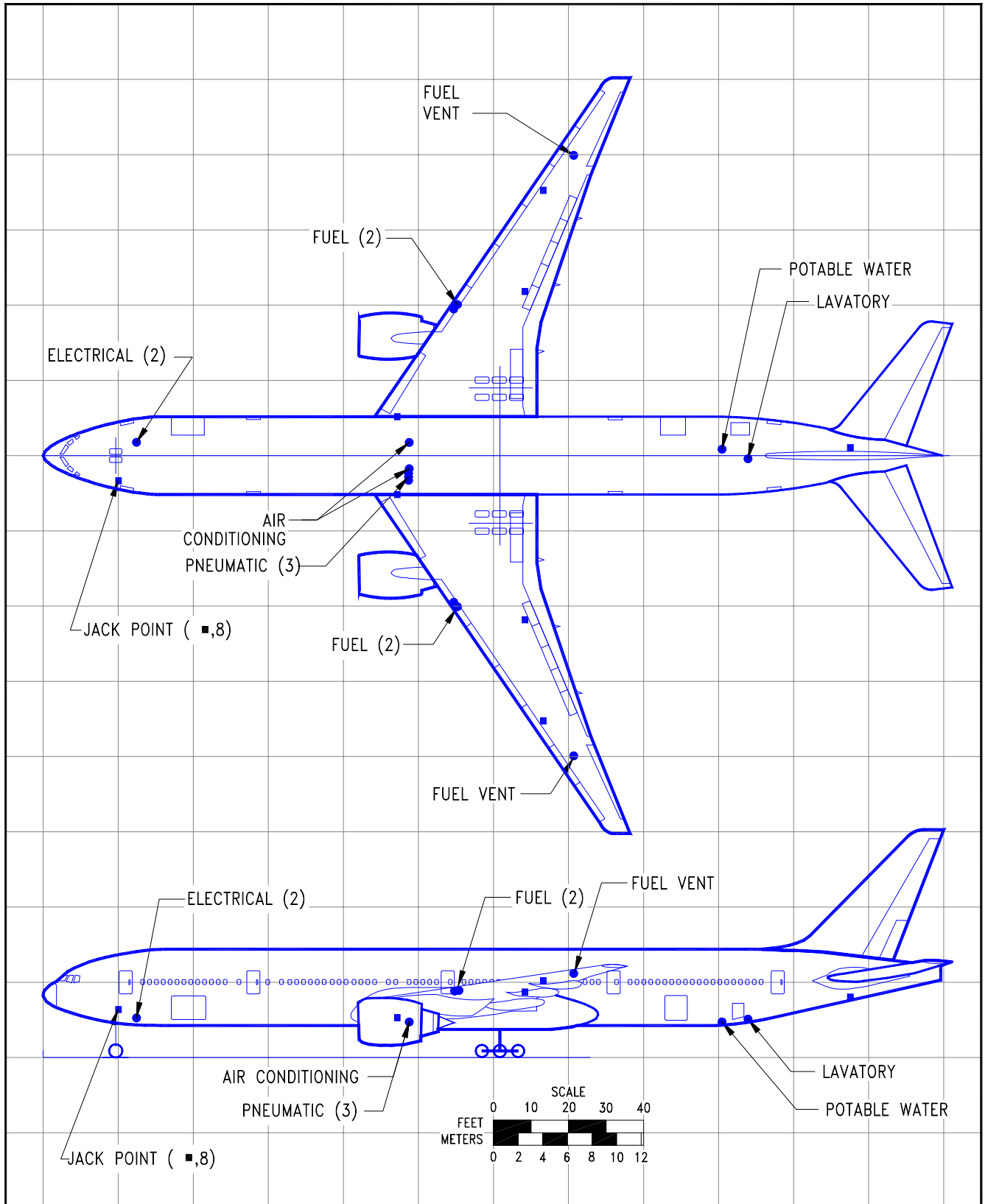
LOWER LOBE 9 LD3'S AFT



#### 5.4 .1 GROUND SERVICING CONNECTIONS

MODEL 777-200

D6-58329



## 5.4.2 GROUND SERVICING CONNECTIONS

MODEL 777-300

D6-58329

SYSTEM	MODEL	DISTANCE AFT OF NOSE		DISTANCE FROM AIRPLANE CENTERLINE				MAX HEIGHT ABOVE GROUND			
		FT	M	LH SIDE		RH SIDE		FT	M		
				FT	M	FT	M				
CONDITIONED AIR  TWO 8-IN (20.3 CM) PORTS	777-200	80	24.4	3	1.1	3	1.1	8	2.4		
	777-300	97	29.6	3	1.1	3	1.1	8	2.4		
ELECTRICAL  TWO CONNECTIONS 90 KVA , 200/115 V AC 400 HZ, 3-PHASE EACH	777-200	23	7.1	-	-	4	1.2	9	2.8		
	777-300	23	7.1	-	-	4	1.2	9	2.8		
FUEL  TWO UNDERWING PRESSURE CONNECTORS ON EACH WING  TANK CAPACITIES (BASIC 777-200) LEFT MAIN = 9,300 GAL (35,200 L) CENTER = 12,400 GAL (46,900 L) RIGHT MAIN = 9,300 GAL (35,200 L) TOTAL = 31,000 GAL (117,300 L) TANK CAPACITIES (HIGH GR. WT 777-200 AND ALL 777-300.) LEFT MAIN = 9,300 GAL (35,200 L) CENTER = 12,400 GAL (46,900 L) CTR WING =13,700 GAL (51,800 L) RIGHT MAIN = 9,300 GAL (35,200 L) TOTAL = 44,700 GAL (169,200 L)  FUEL VENTS	777-200	92 94	28.1 28.5	39 41	11.9 12.5	39 41	11.9 12.5	19 19	5.6 5.6		
	777-300	110 111	33.5 33.9	39 41	11.9 12.5	39 41	11.9 12.5	19 19	5.6 5.6		
	777-200 777-300	125 142	38.1 43.3	80 80	24.4 24.4	80 80	24.4 24.4	22 22	6.7 6.7		
	LAVATORY  ONE SERVICE CONNECTION	777-200	155	47.1	1	0.3	-	-	11	3.3	
		777-300	181	55.2	1	0.3	-	-	11	3.3	
	PNEUMATIC  THREE 3-IN(7.6-CM) PORTS	777-200	80 80 80	24.4 24.4 24.4	5 6 7	1.5 1.7 2.0	- - -	- - -	8 8 8	2.4 2.4 2.4	
			777-300	97 97 97	29.6 29.6 29.6	5 6 7	1.5 1.7 2.0	- - -	- - -	8 8 8	2.4 2.4 2.4
POTABLE WATER  ONE SERVICE CONNECTION FWD LOCATION (OPTIONAL) AFT LOCATION (BASIC)		777-200		29 147	8.8 44.9	4 -	1.3 -	- 3	- 1.0	9 10	2.8 3.0
			777-300	29 181	8.8 55.1	4 -	1.3 -	- 3	- 1.0	9 10	2.8 3.0

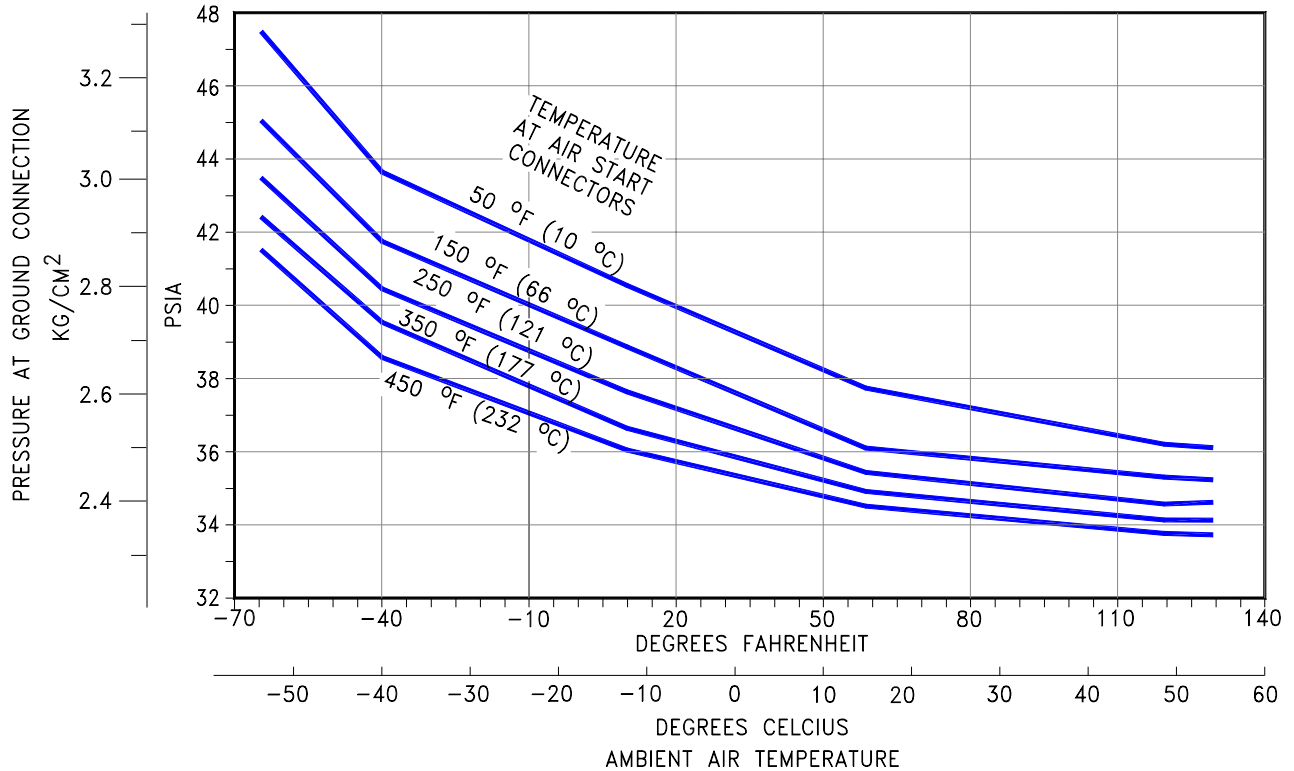
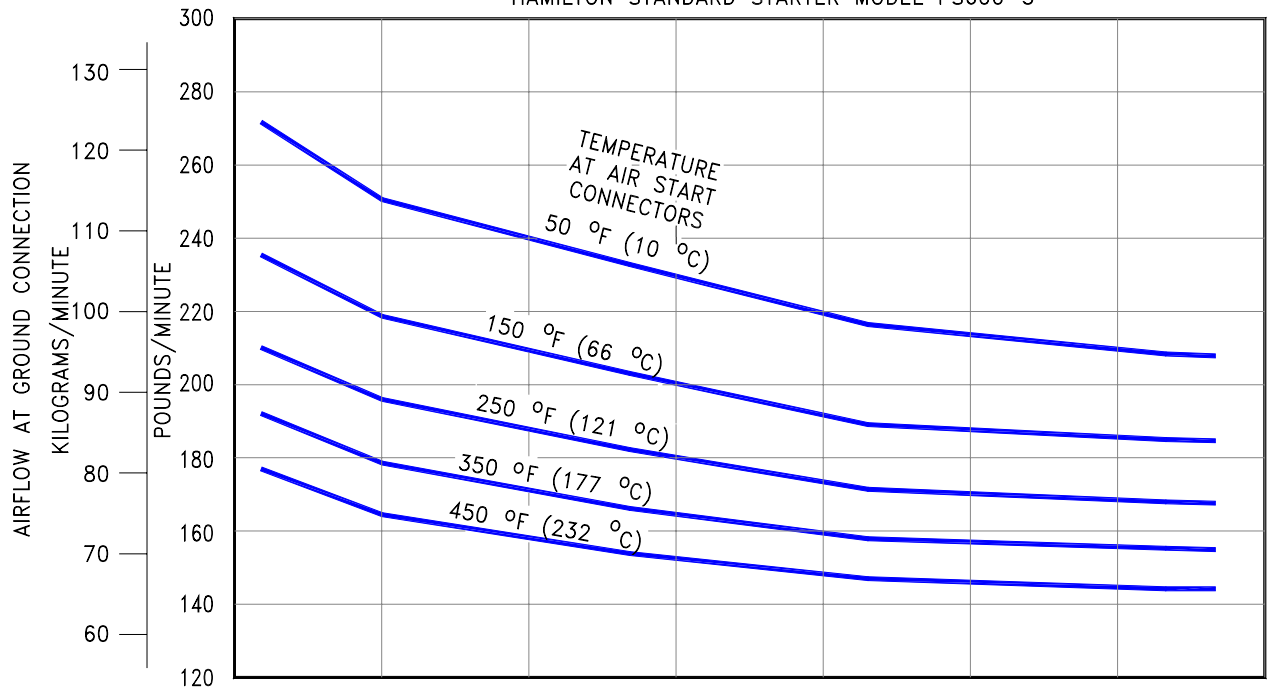
NOTE: DISTANCES ROUNDED TO THE NEAREST FOOT AND 0.1 METER.

### 5.4.3 GROUND SERVICING CONNECTIONS AND CAPACITIES

MODEL 777-200, -300

NOTES:

1. ALTITUDE = SEA LEVEL
2. 90 SECONDS TO IDLE
3. 2 GROUND CONNECTIONS USED
4. ALLIED SIGNAL STARTER MODEL AST200-71 OR  
HAMILTON STANDARD STARTER MODEL PS600-3

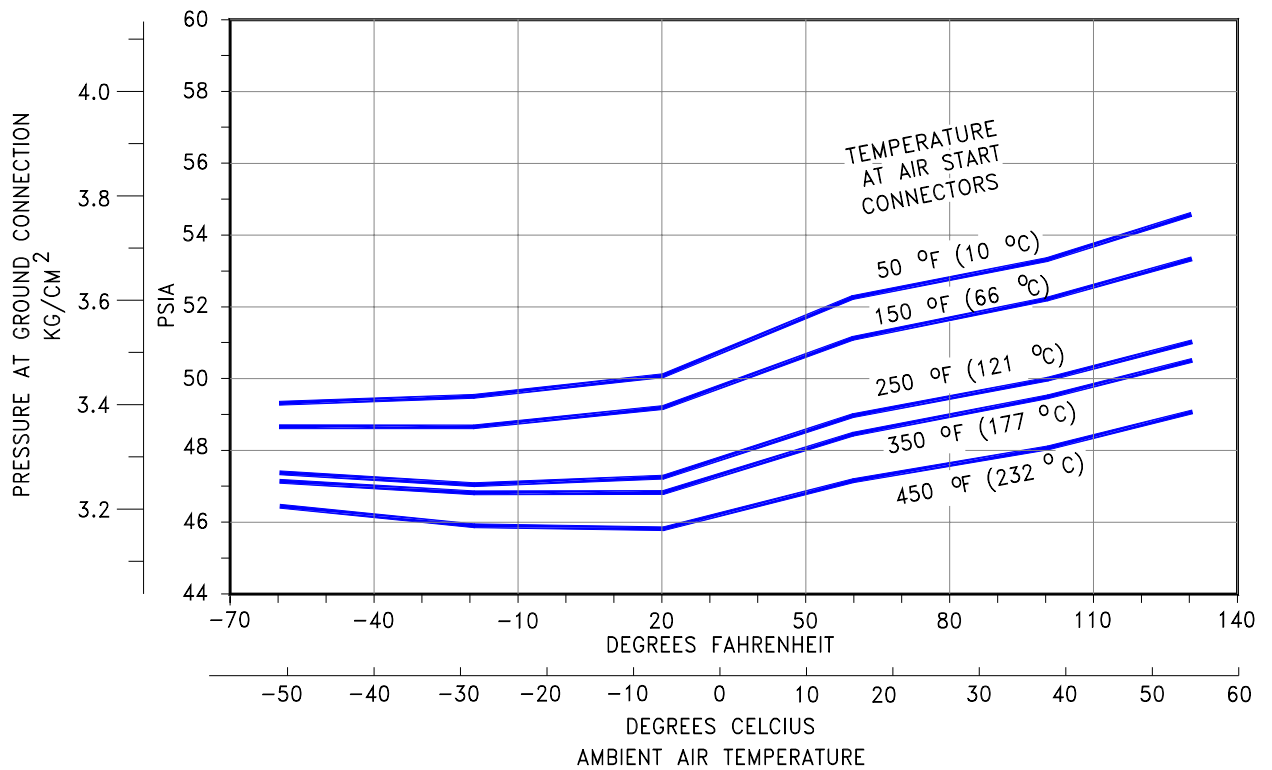
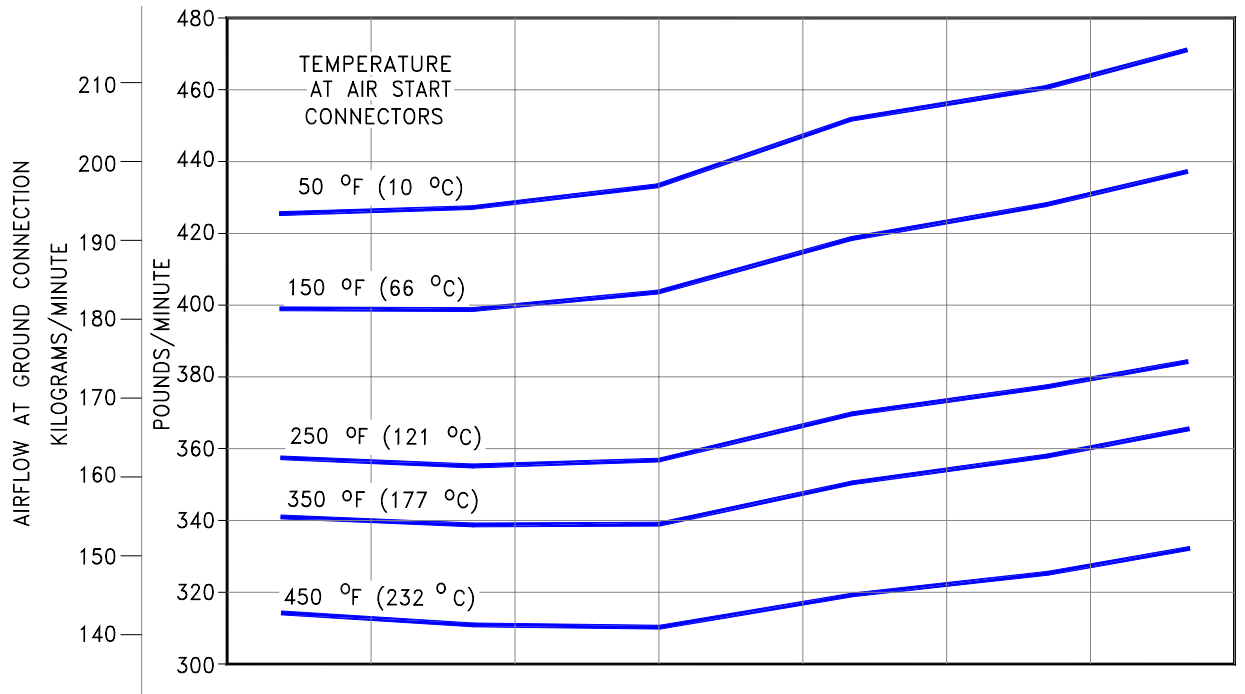


### 5.5.1 ENGINE START PNEUMATIC REQUIREMENTS - SEA LEVEL

MODEL 777-200, -300 (PRATT & WHITNEY ENGINES)

D6-58329

- NOTES:
1. ALTITUDE = SEA LEVEL
  2. 90 SECONDS TO IDLE
  3. 2 GROUND CONNECTIONS USED



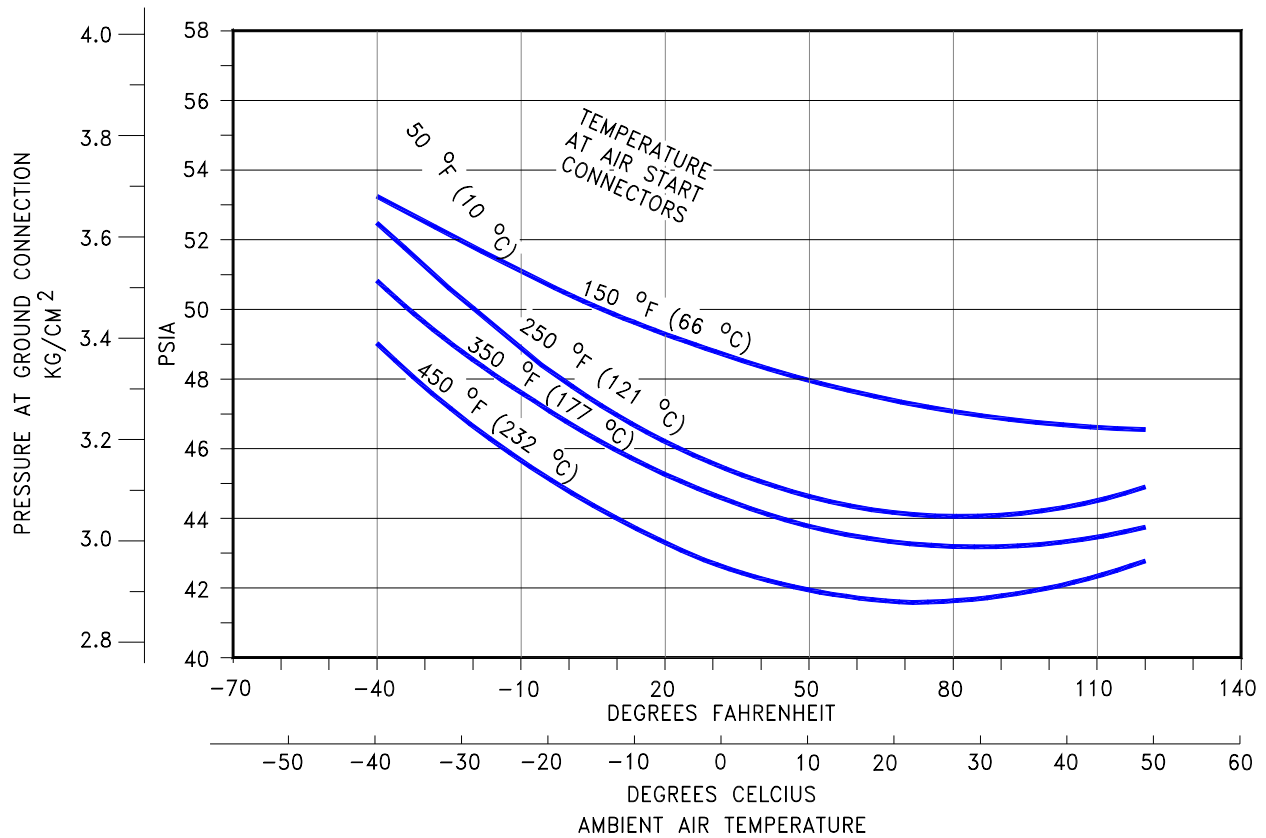
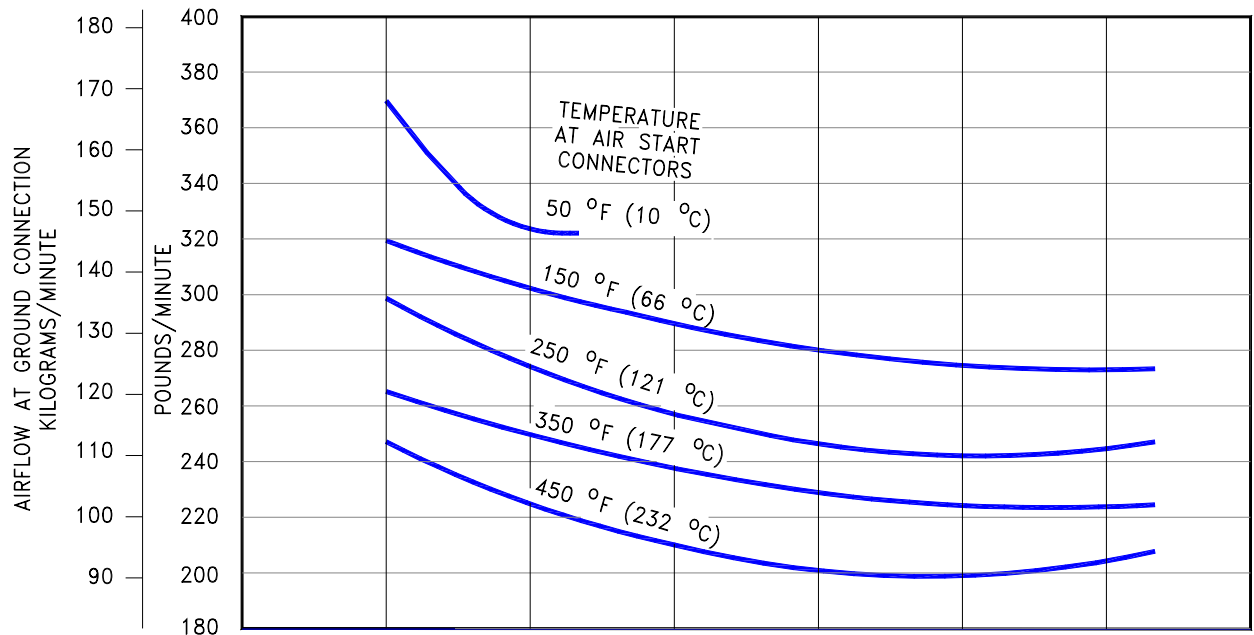
## 5.5.2 ENGINE START PNEUMATIC REQUIREMENTS - SEA LEVEL

MODEL 777-200, -300 (GENERAL ELECTRIC ENGINES)

D6-58329

NOTES:

1. ALTITUDE = SEA LEVEL
2. 90 SECONDS TO IDLE
3. 2 GROUND CONNECTORS USED
4. ALLIED SIGNAL STARTER MODEL AST200-71 OR  
HAMILTON STANDARD STARTER MODEL PS600-3



### 5.5.3 ENGINE START PNEUMATIC REQUIREMENTS - SEA LEVEL

MODEL 777-200,-300 (ROLLS-ROYCE ENGINES)

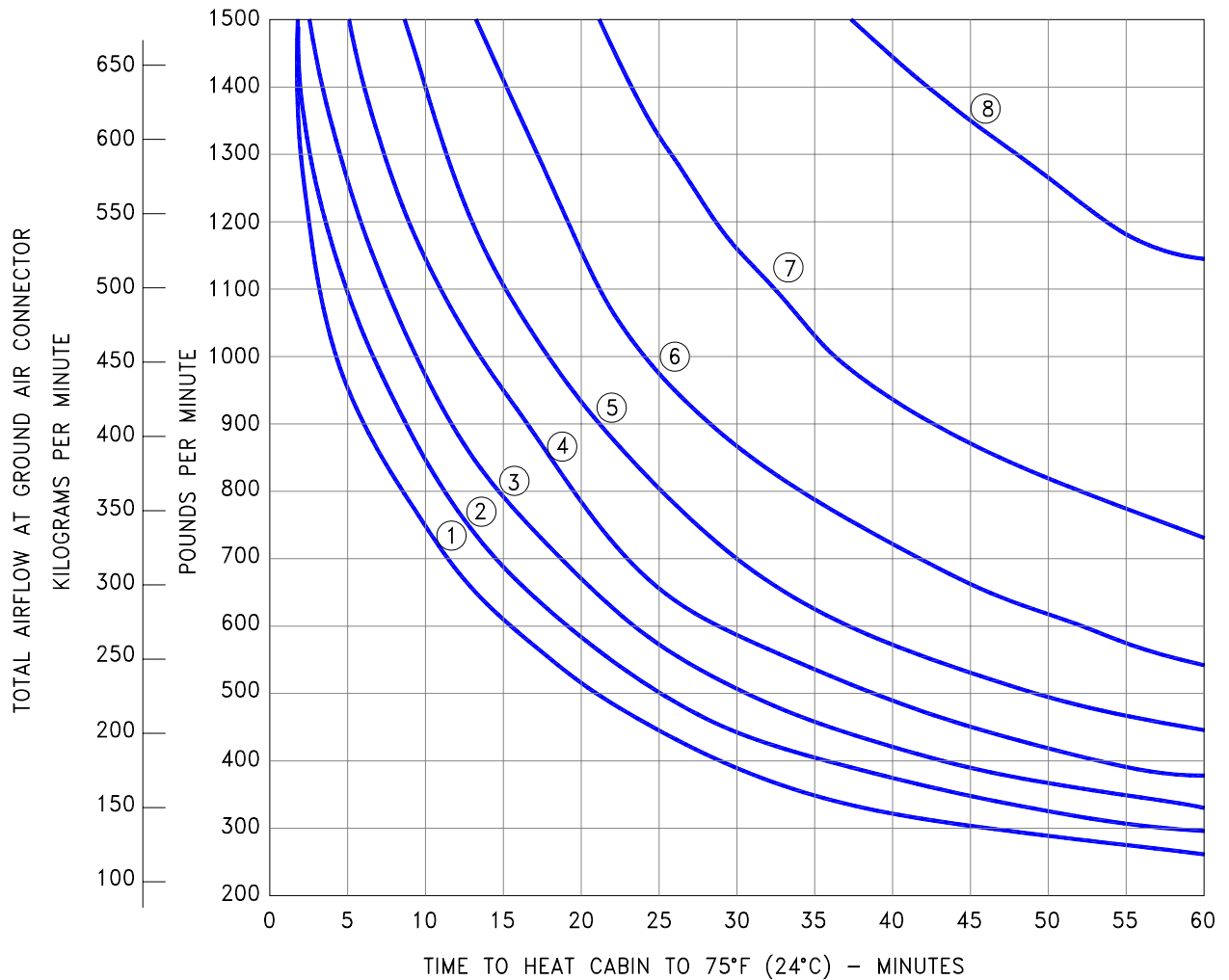
D6-58329



CONDITIONS:

ALL EXTERIOR DOORS AND WINDOWS CLOSED  
 OUTSIDE TEMPERATURE  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ )  
 INITIAL CABIN TEMPERATURE  $-25^{\circ}\text{F}$  ( $-32^{\circ}\text{C}$ )  
 NO SOLAR HEAT LOAD

RECIRCULATION FANS OFF  
 CHILLERS OFF  
 MINIMUM LIGHTING  
 NO OCCUPANTS



NOTE: THIS GRAPH SHOWS THE TIME REQUIRED TO HEAT THE CABIN TO  $75^{\circ}\text{F}$  ( $24^{\circ}\text{C}$ )  
 AS A FUNCTION OF AIRFLOW WHEN USING A CONDITIONED AIR GROUND SOURCE

### 5.6.1 GROUND CONDITIONED AIR REQUIREMENTS - HEATING, PULL-UP

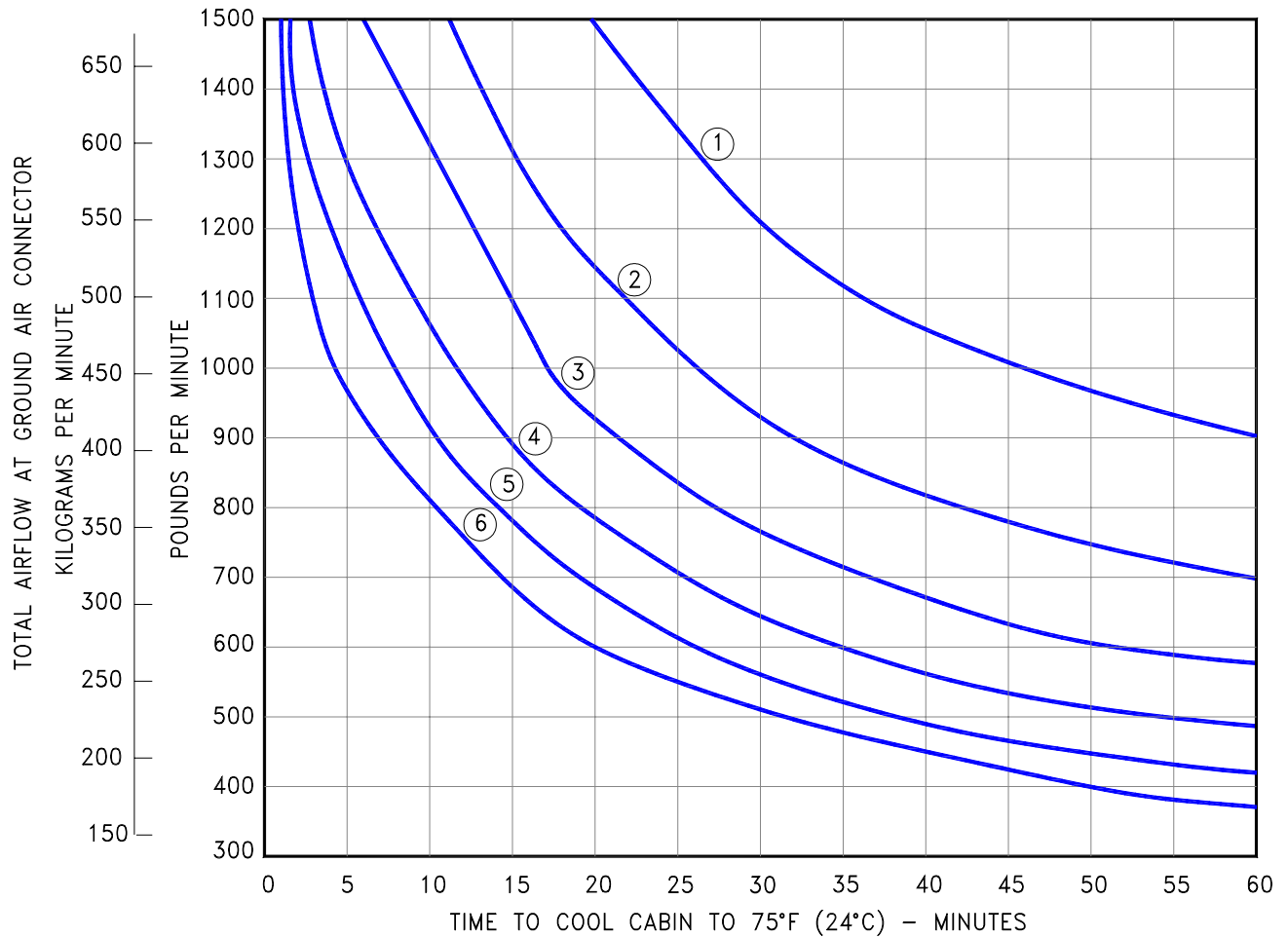
MODEL 777-200

D6-58329

CONDITIONS:

ALL EXTERIOR DOORS AND WINDOWS CLOSED  
 OUTSIDE TEMPERATURE 103°F (39°C)  
 INITIAL CABIN TEMPERATURE 115°F (46°C)  
 FULL SOLAR LOAD

RECIRCULATION FANS OFF  
 CHILLERS ON  
 MINIMUM LIGHTING  
 NO OCCUPANTS



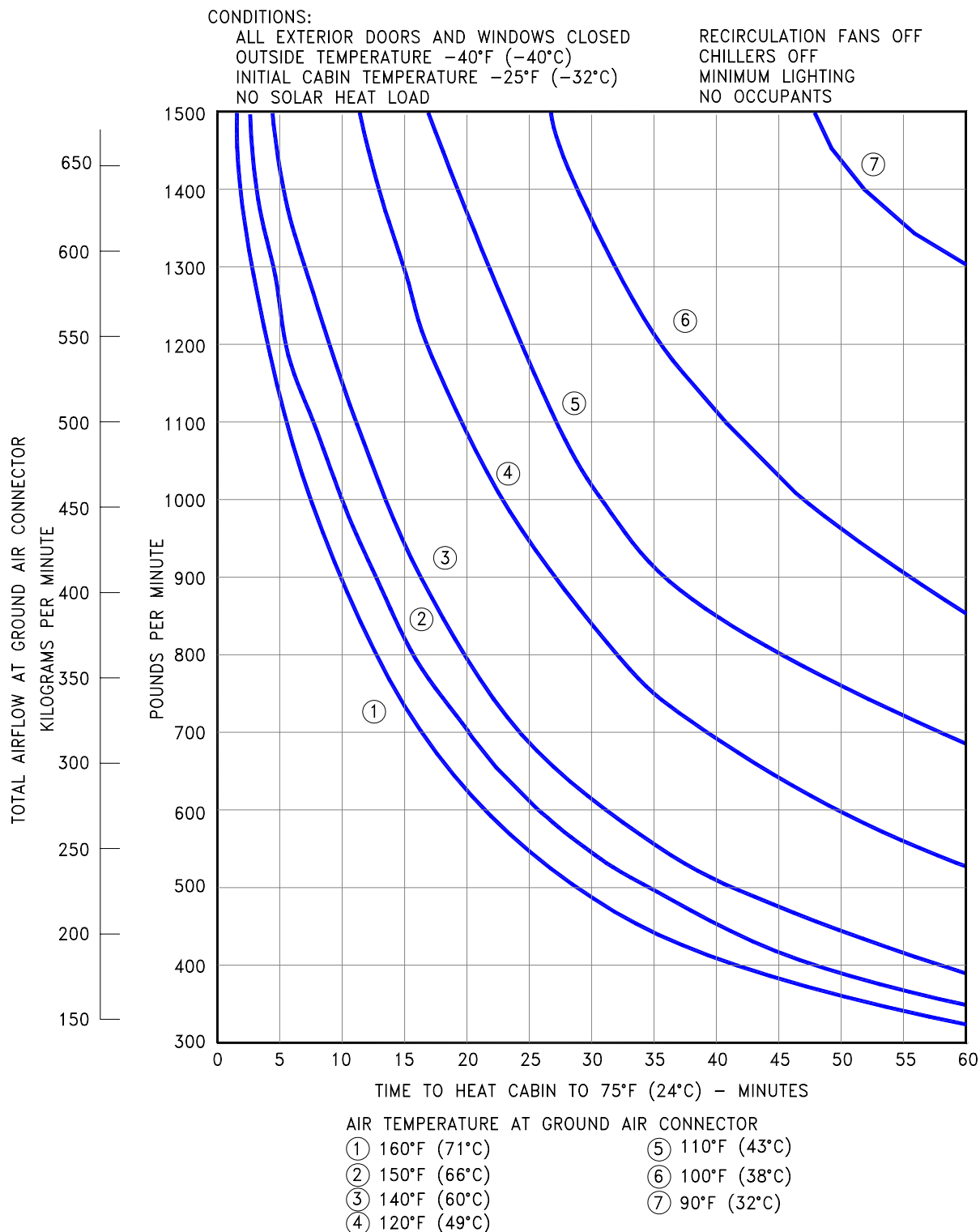
AIR TEMPERATURE AT GROUND CONNECTION			
①	60°F (16°C)	④	45°F (7°C)
②	55°F (13°C)	⑤	40°F (4°C)
③	50°F (10°C)	⑥	35°F (2°C)

NOTE: THIS GRAPH SHOWS THE TIME REQUIRED TO COOL THE CABIN TO 75°F (24°C) AS A FUNCTION OF AIRFLOW WHEN USING A CONDITIONED AIR GROUND SOURCE.

## 5.6.2 GROUND CONDITIONED AIR REQUIREMENTS - COOLING, PULL-DOWN

MODEL 777-200

D6-58329



NOTE: THIS GRAPH SHOWS THE TIME REQUIRED TO HEAT THE CABIN TO 75°C (24°C)  
 AS A FUNCTION OF AIRFLOW WHEN USING A CONDITIONED AIR GROUND SOURCE

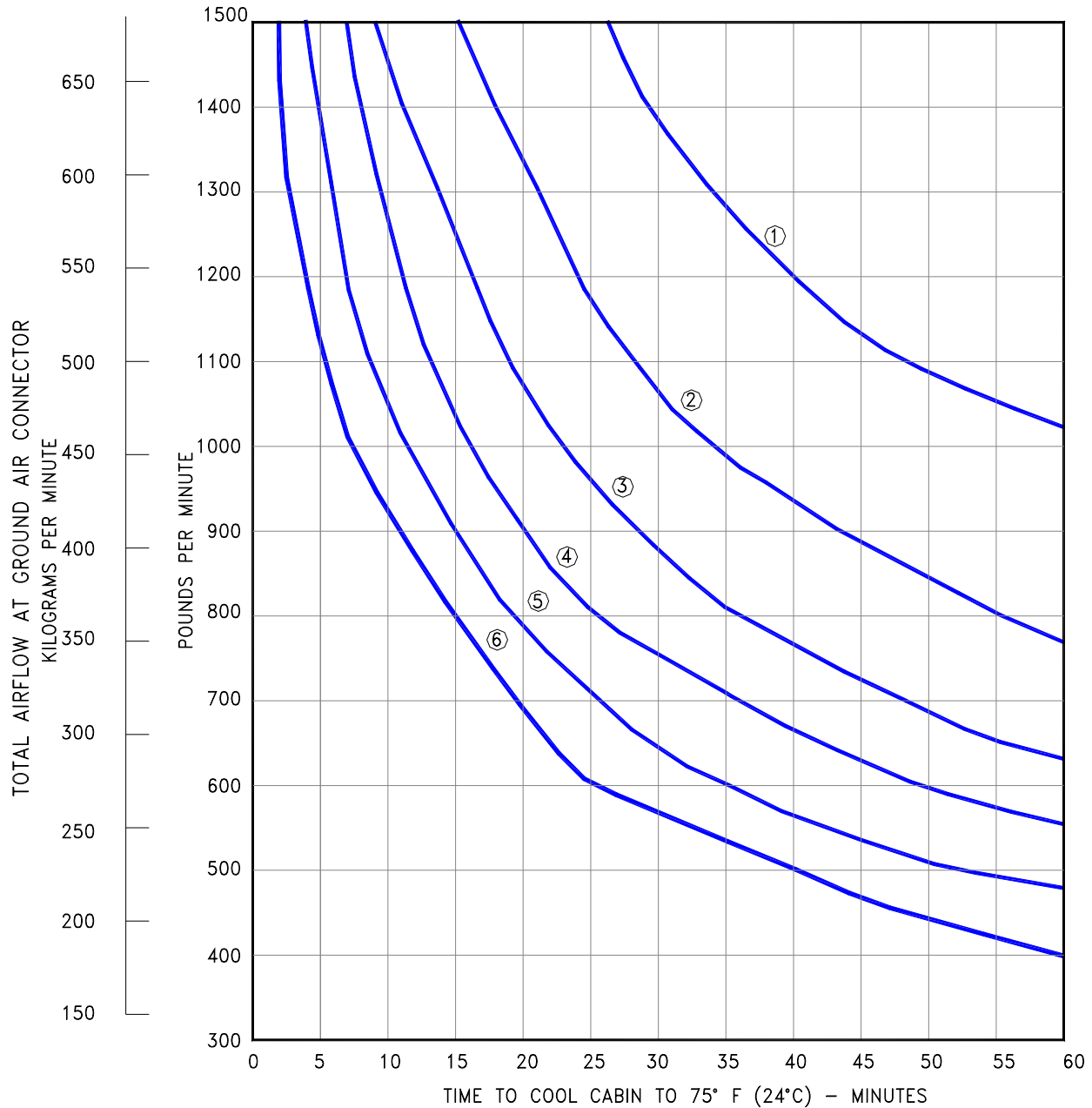
### 5.6.3 GROUND CONDITIONED AIR REQUIREMENTS - HEATING, PULL-UP MODEL 777-300

D6-58329

CONDITIONS:

ALL EXTERIOR DOORS AND WINDOWS CLOSED  
OUTSIDE TEMPERATURE 103°F (39°C)  
INITIAL CABIN TEMPERATURE 115°F (46°C)  
FULL SOLAR LOAD

RECIRCULATION FANS OFF  
CHILLERS ON  
MINIMUM LIGHTING  
NO OCCUPANTS



AIR TEMPERATURE AT GROUND AIR CONNECTOR

- |               |              |
|---------------|--------------|
| ① 60°F (16°C) | ④ 45°F (7°C) |
| ② 55°F (13°C) | ⑤ 40°F (4°C) |
| ③ 50°F (10°C) | ⑥ 35°F (2°C) |

NOTE: THIS GRAPH SHOWS THE TIME REQUIRED TO COOL THE CABIN TO 75°F (24°C) AS A FUNCTION OF AIRFLOW WHEN USING A CONDITIONED AIR GROUND SOURCE.

## 5.6.4 GROUND CONDITIONED AIR REQUIREMENTS - COOLING, PULL-DOWN

MODEL 777-300

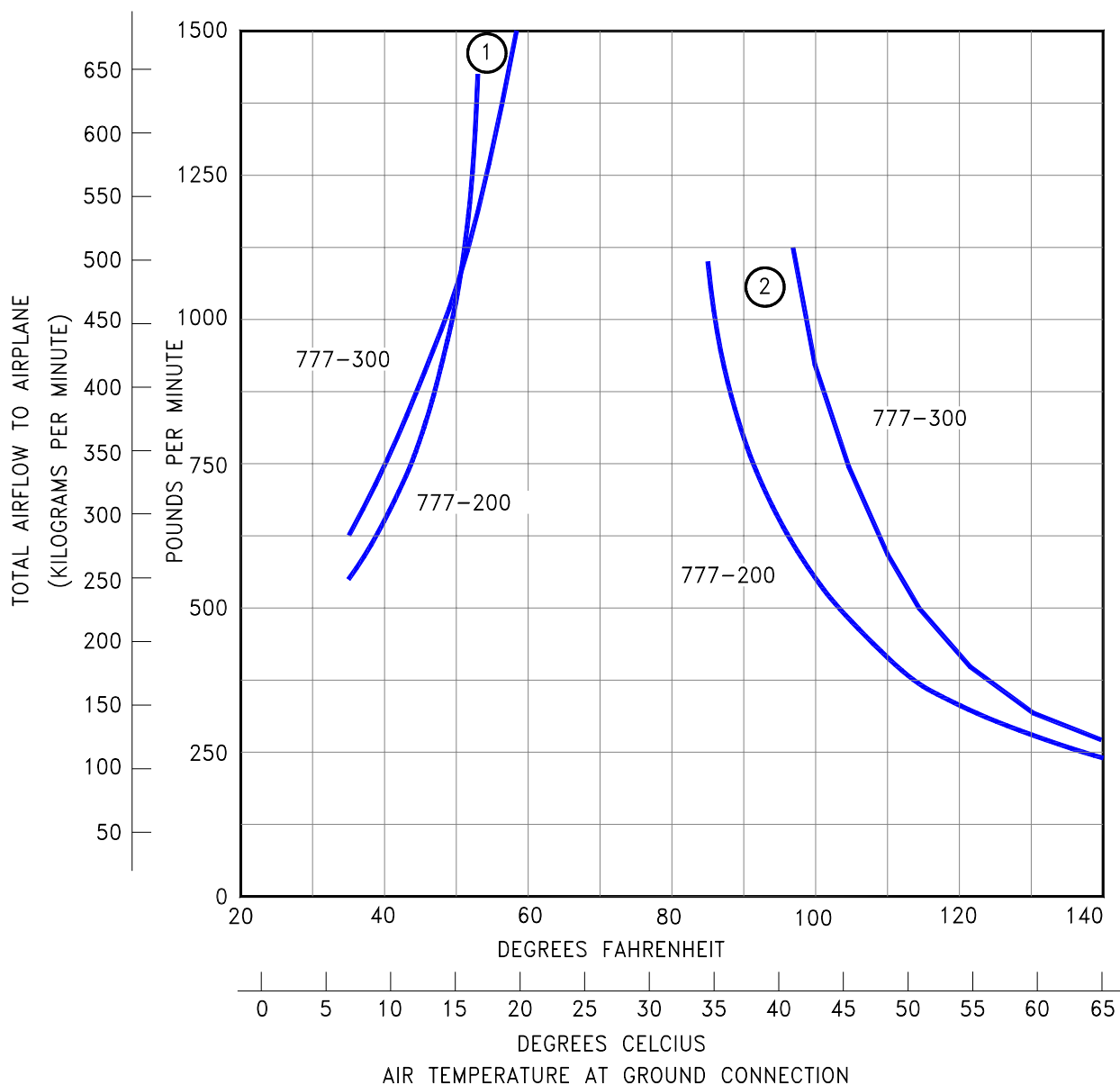
D6-58329

CONDITIONS FOR LINE (1):

ALL EXTERIOR DOORS AND WINDOWS CLOSED  
OUTSIDE TEMPERATURE 103° F (39° C)  
FULL SOLAR AND ELECTRICAL HEAT LOADS  
RECIRCULATING FANS OFF  
CHILLERS ON  
426 PASSENGERS (777-200)  
505 PASSENGERS (777-300)  
CABIN TEMPERATURE MAINTAINED AT  
75° F (24° C)

CONDITIONS FOR LINE (2):

ALL EXTERIOR DOORS AND WINDOWS CLOSED  
OUTSIDE TEMPERATURE -40° F (-40° C)  
NO SOLAR AND ELECTRICAL HEAT LOADS  
RECIRCULATING FANS OFF  
CHILLERS OFF  
NO PASSENGERS  
CABIN TEMPERATURE MAINTAINED AT  
75° F (24° C)

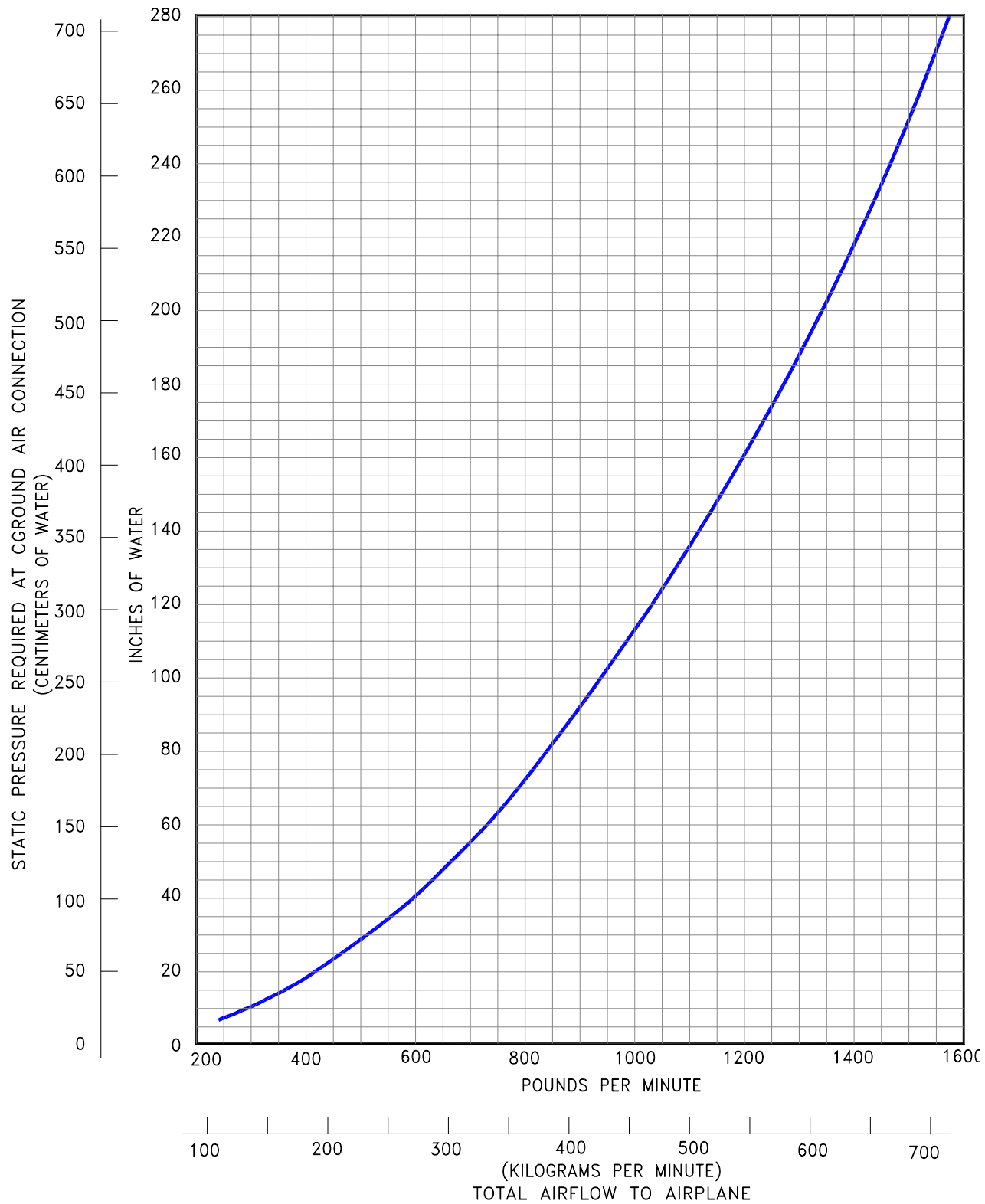


NOTE:

THIS GRAPH SHOWS REQUIRED AIR TEMPERATURES AT THE  
GROUND AIR CONNECTION IN ORDER TO MAINTAIN CABIN  
TEMPERATURE AT 75°F (24°C)

5.7.1 CONDITIONED AIR FLOW REQUIREMENTS - STEADY STATE AIRFLOW

MODEL 777-200, -300



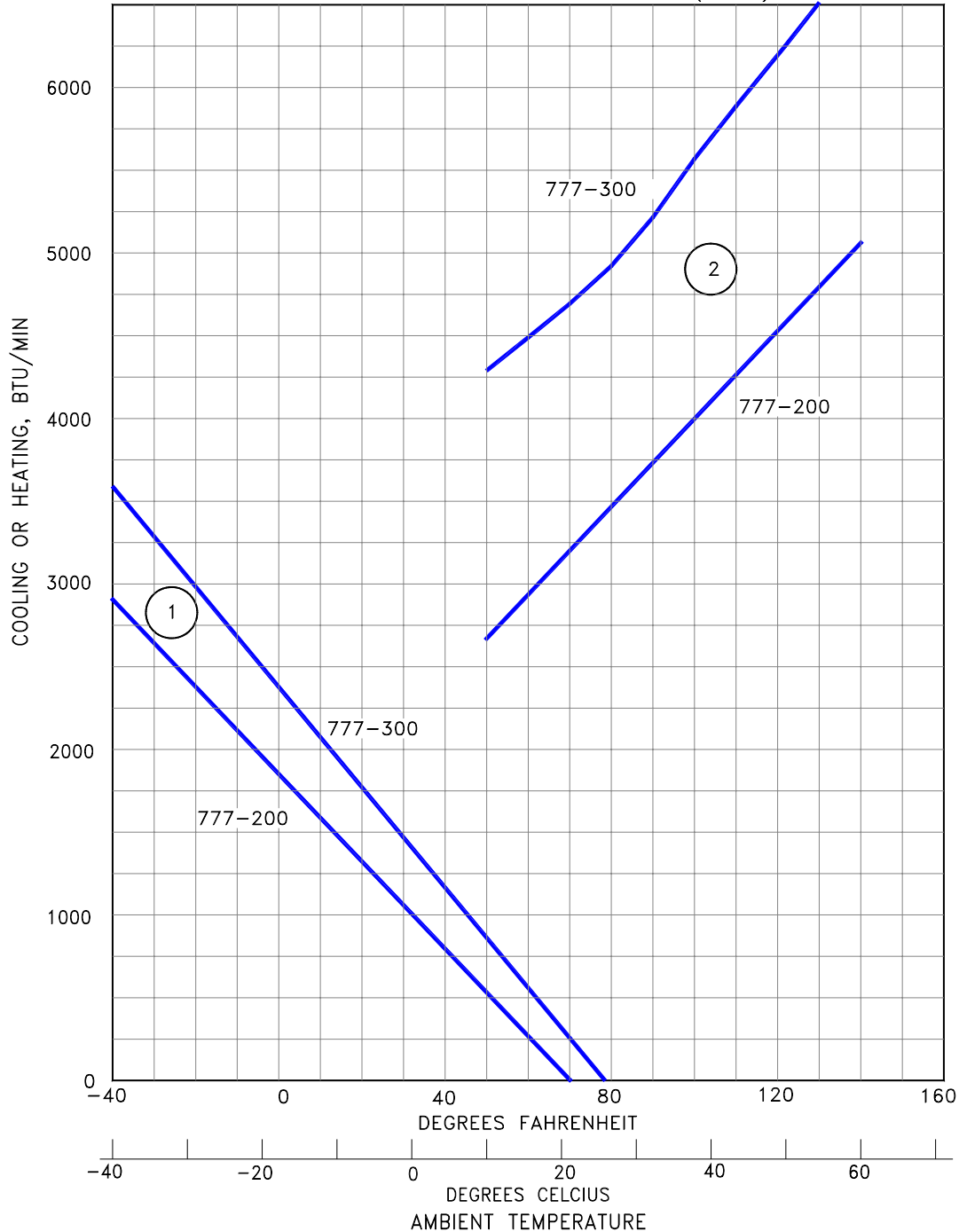
## 5.7.2 AIR CONDITIONING GAGE PRESSURE REQUIREMENTS - STEADY STATE AIRFLOW

MODEL 777-200, -300

D6-58329

CONDITIONS FOR LINE (1) – HEATING  
 ALL EXTERIOR DOORS AND WINDOWS CLOSED  
 NO SOLAR AND ELECTRICAL HEAT LOADS  
 RECIRCULATING FANS OFF, CHILLERS OFF  
 NO OCCUPANTS  
 CABIN TEMPERATURE MAINTAINED AT  
 75° F (24° C)

CONDITIONS FOR LINE (2) – COOLING  
 ALL EXTERIOR DOORS AND WINDOWS CLOSED  
 FULL SOLAR ELECTRICAL HEAT LOADS  
 RECIRCULATING FANS OFF, CHILLERS ON  
 426 OCCUPANTS (777-200)  
 505 OCCUPANTS (777-300)  
 CABIN TEMPERATURE MAINTAINED AT  
 75° F (24° C)



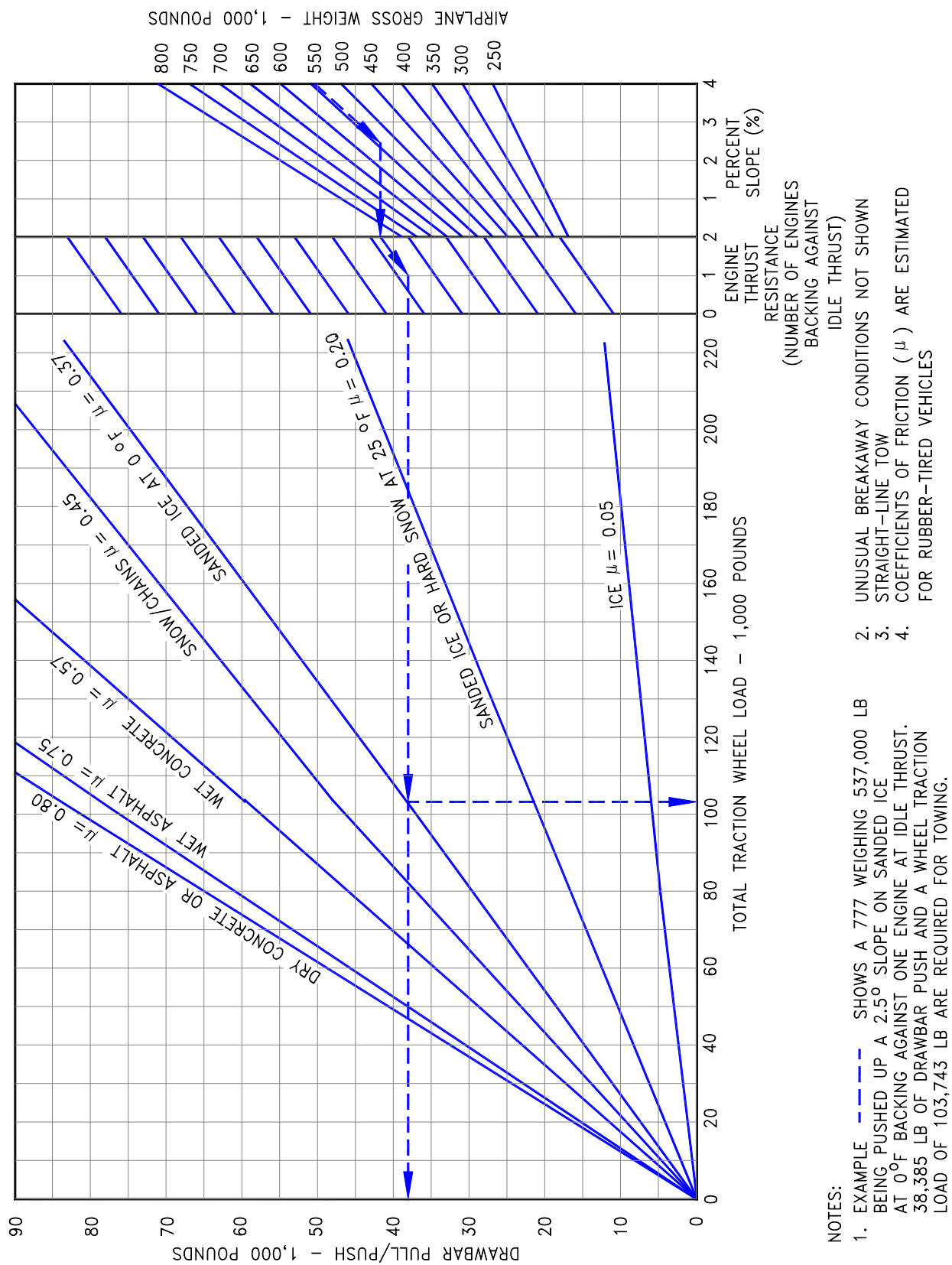
NOTE: THIS GRAPH SHOWS REQUIRED COOLING AND HEATING BTU'S AS A FUNCTION OF AMBIENT TEMPERATURE TO MAINTAIN CABIN TEMPERATURE AT 75°F (24°C)

### 5.7.3 CONDITIONED AIR FLOW REQUIREMENTS - STEADY STATE BTU'S

MODEL 777-200, -300

## 5.8.1 GROUND TOWING REQUIREMENTS - ENGLISH UNITS

MODEL 777-200, -300



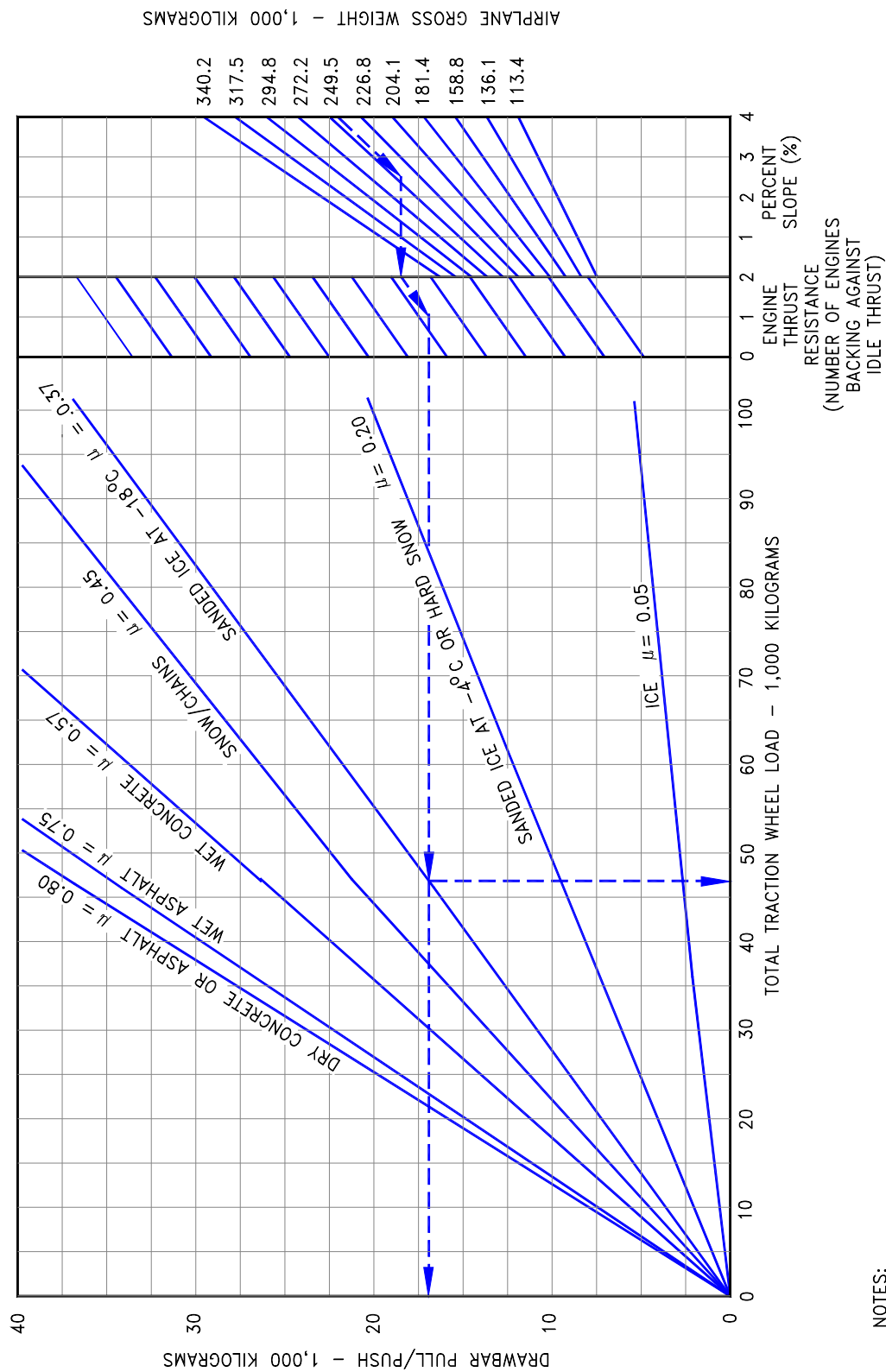
### NOTES:

1. EXAMPLE --- SHOWS A 777 WEIGHING 537,000 LB BEING PUSHED UP A 2.5° SLOPE ON SANDED ICE AT 0° OF BACKING AGAINST ONE ENGINE AT IDLE THRUST. 38,385 LB OF DRAWBAR PUSH AND A WHEEL TRACTION LOAD OF 103,743 LB ARE REQUIRED FOR TOWING.
2. UNUSUAL BREAKAWAY CONDITIONS NOT SHOWN
3. STRAIGHT-LINE TOW
4. COEFFICIENTS OF FRICTION ( $\mu$ ) ARE ESTIMATED FOR RUBBER-TIRED VEHICLES



## 5.8.2 GROUND TOWING REQUIREMENTS - METRIC UNITS

MODEL 777-200, -300



### NOTES:

1. EXAMPLE — SHOWS A 777 WEIGHING 243,500 KG. BEING PUSHED UP A 2.5% SLOPE ON SANDED ICE AT 0°C BACKING AGAINST ONE ENGINE AT IDLE THRUST. 17,400 KG OF DRAWBAR PUSH AND A WHEEL TRACTION LOAD OF 47,100 KG ARE REQUIRED FOR TOWING.
2. UNUSUAL BREAKAWAY CONDITIONS NOT SHOWN
3. STRAIGHT-LINE TOW
4. COEFFICIENTS OF FRICTION ( $\mu$ ) ARE ESTIMATED FOR RUBBER-TIRED VEHICLES

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## **6.0 JET ENGINE WAKE AND NOISE DATA**

### **6.1 Jet Engine Exhaust Velocities and Temperatures**

### **6.2 Airport and Community Noise**

## **6.0 JET ENGINE WAKE AND NOISE DATA**

### **6.1 Jet Engine Exhaust Velocities and Temperatures**

This section shows exhaust velocity and temperature contours aft of the 777-300. The contours were calculated from a standard computer analysis using three-dimensional viscous flow equations with mixing of primary, fan, and free-stream flow. The presence of the ground plane is included in the calculations as well as engine tilt and toe-in. Mixing of flows from the engines is also calculated. The analysis does not include thermal buoyancy effects which tend to elevate the jet wake above the ground plane. The buoyancy effects are considered to be small relative to the lateral velocity and therefore are not included.

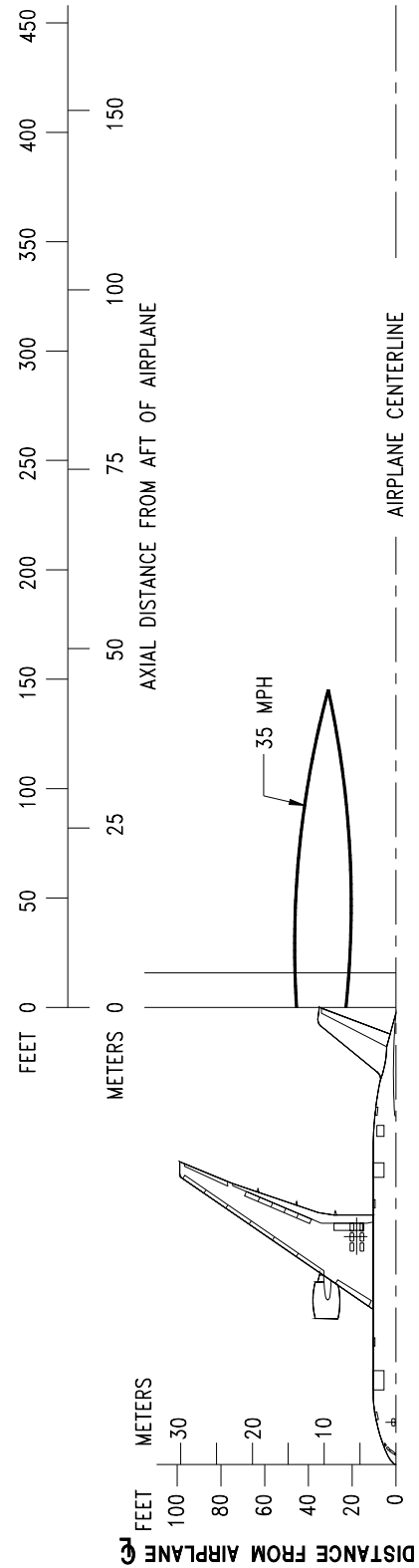
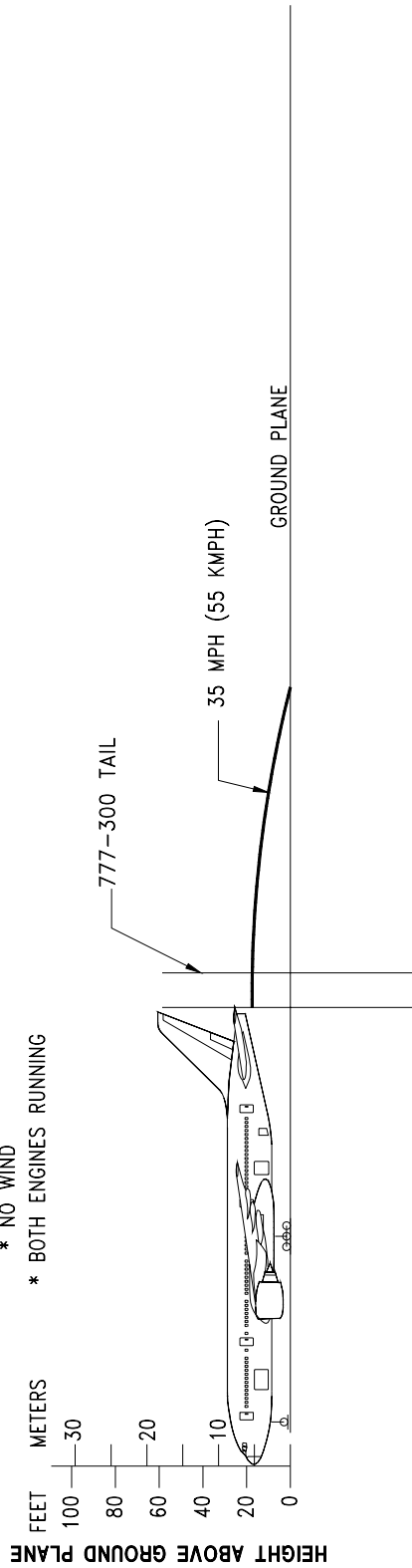
The graphs show jet wake velocity and temperature contours for a representative engine . The results are valid for sea level, static, standard day conditions. The effect of wind on jet wakes was not included. There is evidence to show that a downwind or an upwind component does not simply add or subtract from the jet wake velocity, but rather carries the whole envelope in the direction of the wind. Crosswinds may carry the jet wake contour far to the side at large distances behind the airplane.

### 6.1.1 PREDICTED JET ENGINE EXHAUST VELOCITY CONTOURS - IDLE THRUST

MODEL 777-200,-300

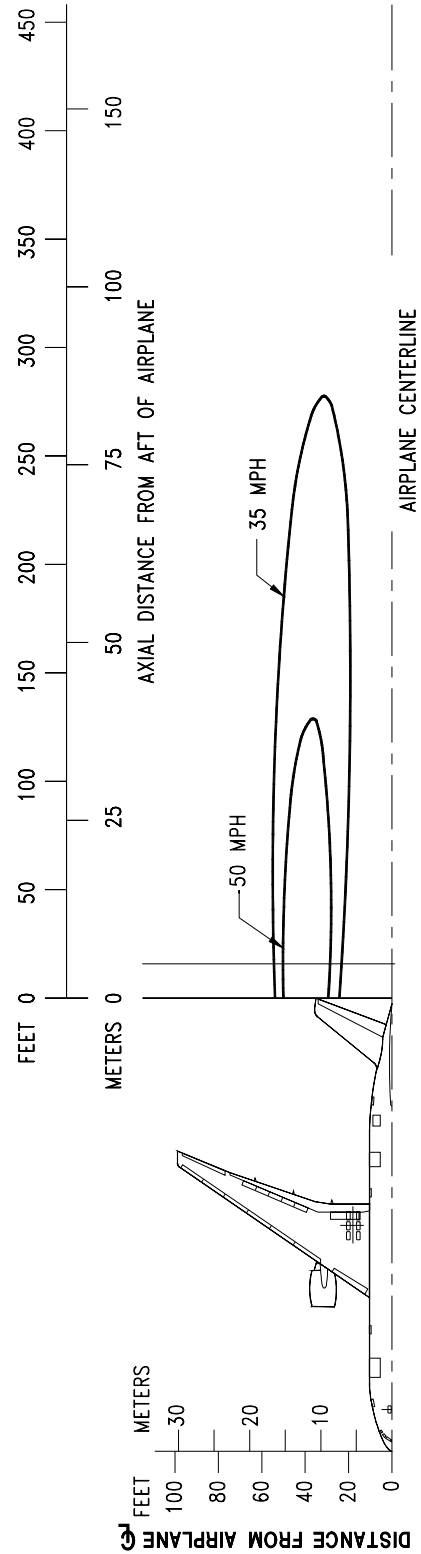
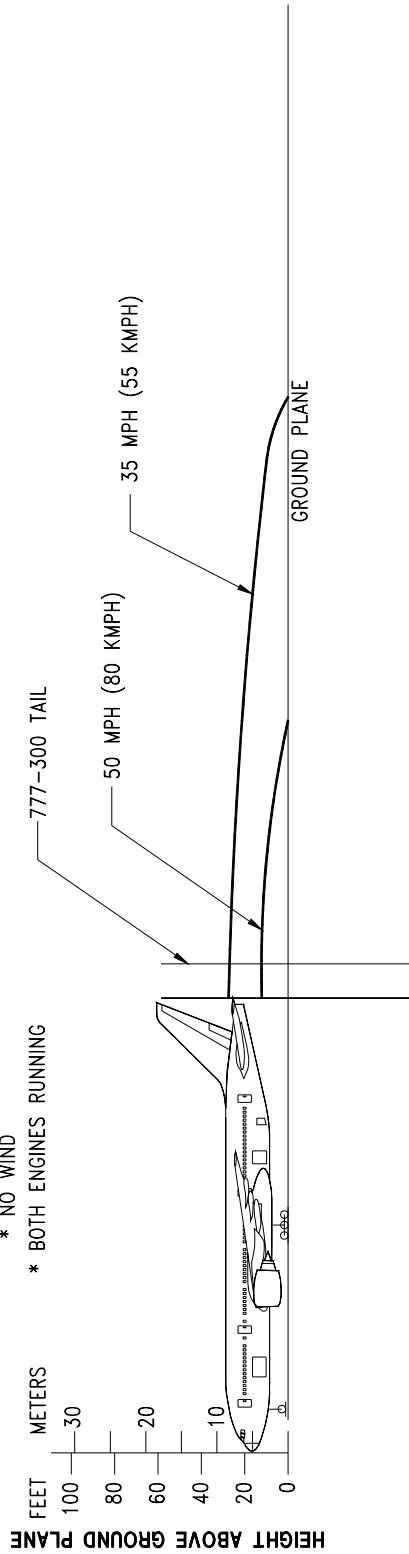
#### NOTES:

- \* ENGINE THRUST AT IDLE SETTING
- \* CONTOURS CALCULATED FROM COMPUTER DATA
- \* STANDARD DAY
- \* SEA LEVEL
- \* NO WIND
- \* BOTH ENGINES RUNNING



NOTES:

- \* ENGINE THRUST AT BREAKAWAY SETTING
- \* CONTOURS CALCULATED FROM COMPUTER DATA
- \* STANDARD DAY
- \* SEA LEVEL
- \* NO WIND
- \* BOTH ENGINES RUNNING



## 6.1.2 PREDICTED JET ENGINE EXHAUST VELOCITY CONTOURS - BREAKAWAY THRUST

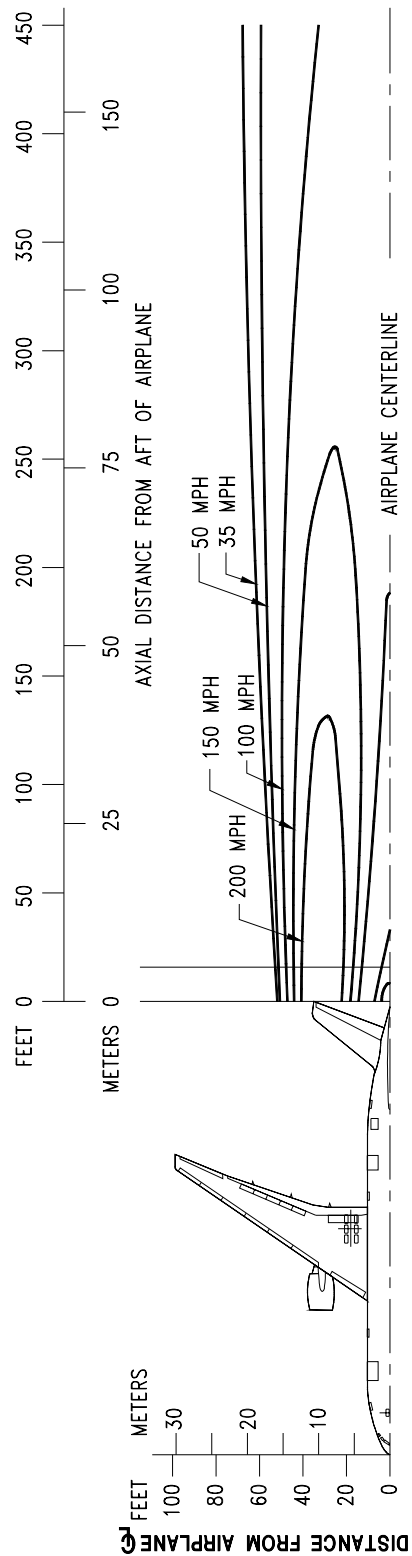
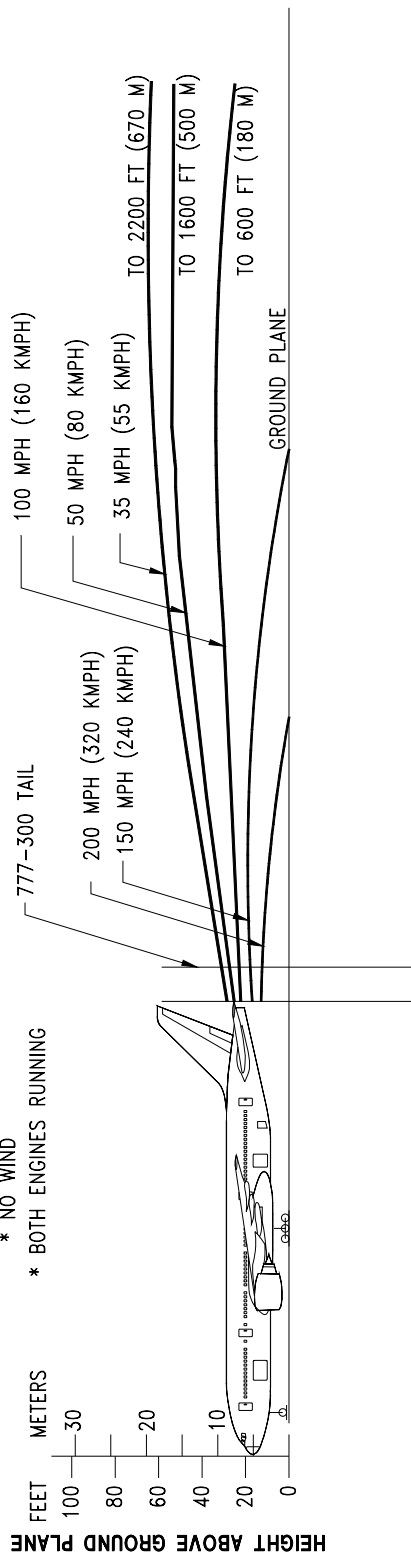
MODEL 777-200, -300

D6-58329-1

### 6.1.3 PREDICTED JET ENGINE EXHAUST VELOCITY CONTOURS - TAKEOFF THRUST MODEL 777-200, -300

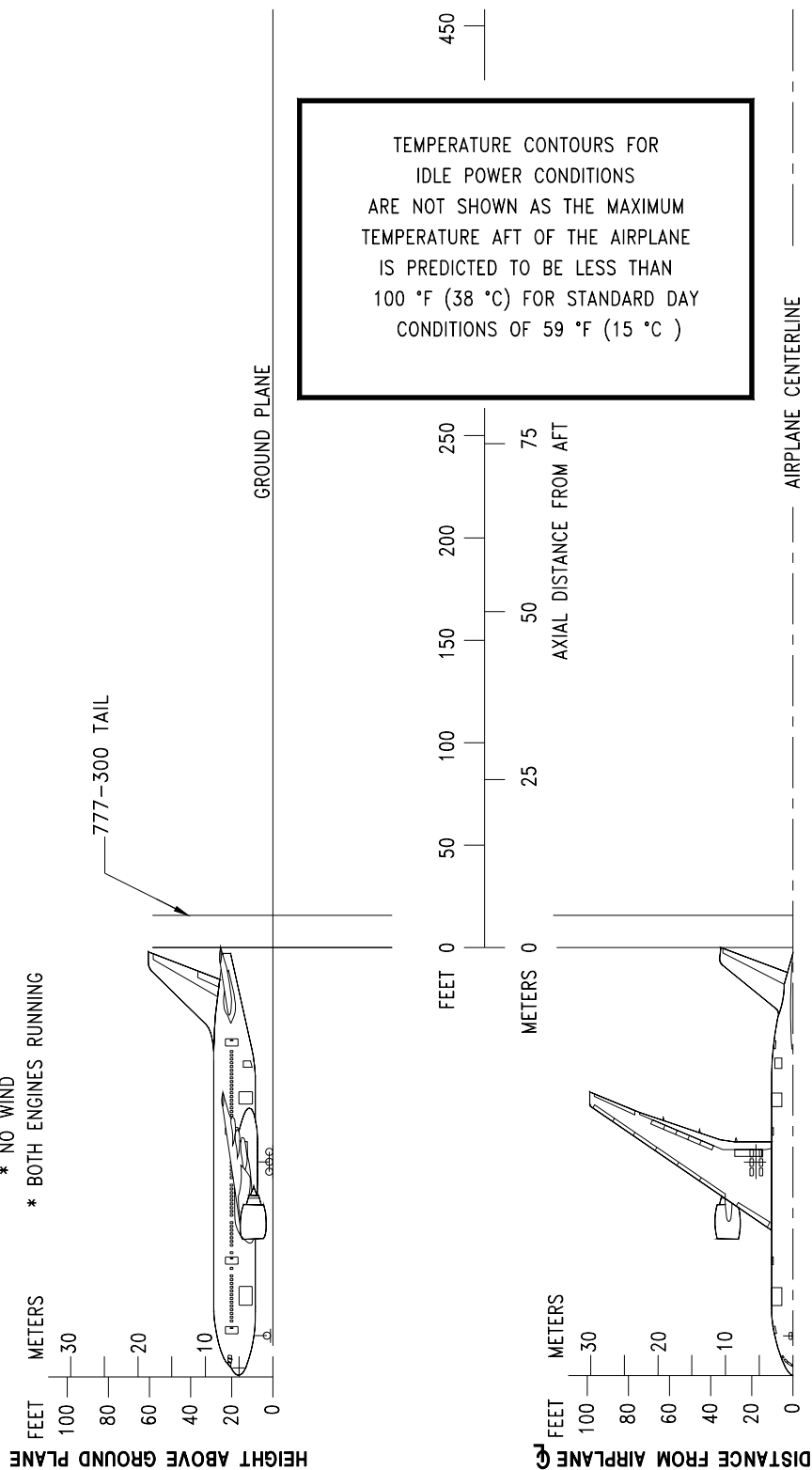
#### NOTES:

- \* ENGINE THRUST AT TAKEOFF SETTING (93K-98K RATING)
- \* CONTOURS CALCULATED FROM COMPUTER DATA
- \* STANDARD DAY
- \* SEA LEVEL
- \* NO WIND
- \* BOTH ENGINES RUNNING



NOTES:

- \* ENGINE THRUST AT IDLE SETTING
- \* CONTOURS CALCULATED FROM COMPUTER DATA
- \* STANDARD DAY
- \* SEA LEVEL
- \* NO WIND
- \* BOTH ENGINES RUNNING

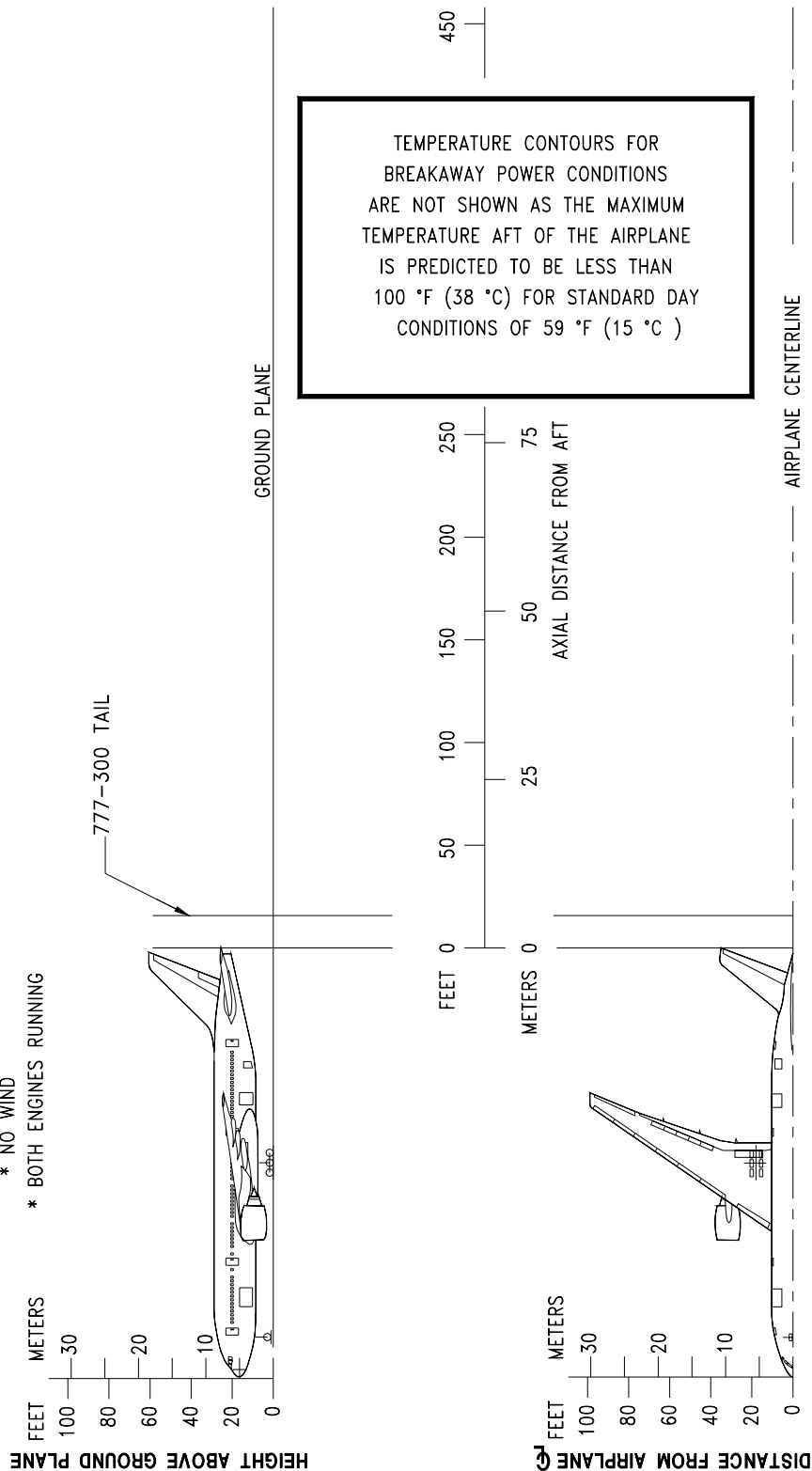


# 6.1.4 PREDICTED JET ENGINE EXHAUST TEMPERATURE CONTOURS - IDLE THRUST MODEL 777-200, -300



NOTES:

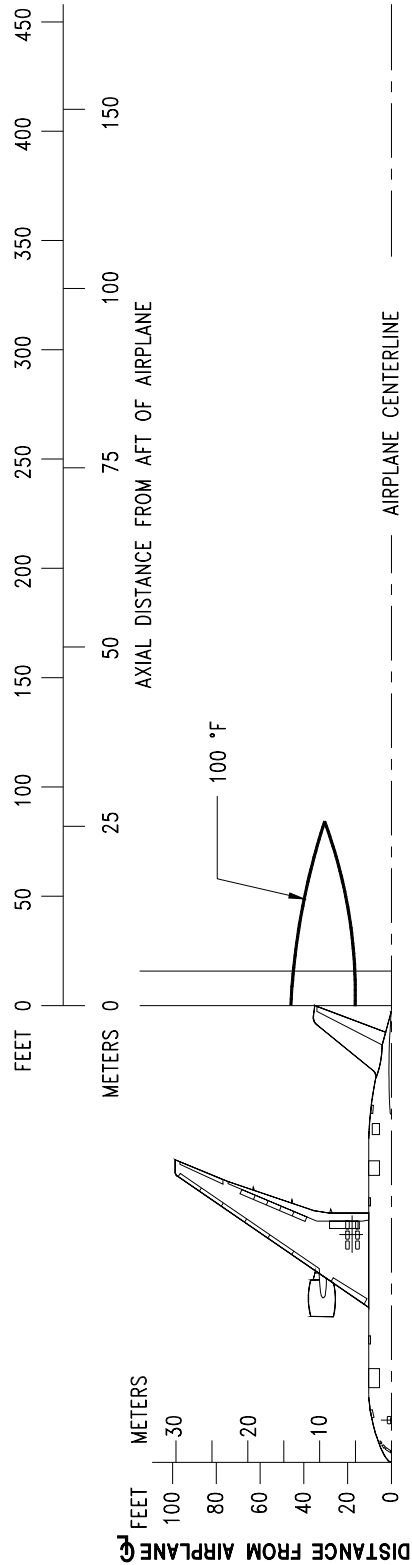
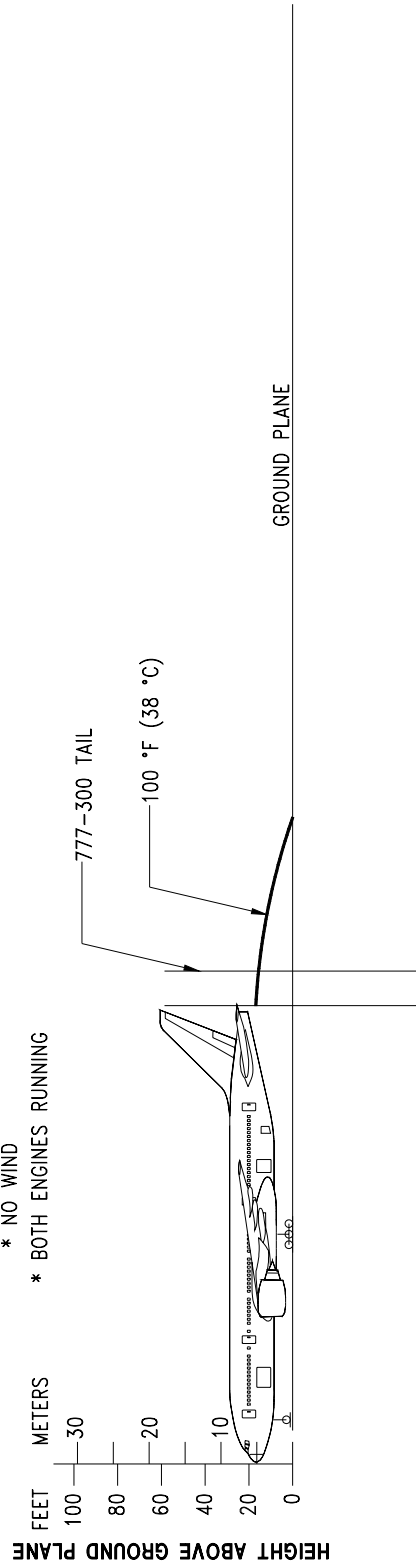
- \* ENGINE THRUST AT BREAKAWAY SETTING
- \* CONTOURS CALCULATED FROM COMPUTER DATA
- \* STANDARD DAY
- \* SEA LEVEL
- \* NO WIND
- \* BOTH ENGINES RUNNING



### 6.1.5 PREDICTED JET ENGINE EXHAUST TEMPERATURE CONTOURS - BREAKAWAY THRUST MODEL 777-200, -300

NOTES:

- \* ENGINE THRUST AT TAKEOFF SETTING (84,600 LB)
- \* CONTOURS CALCULATED FROM COMPUTER DATA
- \* STANDARD DAY
- \* SEA LEVEL
- \* NO WIND
- \* BOTH ENGINES RUNNING



## 6.1.6 PREDICTED JET ENGINE EXHAUST TEMPERATURE CONTOURS - TAKEOFF THRUST MODEL 777-200, -300

D6-58329-1

## 6.2 Airport and Community Noise

Airport noise is of major concern to the airport and community planner. The airport is a major element in the community's transportation system and, as such, is vital to its growth. However, the airport must also be a good neighbor, and this can be accomplished only with proper planning. Since aircraft noise extends beyond the boundaries of the airport, it is vital to consider the impact on surrounding communities. Many means have been devised to provide the planner with a tool to estimate the impact of airport operations. Too often they oversimplify noise to the point where the results become erroneous. Noise is not a simple subject; therefore, there are no simple answers.

The cumulative noise contour is an effective tool. However, care must be exercised to ensure that the contours, used correctly, estimate the noise resulting from aircraft operations conducted at an airport.

The size and shape of the single-event contours, which are inputs into the cumulative noise contours, are dependent upon numerous factors. They include the following:

### 1. Operational Factors

- (a) Aircraft Weight-Aircraft weight is dependent on distance to be traveled, en route winds, payload, and anticipated aircraft delay upon reaching the destination.
- (b) Engine Power Settings-The rates of ascent and descent and the noise levels emitted at the source are influenced by the power setting used.
- (c) Airport Altitude-Higher airport altitude will affect engine performance and thus can influence noise.

2. Atmospheric Conditions-Sound Propagation

(a) Wind-With stronger headwinds, the aircraft can take off and climb more rapidly relative to the ground. Also, winds can influence the distribution of noise in surrounding communities.

(b) Temperature and Relative Humidity-The absorption of noise in the atmosphere along the transmission path between the aircraft and the ground observer varies with both temperature and relative humidity.

3. Surface Condition-Shielding, Extra Ground Attenuation (EGA)

(a) Terrain-If the ground slopes down after takeoff or up before landing, noise will be reduced since the aircraft will be at a higher altitude above ground. Additionally, hills, shrubs, trees, and large buildings can act as sound buffers.

All these factors can alter the shape and size of the contours appreciably. To demonstrate the effect of some of these factors, estimated noise level contours for two different operating conditions are shown below. These contours reflect a given noise level upon a ground level plane at runway elevation.

Condition 1

Landing

Takeoff

Maximum Structural Landing  
Weight

Maximum Gross Takeoff Weight

10-knot Headwind

Zero Wind

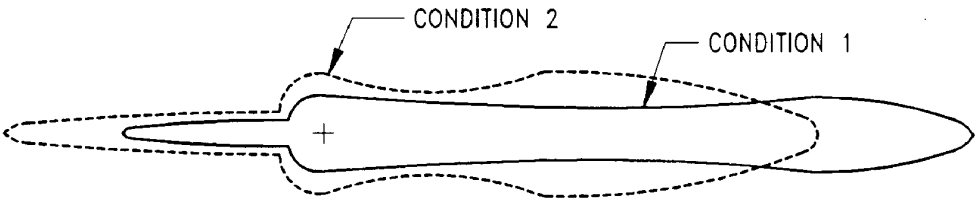
3° Approach

84 °F

84 °F

Humidity 15%

Humidity 15%



Condition 2

Landing:

Takeoff:

85% of Maximum Structural  
Landing Weight

80% of Maximum Gross Takeoff  
Weight

10-knot Headwind

10-knot Headwind

3° Approach

59 °F

59 °F

Humidity 70%

Humidity 70%

As indicated from these data, the contour size varies substantially with operating and atmospheric conditions. Most aircraft operations are, of course, conducted at less than maximum gross weights because average flight distances are much shorter than maximum aircraft range capability and average load factors are less than 100%. Therefore, in developing cumulative contours for planning purposes, it is recommended that the airlines serving a particular city be contacted to provide operational information.

In addition, there are no universally accepted methods for developing aircraft noise contours or for relating the acceptability of specific zones to specific land uses. It is therefore expected that noise contour data for particular aircraft and the impact assessment methodology will be changing. To ensure that the best currently available information of this type is used in any planning study, it is recommended that it be obtained directly from the Office of Environmental Quality in the Federal Aviation Administration in Washington, D.C.

It should be noted that the contours shown herein are only for illustrating the impact of operating and atmospheric conditions and do not represent the single-event contour of the family of aircraft described in this document. It is expected that the cumulative contours will be developed as required by planners using the data and methodology applicable to their specific study.

## **7.0 PAVEMENT DATA**

- 7.1 General Information**
- 7.2 Landing Gear Footprint**
- 7.3 Maximum Pavement Loads**
- 7.4 Landing Gear Loading on Pavement**
- 7.5 Flexible Pavement Requirements - U.S. Army Corps of Engineers Method S-77-1**
- 7.6 Flexible Pavement Requirements - LCN Conversion**
- 7.7 Rigid Pavement Requirements - Portland Cement Association Design Method**
- 7.8 Rigid Pavement Requirements - LCN Conversion**
- 7.9 Rigid Pavement Requirements - FAA Method**
- 7.10 ACN/PCN Reporting System - Flexible and Rigid Pavements**

## **7.0 PAVEMENT DATA**

### **7.1 General Information**

A brief description of the pavement charts that follow will help in their use for airport planning. Each airplane configuration is depicted with a minimum range of six loads imposed on the main landing gear to aid in interpolation between the discrete values shown. All curves for any single chart represent data based on rated loads and tire pressures considered normal and acceptable by current aircraft tire manufacturer's standards. Tire pressures, where specifically designated on tables and charts, are at values obtained under loaded conditions as certificated for commercial use.

Section 7.2 presents basic data on the landing gear footprint configuration, maximum design taxi loads, and tire sizes and pressures.

Maximum pavement loads for certain critical conditions at the tire-to-ground interface are shown in Section 7.3, with the tires having equal loads on the struts.

Pavement requirements for commercial airplanes are customarily derived from the static analysis of loads imposed on the main landing gear struts. The chart in Section 7.4 is provided in order to determine these loads throughout the stability limits of the airplane at rest on the pavement. These main landing gear loads are used as the point of entry to the pavement design charts, interpolating load values where necessary.

The flexible pavement design curves (Section 7.5) are based on procedures set forth in Instruction Report No. S-77-1, "Procedures for Development of CBR Design Curves," dated June 1977. Instruction Report No. S-77-1 was prepared by the U.S. Army Corps of Engineers Waterways Experiment Station, Soils and Pavements Laboratory, Vicksburg, Mississippi. The line showing 10,000 coverages is used to calculate the Aircraft Classification Number (ACN).



The following procedure is used to develop the curves, such as shown in Section 7.5:

1. Having established the scale for pavement depth at the bottom and the scale for CBR at the top, an arbitrary line is drawn representing 6,000 annual departures.
2. Values of the aircraft gross weight are then plotted.
3. Additional annual departure lines are drawn based on the load lines of the aircraft gross weights already established.
4. An additional line representing 10,000 coverages (used to calculate the flexible pavement Aircraft Classification Number) is also placed.

All Load Classification Number (LCN) curves (Sections 7.6 and 7.8) have been developed from a computer program based on data provided in International Civil Aviation Organization (ICAO) document 9157-AN/901, Aerodrome Design Manual, Part 3, "Pavements", First Edition, 1977. LCN values are shown directly for parameters of weight on main landing gear, tire pressure, and radius of relative stiffness ( $l$ ) for rigid pavement or pavement thickness or depth factor ( $h$ ) for flexible pavement.

Rigid pavement design curves (Section 7.7) have been prepared with the Westergaard equation in general accordance with the procedures outlined in the Design of Concrete Airport Pavement (1955 edition) by Robert G. Packard, published by the American Concrete Pavement Association, 3800 North Wilke Road, Arlington Heights, Illinois 60004-1268. These curves are modified to the format described in the Portland Cement Association publication XP6705-2, Computer Program for Airport Pavement Design (Program PDILB), 1968, by Robert G. Packard.

The following procedure is used to develop the rigid pavement design curves shown in Section 7.7:

1. Having established the scale for pavement thickness to the left and the scale for allowable working stress to the right, an arbitrary load line is drawn representing the main landing gear maximum weight to be shown.
2. Values of the subgrade modulus ( $k$ ) are then plotted.
3. Additional load lines for the incremental values of weight on the main landing gear are drawn on the basis of the curve for  $k = 300$ , already established.

The ACN/PCN system (Section 7.9) as referenced in ICAO Annex 14, "Aerodromes," First Edition, July 1990, provides a standardized international airplane/pavement rating system replacing the various S, T, TT, LCN, AUW, ISWL, etc., rating systems used throughout the world. ACN is the Aircraft Classification Number and PCN is the Pavement Classification Number. An aircraft having an ACN equal to or less than the PCN can operate on the pavement subject to any limitation on the tire pressure. Numerically, the ACN is two times the derived single-wheel load expressed in thousands of kilograms, where the derived single wheel load is defined as the load on a single tire inflated to 181 psi (1.25 MPa) that would have the same pavement requirements as the aircraft. Computationally, the ACN/PCN system uses the PCA program PDILB for rigid pavements and S-77-1 for flexible pavements to calculate ACN values. The method of pavement evaluation is left up to the airport with the results of their evaluation presented as follows:

PCN	PAVEMENT TYPE	SUBGRADE CATEGORY	TIRE PRESSURE CATEGORY	EVALUATION METHOD
	R = Rigid F = Flexible	A = High B = Medium C = Low D = Ultra Low	W = No Limit X = To 254 psi (1.75 MPa) Y = To 181 psi (1.25 MPa) Z = To 73 psi (0.5 MPa)	T = Technical U = Using Aircraft

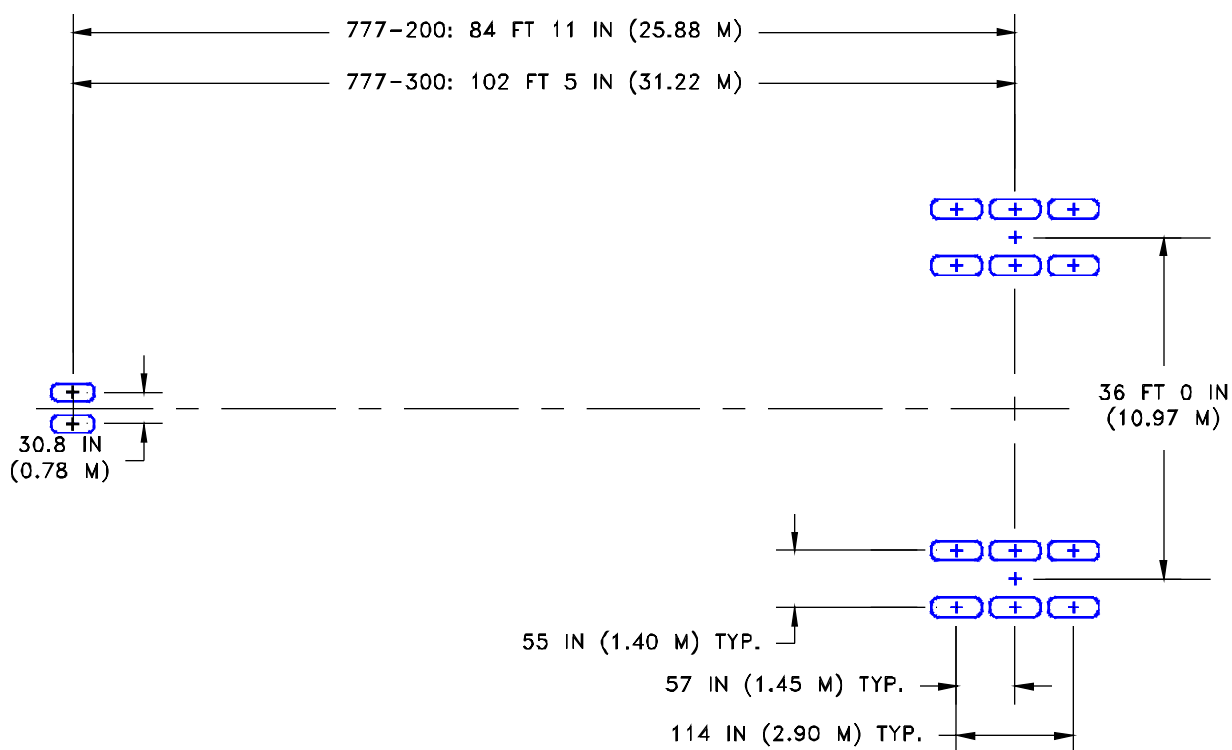
Section 7.9.1 shows the aircraft ACN values for flexible pavements. The four subgrade categories are:

- Code A - High Strength - CBR 15
- Code B - Medium Strength - CBR 10
- Code C - Low Strength - CBR 6
- Code D - Ultra Low Strength - CBR 3

Section 7.9.2 shows the aircraft ACN values for rigid pavements. The four subgrade categories are:

- Code A - High Strength,  $k = 550 \text{ pci (150 MN/m}^3\text{)}$
- Code B - Medium Strength,  $k = 300 \text{ pci (80 MN/m}^3\text{)}$
- Code C - Low Strength,  $k = 150 \text{ pci (40 MN/m}^3\text{)}$
- Code D - Ultra Low Strength,  $k = 75 \text{ pci (20 MN/m}^3\text{)}$

NOT TO SCALE



	UNITS	777-200		777-200 ER				777-300	
MAXIMUM DESIGN	LB	447,000	547,000	557,000	634,000	650,000	658,000	517,800	662,000
TAXI WEIGHT	KG	202,760	248,120	252,650	287,580	294,840	298,460	234,870	300,280
PERCENT OF WT ON MAIN GEAR		SEE SECTION 7.4							
NOSE GEAR TIRE SIZE	IN.	42 X 17 R 18, 26 PR							
NOSE GEAR	PSI	190	195	200	200	200	200	205	205
TIRE PRESSURE	KG/CM <sup>2</sup>	13.36	13.71	14.06	14.06	14.06	14.06	14.41	14.41
MAIN GEAR TIRE SIZE	IN.	50 X 20 R 22, 26 PR	50 X 20 R 22, 32 PR	50 X 20 R 22, 32 PR				50 X 20 R 22, 32 PR	
MAIN GEAR	PSI	149	182	186	205	205	205	171	215
TIRE PRESSURE	KG/CM <sup>2</sup>	10.48	12.80	13.08	14.41	14.41	14.41	12.02	15.12

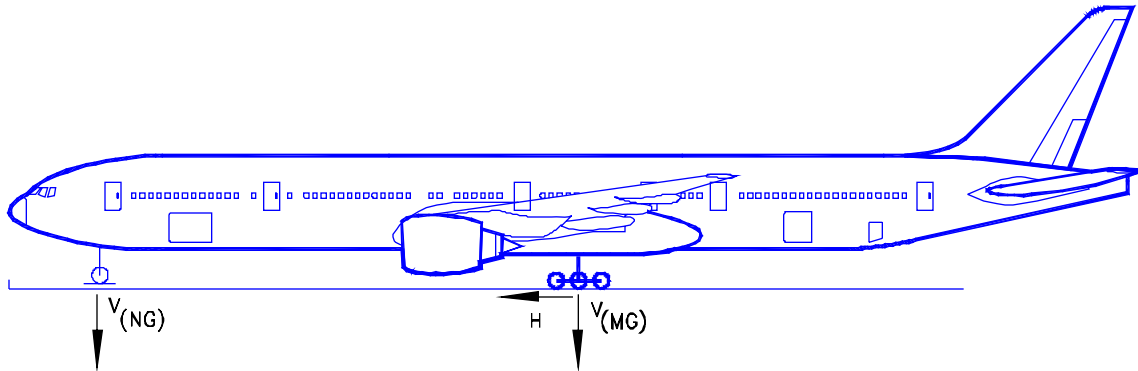
## 7.2 LANDING GEAR FOOTPRINT

MODEL 777-200,-200ER, -300

$V_{(NG)}$  = MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD CENTER OF GRAVITY

$V_{(MG)}$  = MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST AFT CENTER OF GRAVITY

H = MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

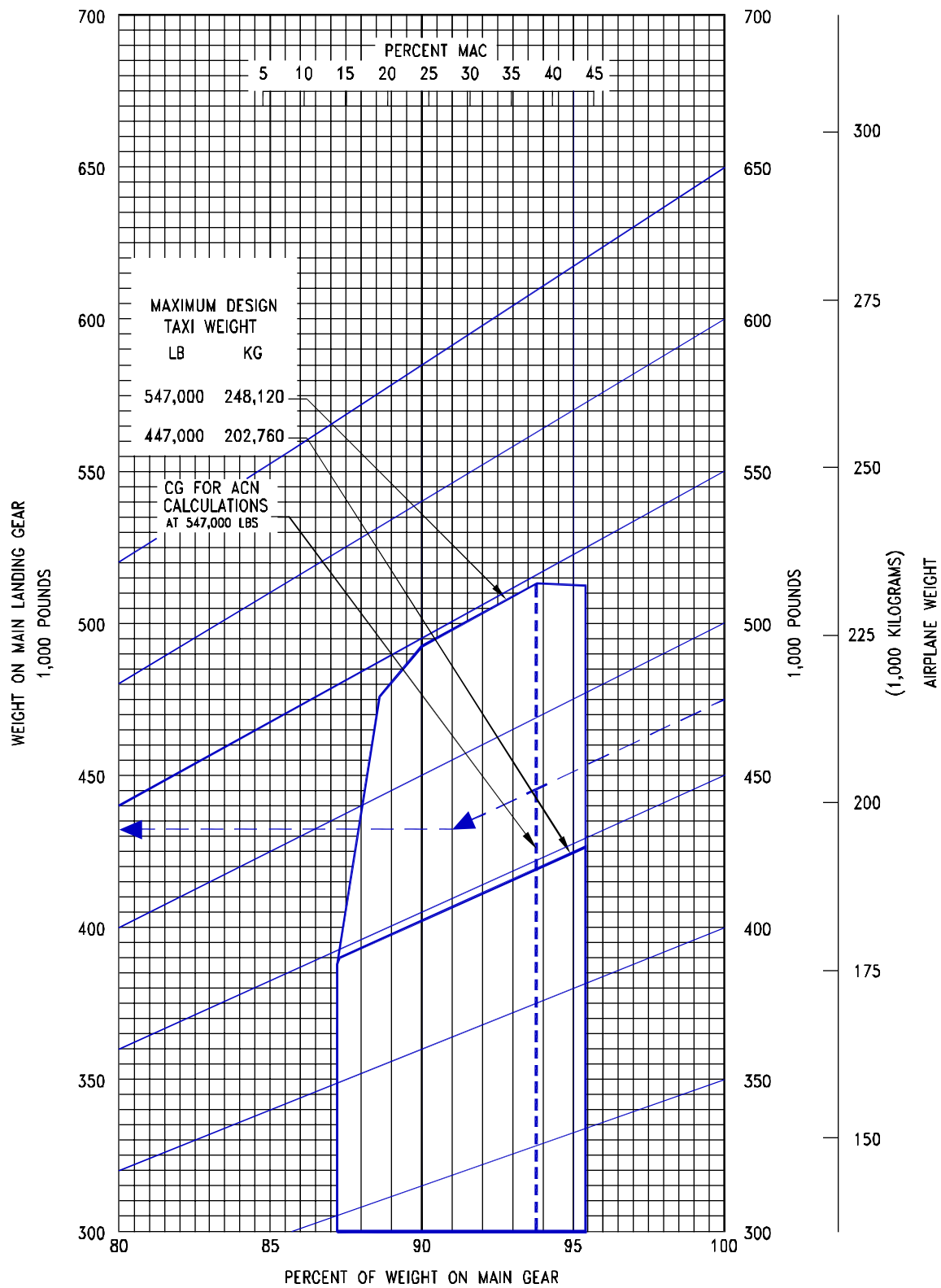


NOTE: ALL LOADS CALCULATED USING AIRPLANE MAXIMUM DESIGN TAXI WEIGHT

MODEL	UNITS	MAXIMUM DESIGN TAXI WEIGHT	$V_{(NG)}$		$V_{(MG)}$ PER STRUT	H PER STRUT	
			STATIC AT MOST FWD C.G.	STATIC + BRAKING 10 FT/SEC <sup>2</sup> DECEL	MAX LOAD AT STATIC AFT C.G.	STEADY BRAKING 10 FT/SEC <sup>2</sup> DECEL	AT INSTANTANEOUS BRAKING ( $u = 0.8$ )
777-200	LB	447,000	56,800	84,000	213,300	69,400	170,600
	KG	202,760	25,800	38,300	96,800	31,500	77,400
777-200	LB	547,000	54,500	88,000	256,200	84,900	204,900
	KG	248,120	24,700	39,900	116,200	38,500	93,000
777-200 ER	LB	557,000	68,200	102,300	265,800	86,500	212,600
	KG	252,650	30,950	46,400	120,600	39,200	96,600
777-200 ER	LB	634,500	70,400	109,200	297,600	98,400	238,100
	KG	287,800	31,900	49,500	134,900	44,700	107,900
777-200 ER	LB	650,000	66,900	106,700	301,300	100,900	241,000
	KG	294,840	30,340	48,400	136,700	45,800	109,400
777-200 ER	LB	658,000	70,100	110,400	302,000	102,200	241,600
	KG	298,460	31,760	50,000	137,000	46,300	109,600
777-300	LB	517,800	61,500	93,200	249,100	80,400	199,300
	KG	234,870	27,900	42,300	113,000	36,500	90,400
777-300	LB	662,000	70,000	110,600	313,900	102,800	251,100
	KG	300,280	31,800	50,200	142,400	46,650	113,900

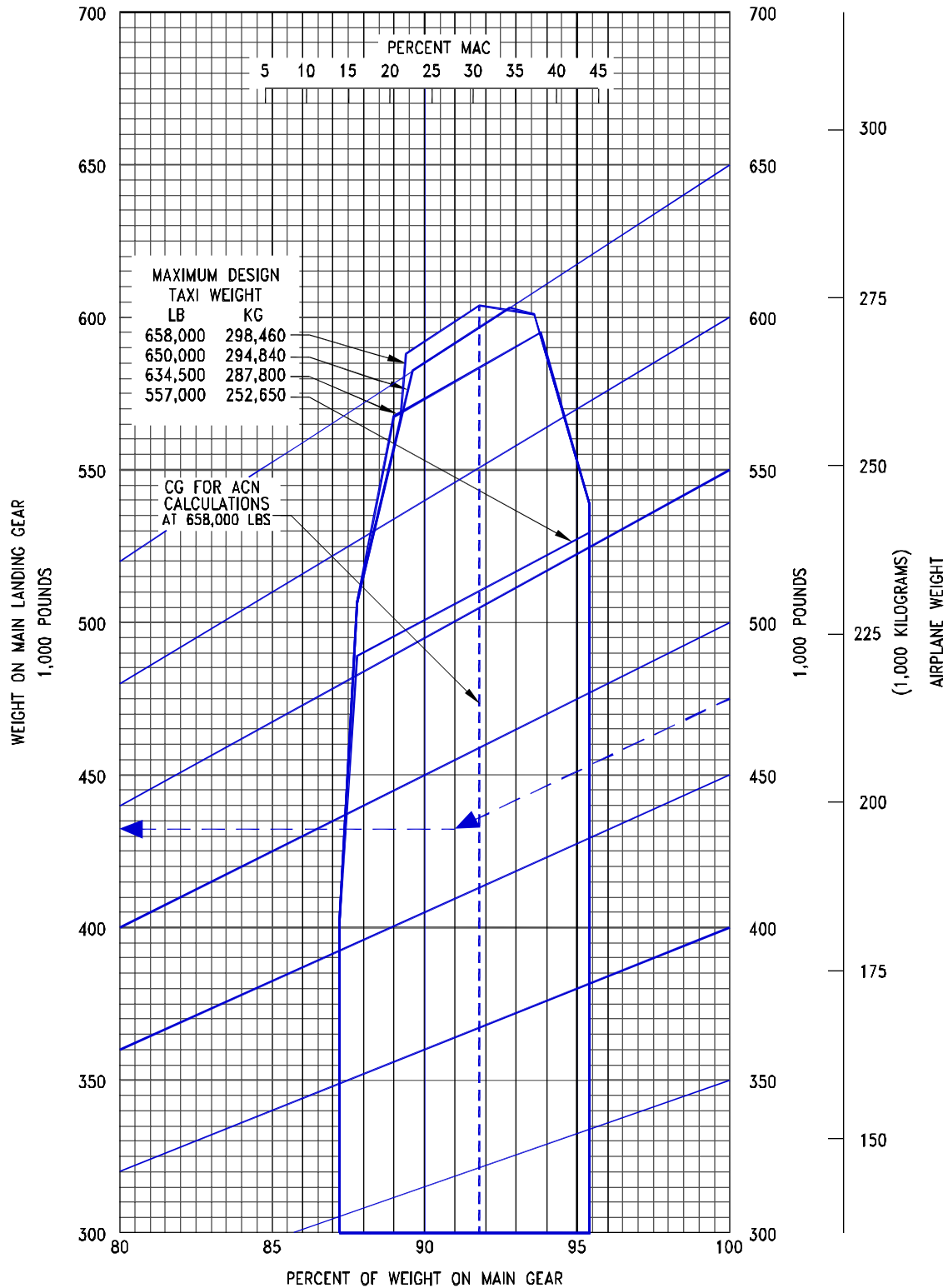
### 7.3 MAXIMUM PAVEMENT LOADS

MODEL 777-200, -200ER, -300



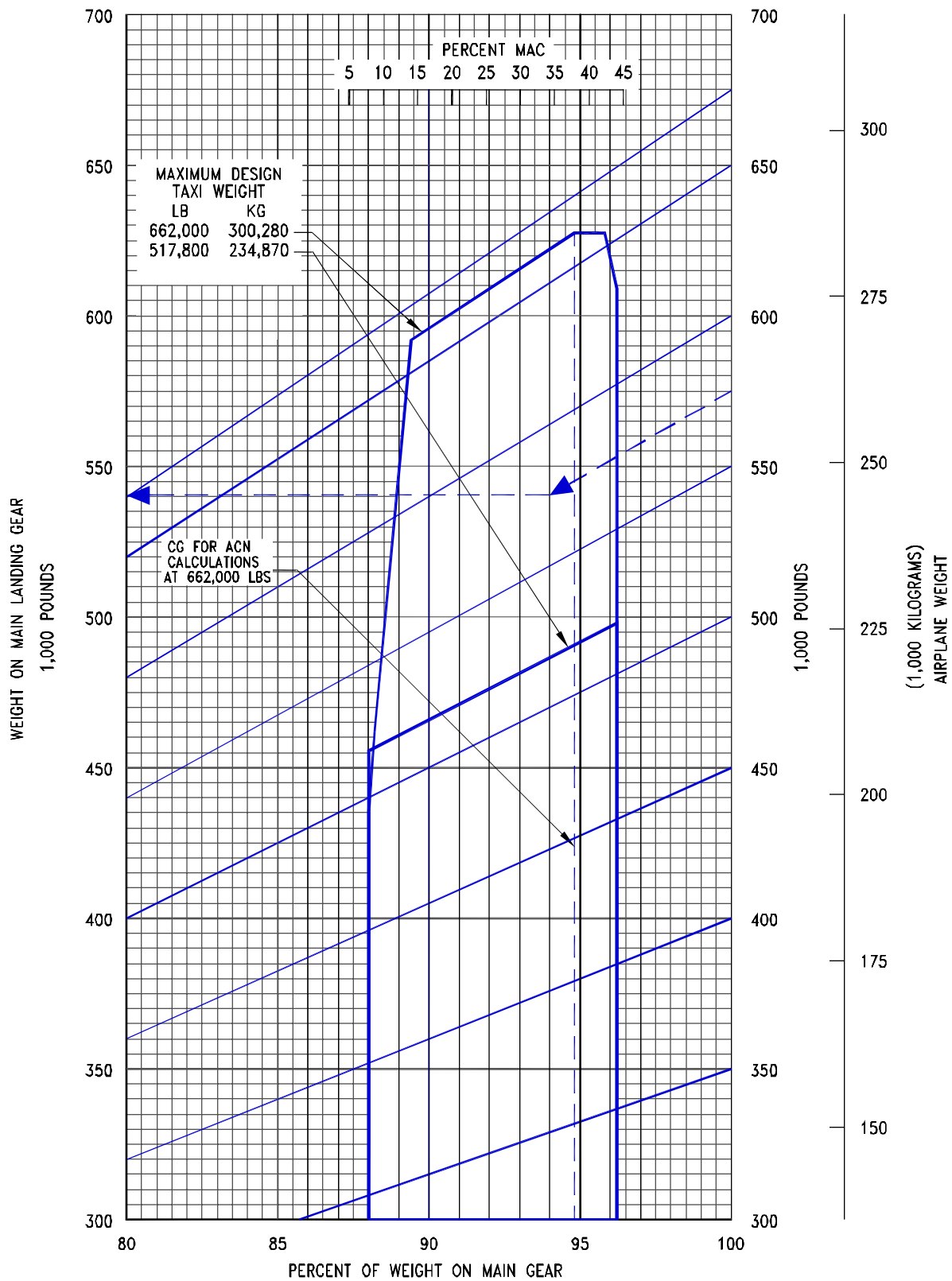
#### 7.4.1 LANDING GEAR LOADING ON PAVEMENT

MODEL 777-200



#### 7.4.2 LANDING GEAR LOADING ON PAVEMENT

MODEL 777-200ER



#### 7.4.3 LANDING GEAR LOADING ON PAVEMENT

MODEL 777-300

## **7.5 Flexible Pavement Requirements - U.S. Army Corps of Engineers Method (S-77-1)**

The following flexible-pavement design chart presents the data of six incremental main-gear loads at the minimum tire pressure required at the maximum design taxi weight.

In the example shown in Section 7.5.1, for a CBR of 25 and an annual departure level of 6,000, the required flexible pavement thickness for a 777-200 airplane with a main gear loading of 450,000 pounds is 12.2 inches. Likewise, the required flexible pavement thickness for the 777-200ER and 777-300 under the same conditions, is also 12.2 inches as shown in Section 7.5.2 and Section 7.5.3.

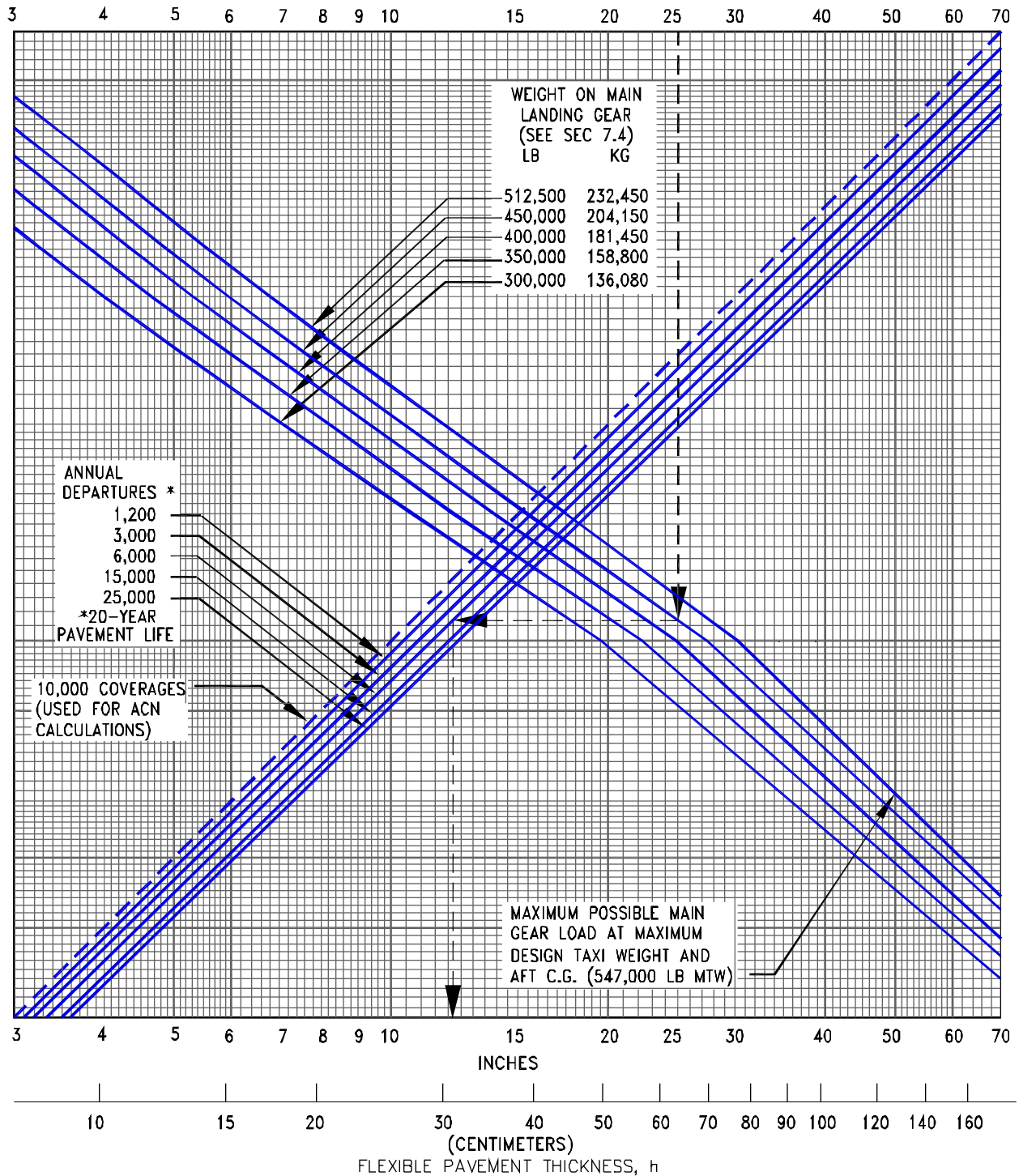
The line showing 10,000 coverages is used for ACN calculations (see Section 7.9).

**The FAA does not officially recognize the validity of the S77-1 flexible pavement design calculation for individual six-wheel gear aircraft. At the time this document (D6-58329) was printed, the FAA was recommending a multi-layer pavement thickness design method for the 777 airplane when considered as a component of the traffic mix. Consequently, the charts presented on the following two pages are provided as an estimate of the design thickness for general guidance purposes only.**



THIS CHART IS AN ESTIMATE OF PAVEMENT REQUIREMENTS BASED ON THE S77-1 METHOD.  
THICKNESSES DETERMINED HEREIN ARE NOT APPROVED BY THE FAA FOR PAVEMENT DESIGN.

NOTE: TIRES - 52 x 20 R22 32 PR AT 182 PSI (12.80 KG/CM SQ)  
CALIFORNIA BEARING RATIO, CBR

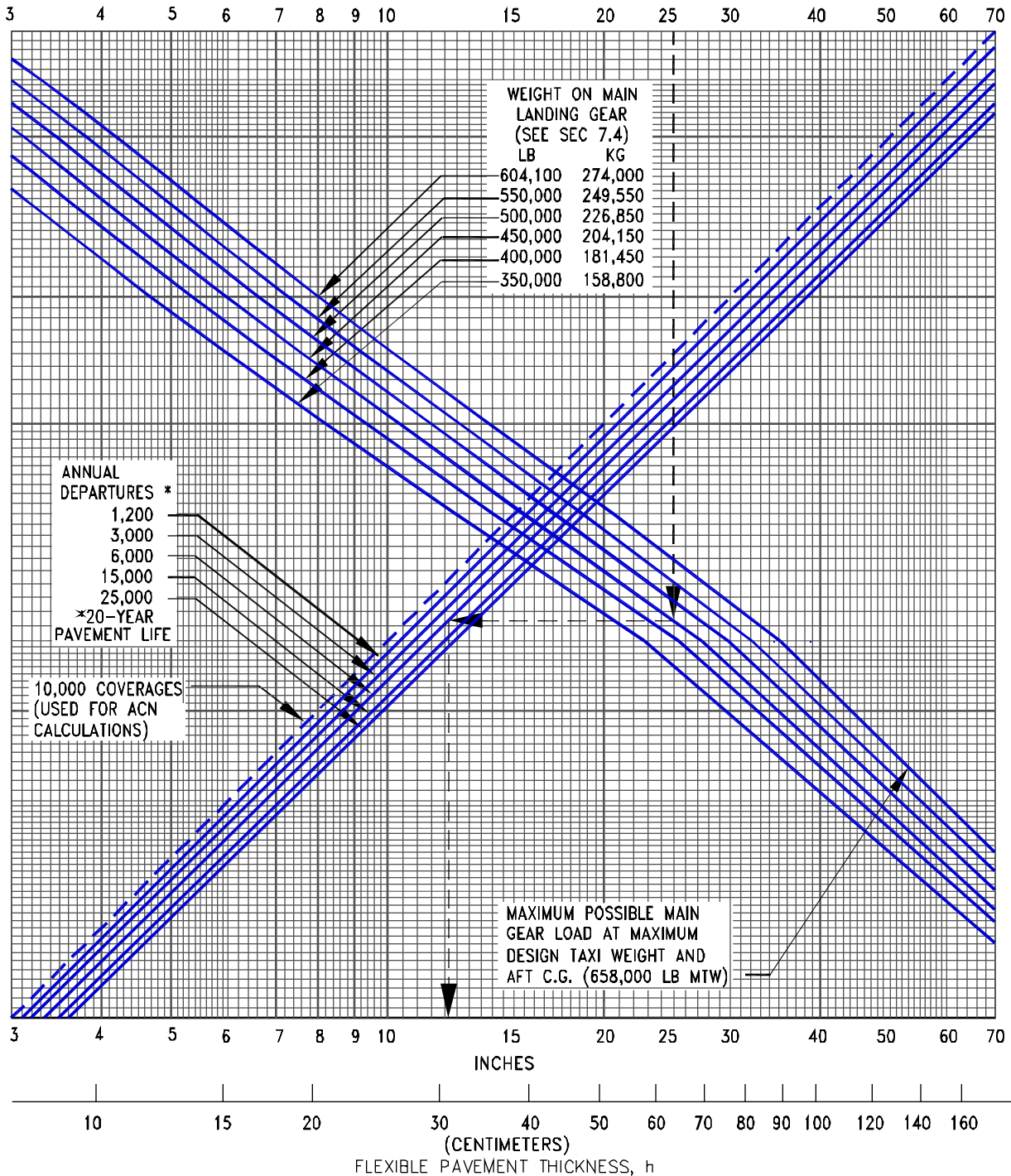


### 7.5.1 FLEXIBLE PAVEMENT REQUIREMENTS - U.S. ARMY CORPS OF ENGINEERS DESIGN METHOD (S-77-1)

MODEL 777-200

THIS CHART IS AN ESTIMATE OF PAVEMENT REQUIREMENTS BASED ON THE S77-1 METHOD.  
THICKNESSES DETERMINED HEREIN ARE NOT APPROVED BY THE FAA FOR PAVEMENT DESIGN.

NOTE: TIRES - 50 x 20 R22 32 PR AT 205 PSI (14.41 KG/CM SQ)  
CALIFORNIA BEARING RATIO, CBR

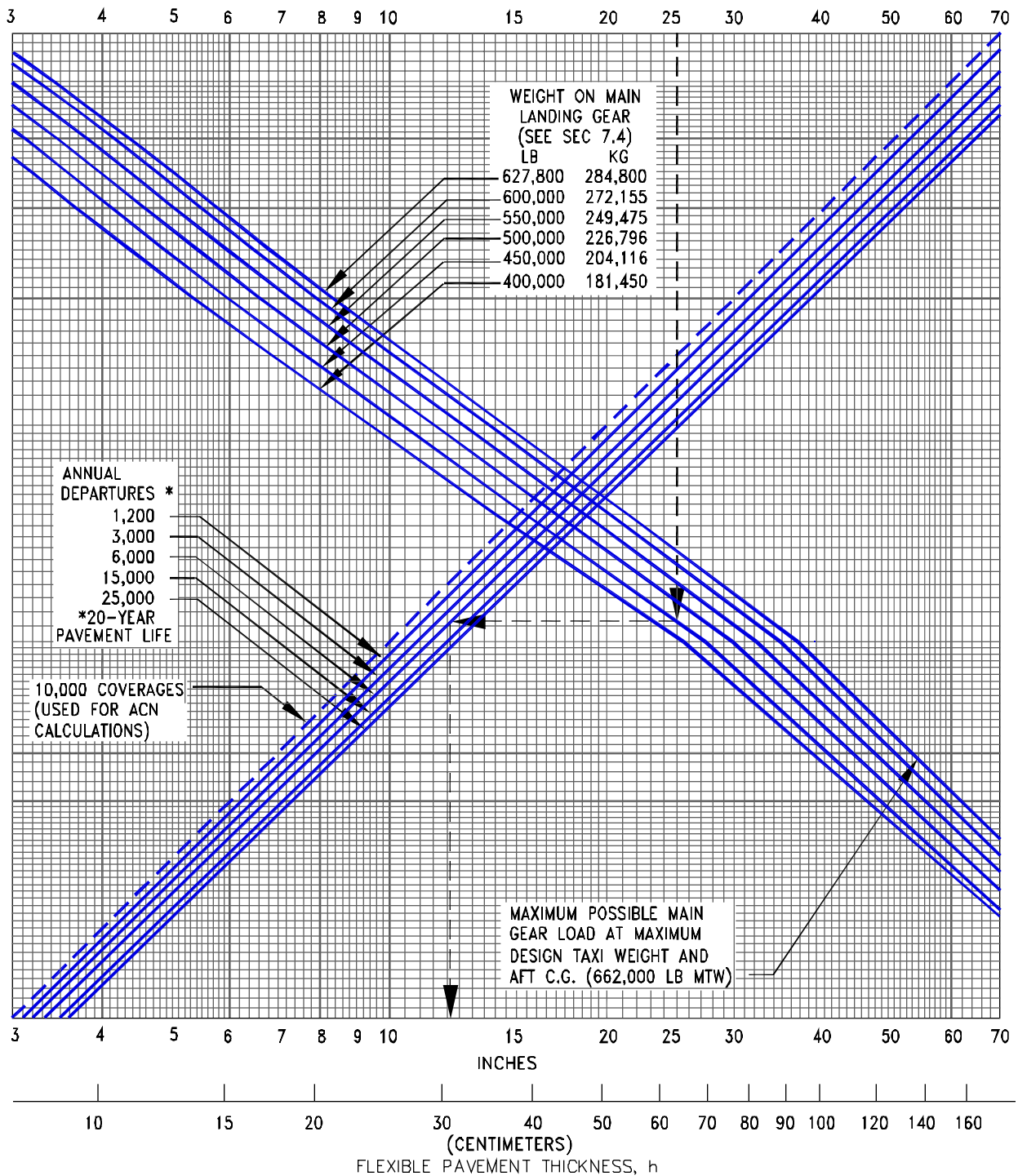


## 7.5.2 FLEXIBLE PAVEMENT REQUIREMENTS - U.S. ARMY CORPS OF ENGINEERS DESIGN METHOD (S-77-1)

MODEL 777-200ER

THIS CHART IS AN ESTIMATE OF PAVEMENT REQUIREMENTS BASED ON THE S77-1 METHOD.  
THICKNESSES DETERMINED HEREIN ARE NOT APPROVED BY THE FAA FOR PAVEMENT DESIGN.

NOTE: TIRES - 50 x 20 R22 32 PR AT 215 PSI (15.12 KG/CM SQ)  
CALIFORNIA BEARING RATIO, CBR



### 7.5.3 FLEXIBLE PAVEMENT REQUIREMENTS - U.S. ARMY CORPS OF ENGINEERS DESIGN METHOD (S-77-1)

MODEL 777-300

## **7.6 Flexible Pavement Requirements - LCN Method**

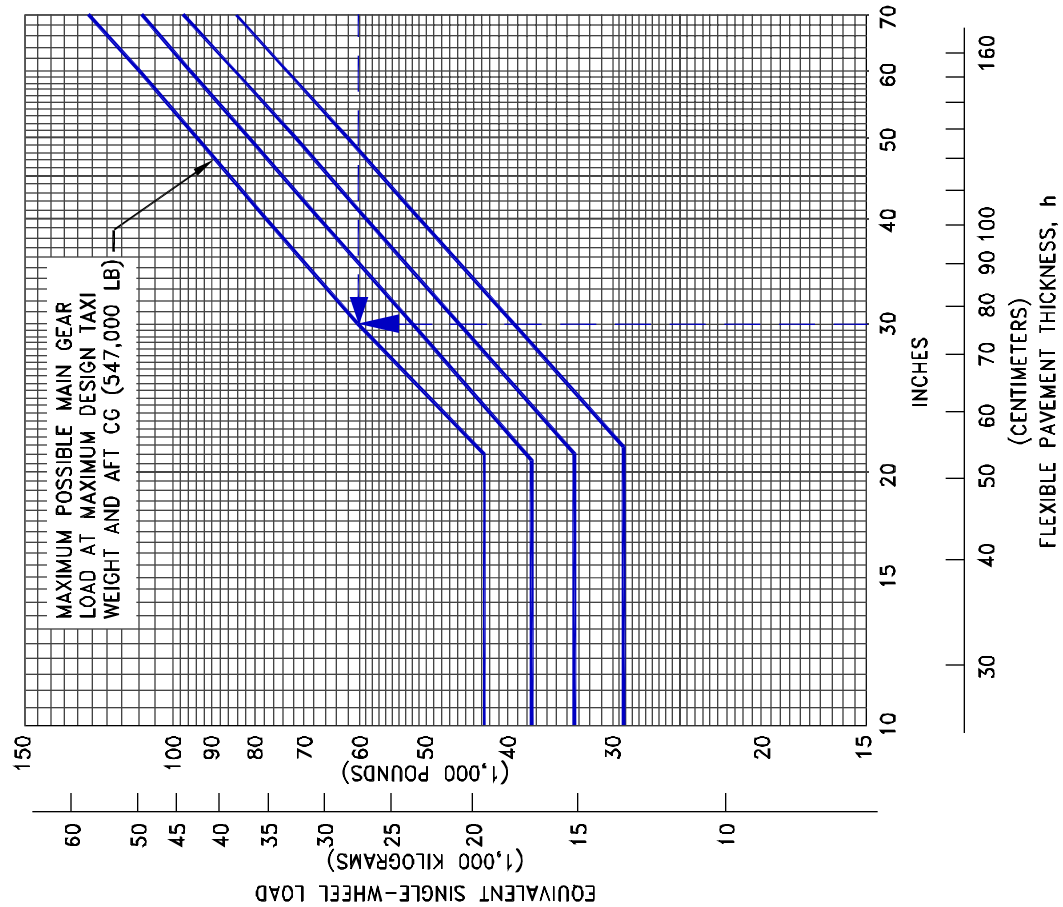
To determine the airplane weight that can be accommodated on a particular flexible pavement, both the Load Classification Number (LCN) of the pavement and the thickness must be known.

In the example shown in Section 7.6.1, flexible pavement thickness is shown at 30 inches with an LCN of 87.5. For these conditions, the maximum allowable weight on the main landing gear is 512,500 lb for a 777-200 airplane with 182-psi main gear tires. In the second example shown in Section 7.6.2, the flexible pavement thickness is shown at 30 inches and the LCN is 91.5. For these conditions, the maximum allowable weight on the main landing gear is 500,000 lb for a 777-200ER airplane with 205-psi main gear tires. Likewise, in the third example shown in Section 7.6.3, the flexible pavement thickness is shown at 30 inches and the LCN is 101. For these conditions, the maximum allowable weight on the main landing gear is 550,000 lb for a 777-300 airplane with 215-psi main gear tires.

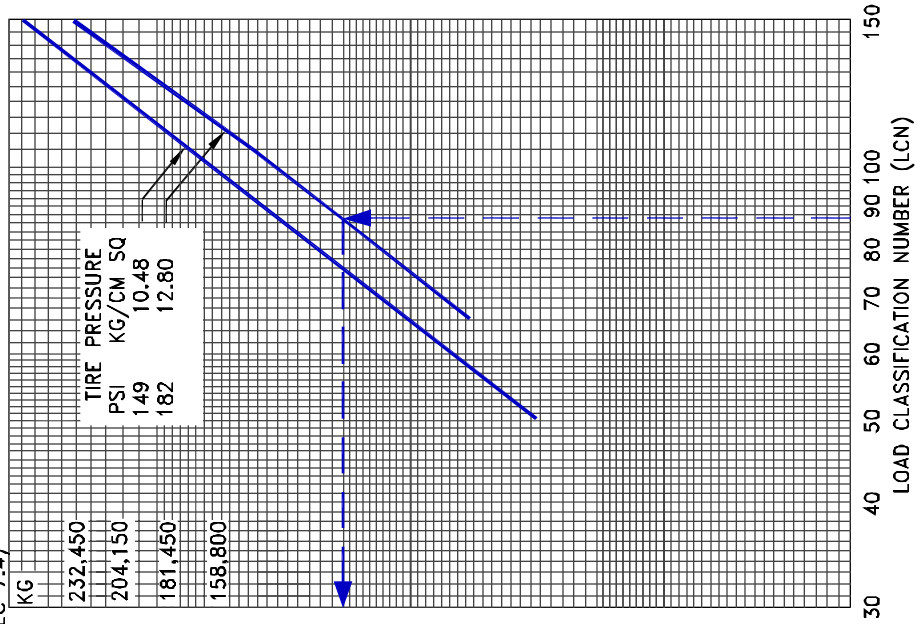
Note: If the resultant aircraft LCN is not more than 10% above the published pavement LCN, the bearing strength of the pavement can be considered sufficient for unlimited use by the airplane. The figure 10% has been chosen as representing the lowest degree of variation in LCN that is significant (reference: ICAO Aerodrome Manual, Part 2, "Aerodrome Physical Characteristics," Chapter 4, Paragraph 4.1.5.7v, 2nd Edition dated 1965).

NOTES:

- \* TIRES - 50 x 20 R22 26PR AT 149 PSI (10.48 KG/CM SQ)
- \* TIRES - 50 x 20 R22 32PR AT 182 PSI (12.80 KG/CM SQ)
- \* EQUIVALENT SINGLE-WHEEL LOADS ARE DERIVED  
ICAO AERODROME MANUAL, PART 2 PAR. 4.1.3, DATED 1965.



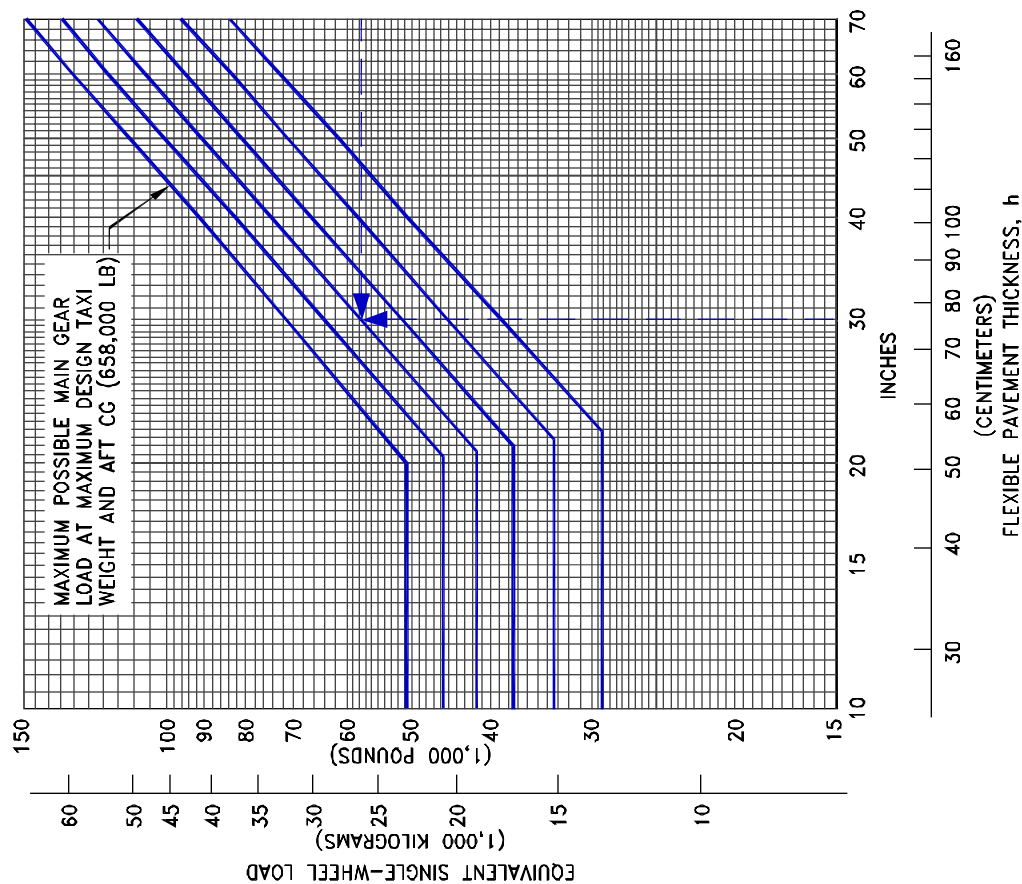
WEIGHT ON MAIN  
LANDING GEAR  
(SEE SEC 7.4)



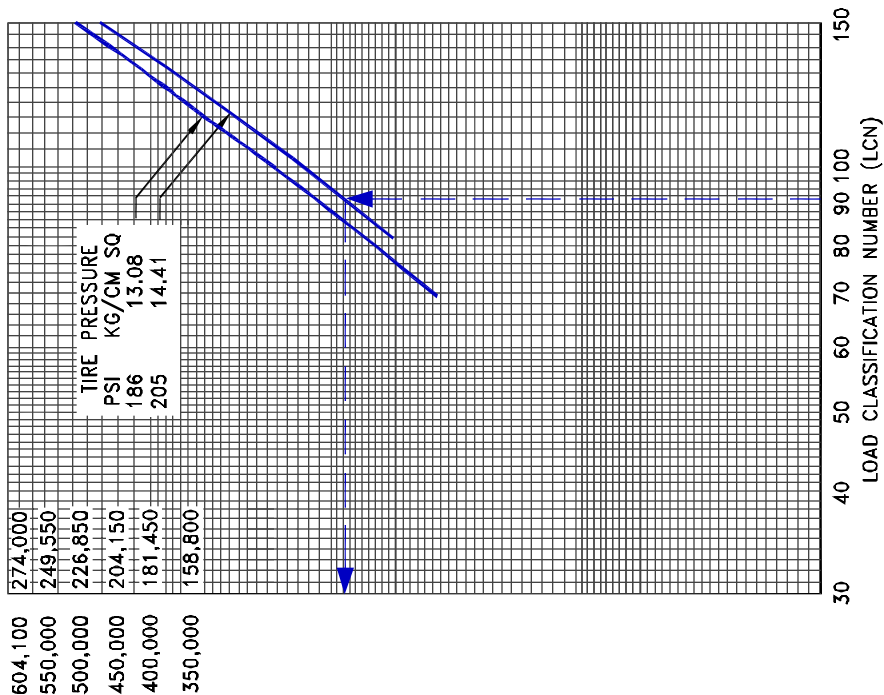
## 7.6.1 FLEXIBLE PAVEMENT REQUIREMENTS - LCN METHOD

MODEL 777-200

- NOTES:
- \* TIRES - 50 x 20 R22 32PR AT 186 PSI (13.08 KG/CM SQ)
  - \* TIRES - 50 x 20 R22 32PR AT 205 PSI (14.41 KG/CM SQ)
  - \* EQUIVALENT SINGLE-WHEEL LOADS ARE DERIVED  
ICAO AERODROME MANUAL, PART 2 PAR. 4.1.3, DATED 1965.



WEIGHT ON MAIN  
LANDING GEAR  
(SEE SEC 7.4)  
LB KG



## 7.6.2 FLEXIBLE PAVEMENT REQUIREMENTS - LCN METHOD

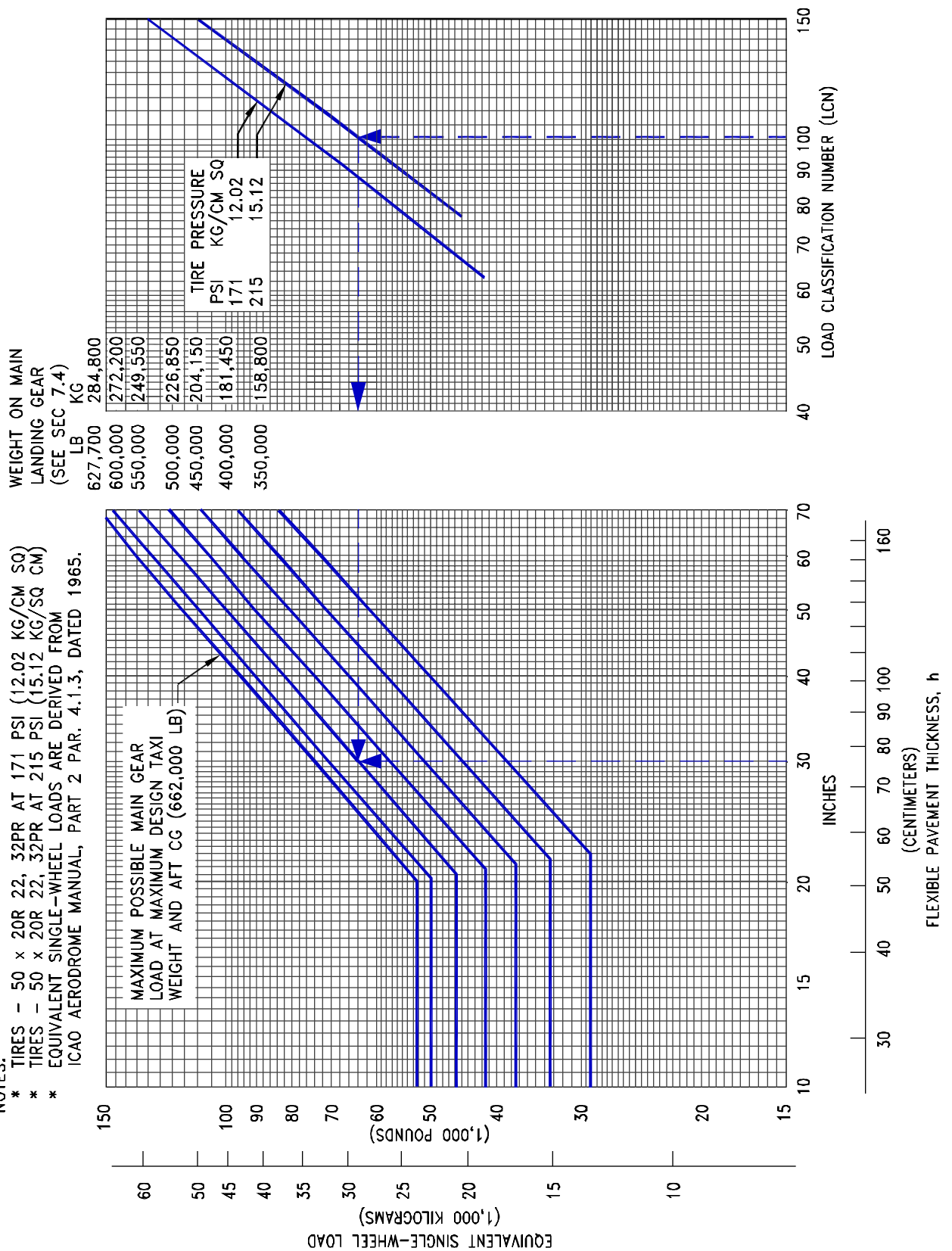
MODEL 777-200ER

### 7.6.3 FLEXIBLE PAVEMENT REQUIREMENTS - LCN METHOD

MODEL 777-300

#### NOTES:

- \* TIRES - 50 x 20R 22, 32PR AT 171 PSI (12.02 KG/CM SQ)
- \* TIRES - 50 x 20R 22, 32PR AT 215 PSI (15.12 KG/SQ CM)
- \* EQUIVALENT SINGLE-WHEEL LOADS ARE DERIVED FROM ICAO AERODROME MANUAL, PART 2 PAR. 4.1.3, DATED 1965.



## **7.7 Rigid Pavement Requirements - Portland Cement Association Design Method**

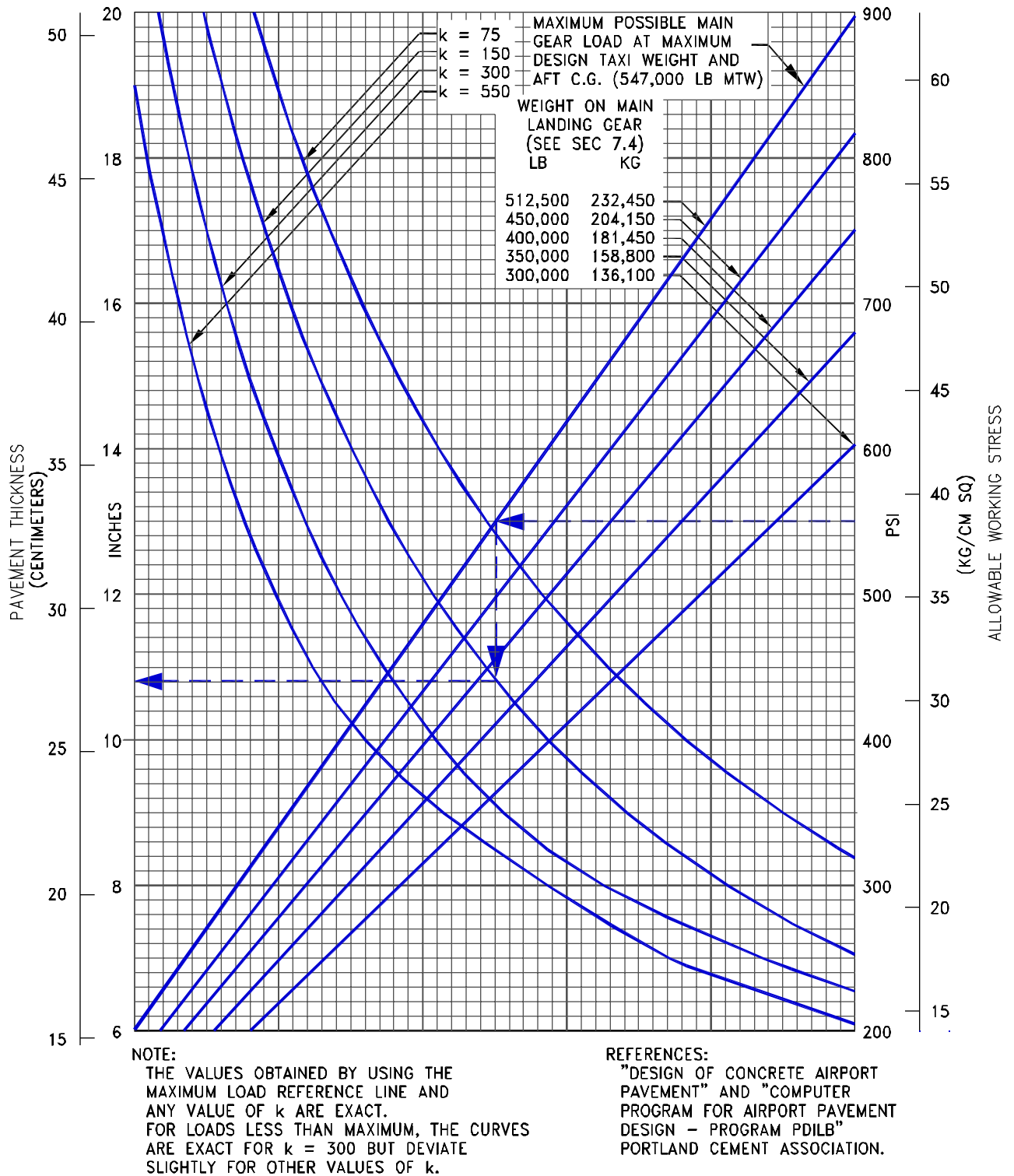
The Portland Cement Association method of calculating rigid pavement requirements is based on the computerized version of "Design of Concrete Airport Pavement" (Portland Cement Association, 1955) as described in XP6705-2, "Computer Program for Airport Pavement Design" by Robert G. Packard, Portland Cement Association, 1968.

The following rigid pavement design chart presents the data for six incremental main gear loads at the minimum tire pressure required at the maximum design taxi weight.

In the example shown in Section 7.7.1, for an allowable working stress of 550 psi, and a subgrade strength (k) of 150, the required rigid pavement thickness is 10.8 inches for a 777-200 airplane with a main gear load of 512,500 lb. In the second example, for the same pavement conditions, the required pavement thickness for a 777-200ER airplane with a main gear load of 550,000 lb is 11.7 inches as shown in Section 7.7.2 In the third example, for the same pavement conditions, the required pavement thickness for a 777-300 airplane with a main gear load of 550,000 lb is 11.8 inches as shown in Section 7.7.3.



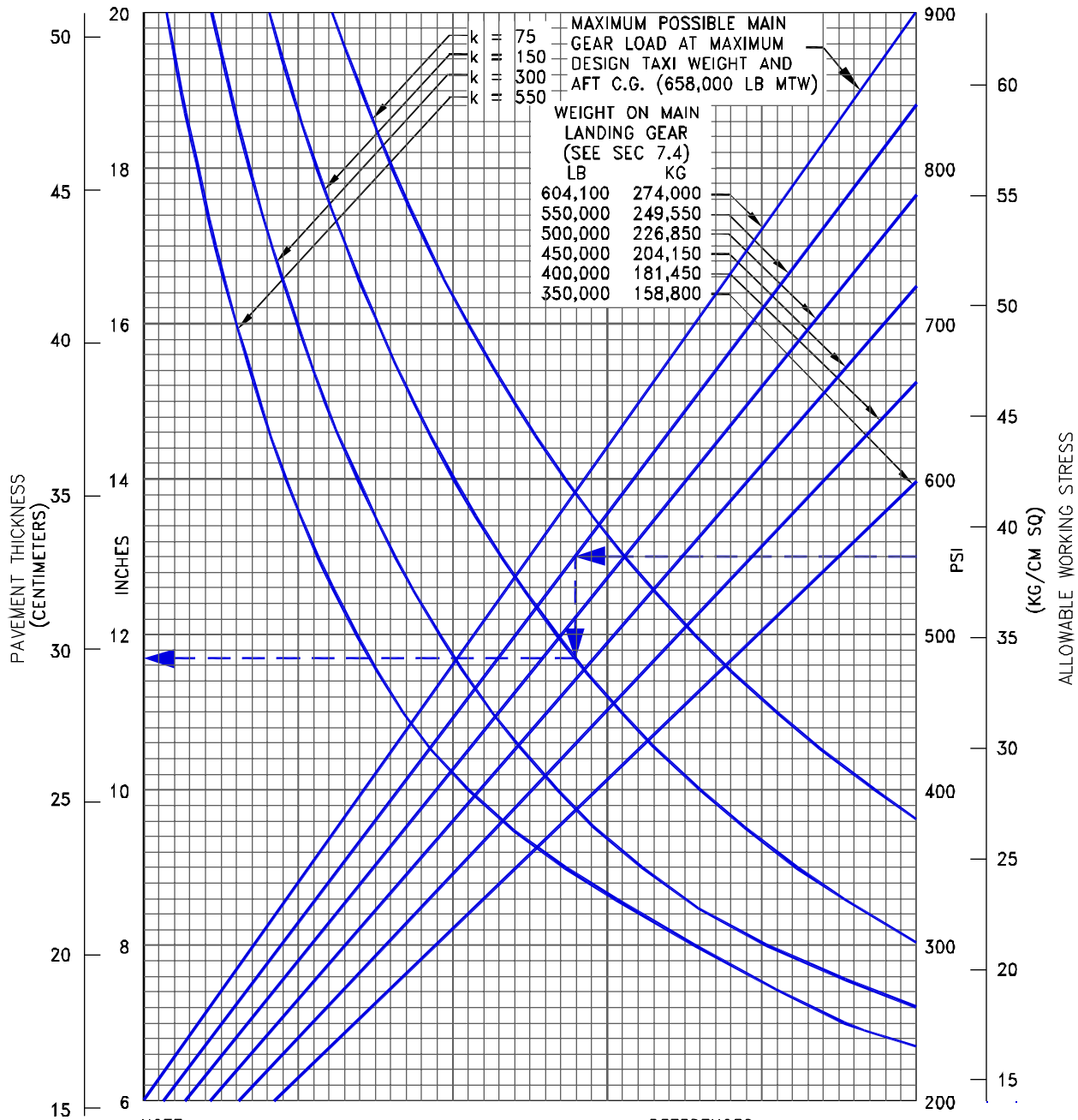
NOTE: TIRES - 50 x 20 R22 32 PR AT 182 PSI (12.80 KG/CM SQ)



### 7.7.1 RIGID PAVEMENT REQUIREMENTS - PORTLAND CEMENT ASSOCIATION DESIGN METHOD

MODEL 777-200

NOTE: TIRES - 50 x 20 R22 32 PR AT 205 PSI (14.41 KG/CM SQ)



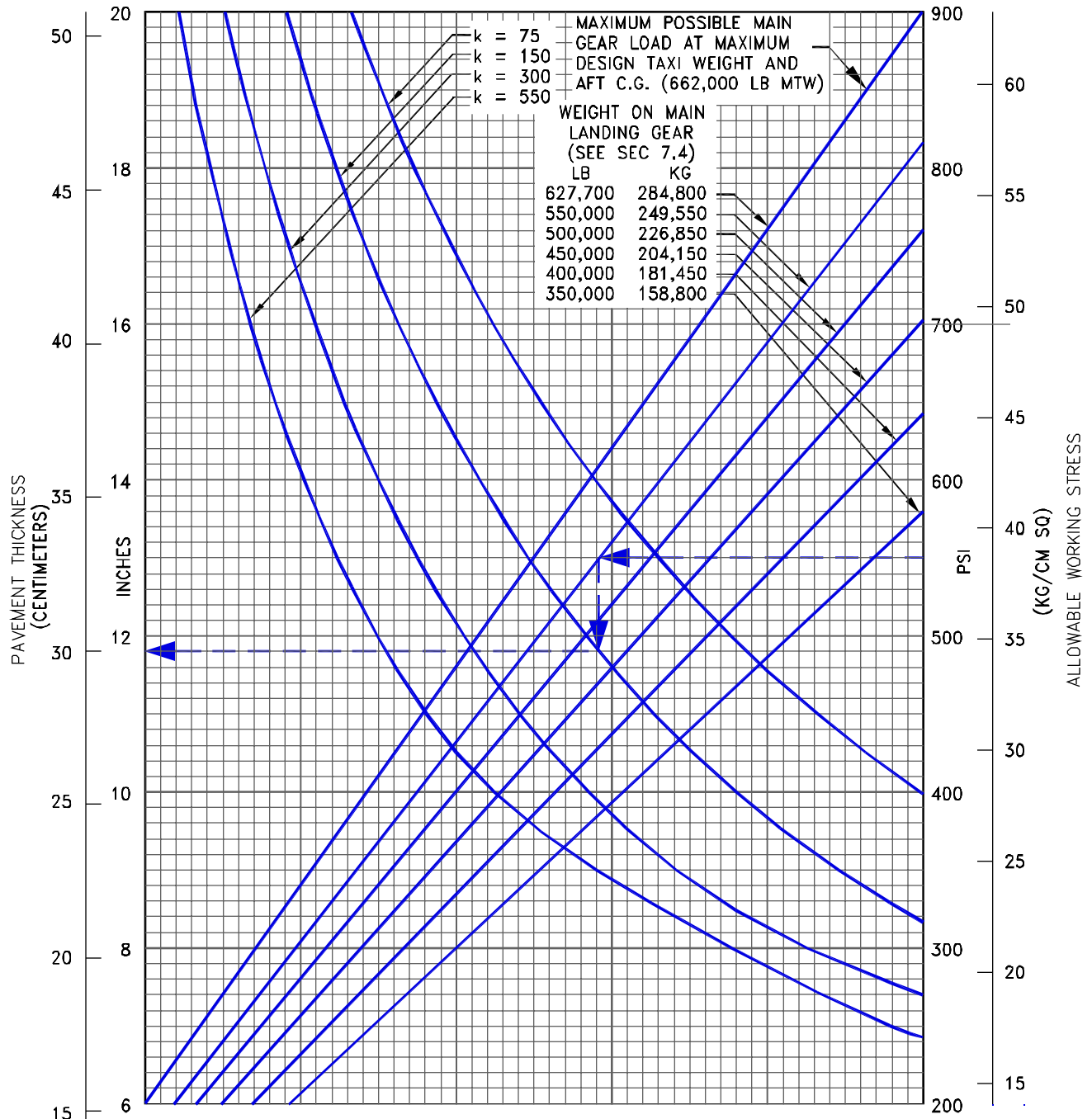
NOTE:  
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUE OF  $k$  ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR  $k = 300$  BUT DEVIATE SLIGHTLY FOR OTHER VALUES OF  $k$ .

REFERENCES:  
"DESIGN OF CONCRETE AIRPORT PAVEMENT" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN - PROGRAM PDILB"  
PORTLAND CEMENT ASSOCIATION.

## 7.7.2 RIGID PAVEMENT REQUIREMENTS - PORTLAND CEMENT ASSOCIATION DESIGN METHOD

MODEL 777-200ER

NOTE: TIRES - 50 x 20 R22 32 PR AT 215 PSI (15.12 KG/CM SQ)



NOTE:  
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUE OF  $k$  ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR  $k = 300$  BUT DEVIATE SLIGHTLY FOR OTHER VALUES OF  $k$ .

REFERENCES:  
"DESIGN OF CONCRETE AIRPORT PAVEMENT" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN - PROGRAM PDILB"  
PORTLAND CEMENT ASSOCIATION.

### 7.7.3 RIGID PAVEMENT REQUIREMENTS - PORTLAND CEMENT ASSOCIATION DESIGN METHOD

MODEL 777-300

## 7.8 Rigid Pavement Requirements - LCN Conversion

To determine the airplane weight that can be accommodated on a particular rigid pavement, both the LCN of the pavement and the radius of relative stiffness ( $l$ ) of the pavement must be known.

In the example shown in Section 7.8.2, for a rigid pavement with a radius of relative stiffness of 40 with an LCN of 78, the maximum allowable weight permissible on the main landing gear is 547,000 lb for an airplane with 182-psi main tires. In the second example shown in Section 7.8.3, for a rigid pavement with a radius of relative stiffness of 38 with an LCN of 84.5, the maximum allowable weight permissible on the main landing gear is 550,000 lb for an airplane with 205-psi main tires. In the third example shown in Section 7.8.4, for a rigid pavement with a radius of relative stiffness of 38 with an LCN of 87.5, the maximum allowable weight permissible on the main landing gear is 550,000 lb for an airplane with 215-psi main tires.

Note: If the resultant aircraft LCN is not more than 10% above the published pavement LCN, the bearing strength of the pavement can be considered sufficient for unlimited use by the airplane. The figure 10% has been chosen as representing the lowest degree of variation in LCN that is significant (reference: ICAO Aerodrome Manual, Part 2, "Aerodrome Physical Characteristics," Chapter 4, Paragraph 4.1.5.7v, 2nd Edition dated 1965).

RADIUS OF RELATIVE STIFFNESS (ℓ)  
VALUES IN INCHES

$$\ell = \sqrt[4]{\frac{Ed^3}{12(1-\mu^2)k}} = 24.1652 \sqrt[4]{\frac{d^3}{k}}$$

WHERE: E = YOUNG'S MODULUS OF ELASTICITY =  $4 \times 10^6$  psi

k = SUBGRADE MODULUS, LB PER CU IN

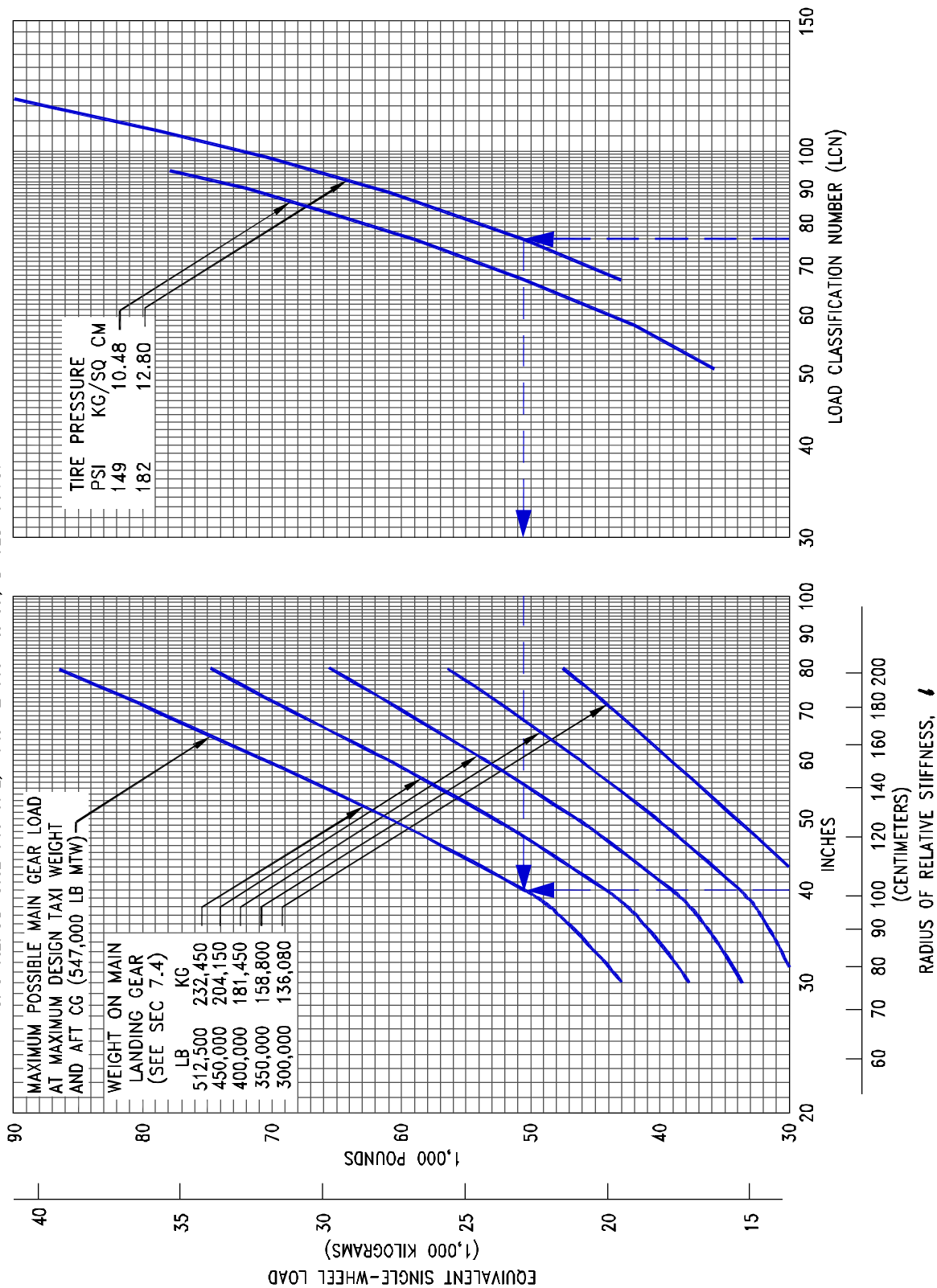
d = RIGID PAVEMENT THICKNESS, IN

$\mu$  = POISSON'S RATIO = 0.15  
 $\mu$

d	k = 75	k = 100	k = 150	k = 200	k = 250	k = 300	k = 350	k = 400	k = 500	k = 550
6.0	31.48	29.29	26.47	24.63	23.30	22.26	21.42	20.71	19.59	19.13
6.5	33.42	31.10	28.11	26.16	24.74	23.63	22.74	21.99	20.80	20.31
7.0	35.33	32.88	29.71	27.65	26.15	24.99	24.04	23.25	21.99	21.47
7.5	37.21	34.63	31.29	29.12	27.54	26.31	25.32	24.49	23.16	22.61
8.0	39.06	36.35	32.84	30.56	28.91	27.62	26.57	25.70	24.31	23.73
8.5	40.87	38.04	34.37	31.99	30.25	28.90	27.81	26.90	25.44	24.84
9.0	42.66	39.70	35.88	33.39	31.57	30.17	29.03	28.07	26.55	25.93
9.5	44.43	41.35	37.36	34.77	32.88	31.42	30.23	29.24	27.65	27.00
10.0	46.17	42.97	38.83	36.13	34.17	32.65	31.41	30.38	28.73	28.06
10.5	47.89	44.57	40.27	37.48	35.44	33.87	32.58	31.52	29.81	29.10
11.0	49.59	46.15	41.70	38.81	36.70	35.07	33.74	32.63	30.86	30.14
11.5	51.27	47.72	43.12	40.12	37.95	36.26	34.89	33.74	31.91	31.16
12.0	52.94	49.26	44.51	41.43	39.18	37.43	36.02	34.83	32.94	32.17
12.5	54.58	50.80	45.90	42.71	40.40	38.60	37.14	35.92	33.97	33.17
13.0	56.21	52.31	47.27	43.99	41.60	39.75	38.25	36.99	34.98	34.16
13.5	57.83	53.81	48.63	45.25	42.80	40.89	39.34	38.05	35.99	35.14
14.0	59.43	55.30	49.97	46.50	43.98	42.02	40.43	39.10	36.98	36.11
14.5	61.01	56.78	51.30	47.74	45.15	43.14	41.51	40.15	37.97	37.07
15.0	62.58	58.24	52.62	48.97	46.32	44.25	42.58	41.18	38.95	38.03
15.5	64.14	59.69	53.93	50.19	47.47	45.35	43.64	42.21	39.92	38.98
16.0	65.69	61.13	55.23	51.40	48.61	46.45	44.69	43.22	40.88	39.92
16.5	67.22	62.55	56.52	52.60	49.75	47.53	45.73	44.23	41.83	40.85
17.0	68.74	63.97	57.80	53.79	50.87	48.61	46.77	45.23	42.78	41.77
17.5	70.25	65.38	59.07	54.97	51.99	49.68	47.80	46.23	43.72	42.69
18.0	71.75	66.77	60.34	56.15	53.10	50.74	48.82	47.22	44.65	43.60
19.0	74.72	69.54	62.83	58.47	55.30	52.84	50.84	49.17	46.50	45.41
20.0	77.65	72.26	65.30	60.77	57.47	54.91	52.83	51.10	48.33	47.19
21.0	80.55	74.96	67.73	63.03	59.61	56.95	54.80	53.00	50.13	48.95
22.0	83.41	77.62	70.14	65.27	61.73	58.98	56.75	54.88	51.91	50.68
23.0	86.23	80.25	72.51	67.48	63.82	60.98	58.67	56.74	53.67	52.40
24.0	89.03	82.85	74.86	69.67	65.89	62.95	60.57	58.58	55.41	54.10
25.0	91.80	85.43	77.19	71.84	67.94	64.91	62.46	60.41	57.13	55.78

**7.8.1 RADIUS OF RELATIVE STIFFNESS  
(REFERENCE: PORTLAND CEMENT ASSOCIATION)**

- NOTES:
- \* TIRES - 50 x 20 R22 26PR AT 149 PSI (10.48 KG/CM SQ)
  - \* TIRES - 50 x 20 R22 32 PR AT 182 PSI (12.80 KG/CM SQ)
  - \* EQUIVALENT SINGLE-WHEEL LOADS ARE DERIVED FROM ICAO AERODROME MANUAL, PART 2 PAR 4.1.3, DATED 1965.



## 7.8.2 RIGID PAVEMENT REQUIREMENTS - LCN CONVERSION

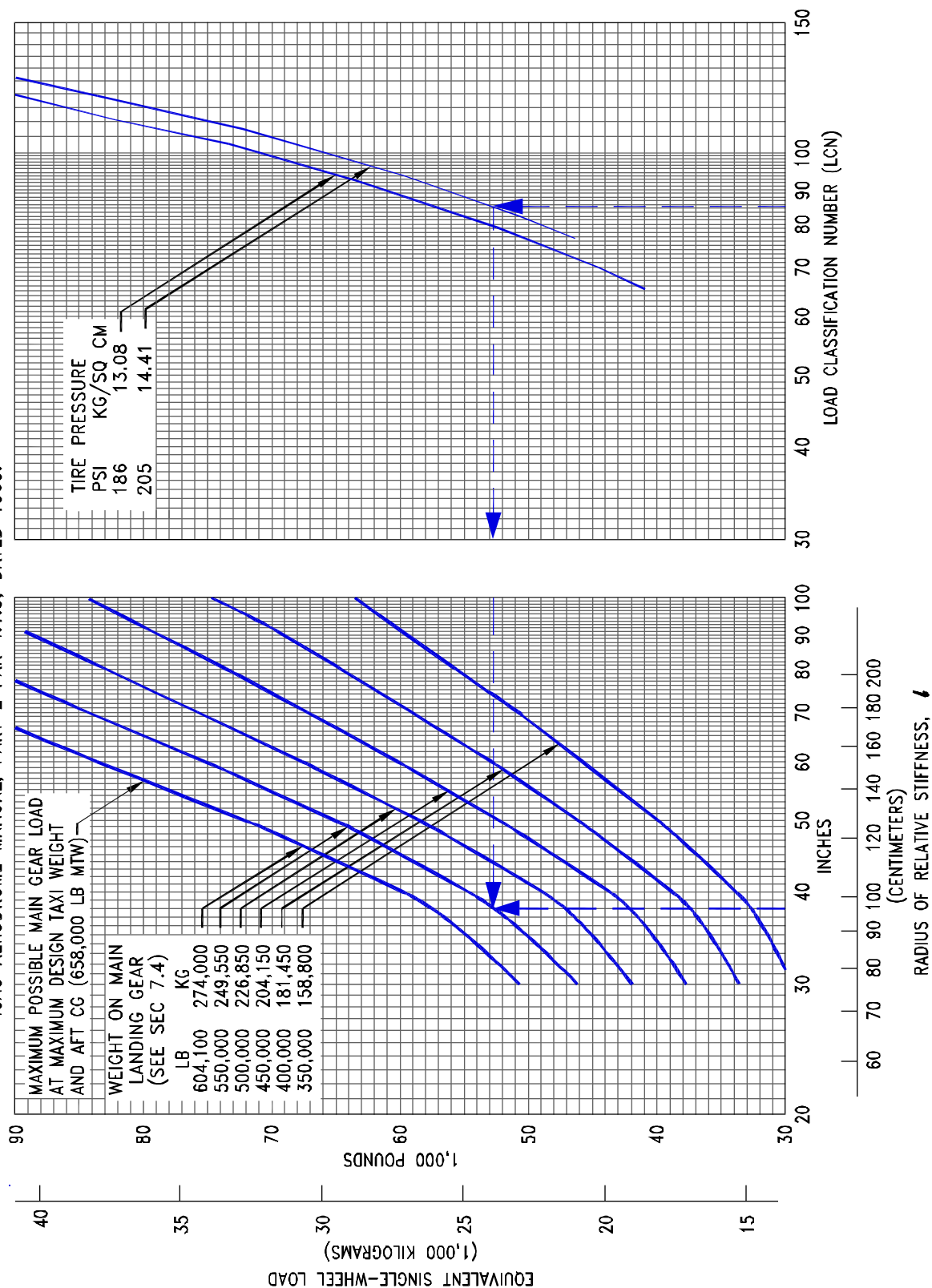
MODEL 777-200

### 7.8.3 RIGID PAVEMENT REQUIREMENTS - LCN CONVERSION

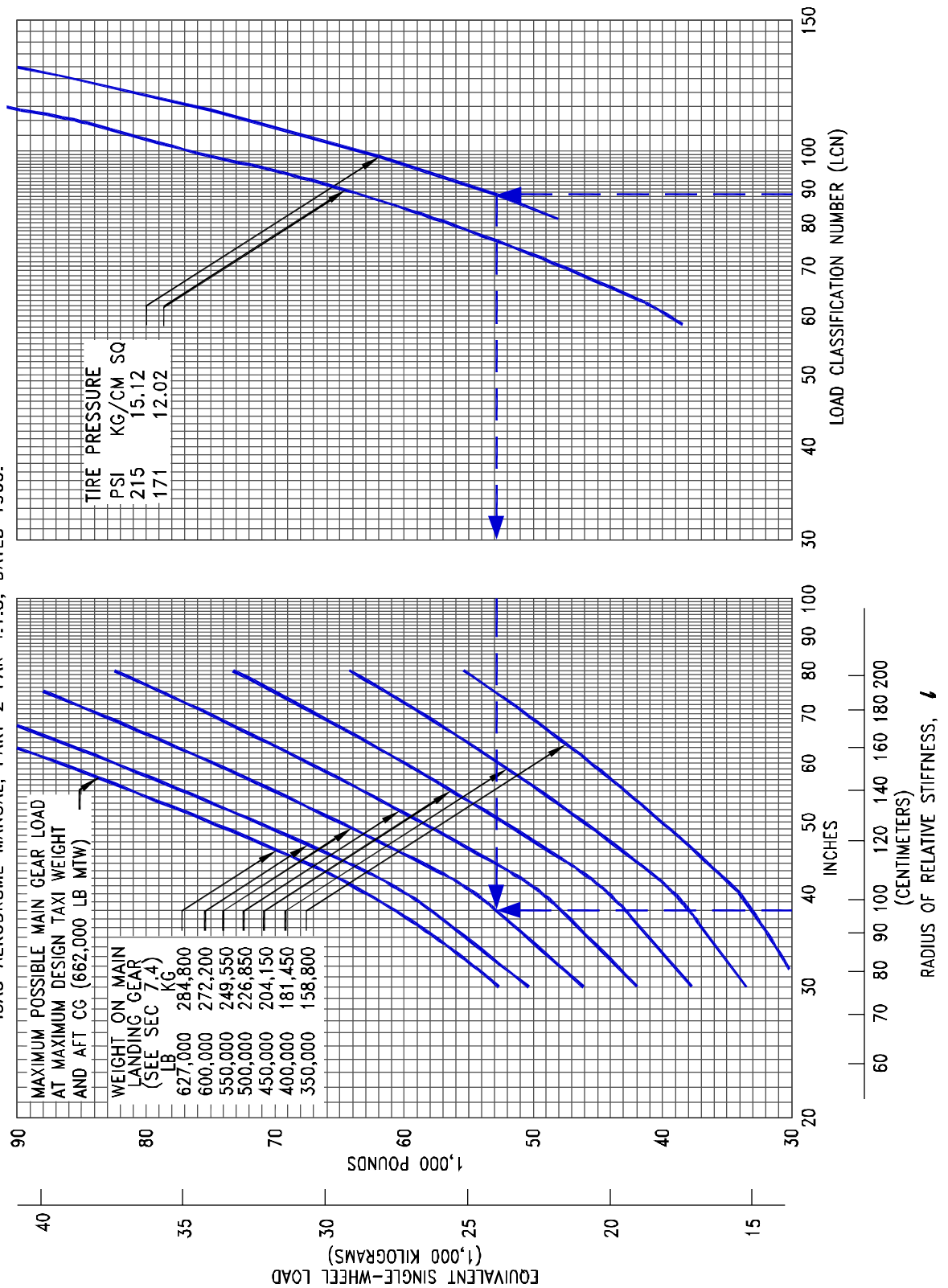
MODEL 777-200ER

#### NOTES:

- \* TIRES - 50 x 20 R22 32 PR AT 186 PSI (13.08 KG/CM SQ)
- \* TIRES - 50 x 20 R22 32 PR AT 205 PSI (14.41 KG/SQ CM)
- \* EQUIVALENT SINGLE-WHEEL LOADS ARE DERIVED FROM ICAO AERODROME MANUAL, PART 2 PAR 4.1.3, DATED 1965.



- NOTES:
- \* TIRES - 50 x 20 R22 32PR AT 215 PSI (15.12 KG/CM SQ)
  - \* TIRES - 50 x 20 R22 32PR AT 171 PSI (12.02 KG/CM SQ)
  - \* EQUIVALENT SINGLE-WHEEL LOADS ARE DERIVED FROM ICAO AERODROME MANUAL, PART 2 PAR 4.1.3, DATED 1965.



#### 7.8.4 RIGID PAVEMENT REQUIREMENTS - LCN CONVERSION

MODEL 777-300



## **7.9 Rigid Pavement Requirements - FAA Design Method**

The FAA does not officially recognize the validity of rigid pavement thickness design calculations for individual six-wheel gear aircraft. At the time this document (D6-58329) was printed, the FAA was recommending a multi-layer pavement thickness design method for the 777 airplane when considered as a component of the traffic mix. Consequently, the chart shown in Section 7.9.1 is provided as an estimate of the design thickness for general guidance purposes only. In the example shown, for a pavement flexural strength of 700 psi, a subgrade strength of  $k = 300$ , and an annual departure level of 6,000, the required pavement thickness for a 777-200, 777-200ER or 777-300 airplane with a main gear load of 600,00 lb is 9.4 inches

DATA TO BE PROVIDED  
AT A LATER DATE

For more information about the data on this page please contact us at:

e-mail: [AirportTechnology@boeing.com](mailto:AirportTechnology@boeing.com)

OR

Fax: 425-237-2665

**7.9.1 RIGID PAVEMENT REQUIREMENTS**

*MODEL 777-200, -200ER, -300*

## 7.10 ACN/PCN Reporting System: Flexible and Rigid Pavements

To determine the ACN of an aircraft on flexible or rigid pavement, both the aircraft gross weight and the subgrade strength category must be known. The chart in Section 7.10.1 shows that for 777-200 aircraft with gross weight of 500,000 lb on a medium subgrade strength (Code B), the flexible pavement ACN is 38.6. In Section 7.10.4, for the same aircraft weight and medium subgrade strength (Code B), the rigid pavement ACN is 40.6.

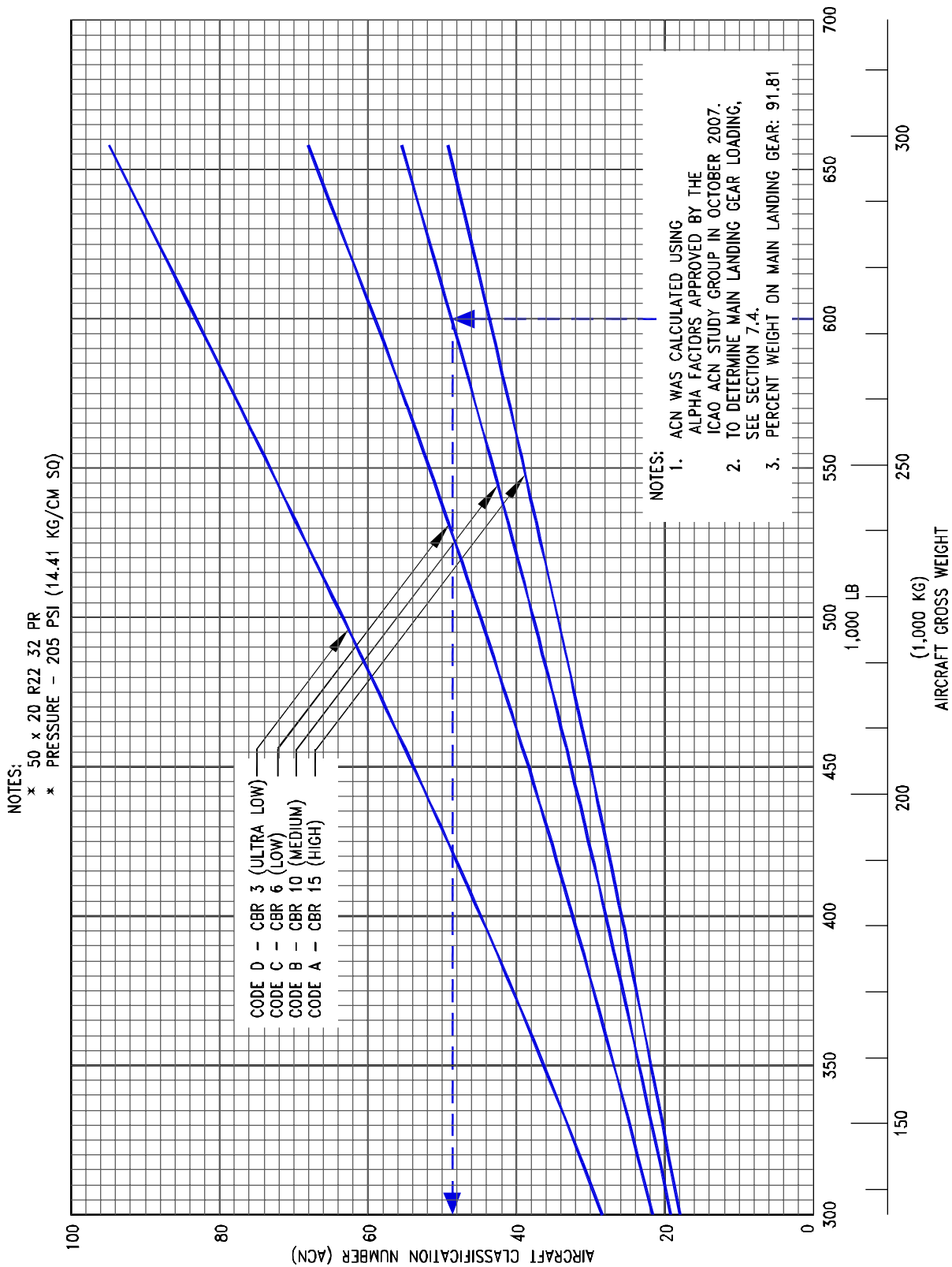
Similarly, for a 777-300 aircraft with gross weight of 600,000 lb on a medium subgrade strength (Code B), the flexible pavement ACN is 51 (Section 7.10.3) and the rigid pavement ACN is 58.2 (Section 7.10.6).

- Notes: 1. An aircraft with an ACN equal to or less than the reported PCN can operate on that pavement subject to any limitations on the tire pressure. (Ref: ICAO Annex 14 Aerodromes, First Edition, July 1990.)
2. The ACN values on the Flexible Pavement charts were calculated using alpha factors approved by the ICAO ACN Study Group in October 2007.

The following table provides ACN data in tabular format similar to the one used by ICAO in the “Aerodrome Design Manual Part 3, Pavements.” If the ACN for an intermediate weight between taxi weight and empty fuel weight of the aircraft is required, Figures 7.10.1 through 7.10.6 should be consulted.

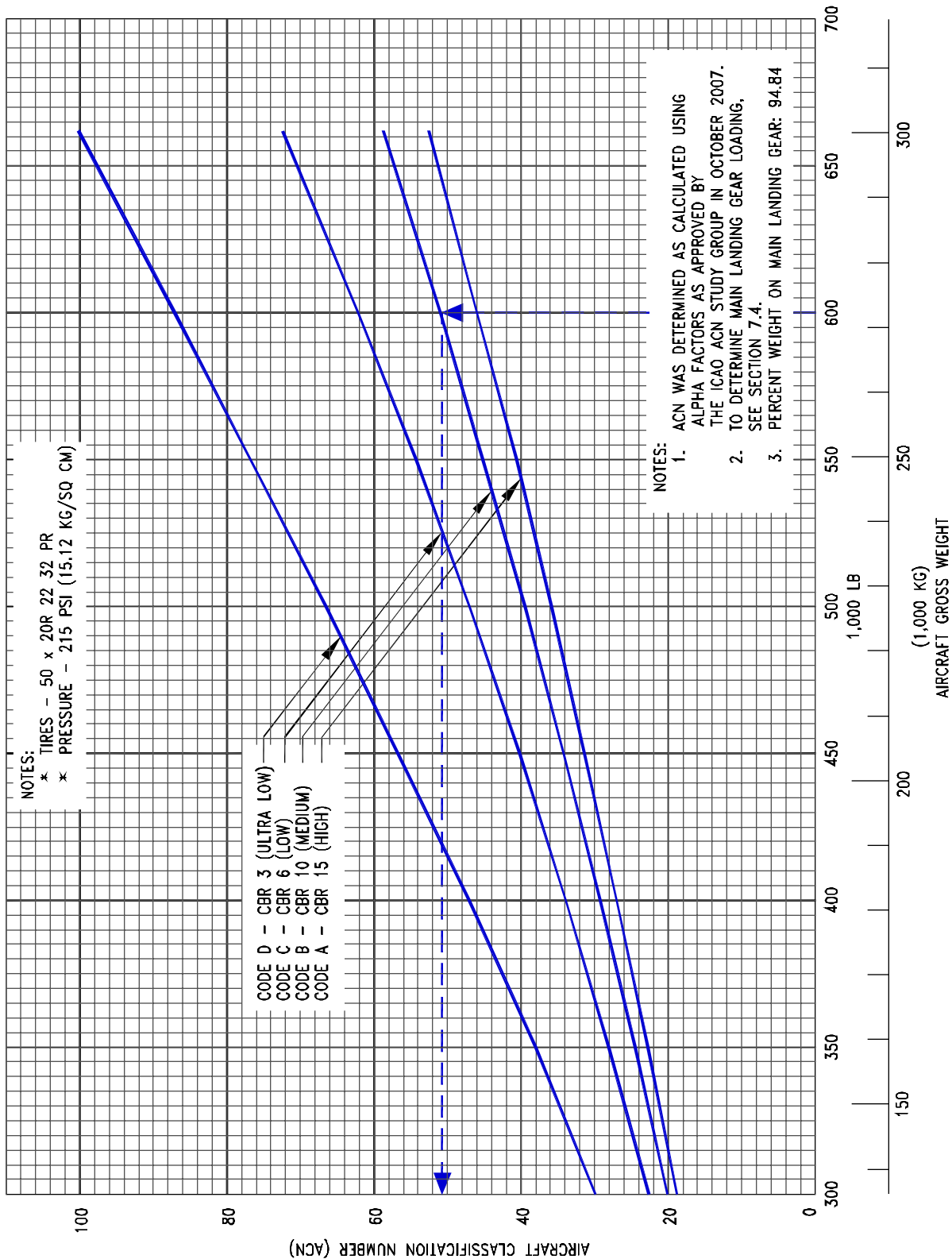
AIRCRAFT TYPE	ALL-UP MASS/ OPERATING MASS EMPTY LB (KG)	LOAD ON ONE MAIN GEAR LEG (%)	TIRE PRESSURE PSI (MPa)	ACN FOR RIGID PAVEMENT SUBGRADES – MN/m <sup>2</sup>				ACN FOR FLEXIBLE PAVEMENT SUBGRADES – CBR			
				HIGH 150	MEDIUM 80	LOW 40	ULTRA LOW 20	HIGH 15	MEDIUM 10	LOW 6	ULTRA LOW 3
777-200	547,000(248,120)	46.845	182 (1.26)	38	47	61	77	39	44	53	75
	302,170(137,060)			21	21	25	31	18	20	23	30
777-200 ER	658,000(298,460)	45.905	205 (1.41)	50	63	82	101	49	56	68	95
	313,500(142,200)			22	22	26	33	19	20	23	30
777-300	662,000(300,278)	47.42	215 (1.48)	54	68	88	108	53	59	72	100
	350,870(159,150)			26	27	33	41	23	25	28	38





## 7.10.2 AIRCRAFT CLASSIFICATION NUMBER - FLEXIBLE PAVEMENT

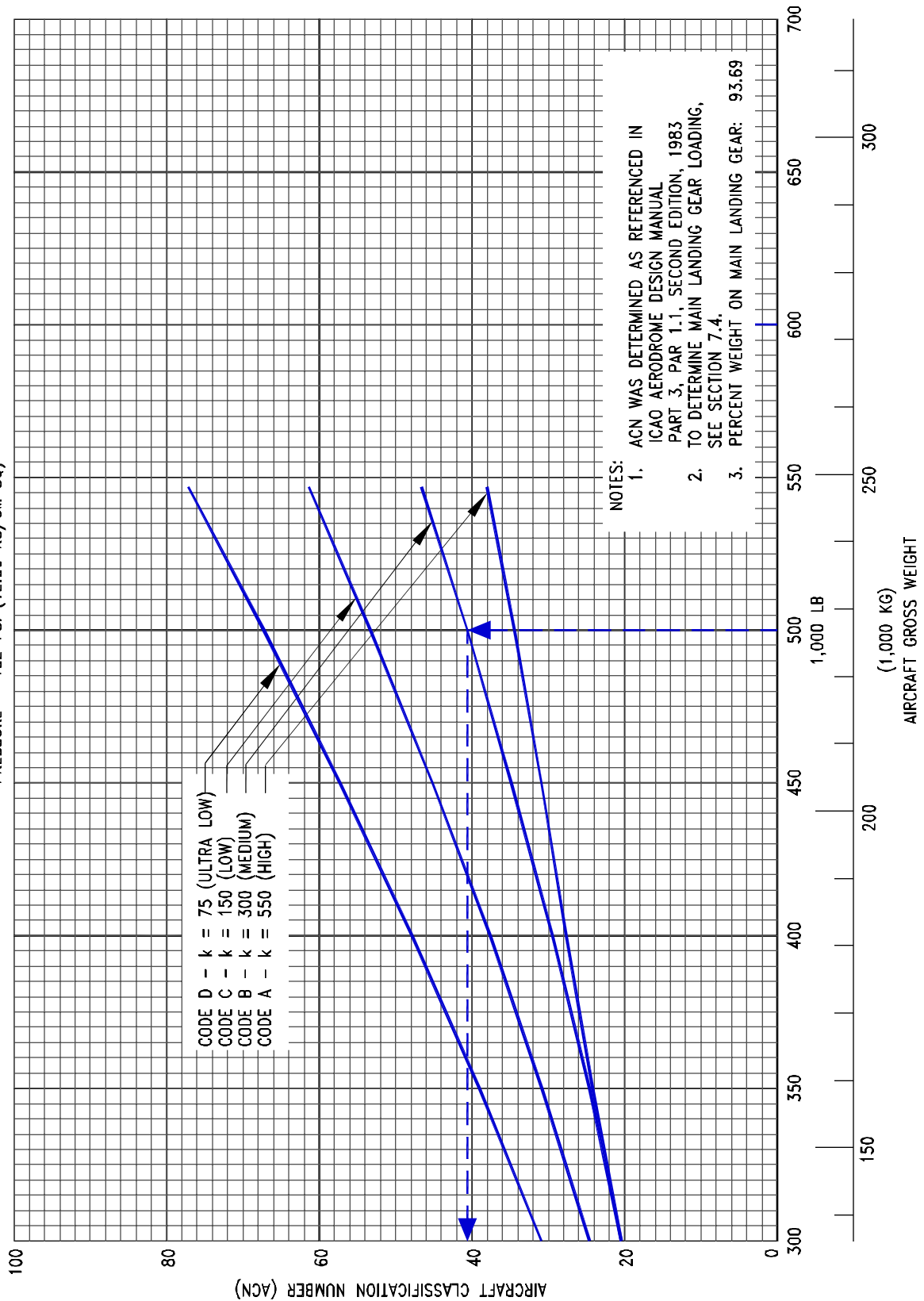
MODEL 777-200ER



### 7.10.3 AIRCRAFT CLASSIFICATION NUMBER - FLEXIBLE PAVEMENT

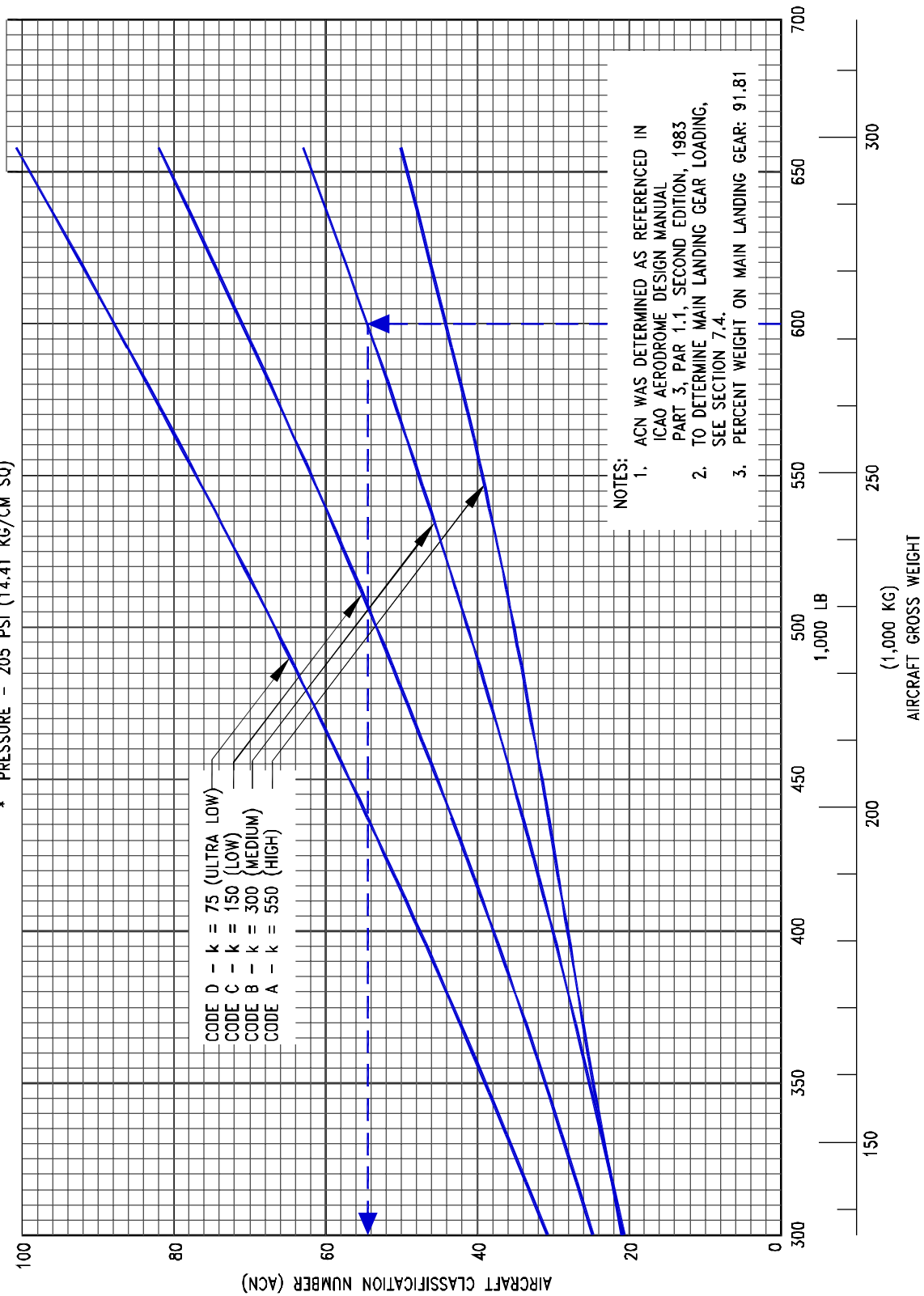
MODEL 777-300

NOTES:  
 \* TIRES - 50 x 20 R22 32PR  
 \* PRESSURE - 182 PSI (12.80 KG/CM SQ)



#### 7.10.4 AIRCRAFT CLASSIFICATION NUMBER - RIGID PAVEMENT MODEL 777-200

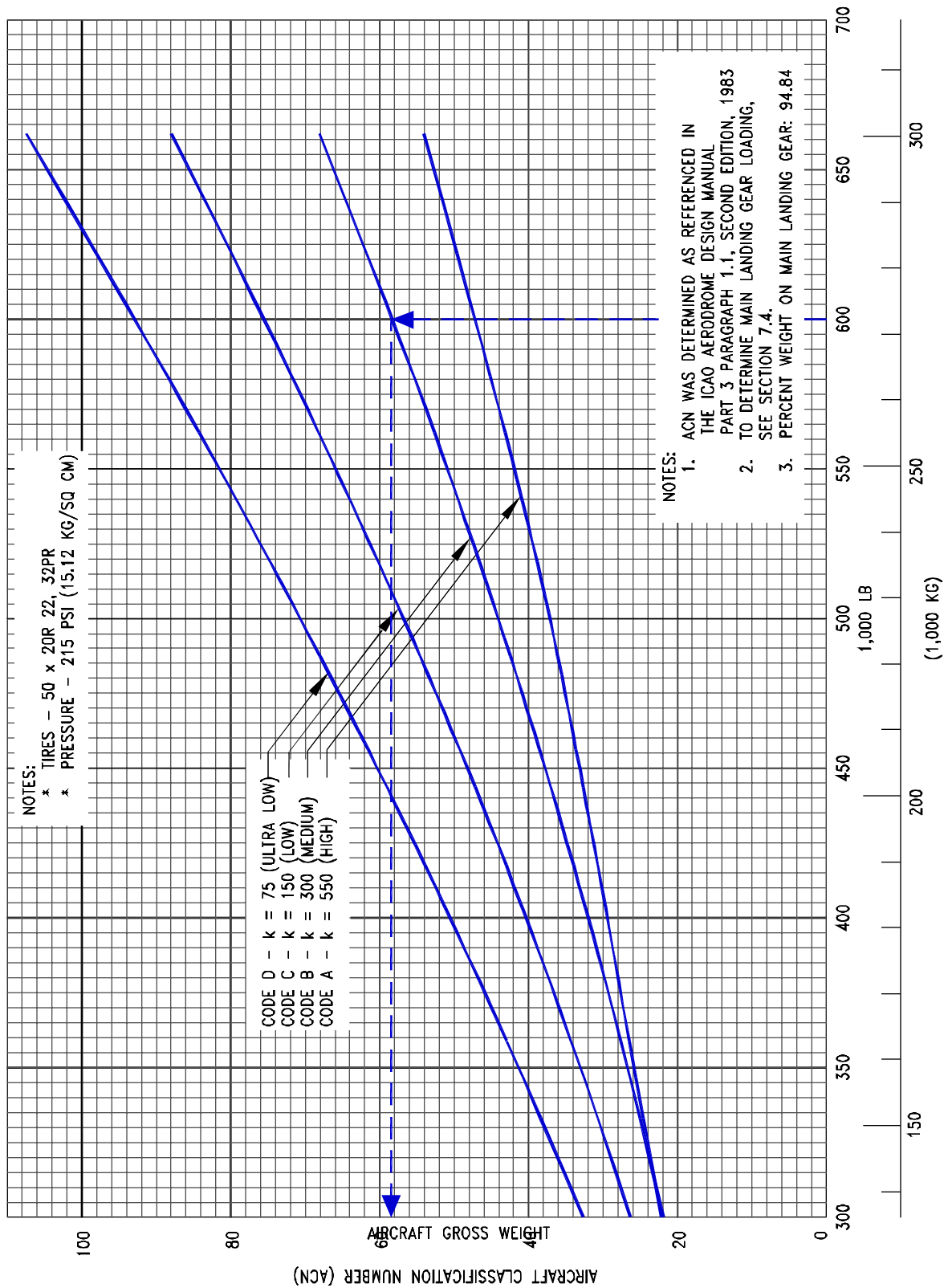
NOTES:  
 \* TIRES - 50 x 20 R22 32PR  
 \* PRESSURE - 205 PSI (14.41 KG/CM SQ)



NOTES:  
 1. ACN WAS DETERMINED AS REFERENCED IN ICAO AERODROME DESIGN MANUAL PART 3, PAR 1.1, SECOND EDITION, 1983  
 2. TO DETERMINE MAIN LANDING GEAR LOADING, SEE SECTION 7.4.  
 3. PERCENT WEIGHT ON MAIN LANDING GEAR: 91.81

### 7.10.5 AIRCRAFT CLASSIFICATION NUMBER - RIGID PAVEMENT MODEL 777-200ER





### 7.10.6 AIRCRAFT CLASSIFICATION NUMBER - RIGID PAVEMENT

MODEL 777-300

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## **8.0 FUTURE 777 DERIVATIVE AIRPLANES**

## **8.0 FUTURE 777 DERIVATIVE AIRPLANES**

Several derivatives are being studied to provide additional capabilities of the 777 family of airplanes. Future growth versions could require additional passenger capacity or increased range or both. Whether these growth versions could be built would depend entirely on airline requirements. In any event, impact on airport facilities will be a consideration in the configuration and design.

## **9.0 SCALED 777 DRAWINGS**

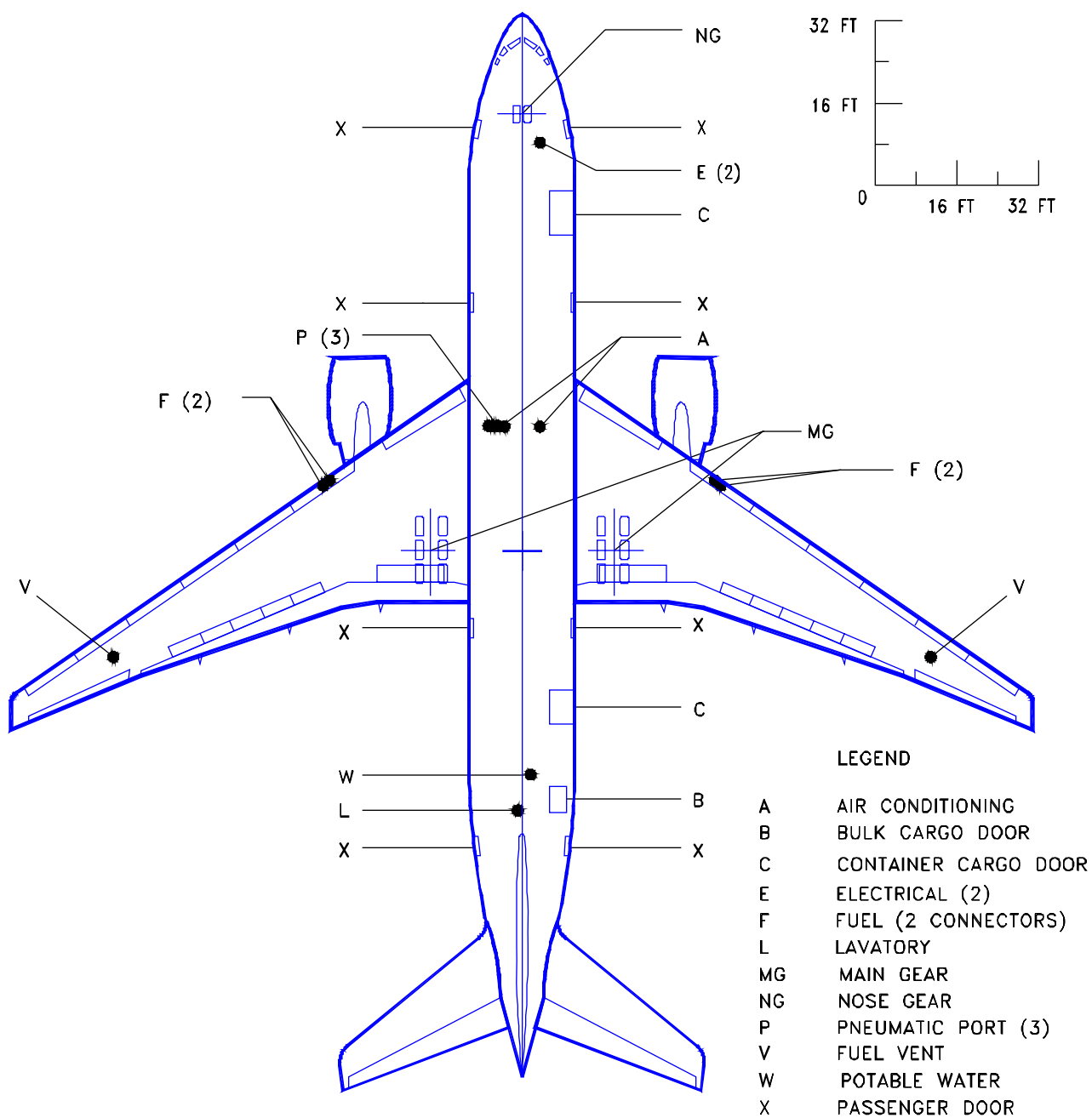
**9.1 - 9.5 Scaled Drawings, 777-200**

**9.6 - 9.10 Scaled drawings, 777-300**

## 9.0 SCALED DRAWINGS

The drawings in the following pages show airplane plan view drawings, drawn to approximate scale as noted. The drawings may not come out to exact scale when printed or copied from this document. Printing scale should be adjusted when attempting to reproduce these drawings. Three-view drawing files of the 777 airplane models, along with other Boeing airplane models, can be downloaded from the following website:

<http://www.boeing.com/airports>

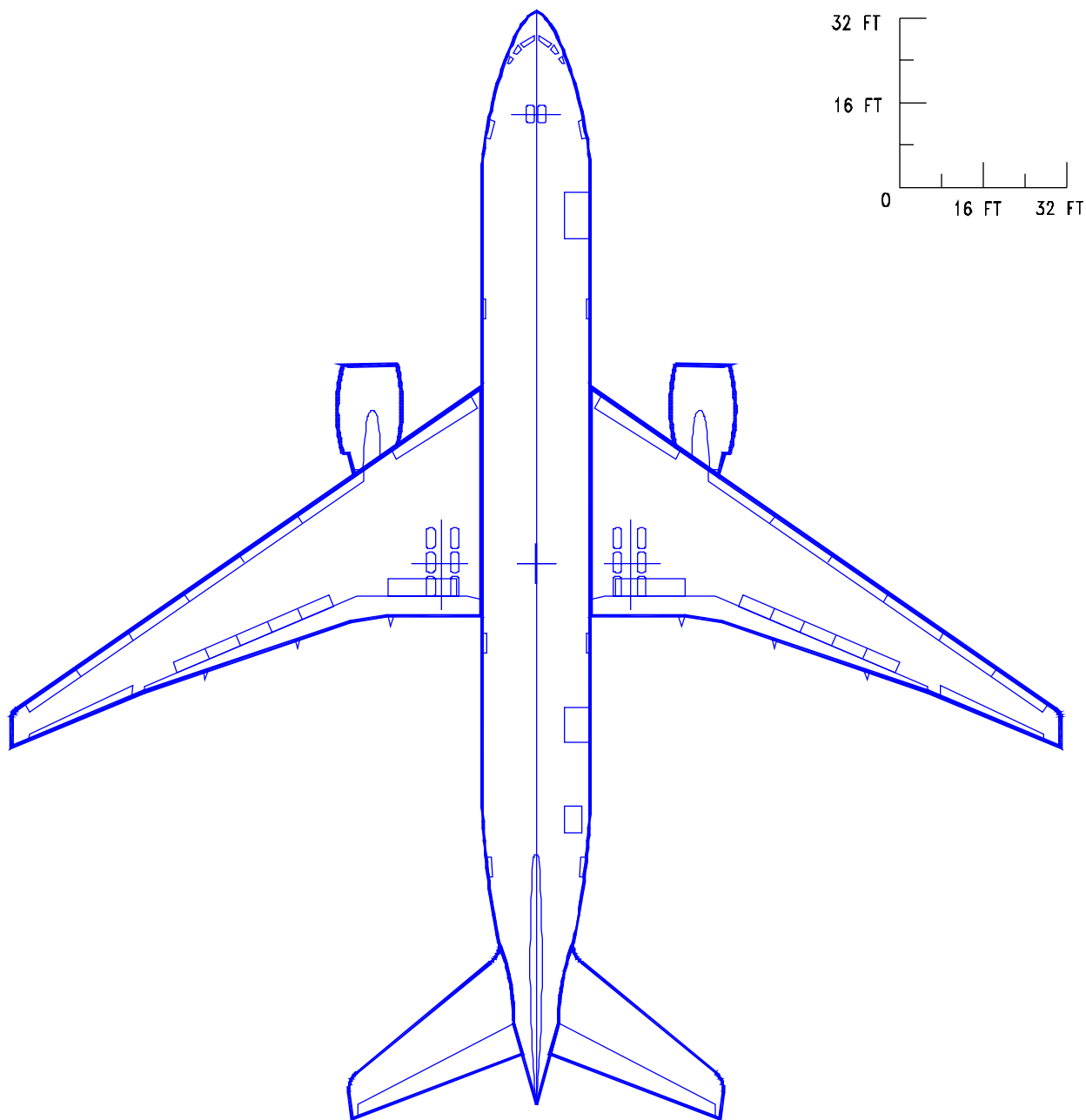


**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.1.1 SCALED DRAWING - 1 IN. = 32 FT**  
*MODEL 777-200*

D6-58329

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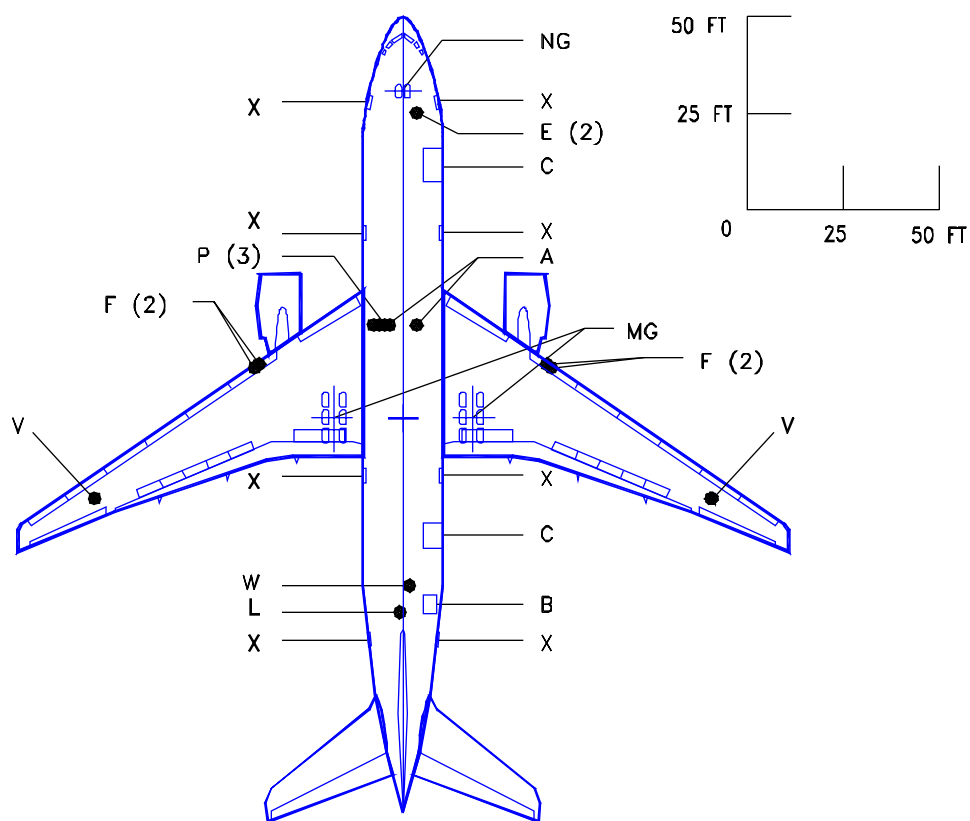


**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.1.2 SCALED DRAWING - 1 IN. = 32 FT**  
*MODEL 777-200*

D6-58329



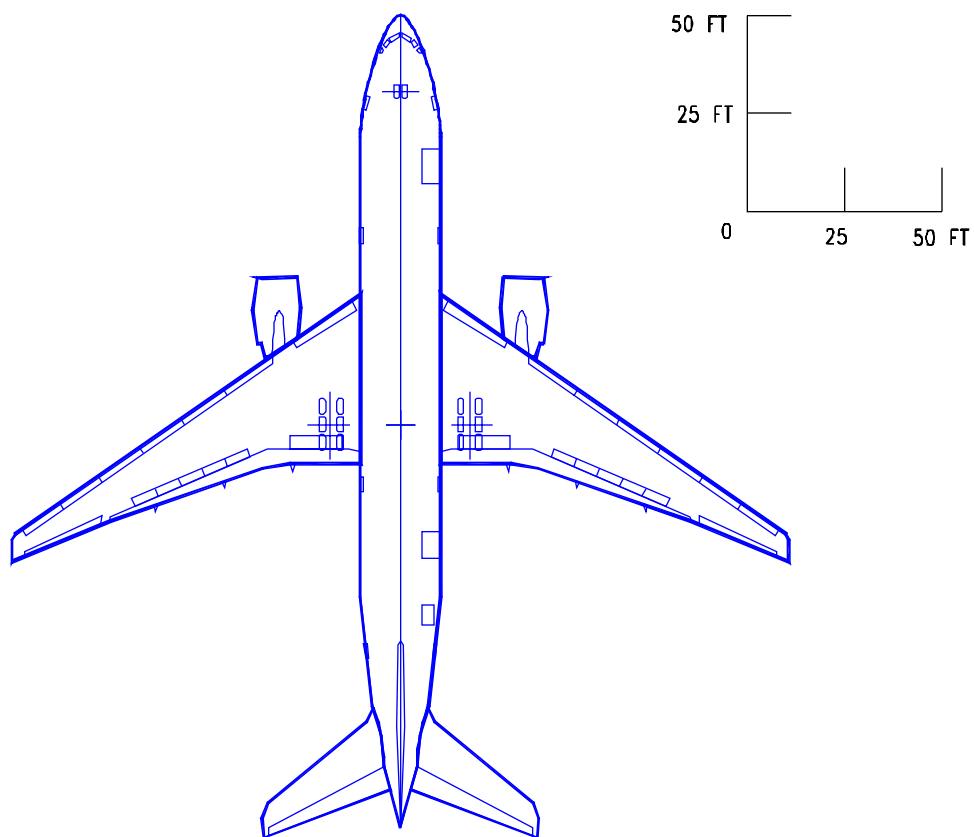


#### LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL (2)
F	FUEL (2 CONNECTORS)
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
P	PNEUMATIC PORT (3)
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

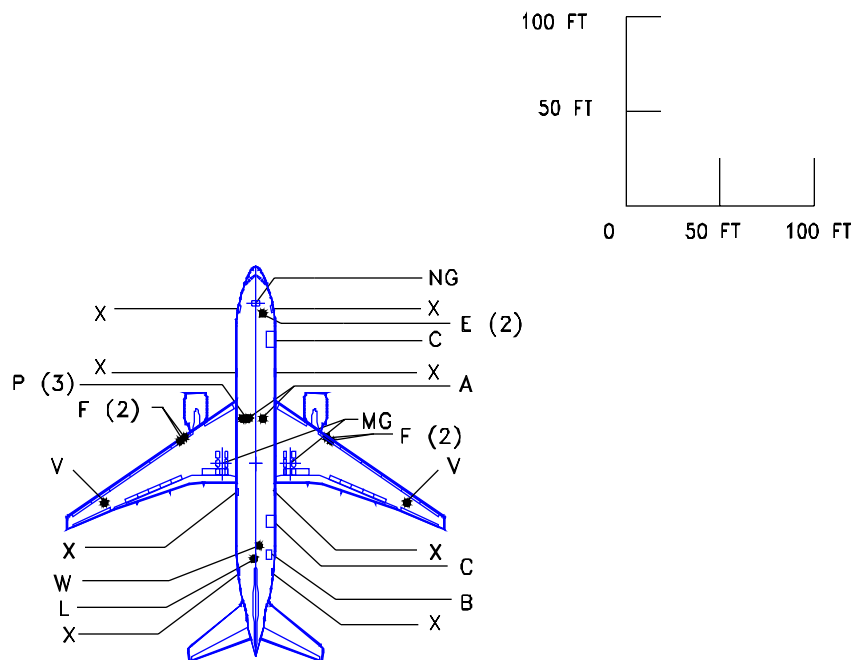
#### 9.2.1 SCALED DRAWING - 1 IN. = 50 FT MODEL 777-200



**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.2.2 SCALED DRAWING - 1 IN. = 50 FT**  
*MODEL 777-200*

D6-58329

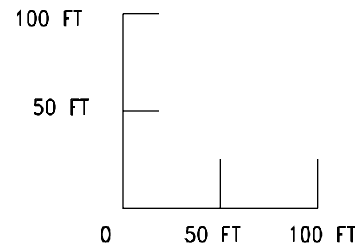
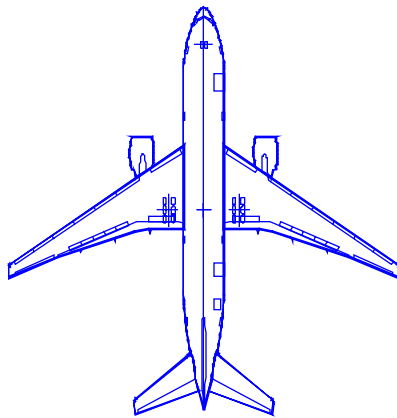


#### LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL (2)
F	FUEL (2 CONNECTORS)
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
P	PNEUMATIC PORT (3)
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

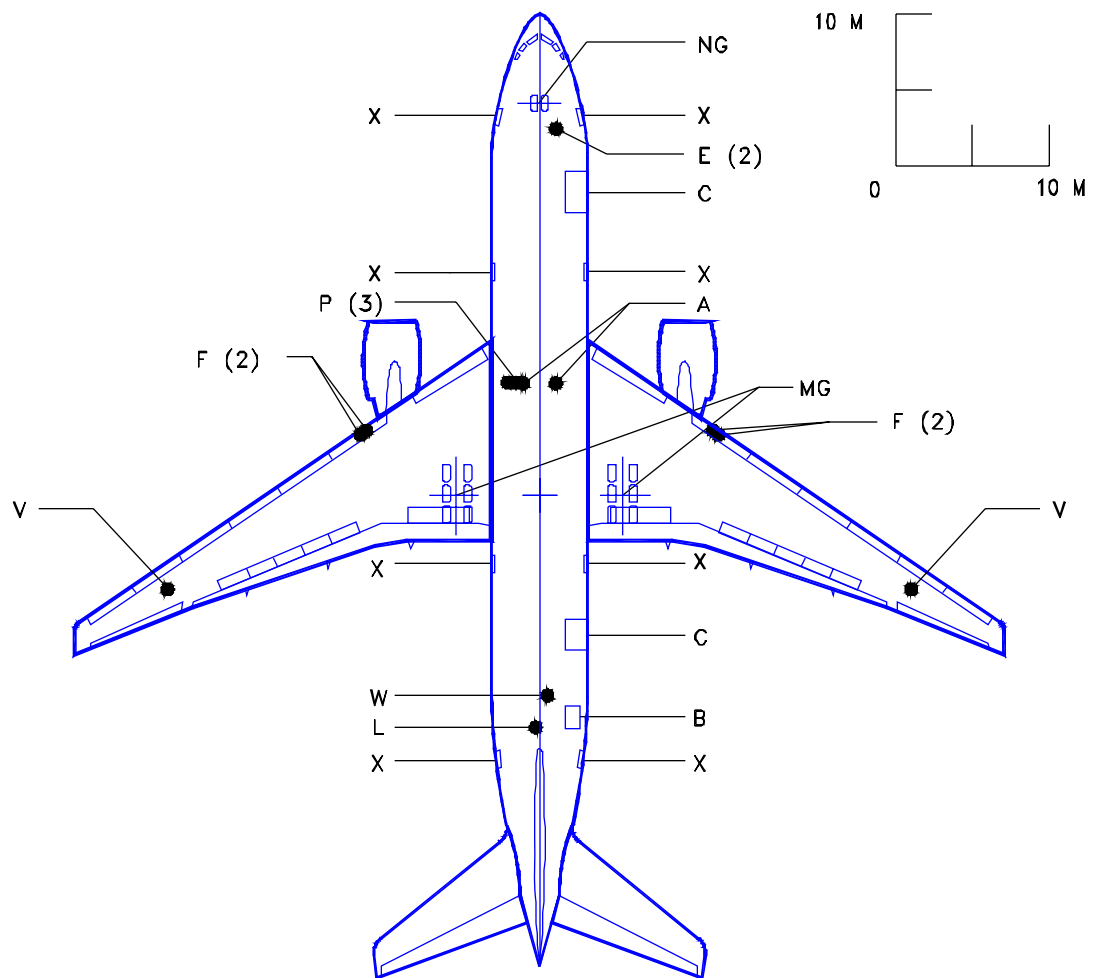
#### 9.3.1 SCALED DRAWING - 1 IN = 100 FT MODEL 777-200



**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.3.2 SCALED DRAWING - 1 IN = 100 FT**  
*MODEL 777-200*

D6-58329

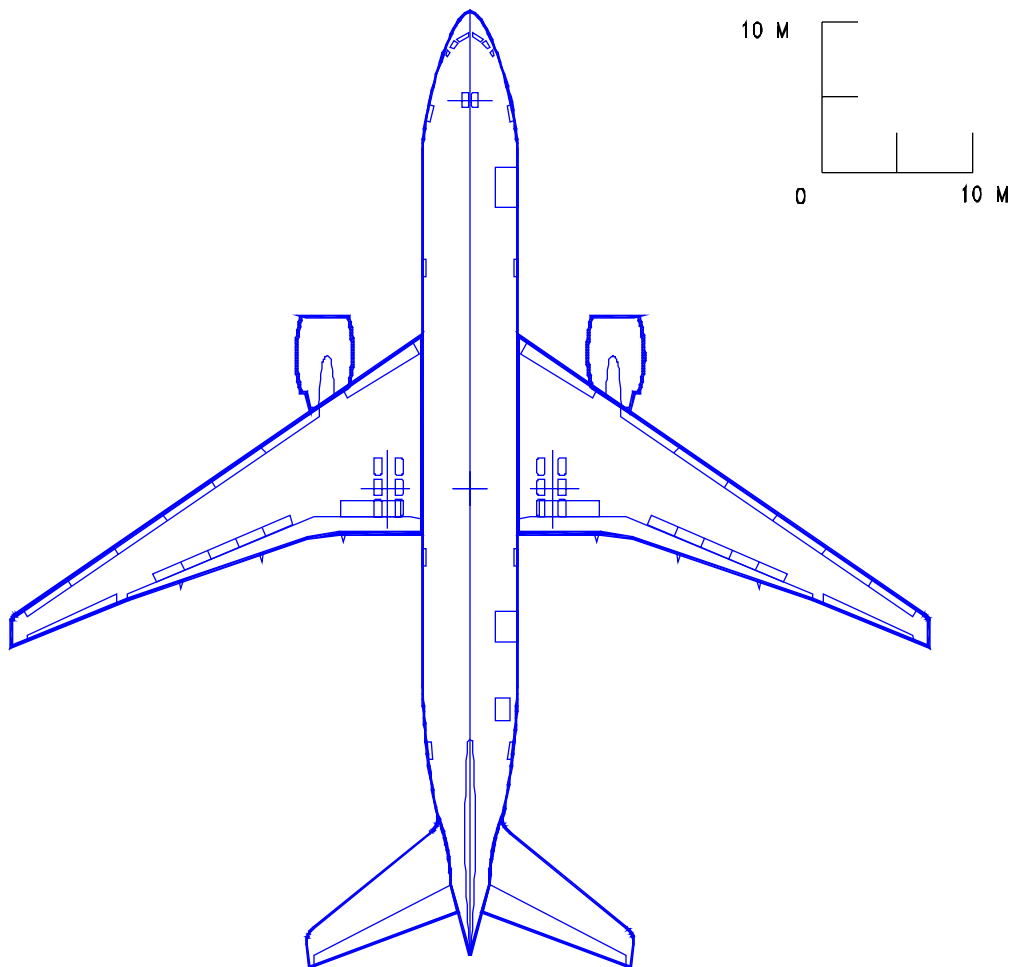


#### LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL (2)
F	FUEL (2 CONNECTORS)
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
P	PNEUMATIC PORT (3)
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

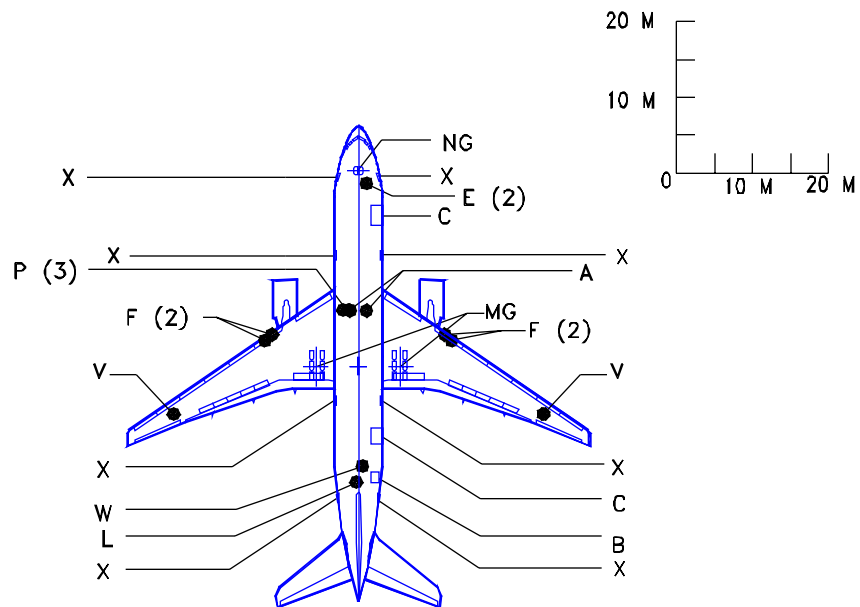
#### 9.4.1 SCALED DRAWING - 1:500 MODEL 777-200



**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.4.2 SCALED DRAWING - 1:500**  
*MODEL 777-200*

D6-58329

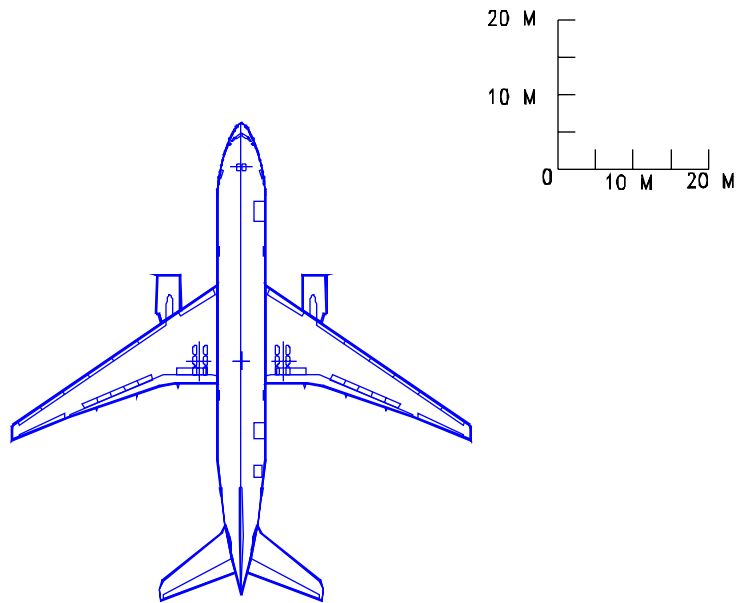


#### LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL (2)
F	FUEL (2 CONNECTORS)
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
P	PNEUMATIC PORT (3)
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

#### 9.5.1 SCALED DRAWING - 1:1000 MODEL 777-200

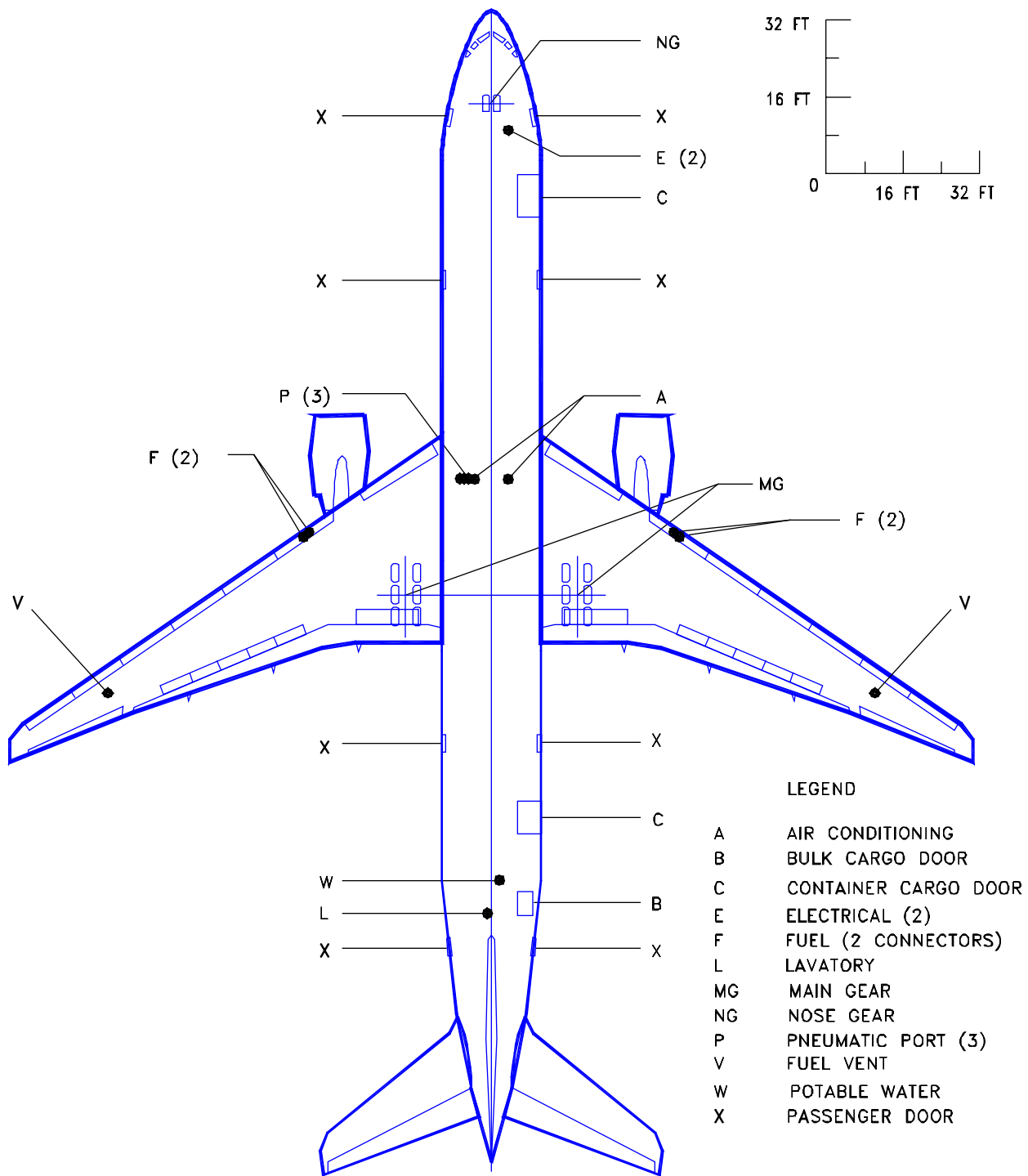


**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.5.2 SCALED DRAWING - 1:1000**  
*MODEL 777-200*

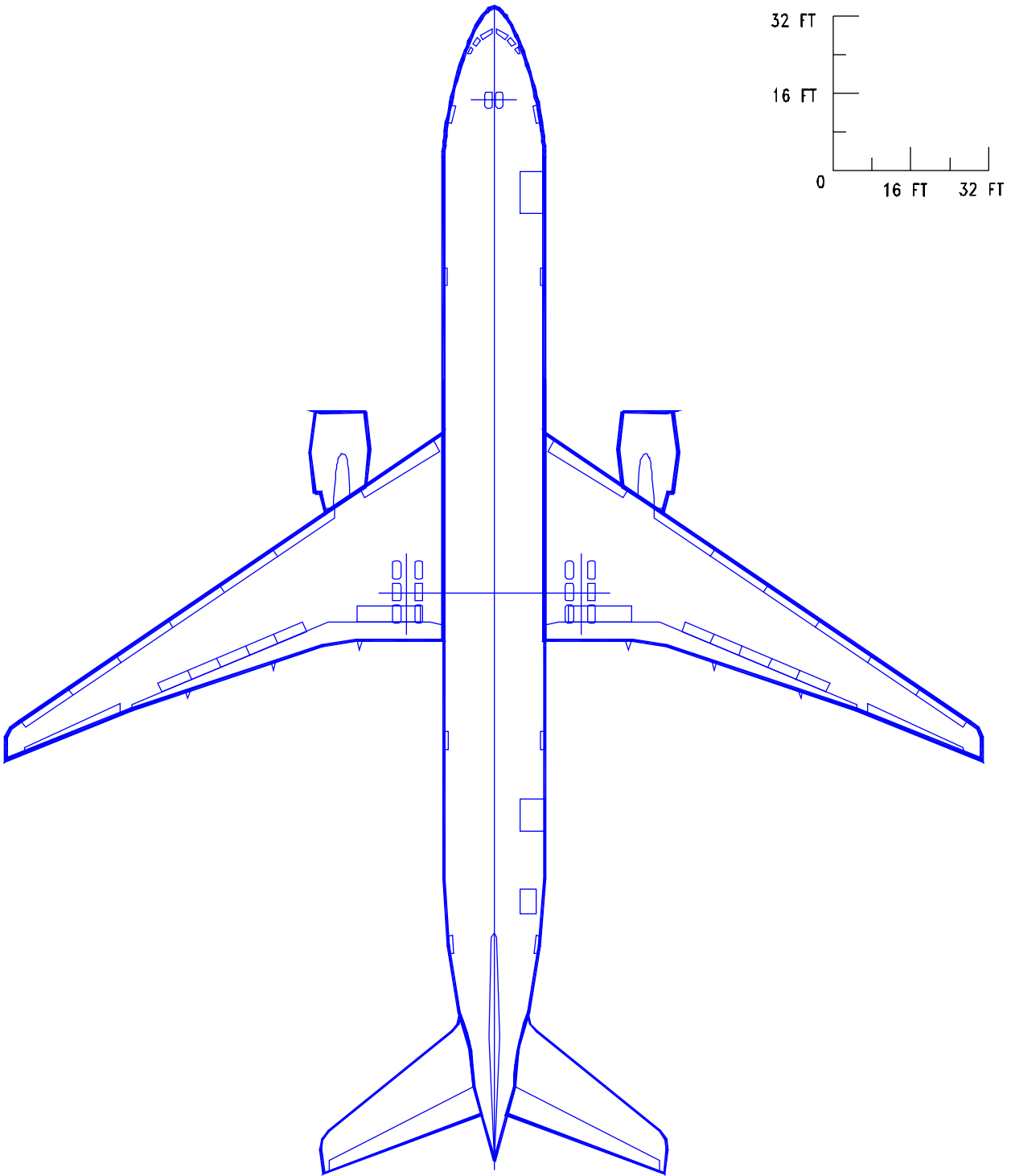
D6-58329





**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

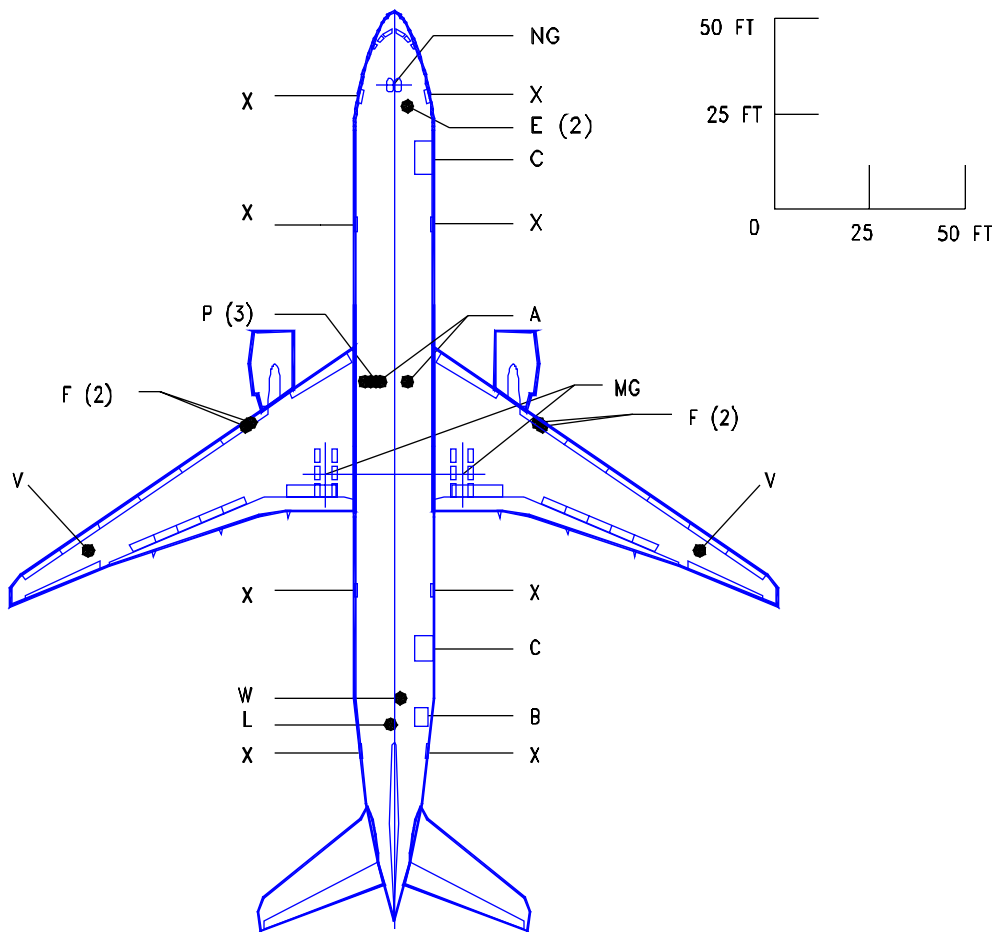
**9.6.1 SCALED DRAWING - 1 IN. = 32 FT**  
*MODEL 777-300*



**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.6.2 SCALED DRAWING - 1 IN. = 32 FT**  
*MODEL 777-300*

D6-58329

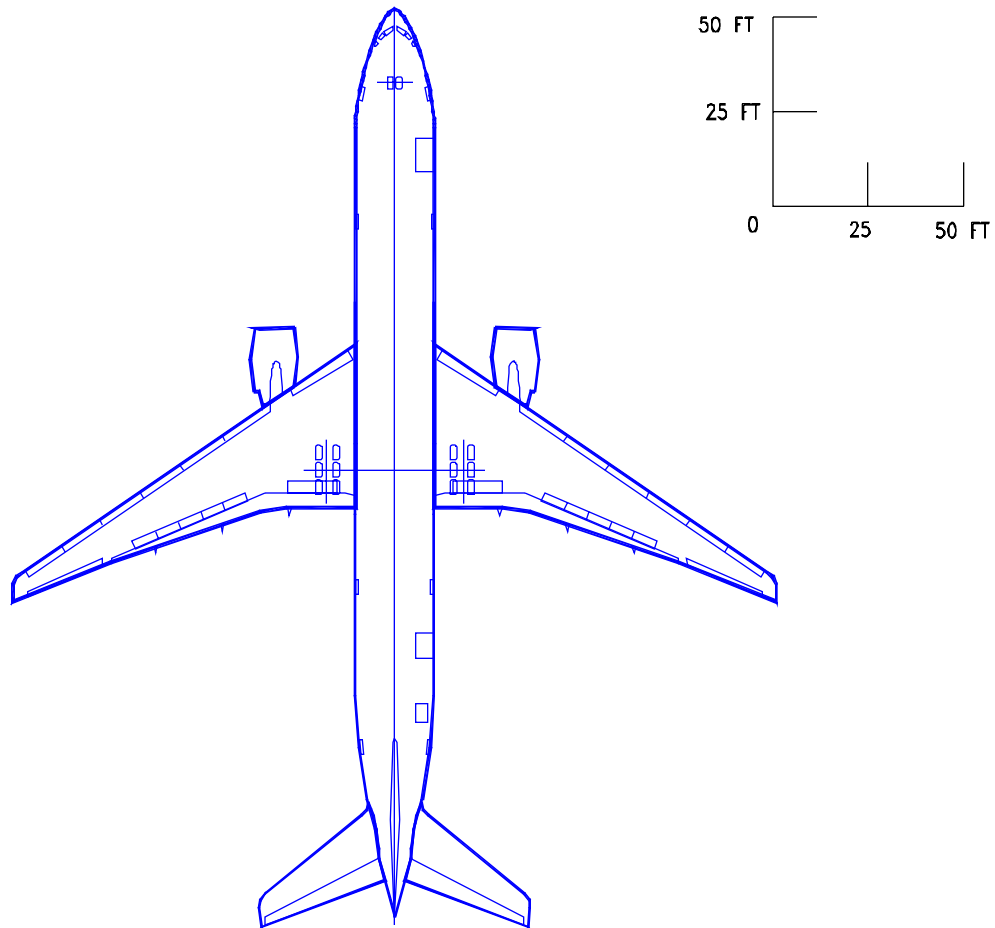


#### LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL (2)
F	FUEL (2 CONNECTORS)
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
P	PNEUMATIC PORT (3)
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

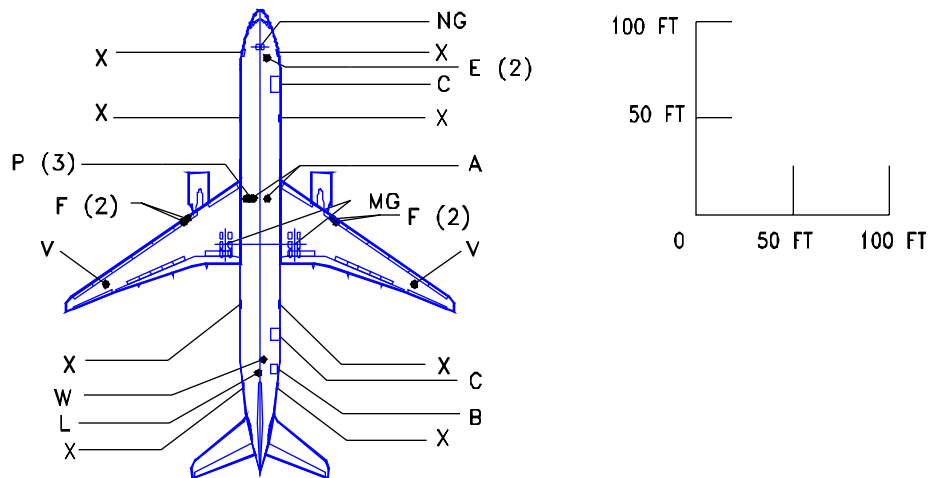
#### 9.7.1 SCALED DRAWING - 1 IN. = 50 FT MODEL 777-300



**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.7.2 SCALED DRAWING - 1 IN. = 50 FT**  
*MODEL 777-300*

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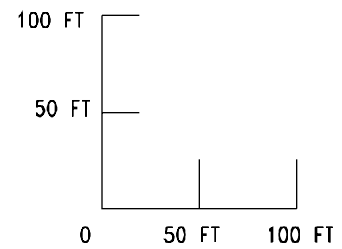
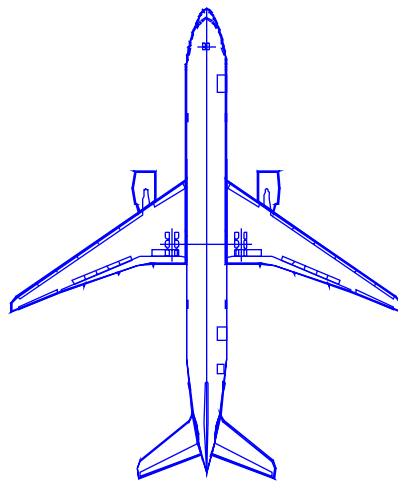
### LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL (2)
F	FUEL (2 CONNECTORS)
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
P	PNEUMATIC PORT (3)
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

### 9.8.1 SCALED DRAWING - 1 IN = 100 FT

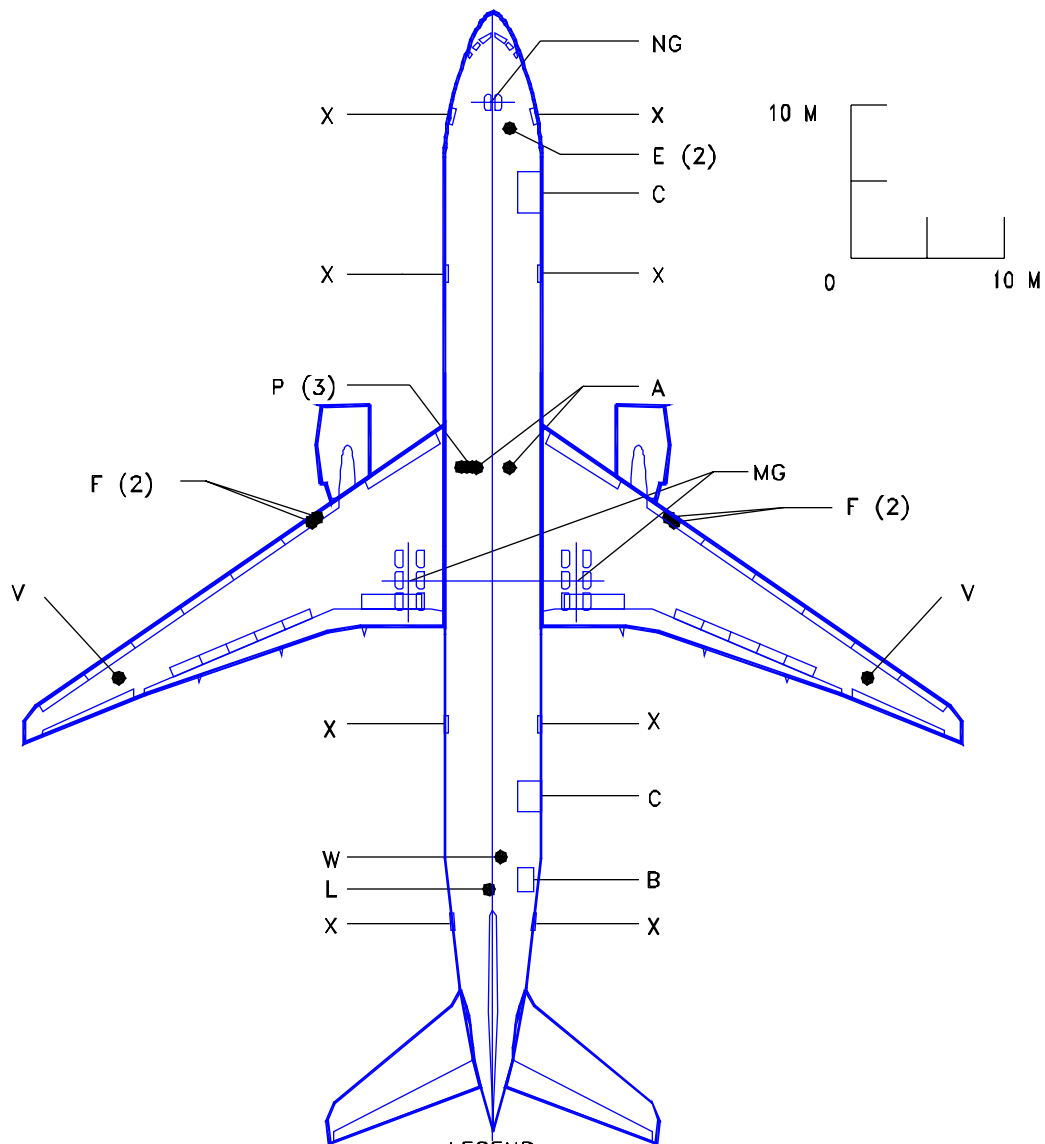
*MODEL 777-300*



**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.8.2 SCALED DRAWING - 1 IN = 100 FT**  
*MODEL 777-300*

D6-58329

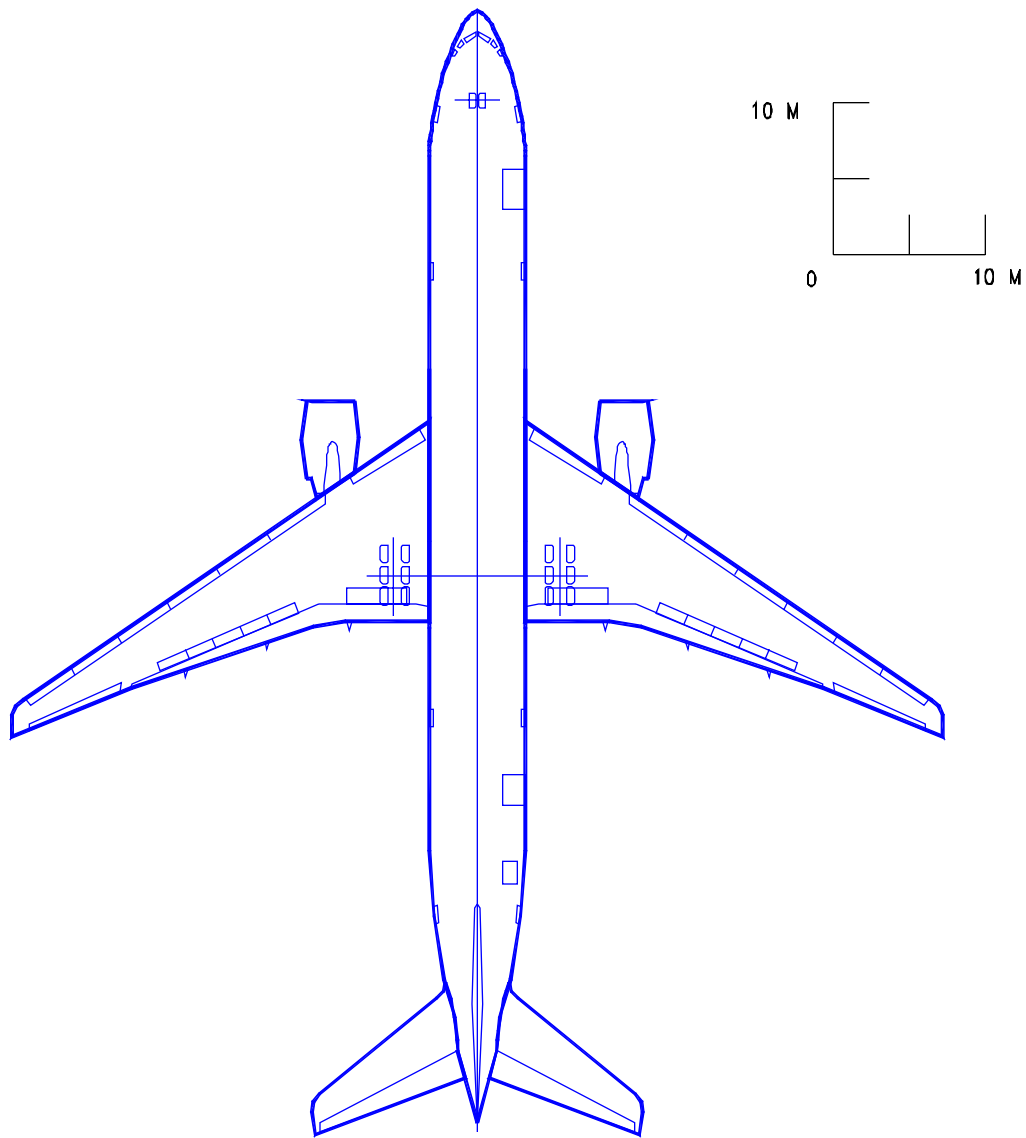


#### LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL (2)
F	FUEL (2 CONNECTORS)
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
P	PNEUMATIC PORT (3)
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

#### 9.9.1 SCALED DRAWING - 1:500 MODEL 777-300

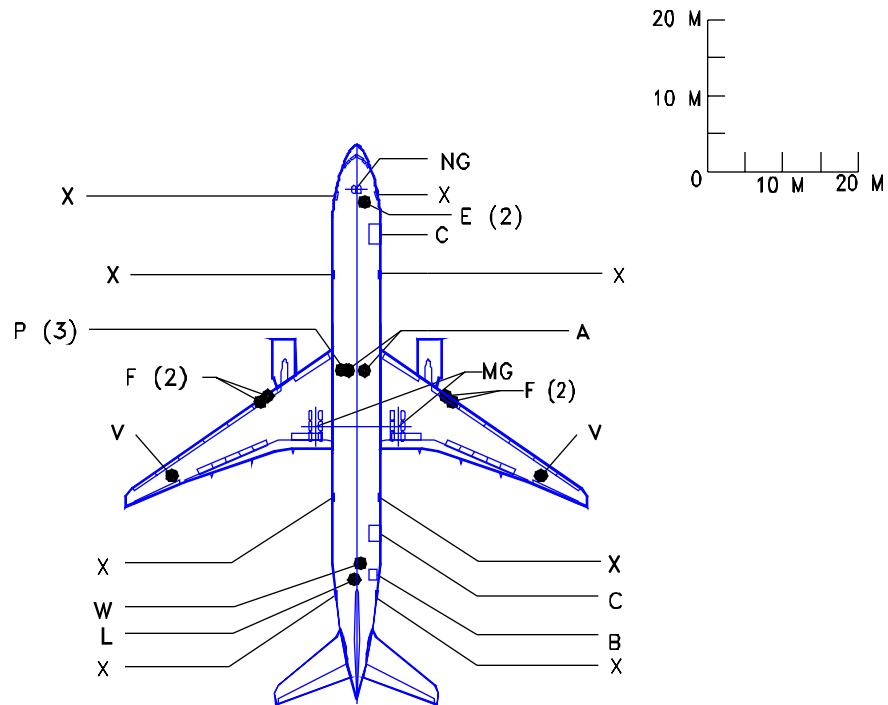


**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.9.2 SCALED DRAWING - 1:500**  
*MODEL 777-300*

D6-58329



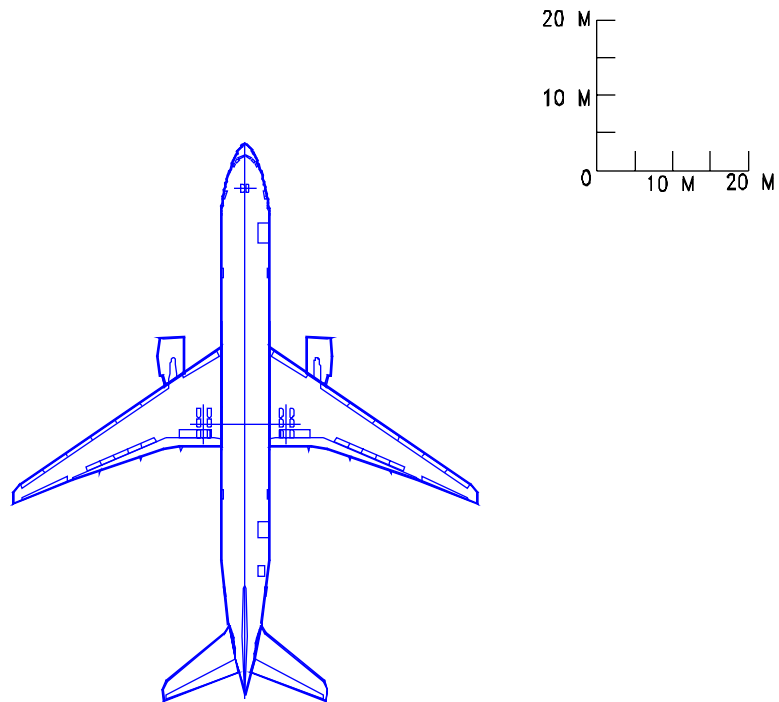


#### LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL (2)
F	FUEL (2 CONNECTORS)
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
P	PNEUMATIC PORT (3)
V	FUEL VENT
W	POTABLE WATER
X	PASSENGER DOOR

**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

#### 9.10.1 SCALED DRAWING - 1:1000 MODEL 777-300



**NOTE: ADJUST SCALE WHEN PRINTING THIS PAGE**

**9.10.2 SCALED DRAWING - 1:1000**  
*MODEL 777-300*

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