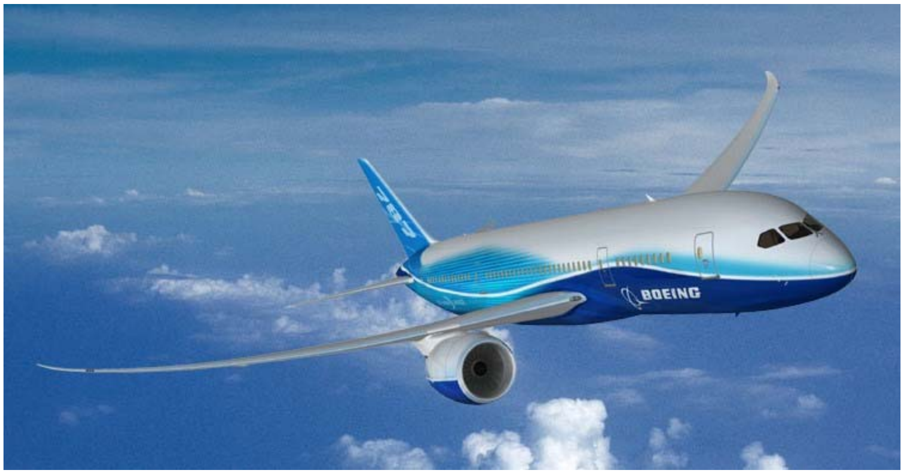
PRELIMINARY INFORMATION



787

Airplane Characteristics for

Airport Planning

Boeing Commercial Airplanes

D6-58331

787 AIRPLANE CHARACTERISTICS FOR AIRPORT PLANNING
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Updated 75 to 96	October 2006				

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1.1 Scope

1.2 Introduction

1.3 A Brief Description of the 787 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
- Air Transport Association of America
- 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," available from the US AIA, 1250 Eye St., Washington DC 20005, for long-range planning needs. This document is updated periodically and represents the coordinated efforts of the following organizations regarding future aircraft growth trends:

- International Coordinating Council of Aerospace Industries Associations
- Airports Council International - North American and World Organizations
- Air Transport Association of America
- International Air Transport Association

1.2 Introduction

This document conforms to NAS 3601. It provides characteristics of the Boeing Model 787 airplane 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.

For additional information contact:

Boeing Commercial Airplanes
P.O. Box 3707
Seattle, Washington 98124-2207
U.S.A.

Attention: Manager, Airport Technology
Mail Code 67-KR

1.3 A Brief Description of the 787 Family of Airplanes

The 787 is a family of twin-engine airplanes, very fuel efficient and with exceptional environmental performance. The 787 airplanes are being developed by an International team of aerospace companies, led by Boeing at its Everett Facility near Seattle, Washington. Using a suite of new technologies, as much as 50 percent of the primary structure will be composite materials.

787-8

The 787-8 is the first airplane in the 787 family of twin-engine airplanes and is designed for medium to long range flights. The 787-8 can carry 210 to 250 passengers in a three-class configuration and up to 375 passengers in a single-class configuration.

787 Engines

General Electric and Rolls-Royce have been selected to develop engines using advanced engine technology for increased efficiency for the 787 airplane.

Cargo Handling

The lower lobe cargo compartments can accommodate a variety of containers and pallets now used in narrow-body and wide-body airplanes.

Ground Servicing

The 787 has ground service connections compatible with existing ground service equipment, and no special equipment is necessary.

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 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.)

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

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.

Spec 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 Structural 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.

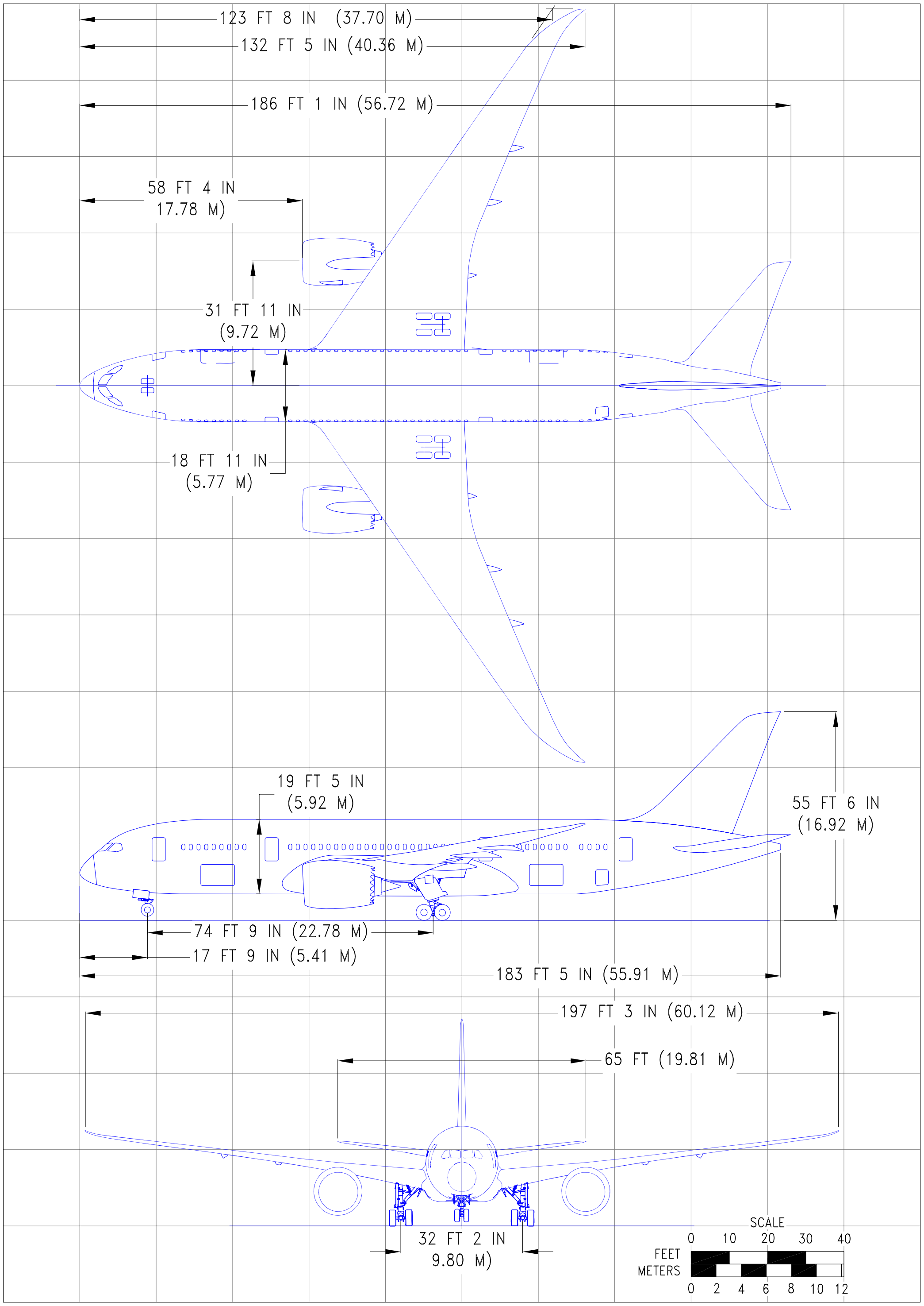
Usable Fuel. Fuel available for aircraft propulsion.

CHARACTERISTICS	UNITS	ENGINE MANUFACTURER	
		GENERAL ELECTRIC	ROLLS-ROYCE
MAX DESIGN TAXI WEIGHT	POUNDS	482,000	482,000
	KILOGRAMS	218,631	218,631
MAX DESIGN TAKEOFF WEIGHT	POUNDS	480,000	480,000
	KILOGRAMS	217,724	217,724
MAX DESIGN LANDING WEIGHT	POUNDS	365,000	365,000
	KILOGRAMS	165,561	165,561
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	340,000	340,000
	KILOGRAMS	154,221	154,221
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	240,000	240,000
	KILOGRAMS	108,862	108,862
MAX STRUCTURAL PAYLOAD	POUNDS	100,000	100,000
	KILOGRAMS	45,359	45,359
SEATING CAPACITY	ONE-CLASS	375 ALL-ECONOMY SEATS; EXIT LIMIT = 440 SEATS	
	MIXED CLASS	224 THREE-CLASS; 12 FIRST CLASS, 42 BUSINESS CLASS, 170 ECONOMY CLASS (SEE SEC 2.4)	
MAX CARGO - LOWER DECK	CUBIC FEET	4,826 (2)	4,826 (2)
	CUBIC METERS	136.7 (2)	136.7 (2)
USABLE FUEL	US GALLONS	33,528	33,528
	LITERS	126,903	126,903
	POUNDS	224,638	224,638
	KILOGRAMS	101,894	101,894

NOTES:
(1) SPEC WEIGHT FOR TYPICAL ENGINE/WEIGHT CONFIGURATION SHOWN TYPICAL OPERATING EMPTY WEIGHT SHOWN. ACTUAL WEIGHT WILL DEPEND ON SPECIFIC AIRLINE CONFIGURATION.
(2) 16 LD3 CONTAINERS IN FWD COMPARTMENT AT 158 CU FT (4.5 CU M) EACH ; 12 LD3 CONTAINERS IN AFT COMPARTMENT; 402 CU FT (11.4 CU M) IN BULK CARGO COMPARTMENT. SEE SEC 2.6 FOR OTHER LOADING COMBINATIONS.

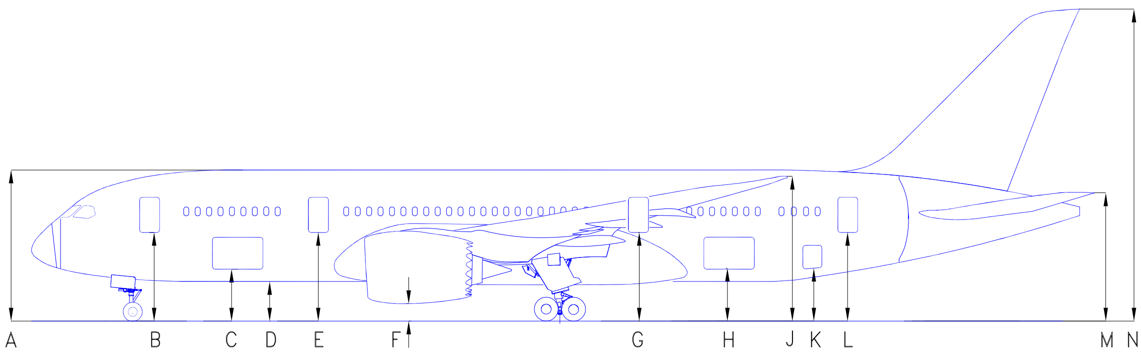
2.1 GENERAL CHARACTERISTICS

MODEL 787-8



2.2 GENERAL DIMENSIONS

MODEL 787-8



	NOMINAL (1)	
	FEET - INCHES	METERS
A	25 - 3	7.70
B	14 - 2	4.32
C	8 - 0	2.44
D	5 - 9	1.75
E	14 - 7	4.45
F (GE ENGINES)	2 - 5	0.74
F (RR ENGINES)	2 - 4	0.71
G	15 - 4	4.67
H	9 - 2	2.79
J	25 - 2	7.67
K	9 - 6	2.90
L	15 - 10	4.83
M	23 - 5	7.13
N	55 - 6	16.92

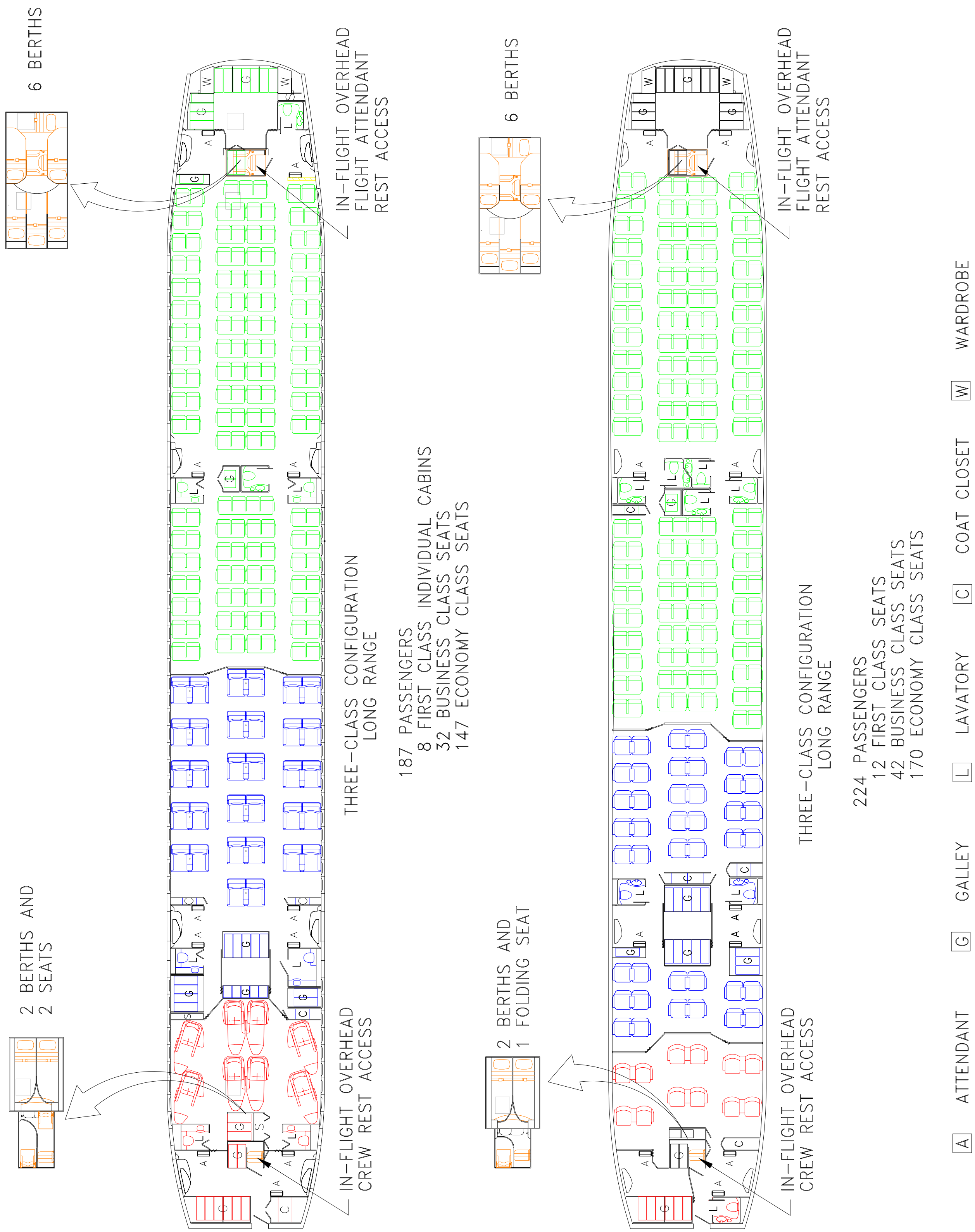
NOTES:

1. NOMINAL DIMENSIONS BASED ON A STATIC AIRPLANE.
2. DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

2.3 GROUND CLEARANCES

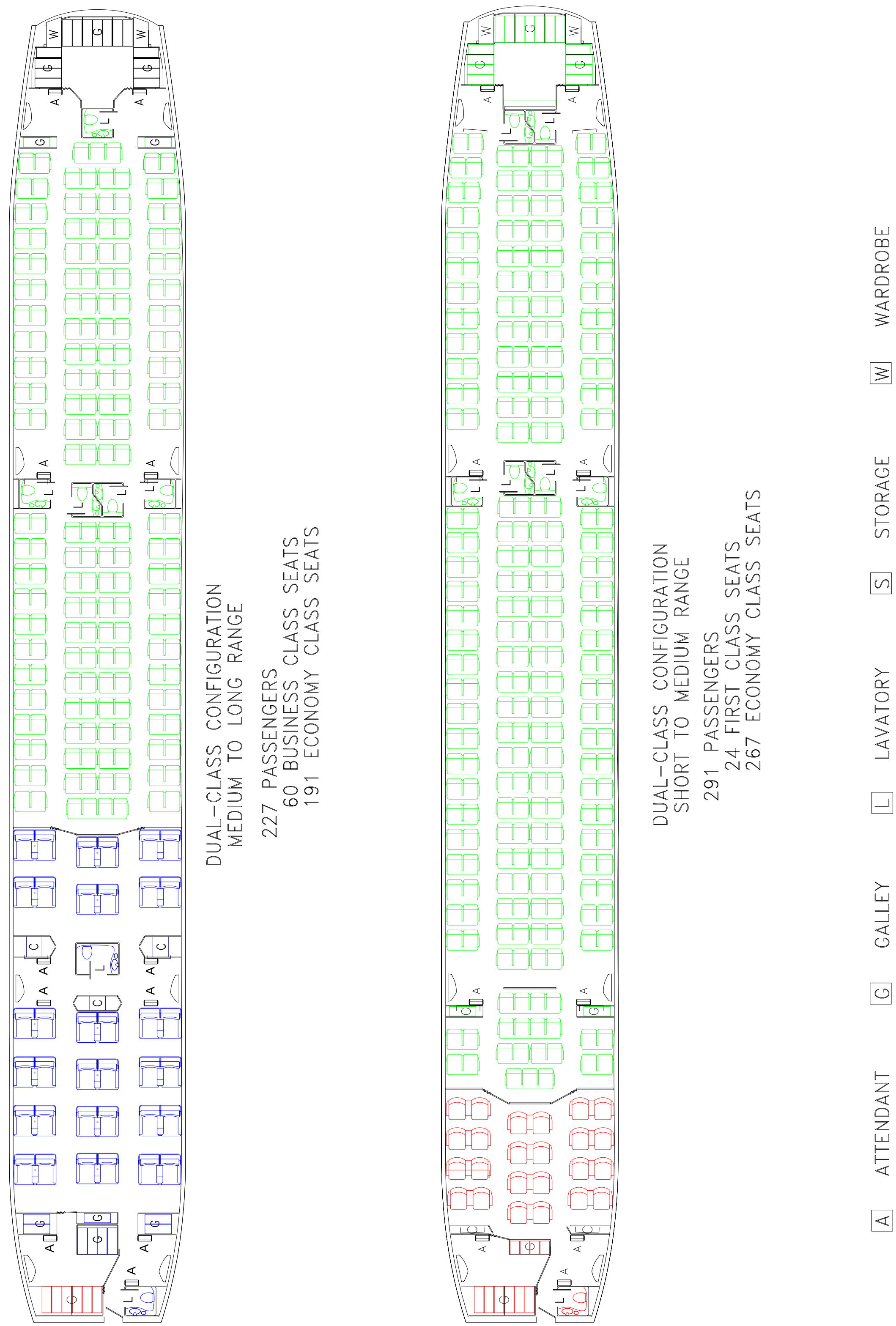
MODEL 787-8

PRELIMINARY INFORMATION



2.4.1 INTERIOR ARRANGEMENTS – LONG-RANGE CONFIGURATIONS

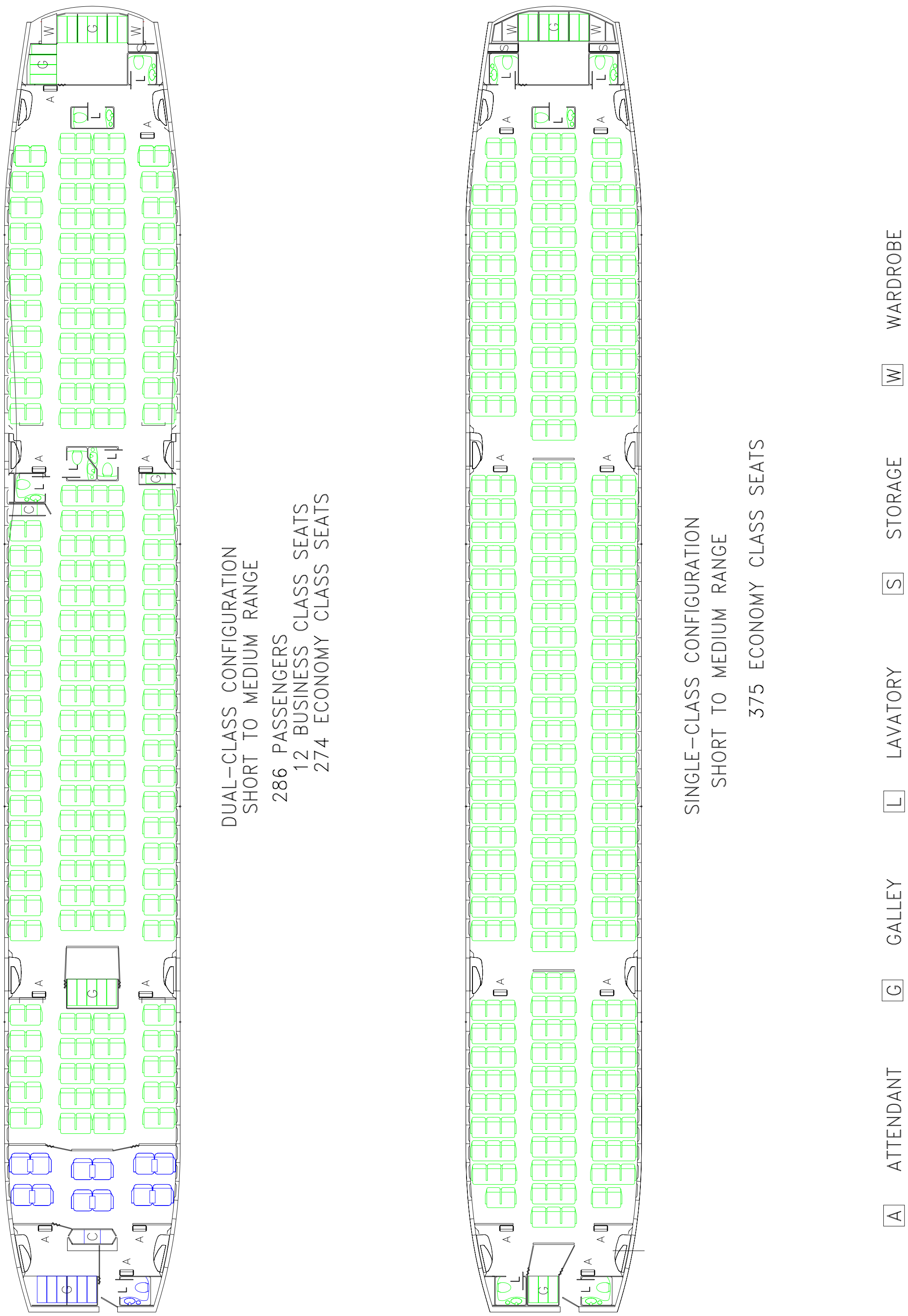
MODEL 787-8



2.4.2 INTERIOR ARRANGEMENTS – SHORT-TO-MEDIUM-TO-LONG RANGE

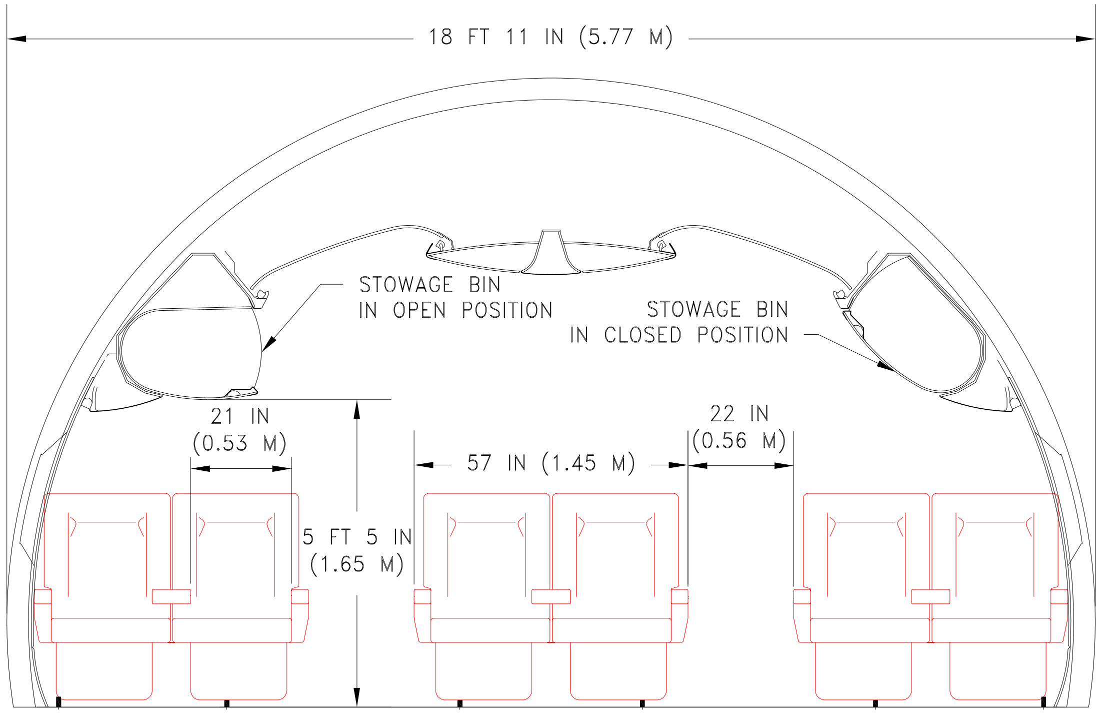
MODEL 787-8

PRELIMINARY INFORMATION

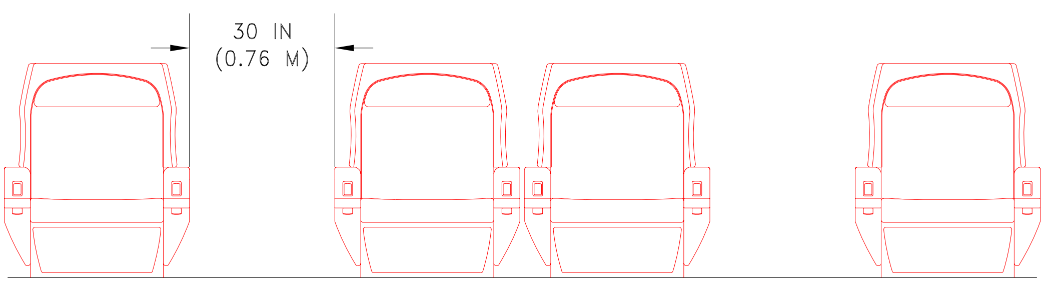


2.4.3 INTERIOR ARRANGEMENTS – SHORT-TO-MEDIUM RANGE

MODEL 787-8



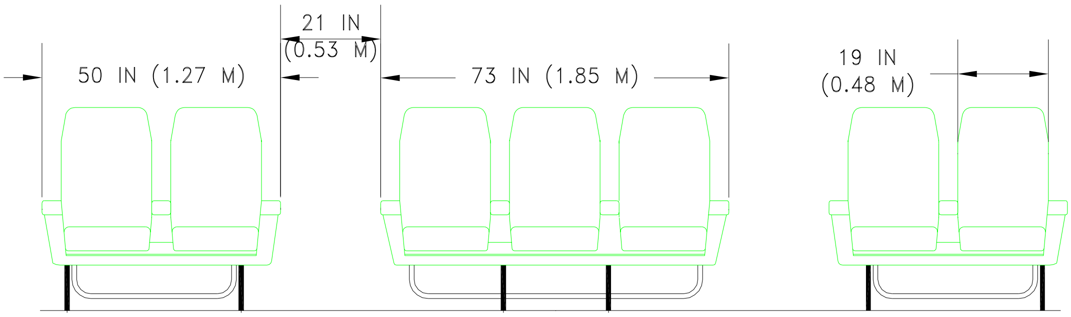
FIRST CLASS/BUSINESS CLASS SEATS



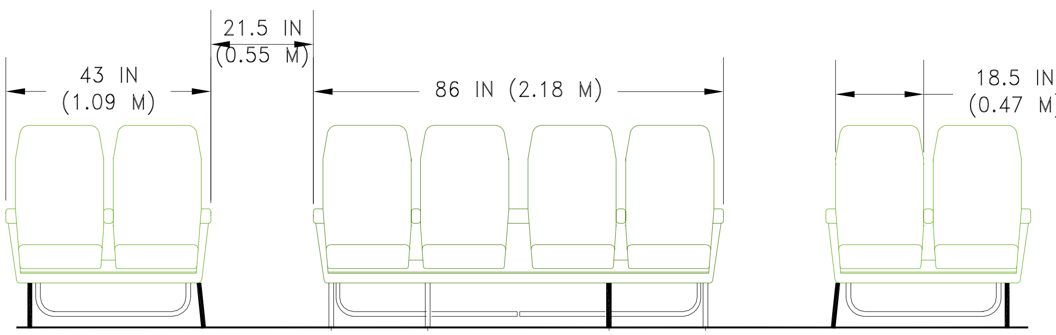
FIRST CLASS POD

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

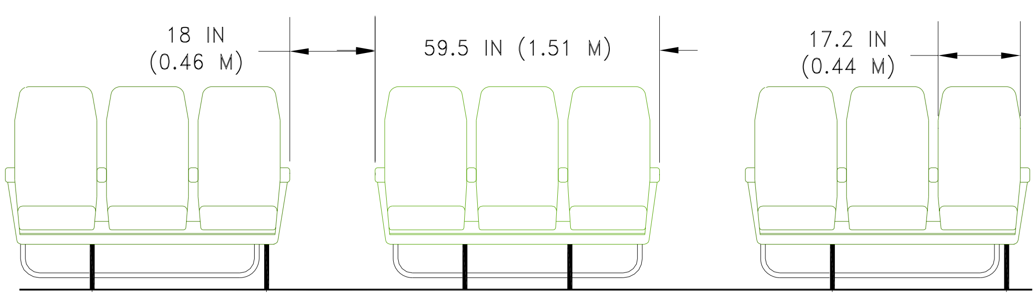
MODEL 787-8



BUSINESS CLASS/PREMIUM ECONOMY CLASS SEATS



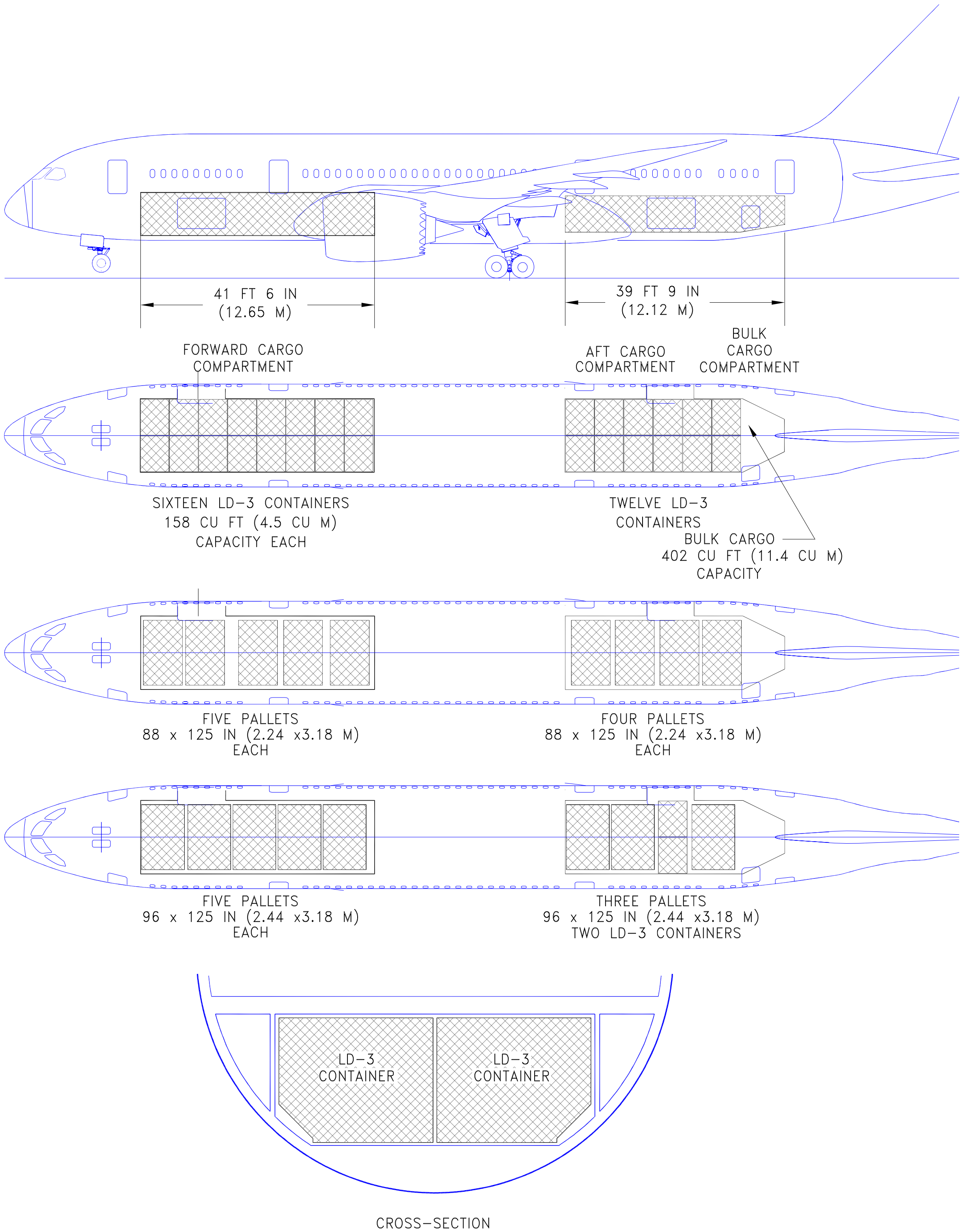
8–ABREAST ECONOMY SEATS



9–ABREAST ECONOMY SEATS

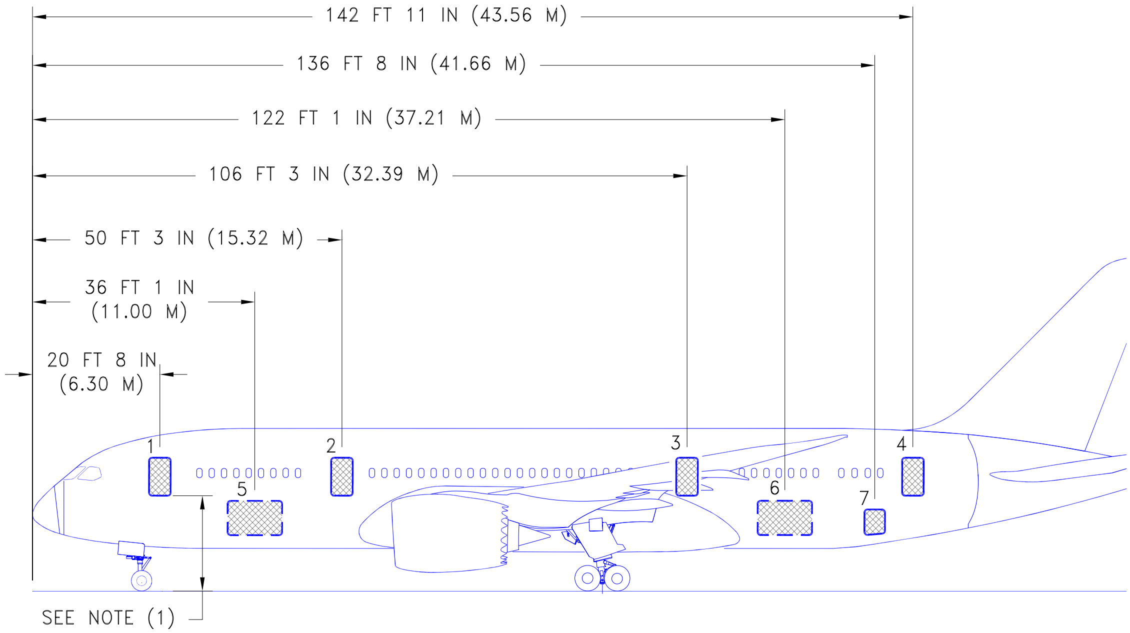
2.5.2 CABIN CROSS-SECTIONS - ALTERNATE SEATING ARRANGEMENTS
MODEL 787-8

PRELIMINARY INFORMATION



2.6 LOWER CARGO COMPARTMENTS – CONTAINERS AND BULK CARGO

MODEL 787-8



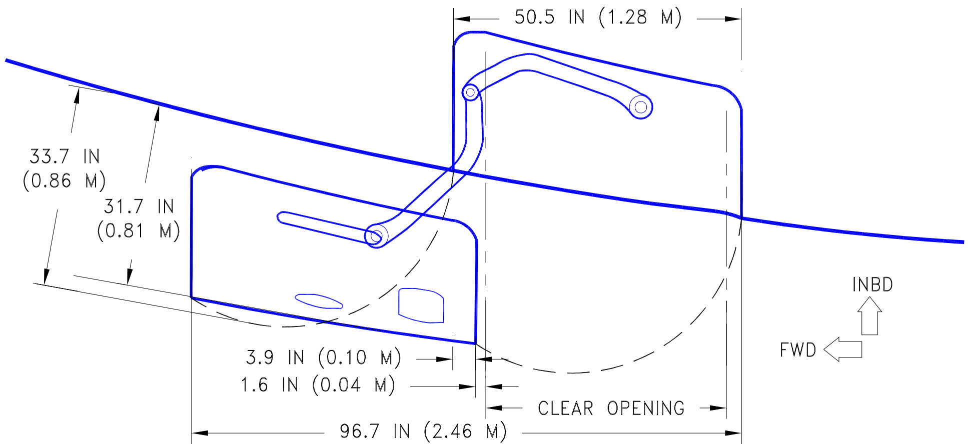
	DOOR NAME	DOOR LOCATION	DOOR CLEAR OPENING
1	MAIN ENTRY/SERVICE DOOR NO 1 (2)	LEFT AND RIGHT	42 IN x 72 IN (1.07 x 1.83 M)
2	MAIN ENTRY/SERVICE DOOR NO 2 (2)	LEFT AND RIGHT	42 IN x 72 IN (1.07 x 1.83 M)
3	EMERGENCY EXIT DOOR NO 3	LEFT AND RIGHT	36 IN x 74 IN (0.91 x 1.88 M)
4	MAIN ENTRY/SERVICE DOOR NO 4 (2)	LEFT AND RIGHT	42 IN x 72 IN (1.07 x 1.83 M)
5	FORWARD CARGO DOOR	RIGHT	106 IN x 67 IN (2.69 x 1.70 M)
6	AFT CARGO DOOR	RIGHT	106 IN x 67 IN (2.69 x 1.70 M)
7	BULK CARGO DOOR	LEFT	40 IN x 45 IN (1.02 x 1.14 M)

NOTES:

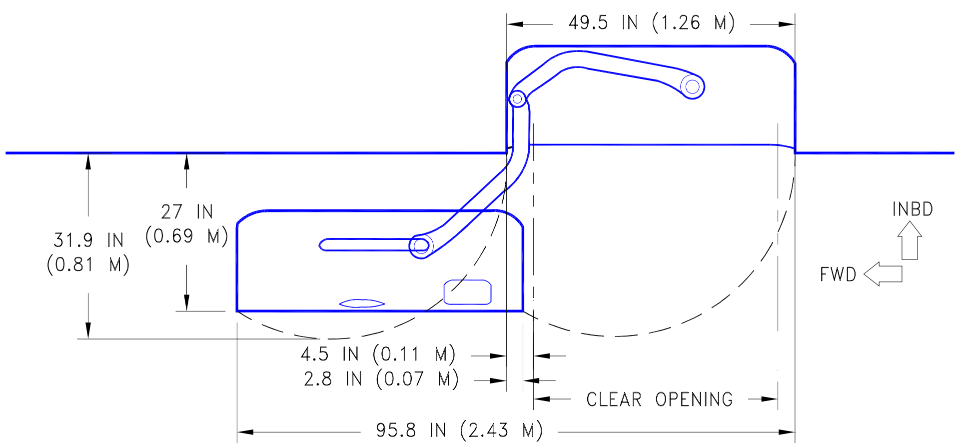
(1) SEE SEC 2.3 FOR DOOR SILL HEIGHTS

(2) ENTRY DOORS LEFT SIDE, SERVICE DOORS RIGHT SIDE

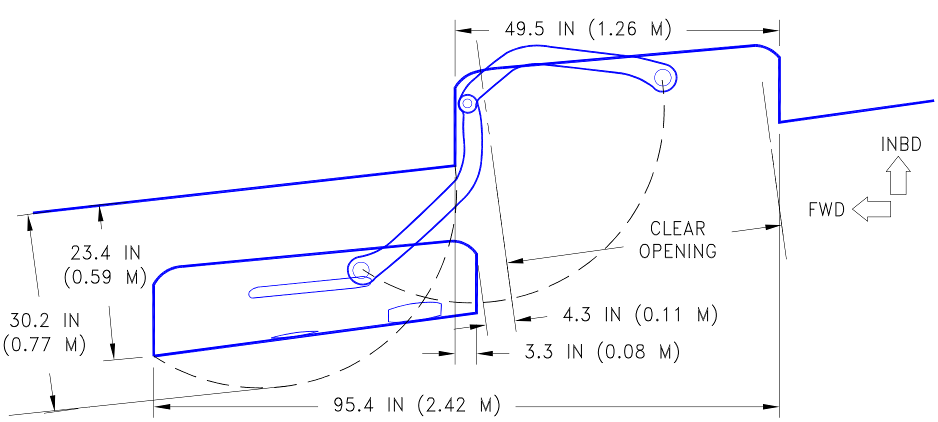
2.7.1 DOOR LOCATIONS AND SIZES - PASSENGER AND CARGO DOORS
MODEL 787-8



DOOR NO 1 SWING ENVELOP
(LEFT DOOR SHOWN, RIGHT DOOR OPPOSITE)



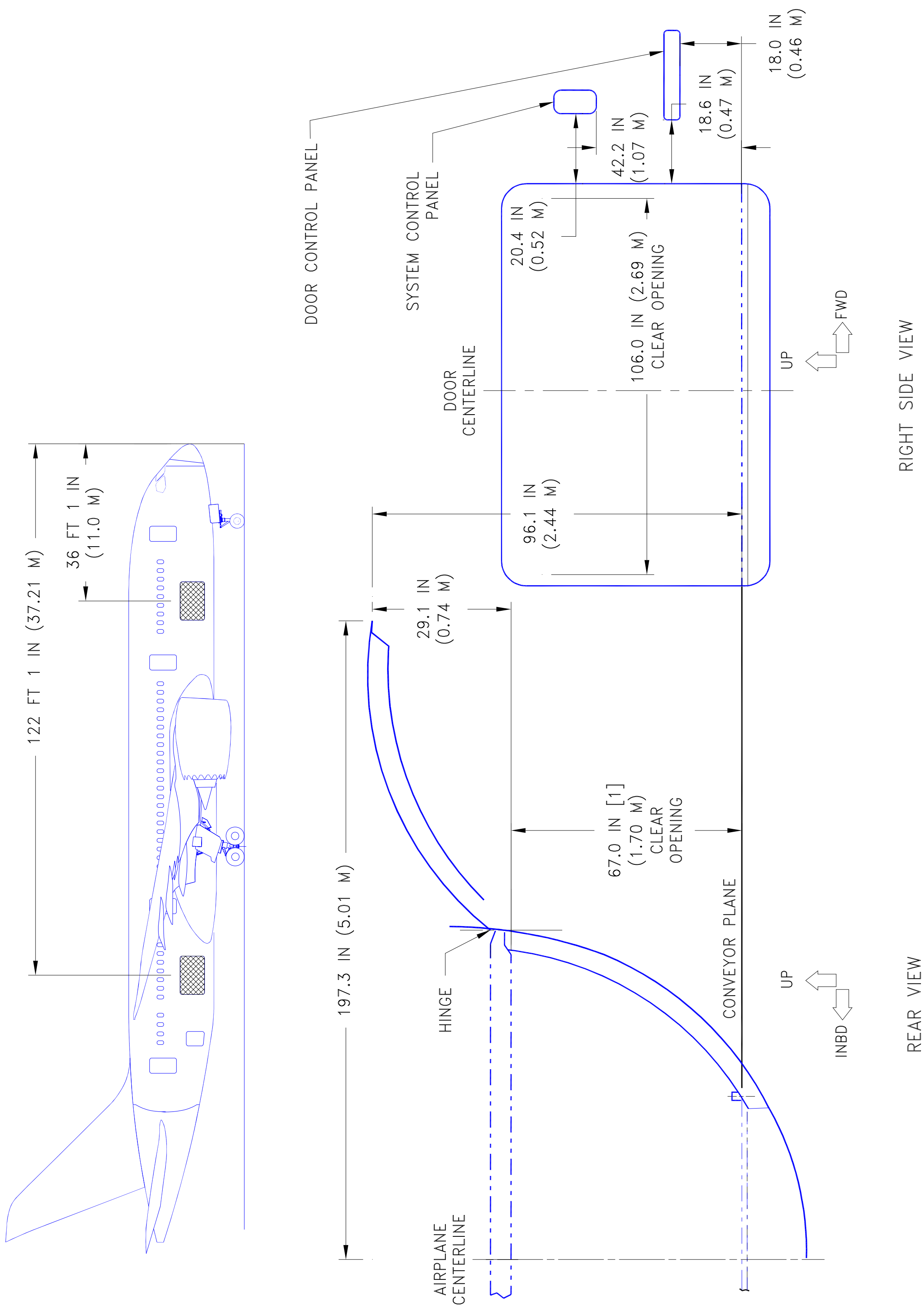
DOOR NO 2 SWING ENVELOP
(LEFT DOOR SHOWN, RIGHT DOOR OPPOSITE)



DOOR NO 4 SWING ENVELOP
(LEFT DOOR SHOWN, RIGHT DOOR OPPOSITE)

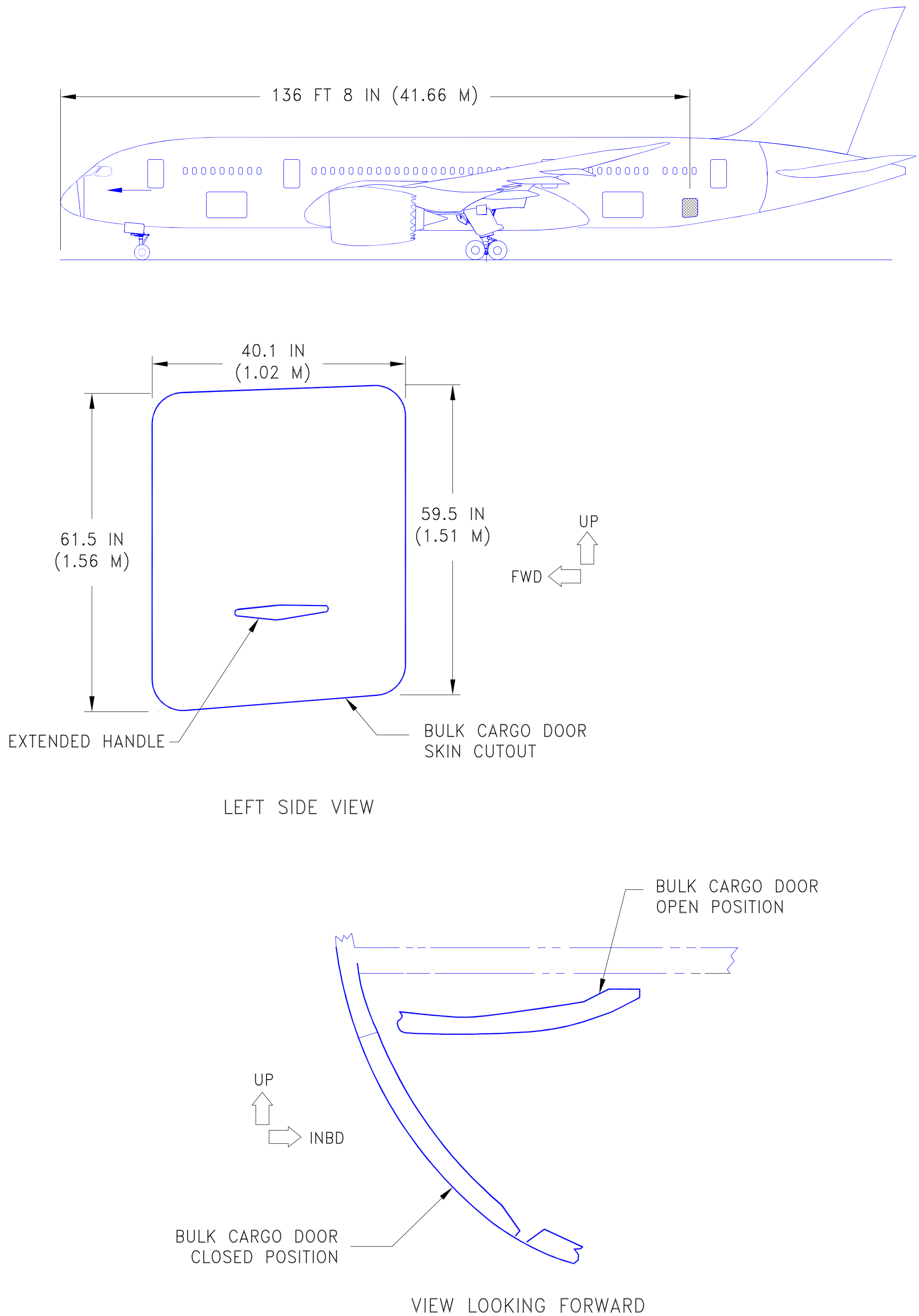
2.7.2 DOOR CLEARANCES – MAIN DECK ENTRY AND SERVICE DOORS

MODEL 787-8



2.7.3 DOOR CLEARANCES – LOWER DECK CARGO DOOR

MODEL 787-8



2.7.4 DOOR CLEARANCES - BULK CARGO DOOR

MODEL 787-8

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SECTION 3.0 – AIRPLANE PERFORMANCE

(Pages 21 – 36)

CURRENTLY UNDERGOING REVISION

4.0 GROUND MANEUVERING

4.0 GROUND MANEUVERING

4.1 General Information

This section provides airplane turning capability and maneuvering characteristics.

For ease of presentation, these data have been determined from the theoretical limits imposed by the geometry of the aircraft, and where noted, provide for a normal allowance for tire slippage. As such, they reflect the turning capability of the aircraft in favorable operating circumstances. These data should be used only as guidelines for the method of determination of such parameters and for the maneuvering characteristics of this aircraft.

In the ground operating mode, varying airline practices may demand that more conservative turning procedures be adopted to avoid excessive tire wear and reduce possible maintenance problems. Airline operating procedures will vary in the level of performance over a wide range of operating circumstances throughout the world. Variations from standard aircraft operating patterns may be necessary to satisfy physical constraints within the maneuvering area, such as adverse grades, limited area, or high risk of jet blast damage. For these reasons, ground maneuvering requirements should be coordinated with the using airlines prior to layout planning.

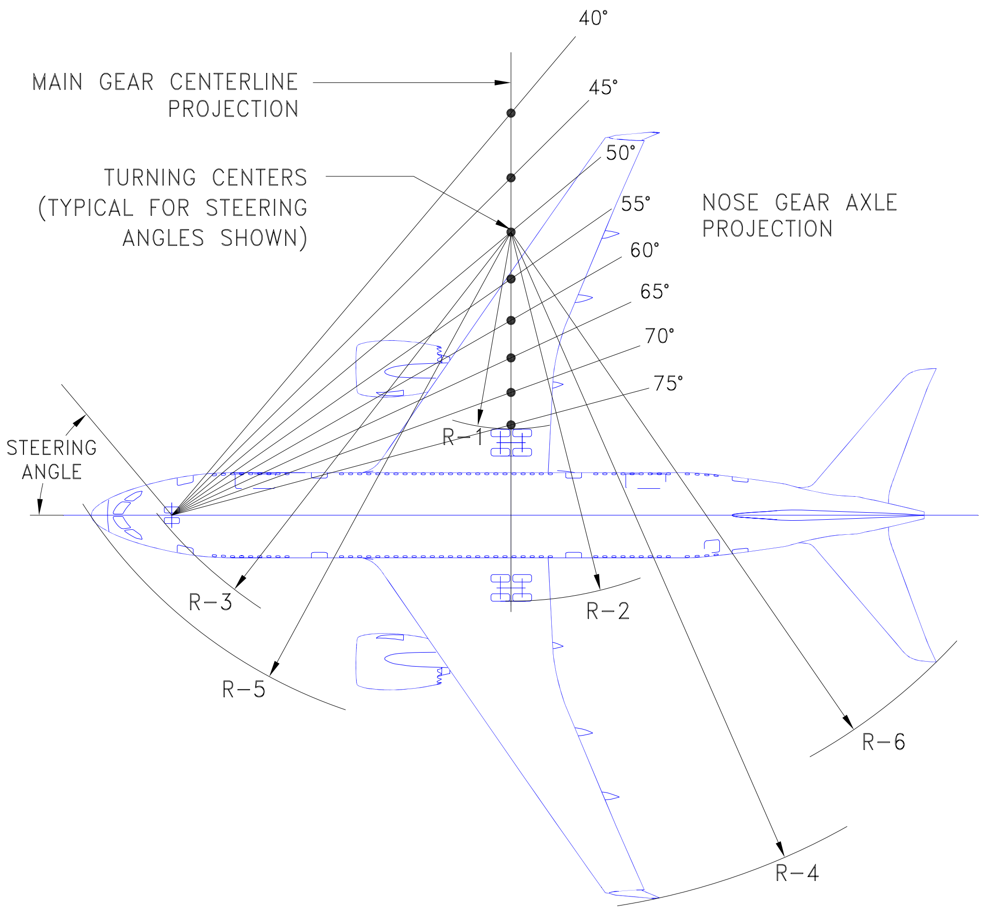
Section 4.2 shows turning radii for various nose gear steering angles. Radii for the main and nose gears are measured from the turn center to the outside of the tire.

Section 4.3 provides data on minimum width of pavement required for 180^{o} turn.

Section 4.4 shows the pilot’s visibility from the cockpit and the limits of ambinocular vision through the windows. Ambinocular vision is defined as the total field of vision seen simultaneously by both eyes.

Section 4.5 shows approximate wheel paths of a 787 on runway to taxiway, and taxiway to taxiway turns.

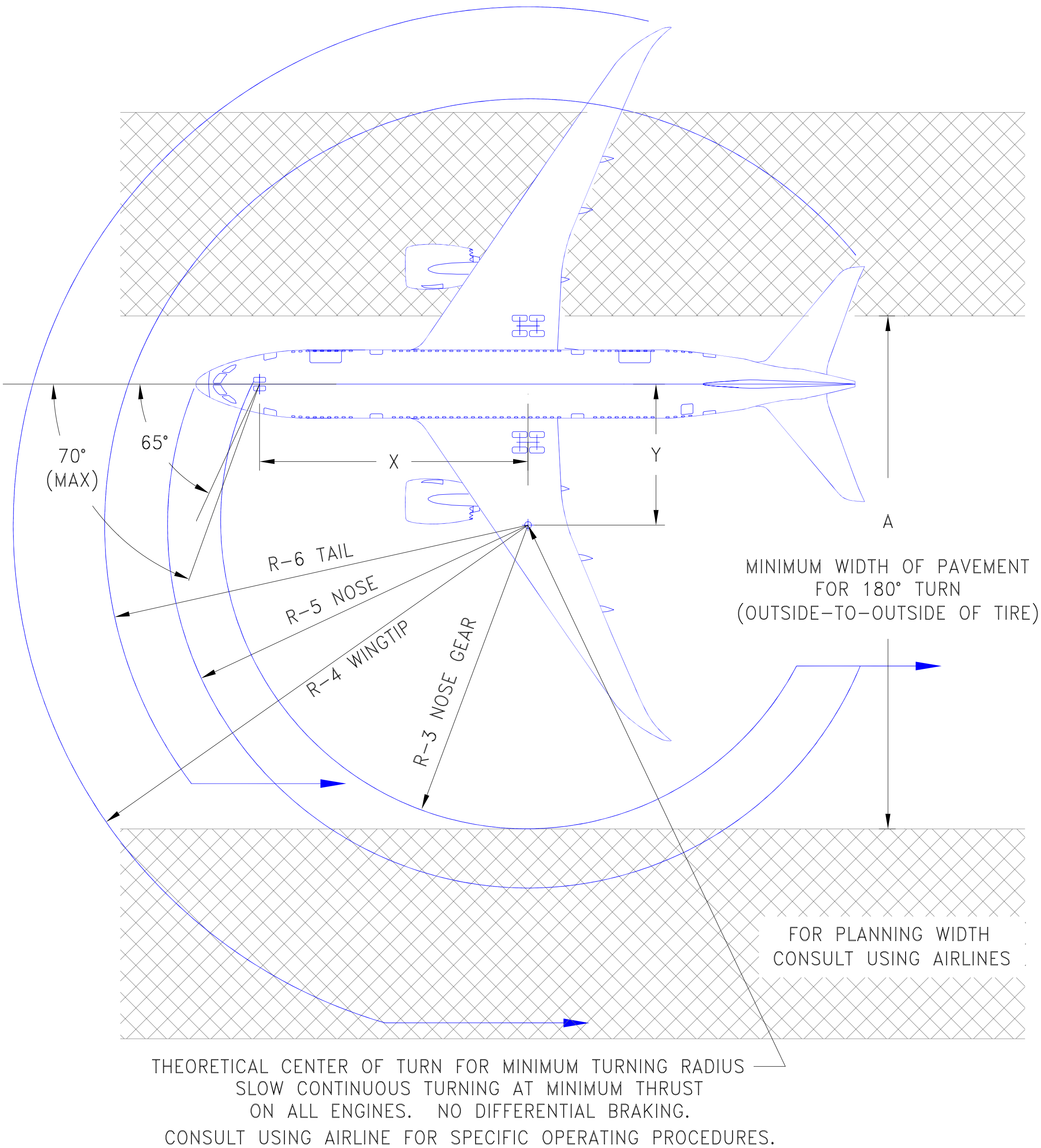
Section 4.6 illustrates a typical runway holding bay configuration.



NOTES: * ACTUAL OPERATING TURNING RADII MAY BE GREATER THAN SHOWN.
* CONSULT WITH AIRLINE FOR SPECIFIC OPERATING PROCEDURE

STEERING ANGLE (DEG)	R-1 INNER GEAR		R-2 OUTER GEAR		R-3 NOSE GEAR		R-4 WING TIP		R-5 NOSE		R-6 TAIL	
	FT	M	FT	M	FT	M	FT	M	FT	M	FT	M
30	110.4	33.7	148.5	45.3	151.4	46.1	231.6	70.6	159.1	48.5	187.1	57.0
35	87.7	26.7	125.8	38.3	132.2	40.3	209.2	63.8	141.3	43.1	167.8	51.1
40	70.0	21.3	108.1	32.9	118.2	36.0	191.9	58.5	128.4	39.1	153.4	46.8
45	55.7	17.0	93.8	28.6	107.6	32.8	177.9	54.2	118.9	36.2	142.3	43.4
50	43.7	13.3	81.8	24.9	99.5	30.3	166.2	50.7	111.8	34.1	133.5	40.7
55	33.3	10.1	71.4	21.8	93.2	28.4	156.2	47.6	106.3	32.4	126.3	38.5
60	24.1	7.3	62.2	19.0	88.2	26.9	147.3	44.9	102.1	31.1	120.3	36.7
65	15.8	4.8	53.9	16.4	84.4	25.7	139.3	42.5	98.8	30.1	115.3	35.1
70	8.2	2.5	46.3	14.1	81.5	24.8	132.0	40.2	96.4	29.4	111.0	33.8

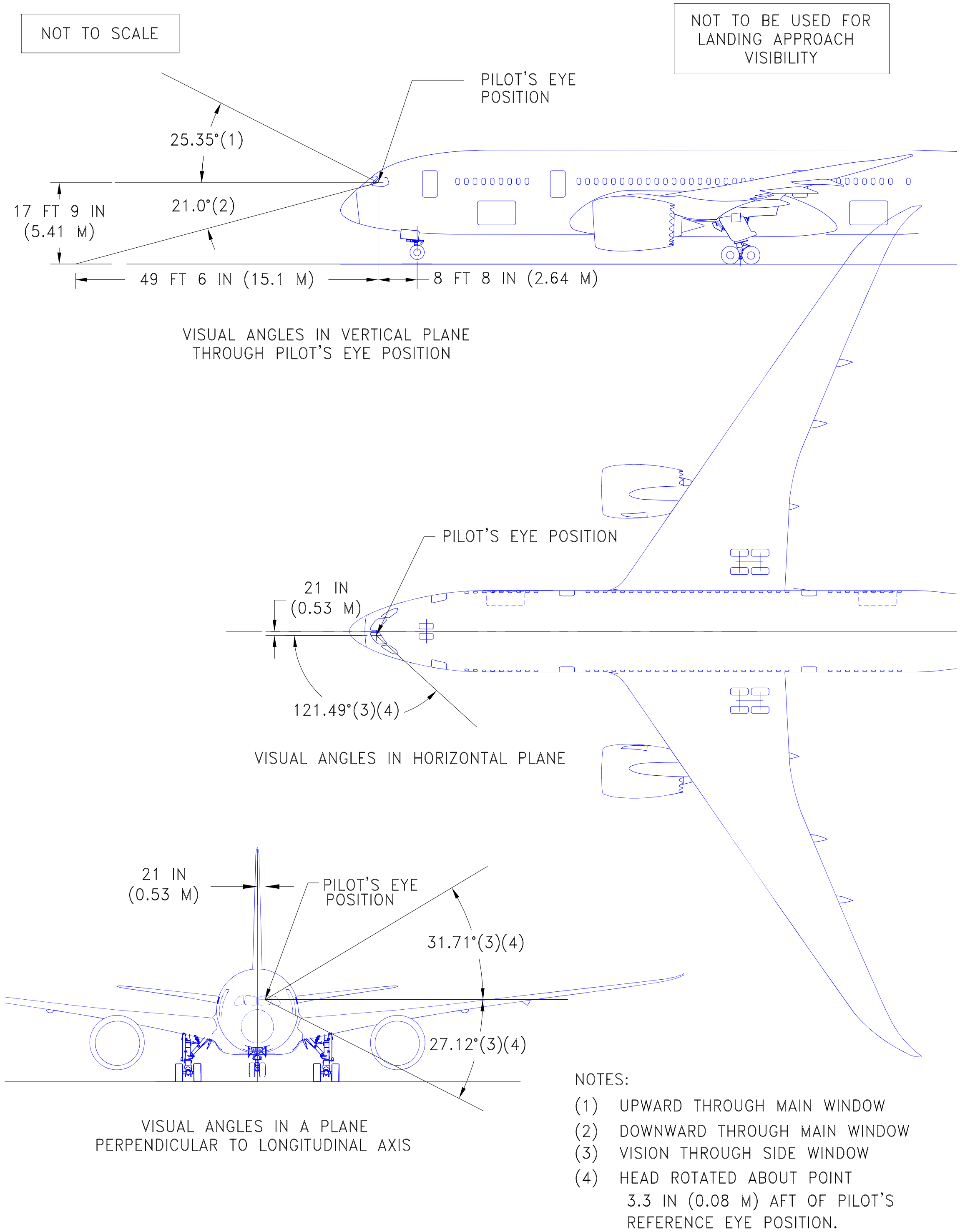
4.2.1 TURNING RADII - NO SLIP ANGLE
MODEL 787-8



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
787-8	65	74.8	22.8	34.9	10.6	138.3	42.2	84.4	25.7	139.3	42.5	98.8	30.1	115.3	35.1

4.3 CLEARANCE RADII

MODEL 787-8

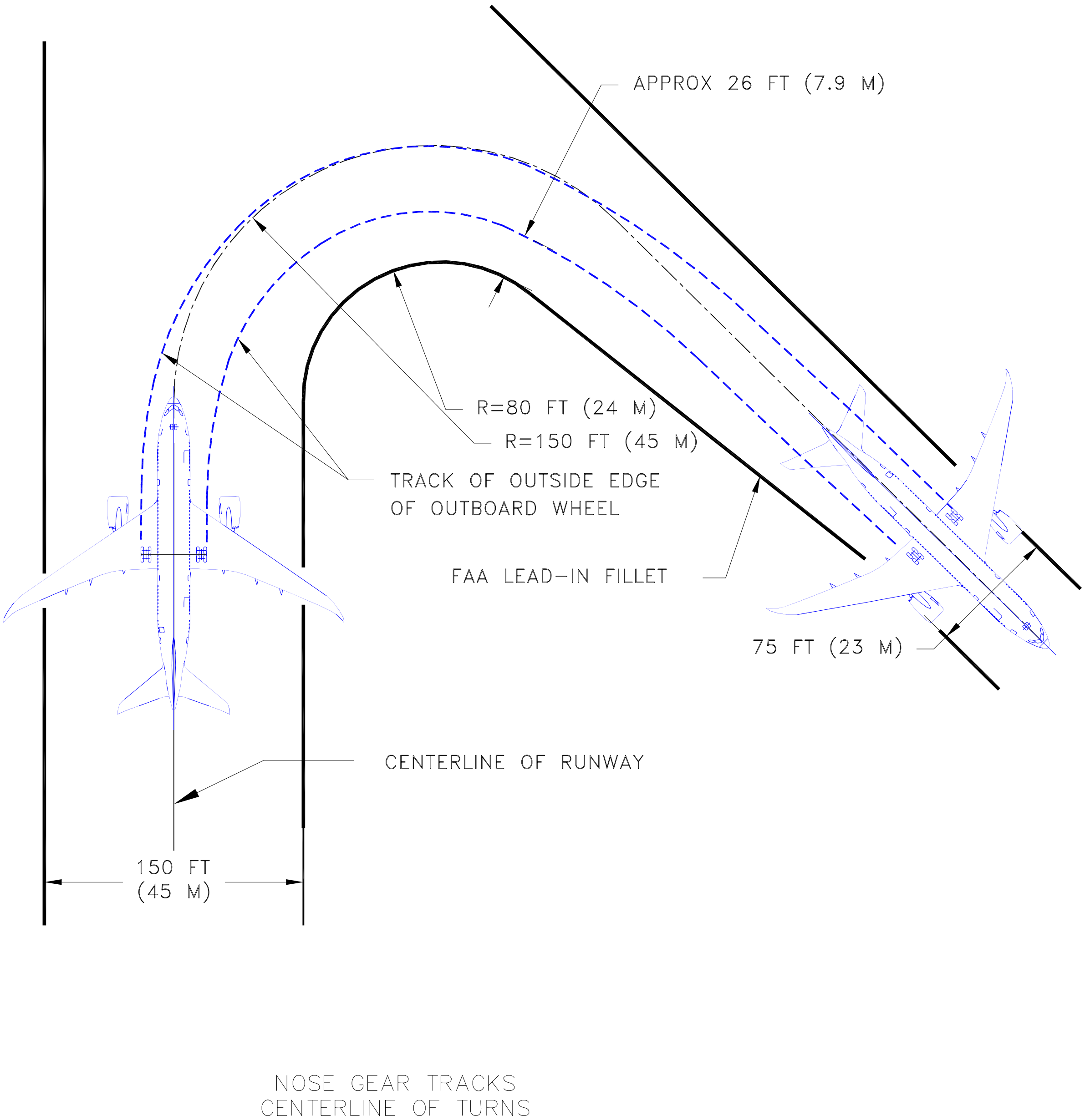


4.4 VISIBILITY FROM COCKPIT IN STATIC POSITION

MODEL 787-8

NOTE

BEFORE DETERMINING THE SIZE OF THE INTERSECTION FILLET, CHECK WITH THE AIRLINES REGARDING THE OPERATING PROCEDURES THAT THEY USE AND THE AIRCRAFT TYPES THAT ARE EXPECTED TO SERVE THE AIRPORT

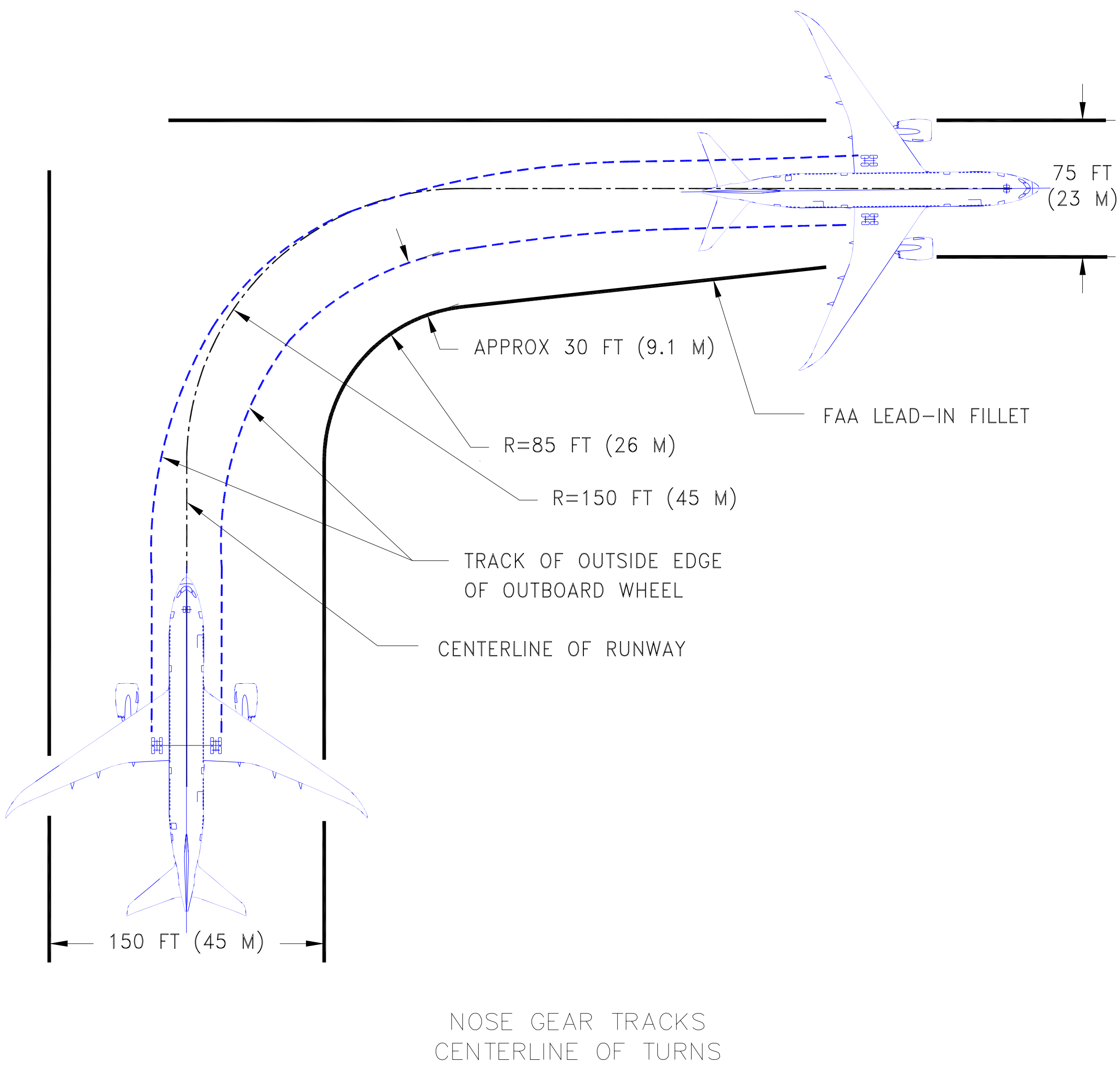


4.5.1 RUNWAY AND TAXIWAY TURNPATHS - RUNWAY-TO-TAXIWAY, MORE THAN 90-DEGREE TURN

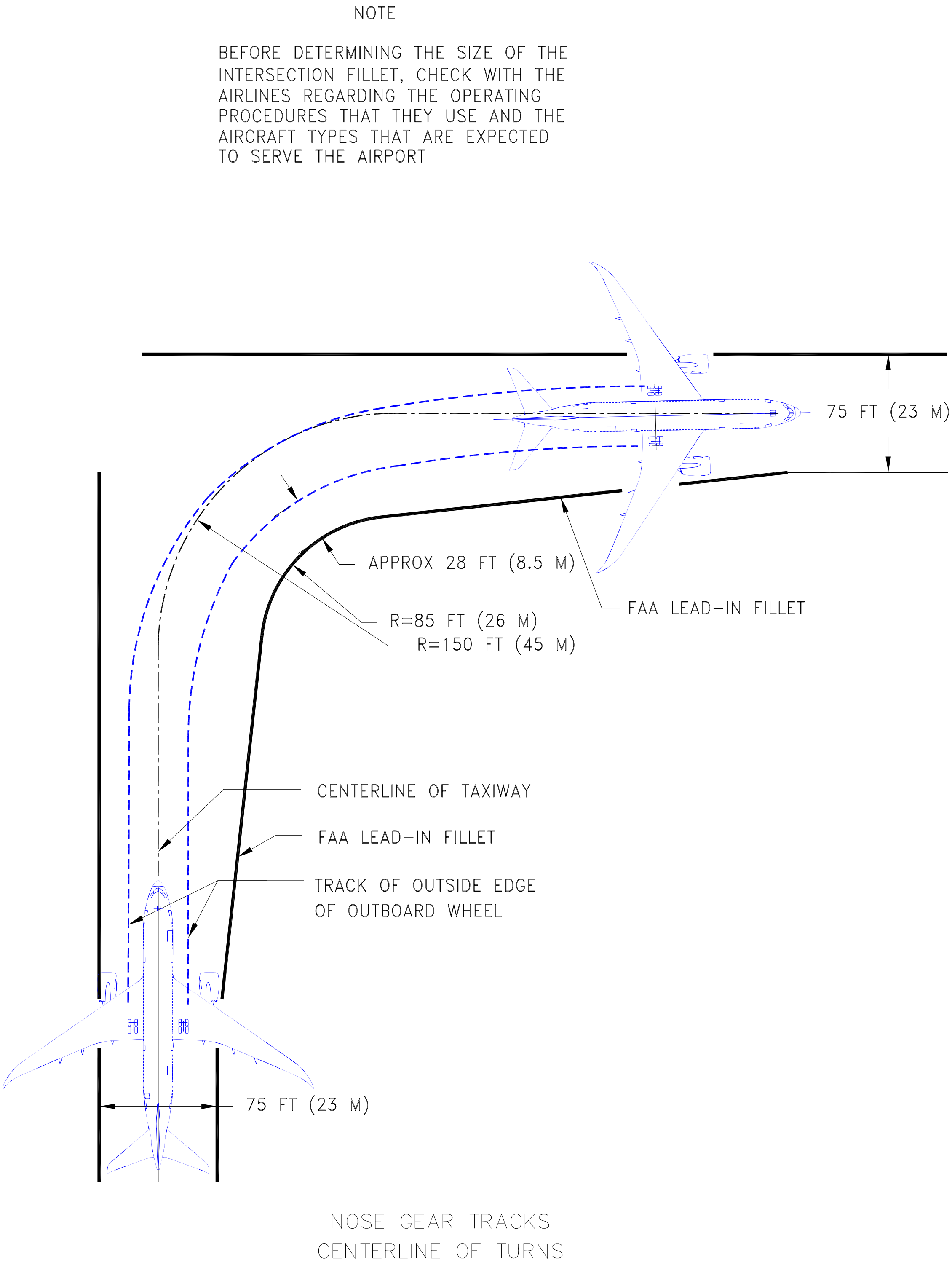
MODEL 787-8

NOTE

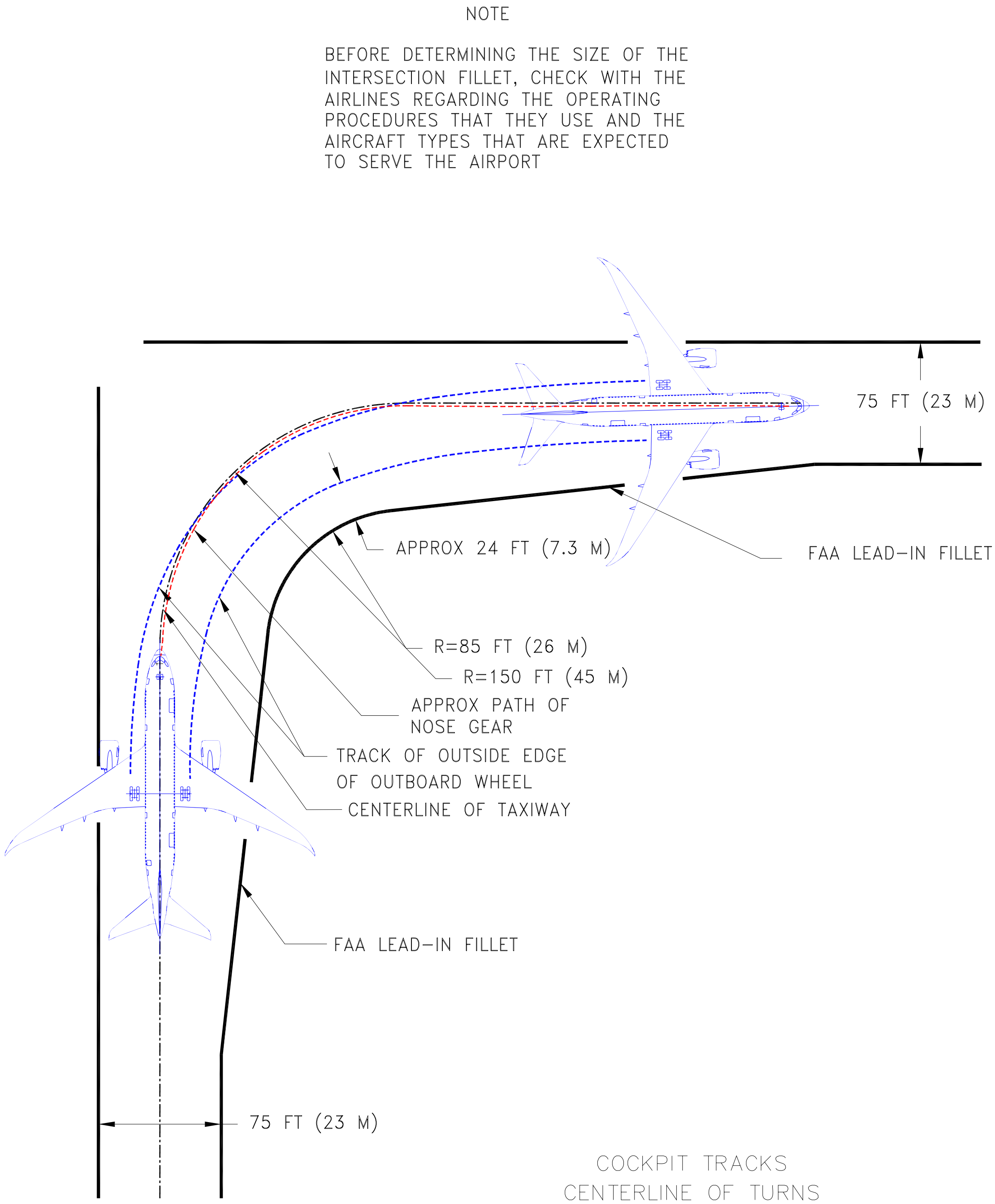
BEFORE DETERMINING THE SIZE OF THE INTERSECTION FILLET, CHECK WITH THE AIRLINES REGARDING THE OPERATING PROCEDURES THAT THEY USE AND THE AIRCRAFT TYPES THAT ARE EXPECTED TO SERVE THE AIRPORT



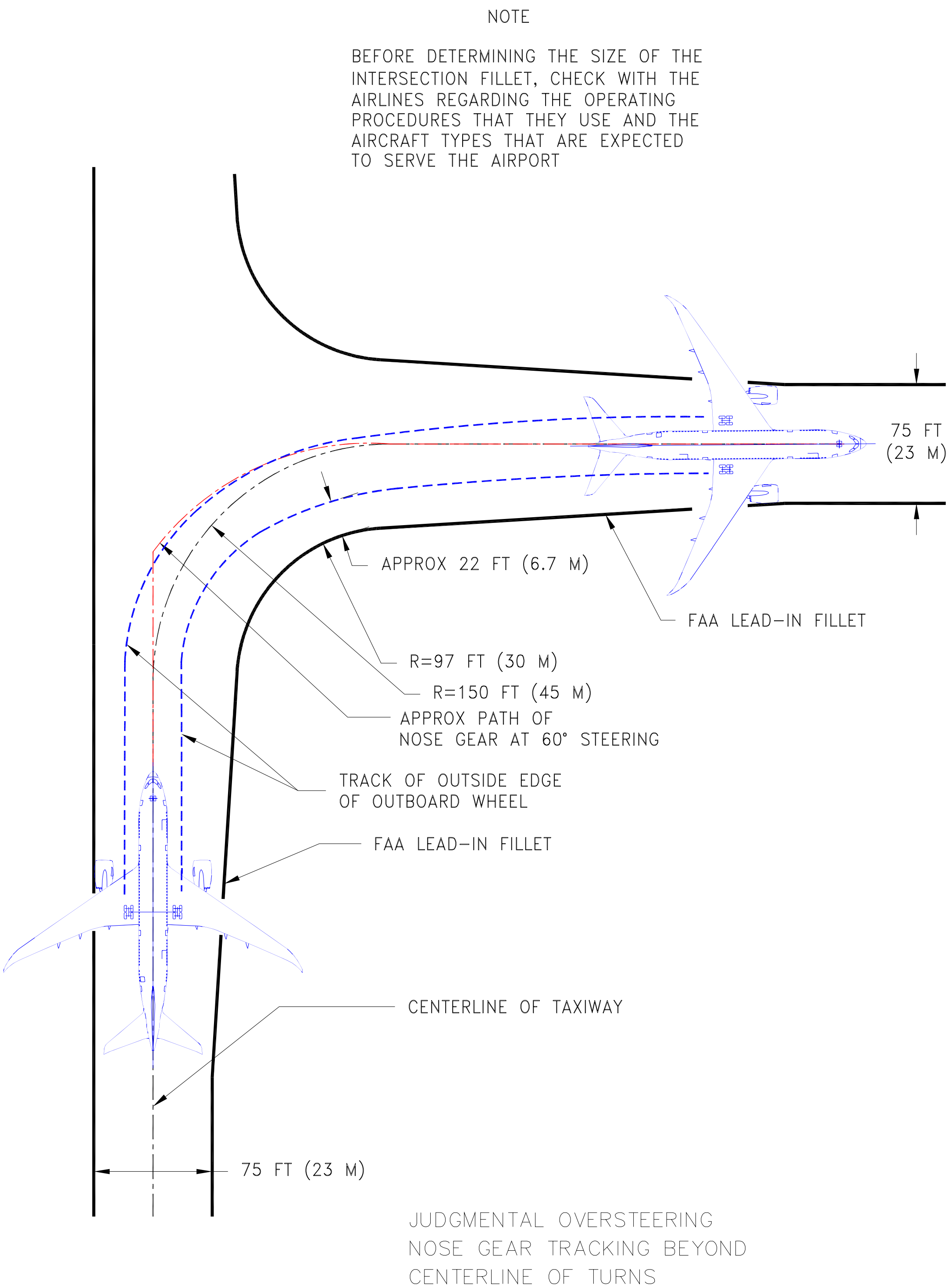
4.5.2 RUNWAY AND TAXIWAY TURNPATHS - RUNWAY-TO-TAXIWAY, 90-DEGREE TURN
MODEL 787-8



4.5.3 RUNWAY AND TAXIWAY TURNPATHS - TAXIWAY-TO-TAXIWAY, 90-DEGREE TURN, NOSE GEAR TRACKS CENTERLINE
MODEL 787-8

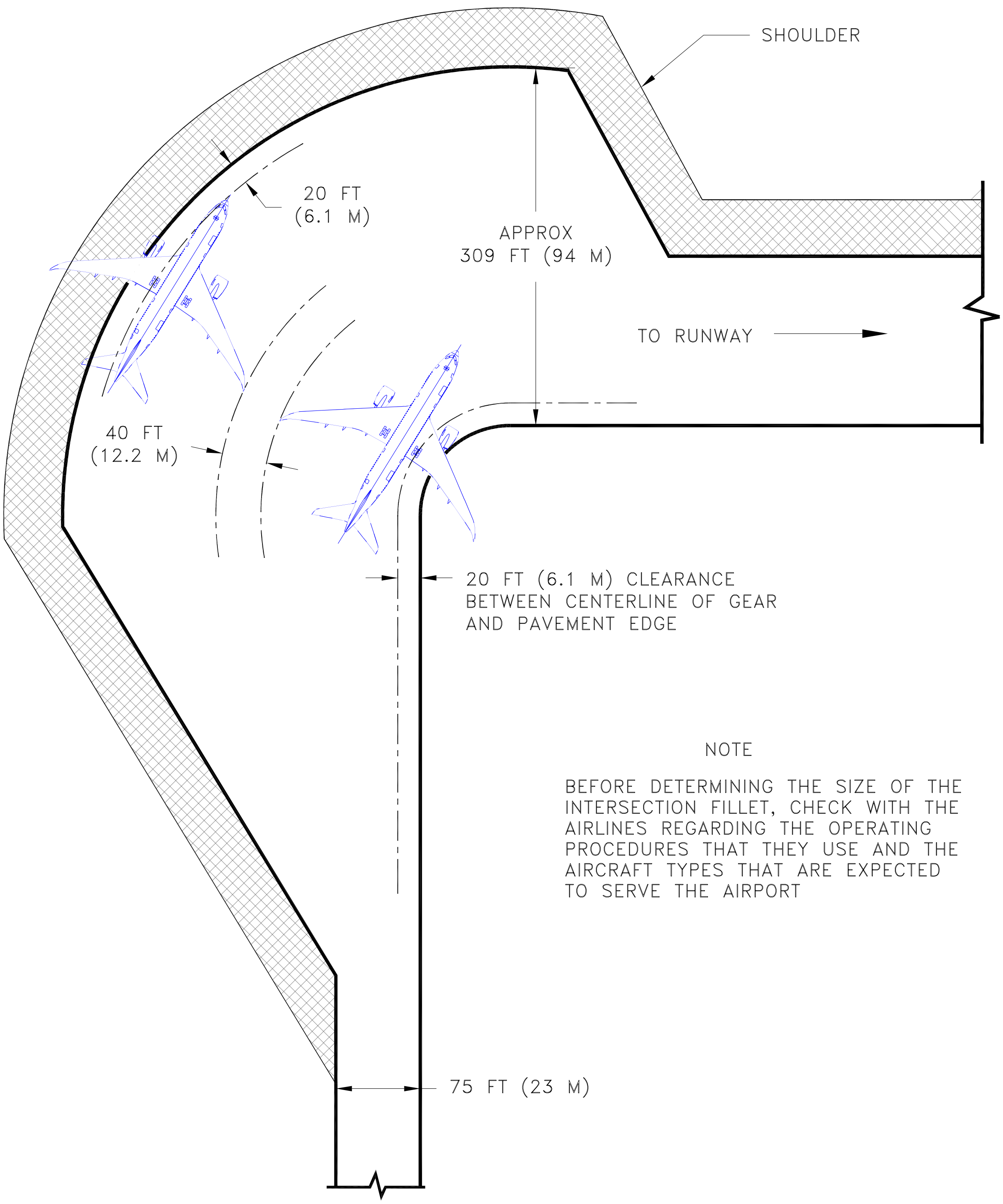


4.5.4 RUNWAY AND TAXIWAY TURNPATHS - TAXIWAY-TO-TAXIWAY, 90-DEGREE TURN, COCKPIT TRACKS CENTERLINE
MODEL 787-8



4.5.5 RUNWAY AND TAXIWAY TURNPATHS - TAXIWAY-TO-TAXIWAY, 90-DEGREE TURN, JUDGMENTAL OVERSTEERING

MODEL 787-8



4.6 RUNWAY HOLDING BAY

MODEL 787-8

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5.0 TERMINAL SERVICING

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.

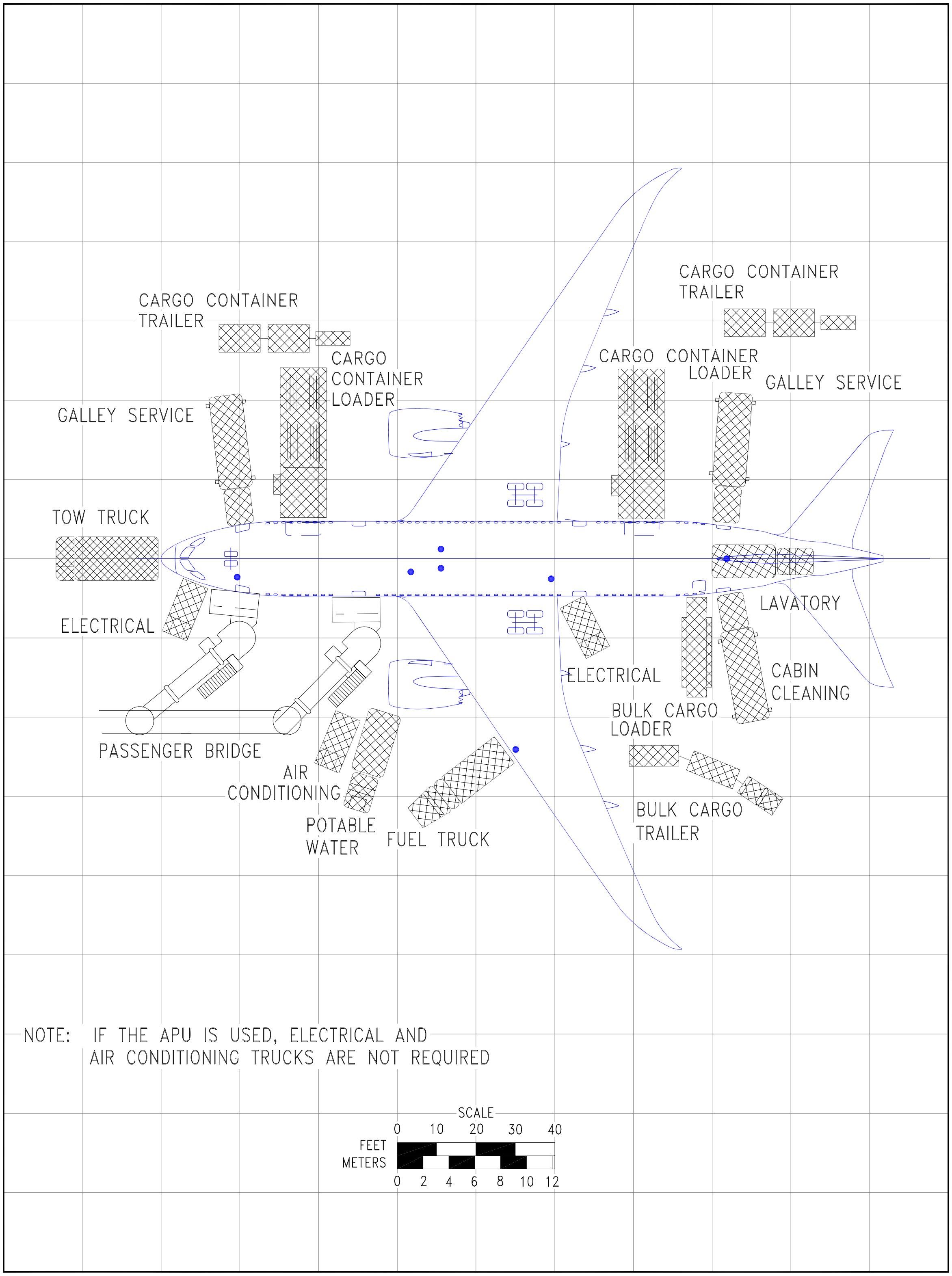
Section 5.4 shows the locations of ground service connections in graphic and in tabular forms. Typical capacities and service requirements are shown in the tables. Services with requirements that vary with conditions are described in subsequent sections.

Section 5.5 shows minimum electrical ground power requirements for engine start. The curves are based on 120-second and 180-second start times depending on the ground power unit.

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 (20.3 cm) 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. AIRPLANE SERVICING ARRANGEMENT - TYPICAL TURNAROUND

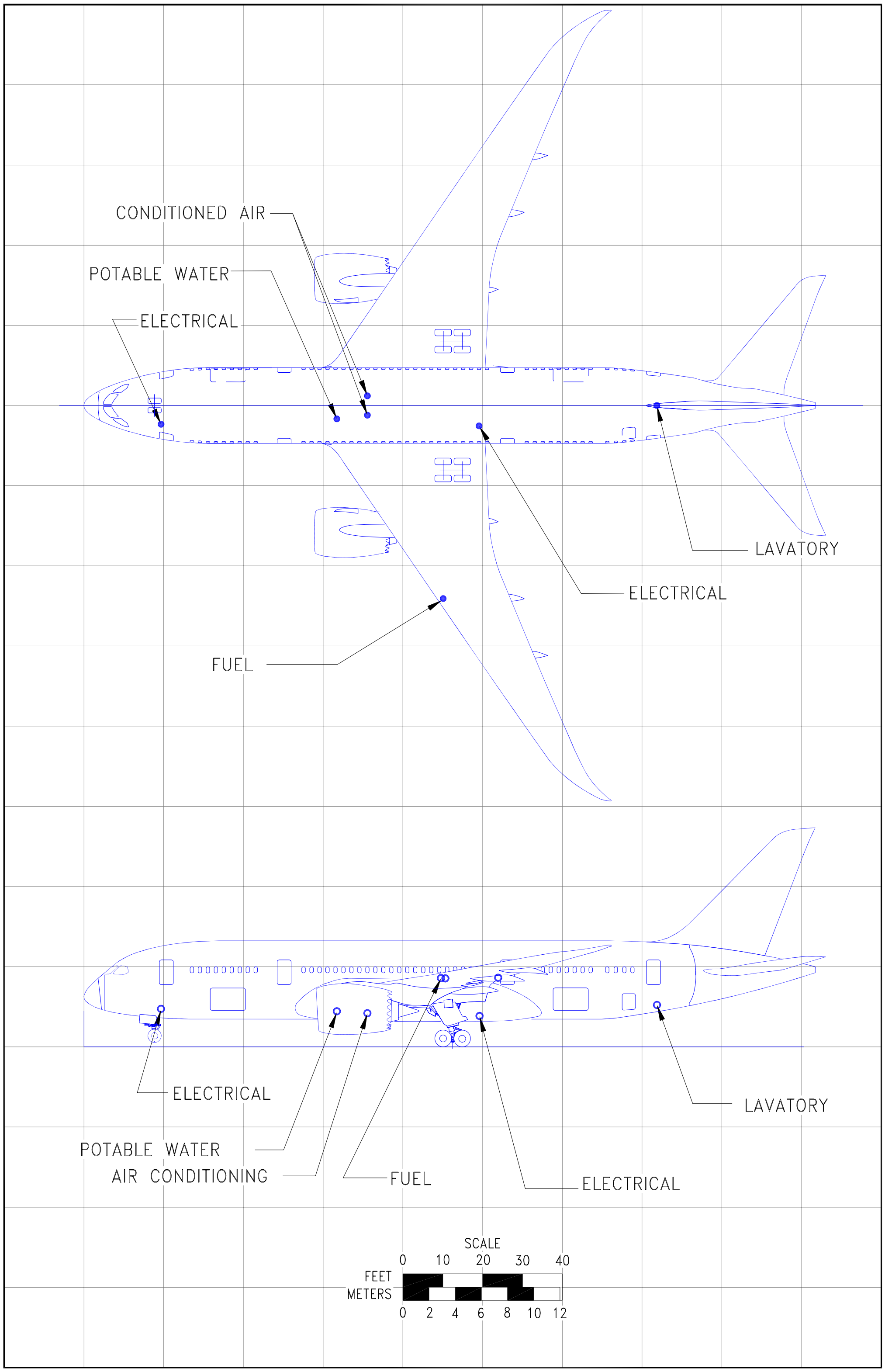
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

5.2.1 TERMINAL OPERATIONS - TURNAROUND STATION
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

5.3.1 TERMINAL OPERATIONS - EN ROUTE STATION
MODEL 787-8



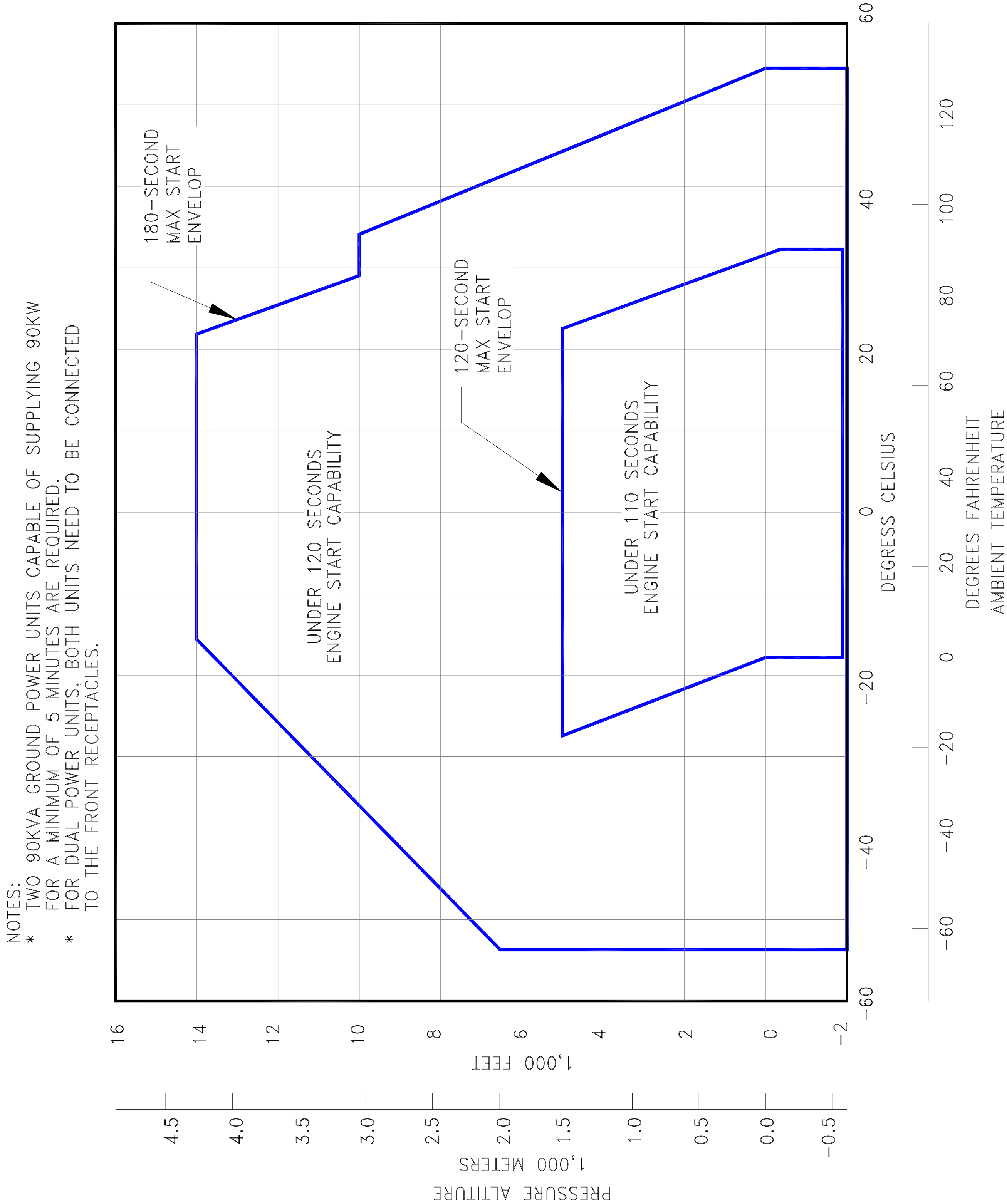
5.4. GROUND SERVICING CONNECTIONS

MODEL 787-8

SYSTEM	MODEL	DISTANCE AFT OF NOSE		DISTANCE FROM AIRPLANE CENTERLINE				MAX HT ABOVE GROUND	
				LH SIDE		RH SIDE			
		FT	M	FT	M	FT	M	FT	M
CONDITIONED AIR TWO 8-IN (20.3 CM) PORTS	787-8	71	21.6	2	0.6	2	0.6	6	1.8
ELECTRICAL TWO LOCATIONS WITH TWO CONNECTIONS EACH 90 KVA , 200/115 V AC 400 HZ,	787-8	24 99	7.3 30.2	5 5	1.5 1.5	- -	- -	8 7	2.4 2.1
POTABLE WATER ONE SERVICE CONNECTION	787-8	63	19.2	3	0.9	-	-	6	1.8
FUEL ONE UNDERWING PRESSURE CONNECTOR WITH TWO FUELING PORTS TOTAL CAPACITY 33,528 US GAL (126,903 LITERS)	787-8	90	27.4	48	14.6	-	-	17	5.2
LAVATORY BOTH FORWARD AND AFT TOILETS ARE SERVICED THROUGH ONE SERVICE PANEL	787-8	144	43.9	0	0	0	0	9.5	2.9

5.4.2 GROUND SERVICING CONNECTIONS AND CAPACITIES
MODEL 787-8

PRELIMINARY INFORMATION



5.5 ENGINE START REQUIREMENTS

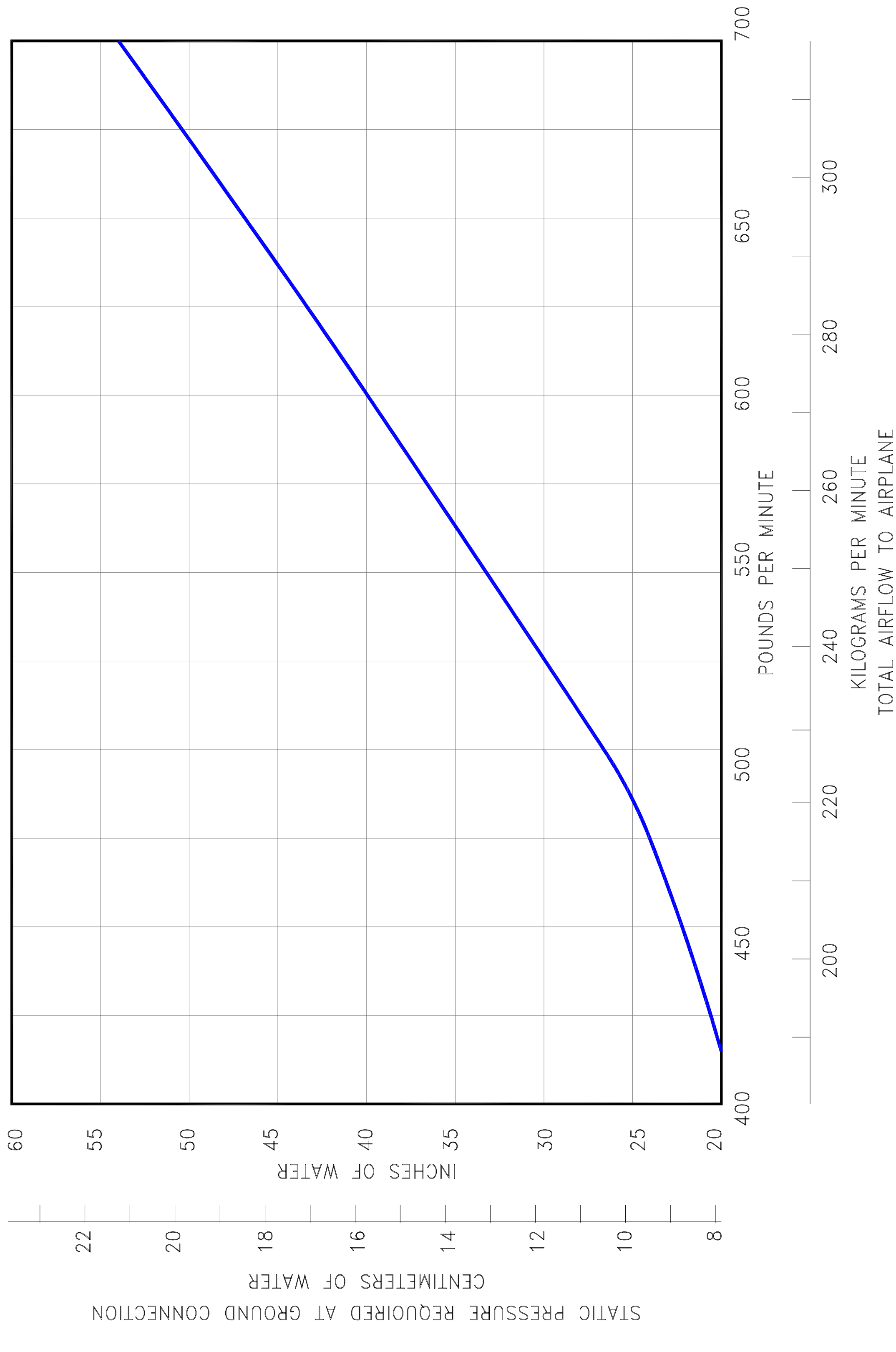
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

5.6.1 CONDITIONED AIR FLOW REQUIREMENTS – HEATING
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

5.6.2 CONDITIONED AIR FLOW REQUIREMENTS – COOLING
MODEL 787-8



5.7.1 CONDITIONED AIR FLOW REQUIREMENTS – STEADY STATE
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

5.8.1 GROUND TOWING REQUIREMENTS - ENGLISH UNITS
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

5.8.2 GROUND TOWING REQUIREMENTS - METRIC UNITS
MODEL 787-8

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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 787-8 airplane. 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 exhaust velocity and therefore are not included.

The graphs show jet wake velocity and temperature contours for representative engines. The results are valid for sea level, static, standard day conditions. The effect of wind on jet wakes is 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.

DATA TO BE PROVIDED
AT A LATER DATE

6.1.1 PREDICTED JET ENGINE EXHAUST VELOCITY CONTOURS - IDLE THRUST
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

6.1.2 PREDICTED JET ENGINE EXHAUST VELOCITY CONTOURS - BREAKAWAY THRUST
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

6.1.3 PREDICTED JET ENGINE EXHAUST VELOCITY CONTOURS - TAKEOFF THRUST

MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

6.1.4 PREDICTED JET ENGINE EXHAUST TEMPERATURE CONTOURS - IDLE THRUST
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

6.1.5 PREDICTED JET ENGINE EXHAUST TEMPERATURE CONTOURS - BREAKAWAY THRUST
MODEL 787-8

DATA TO BE PROVIDED
AT A LATER DATE

6.1.6 PREDICTED JET ENGINE EXHAUST TEMPERATURE CONTOURS - TAKEOFF THRUST
MODEL 787-8

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.

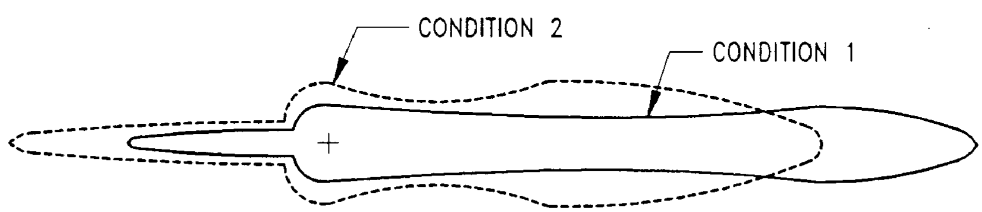
3. Surface Condition-Shielding, Extra Ground Attenuation (EGA)

(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

7.0 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 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 (ι) 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 7.10) 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:

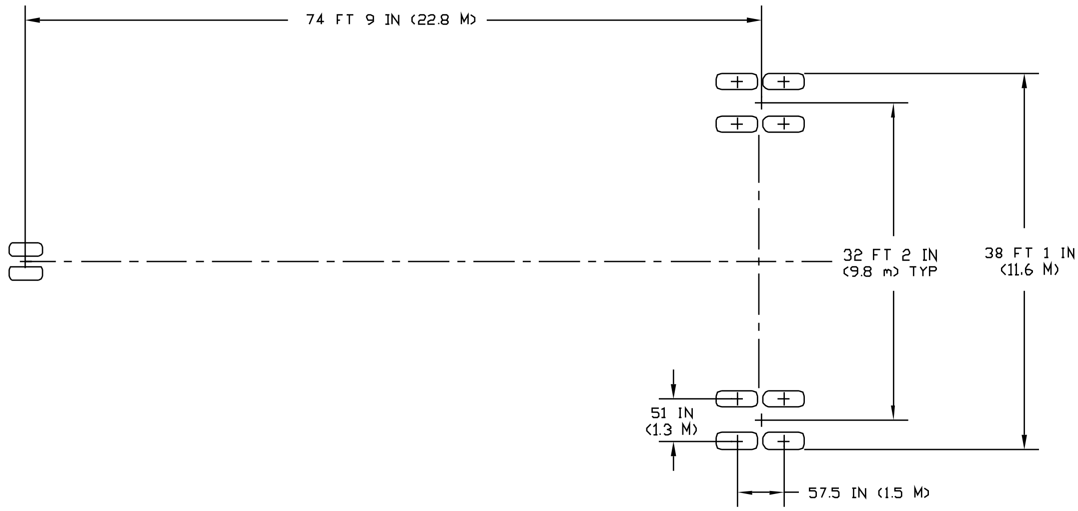
PCN	PAVEMENT TYPE	SUBGRADE CATEGORY	TIRE PRESSURE CATEGORY	EVALUATION METHOD
	R = Rigid F = Flexible	A = High B = Medium C = Low D = Ultra Low	W = No Limit X = To 217 psi (1.5 MPa) Y = To 145 psi (1.0 MPa) Z = To 73 psi (0.5 MPa)	T = Technical U = Using Aircraft

Section 7.10.1 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 7.10.2 shows the aircraft ACN values for rigid pavements. The four subgrade categories are:

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



	UNITS	787-8
MAXIMUM DESIGN TAXI WEIGHT	LB	482,000
	KG	218,632
PERCENT OF WEIGHT ON MAIN GEAR		SEE SECTION 7.4
NOSE GEAR TIRE SIZE	IN.	40 x 16.0 R16 26PR
NOSE GEAR TIRE PRESSURE	PSI	187
	KG/CM^2	13.15
MAIN GEAR TIRE SIZE	IN.	50 x 20.0 R22 34 PR
MAIN GEAR TIRE PRESSURE	PSI	221
	KG/CM^2	15.47

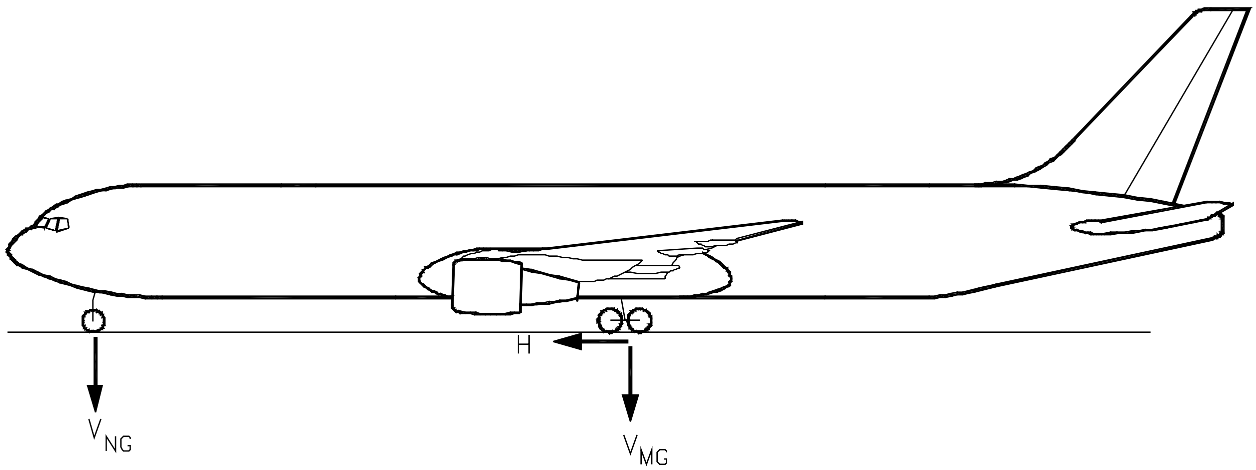
7.2 LANDING GEAR FOOTPRINT

MODEL 787-8

$V_{(NG)}$ = 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

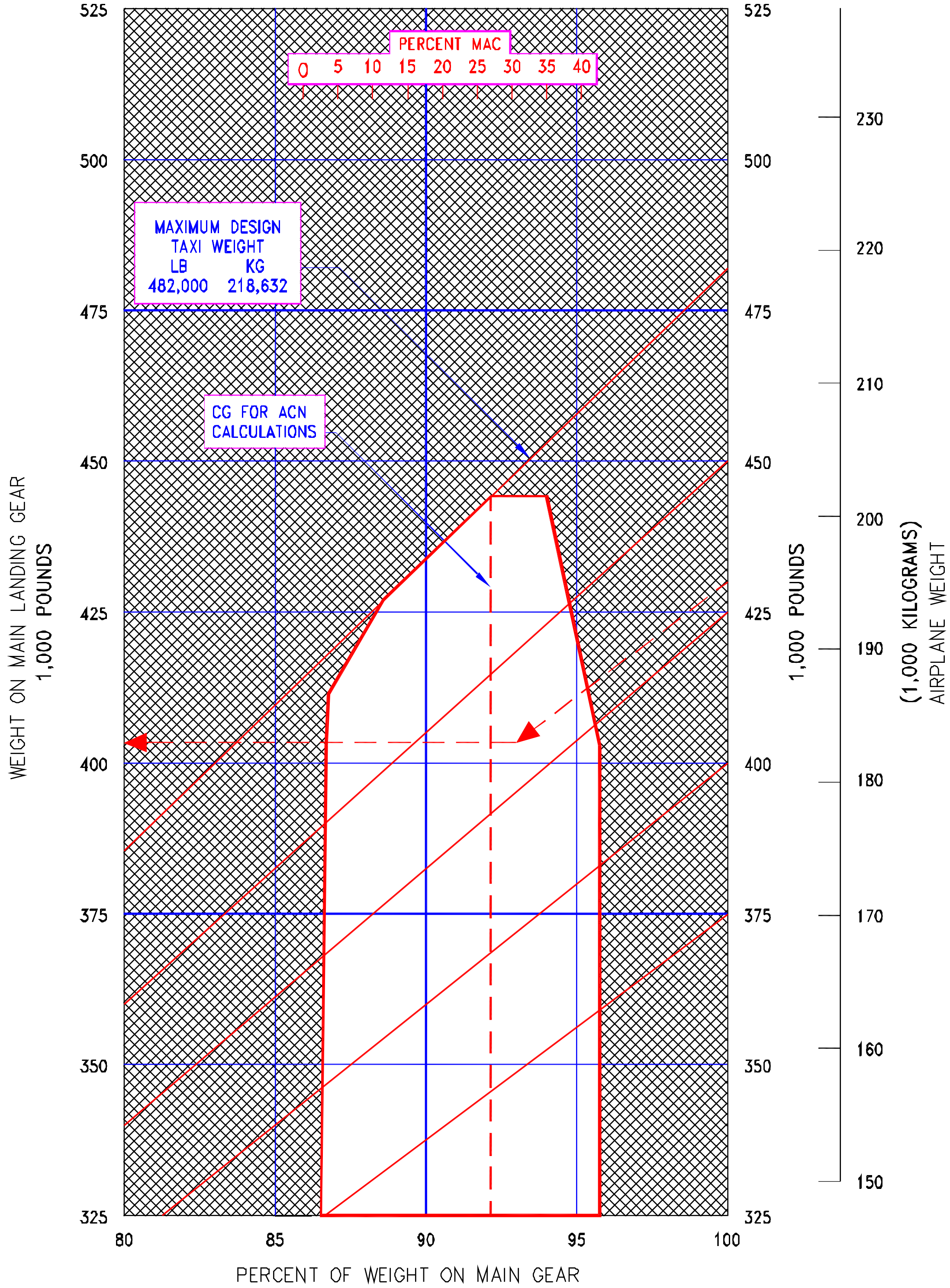


NOTE: ALL LOADS CALCULATED USING AIRPLANE MAXIMUM DESIGN TAXI WEIGHT

MODEL	UNIT	MAXIMUM DESIGN TAXI WEIGHT	$V_{(NG)}$		$V_{(MG)}$ PER STRUT	H PER STRUT	
			STATIC AT MOST FWD C.G.	STATIC + BRAKING 10 FT/SEC^2 DECEL	MAX LOAD AT STATIC AFT C.G.	STEADY BRAKING 10 FT/SEC^2 DECEL	AT INSTANTANEOUS BRAKING (u= 0.8)
787-8	LB	482,000	55,166	84,240	222,042	74,855	177,634
	KG	218,632	25,022	38,210	100,716	33,954	80,573

7.3 MAXIMUM PAVEMENT LOADS

MODEL 787-8



7.4 LANDING GEAR LOADING ON PAVEMENT

MODEL 787-8

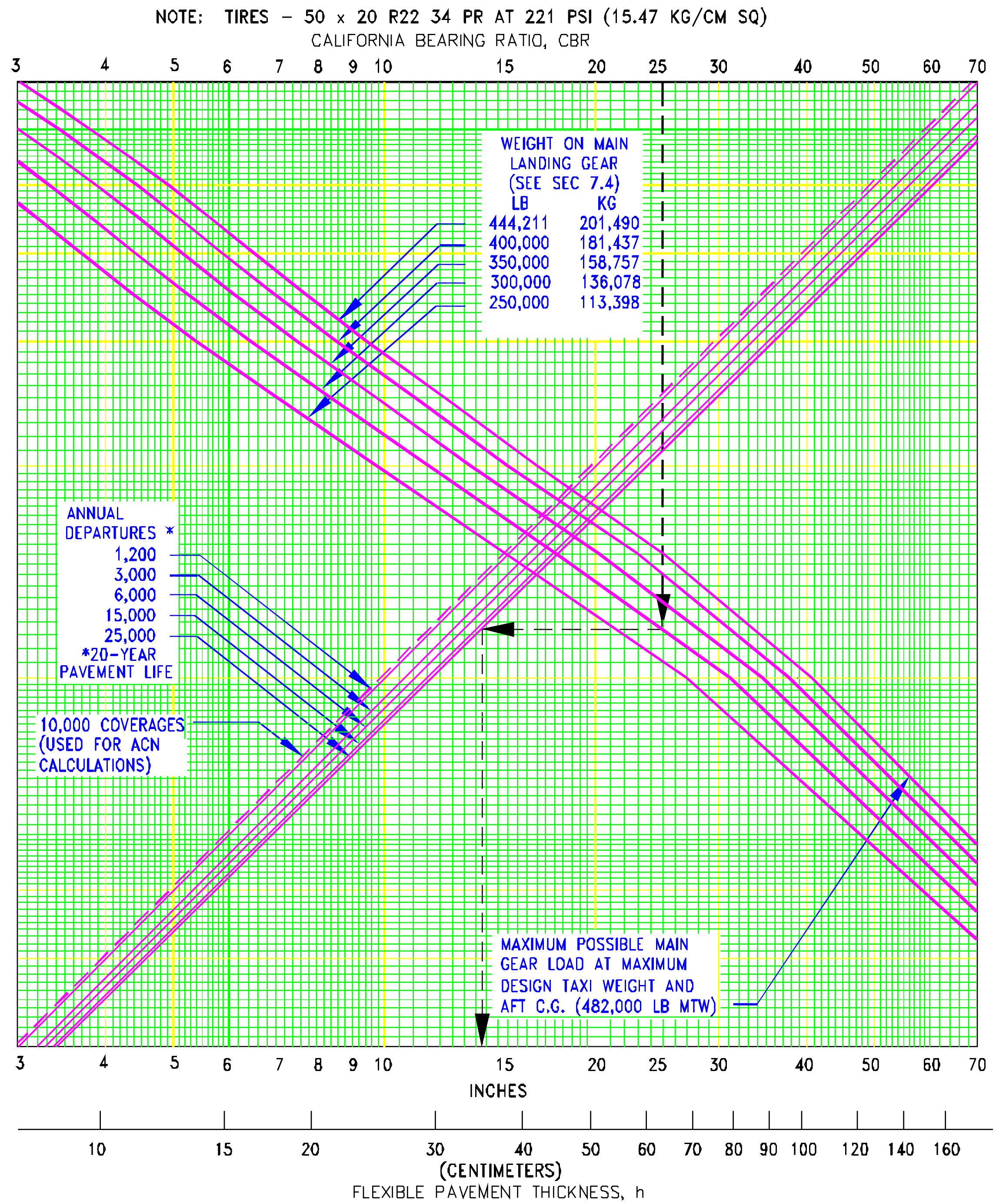
7.5 Flexible Pavement Requirements - U.S. Army Corps of Engineers Method (S-77-1)

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

In the example shown , for a CBR of 25 and an annual departure level of 25,000, the required flexible pavement thickness for an airplane with a main gear loading of 300,000 pounds is 13.8 inches.

The line showing 10,000 coverages is used for ACN calculations (see Section 7.10).

The FAA design method uses a similar procedure using total airplane weight instead of weight on the main landing gears. The equivalent main gear loads for a given airplane weight could be calculated from Section 7.4.



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

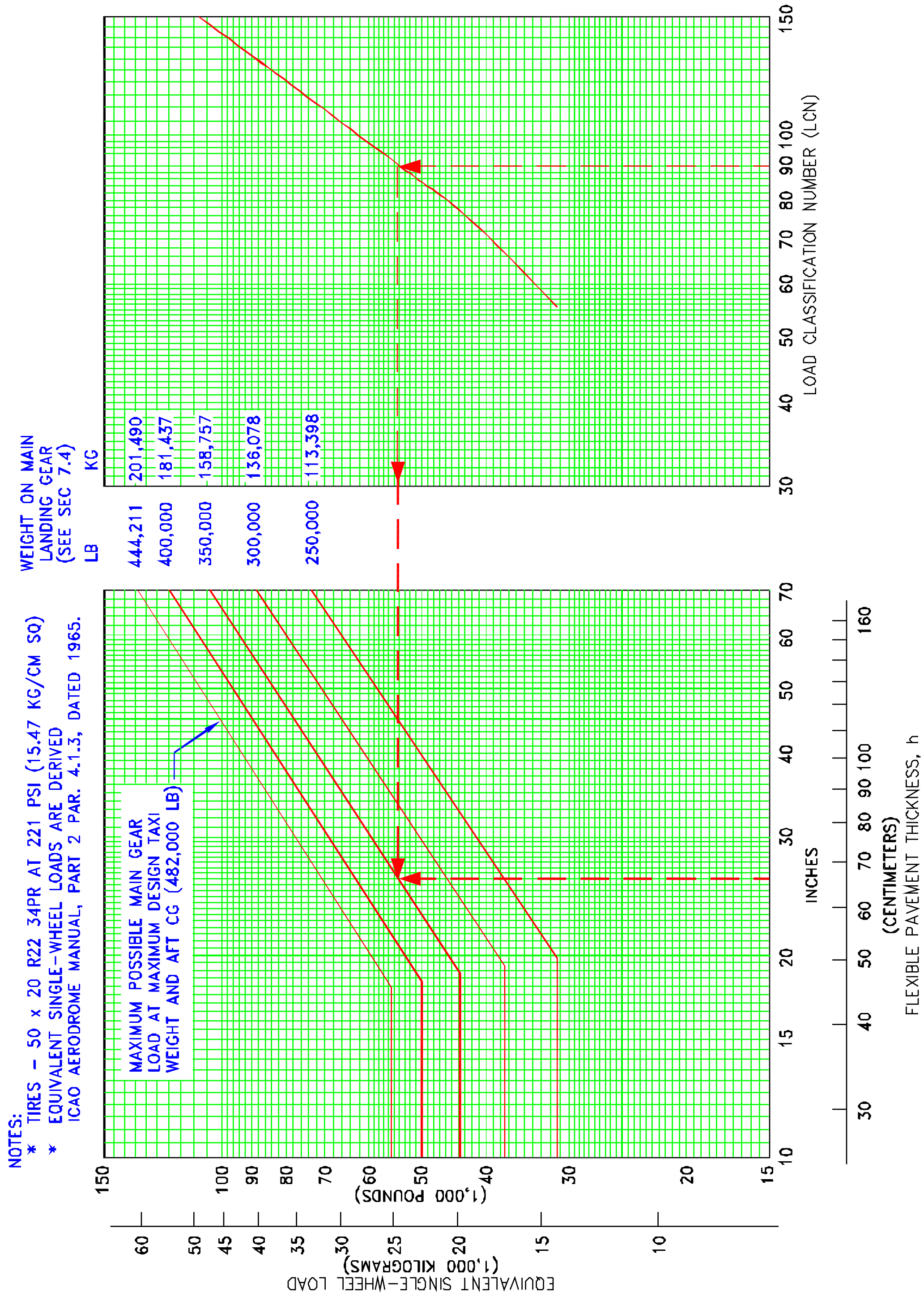
MODEL 787-8

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, flexible pavement thickness is shown at 28 in. with an LCN of 90. For these conditions, the apparent maximum allowable weight permissible on the main landing gear is 350,000 lb for an airplane with 221-psi main gear tires.

Note: If the resultant aircraft LCN is not more that 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).



7.6.1 FLEXIBLE PAVEMENT REQUIREMENTS - LCN METHOD

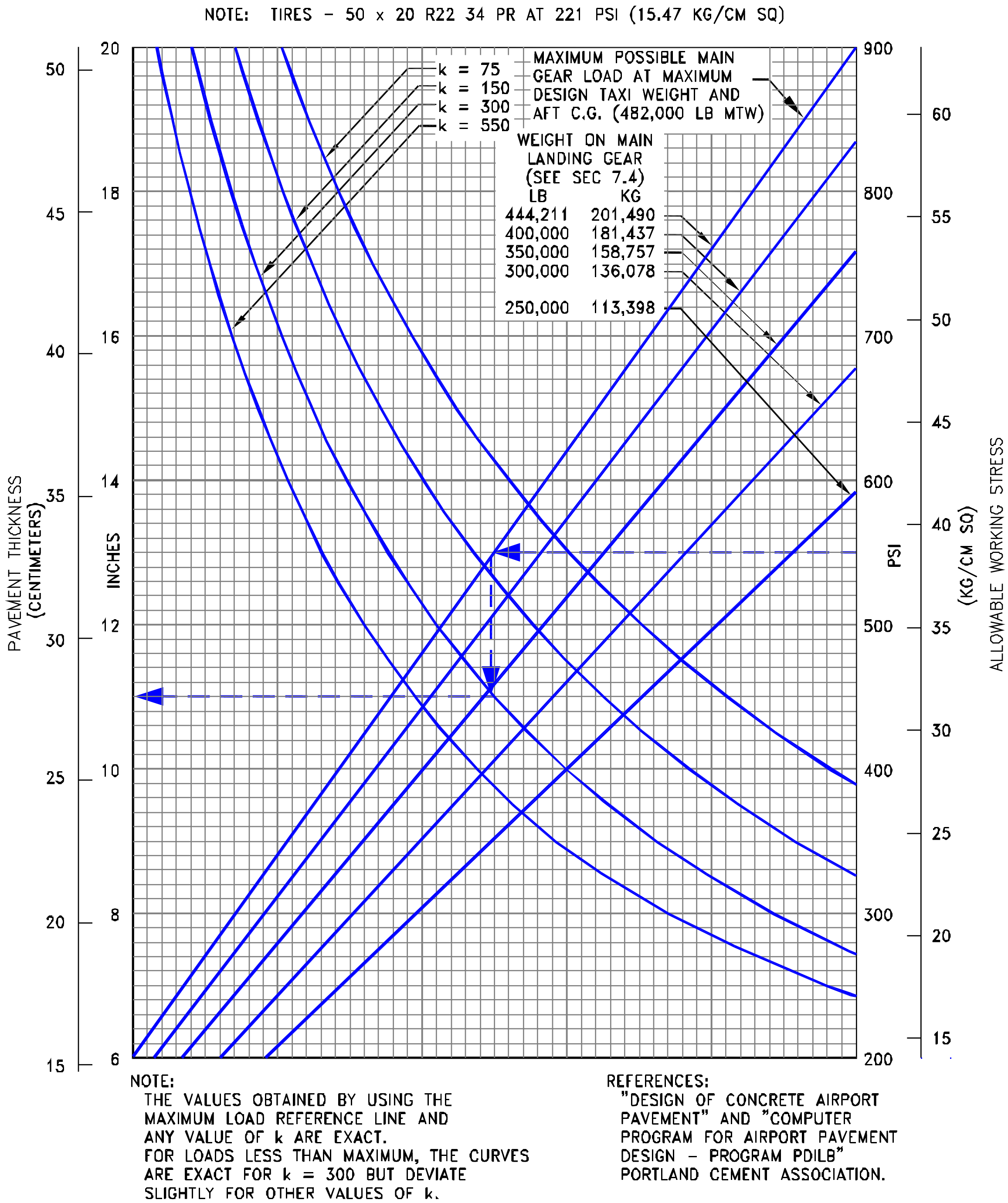
MODEL 787-8

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 five incremental main gear loads at the minimum tire pressure required at the maximum design taxi weight.

In the example shown, for an allowable working stress of 550 psi, a main gear load of 444,204 lb, and a subgrade strength (k) of 300, the required rigid pavement thickness is 11.0 in.



7.7.1 RIGID PAVEMENT REQUIREMENTS - PORTLAND CEMENT ASSOCIATION DESIGN METHOD

MODEL 787-8

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 7.8.2, for a rigid pavement with a radius of relative stiffness of 39 with an LCN of 88, the apparent maximum allowable weight permissible on the main landing gear is 350,000 lb for an airplane with 221-psi main tires.

Note: If the resultant aircraft LCN is not more that 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).

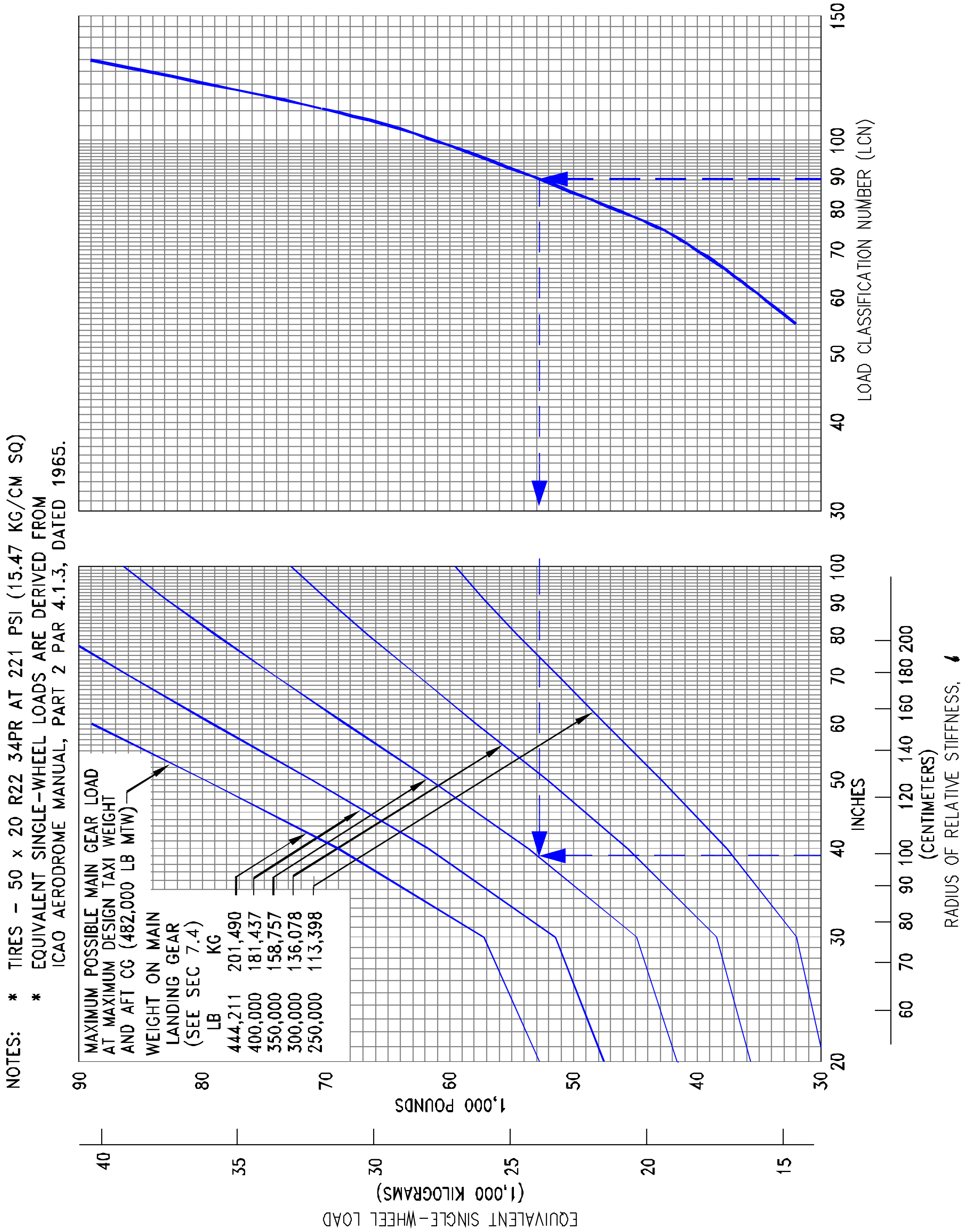
RADIUS OF RELATIVE STIFFNESS (ℓ)
VALUES IN INCHES

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

WHERE: E = YOUNG'S MODULUS OF ELASTICITY = 4 x 10^6 psi
k = SUBGRADE MODULUS, LB PER CU IN
d = RIGID PAVEMENT THICKNESS, IN
μ = POISSON'S RATIO = 0.15

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)**



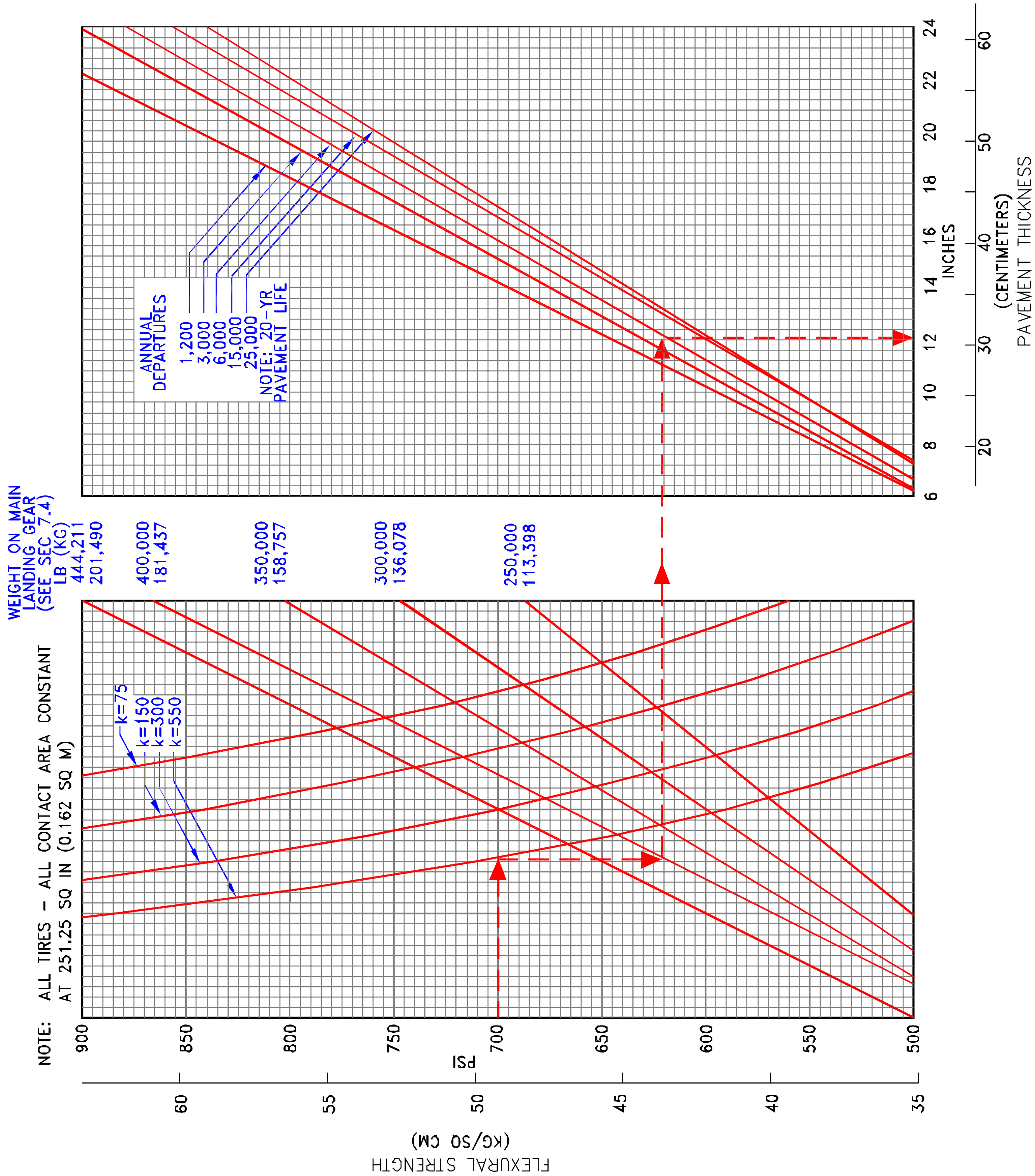
7.8.2 RIGID PAVEMENT REQUIREMENTS - LCN CONVERSION

MODEL 787-8

7.9 Rigid Pavement Requirements - FAA Design Method

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

In the example shown, the pavement flexural strength is shown at 700 psi, the subgrade strength is shown at k = 550, and the annual departure level is 6,000. For these conditions, the required rigid pavement thickness for an airplane with a main gear loading of 400,000 pounds is 12.0 inches.



7.9.1 RIGID PAVEMENT REQUIREMENTS - FAA METHOD

MODEL 787-8

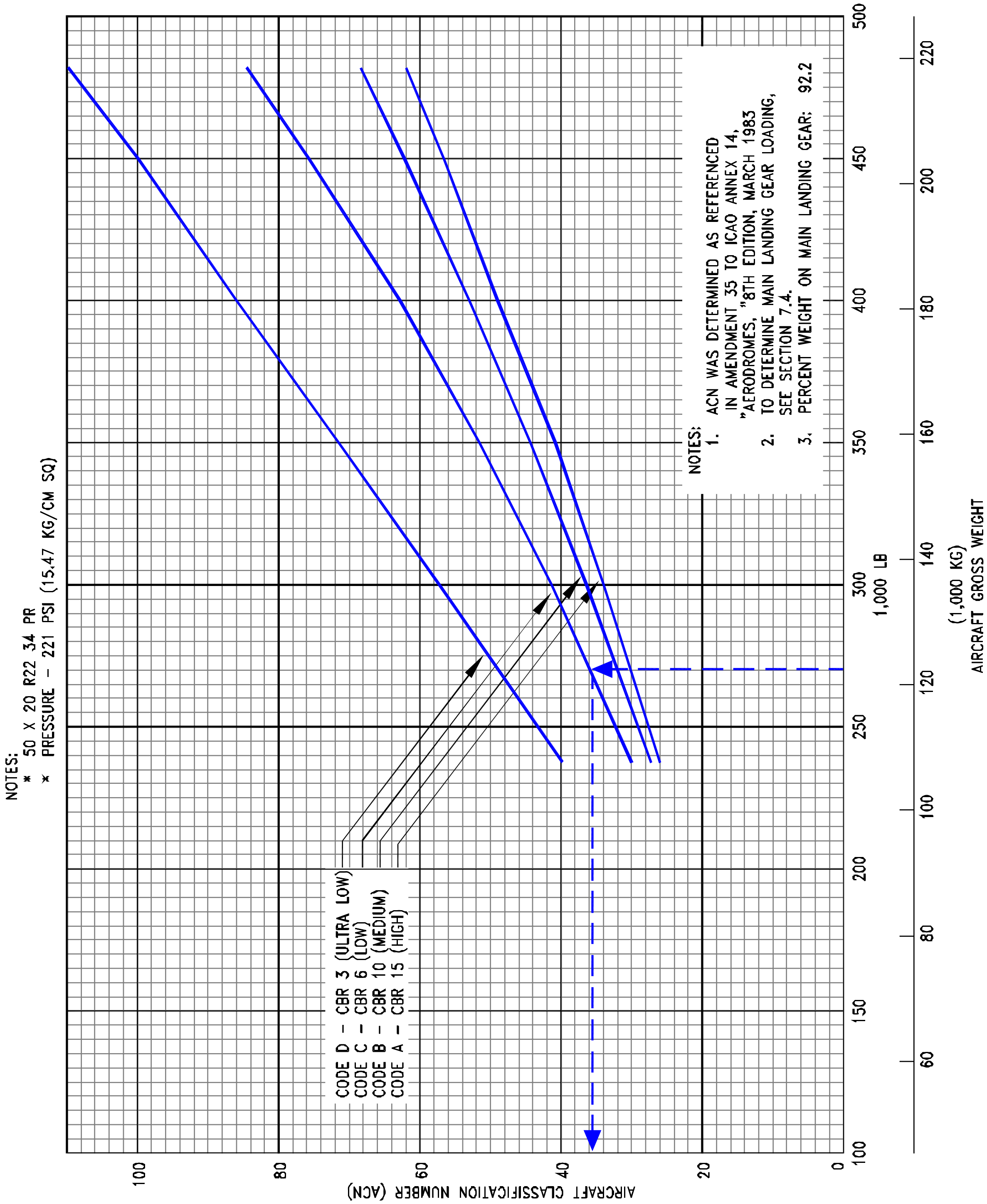
7.10 ACN/PCN Reporting System - Flexible and Rigid Pavements

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. In the chart in 7.10.1, for an aircraft with gross weight of 270,000 lb on a low subgrade strength (Code C), the flexible pavement ACN is 36. Referring to 7.10.2, the same aircraft on a low subgrade rigid pavement also has an ACN of 36.

Note: An aircraft with an ACN equal to or less that the reported PCN can operate on that pavement subject to any limitations on the tire pressure. (Ref.: Ammendment 35 to ICAO Annex 14 Aerodrome, Eighth Edition, March 1983.)

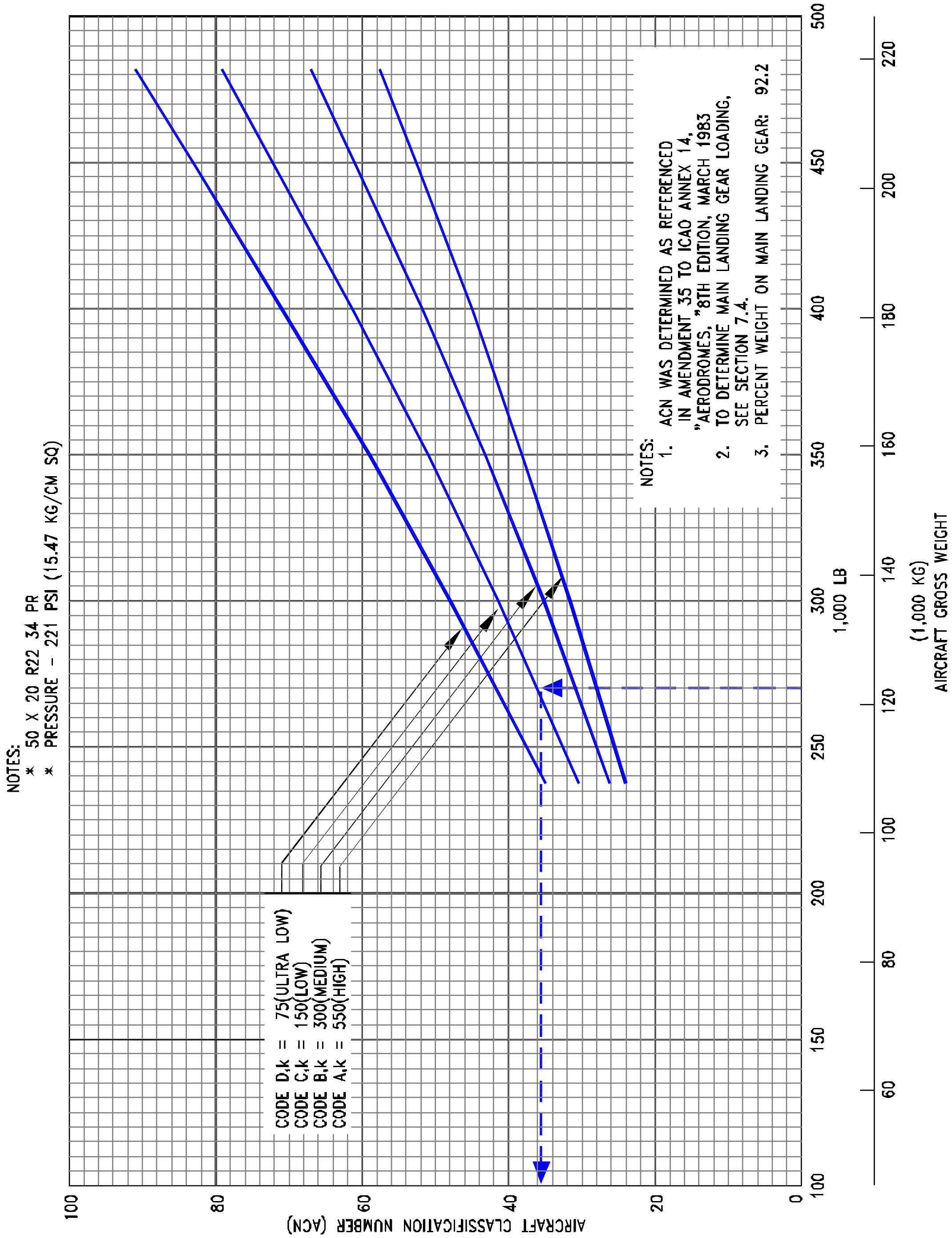
The following table provides ACN data in tabular format similar to the one used by ICAO in the "Aerodrome Design Manual Part 3, Pavements." If the ACN for an intermediate weight between taxi weight and empty fuel weight of the aircraft is required, Figures 7.10.1 through 7.10.10 should be consulted.

				ACN FOR RIGID PAVEMENT SUBGRADES – MN/m^3				ACN FOR FLEXIBLE PAVEMENT SUBGRADES – CBR			
AIRCRAFT TYPE	ALL-UP MASS/ OPERATING MASS EMPTY LB (KG)	LOAD ON ONE MAIN GEAR LEG (%)	TIRE PRESSURE PSI (MPa)	HIGH 150	MEDIUM 80	LOW 40	ULTRA LOW 20	HIGH 15	MEDIUM 10	LOW 6	ULTRA LOW 3
787-8	482,000(218,632)	46.08	221 (1.52)	58	67	79	91	62	68	85	110
	237,400(107,682)			24	26	30	35	26	27	30	40



7.10.1 AIRCRAFT CLASSIFICATION NUMBER - FLEXIBLE PAVEMENT

MODEL 787-8



7.10.2 AIRCRAFT CLASSIFICATION NUMBER - RIGID PAVEMENT
MODEL 787-8

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8.0 FUTURE 787 DERIVATIVE AIRPLANES

8.0 FUTURE 787 DERIVATIVE AIRPLANES

Several derivatives are being studied to provide additional capabilities of the 787 family of airplanes. Future growth versions could address additional passenger count, or cargo capacity, or increased range.

The derivatives that are currently being studied are the -3, and -9. The -3 is a short-range derivative of the 787-8 with the same fuselage size and passenger count. The -9 is a longer-body version of the -8 and is a long-range aircraft with increased passenger count over the -8. Several wing configurations and wingspans are also being studied to address increased payload and range requirements.

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.

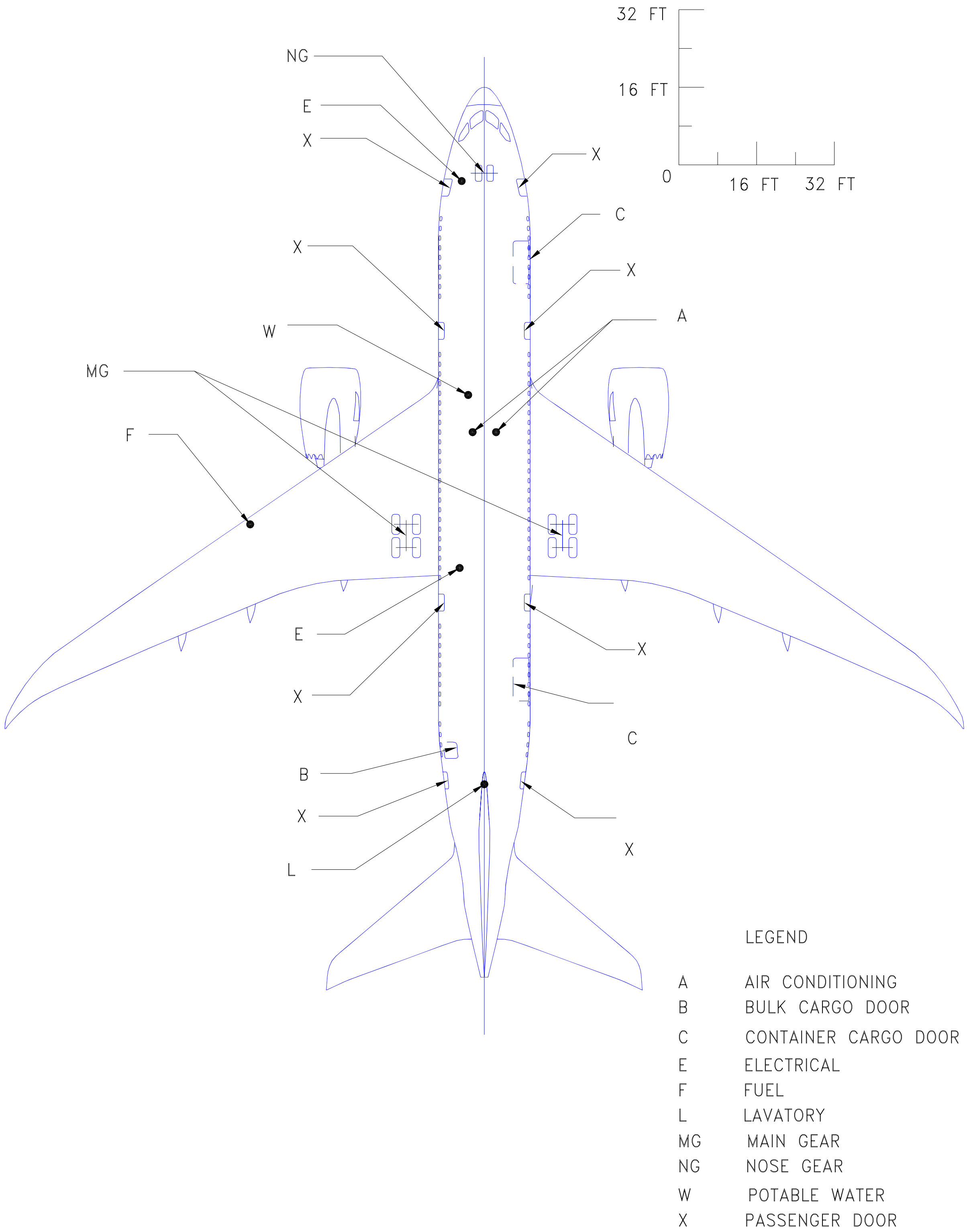
9.0 SCALED 787 DRAWINGS

9.1 – 9.5 Model 787-8

9.0 SCALED DRAWINGS

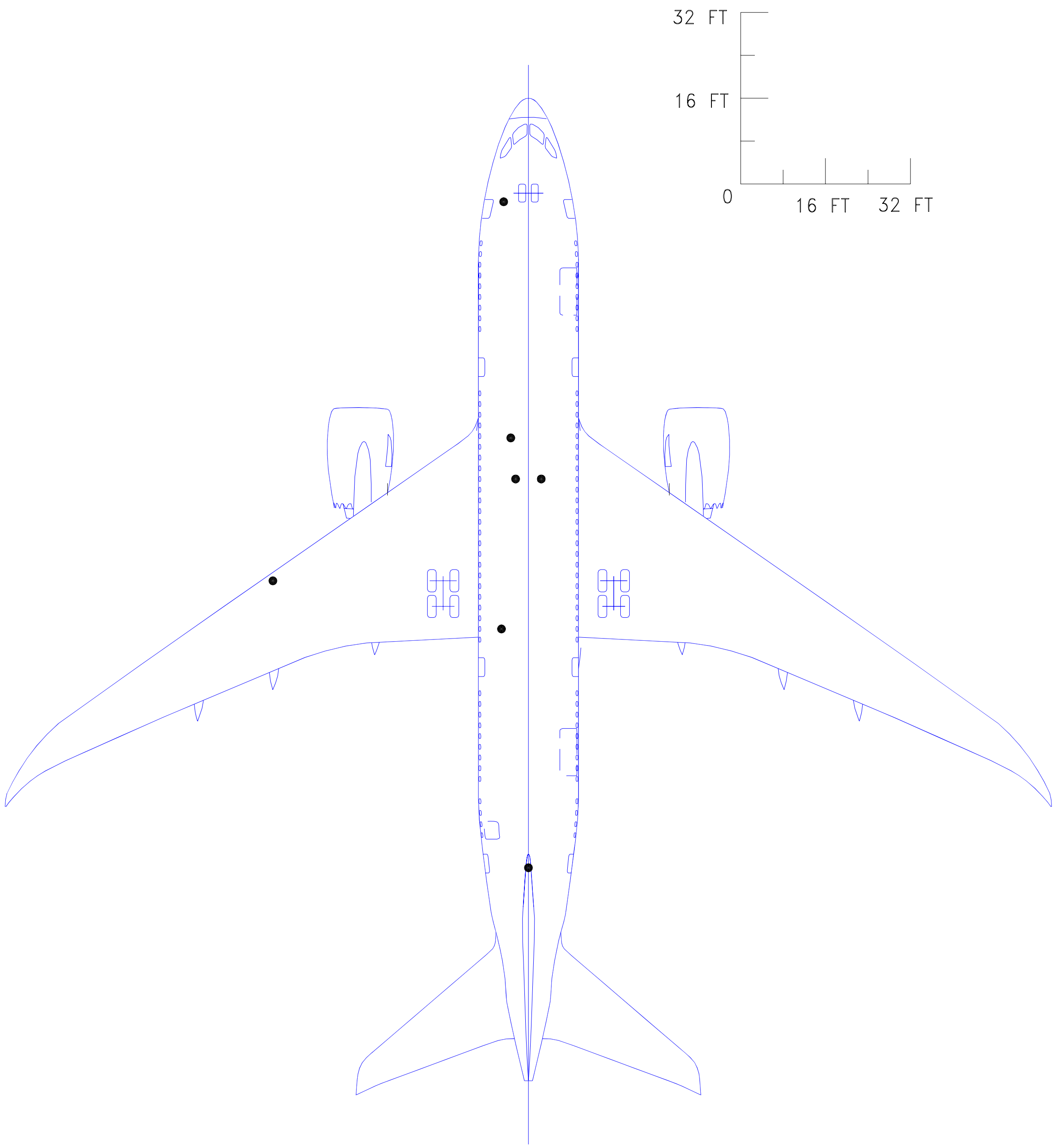
The drawings in the following pages show airplane plan view drawings, drawn to approximate scale as noted. The drawings may not come out to exact scale when printed or copied from this document. Printing scale should be adjusted when attempting to reproduce these drawings. Three-view drawing files of the 787-8 along with other Boeing airplane models, can be downloaded from the following website:

http://www.boeing.com/airports



NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

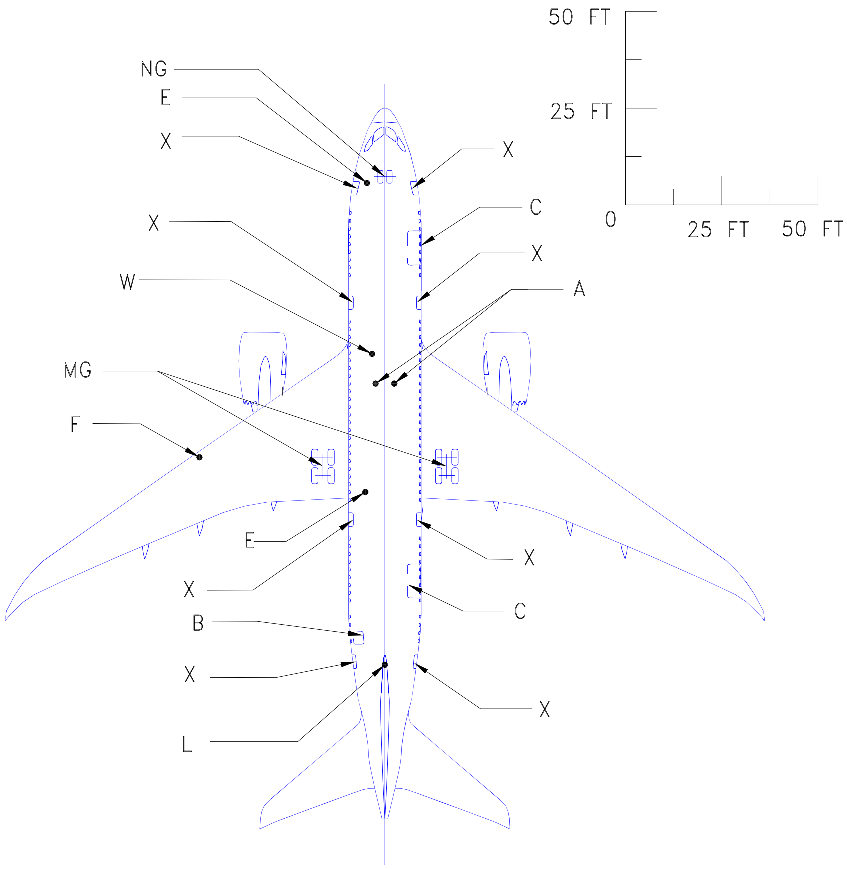
9.1.1 SCALED DRAWING - 1 IN. = 32 FT
MODEL 787-8



NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.1.2 SCALED DRAWING - 1 IN. = 32 FT

MODEL 787-8

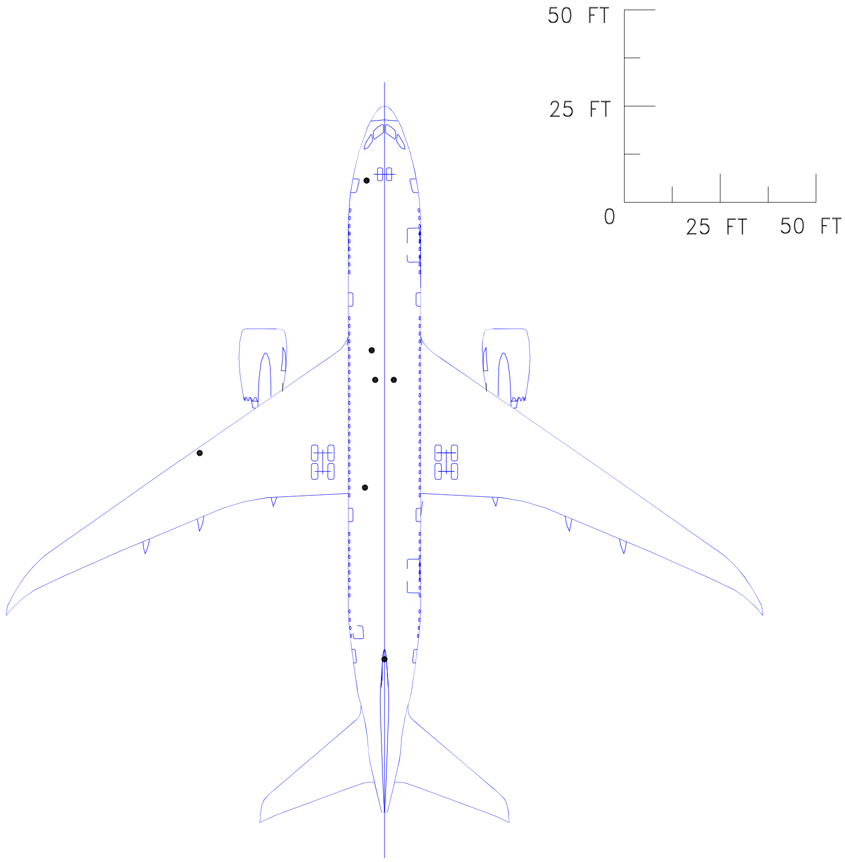


LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL
F	FUEL
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
W	POTABLE WATER
X	PASSENGER DOOR

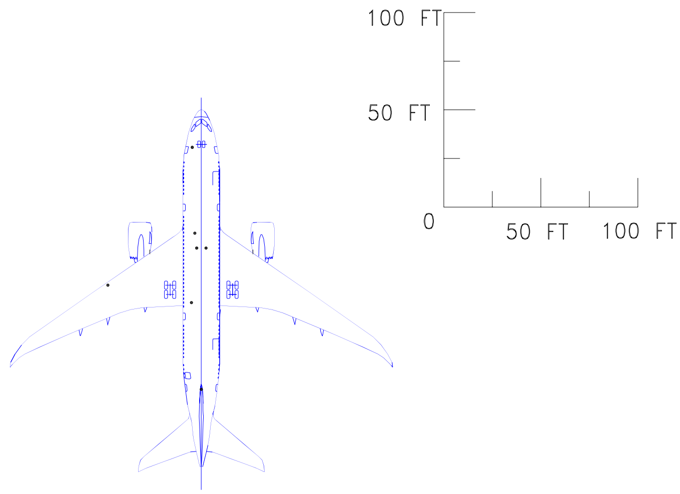
NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.2.1 SCALED DRAWING - 1 IN. = 50 FT
MODEL 787-8



NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.2.2 SCALED DRAWING - 1 IN. = 50 FT
MODEL 787-8



NOTE:

SEE CORRESPONDING PAGE FOR 1 IN = 32 FT
FOR IDENTIFICATIONS OF SERVICE POINTS

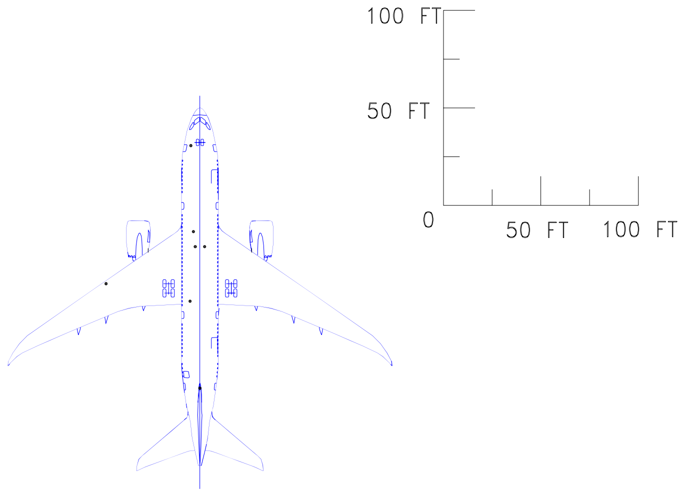
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL
F	FUEL
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.3.1 SCALED DRAWING - 1 IN = 100 FT

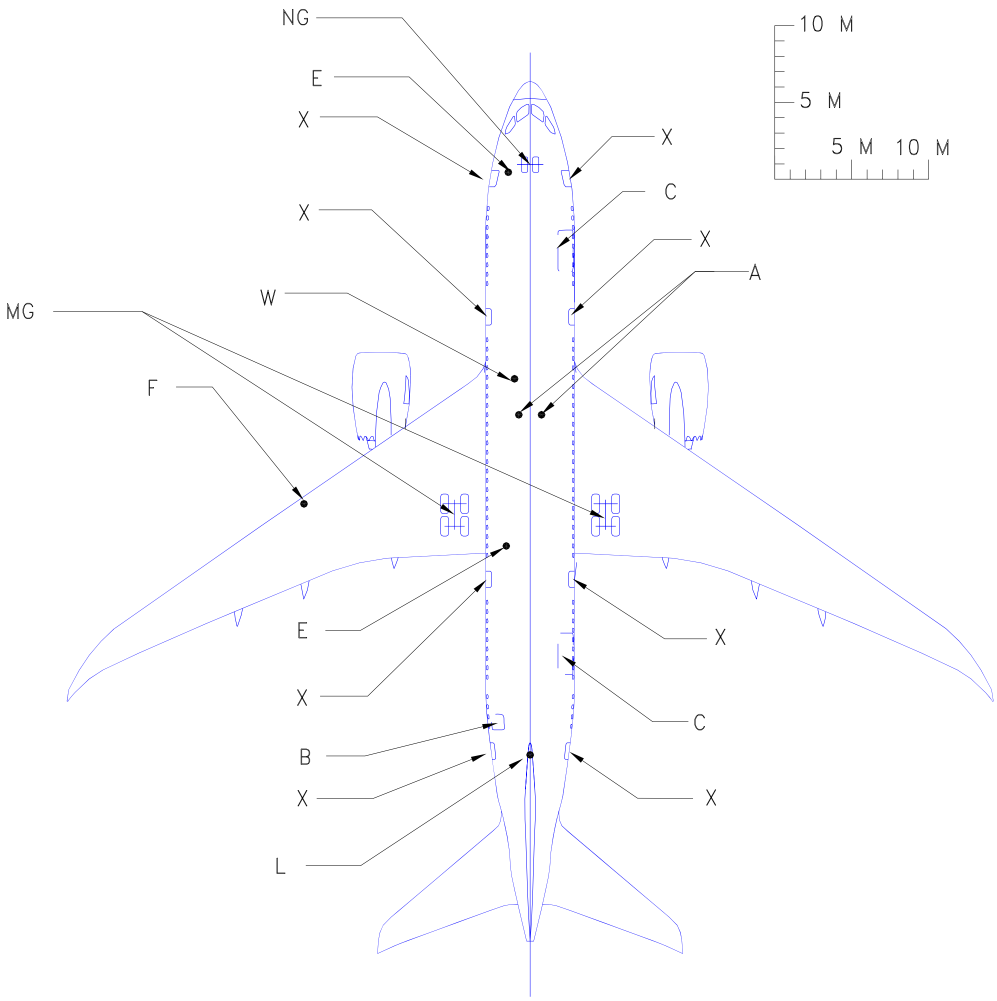
MODEL 787-8



NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.3.2 SCALED DRAWING - 1 IN = 100 FT

MODEL 787-8



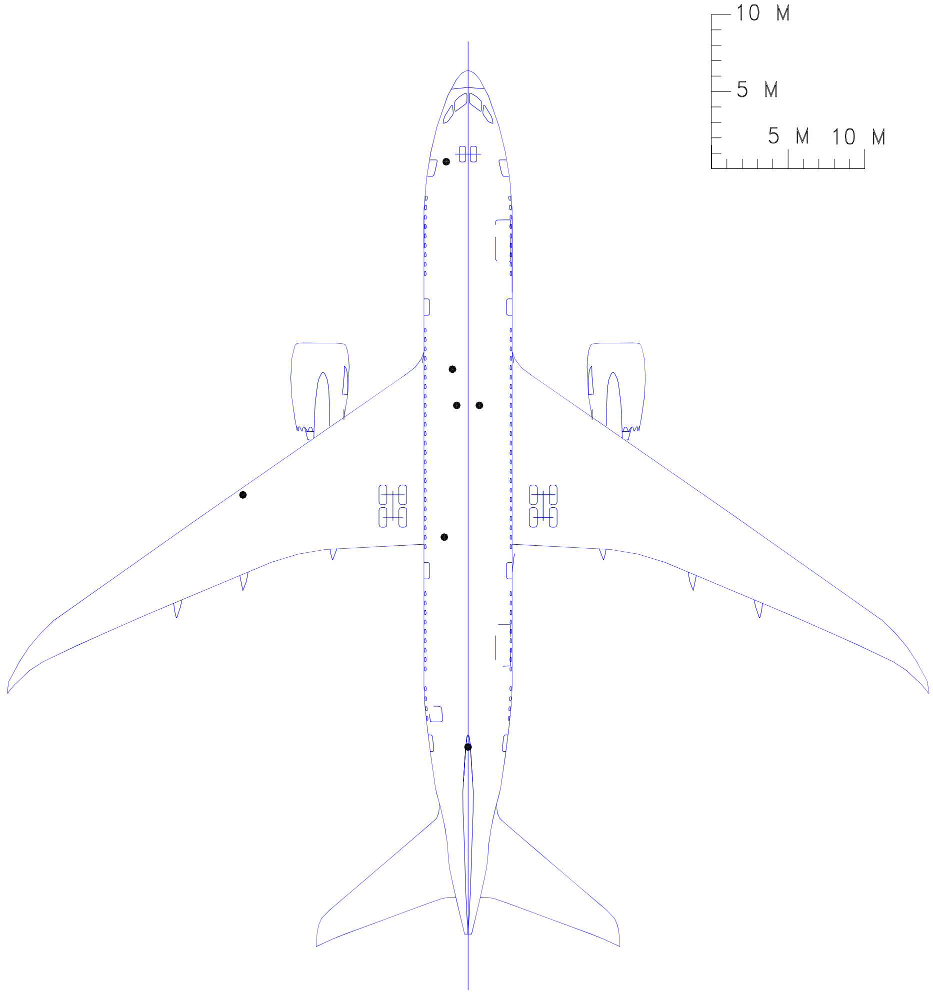
LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL
F	FUEL
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.4.1 SCALED DRAWING - 1:500

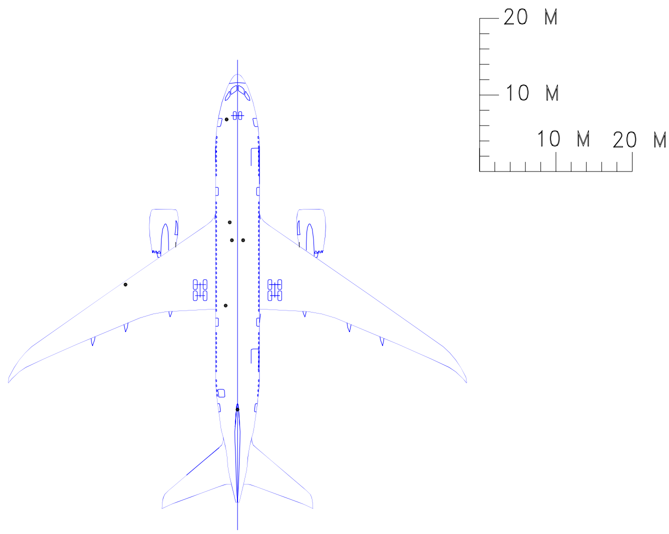
MODEL 787-8



NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.4.2 SCALED DRAWING - 1:500

MODEL 787-8



NOTE:

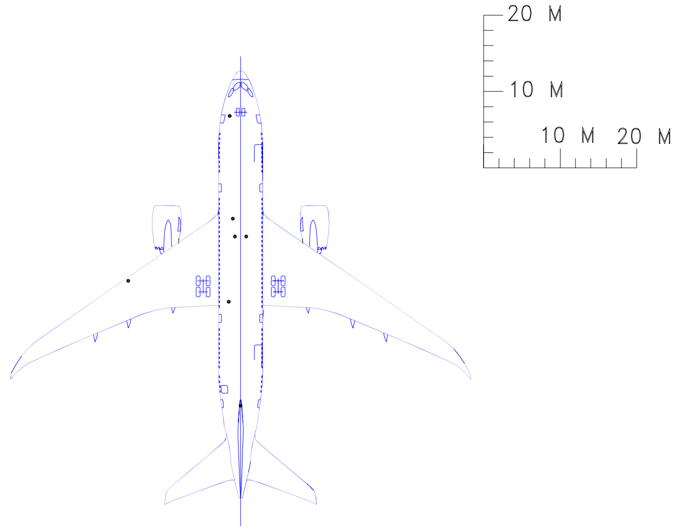
SEE CORRESPONDING PAGE FOR 1 IN = 32 FT
FOR IDENTIFICATIONS OF SERVICE POINTS

LEGEND

A	AIR CONDITIONING
B	BULK CARGO DOOR
C	CONTAINER CARGO DOOR
E	ELECTRICAL
F	FUEL
L	LAVATORY
MG	MAIN GEAR
NG	NOSE GEAR
W	POTABLE WATER
X	PASSENGER DOOR

NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.5.1 SCALED DRAWING - 1:1000
MODEL 787-8



NOTE: WHEN PRINTING THIS DRAWING, MAKE SURE TO ADJUST FOR PROPER SCALING

9.5.2 SCALED DRAWING - 1:1000

MODEL 787-8