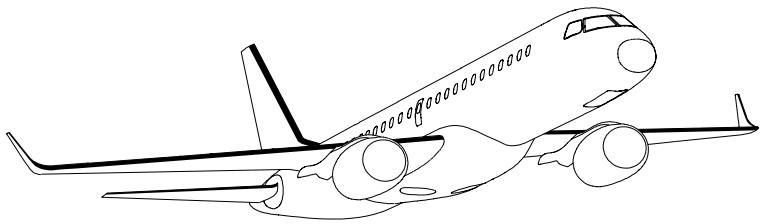

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AIRPORT PLANNING MANUAL

APM-3241
07 OCTOBER 2008
REVISION 11 - 09 OCTOBER 2015

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FRONT MATTER - REVISION No. 11 DATED OCTOBER 09/2015

Pages which have been added, revised, or deleted by the current revision are indicated by an asterisk, on the List of Effective Pages.

This issue incorporates all preceding Temporary Revisions (if any).

Modifications introduced by this revision are all editorial in nature, with no technical implications, they not being therefore highlighted and no substantiation source being presented herein.

HIGHLIGHTS

RECORD OF REVISIONS

The user must update the Record of Revisions when a revision is put into the manual.

REV No.	ISSUE DATE	DATE INSERTED	BY

REV No.	ISSUE DATE	DATE INSERTED	BY

RETAIN THIS RECORD IN THE FRONT OF MANUAL OR CHAPTER.
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL, AND ENTER REVISION NUMBER, DATE INSERTED AND INITIALS.

RECORD OF TEMPORARY REVISIONS

Temporary Rev. No.	Page Number	Issued Date	By	Date Removed	By

TEMPORARY REVISION STATUS REPORT

This list is intended to show the operator which temporary revisions are applicable to his fleet.
The list consists of the temporary revision number, the related issue date, the incorporation date, and the affected subject.

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LIST OF SERVICE BULLETINS

This list is intended to let the operator know which Service Bulletins are incorporated to the APM.

The list consists of the Service Bulletin numbers and the respective revisions (if applicable), the affected section (s) (APM Section Number), information on whether the Service Bulletin affects the manual, the aircraft (Effectivity) affected by the Service Bulletins and the incorporation date.

A revision bar is placed on the left margin of the list whenever data are inserted or revised.

NOTE: The effectivity is indicated by means of two numerical groups separated by a dash. The first group presented in the effectivity column corresponds to the last digits of the lowest aircraft designation number to indicate the beginning of the effectivity, and the second group corresponds to the last digits of the highest aircraft designation number to indicate the end of the effectivity.

Pages revised or added by the current revision are indicated by an asterisk (*). Pages deleted by the current revision are indicated by * (del). Pages deleted by the previous revision are indicated by (del).

EFFECTIVITY: ALL

LIST OF EFFECTIVE PAGES

Pages revised or added by the current revision are indicated by an asterisk (*). Pages deleted by the current revision are indicated by * (del). Pages deleted by the previous revision are indicated by (del).

EFFECTIVITY: ALL

TABLE OF CONTENTS

SECTION 7 - PAVEMENT DATA

SECTION 8 - POSSIBLE EMBRAER LINEAGE DERIVATIVE AIRCRAFT

SECTION 9 - SCALED DRAWINGS

LIST OF TABLES

LIST OF FIGURES

1. SCOPE

1.1. PURPOSE

This document provides airplane characteristics for general airport planning. Since the operational practices vary among the airlines, specific data should be coordinated with the using airlines before the facility design is made.
EMBRAER should be contacted for any additional information required.

1.2. INTRODUCTION

The APM has been prepared in accordance with NAS 3601.
It provides aircraft characteristics for general airport planning, airport operators, airlines, and engineering consultant organizations.
The APM is arranged as shown in the table below:

Table 1.1 - APM Arrangement

ARRANGEMENTS	CONTENTS
Manual Front Matter	Title Page
	Costumer Comment Form
	Highlights
	Record of Revision Sheet
	Temporary Revision Sheet
	List of Service Bulletins
	List of Effective Pages
	Table of Contents
	List of Tables
	List of Figures
Section	Scope
	Aircraft Description
	Aircraft Performance
	Ground Maneuvering
	Terminal Servicing
	Operating Conditions
	Pavement Data
	Possible Derivative Aircraft
	Scaled Drawings

The front matter for the whole manual contains:

- Title Page: Shows the manufacturer's masthead, identification of the manual, the initial issue date, and revision number and date.
- Highlights: Advises the operator on the revised pages.
- Record of Revisions Sheet: Lists the successive revision numbers, issue date, insertion date and incorporators initials, which must be kept current by the operator.

- List of Service Bulletins: Lists the Service Bulletins, including all issued revisions, which affect the manual as well as the affected section(s) (APM Section Number), the aircraft affected by the Service Bulletin, and the date of incorporation of the SB in the manual.
- Temporary Revision Sheet: Lists the temporary revision numbers, page number, issue date, person responsible for the insertion and insertion date.
- List of Effective Pages: Lists all sections and their list of effective pages with the latest issue dates.
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1.2.1. Revisions

Embraer may revise this manual periodically as required to update information or provide information not available at the time of printing.
Revised data may result from Embraer approved aircraft modifications and new available options. Changes to the text are indicated by a black bar in the page left-side margin, beside the revised, added, or deleted material.
Relocated or rearranged text or illustrations will be indicated by a black bar beside the page number.

1.3. ABBREVIATIONS

This list gives all the abbreviations, acronyms and measurement units used in this manual with their definitions.

Table 1.2 - List of Acronyms and Abbreviations used in the APM

ACRONYMS AND ABBREVIATIONS	DESCRIPTION
°C	Degree Celsius
°F	Degree Fahrenheit
ℓ	Liter
ACN	Aircraft Classification Number
AFM	Airplane Flight Manual
AOM	Airplane Operations Manual

Table 1.2 - List of Acronyms and Abbreviations used in the APM

ACRONYMS AND ABBREVIATIONS	DESCRIPTION
APM	Airport Planning Manual
APU	Auxiliary Power Unit
ATTCS	Automatic Takeoff-Thrust Control-System
BOW	Basic Operating Weight
CBR	California Bearing Ratio
ECJ	Embraer Corporate Jet
ECS	Environmental Control System
FAA	Federal Aviation Administration
GEAE	General Electric Aircraft Engines
ICAO	International Civil Aviation Organization
ISA	International Standard Atmosphere
JAR	Joint Aviation Requirements
LCN	Load Classification Number
MLW	Maximum Landing Weight
MRW	Maximum Ramp Weight
MTOW	Maximum Takeoff Weight
MZFW	Maximum Zero Fuel Weight
N	Newton
dBA	A-Weighted Decibel
ft	Foot
ft^2	Square Foot
gal.	Gallon
in	Inch
in^2	Square Inch
inHg	Inch of Mercury
kPa	Kilopascal
kg	Kilogram
lb	Pound
lb/in^3	Pound per Cubic Inch
lbf	Pound Force
m	Meter
m^2	Square Meter
m^3	Cubic Meter
psi	Pounds per Square Inch

2. AIRCRAFT DESCRIPTION

2.1. AIRCRAFT CHARACTERISTICS

The aircraft is:

- All-metal;
- Low winged;
- Conventional tailed;
- Monoplane;
- Features a retractable tricycle-type twin-wheeled landing-gear system.

There are two high bypass ratio turbofan GEAE CF34-10E7B with 82.3 kN (18500 lbf) maximum takeoff thrust (Sea Level, Static Condition and ISA) installed under the wings.
The aircraft has a MTOW of 54500 kg (120152 lb).

2.1.1. Definitions

MRW

It is the maximum allowed aircraft weight for taxiing or maneuvering on the ground.

MLW

It is the maximum allowed weight at which the aircraft may normally be landed.

MTOW

It is the maximum allowed total loaded aircraft weight at the start of the takeoff run.

BOW

It is the weight of the structure, powerplant, instruments, flight controls, hydraulic, electronic, electrical, air conditioning, oxygen, anti-icing and pressurization systems, interior furnishings, portable and emergency equipment and other items of equipment that are an integral part of the aircraft configuration. It also includes unusable fuel, total engine and APU oil, total hydraulic fluid, toilet fluid and water, potable water, crew and crew baggage, navigation kit (manuals, charts), catering (beverages and food) and removable service equipment for the galley.

MZFW

It is the maximum allowed weight without usable fuel in tanks.

Maximum Payload

It is the difference between the MZFW and the BOW.

Maximum Seating Capacity

It is the maximum number of passengers specifically certified or anticipated for certification.

Usable Fuel

Fuel available for the aircraft propulsion.

Table 2.1 - Aircraft General Characteristics

DESIGN WEIGHTS	AIRCRAFT MODELS
	ECJ
MRW	54700 kg (1205932 lb)
MTOW	54500 kg (120152 lb)
MLW	45800 kg (100972 lb)
BOW [1]	31850kg (70217lb)
MZFW	36500 kg (80469lb)
Maximum Payload [1]	4650 kg (10251 lb)
Maximum Seating Capacity	19 passengers
Usable Fuel [2]	21867 kg (48208 lb)
	27232 ℓ (7194 gal.)

1. Typical standard configuration (weights may vary according to optional equipment installed or interior layouts).
2. Adopted fuel density of 0.803 kg/ℓ (6.70 lb/gal.).

2.2. GENERAL AIRCRAFT DIMENSIONS

2.2.1. External Dimensions

- Span over winglets - 28.72 m (94 ft 3 in.)
- Height (maximum) - 10.55 m (34 ft 7 in.)
- Overall length - 36.24 m (118 ft 11 in.)

2.2.2. Wing

- Reference area - 92.50 m^2 (996 ft^2)
- Reference aspect ratio - 8.1

2.2.3. Fuselage

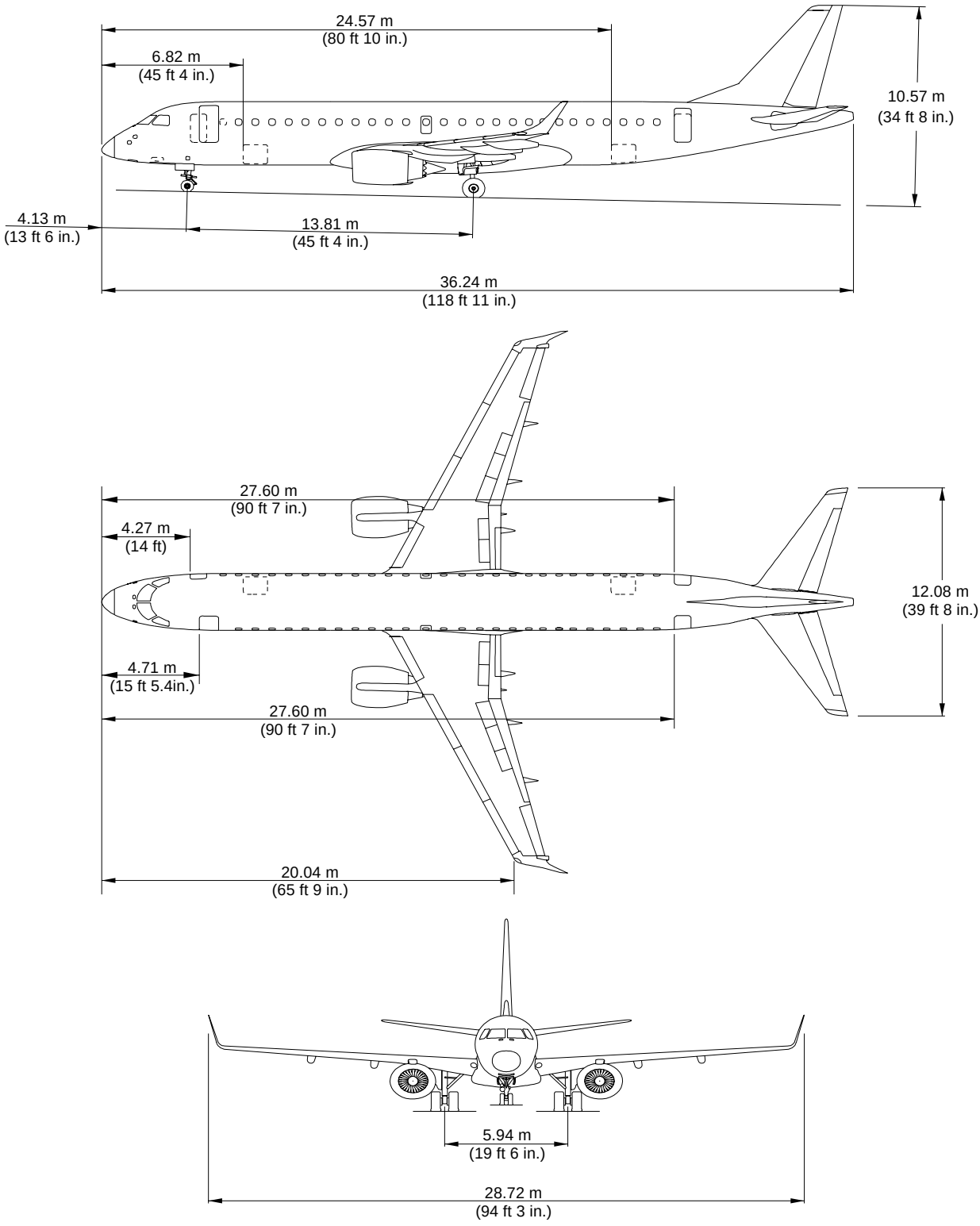
- Total Length - 36.24 m (118 ft 11 in.)
- Length of pressurized section - 29.08 m (95 ft 5 in.)

2.2.4. Horizontal Tail

- Span - 12.08 m (39 ft 8 in.)
- Area - 26.00 m^2 (280 ft^2)

2.2.5. Vertical Tail

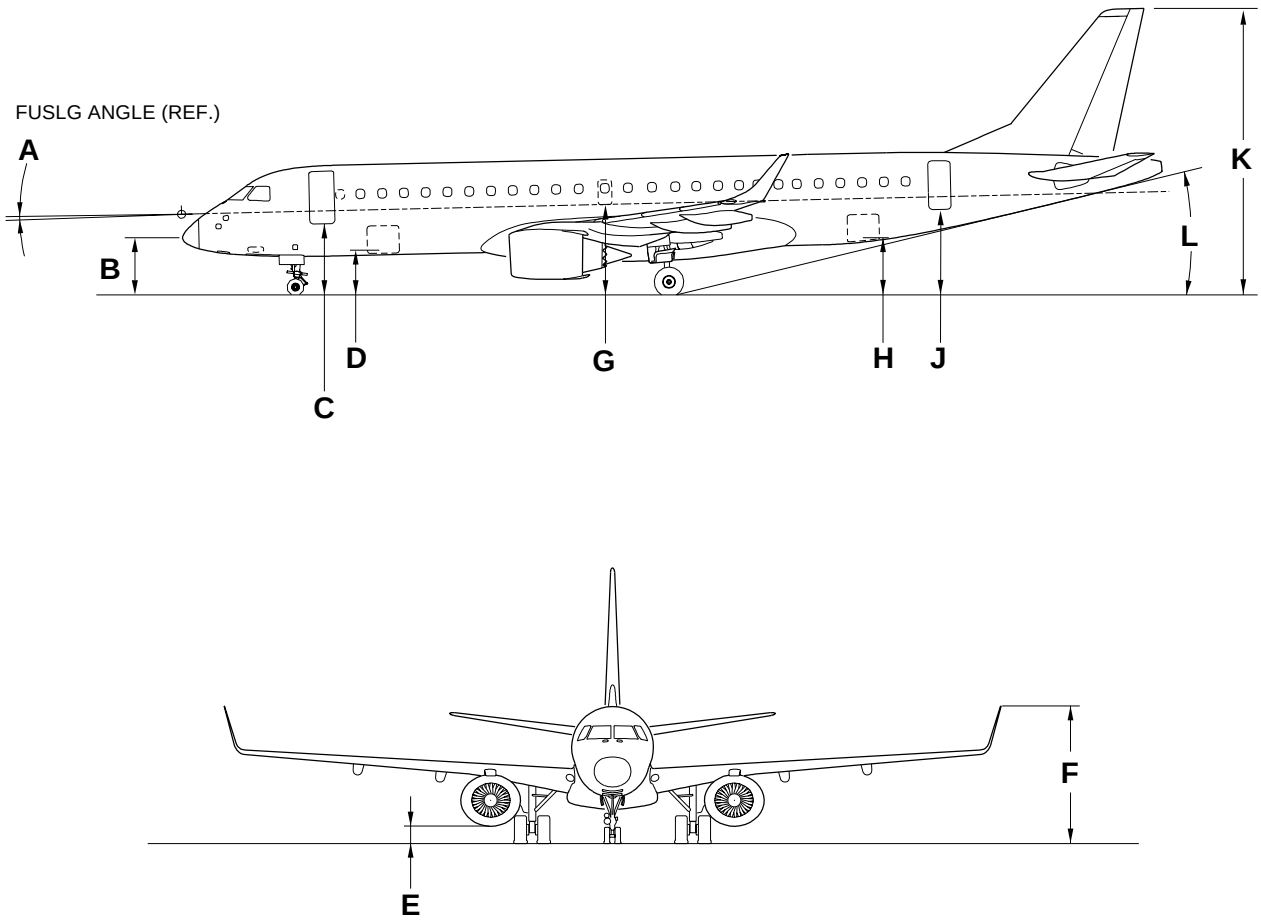
- Reference area - 16.20 m^2 (174 ft^2 54 in^2)



General Aircraft Dimensions
Figure 2.1

EFFECTIVITY: ALL

2.3. GROUND CLEARANCES



Aircraft Ground Clearances
Figure 2.2

Table 2.2 - Ground Clearance - Lineage Aircraft Model

WEIGHT	CG (%MAC)	FUS ANGLE (DEG) (A)	NOSE (B)	FORWARD PASSEN-GER DOOR (C)	FORWARD CARGO DOOR (D)	NACELLE (E)	WINGLET (F)	OVERWING ESCAPE HATCH (G)	AUXIL-IARY FUEL TANK COM-PART-MENT DOOR (H)	AFT BAGGAGE DOOR (J)	VERTICAL TAIL (K)	TAIL SKID ANGULAR CLEAR-ANCE (DEG) (L)
54700 kg 120593lb	14.1	-1.05	2.06 m 6 ft 9in.	2.59 m 8 ft 6in.	1.57 m 5 ft2 in.	0.48 m 1 ft 7in.	5.06 m 16 ft 7in.	3.23 m 10 ft 7in.	1.97 m 6 ft 5in.	3.00 m 9 ft 10 in.	10.39 m 34 ft1in.	12.6
54700 kg 120593lb	25.9	-0.9	2.11 m 7ft 11in.	2.62 m 9ft 7in.	1.59 m 5 ft 3in.	0.48 m 1 ft 7in.	5.05 m 16 ft 7in.	3.23 m 10 ft 7in.	1.94m 6 ft 4in.	2.97 m 9 ft 9in.	10.33 m 33 ft 11in.	12.4
54500 kg 120152lb	14.1	-1.05	2.06 m 6 ft 9in.	2.59 m 8 ft 6in.	1.57 m 5 ft2 in.	0.47 m 1 ft 6in.	5.06 m 16 ft 7in.	3.23 m 10 ft 7in.	1.97 m 6 ft 5in.	3.00 m 9 ft 10 in.	10.39 m 34 ft1in.	12.6
54500 kg 120152lb	25.9	-0.9	2.11 m 7ft 11in.	2.62 m 9ft 7in.	1.59 m 5 ft 3in.	0.49 m 1 ft 7in.	5.04 m 16 ft 6in.	3.23 m 10 ft 7in.	1.94m 6 ft 4in.	2.97 m 9 ft 9in.	10.34 m 33 ft 11in.	12.4
48090kg 106020lb	6	-1.17	2.05 m 6 ft 8in.	2.60 m 8 ft 6in.	1.57 m 5 ft2 in.	0.49 m 1 ft 7in.	5.09 m 16 ft 8in.	3.25 m 10 ft 7in.	2.00m 6 ft 6in.	3.05 m 10ft 0 in.	10.45 m 34 ft 3in.	12.8
47000kg 103617lb	29.0	-0.85	2.14m 7 ft	2.65 m 8 ft 8in.	1.62 m 5 ft 4 in.	0.51 m 1 ft 8in.	5.06m 16 ft 7in.	3.25 m 10 ft 7in.	1.92 m 6 ft 4in.	2.95 m 9 ft 8in.	10.29 m 33 ft 9in.	12.44
45800 kg 100972 lb	6.0	-1.18	2.05m 6 ft 9in.	2.59 m 8 ft 6 in.	1.57 m 5 ft2 in.	0.50 m 1 ft 8in.	5.10 m 16 ft 9in.	3.25 m 10 ft 8in.	2.01m 6 ft 7in.	3.06 m 10ft 0in.	10.46 m 34 ft 4in.	12.84
45800kg 100972 lb	29.0	-0.86	2.14 m 7 ft 0in.	2.65 m 8 ft 8in.	1.63 m 5 ft4 in.	0.51 m 1 ft 8in.	5.07 m 16 ft 7in.	3.26 m 10 ft 8in.	1.96 m 6 ft 5in.	3.00m 9 ft10in.	10.35m 33 ft 11in.	12.47
43700 kg 96342 lb	6.0	-1.19	2.05 m 6 ft 9in.	2.59 m 8 ft 6in.	1.58 m 5 ft2in.	0.51m 1 ft 8 in.	5.11 m 16 ft9 in.	3.26 m 10 ft8 in.	2.02m 6 ft87in.	3.07 m 10ft 1in.	10.47 m 34 ft 6in.	12.9
43700 kg 963429 lb	29.0	-0.86	2.15 m 7 ft 0in.	2.66 m 8 ft 9in.	1.63 m 5 ft4 in.	0.52 m 1 ft 8 in.	5.07m 16 ft 8in.	3.26 m 10 ft8 in.	1.97 m 6 ft 6in.	3.00m 9 ft 10in.	10.36 m 34 ft 0in.	12.51
36500kg 80469lb	6.0	-1.26	2.07 m 6 ft 9in.	2.61 m 8 ft 7in.	1.60 m 5 ft 3in.	0.53m 1 ft 9in.	5.15 m 16 ft 11in.	3.26 m 10 ft 8in.	2.06 m 6 ft 9in.	3.11m 10ft 2in.	10.53 m 34 ft 7in.	13.11
36500 kg 80469 lb	28.7	-0.9	2.16 m 7 ft 1in.	2.68 m 8 ft10in.	1.66 m 5 ft 5in.	0.55m 1 ft 10in.	5.11 m 16 ft 9in.	3.29 m 10 ft 9in.	2.01m 6 ft 7in.	3.04m 10ft 0 in.	10.40m 34 ft 1 in.	12.7

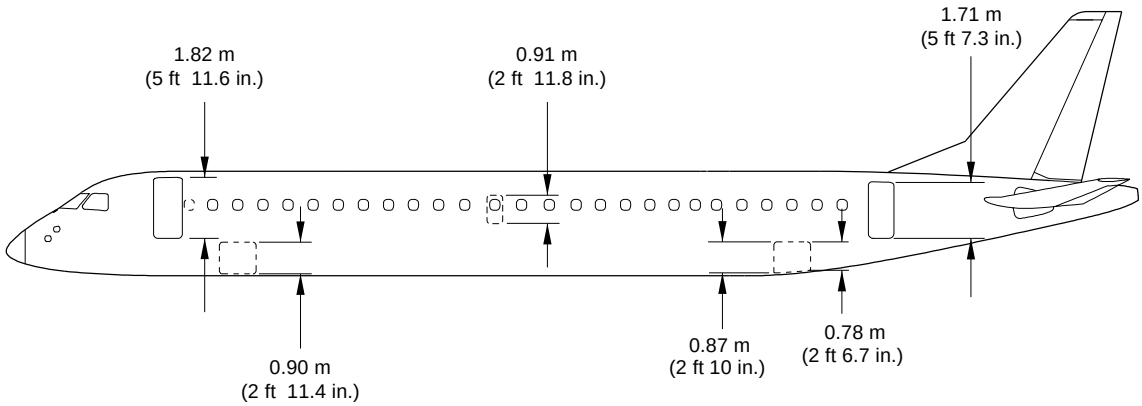
2.4. INTERIOR ARRANGEMENTS

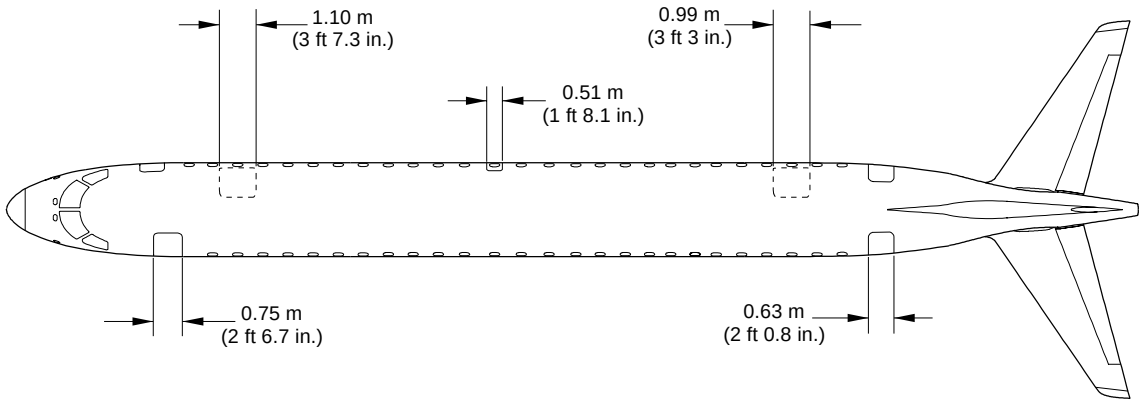
The interior arrangement provides accommodation for two pilots, one observer, one flight attendant, and 19 passengers.

2.4.1. Cockpit

The cockpit is acoustically and thermally insulated for appearance and durability. It follows the worldwide trend of rounded edges, which avoids harm to the flight crew.
The cockpit is separated from the passenger cabin by a bulkhead with a lockable door. The cockpit door is provided with lockable means openable only from the cockpit side, spy hole and escape mechanism on the cockpit side.

2.5. DOOR CLEARANCES





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NOTE: FOR DIMENSIONS OF ALL DOORS, CONSIDER THAT AIRCRAFT IS IN OPERATION, THAT IS, EQUIPPED WITH DOOR LININGS AND DOOR SURROUNDS.

Door Dimensions
Figure 2.3

3. AIRCRAFT PERFORMANCE

3.1. GENERAL INFORMATION

The performance of the aircraft and engine depends on the generation of forces by the interaction between the aircraft or engine and the air mass through which it flies. The atmosphere has a pronounced effect on the temperature, pressure and density of the air.
The ICAO establishes standard basics for estimating and comparing aircraft and engine performance. Some ICAO standard basics are shown below:

1. Sea level standard day:
   Standard Temperature To = 15 °C (288.15 K)
   Standard Pressure Po = 101.3 kPa (29.92 inHg)
   Standard Density ρo = 0.002377 slug per cubic feet
2. ISA

Table 3.1 - ISA

ALTITUDE		TEMPERATURE	
m	**ft**	**°C**	**°F**
0	0	15.0	59.0
305	1000	13.0	55.4
610	2000	11.0	51.9
915	3000	9.1	48.3
1220	4000	7.1	44.7
1524	5000	5.1	41.2
3049	10000	-4.8	23.3
4573	15000	-14.7	5.5
6098	20000	-24.6	-12.3
7622	25000	-34.5	-30.2
9146	30000	-44.4	-48.0
11003	36089	-56.5	-69.7
12195	40000	-56.5	-69.7

NOTE: The performance data shown in this section must not be used for operations.

NOTE: For further information about performance, refer to AOM and AFM.

Tire speed limits are not applicable to this specific aircraft.
This section provides the following information:

- The payload x range charts.
- The takeoff field length charts.
- The landing field length charts.

NOTE: For other charts containing payload x ranges, takeoff field lengths and/or landing field lengths with conditions different from those presented in this section, Embraer should be contacted so that these charts can be obtained.

3.2. PAYLOAD X RANGE

The Payload x Range charts are based on the following conditions:

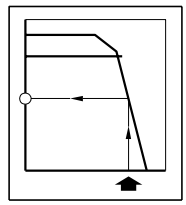
- CF34 - 10E7B engine models;
- Aircraft carrying passengers at 100 kg (220 lb) each one;
- Atmosphere according to ISA or ISA + 10 °C conditions;
- MTOW.

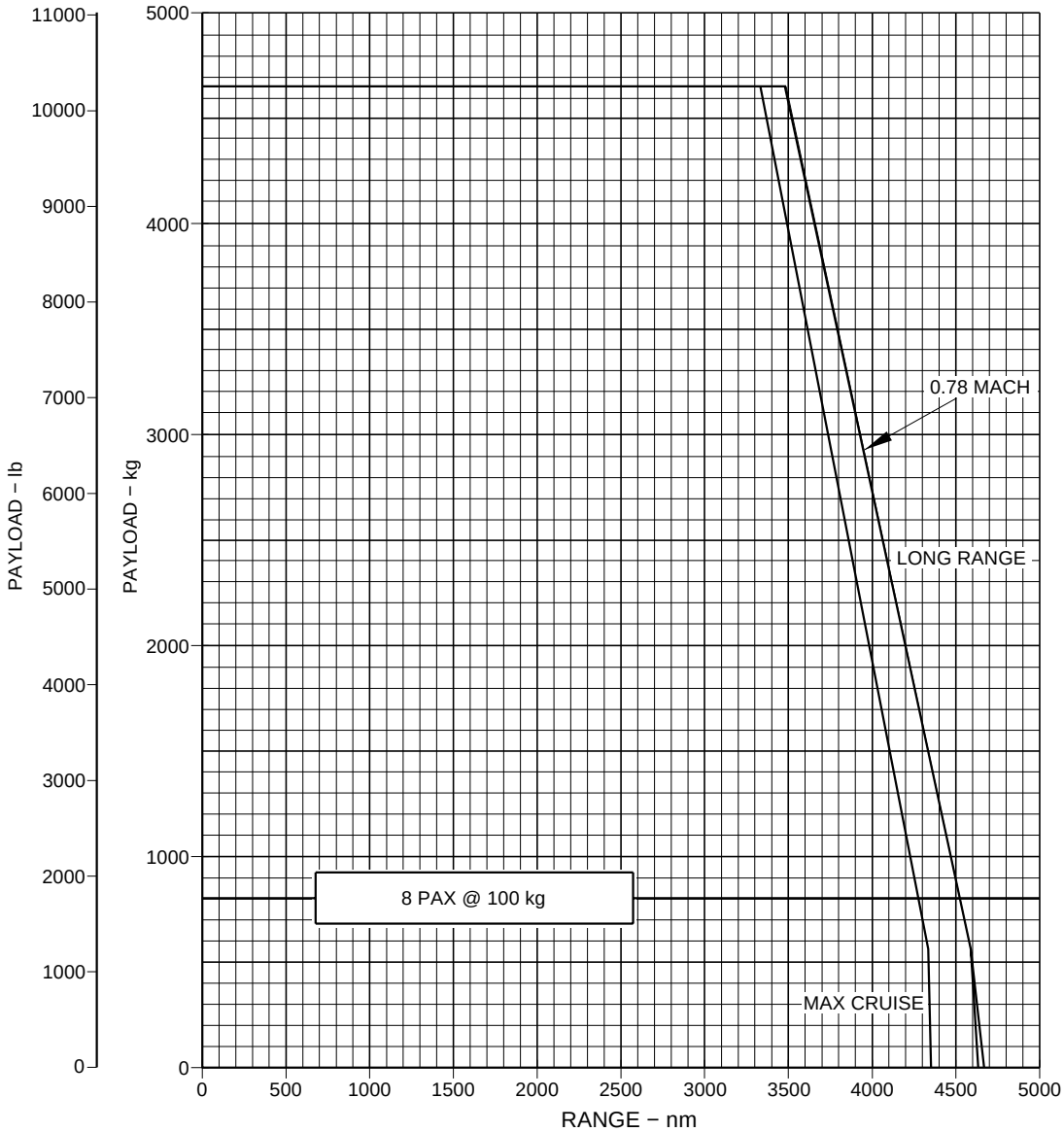
PAYLOAD VS RANGE

CF34 − 10E7 ENGINES
FLIGHT LEVEL 330/350/410
ISA

RESERVE : 100 nm ALTERNATE + 45 min FLIGHT

MTOW = 54500 kg (120152 lb)





NOTES:

MAX TAKEOFF WEIGHT	54500 kg (120152 lb)
MAX ZERO FUEL WEIGHT	36500 kg (80469 lb)
BASIC OPERATING WEIGHT	31850 kg (70217 lb)
MAX USABLE FUEL	22089 Kg (48698 lb)

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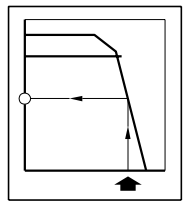
Payload x Range - ISA Conditions
Figure 3.1

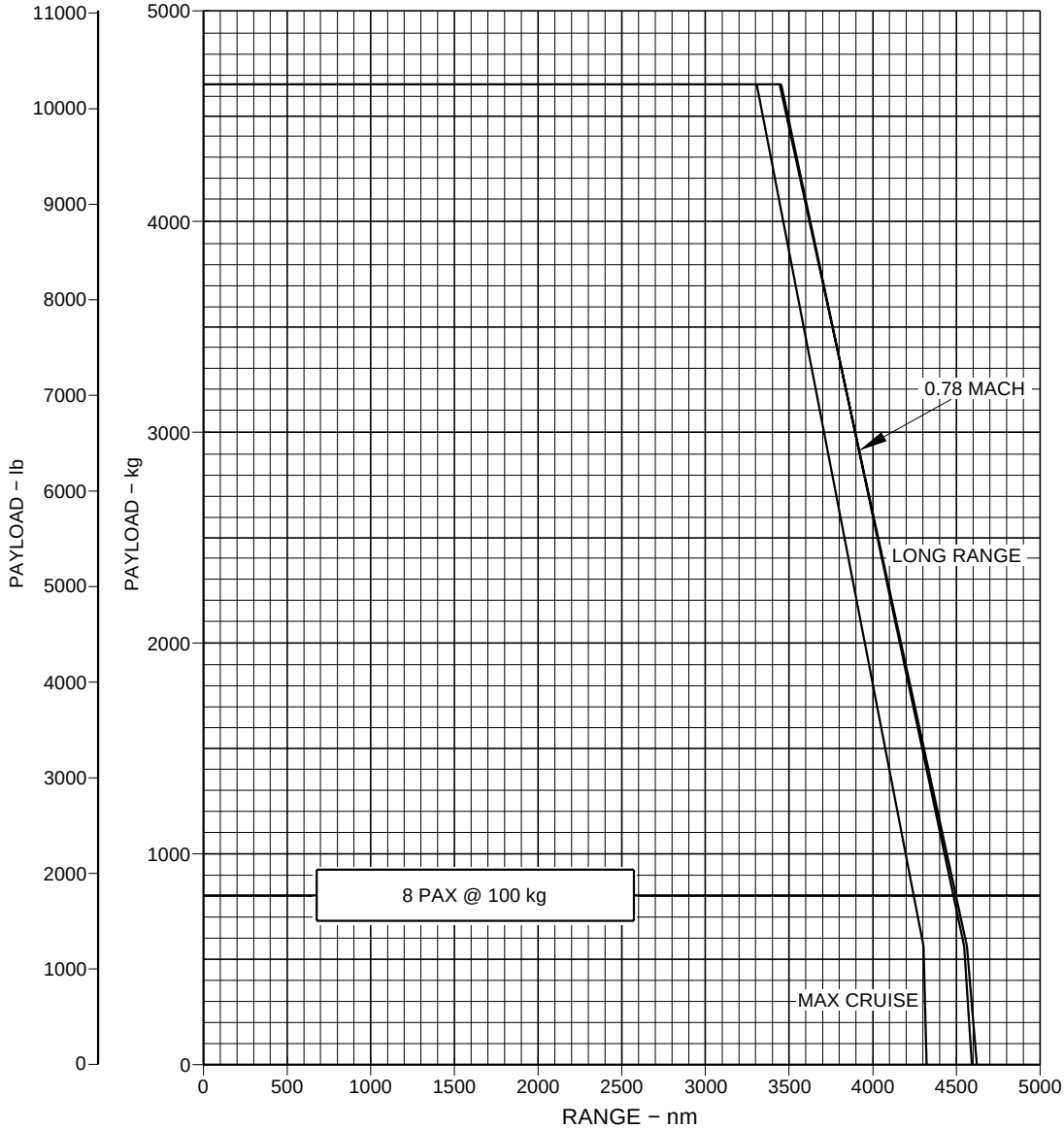
PAYLOAD VS RANGE

CF34 − 10E7 ENGINES
FLIGHT LEVEL 330/370/410
ISA + 10°C

RESERVE : 100 nm ALTERNATE + 45 min FLIGHT

MTOW = 54500 kg (120152 lb)





NOTES:

MAX TAKEOFF WEIGHT - - - - - - - - - - - - - - - - - 54500 kg (120152 lb)
MAX ZERO FUEL WEIGHT - - - - - - - - - - - - - - - 36500 kg (80469 lb)
BASIC OPERATING WEIGHT - - - - - - - - - - - - - 31850 kg (70217 lb)
MAX USABLE FUEL - - - - - - - - - - - - - - - - - - - 22089 Kg (48698 lb)

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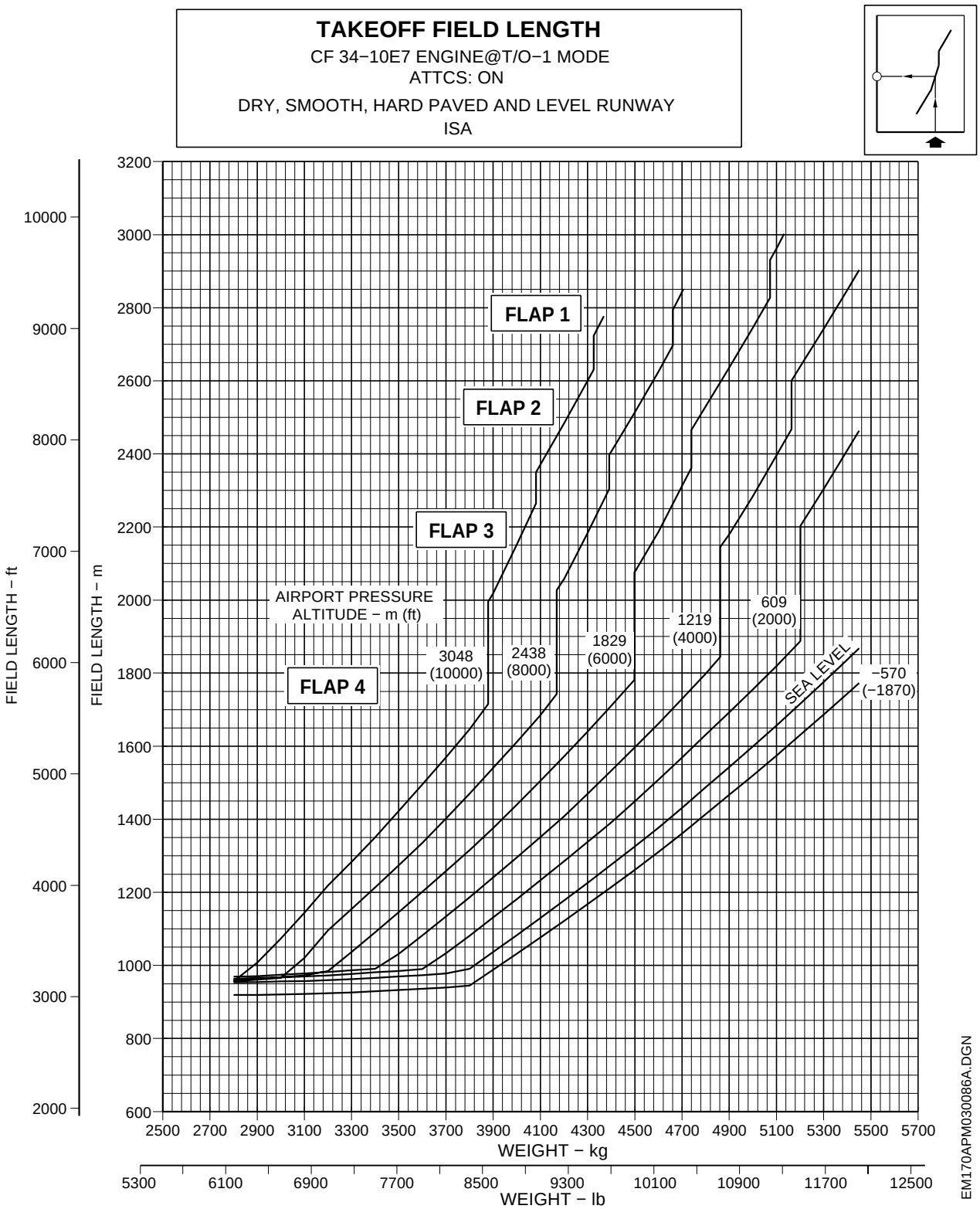
Payload x Range - ISA + 10 °C Conditions
Figure 3.2

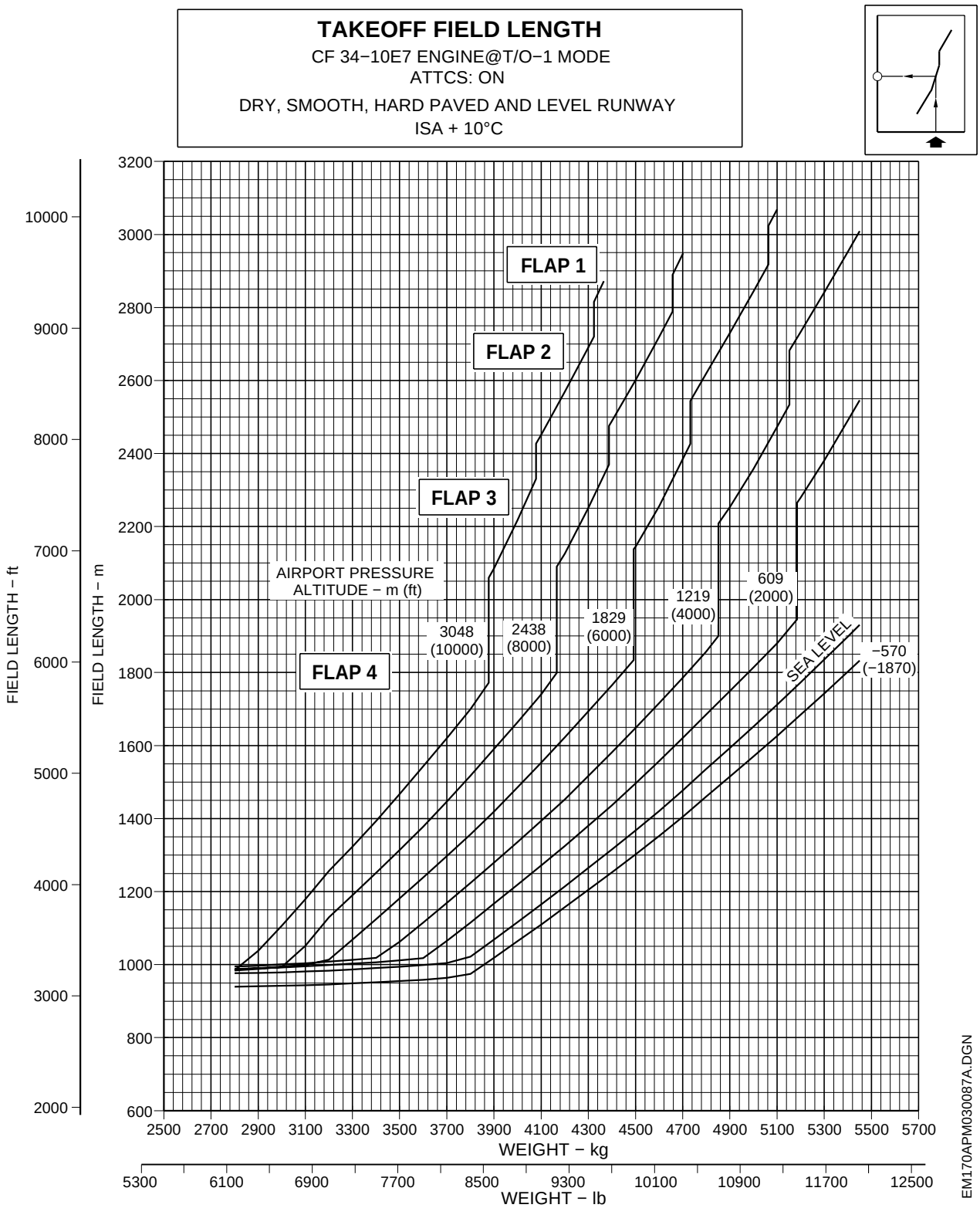
3.3. TAKEOFF FIELD LENGTHS

The takeoff performance is based on the requirements of JAR 25, Change 14, plus amendment 25/96/1. The takeoff field lengths charts provide data about the maximum takeoff weights for compliance with the operating regulations relating to takeoff field lengths.
Data are presented according to the following associated conditions:

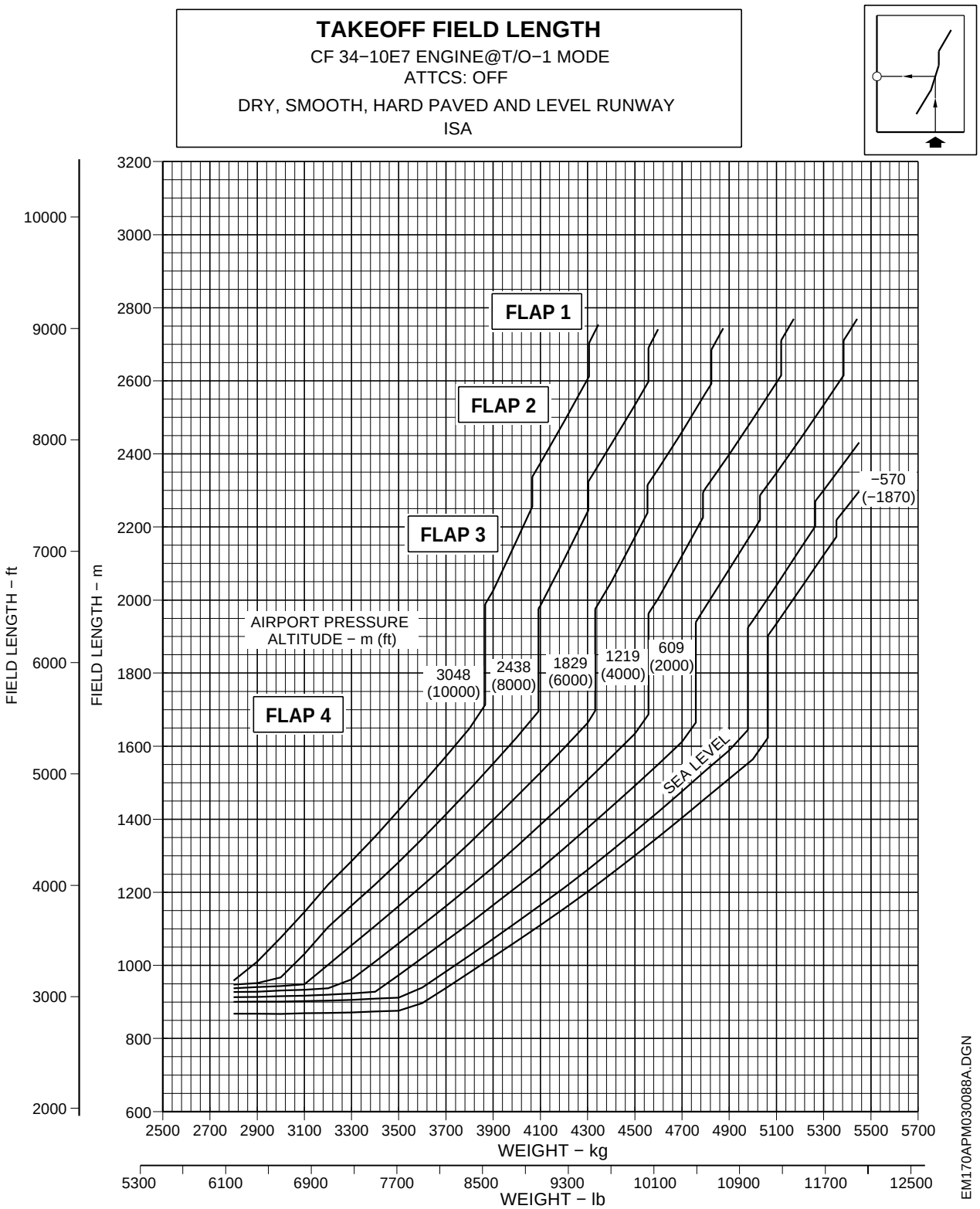
- CF34 - 10E7B engine models;
- Takeoff Mode: 1;
- ATTCS positioning: ON and OFF;
- Flaps setting position: 1, 2 and 4;
- Pavement conditions: dry, hard paved and level runway surface with no obstacles;
- Zero wind and atmosphere according to ISA or ISA + 10 °C conditions;
- Pack OFF: No engine bleed extraction for air conditioning packs was considered in the takeoff and landing charts.



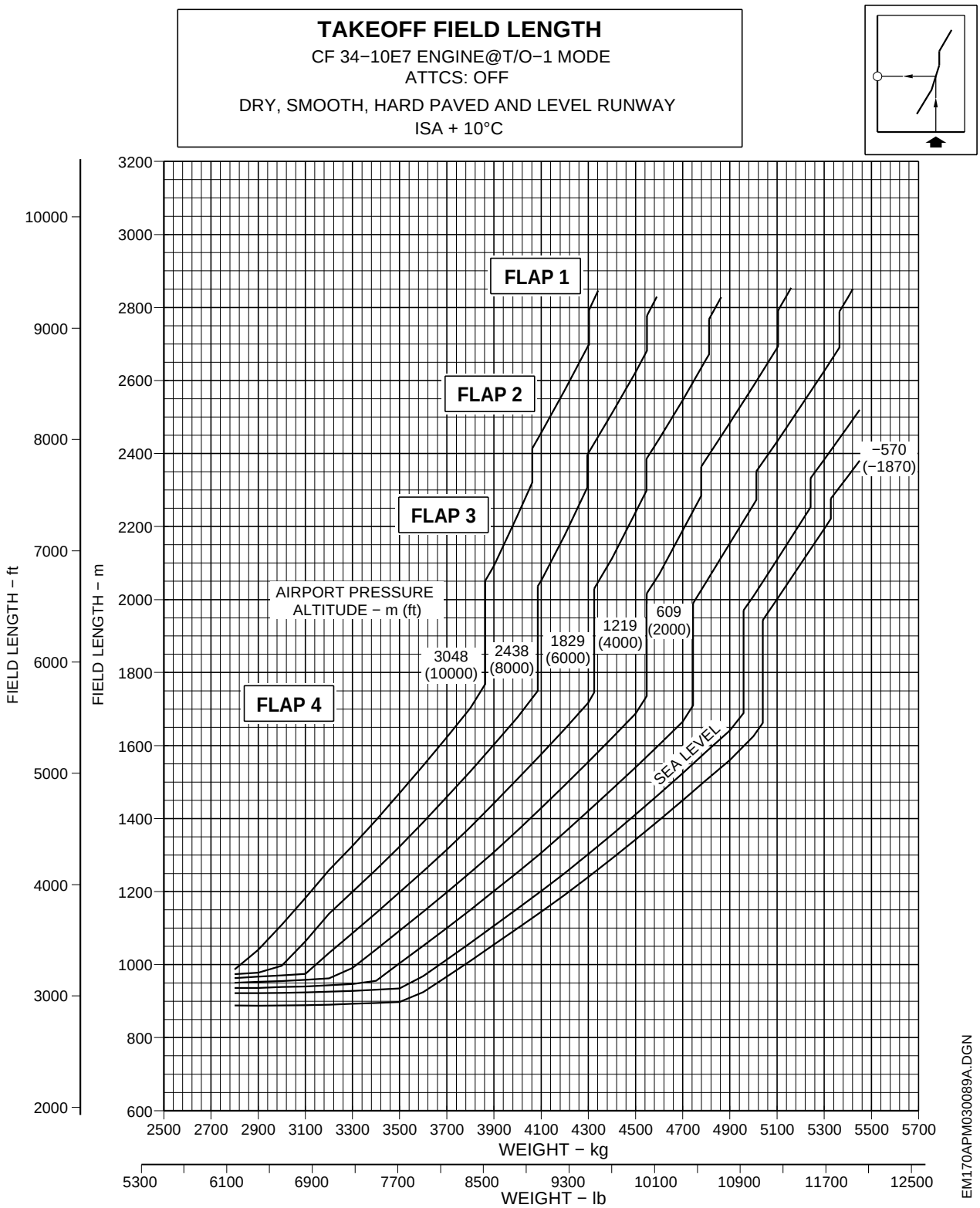
Takeoff Field Lengths - ISA Conditions
Figure 3.3



Takeoff Field Lengths - ISA + 10 °C Conditions
Figure 3.4



Takeoff Field Lengths - ISA Conditions
Figure 3.5

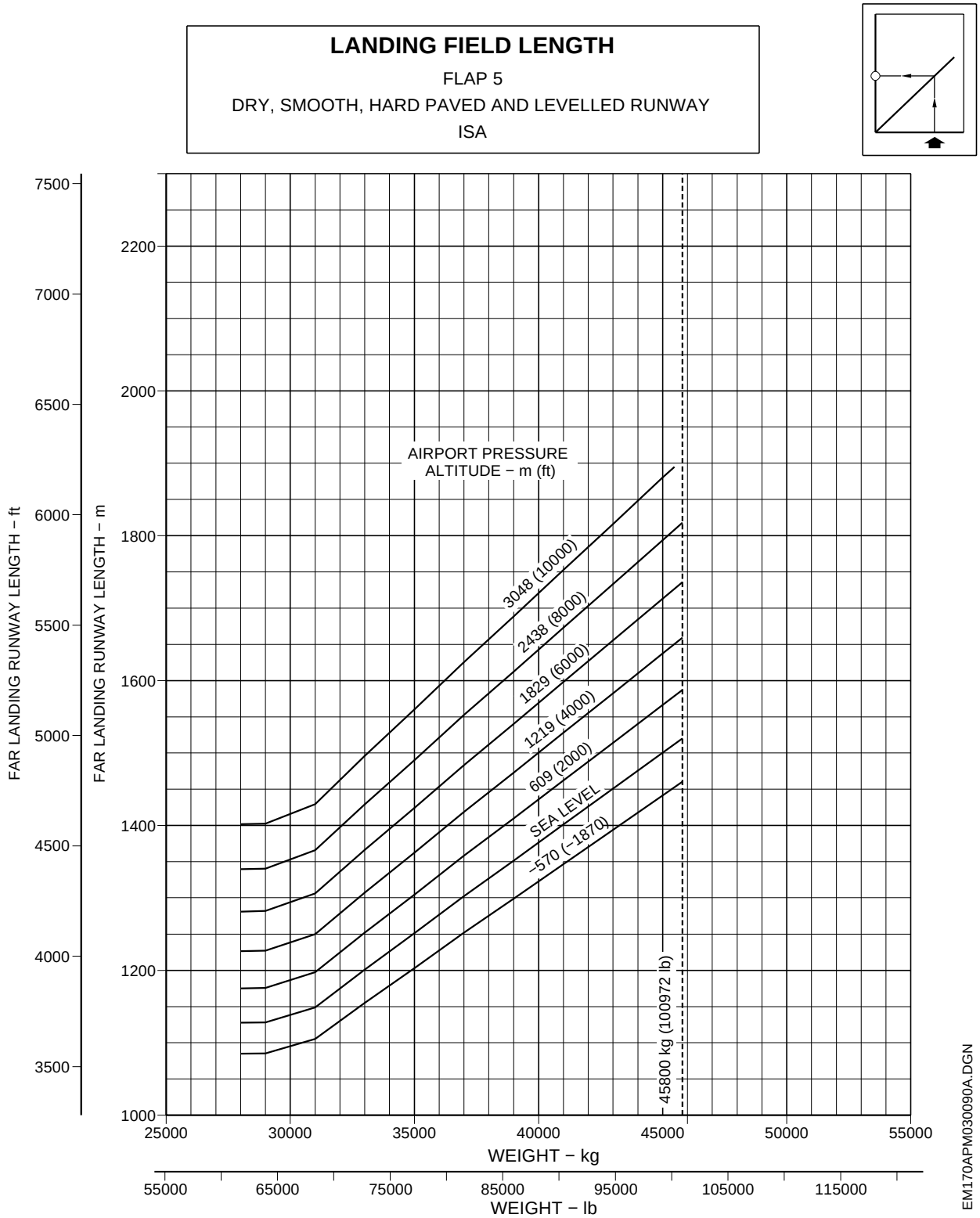


Takeoff Field Lengths - ISA Conditions + 10 °C
Figure 3.6

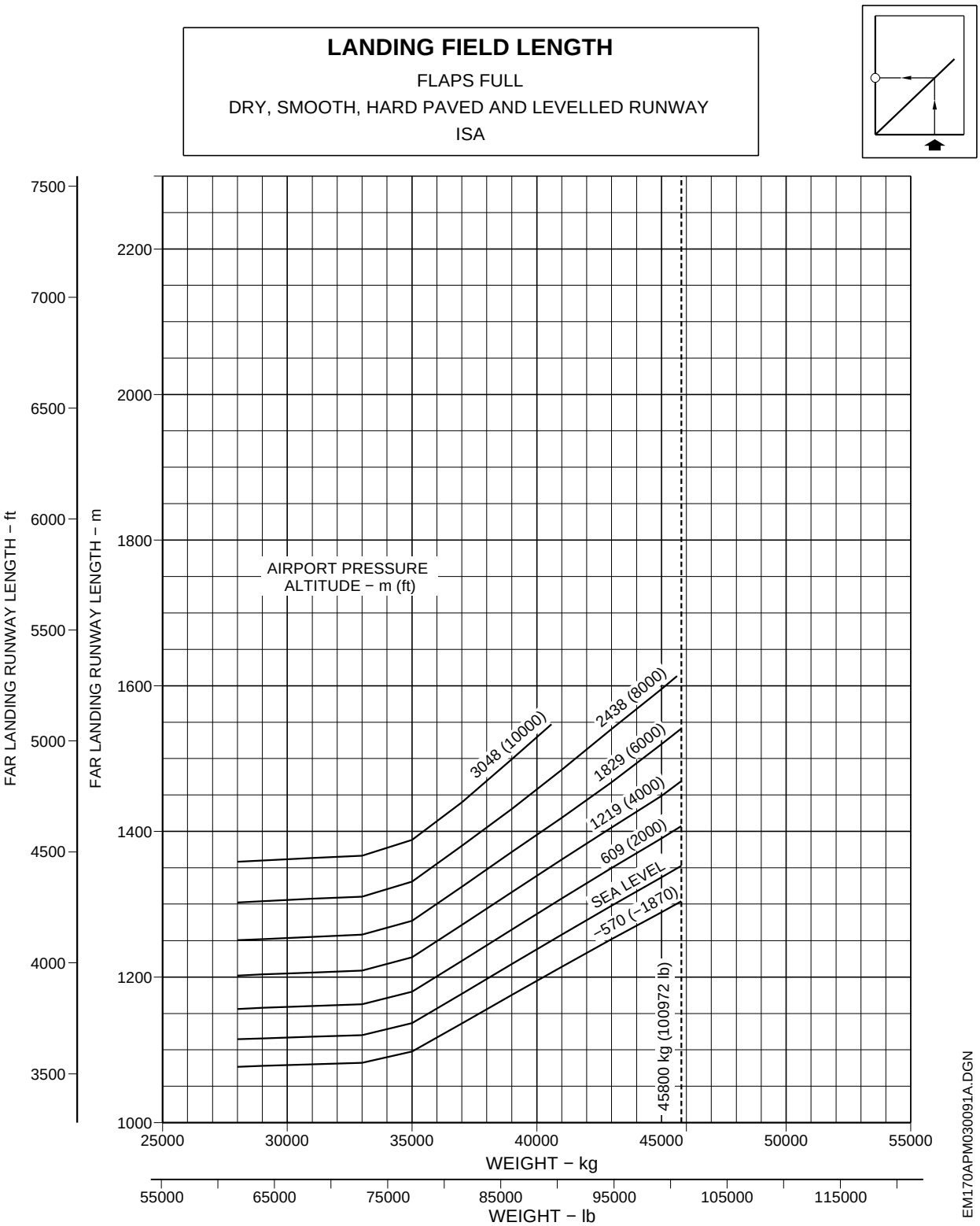
3.4. LANDING FIELDS LENGTHS

The landing field lengths charts provide data about the maximum landing weights for compliance with the operating regulations relating to landing field lengths.
Data is presented according to the following associated conditions:

- Landing gear: down;
- Flaps setting position: 5 or full;
- Pavement conditions: dry, hard paved and level runway surface with no obstacles;
- Zero wind and atmosphere according to ISA conditions;
- Pack OFF: No engine bleed extraction for air conditioning packs was considered in the takeoff and landing charts.



Landing Field Lengths - Flaps 5
Figure 3.7



Landing Field Lengths - Flaps Full
Figure 3.8

4. GROUND MANEUVERING

4.1. GENERAL INFORMATION

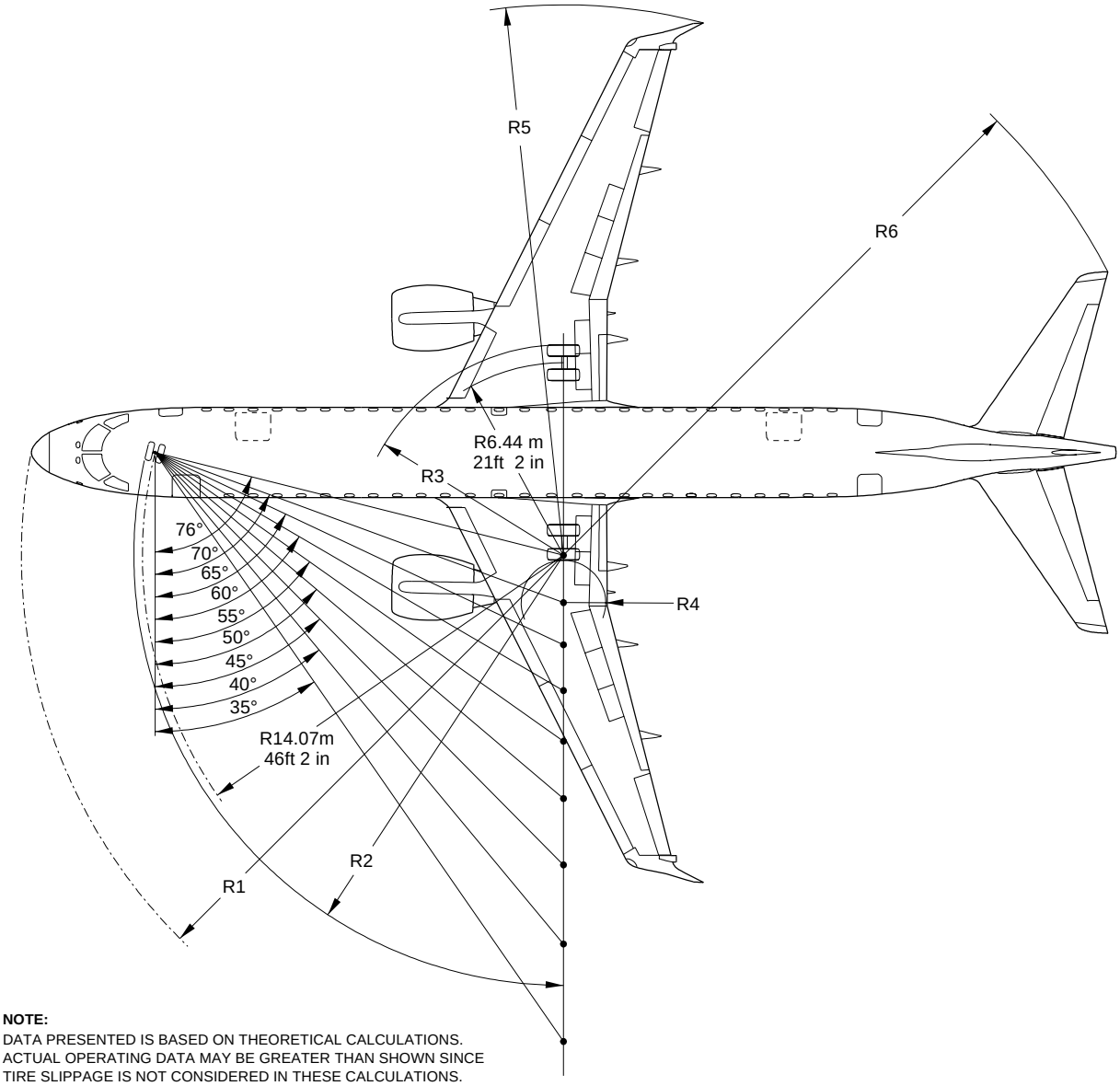
This section provides the aircraft turning capability and maneuvering characteristics. For ease of presentation, these data have been determined from theoretical limits imposed by the geometry of the aircraft.
As such, they reflect the turning capability of the aircraft in favorable operating circumstances. These data should be used only as guidelines for the method of determination of such parameters and for the maneuvering characteristics of the 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.
Variations from standard aircraft operating patterns may be necessary to satisfy physical constants within the maneuvering area, such as adverse grades, limited area, or high risk of jet blast damage. For these reasons, the ground maneuvering requirements should be coordinated with the using airline prior to the layout planning.
This section is presented as follows:

- The turning radii for nose landing gear steering angles.
- 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 by both eyes at the same time.
- The performance of the aircraft on runway-to-taxiway, taxiway-to-taxiway and runway holding bays dimensions.

4.2. TURNING RADII

This subsection presents the following information:

- The turning radii for various nose landing gear steering angles. The minimum turning radius is determined, considering that the maximum nose landing gear steering angle is 76 degrees left and right.
- Data on the minimum width of the pavement for a 180° turn.



NOTE:
DATA PRESENTED IS BASED ON THEORETICAL CALCULATIONS.
ACTUAL OPERATING DATA MAY BE GREATER THAN SHOWN SINCE
TIRE SLIPPAGE IS NOT CONSIDERED IN THESE CALCULATIONS.

STEERING STEEL	NOSE		NOSE GEAR		OUTBOARD GEAR		INBOARD GEAR		RIGHT WINGLET		RIGHT TAILTIP	
	R1		R2		R3		R4		R5		R6	
35°	26.53 m	87 ft	24.16 m	79 ft 3 in	23.28 m	76 ft 5 in	16.08 m	52 ft 9 in	34.35 m	112 ft 8 in	31.50 m	103 ft 4 in
40°	24.21 m	79 ft 5 in	21.58 m	70 ft 10 in	20.03 m	65 ft 9 in	12.82 m	42 ft 1 in	31.13 m	102 ft 2 in	28.91 m	94 ft 10 in
45°	22.50 m	73 ft 10 in	19.64 m	64 ft 5 in	17.38 m	57 ft	10.18 m	35 ft 5 in	28.52 m	93 ft 7 in	26.90 m	88 ft 3 in
50°	21.22 m	69 ft 7 in	18.14 m	59 ft 6 in	15.17 m	49 ft 9 in	7.96 m	26 ft 1 in	26.33 m	86 ft 5 in	25.32 m	83 ft 1 in
55°	20.24 m	66 ft 5 in	16.98 m	55 ft 9 in	13.25 m	43 ft 6 in	6.05 m	19 ft 10 in	24.45 m	80 ft 3 in	24.02 m	78 ft 10 in
60°	19.49 m	63 ft 11 in	16.07 m	52 ft 9 in	11.56 m	37 ft 11 in	4.35 m	14 ft 3 in	22.79 m	74 ft 9 in	22.95 m	75 ft 4 in
65°	18.91 m	63 ft	15.36 m	50 ft 5 in	10.03 m	32 ft 11 in	2.82 m	9 ft 3 in	21.30 m	69 ft 10 in	22.05 m	72 ft 4 in
70°	18.48 m	60 ft 8 in	14.82 m	48 ft 7 in	8.62 m	28 ft 3 in	1.41 m	4 ft 8 in	19.93 m	65 ft 5 in	21.29 m	69 ft 10 in
76°	18.12 m	59 ft 5 in	14.36 m	47 ft 1 in	7.04 m	23 ft 1 in	0.17 m	7 in	18.39 m	60 ft 4 in	20.51 m	67 ft 3 in

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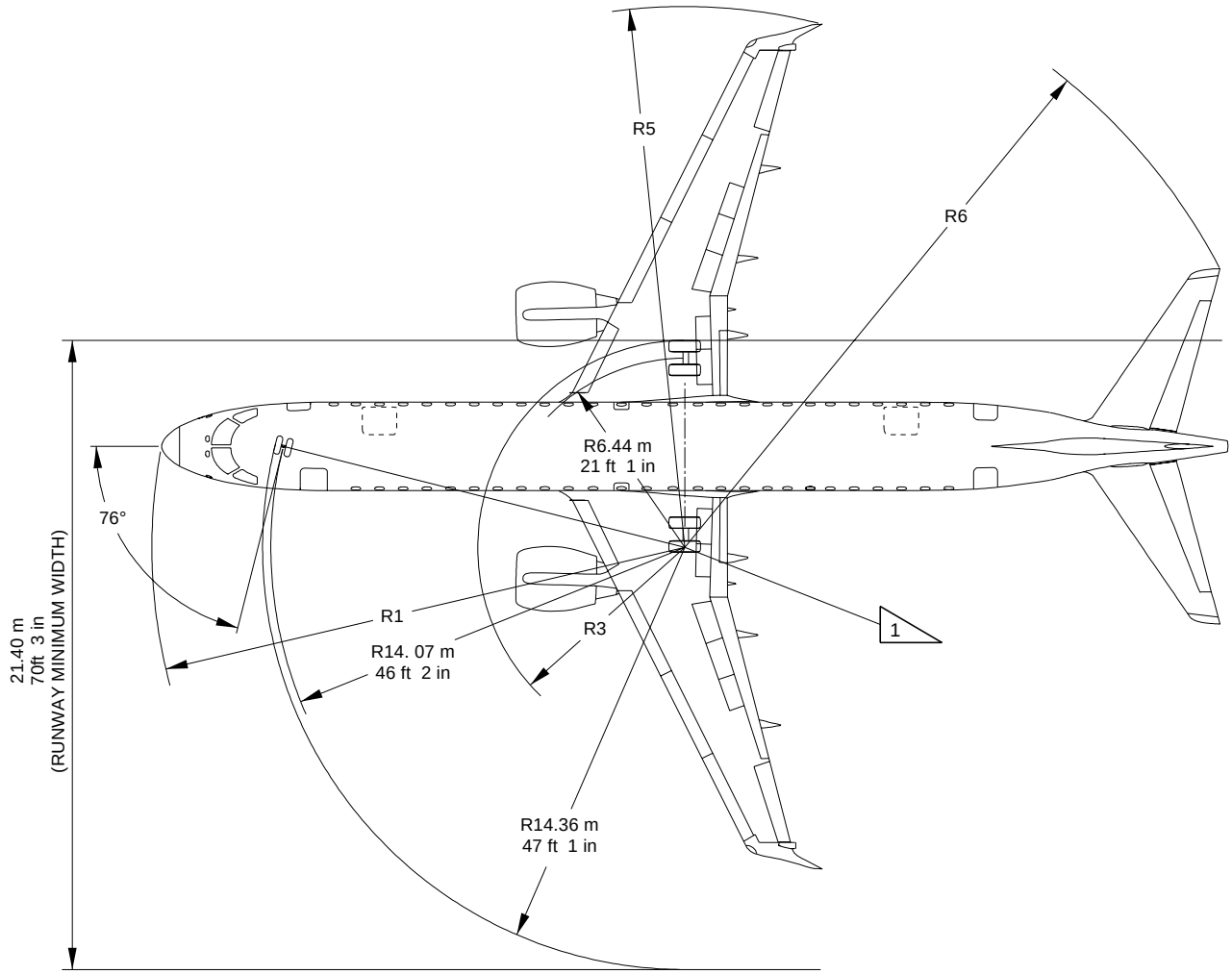
Turning Radii - No Slip Angle
Figure 4.1

4.3. MINIMUM TURNING RADII



NOTE:
ACTUAL OPERATING DATA MAY BE GREATER THAN VALUES SHOWN
SINCE TIRE SLIPPAGE IS NOT CONSIDERED IN THESE CALCULATIONS.

STEERING STEEL	NOSE		NOSE GEAR		OUTBOARD GEAR		INBOARD GEAR		RIGHT WINGLET		RIGHT TAILTIP	
	R1		R2		R3		R4		R5		R6	
76°	18.12 m	59 ft 5 in	14.36 m	47 ft 1 in	7.04 m	23 ft 1 in	0.17 m	7 in	18.39 m	60 ft 4 in	20.51 m	67 ft 3 in

1 THEORETICAL CENTER OF TURN FOR MINIMUN RADIUS.
SHOWS CONTINUOUS TURNING WITH ENGINE THRUST AS REQUIRED.
NO DIFFERENTIAL BRAKING.

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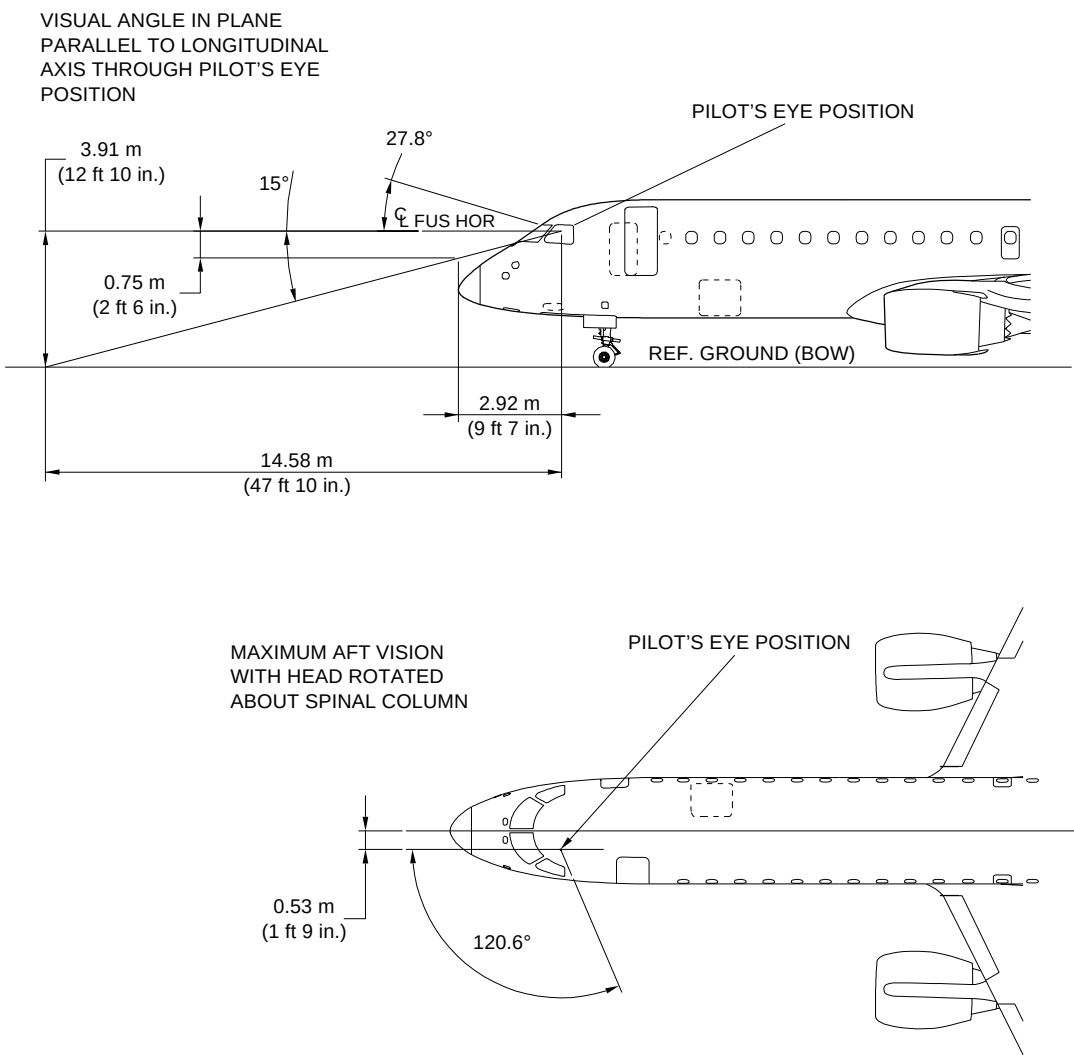
Minimum Turning Radius
Figure 4.2

4.4. VISIBILITY FROM COCKPIT



Visibility from Cockpit in Static Position
Figure 4.3

4.5. RUNWAY AND TAXIWAY DIMENSIONS

To determine the minimum dimensions for runway and taxiway where the aircraft can be operated, the reference code of the aircraft must be determined.
The reference code of a specific aircraft is obtained in accordance with the Aerodrome Design and Operations - Volume 1, by the ICAO.
The code is composed of two elements which are related to the aircraft performance characteristics and dimensions:

- Element 1 is a number based on the aircraft reference field length;
- Element 2 is a letter based on the aircraft wingspan and outer main landing gear wheel span.

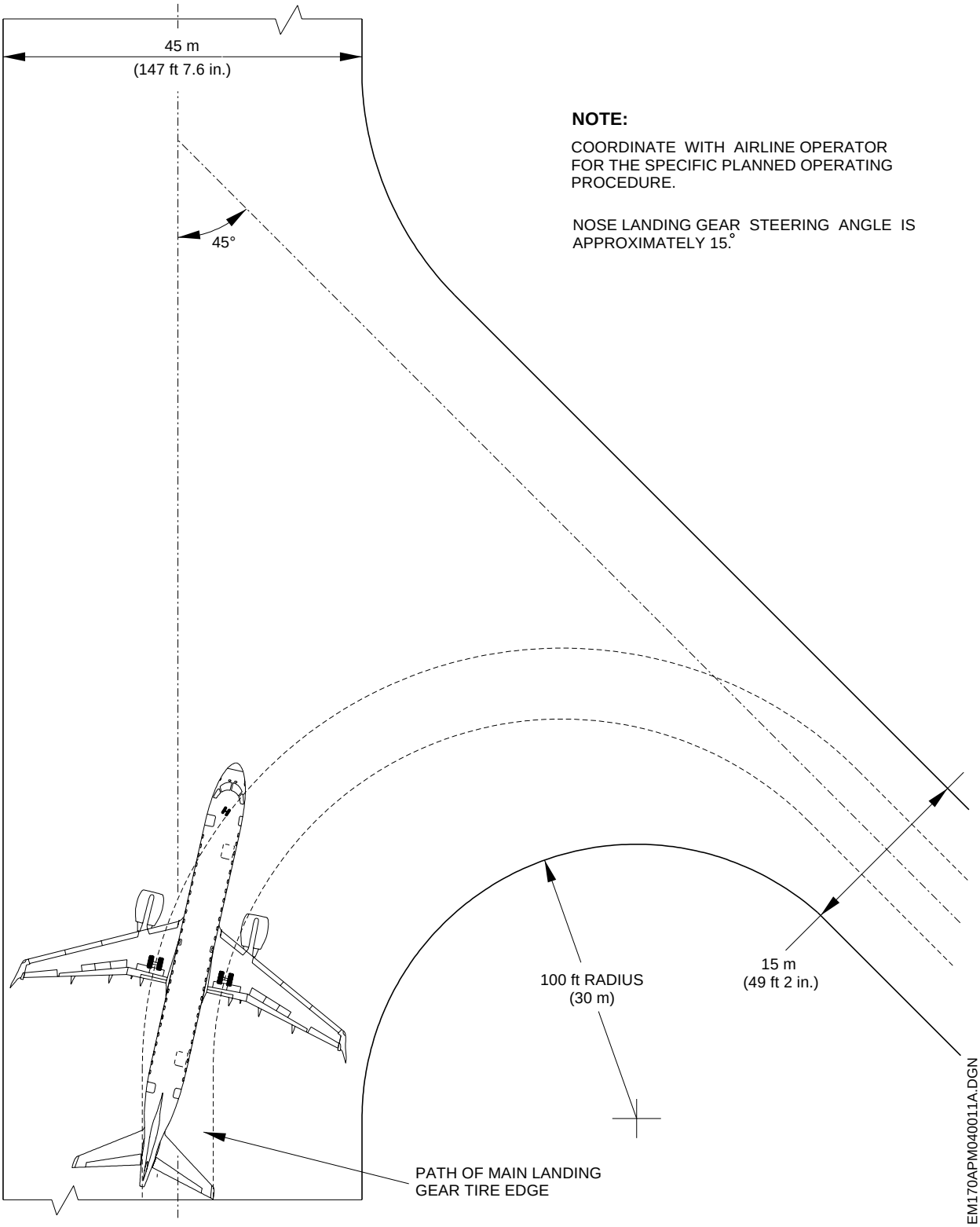
The table below shows the reference codes:

Table 4.1 - Reference Codes

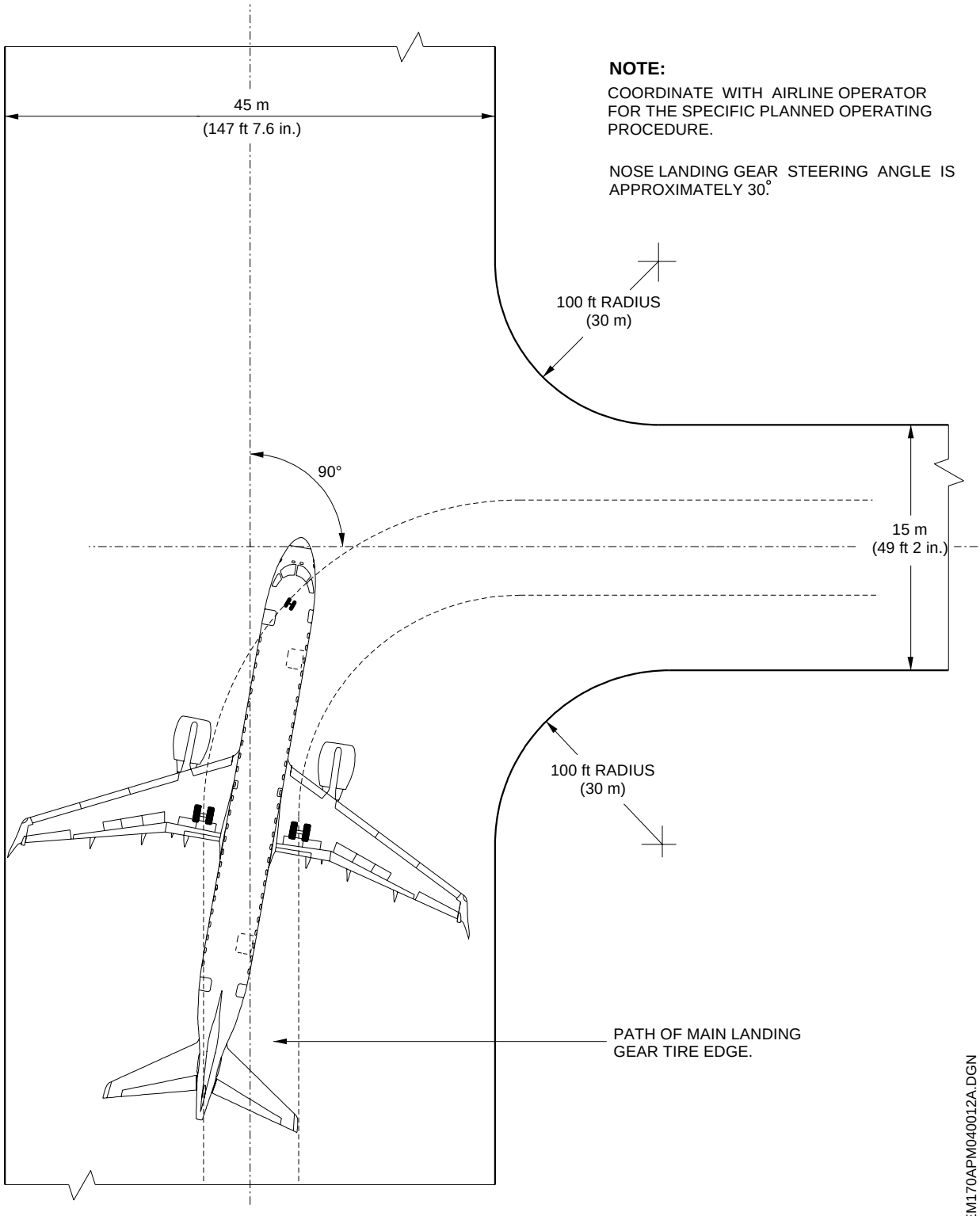
CODE ELEMENT 1		CODE ELEMENT 2		
CODE NUMBER	**AIRCRAFT REFERENCE FIELD LENGTH**	**CODE LETTER**	**WING SPAN**	**OUTER MAIN LANDING GEAR WHEEL SPAN**
1	less than 800 m (2624 ft 8 in)	A	Up to 15 m (49 ft 3 in)	Up to 4.5 m (14 ft 9 in)
2	800 m (2624 ft 8 in) up to 1200 m (3937 ft)	B	15 m (49 ft 3 in) to 24 m (78 ft 9 in)	4.5 m (14 ft 9 in) to 6 m (19 ft 8 in)
3	1200 m (3937 ft) up to 1800 m (5905 ft 6 in)	C	24 m (78 ft 9 in) to 36 m (118 ft 1 in)	6 m (19 ft 8 in) to 9 m (29 ft 6 in)
4	1800 m (5905 ft 6 in) and over	D	36 m (118 ft 1 in) to 52 m (170 ft 7 in)	9 m (29 ft 6 in) to 14 m (45 ft 11 in)
5	–	E	52 m (170 ft 7 in) to 65 m (213 ft 3 in)	9 m (29 ft 6 in) to 14 m (45 ft 11 in)

In accordance with the table, the reference code for the EMBRAER 190 is 4C.
With the reference code it is possible to obtain the limits of the runway and taxiway where the aircraft can be operated. For reference code 4C the limits are:

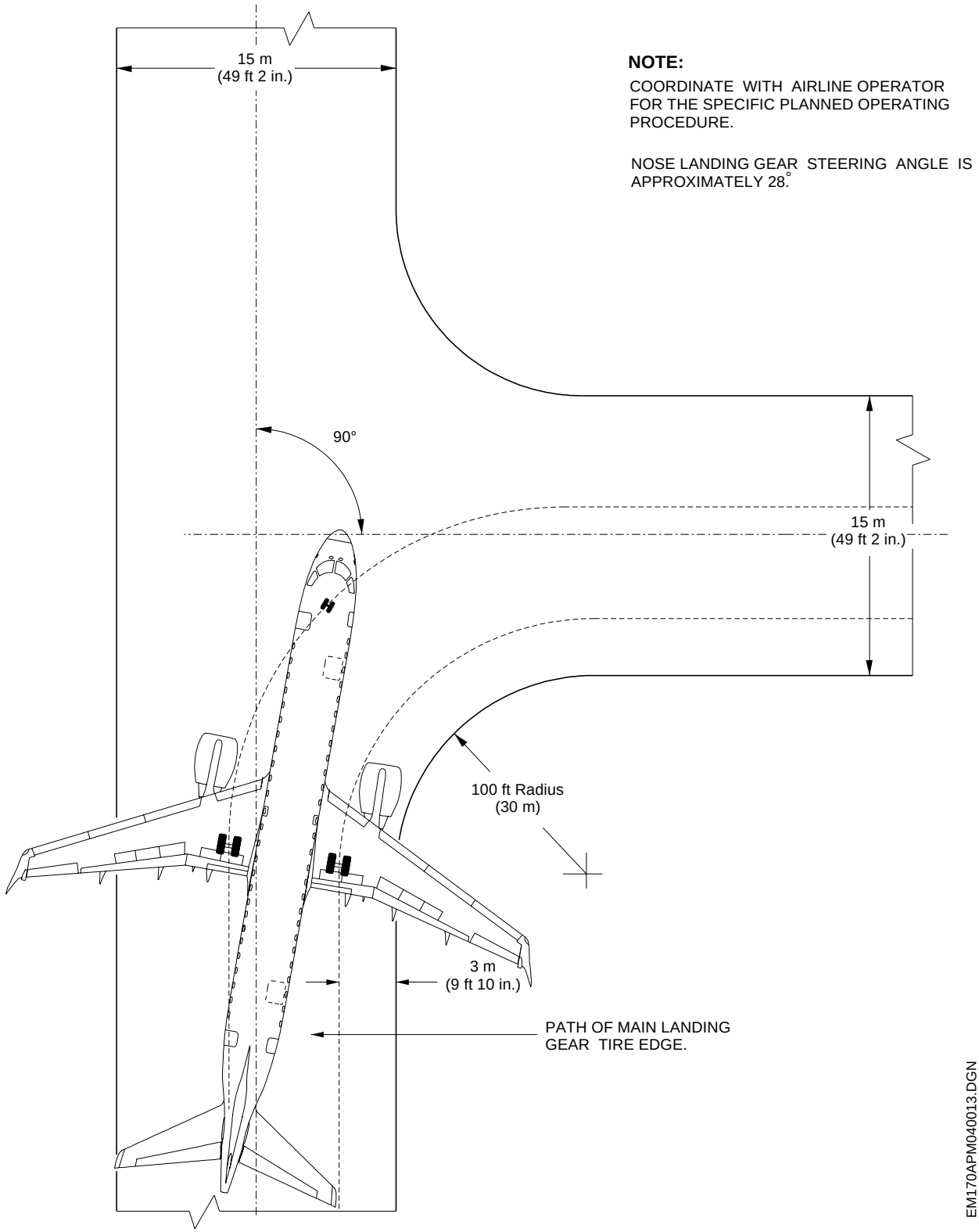
- The width of a runway should be not less than 45 m (147 ft 7.6 in);
- The width of a taxiway should be not less than 15 m (49 ft 2 in);
- The design of the curve in a taxiway should be such that, when the cockpit remains over the taxiway centre line marking, the clearance distance between the outer main landing gear wheels of the aircraft and the edge of the taxiway should not be less than 3 m (9 ft 10 in);
- The clearance between a parked aircraft and one moving along the taxiway in a holding bay should not be less than 15 m (49 ft 2 in).



More than 90° Turn - Runway to Taxiway
Figure 4.4

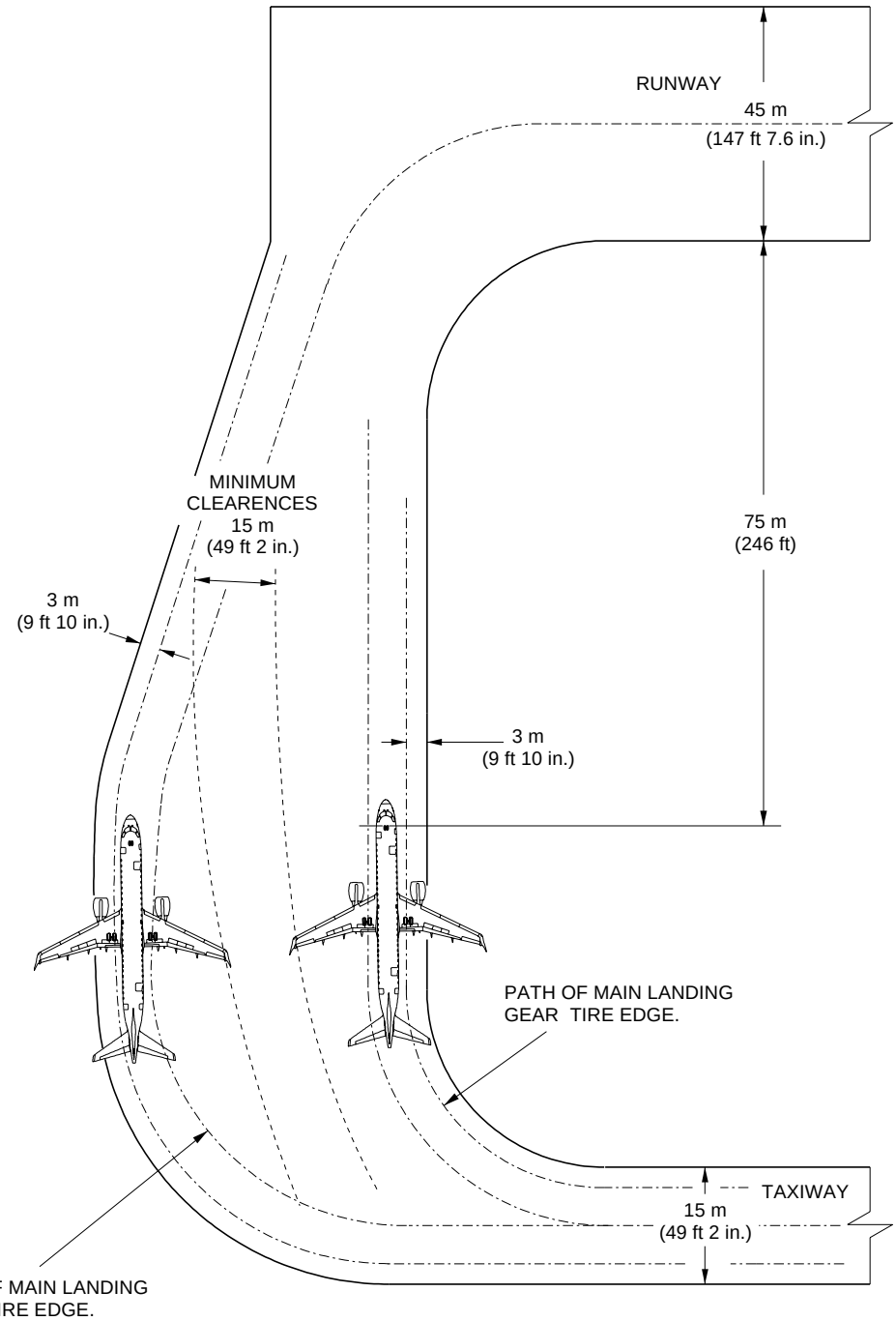


90° Turn - Runway to Taxiway
Figure 4.5



90° Turn - Taxiway to Taxiway
Figure 4.6

4.6. RUNWAY HOLDING APRON



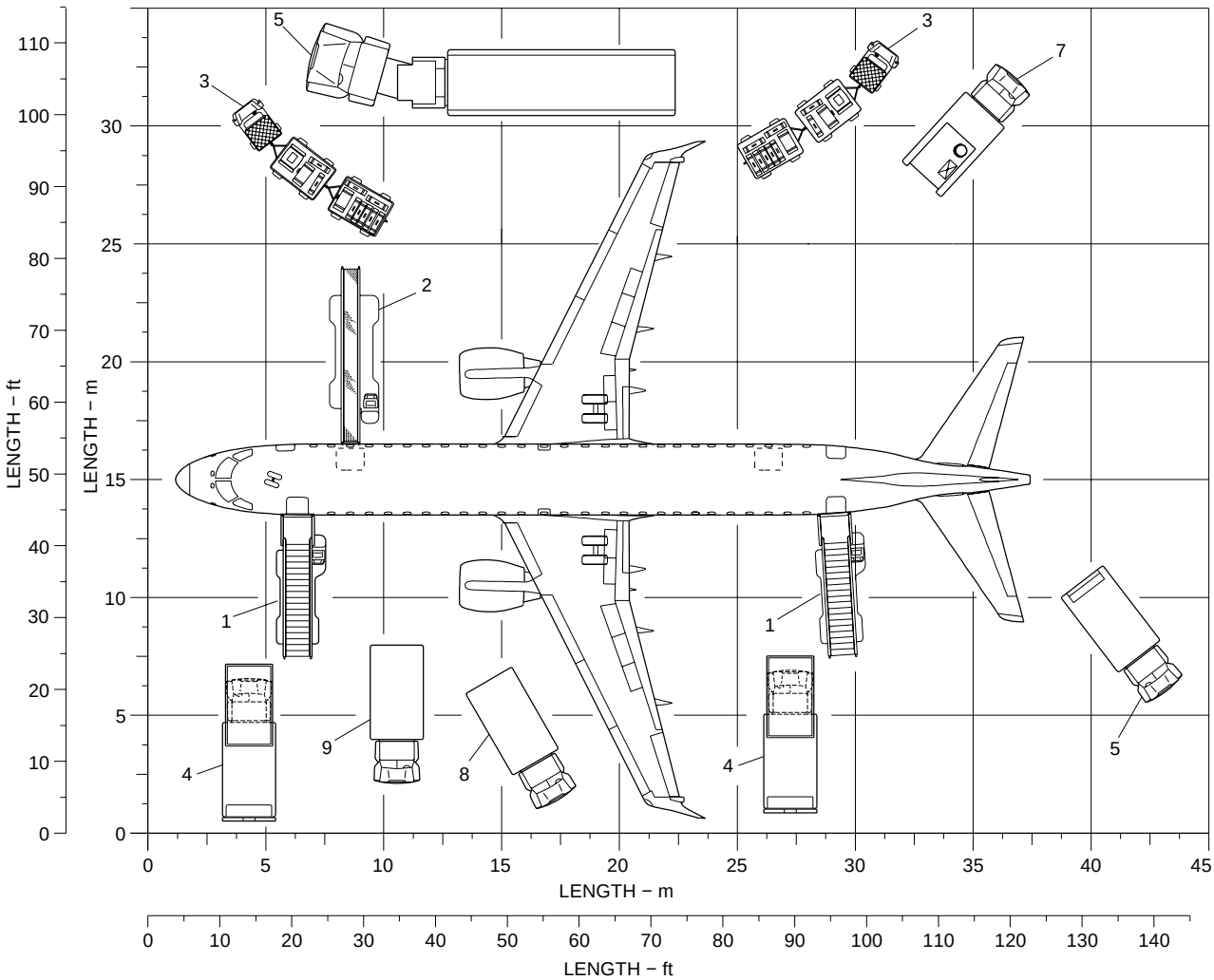
Runway Holding Bay
Figure 4.7

5. TERMINAL SERVICING

During turnaround at the air terminal, certain services must be performed on aircraft, usually within a given time to meet flight schedules. This section shows service vehicle arrangements, schedules, locations of servicing points, and typical servicing requirements. The data presented herein reflect ideal conditions for a single aircraft. Servicing requirements may vary according to the aircraft condition and airline operational (servicing) procedures.
This section provides the following information:

- The typical arrangements of equipments during turnaround;
- The typical turnaround servicing time at an air terminal;
- The locations of ground servicing connections in graphic and tabular forms;
- The typical sea level air pressure and flow requirements for starting the engine;
- The air conditioning requirements;
- The ground towing requirements for various towing conditions. Towbar pull and total traction wheel load may be determined by considering aircraft weight, pavement slope, coefficient of friction, and engine idle thrust.

5.1. AIRCRAFT SERVICING ARRANGEMENT



SERVICING ARRANGEMENT

01 − PASSENGER STAIRS
02 − BAGGAGE LOADER
03 − BAGGAGE / CARGO
04 − GALLEY SERVICE
05 − FUEL SERVICE
06 − POTABLE WATER
07 − LAVATORY SERVICE
08 − AIR CONDITIONING
09 − PNEUMATIC STARTER

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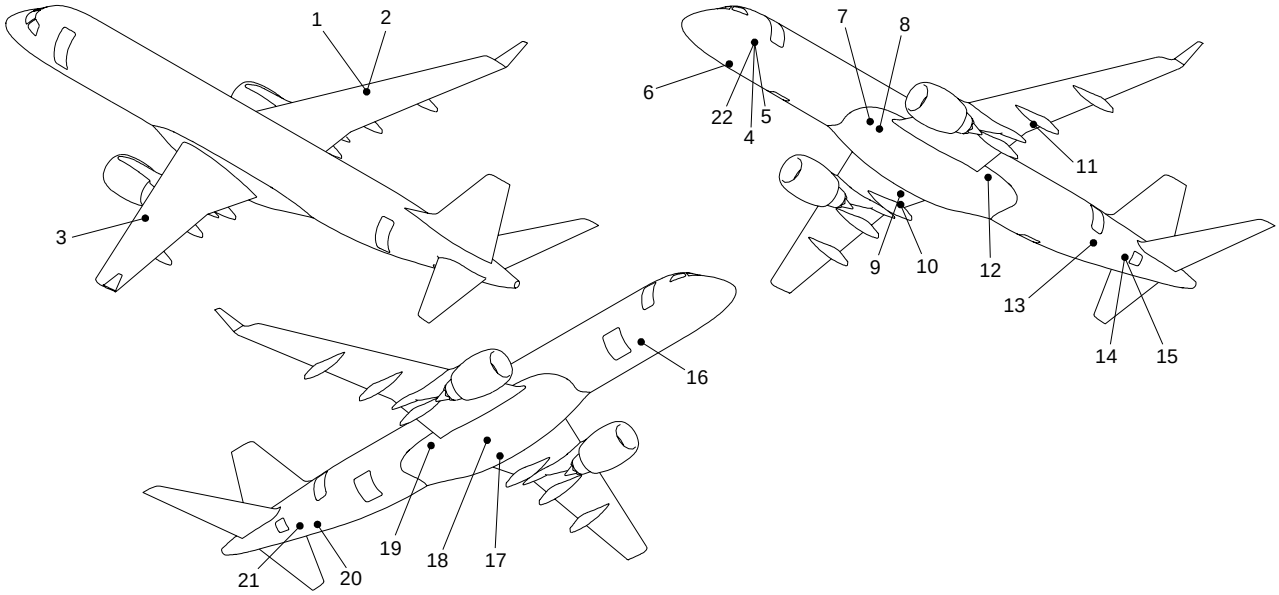
Aircraft Servicing Arrangement With Passenger Stairs
Figure 5.1

5.2. GROUND SERVICING CONNECTIONS



ITEM	DESCRIPTION	COORD. X (mm)	COORD. Y (mm)	COORD. Z (mm)	HEIGHT ABOVE GROUND (mm)
1	PRESSURE REFUELING PANEL	17316.95	7803.78	−543.75	2862.76
2	GRAVITY REFUELING PORT (RH)	17695.04	7774.46	−310.92	3104.19
3	GRAVITY REFUELING PORT (LH)	17932.67	−7646.75	−308.24	3112.32
4	FORWARD RAMP HEADSET	4164.44	−936.13	−1262.71	1842.51
5	STEERING SWITCH DISENGAGE	4136.97	−951.46	−1279.29	1825.31
6	WHEEL JACK POINT − NLG	4125.32	0.00	−2854.38	250.36
7	AIR COND. GROUND CONNECTION	13268.52	0.00	−1979.71	1334.39
8	ENGINE AIR STARTING (LOW PRESSURE UNIT)	13629.01	57.25	−1952.83	1369.51
9	GROUNDING POINT (ELECTRICAL)	18052.28	2930.25	−1744.67	1679.01
10	WHEEL JACK POINT− MLG (RH)	18078.03	2970.00	−2988.86	435.73
11	WHEEL JACK POINT− MLG (LH)	18078.03	−2970.00	−2988.86	435.73
12	HYD. SYS # 1 SERVICE PANEL	20139.16	−808.01	−1602.04	1869.43
13	WATER SERVICING PANEL	27861.83	−329.37	−1178.74	2469.64
14	EXTERNAL POWER SUPPLY 28 VDC / 400A	30421.65	−471.73	−605.30	3101.60
15	AFT RAMP HEADSET	30562.26	−449.47	−585.54	3124.58
16	OXYGEN SERVICING PANEL / BOTTLE	6562.14	1159.87	−961.05	2109.06
17	FUEL TANK DRAIN VALVE (LH)	16444.90	−691.60	−1611.45	1775.35
18	FUEL TANK DRAIN VALVE (RH)	16476.65	526.50	−1611.45	1776.08
19	HYD. SYS # 2 SERVICE PANEL	20139.16	808.01	−1602.04	1869.43
20	WASTE SERVICING PANEL	28784.01	349.20	−991.80	2677.66
21	HYD. SYS # 3 SERVICE PANEL	30398.86	519.15	−590.09	3116.29
22	EXTERNAL POWER SUPPLY 115 VAC	4146.90	−810.70	−1339.53	1765.31

NOTE:

THE GROUND CLEARANCES IN THE TABLE REFER TO THE AIRCRAFT WITH THE MINIMUM OPERATING WEIGHT (MOW) = 29500 kg (CG FWD 4.0% CMA)

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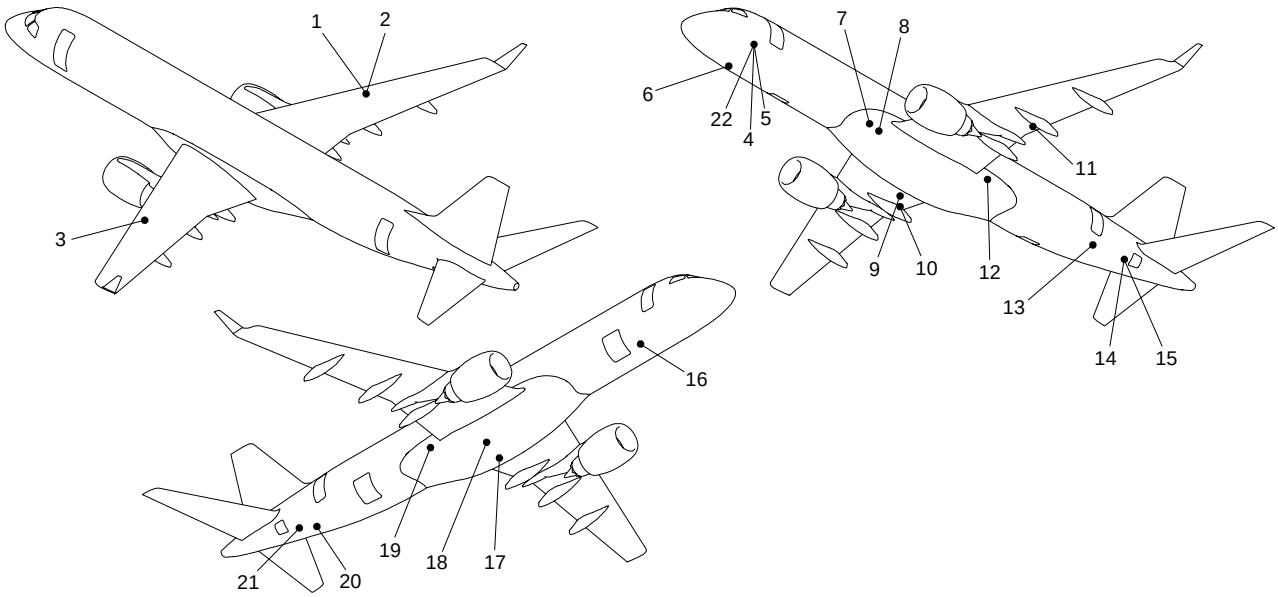
Ground Servicing Connections
Figure 5.2



ITEM	DESCRIPTION	COORD. X (mm)	COORD. Y (mm)	COORD. Z (mm)	HEIGHT ABOVE GROUND (mm)
1	PRESSURE REFUELING PANEL	17316.95	7803.78	−543.75	2849.66
2	GRAVITY REFUELING PORT (RH)	17695.04	7774.46	−310.92	3088.37
3	GRAVITY REFUELING PORT (LH)	17932.67	−7646.75	−308.24	3094.78
4	FORWARD RAMP HEADSET	4146.44	−936.13	−1262.71	1924.92
5	STEERING SWITCH DISENGAGE	4136.97	−951.46	−1279.29	1907.92
6	WHEEL JACK POINT − NLG	4125.32	0.00	−2854.38	250.48
7	AIR COND. GROUND CONNECTION	13268.52	0.00	−1979.71	1350.51
8	ENGINE AIR STARTING (LOW PRESSURE UNIT)	13629.01	57.25	−1952.83	1383.02
9	GROUNDING POINT (ELECTRICAL)	18052.28	2930.25	−1744.67	1660.39
10	WHEEL JACK POINT− MLG (RH)	18077.02	2970.00	−2969.64	428.34
11	WHEEL JACK POINT− MLG (LH)	18077.02	−2970.00	−2969.64	428.34
12	HYD. SYS # 1 SERVICE PANEL	20139.16	−808.01	−1602.04	1835.66
13	WATER SERVICING PANEL	27861.83	−329.37	−1178.74	2379.79
14	EXTERNAL POWER SUPPLY 28 VDC / 400A	30421.65	−471.73	−605.30	2993.22
15	AFT RAMP HEADSET	30562.26	−449.47	−585.54	3015.18
16	OXYGEN SERVICING PANEL / BOTTLE	6562.14	1159.87	−961.05	2264.08
17	FUEL TANK DRAIN VALVE (LH)	16444.90	−691.60	−1611.45	1768.43
18	FUEL TANK DRAIN VALVE (RH)	16476.65	526.50	−1611.45	1768.43
19	HYD. SYS # 2 SERVICE PANEL	20139.16	808.01	−1602.04	1835.66
20	WASTE SERVICING PANEL	28784.01	349.20	−991.80	2581.13
21	HYD. SYS # 3 SERVICE PANEL	30398.86	519.15	−590.09	3008.07
22	EXTERNAL POWER SUPPLY 115 VAC	4146.90	−810.70	−1339.53	1847.84

NOTE:

THE GROUND CLEARANCES IN THE TABLE REFER TO THE AIRCRAFT WITH THE MINIMUM OPERATING WEIGHT (MOW) = 29500 kg (CG REAR 29.0% CMA)

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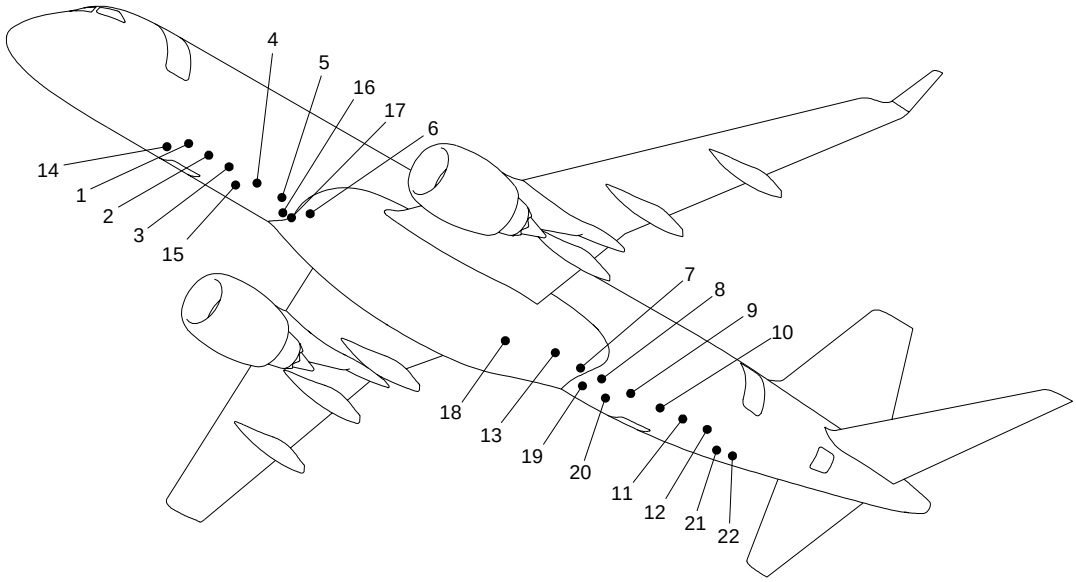
Ground Servicing Connections
Figure 5.3



ITEM	DESCRIPTION	COORD. X (mm)	COORD. Y (mm)	COORD. Z (mm)	HEIGHT ABOVE GROUND (mm)
1	DRAIN FUEL TANK A1	6634.82	−322.04	−1659.53	1502.43
2	DRAIN FUEL TANK A2	7484.82	−322.04	−1659.53	1521.91
3	DRAIN FUEL TANK E1	8334.78	−322.04	−1659.53	1541.39
4	DRAIN FUEL TANK E2	9384.78	−322.04	−1659.53	1565.46
5	DRAIN FUEL TANK E3	10520.00	−322.04	−1659.53	1591.48
6	DRAIN FUEL TANK E4	11484.78	−322.04	−1659.53	1613.60
7	DRAIN FUEL TANK D2	21952.10	−317.26	−1659.05	1807.04
8	DRAIN FUEL TANK D3	22807.28	−317.80	−1659.46	1820.02
9	DRAIN FUEL TANK D4	23861.00	−318.39	−1658.72	1837.25
10	DRAIN FUEL TANK C	25094.06	−317.65	−1597.73	1917.53
11	DRAIN FUEL TANK F	26004.77	−299.99	−1507.15	2022.35
12	DRAIN FUEL TANK G	26932.67	−290.45	−1379.99	2164.02
13	DRAIN FUEL TANK D1	20984.28	−353.44	−1649.47	1801.47
14	DRAIN FUEL	6324.00	0.00	−1702.50	1452.35
15	DRAIN FUEL	8960.00	0.00	−1702.55	1512.71
16	DRAIN FUEL	10919.00	0.00	−1702.50	1557.67
17	DRAIN FUEL	11150.31	0.00	−1702.55	1562.92
18	DRAIN FUEL	19547.35	0.00	−1700.60	1727.86
19	DRAIN FUEL	22404.00	0.00	−1700.60	1772.57
20	DRAIN FUEL	23412.00	0.00	−1701.60	1787.35
21	DRAIN FUEL	27676.43	0.00	−1292.26	2263.38
22	DRAIN FUEL	28667.47	0.00	−1111.72	2459.41

NOTE:
THE GROUND CLEARANCES IN THE TABLE REFER TO THE AIRCRAFT WITH THE MINIMUM OPERATING WEIGHT (MOW) = 29500 kg (CG REAR 29.0% CMA)

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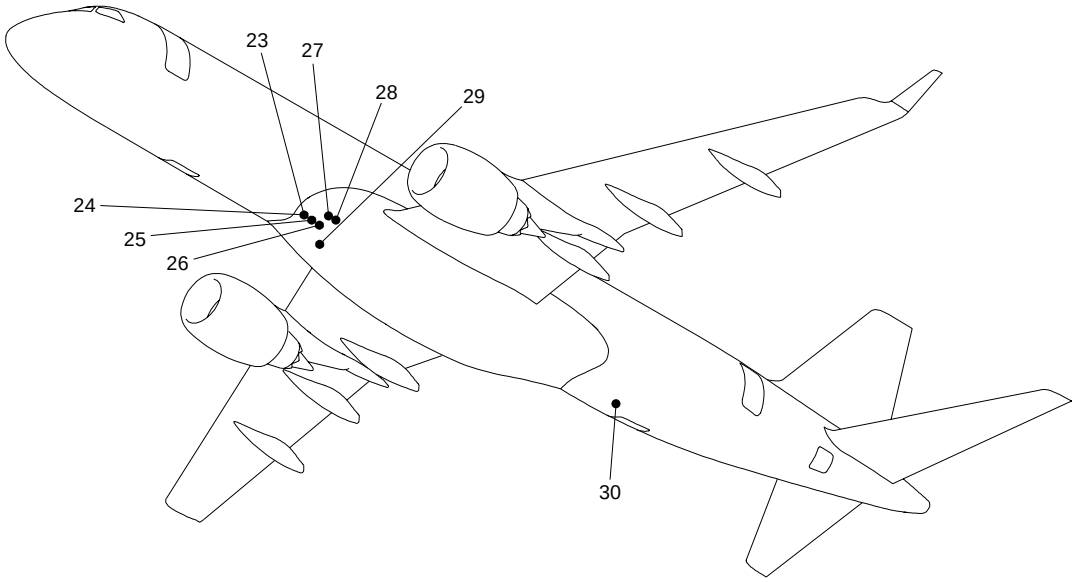
Ground Servicing Connections
Figure 5.4



ITEM	DESCRIPTION	COORD. X (mm)	COORD. Y (mm)	COORD. Z (mm)	HEIGHT ABOVE GROUND (mm)
23	DRY DRAIN	11584.00	−144.39	−1694.12	1581.29
24	DRY DRAIN	11584.00	−184.29	−1689.94	1585.46
25	DRY DRAIN	11766.10	−184.73	−1689.20	1590.38
26	DRY DRAIN	11906.10	−184.75	−1689.32	1593.47
27	DRY DRAIN	12164.70	−482.10	−1613.70	1675.00
28	DRY DRAIN	12264.70	−481.98	−1613.37	1677.62
29	DRY DRAIN	12684.98	145.30	−1694.19	1606.45
30	DRY DRAIN	23643.29	0.00	−1699.58	1792.99

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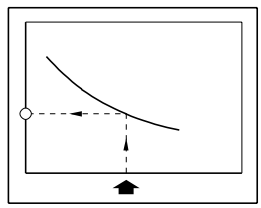
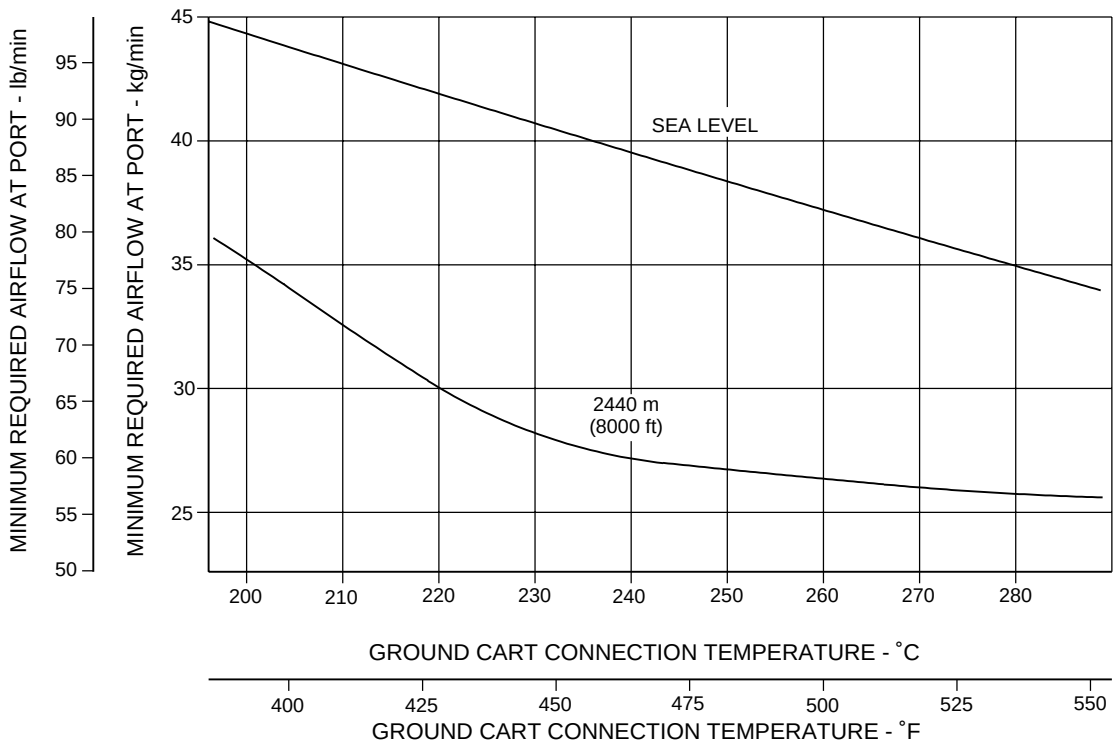
NOTE:
THE GROUND CLEARANCES IN THE TABLE REFER TO THE AIRCRAFT WITH THE MINIMUM OPERATING WEIGHT (MOW) = 29500 kg (CG REAR 29.0% CMA)

Ground Servicing Connections
Figure 5.5

5.3. ENGINE STARTING PNEUMATIC REQUIREMENTS





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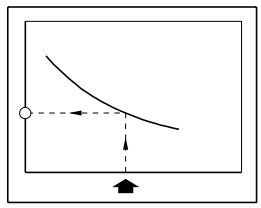
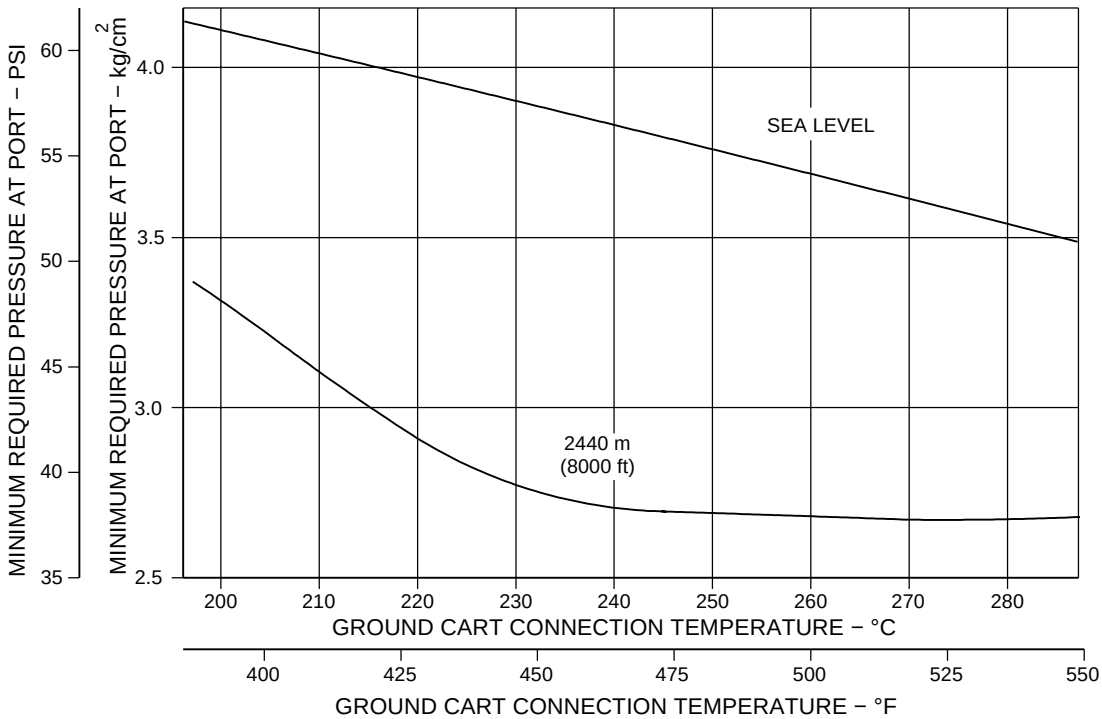
Engine Starting Pneumatic Requirements - Airflow x Temperature
Figure 5.6





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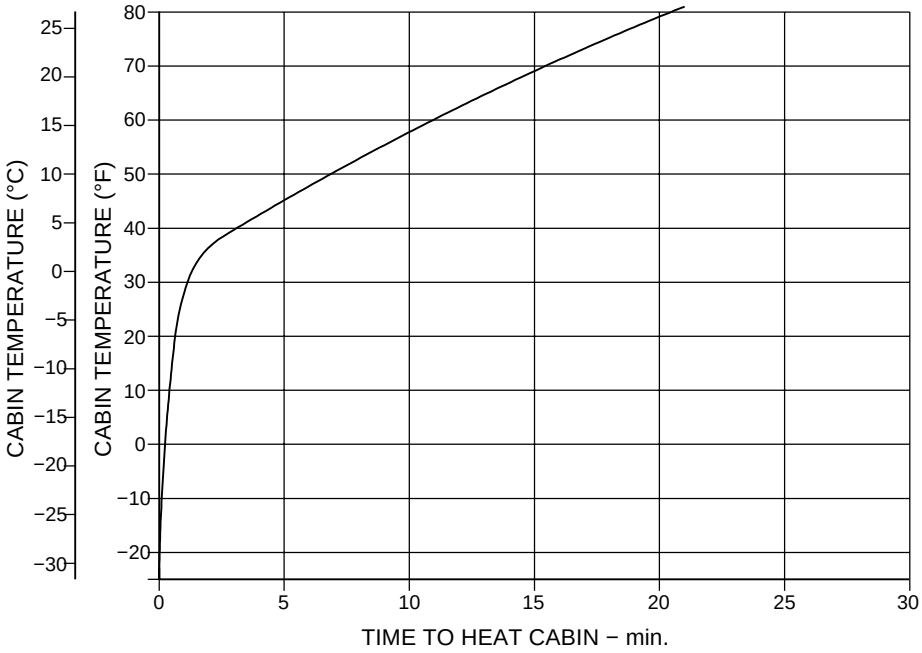
Engine Starting Pneumatic Requirements - Pressure x Temperature
Figure 5.7

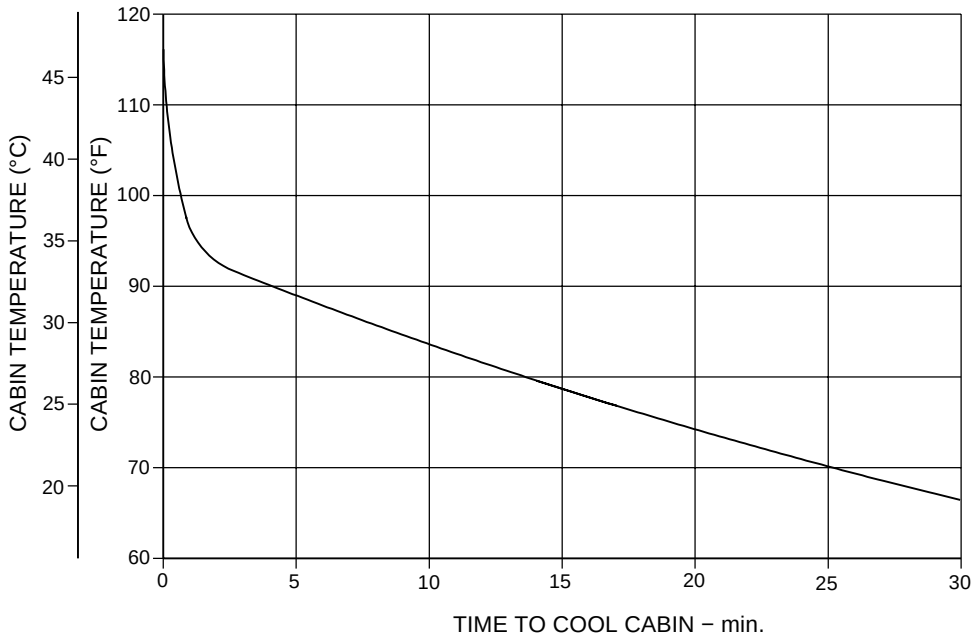
5.4. GROUND PNEUMATIC POWER REQUIREMENTS



HEATING

Initial cabin temp: −32°C (−25°F)
Outside air temp: −40°C (−40°F)
Relative Humidity: 0%
No crew or passengers
No other heat load

Bleed air from APU:
87 kg/min. (192.0 lb/min.)
452 kPa (65.5 psia)
2 operating packs (ECS)



COOLING

Initial cabin temp: 47°C (116°F)
Outside air temp: 40°C (104°F)
Relative Humidity: 40%
No crew or passengers
No other heat load

Bleed air from APU:
56 kg/min. (122.9 lb/min.)
413 kPa (59.9 psia)
2 operating packs (ECS)

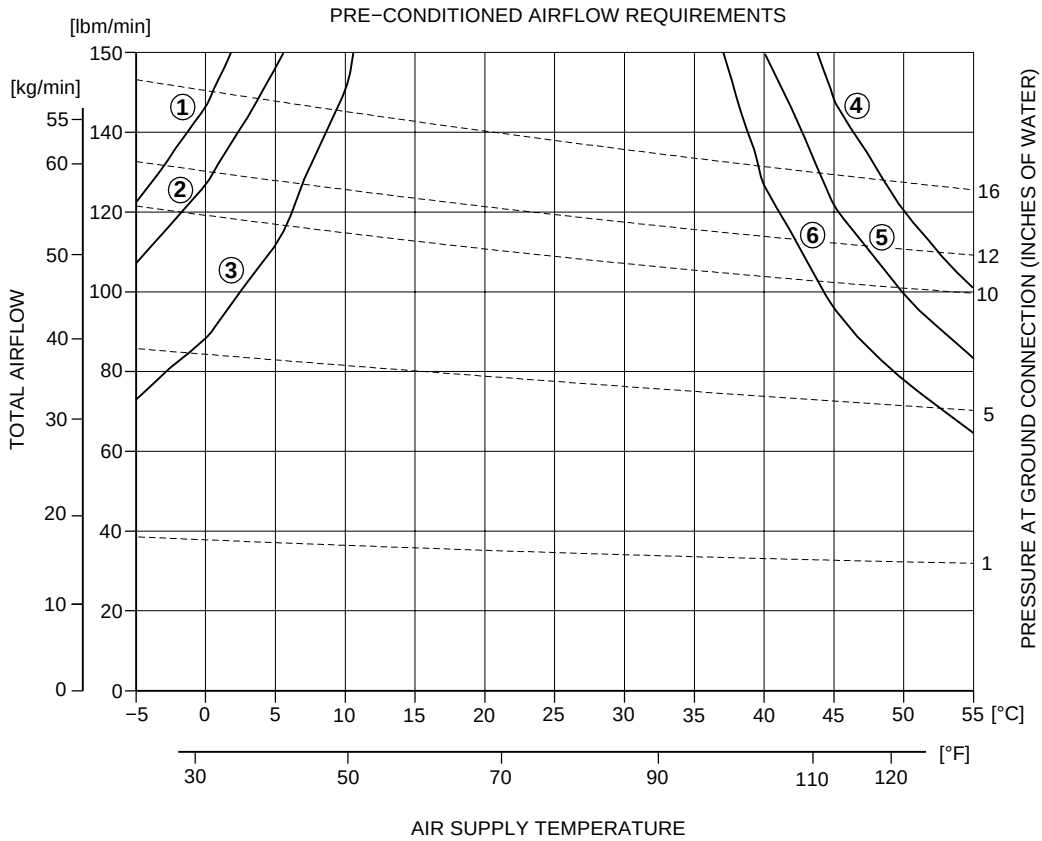
EM170APM050007B.DGN

Ground Pneumatic Power Requirements
Figure 5.8

5.5. PRECONDITIONED AIRFLOW REQUIREMENTS

This subsection presents the following information:

- The air conditioning requirements for heating and cooling using ground conditioned air. The curves show airflow requirements to heat or cool the aircraft within a given time at ambient conditions.
- The 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 a ground air connection directly to the passenger cabin, bypassing the air cycle machines.



LEGEND:

① CABIN AT 24°C (74°F), 97 OCCUPANTS, BRIGHT DAY (SOLAR IRRADIATION), 39°C (103°F) DAY.

② SAME AS 1 EXCEPT CABIN 27°C (81°F)

③ SAME AS 1 EXCEPT CABIN 24°C (74°F), NO CABIN OCCUPANTS, FOUR CREWS MEMBERS ONLY.

④ CABIN AT 24°C (74°F), NO CABIN OCCUPANTS, FOUR CREW MEMBERS ONLY, OVERCAST DAY (NO SOLAR IRRADIATION), −40°C (−40°F) DAY.

⑤ SAME AS 4 EXCEPT −29°C (−20°F) DAY.

⑥ SAME AS 4 EXCEPT −18°C (−0°F) DAY.

NOTES:

MAXIMUM ALLOWABLE TEMPERATURE 88°C (190°F) (UPPER LIMIT DURING PULL UP OPERATION).

MAXIMUM ALLOWABLE PRESSURE AT GROUND CONNECTION 406mmH20 (16 INCHES OF WATER).

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Preconditioned Airflow Requirements
Figure 5.9

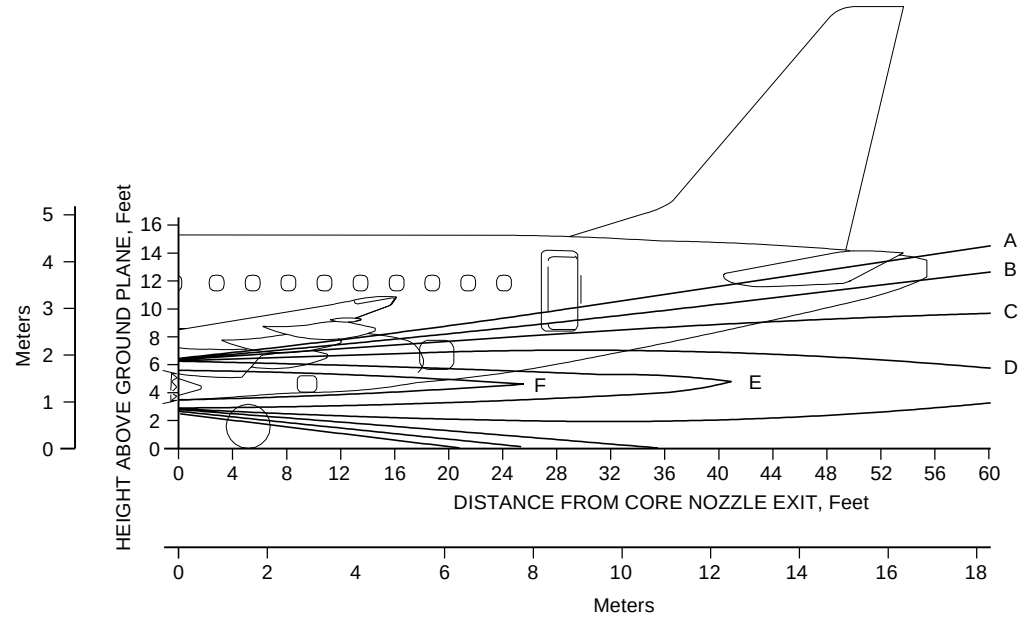
6. OPERATING CONDITIONS

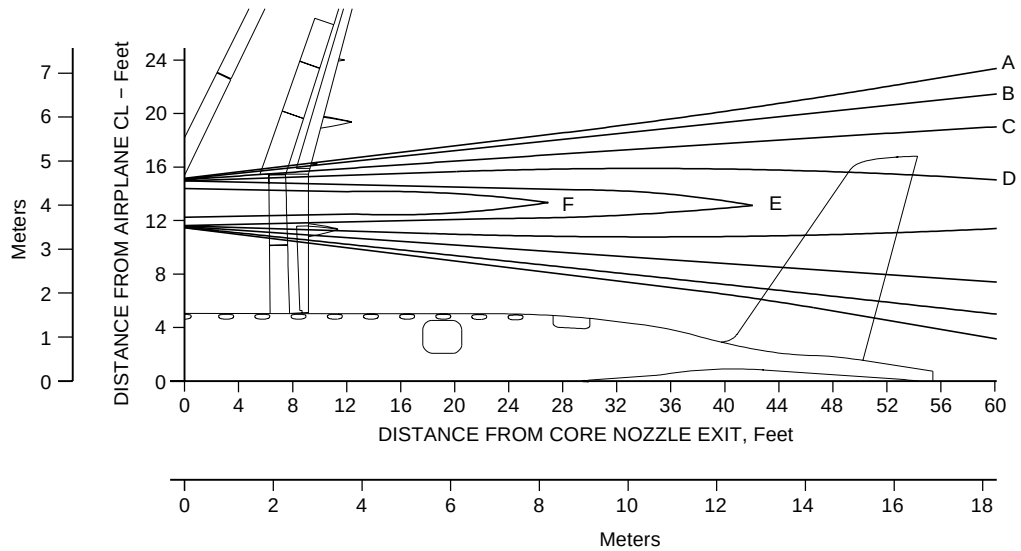
This section provides the following information:

- The jet engine exhaust velocities and temperatures;
- The airport and community noise levels;
- The hazard areas.

6.1. ENGINE EXHAUST VELOCITIES AND TEMPERATURES

TAKEOFF POWER, SEA LEVEL, Tamb = ISA +20°C, FNIN1 = 84347 N (18962 lbf)





VELOCITY m/s (ft/s) MAX = 482.5 (1583)	
A	15.2 (50)
B	30.5 (100)
C	60.9 (200)
D	121.9 (400)
E	243.8 (800)
F	396.2 (1300)

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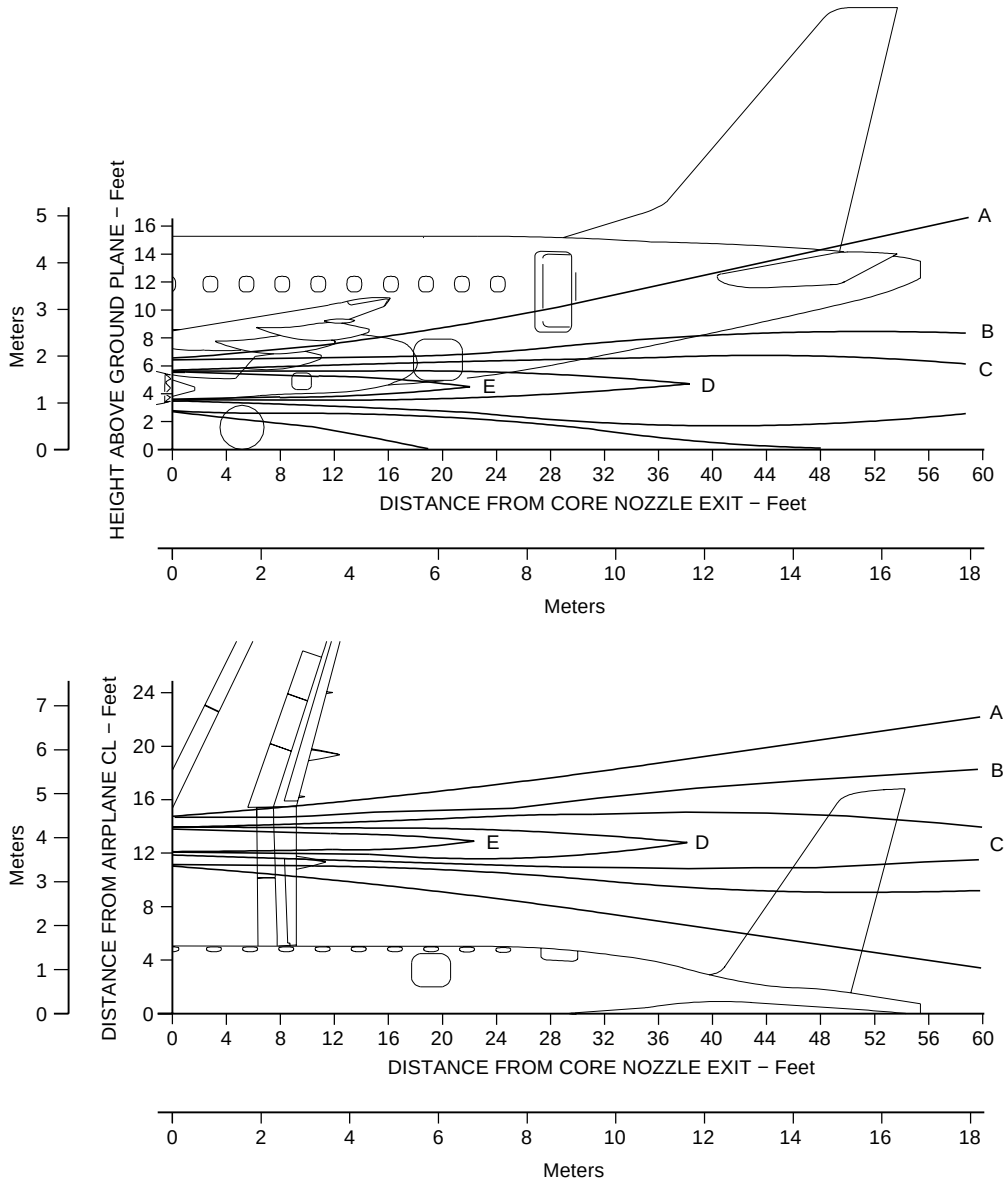
NOTE:
EXHAUST VELOCITY CONTOURS INCLUDE WORST CASE 20 kn HEADWIND WITH GROUND EFFECTS.

Jet Wake Velocity Profile - Takeoff Power
Figure 6.1

TAKEOFF POWER, SEA LEVEL, Tamb = ISA +20°C, FNIN1 = 84347 N (18962 lbf)



TOTAL TEMPERATURE MAX = 689°C (1273°F)		
	°C	°F
A	38	100
B	66	150
C	93	200
D	204	400
E	582	900

NOTE:
EXHAUST TEMPERATURE CONTOURS INCLUDE WORST CASE 20 kn HEADWIND.

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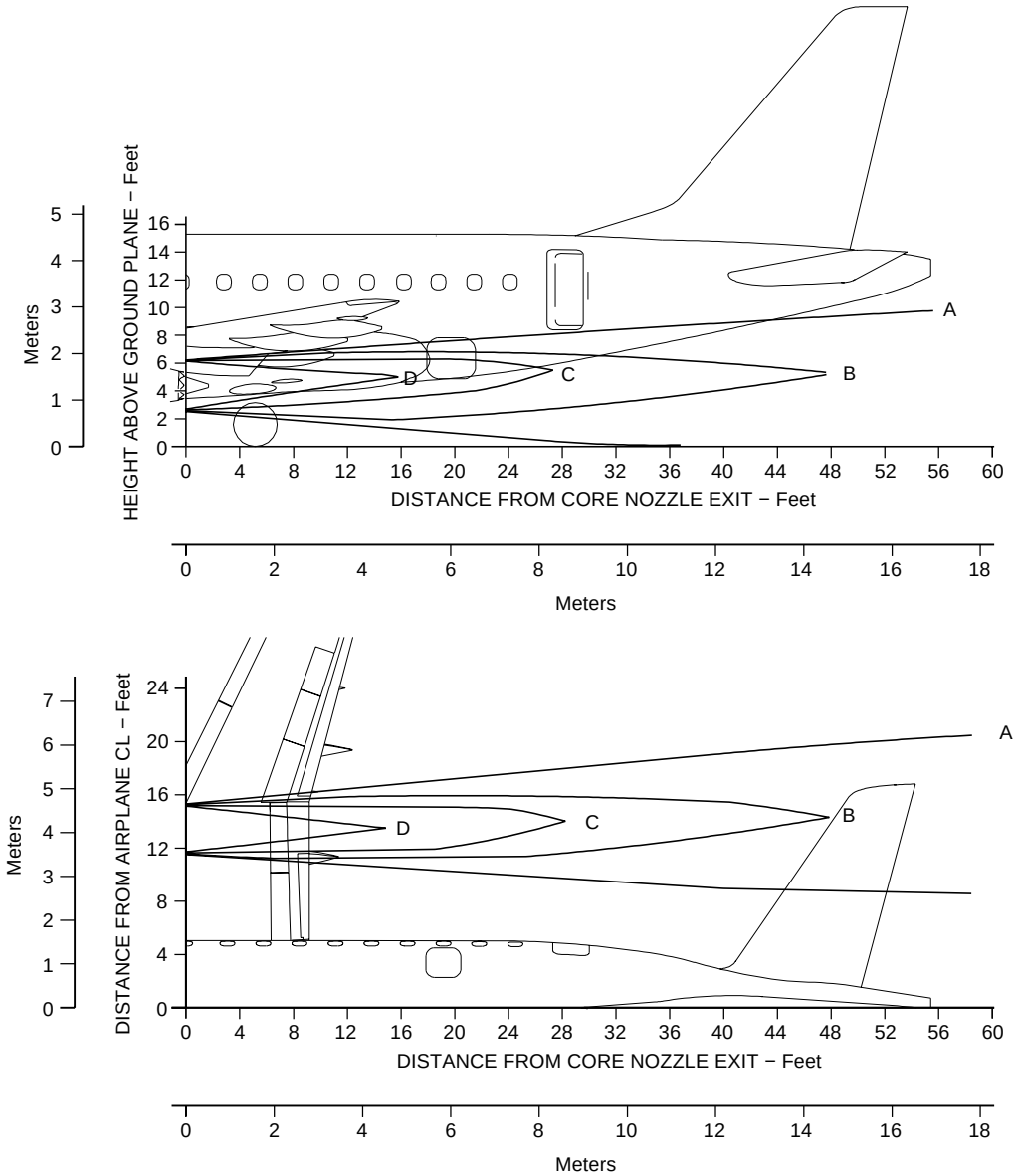
Jet Wake Temperature Profile - Takeoff Power
Figure 6.2

GROUND IDLE, SEA LEVEL, Tamb = ISA +15°C, FNIN1 = 2558 N (575 lbf)



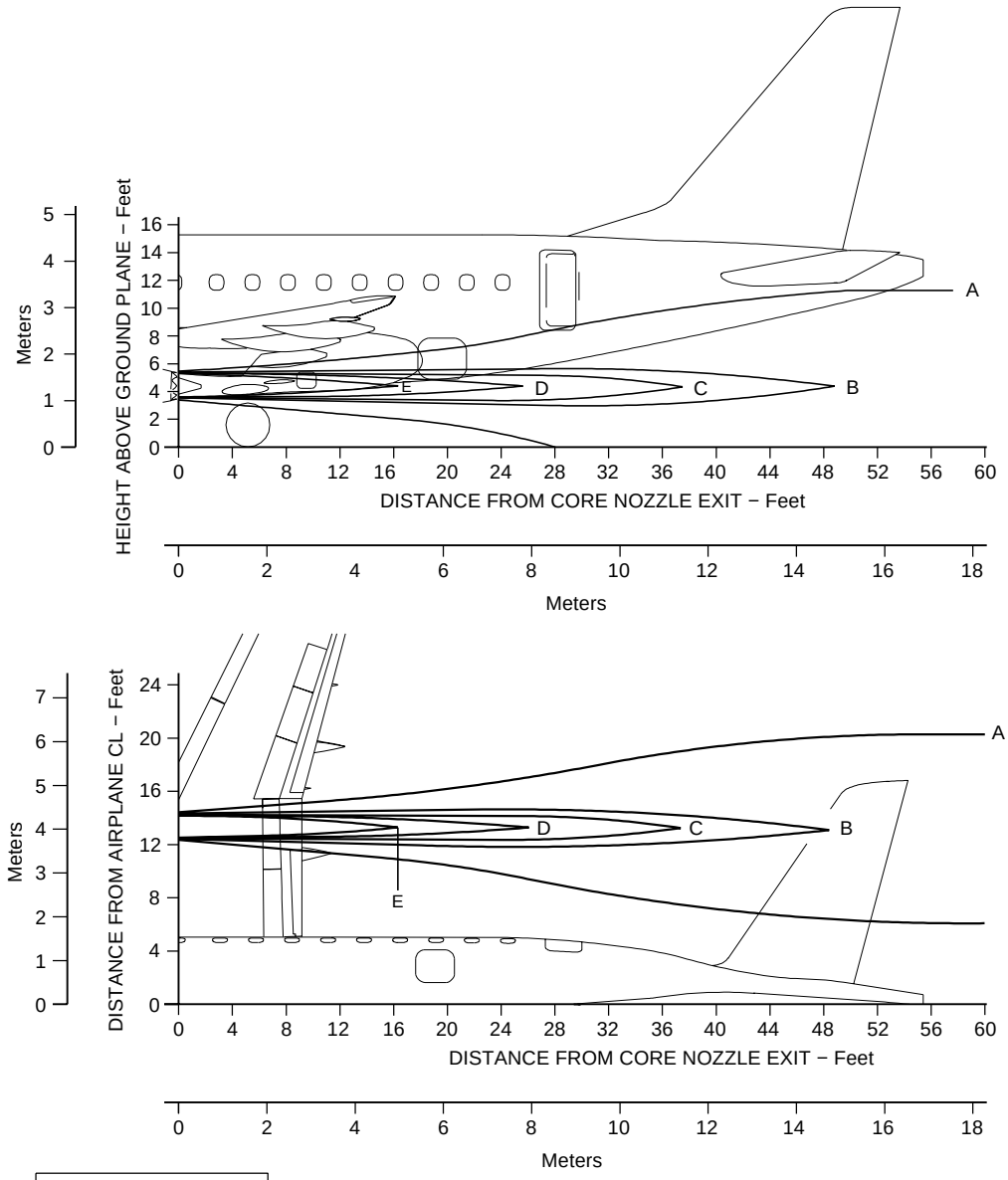
VELOCITY m/s (ft/s) MAX = 89.0 (292)		
A	15.2	(50)
B	30.5	(100)
C	45.7	(150)
D	57.9	(190)

NOTE:
EXHAUST VELOCITY CONTOURS INCLUDE WORST CASE 20 kn HEADWIND WITH GROUND EFFECTS.

EM170MFEP020015A.DGN

Jet Wake Velocity Profile - Ground Idle
Figure 6.3

GROUND IDLE, SEA LEVEL, Tamb = ISA +15°C, FNIN1 = 2558 N (575 lbf)



TOTAL TEMPERATURE MAX = 519°C (966°F)		
	°C	°F
A	38	100
B	66	150
C	93	200
D	204	400
E	582	900

NOTE:
EXHAUST TEMPERATURE CONTOURS INCLUDE WORST CASE 20 kn HEADWIND.

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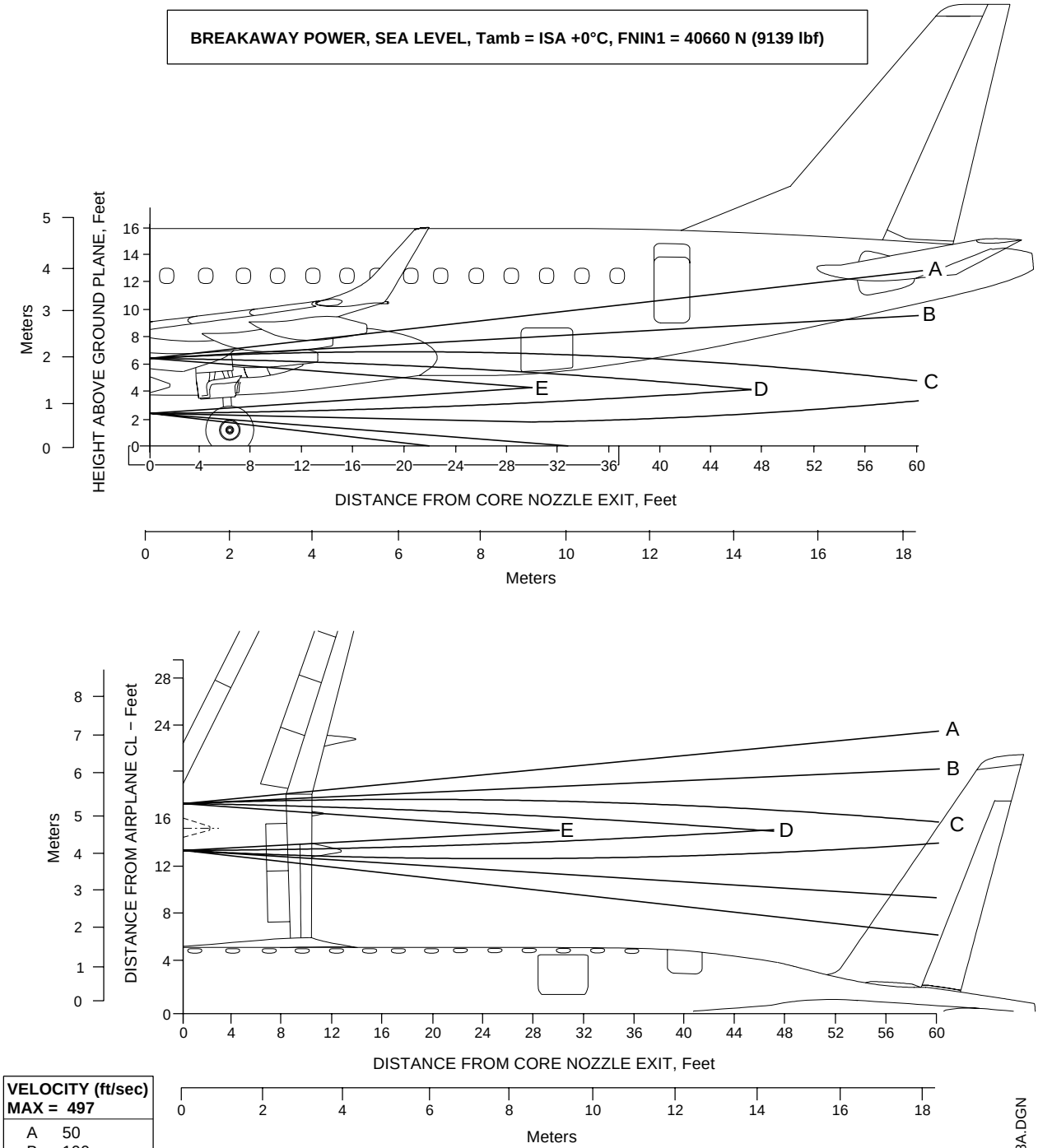
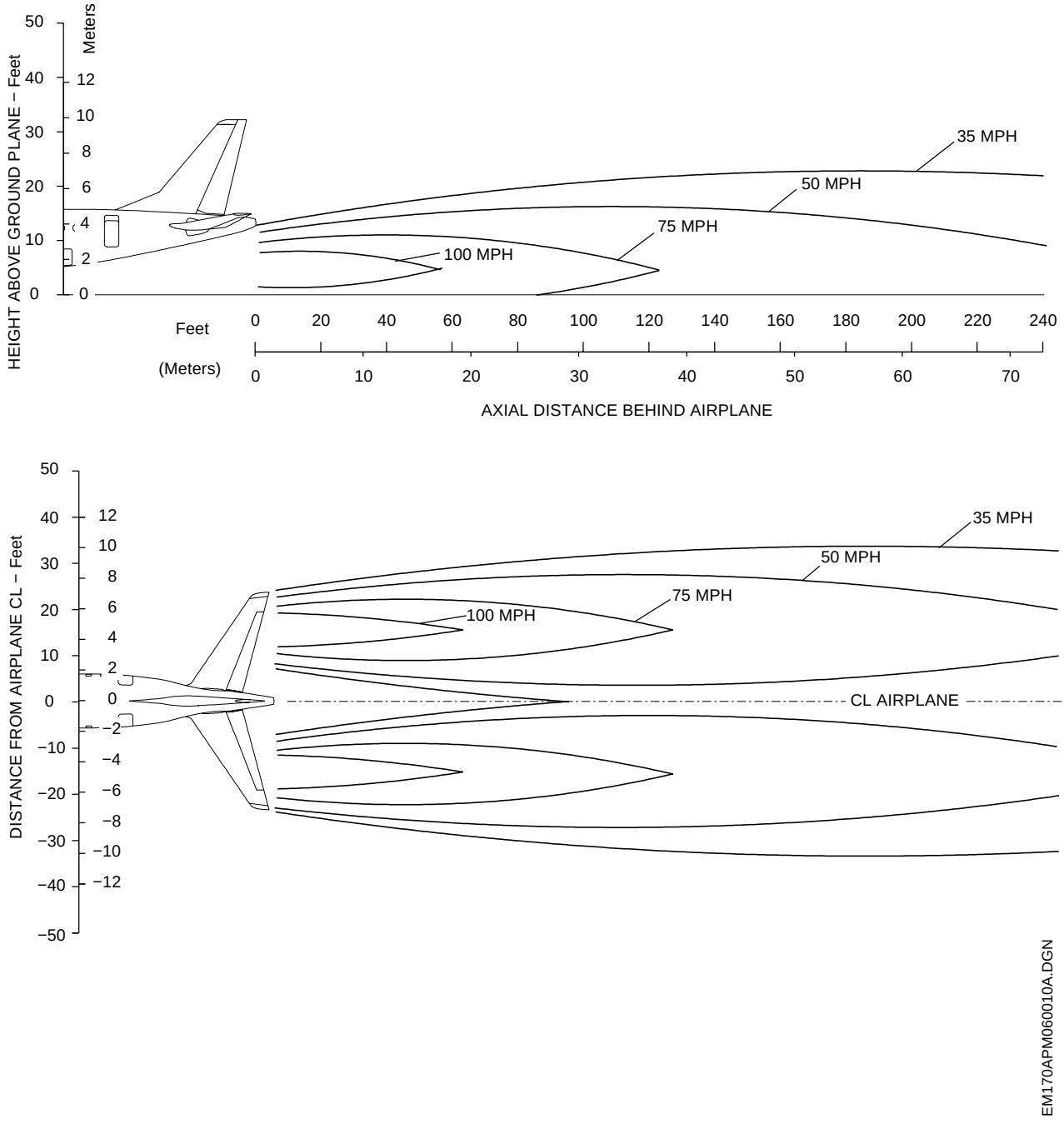
Jet Wake Temperature Profile - Ground Idle
Figure 6.4



NOTE:
EXHAUST VELOCITY CONTOURS INCLUDE WORST CASE 20 knot HEADWIND WITH GROUND EFFECTS.

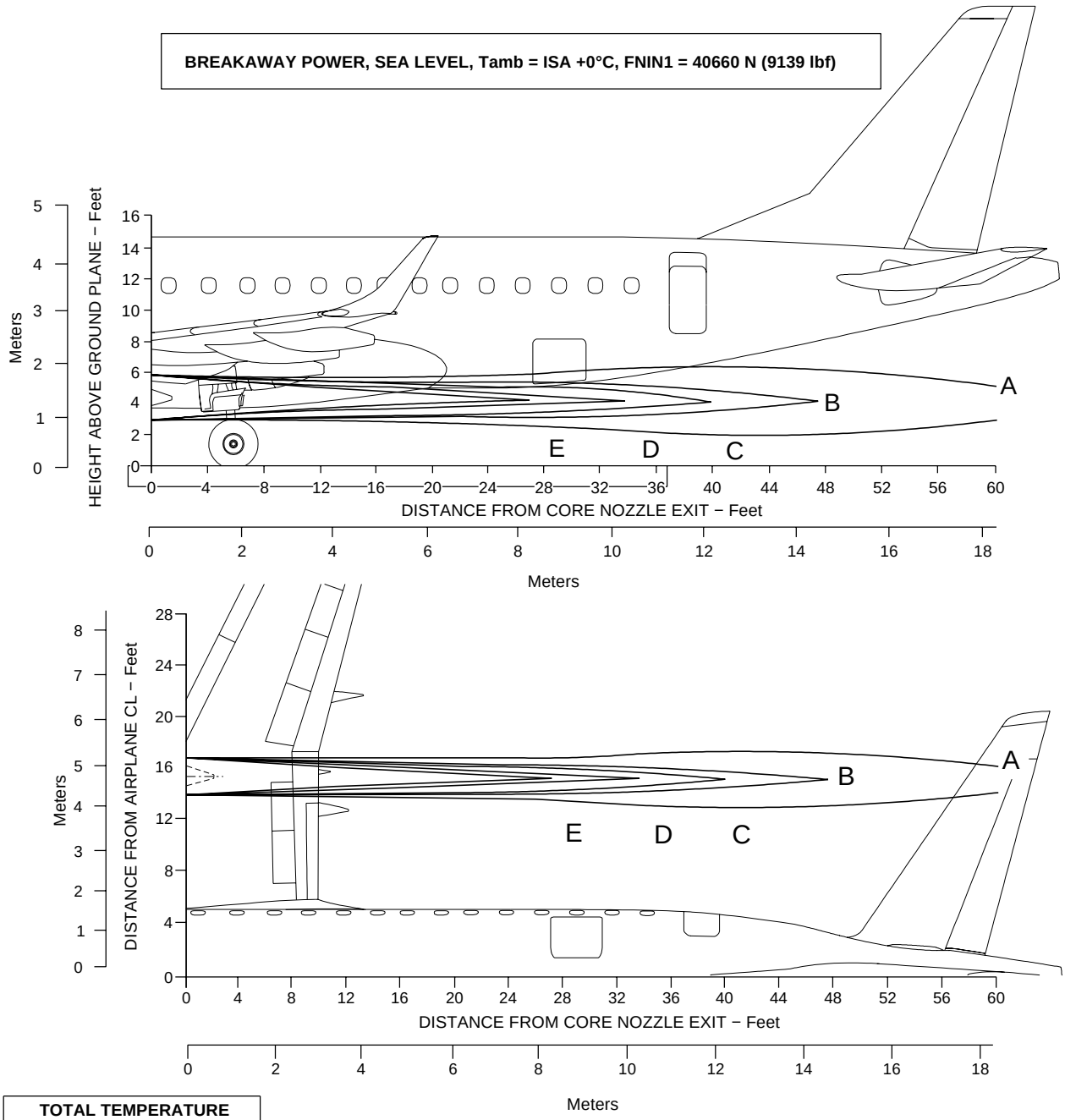
Jet Wake Velocity Profile - Breakaway Power
Figure 6.5
Sheet 1

BREAKAWAY POWER, SEA LEVEL, Tamb = ISA +0°C, FNIN1 = 40660 N (9139 lbf)



Jet Wake Velocity Profile - Breakaway Power
Figure 6.5
Sheet 2

BREAKAWAY POWER, SEA LEVEL, Tamb = ISA +0°C, FNIN1 = 40660 N (9139 lbf)



TOTAL TEMPERATURE MAX = 697 °F (369 °C)		
	°F	°C
A	100	38
B	150	66
C	200	93
D	400	204
E	650	343

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NOTE:
EXHAUST TEMPERATURE CONTOURS INCLUDE WORST CASE 20 knot HEADWIND.

Jet Wake Temperature Profile - Breakaway Power
Figure 6.6

6.2. AIRPORT AND COMMUNITY NOISE

Aircraft noise is a major concern for the airport and community planner. The airport is a basic element in the community's transportation system and, thus, is vital to its growth. However, the airport must also be a good neighbor, and this can only be accomplished with proper planning. Since aircraft noise extends beyond the boundaries of the airport, it is vital to consider the noise impact on the 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 matter; 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 operational factors (aircraft weight, engine power setting, airport altitude), atmospheric conditions (wind, temperature, relative humidity, surface condition), and terrain.

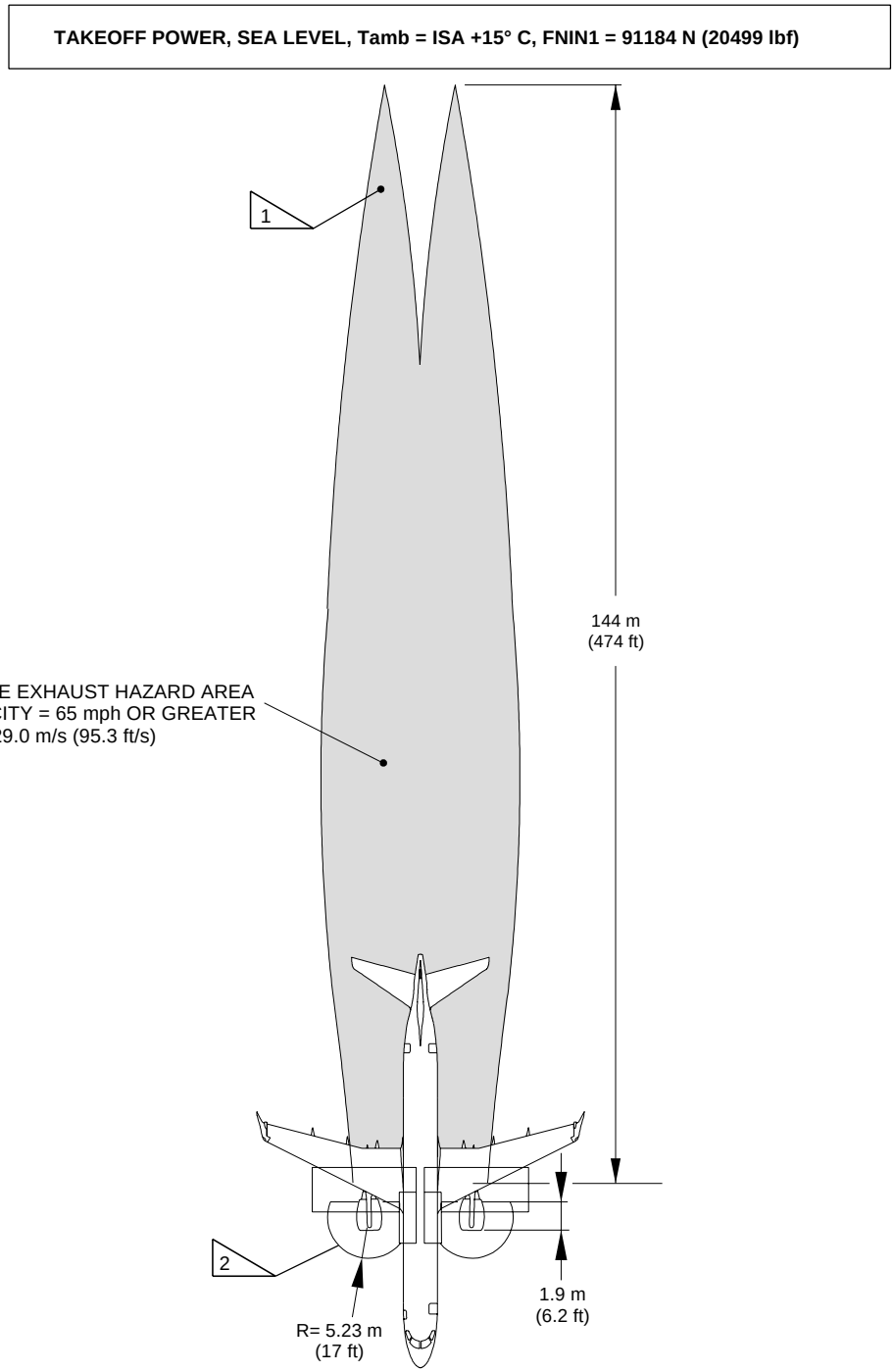
6.2.1. External Certification Noise Levels

The aircraft comply with the Stage 3 / Chapter 3 noise limits set forth in 14 CFR Part 36, ICAO Annex 16, Volume 1, Chapter 3, Amendment 7 and CTA RBHA 36.

6.2.2. Ramp Noise Levels

The ramp noise will not exceed 80 dBA (maximum) and 77 dBA (average) on the rectangular perimeter of 20 m (65 ft 7 in) from the aircraft centerline, nose and tail, 90 dBA on the service positions and 80 dBA on the passenger entrance positions resulting from operation of the APU (if fitted), ECS, equipment cooling fans and vent fans, in any combination.

6.3. HAZARD AREAS



NOTE:

NO ACCESS TO ENGINE ACCESSORIES AT TAKEOFF POWER.

1 EXHAUST HAZARD AREA − CONDITION: 20 kn HEADWIND WITH GROUND EFFECTS.

2 INLET HAZARD AREA − CONDITION: 20 kn HEADWIND/CROSSWIND BASED ON 12.2 m/s (40 ft/s) CRITICAL VELOCITY WITH 0.9 m (3 ft) CONTINGENCY FACTOR.

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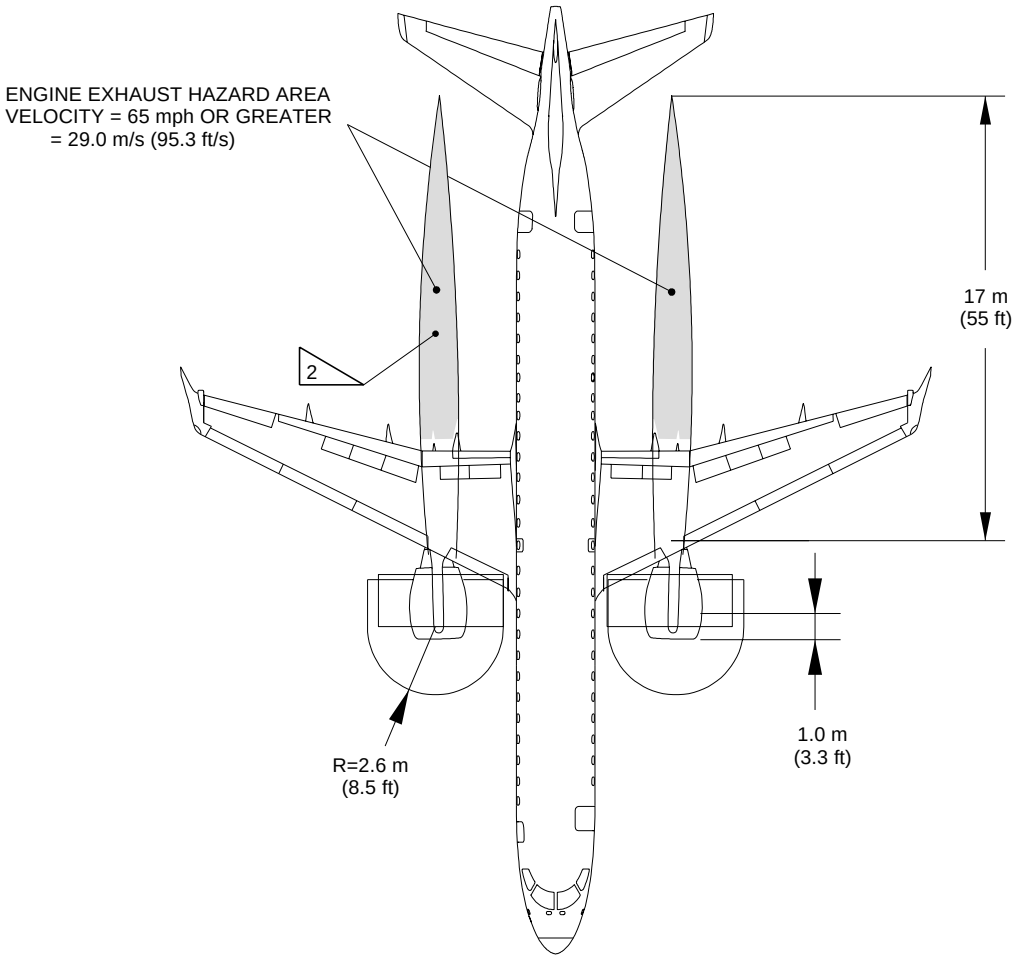
Hazard Areas - Takeoff Power
Figure 6.7

GROUND IDLE, SEA LEVEL, Tamb = ISA+15° C, FNIN1 = 3768 N (847 lbf)



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1 INLET HAZARD AREA − CONDITION: 20 kn HEADWIND/CROSSWIND/TAILWIND BASED ON 12.2 m/s (40 ft/s) CRITICAL VELOCITY WITH 0.9 m (3 ft) CONTINGENCY FACTOR.

2 EXHAUST HAZARD AREA − CONDITION: 20 kn HEADWIND WITH GROUND EFFECTS.

Hazard Areas - Ground Idle
Figure 6.8

7. PAVEMENT DATA

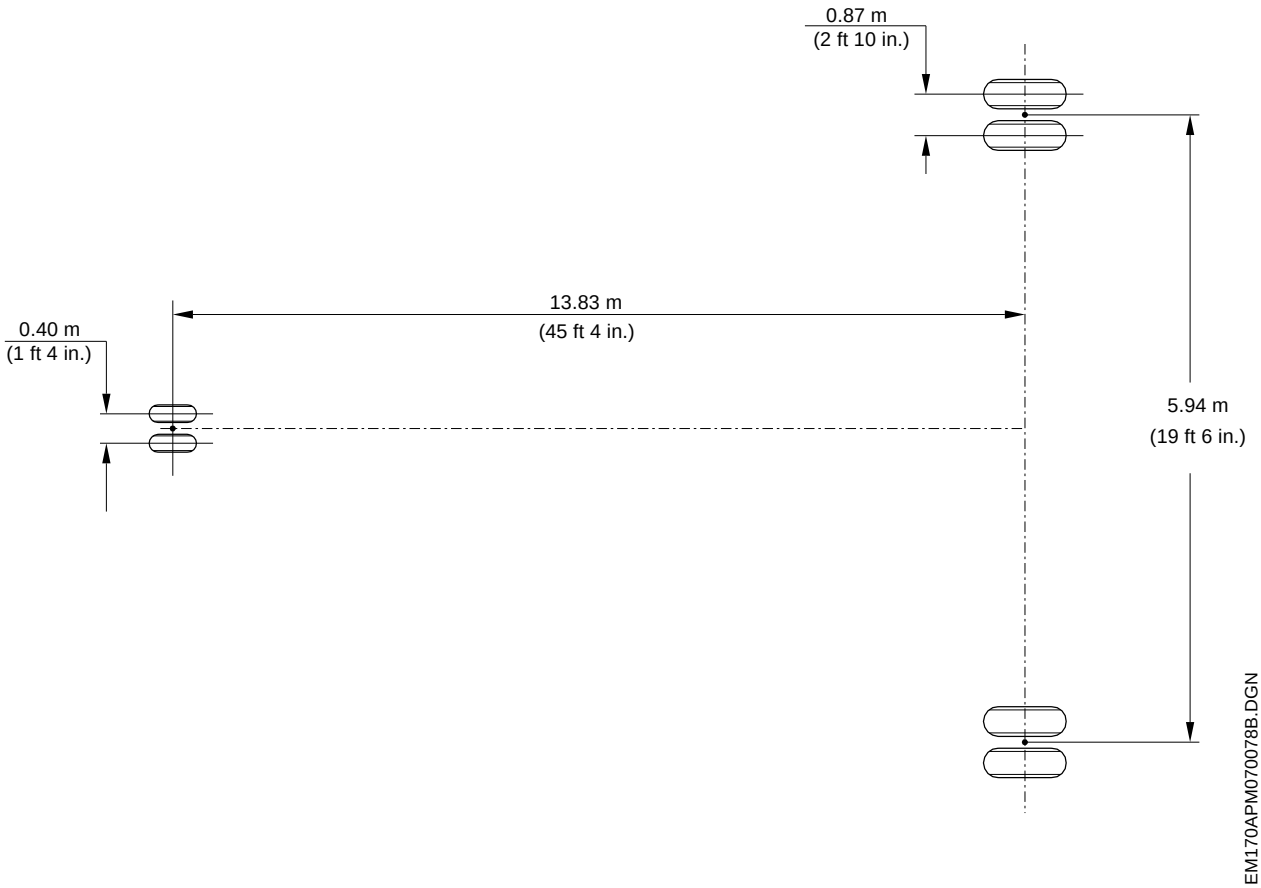
7.1. GENERAL INFORMATION

Pavement is defined as a structure consisting of one or more layers of processed materials.
The primary function of a pavement is to distribute concentrated loads so that the supporting capacity of the subgrade soil is not exceeded. The subgrade soil is defined as the material on which the pavement rests, whether embankment or excavation.
Several methods for design of airport pavements have been developed that differ considerably in their approach.
The design methods are derived from observation of pavements in service or experimental pavements. Thus, the reliability of any method is proportional to the amount of experimental verification behind the method, and all methods require a considerable amount of common sense and judgment on the part of the engineer who applies them.
A brief description of the following pavement charts will be helpful in their use for airport planning. Each aircraft configuration is depicted with a minimum range of five loads imposed on the main landing gear to aid in the interpolation between the discrete values shown. The tire pressure used for the aircraft charts will produce the recommended tire deflection with the aircraft loaded to its maximum ramp weight and with center of gravity position. The tire pressure, where specifically designated in tables and charts, are values obtained under loaded conditions as certified for commercial use.
This section is presented as follows:

- The basic data on the landing gear footprint configuration, maximum design ramp loads, and tire sizes and pressures.
- The maximum pavement loads for certain critical conditions at the tire-ground interfaces.
- A chart in order to determine the loads throughout the stability limits of the aircraft at rest on the pavement. Pavement requirements for commercial aircraft are customarily derived from the static analysis of loads imposed on the main landing gear struts. These main landing gear loads are used to enter the pavement design charts which follow, interpolating load values where necessary.
- The flexible pavement curves prepared in accordance with the US Army Corps of Engineers Design Method and the LCN Method.
- The rigid pavement design curves in accordance with the Portland Cement Association Design Method and the LCN Method.
- The aircraft ACN values for flexible and rigid pavements.

7.2. FOOTPRINT

	AIRCRAFT MODEL
	ECJ
MAXIMUM RAMP WEIGHT	54700 kg (120593 lb)
NOSE GEAR TIRE SIZE	24 x 7.7 16PR
NOSE GEAR TIRE PRESSURE	9.14 − 0/+0.4 kg/cm ² (130 − 0/+5 psi)
MAIN GEAR TIRE SIZE	H41 x 16−20 22PR
MAIN GEAR TIRE PRESSURE	11.11 − 0/+0.4 kg/cm ² (158 − 0/+5 psi)

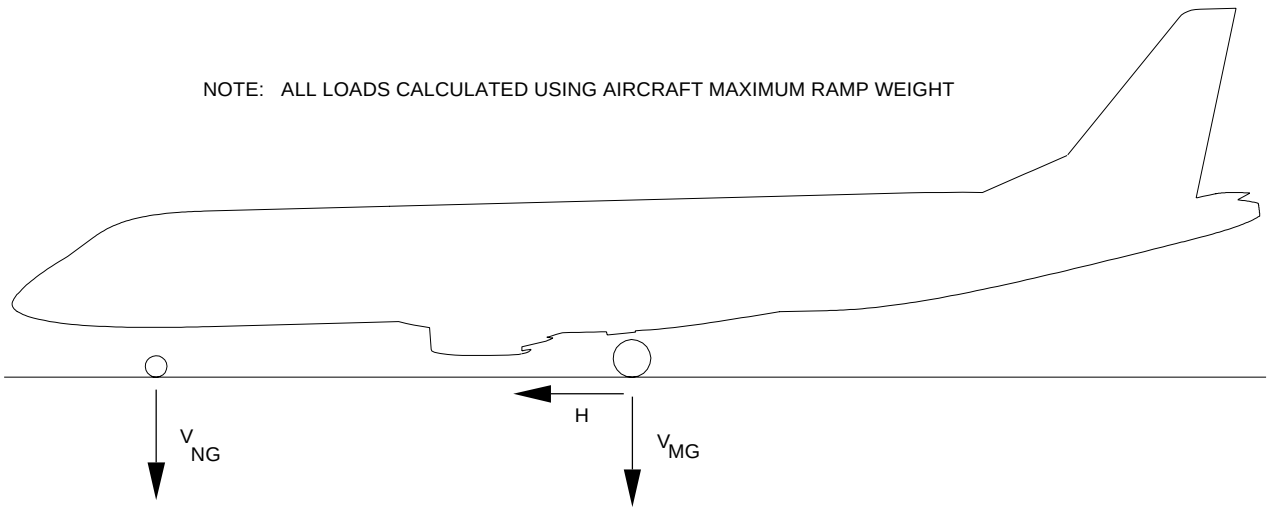


Footprint
Figure 7.1

7.3. MAXIMUM PAVEMENT LOADS

LEGEND: V_{NG} =MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD C.G.
V_{MG} =MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST FORWARD C.G.
H=MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

NOTE: ALL LOADS CALCULATED USING AIRCRAFT MAXIMUM RAMP WEIGHT



MODEL	MAXIMUM RAMP WEIGHT	V_{NG}		V_{MG} (PER STRUT)	H (PER STRUT)	
		STATIC AT MOST FORWARD C.G.	STEADY BRAKING WITH DECELERATION OF 3,0 m/sec^2	STATIC AT MOST AFT C.G.	STEADY BRAKING WITH DECELERATION OF 3,0 m/sec^2	INSTANTANEOUS BRAKING (FRICTION COEF. OF 0.8)
ECJ	54700 kg (120593 lb)	6184 kg (13633 lb)	9426 kg (20781 lb)	25140 kg (55424 lb)	7446 kg (16416 lb)	17203 kg (37926 lb)

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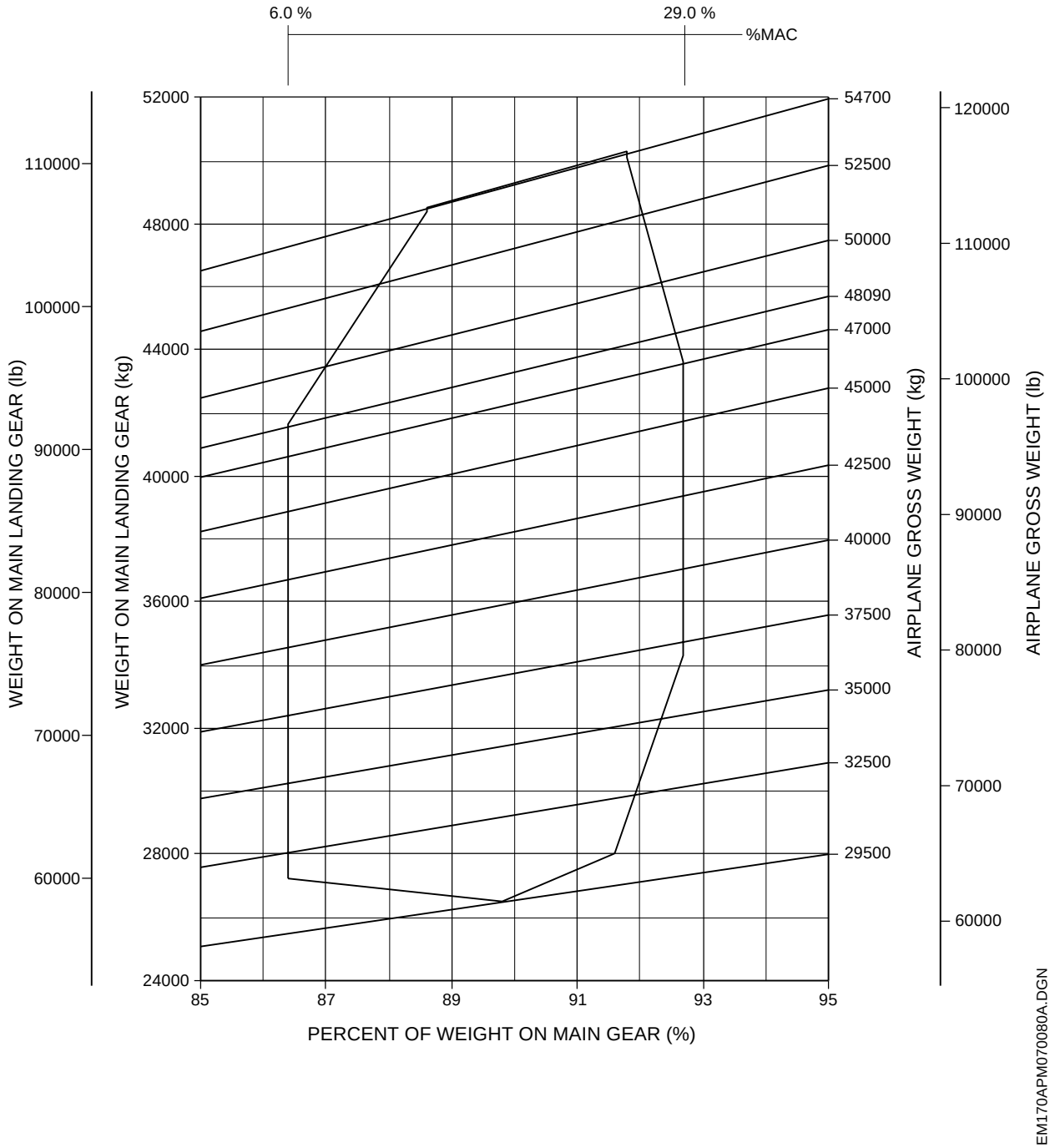
Maximum Pavement Loads
Figure 7.2

7.4. LANDING GEAR LOADING ON PAVEMENT



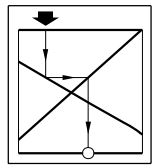
Landing Gear Loading on Pavement
Figure 7.3

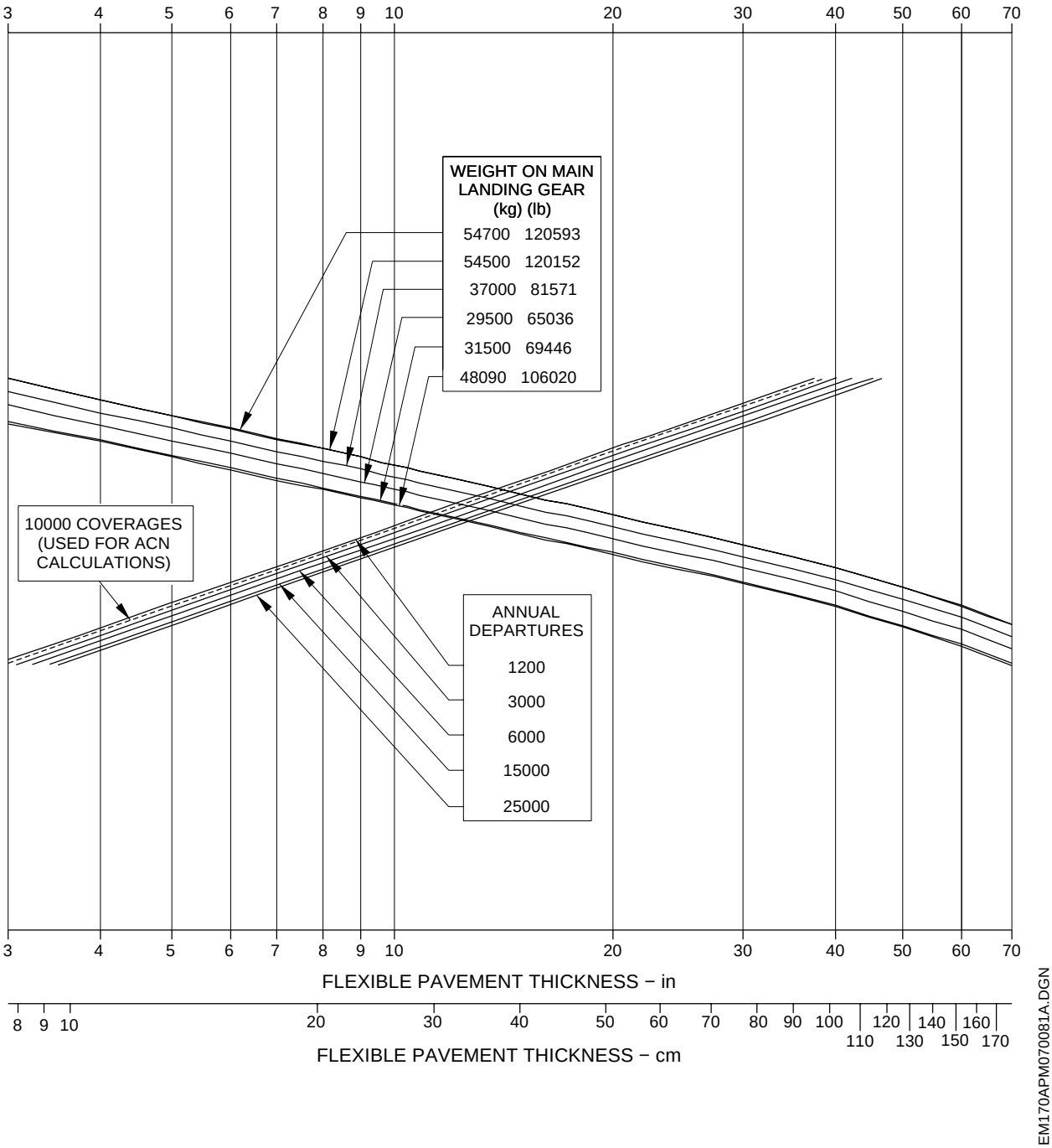
7.5. FLEXIBLE PAVEMENT REQUIREMENTS, U.S. CORPS OF ENGINEERS DESIGN METHOD

The flexible pavement curves are based on the procedures set forth in Instruction Report No. S-77-1, “Procedures for Development of CBR Design Curves”, dated June 1977, and modified according to the methods described in FAA Advisory Circular 150/5320-6D, “Airport Pavement Design and Evaluation”, dated July 7, 1995. Instruction Report No. S-77-1 was prepared by the US Army Corps of Engineers Waterways Experiment Station, Soils and Pavements Laboratory, Vicksburg, Mississippi. The line showing 10,000 coverages is used to calculate ACN.

SUBGRADE STRENGHT − CBR MODEL

NOTES:
- TIRE SIZE: H41 x 16−20 22 PR
- TIRE PRESSURE: 11.11 kgf/cm^2 (158 psi) (UNLOADED)

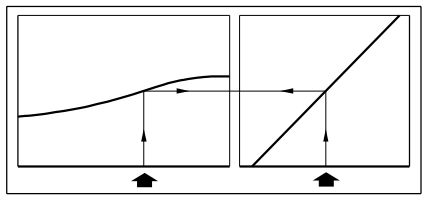




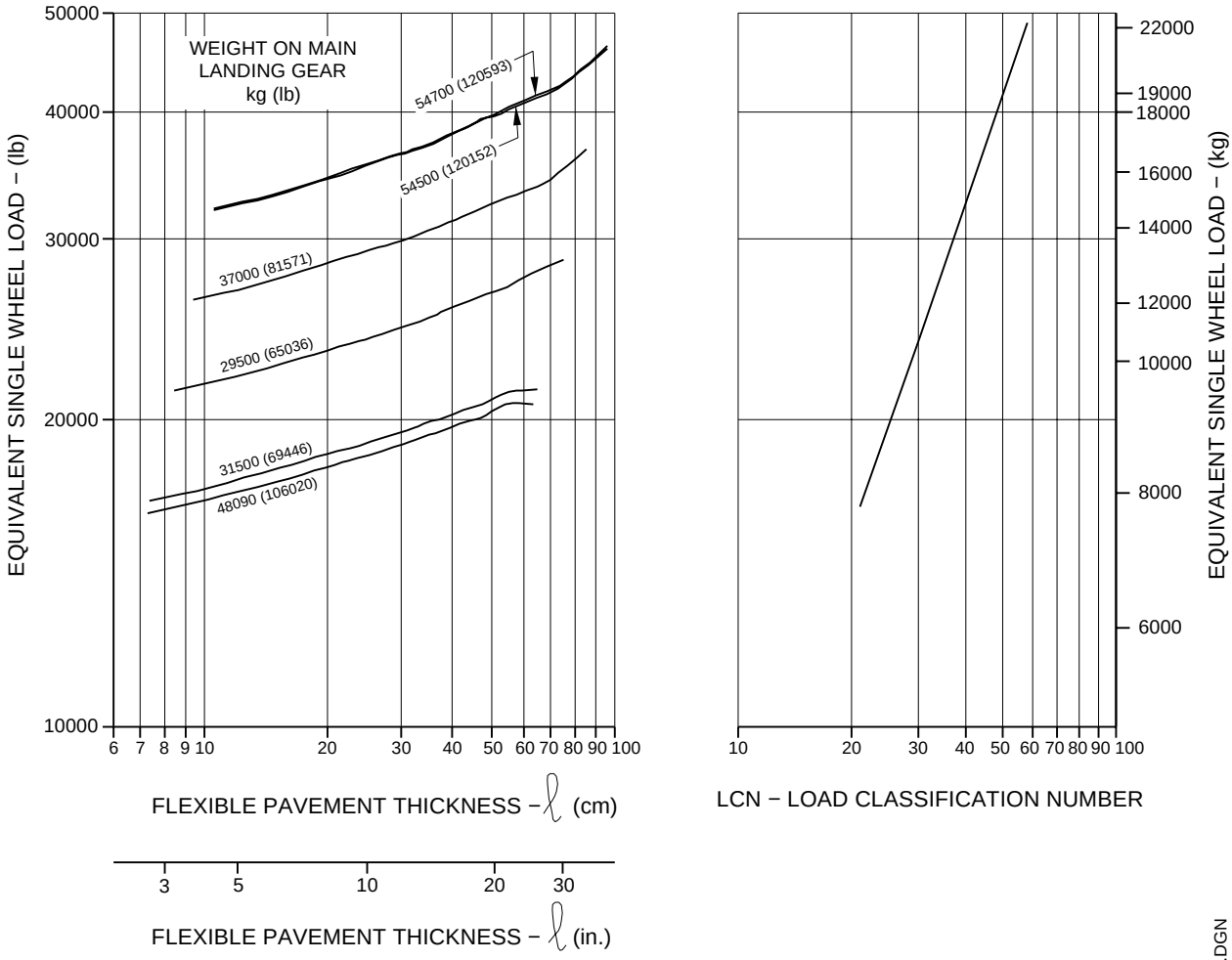
Flexible Pavement Requirements - US Army Corps of Engineers Design Method
Figure 7.4

7.6. FLEXIBLE PAVEMENT REQUIREMENTS, LCN METHOD

The LCN method presents curves for flexible pavements. They have been built using procedures and curves in the ICAO Aerodrome Design Manual, Part 3 - Pavements, Document 9157-AN/901, 1983. The same chart includes the data of equivalent single-wheel load versus pavement thickness.



NOTES:
- TIRE SIZE: H41 x 16−20 22 PR
- TIRE PRESSURE: 11.11 kgf/cm^2 (158 psi) (UNLOADED)



NOTES:
EQUIVALENT SINGLE WHEEL LOADS ARE DERIVED BY METHODS SHOWN IN ICAO AERODROME MANUAL. PART 2, PAR. 4.1.3

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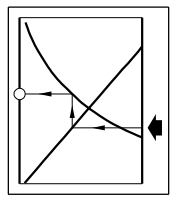
Flexible Pavement Requirements - LCN Method
Figure 7.5

7.7. RIGID PAVEMENT REQUIREMENTS, PORTLAND CEMENT ASSOCIATION DESIGN METHOD

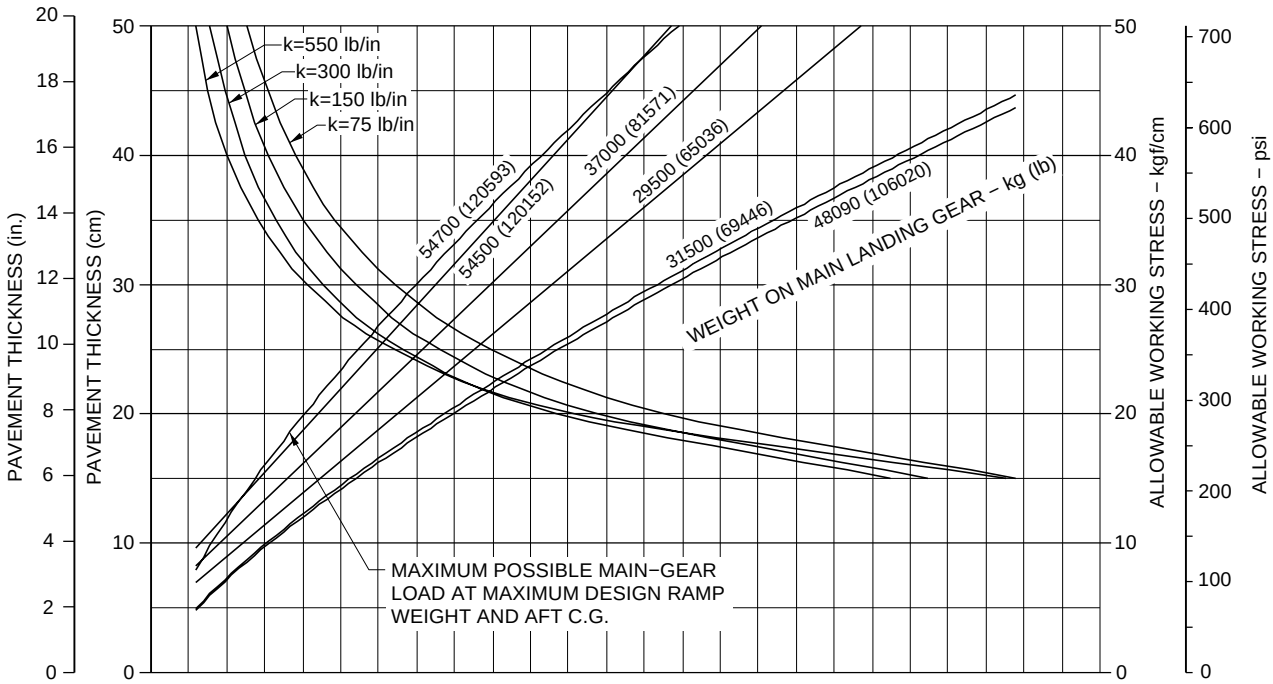
This method has a chart that has been prepared with the use of the Westergaard Equation in general accordance with the procedures outlined in the 1955 edition of “Design of Concrete Airport Pavement” published by the Portland Cement Association, 33 W. Grand Ave., Chicago 10, Illinois, but modified to the new format described in the 1968 Portland Cement Association publication, “Computer Program for Concrete Airport Pavement Design” by Robert G. Packard. The following procedure is used to develop rigid pavement design curves such as those shown in the chart:

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

RIGID PAVEMENT REQUIREMENTS



NOTES:
- TIRE SIZE: H41 x 16−20 22PR
- TIRE PRESSURE: 11.11 kgf/cm^2 (158 psi) (UNLOADED)



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".

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Rigid Pavement Requirements - Portland Cement Association Design Method
Figure 7.6

7.8. RIGID PAVEMENT REQUIREMENTS, LCN METHOD

This LCN Method presents curves for rigid pavements. They have been built using procedures and curves in ICAO Aerodrome Design Manual, Part 3 - Pavements, Document 9157-AN/901, 1983. The same chart includes the data of equivalent single-wheel load versus radius of relative stiffness.
To determine the aircraft weight that can be accommodated on a particular rigid airport pavement, both the LCN of the pavement and the radius of relative stiffness must be known.
The radius of relative stiffness values is obtained from a table. This table presents the radius of relative stiffness values based on Young's modulus (E) of 4,000,000 psi and Poisson's ratio (μ) of 0.15.
For convenience in finding this radius based on other values of E and μ, the curves are included. For example, to find an RRS value based on an E of 3,000,000 psi, the "E" factor of 0.931 is multiplied by the RRS value found in figure 7.6.3. The effect of the variations of μ on the RRS value is treated in a similar manner.

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 = 4×10^6 psi
k = SUBGRADE MODULUS, lb/in^3
d = RIGID−PAVEMENT THICKNESS. in.
μ = POISSON'S RATIO = 0.15

d(in)	k=75	k=100	k=150	k=200	k=250	k=300	k=350	k=400	k=500	k=550
6.0	31.48	29.30	26.47	24.63	23.30	22.26	21.42	20.72	19.59	19.13
6.5	33.43	31.11	28.11	26.16	24.74	23.64	22.74	22.00	20.80	20.31
7.0	35.34	32.89	29.72	27.65	26.15	24.99	24.04	23.25	21.99	21.47
7.5	37.22	34.63	31.29	29.12	27.54	26.32	25.32	24.49	23.16	22.61
8.0	39.06	36.35	32.85	30.57	28.91	27.62	26.58	25.70	24.31	23.74
8.5	40.88	38.04	34.37	31.99	30.25	28.91	27.81	26.90	25.44	24.84
9.0	42.67	39.71	35.88	33.39	31.58	30.17	29.03	28.08	26.55	25.93
9.5	44.43	41.35	37.36	34.77	32.89	31.42	30.23	29.24	27.65	27.00
10.0	46.18	42.97	38.83	36.14	34.17	32.65	31.42	30.39	28.74	28.06
10.5	47.90	44.57	40.28	37.48	35.45	33.87	32.59	31.52	29.81	29.11
11.0	49.60	46.16	41.71	38.81	36.71	35.07	33.75	32.64	30.87	30.14
11.5	51.28	47.72	43.12	40.13	37.95	36.26	34.89	33.74	31.91	31.16
12.0	52.94	49.27	44.52	41.43	39.18	37.44	36.02	34.84	32.95	32.17
12.5	54.59	50.80	45.90	42.72	40.40	38.60	37.14	35.92	33.97	33.17
13.0	56.22	52.32	47.27	43.99	41.61	39.75	38.25	36.99	34.99	34.16
13.5	57.83	53.82	48.63	45.26	42.80	40.89	39.35	38.06	35.99	35.14
14.0	59.43	55.31	49.98	46.51	43.98	42.02	40.44	39.11	36.99	36.12
14.5	61.02	56.78	51.31	47.75	45.16	43.15	41.51	40.15	37.97	37.08
15.0	62.59	58.25	52.63	48.98	46.32	44.26	42.58	41.19	38.95	38.03
15.5	64.15	59.70	53.94	50.20	47.47	45.36	43.64	42.21	39.92	38.98
16.0	65.69	61.13	55.24	51.41	48.62	46.45	44.70	43.23	40.88	39.92
16.5	67.23	62.56	56.53	52.61	49.75	47.54	45.74	44.24	41.84	40.85
17.0	68.75	63.98	57.81	53.80	50.88	48.61	46.77	45.24	42.78	41.78
17.5	70.26	65.38	59.08	54.98	52.00	49.68	47.80	46.23	43.72	42.70
18.0	71.76	66.78	60.34	56.15	53.11	50.74	48.82	47.22	44.66	43.61
18.5	73.25	68.17	61.60	57.32	54.21	51.80	49.84	48.20	45.59	44.51
19.0	74.73	69.54	62.84	58.48	55.31	52.84	50.84	49.17	46.51	45.41
19.5	76.20	70.91	64.08	59.63	56.39	53.88	51.84	50.14	47.42	46.30
20.0	77.66	72.27	65.30	60.77	57.47	54.91	52.84	51.10	48.33	47.19
20.5	79.11	73.62	66.52	61.91	58.55	55.94	53.83	52.06	49.23	48.07
21.0	80.55	74.96	67.74	63.04	59.62	56.96	54.81	53.01	50.13	48.95
21.5	81.99	76.30	68.94	64.16	60.68	57.97	55.78	53.95	51.02	49.82
22.0	83.41	77.63	70.14	65.28	61.73	58.98	56.75	54.89	51.91	50.69
22.5	84.83	78.95	71.34	66.38	62.78	59.99	57.72	55.82	52.79	51.55
23.0	86.24	80.26	72.52	67.49	63.83	60.98	58.68	56.75	53.67	52.41
23.5	87.64	81.56	73.70	68.59	64.86	61.97	59.63	57.67	54.54	53.26
24.0	89.04	82.86	74.87	69.68	65.90	62.96	60.58	58.59	55.41	54.11
24.5	90.43	84.15	76.04	70.76	66.92	63.94	61.52	59.50	56.28	54.95
25.0	91.81	85.44	77.20	71.84	67.95	64.92	62.46	60.41	57.14	55.79

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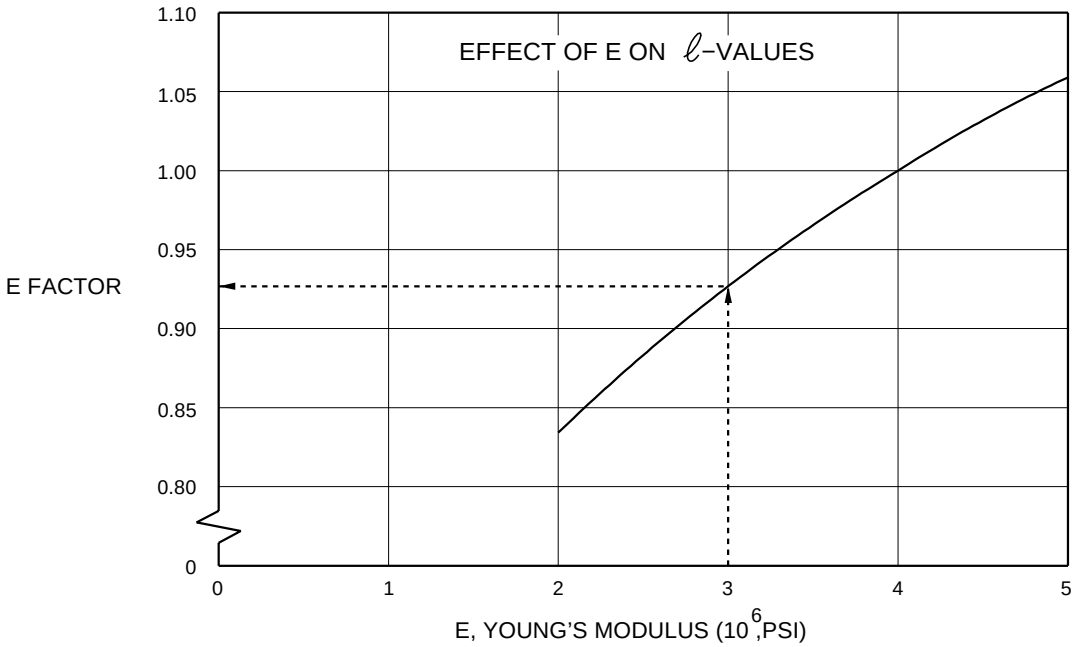
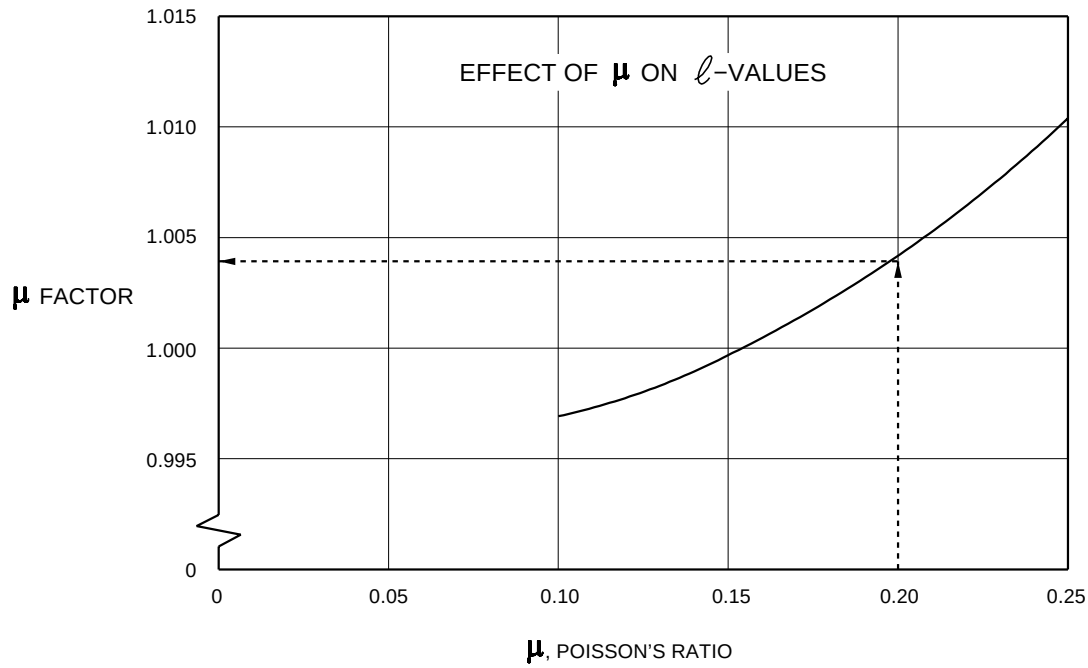
Radius of Relative Stiffness
Figure 7.7





NOTE: BOTH CURVES ON THIS PAGE ARE USED TO ADJUST THE ℓ–VALUES.

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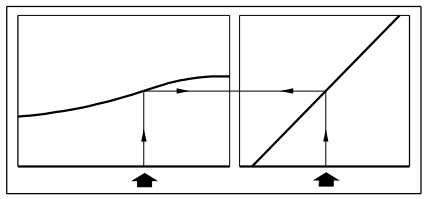
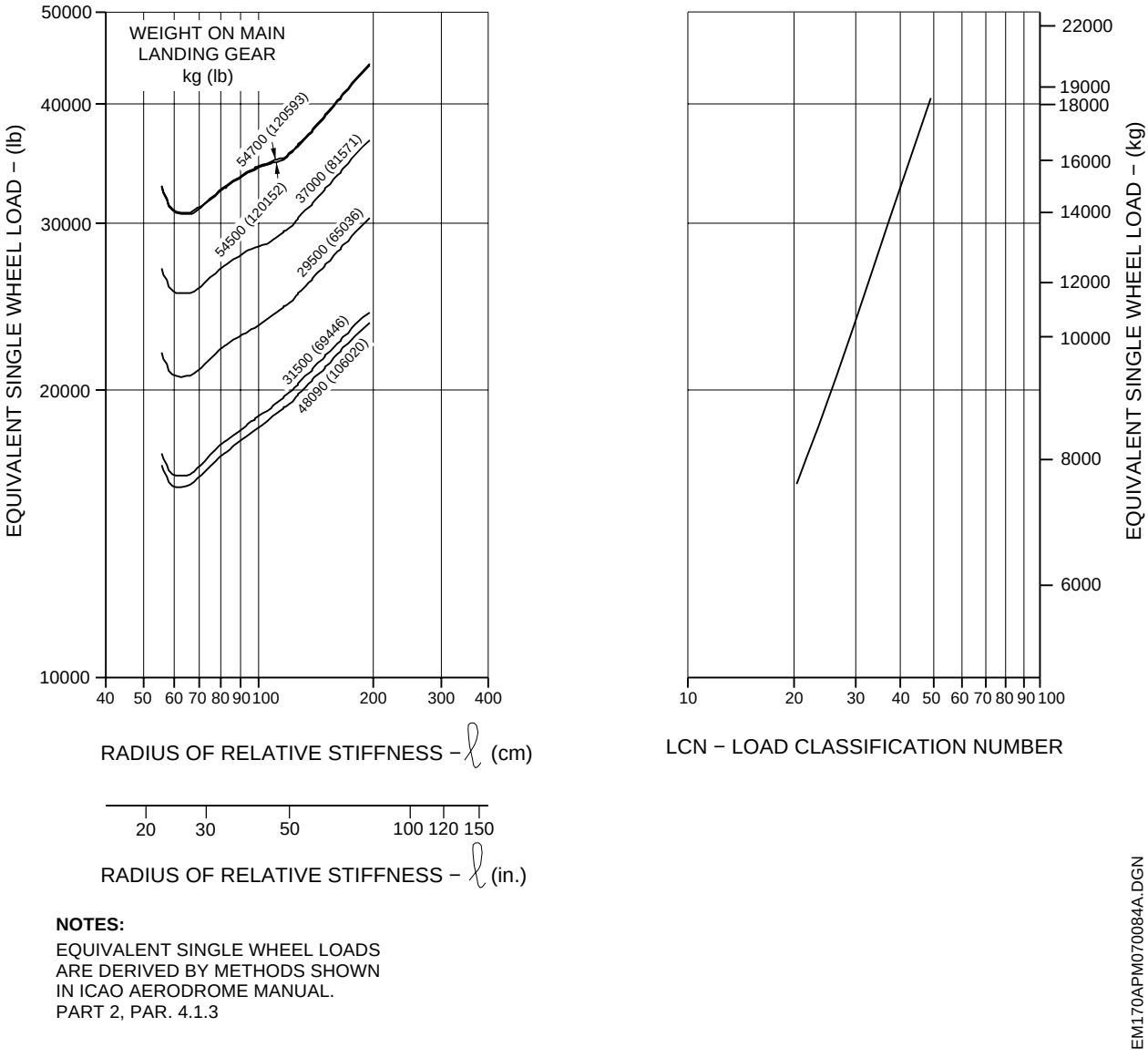
Radius of Relative Stiffness (other values)
Figure 7.8



NOTES:
- TIRE SIZE: H41 x 16−20 22 PR
- TIRE PRESSURE: 11.11 kgf/cm^2 (158 psi) (UNLOADED)



NOTES:
EQUIVALENT SINGLE WHEEL LOADS ARE DERIVED BY METHODS SHOWN IN ICAO AERODROME MANUAL. PART 2, PAR. 4.1.3

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Rigid Pavement Requirements - LCN Method
Figure 7.9

7.9. ACN - PCN SYSTEM - FLEXIBLE AND RIGID PAVEMENTS

The ACN/PCN system as referenced in Amendment 35 to ICAO Annex 14, “Aerodromes”, provides a standardized international aircraft/pavement rating system.
The PCN is an index rating of the mass that according to evaluation can be borne by the pavement when applied by a standard single wheel. The ACN is established for the particular pavement type and subgrade category of the rated pavement, as well as for the particular aircraft mass and characteristics. An aircraft shall have an ACN equal to or less than the PCN to operate without restriction on the pavement.
The method of pavement evaluation is left up to the airport, and the results of such evaluation are presented as follows:

Table 7.1 - Pavement Evaluation

PAVEMENT TYPE	SUBGRADE CATEGORY	TIRE PRESSURE CATEGORY	METHOD
R – Rigid	A – High	W – No Limit	T – Technical
F – Flexible	B – Medium	X – to 1.5 Mpa (217 psi)	U – Using aircraft
	C – Low	Y – to 1.0 Mpa (145 psi)	
	D – Ultra Low	Z – to 0.5 Mpa (73 psi)	
Report example: PCN 80/R/B/X/T, where: 80 = PCN R = Pavement Type: Rigid B = Subgrade Category: Medium X = Tire Pressure Category: Medium (limited to 1.5 Mpa) T = Evaluation Method: Technical			

The flexible pavements have four subgrade categories:

A. High Strength - CBR 15.

B. Medium Strength - CBR 10.

C. Low Strength - CBR 6.

D. Ultra Low Strength - CBR 3.

The rigid pavements have four subgrade categories:

A. High Strength - Subgrade k = 150 MN/m^3 (550 lb/in^3).

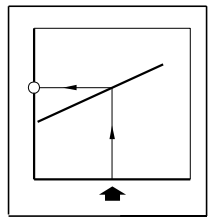
B. Medium Strength - k = 80 MN/m^3 (300 lb/in^3).

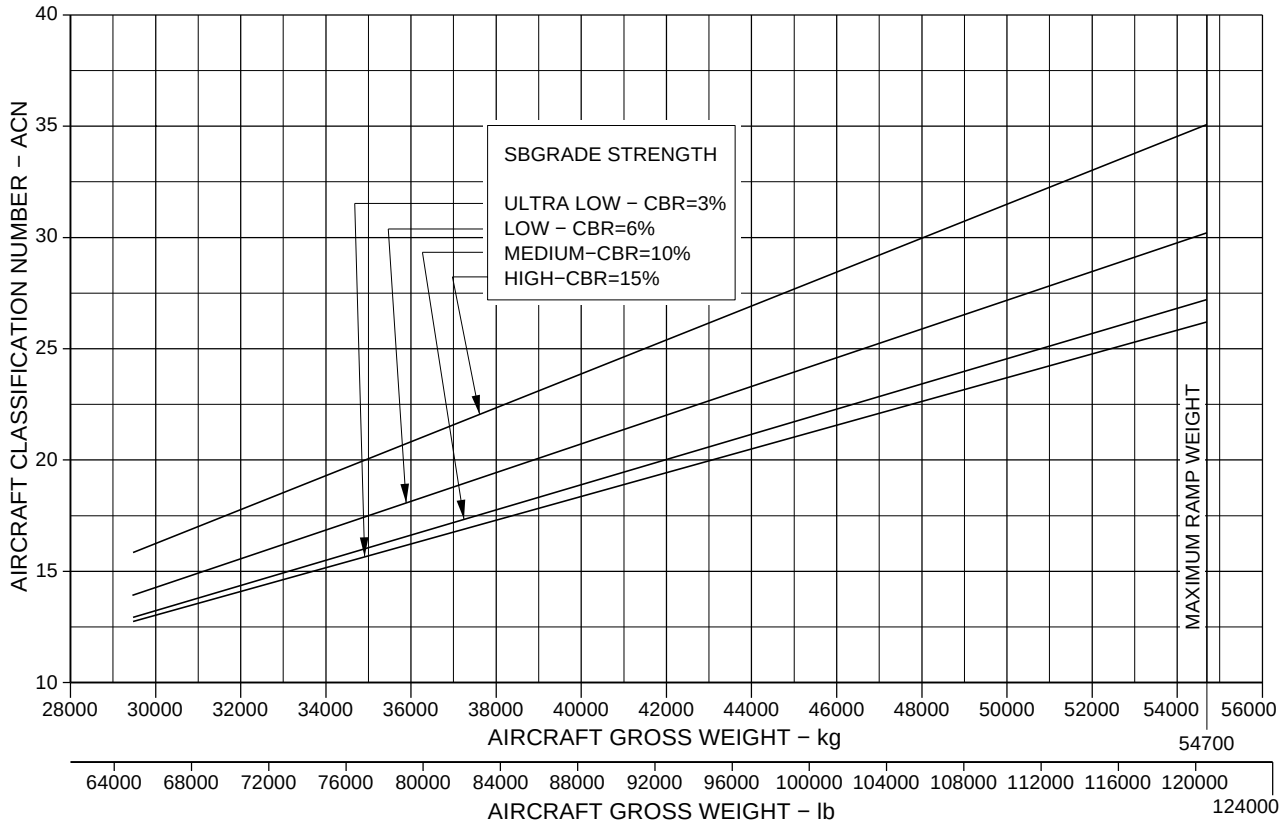
C. Low Strength - k = 40 MN/m^3 (150 lb/in^3).

D. Ultra Low Strength - k = 20 MN/m^3 (75 lb/in^3).

FLEXIBLE PAVEMENT SUBGRADE

NOTES:
- TIRE SIZE: H41 x 16−20 22PR
- TIRE PRESSURE: 11.11 kgf/cm^2 (158 psi) (UNLOADED)





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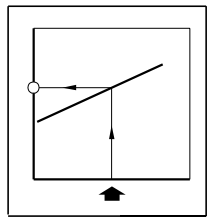
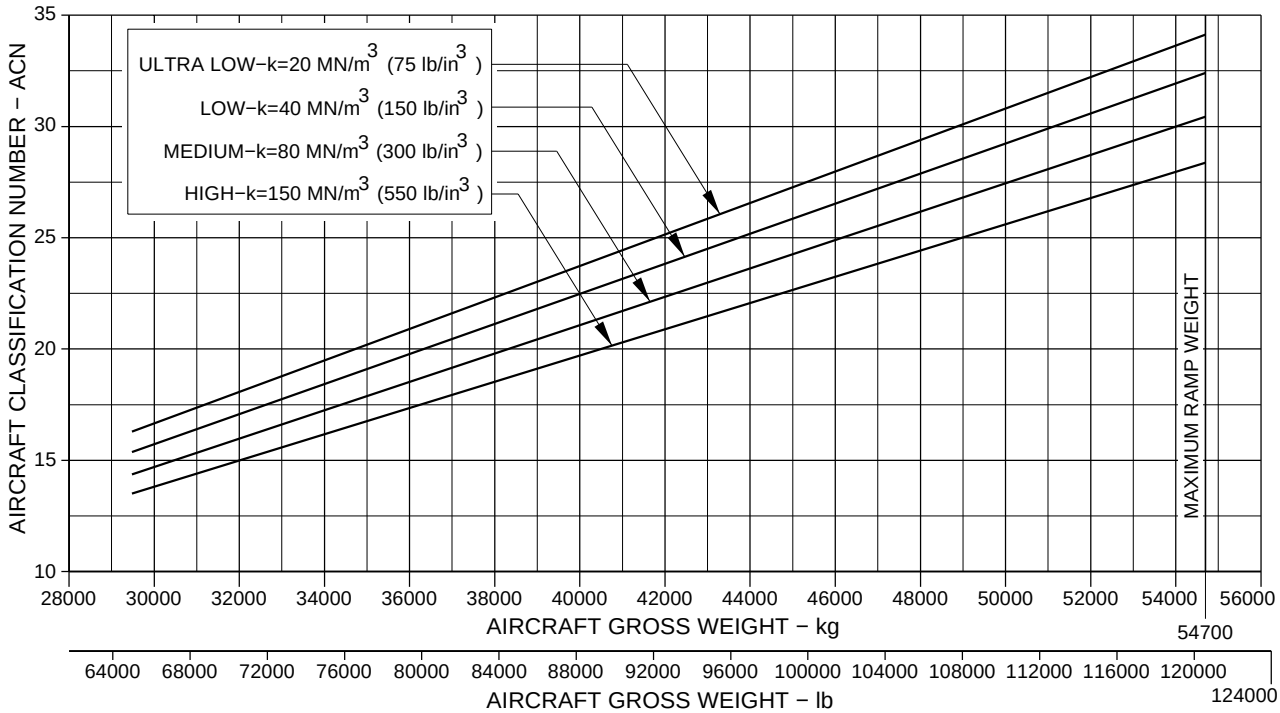
ACN For Flexible Pavement
Figure 7.10

EFFECTIVITY: ALL

RIGID PAVEMENT SUBGRADE

NOTES:
- TIRE SIZE: H41 x 16−20 22PR
- TIRE PRESSURE: 11.11 kgf/cm^2 (158 psi) (UNLOADED)





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ACN For Rigid Pavement
Figure 7.11

8. POSSIBLE EMBRAER LINEAGE DERIVATIVE AIRCRAFT

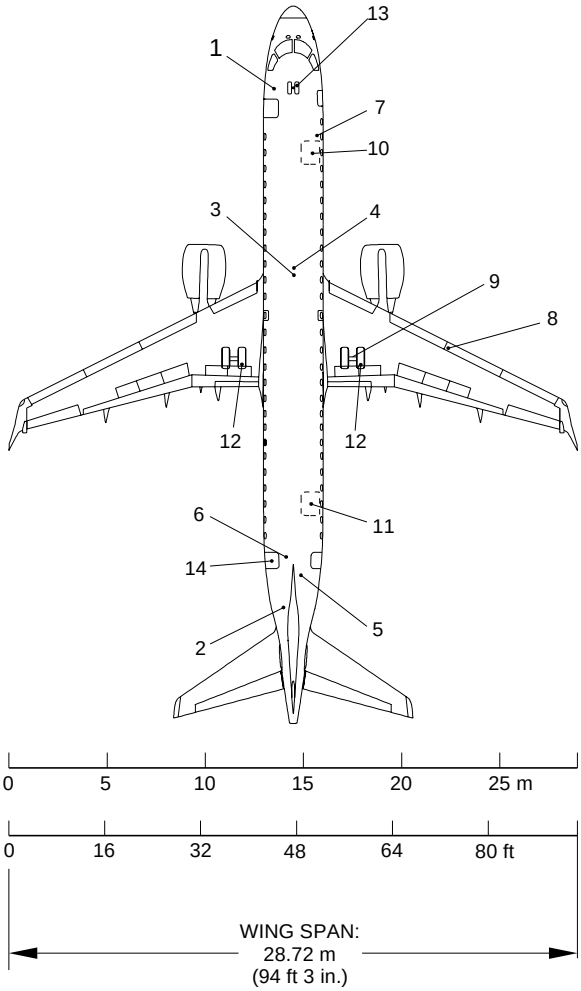
8.1. NOT APPLICABLE

9. SCALED DRAWINGS

9.1. GENERAL

This section provides plan views to the following scales:

- English/American Customary Weights and Measures
  1 inch = 32 feet
  1 inch = 50 feet
  1 inch = 100 feet
- Metric
  1:500
  1:1000



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	EXTERNAL POWER SUPPLY 115 VAC	8	PRESSURE REFUELING / DEFUELING
2	EXTERNAL POWER SUPPLY 28 VDC	9	GROUNDING POINT (RIGHT MLG)
3	ENGINE AIR STARTING	10	FORWARD CARGO DOOR
4	AIR CONDITIONING LOW PRESSURE	11	AUXILIARY FUEL TANK COMPARTMENT DOOR
5	WASTE SERVICING PANEL	12	MAIN LANDING GEAR
6	POTABLE WATER SERVICING PANEL	13	NOSE LANDING GEAR
7	OXYGEN REFILL / REPLACE BOTTLE	14	AFT BAGGAGE DOOR

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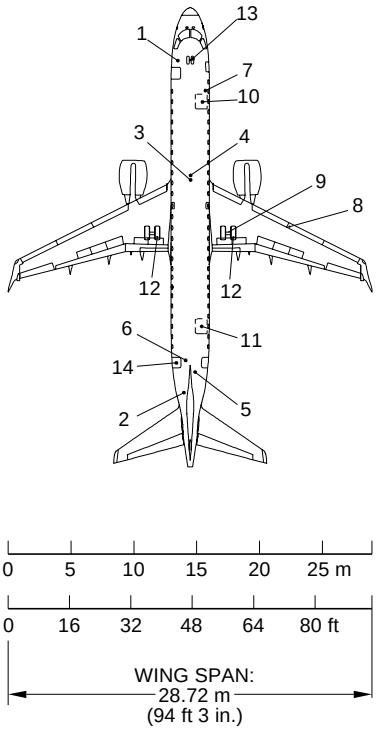
Scale: 1 Inch Equals 32 Feet
Figure 9.1

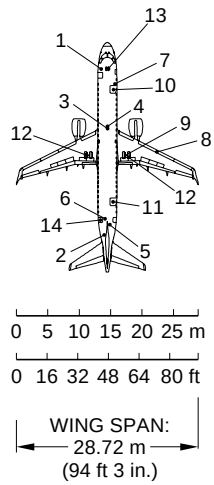
EFFECTIVITY: ALL



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	EXTERNAL POWER SUPPLY 115 VAC	8	PRESSURE REFUELING / DEFUELING
2	EXTERNAL POWER SUPPLY 28 VDC	9	GROUNDING POINT (RIGHT MLG)
3	ENGINE AIR STARTING	10	FORWARD CARGO DOOR
4	AIR CONDITIONING LOW PRESSURE	11	AUXILIARY FUEL TANK COMPARTMENT DOOR
5	WASTE SERVICING PANEL	12	MAIN LANDING GEAR
6	POTABLE WATER SERVICING PANEL	13	NOSE LANDING GEAR
7	OXYGEN REFILL / REPLACE BOTTLE	14	AFT BAGGAGE DOOR

EM170APM090022A.DGN

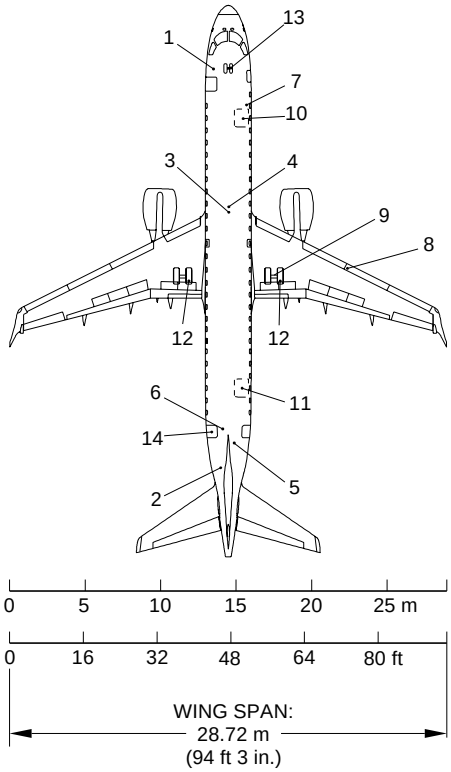
Scale: 1 Inch Equals 50 Feet
Figure 9.2



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	EXTERNAL POWER SUPPLY 115 VAC	8	PRESSURE REFUELING / DEFUELING
2	EXTERNAL POWER SUPPLY 28 VDC	9	GROUNDING POINT (RIGHT MLG)
3	ENGINE AIR STARTING	10	FORWARD CARGO DOOR
4	AIR CONDITIONING LOW PRESSURE	11	AUXILIARY FUEL TANK COMPARTMENT DOOR
5	WASTE SERVICING PANEL	12	MAIN LANDING GEAR
6	POTABLE WATER SERVICING PANEL	13	NOSE LANDING GEAR
7	OXYGEN REFILL / REPLACE BOTTLE	14	AFT BAGGAGE DOOR

EM170APM090023A.DGN

Scale: 1 Inch Equals 100 Feet
Figure 9.3



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	EXTERNAL POWER SUPPLY 115 VAC	8	PRESSURE REFUELING / DEFUELING
2	EXTERNAL POWER SUPPLY 28 VDC	9	GROUNDING POINT (RIGHT MLG)
3	ENGINE AIR STARTING	10	FORWARD CARGO DOOR
4	AIR CONDITIONING LOW PRESSURE	11	AUXILIARY FUEL TANK COMPARTMENT DOOR
5	WASTE SERVICING PANEL	12	MAIN LANDING GEAR
6	POTABLE WATER SERVICING PANEL	13	NOSE LANDING GEAR
7	OXYGEN REFILL / REPLACE BOTTLE	14	AFT BAGGAGE DOOR

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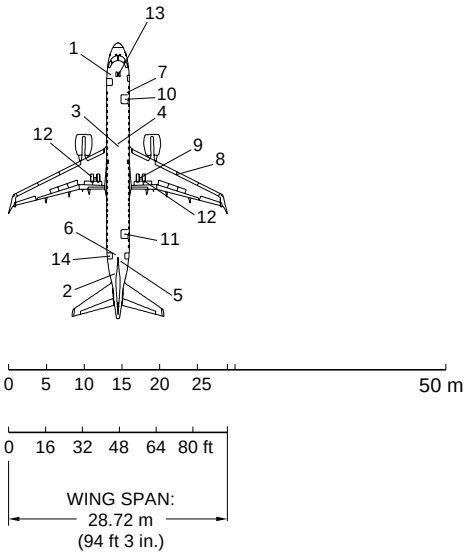
Scale: 1 to 500
Figure 9.4



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	EXTERNAL POWER SUPPLY 115 VAC	8	PRESSURE REFUELING / DEFUELING
2	EXTERNAL POWER SUPPLY 28 VDC	9	GROUNDING POINT (RIGHT MLG)
3	ENGINE AIR STARTING	10	FORWARD CARGO DOOR
4	AIR CONDITIONING LOW PRESSURE	11	AUXILIARY FUEL TANK COMPARTMENT DOOR
5	WASTE SERVICING PANEL	12	MAIN LANDING GEAR
6	POTABLE WATER SERVICING PANEL	13	NOSE LANDING GEAR
7	OXYGEN REFILL / REPLACE BOTTLE	14	AFT BAGGAGE DOOR

EM170APM090025A.DGN

Scale: 1 to 1000
Figure 9.5