A321

AIRPLANE CHARACTERISTICS

AC

AIRBUS S.A.S.
Customer Services
Technical Data Support and Services
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FRANCE

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Revision No. 14 - Sep 01/10

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****ON A/C A321-100 A321-200**

Purpose

1. General
The A321 AIRPLANE CHARACTERISTICS (AC) manual is issued for the A321-100 and A321-200 basic versions to provide the necessary data needed by airport operators and airlines for the planning of airport facilities.

This document conforms to NAS 3601.

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1-2-0 Introduction

**ON A/C A321-100 A321-200

Introduction

1. General

This manual comprises 9 chapters with a List of Effective Pages (LEP) at the beginning of the manual and a Table Of Content (TOC) at the beginning of each chapter.

Chapter 1: SCOPE

Chapter 2: AIRPLANE DESCRIPTION

This chapter contains general dimensional and other basic aircraft data.

It covers:
- aircraft dimensions and ground clearances,
- passenger and cargo compartment arrangement.

Chapter 3: AIRPLANE PERFORMANCE

This chapter indicates the aircraft performance.

It covers:
- payload range,
- takeoff and landing runway requirements,
- landing approach speed.

Chapter 4: GROUND MANEUVERING

This chapter provides the aircraft turning capability and maneuvering characteristics on the ground.

It includes:
- turning radii and visibility from the cockpit,
- runway and taxiway turn path.

Chapter 5: TERMINAL SERVICING

This chapter provides information for the arrangement of ground handling and servicing equipments.

It covers:
- location and connections of ground servicing equipments,

- engine starting pneumatic and preconditioned airflow requirements.

Chapter 6: OPERATING CONDITIONS

This chapter contains data and safety/environmental precautions related to engine and APU operation on the ground.

It covers:
- contour size and shape of the jet engine exhaust velocities and temperature,
- noise data.

Chapter 7: PAVEMENT DATA

This chapter contains the pavement data helpful for airport planning.

It gives:
- landing gear foot print and static load,
- charts for flexible pavements with Load Classification Number (LCN),
- charts for rigid pavements with LCN,
- Aircraft Classification Number (ACN), Pavement Classification Number (PCN), reporting system for flexible and rigid pavements.

Chapter 8: DERIVATIVE AIRPLANES

This chapter gives relevant data of possible A321 new version with the associated size change.

Chapter 9: SCALED DRAWING

This chapter contains different A321 scaled drawings.

AIRPLANE DESCRIPTION

2-1-0 General Airplane Characteristics

****ON A/C A321-100 A321-200**

General Airplane Characteristics

1. General Airplane Characteristics
   The weight terms used throughout this manual are given below together with their respective definitions.

   Maximum Taxi Weight (MTW):
   Maximum weight for ground maneuver as limited by aircraft strength and airworthiness requirements. (It includes weight of run-up and taxi fuel). It is also called Maximum Ramp Weight (MRW).

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

   Maximum 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 Zero Fuel Weight (MZFW):
   Maximum operational weight of the aircraft without usable fuel.

   Operational Empty Weight (OEW):
   Weight of structure, powerplant, furnishings, systems, and other items of equipment that are an integral part of a particular aircraft configuration plus the operator's items. The operator's items are the flight and cabin crew and their baggage, unusable fuel, engine oil, emergency equipment, toilet chemical and fluids, galley structure, catering equipment, passenger seats and life vests, documents, etc.

   Maximum Payload:
   Maximum Zero Fuel Weight (MZFW) minus Operational Empty Weight (OEW).

   Maximum Seating Capacity:
   Maximum number of passengers specifically certified or anticipated for certification.

   Maximum Cargo Volume:
   Maximum usable volume available for cargo.

   Usable Fuel:
   Fuel available for aircraft propulsion.

2-1-1 General Airplane Characteristics Data

****ON A/C A321-100 A321-200**

General Airplane Characteristics Data

****ON A/C A321-100**

1. The following table provides characteristics of A321-100 Models, these data are specific to each Weight Variant:

Aircraft Characteristics						
		WV000	WV002	WV003	WV004	WV005
Maximum Ramp Weight (MRW) Maximum Taxi Weight (MTW)	Kilograms	83 400	83 400	85 400	78 400	83 400
	Pounds	183 865	183 865	188 275	172 842	183 865
Maximum Takeoff Weight (MTOW)	Kilograms	83 000	83 000	85 000	78 000	83 000
	Pounds	182 984	182 984	187 393	171 961	182 984
Maximum Landing Weight (MLW)	Kilograms	73 500	74 500	74 500	73 500	75 000
	Pounds	162 040	164 244	164 244	162 040	165 347
Maximum Zero Fuel Weight (MZFW)	Kilograms	69 500	70 500	70 500	69 500	71 000
	Pounds	153 221	155 426	155 426	153 221	156 528
Estimated Operational Empty Weight (OEW)	CFM Engines	46 856 kg (103 300 lb)				
	IAE Engines	46 959 kg (103 527 lb)				
Estimated Maximum Payload CFM 56	Kilograms	22 644	23 644		22 644	24 144
	Pounds	49 921	52 126		49 921	53 228
Estimated Maximum Payload IAE V2500	Kilograms	22 541	23 541		22 541	24 041
	Pounds	49 694	51 899		49 694	53 001

Aircraft Characteristics				
		WV006	WV007	WV008
Maximum Ramp Weight (MRW) Maximum Taxi Weight (MTW)	Kilograms	78 400	80 400	89 400
	Pounds	172 842	177 252	197 093
Maximum Takeoff Weight (MTOW)	Kilograms	78 000	80 000	89 000
	Pounds	171 961	176 370	196 211
Maximum Landing Weight (MLW)	Kilograms	74 500	73 500	75 500
	Pounds	164 244	162 040	166 449
Maximum Zero Fuel Weight (MZFW)	Kilograms	70 500	69 500	71 500
	Pounds	155 426	153 221	157 630

Aircraft Characteristics				
		WV006	WV007	WV008
Estimated Operational Empty Weight (OEW)	CFM Engines	46 856 kg (103 300 lb)		
	IAE Engines	46 959 kg (103 527 lb)		
Estimated Maximum Payload CFM 56	Kilograms	23 644	22 644	24 644
	Pounds	52 126	49 921	54 331
Estimated Maximum Payload IAE V2500	Kilograms	23 541	22 541	24 541
	Pounds	51 899	49 694	54 104

****ON A/C A321-200**

2. The following table provides characteristics of A321-200 Models, these data are specific to each Weight Variant:

Aircraft Characteristics						
		WV000	WV001	WV002	WV003	WV004
Maximum Ramp Weight (MRW) Maximum Taxi Weight (MTW)	Kilograms	89 400	93 400	89 400	91 400	87 400
	Pounds	197 093	205 912	197 093	201 502	192 684
Maximum Takeoff Weight (MTOW)	Kilograms	89 000	93 000	89 000	91 000	87 000
	Pounds	196 211	205 030	196 211	200 621	191 802
Maximum Landing Weight (MLW)	Kilograms	75 500	77 800	77 800	77 800	75 500
	Pounds	166 449	171 520	171 520	171 520	166 449
Maximum Zero Fuel Weight (MZFW)	Kilograms	71 500	73 800	73 800	73 800	71 500
	Pounds	157 630	162 701	162 701	162 701	157 630
Estimated Operational Empty Weight (OEW)	CFM Engines	46 856 kg (103 300 lb)				
	IAE Engines	46 959 kg (103 527 lb)				
Estimated Maximum Payload CFM 56	Kilograms	24 644	26 944			24 644
	Pounds	54 331	59 401			54 331
Estimated Maximum Payload IAE V2500	Kilograms	24 541	26 841			24 541
	Pounds	54 104	59 174			54 104

Aircraft Characteristics						
		WV005	WV006	WV007	WV008	WV009
Maximum Ramp Weight (MRW) Maximum Taxi Weight (MTW)	Kilograms	85 400	83 400	83 400	80 400	78 400
	Pounds	188 275	183 865	183 865	177 252	172 842

Aircraft Characteristics						
		WV005	WV006	WV007	WV008	WV009
Maximum Takeoff Weight (MTOW)	Kilograms	85 000	83 000	83 000	80 000	78 000
	Pounds	187 393	182 984	182 984	176 370	171 961
Maximum Landing Weight (MLW)	Kilograms	75 500	75 500	73 500	73 500	73 500
	Pounds	166 449	166 449	162 040	162 040	162 040
Maximum Zero Fuel Weight (MZFW)	Kilograms	71 500	71 500	69 500	69 500	69 500
	Pounds	157 630	157 630	153 221	153 221	153 221
Estimated Operational Empty Weight (OEW)	CFM Engines	46 856 kg (103 300 lb)				
	IAE Engines	46 959 kg (103 527 lb)				
Estimated Maximum Payload CFM 56	Kilograms	24 644		22 644		
	Pounds	54 331		49 921		
Estimated Maximum Payload IAE V2500	Kilograms	24 541		22 541		
	Pounds	54 104		49 694		

Aircraft Characteristics			
		WV010	WV011
Maximum Ramp Weight (MRW) Maximum Taxi Weight (MTW)	Kilograms	85 400	93 900
	Pounds	188 275	207 014
Maximum Takeoff Weight (MTOW)	Kilograms	85 000	93 500
	Pounds	187 393	206 132
Maximum Landing Weight (MLW)	Kilograms	77 800	77 800
	Pounds	171 520	171 520
Maximum Zero Fuel Weight (MZFW)	Kilograms	73 800	73 800
	Pounds	162 701	162 701
Estimated Operational Empty Weight (OEW)	CFM Engines	46 856 kg (103 300 lb)	
	IAE Engines	46 959 kg (103 527 lb)	
Estimated Maximum Payload CFM 56	Kilograms	26 944	
	Pounds	59 401	
Estimated Maximum Payload IAE V2500	Kilograms	26 841	
	Pounds	59 174	

**ON A/C A321-100

3. The following table provides characteristics of A321-100 Models, these data are common to each Weight Variant:

Aircraft Characteristics		
Standard Seating Capacity	Single-class	220
Usable Fuel Capacity	Liters	23 700 - 26 692* - 29 684**
	US gallons	6 261 - 7 051* - 7 842**
	Kilograms (density = 0.785 kg/l)	18 604 - 20 953* - 23 301**
	Pounds	41 015 - 46 193* - 51 370**
Pressurized Fuselage Volume (A/C non equipped)	Cubic meters	418
	Cubic feet	14 762
Passenger Compartment Volume	Cubic meters	155
	Cubic feet	5 474
Cockpit Volume	Cubic meters	9
	Cubic feet	318
Usable Volume, FWD CC	Cubic meters	22.81
	Cubic feet	806
Usable Volume, AFT CC	Cubic meters	23.03
	Cubic feet	814
Usable Volume, Bulk CC	Cubic meters	5.88
	Cubic feet	208
Water Volume, FWD CC	Cubic meters	25.42
	Cubic feet	897.7
Water Volume, AFT CC	Cubic meters	25.69
	Cubic feet	907.2
Water Volume, Bulk CC	Cubic meters	7.76
	Cubic feet	274

* OPTION: 1 ACT
** OPTION: 2 ACT

**ON A/C A321-200

4. The following table provides characteristics of A321-200 Models, these data are common to each Weight Variant:

Aircraft Characteristics		
Standard Seating Capacity	Single-class	220
Usable Fuel Capacity	Liters	23 700 - 26 692* - 29 684**
	US gallons	6 261 - 7 051* - 7 842**
	Kilograms (density = 0.785 kg/l)	18 604 - 20 953* - 23 301**
	Pounds	41 015 - 46 193* - 51 370**
Pressurized Fuselage Volume (A/C non equipped)	Cubic meters	418
	Cubic feet	14 762
Passenger Compartment Volume	Cubic meters	155
	Cubic feet	5 474
Cockpit Volume	Cubic meters	9
	Cubic feet	318
Usable Volume, FWD CC	Cubic meters	22.81
	Cubic feet	806
Usable Volume, AFT CC	Cubic meters	23.03
	Cubic feet	814
Usable Volume, Bulk CC	Cubic meters	5.88
	Cubic feet	208
Water Volume, FWD CC	Cubic meters	25.42
	Cubic feet	897.7
Water Volume, AFT CC	Cubic meters	25.69
	Cubic feet	907.2
Water Volume, Bulk CC	Cubic meters	7.76
	Cubic feet	274

* OPTION: 1 ACT
** OPTION: 2 ACT

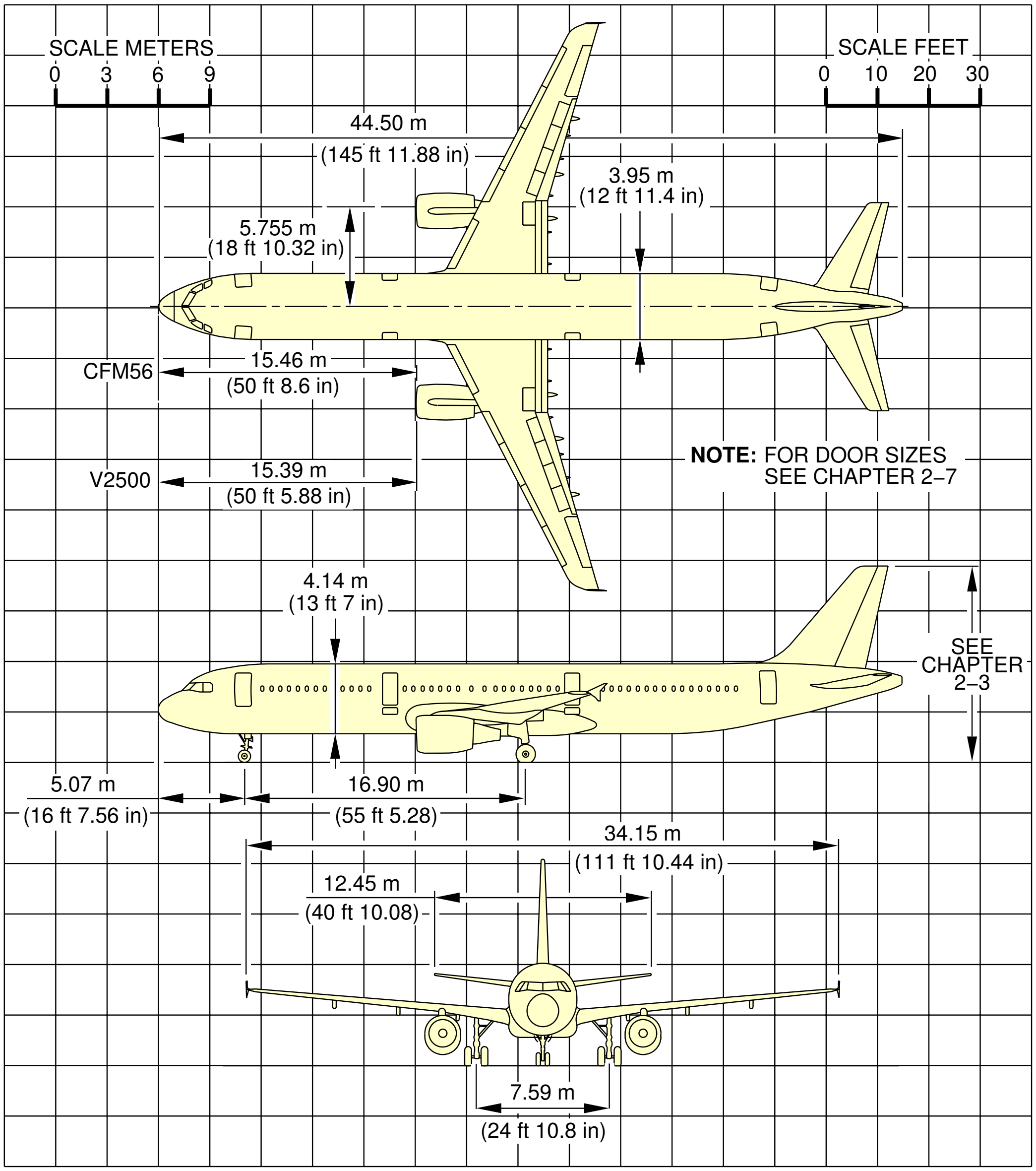
2-2-0 General Airplane Dimensions

****ON A/C A321-100 A321-200**

General Airplane Dimensions

1. This section provides General Airplane Dimensions.

**ON A/C A321-100 A321-200



N_AC_020200_1_0050101_01_01

General Airplane Dimensions
FIGURE 1

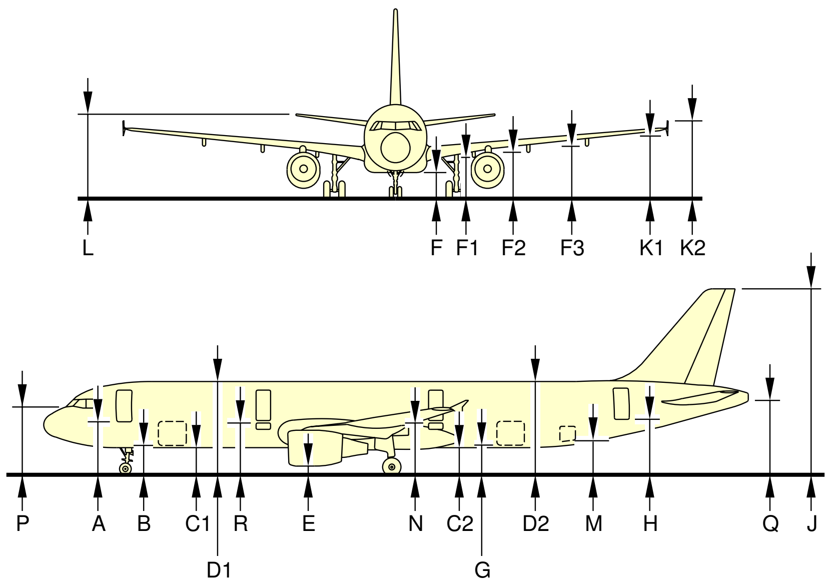
2-3-0 Ground Clearances

****ON A/C A321-100 A321-200**

Ground Clearances

1. This section gives the height of various points of the aircraft, above the ground, for different aircraft configurations.
   Dimensions in the tables are approximate and will vary with tire type and conditions.
   The dimensions are given for:
   - The basic aircraft OWE with a mid CG,
   - the MRW for the lightest weight variant with a FWD CG and a AFT CG,
   - the MRW for the heaviest weight variant with a FWD CG and a AFT CG,
   - aircraft on jacks, FDL at 4.6m (15.09ft).

**ON A/C A321-100 A321-200



NOTE: POINTS A, B, G, H & N ARE MID DOOR AT FLOOR LEVEL.

	OWE 46 856 kg		MRW (WV0) 89 400 kg				MRW (WV8) 93 900 kg				AC JACKED FDL = 4.60 m	
	CG 25%		FWD CG 17.5%		AFT CG 38%		FWD CG 19%		AFT CG 36.9%			
	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft
A	3.50	11.48	3.39	11.12	3.48	11.42	3.39	11.12	3.47	11.38	4.13	13.55
B	2.10	6.89	2.00	6.56	2.07	6.79	1.99	6.53	2.05	6.73	2.71	8.89
C1	1.84	6.04	1.73	5.68	1.79	5.87	1.73	5.68	1.78	5.84	2.43	7.97
C2	1.99	6.53	1.88	6.17	1.82	5.97	1.87	6.14	1.82	5.97	2.43	7.97
D1	5.98	19.62	5.87	19.26	5.93	19.46	5.87	19.26	5.92	19.42	6.58	21.59
D2	6.13	20.11	6.03	19.78	5.96	19.55	6.01	19.72	5.96	19.55	6.58	21.59
E (CFM)	0.71	2.33	0.60	1.97	0.61	2.00	0.59	1.94	0.60	1.97	1.24	4.07
E (IAE)	0.89	2.92	0.78	2.56	0.79	2.59	0.77	2.53	0.78	2.56	1.42	4.66
F	1.76	5.77	1.65	5.41	1.63	5.35	1.64	5.38	1.62	5.31	2.26	7.41
F1	2.75	9.02	2.64	8.66	2.63	8.63	2.63	8.63	2.62	8.60	3.25	10.66
F2	3.18	10.43	3.07	10.07	3.05	10.01	3.06	10.04	3.05	10.01	3.68	12.07
F3	3.52	11.55	3.41	11.19	3.38	11.09	3.40	11.15	3.38	11.09	4.01	13.16
G	2.26	7.41	2.16	7.09	2.10	6.89	2.14	7.02	2.09	6.86	2.71	8.89
H	3.73	12.24	3.63	11.91	3.53	11.58	3.61	11.84	3.53	11.58	4.13	13.55
J	12.10	39.70	11.99	39.34	11.86	38.91	11.97	39.27	11.85	38.88	12.45	40.85
K1	3.91	12.83	3.80	12.47	3.77	12.37	3.79	12.43	3.76	12.34	4.38	14.37
K2	4.88	16.01	4.77	15.65	4.74	15.55	4.76	15.62	4.73	15.52	5.35	17.55
L	5.58	18.31	5.47	17.95	5.34	17.52	5.45	17.88	5.34	17.52	5.93	19.46
M	2.33	7.64	2.22	7.28	2.14	7.02	2.20	7.22	2.14	7.02	2.75	9.02
N	4.01	13.16	3.90	12.80	3.91	12.83	3.89	12.76	3.90	12.80	4.54	14.89
P	4.30	14.11	4.19	13.75	4.30	14.11	4.19	13.75	4.29	14.07	4.96	16.27
Q	4.86	15.94	4.76	15.62	4.61	15.12	4.73	15.52	4.61	15.12	5.20	17.06
R	3.57	11.71	3.46	11.35	3.49	11.45	3.45	11.32	3.48	11.42	4.13	13.55

N_AC_020300_1_0050101_01_02

Ground Clearances
FIGURE 1

2-4-0 Interior Arrangements

****ON A/C A321-100 A321-200**

Interior Arrangements

1. This section gives the standard interior arrangements configuration.

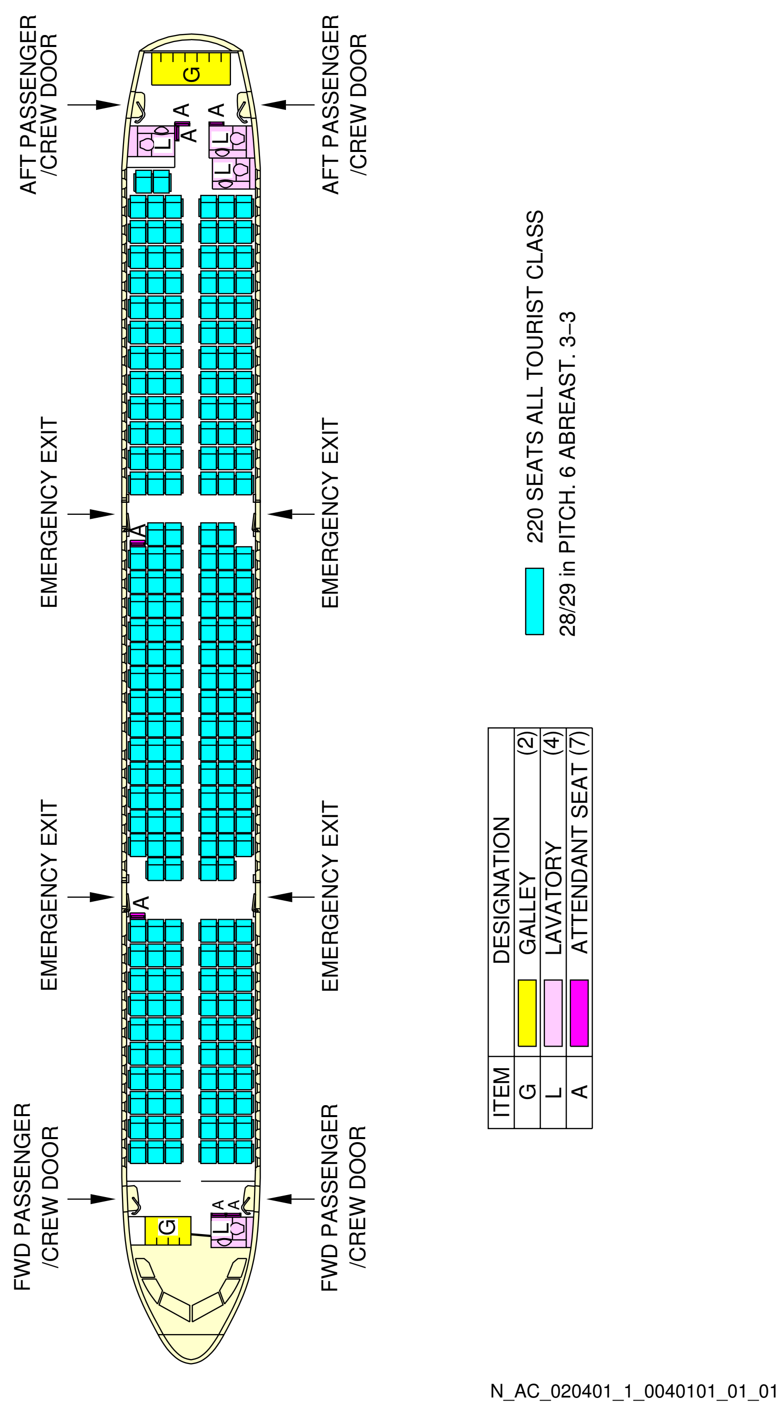
2-4-1 Passenger Compartment Layout

****ON A/C A321-100 A321-200**

Typical Configuration

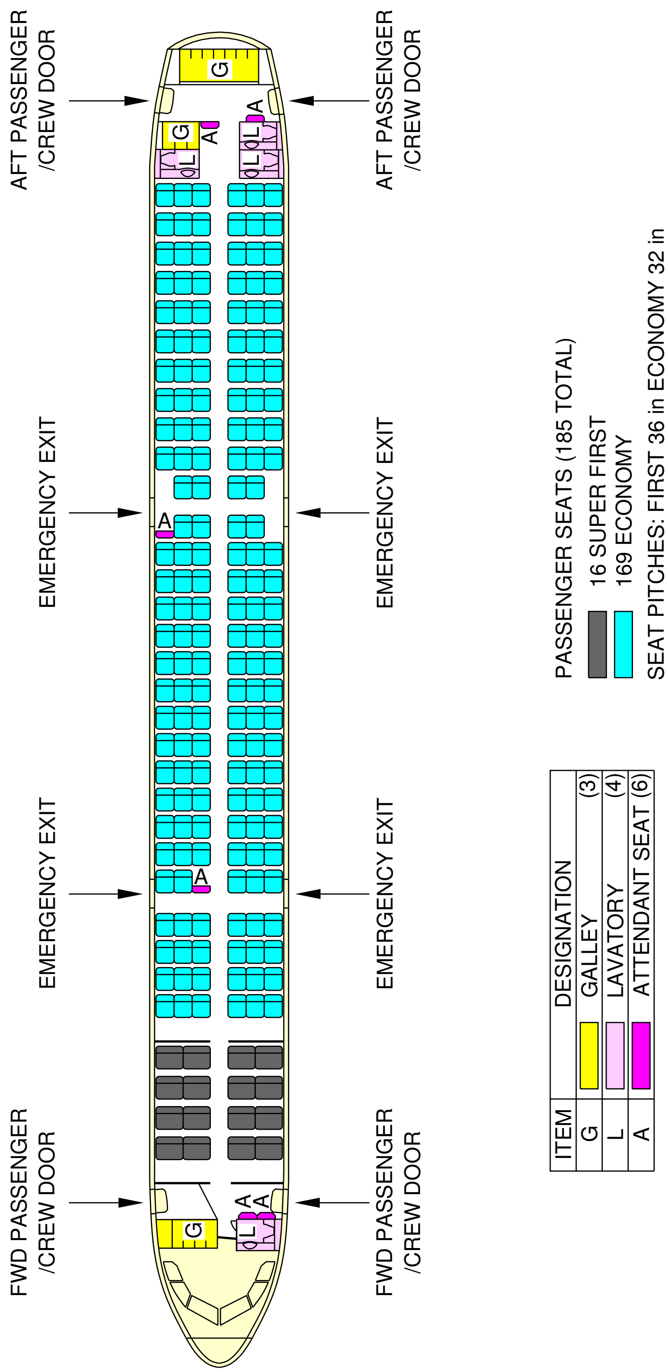
1. This section gives the typical interior configuration.

**ON A/C A321-100 A321-200



Typical Configuration
Typical Configuration Single-Class, High Density
FIGURE 1

**ON A/C A321-100 A321-200



N_AC_020401_1_0060101_01_05

Typical Configuration
Typical Configuration Two-Class
FIGURE 2

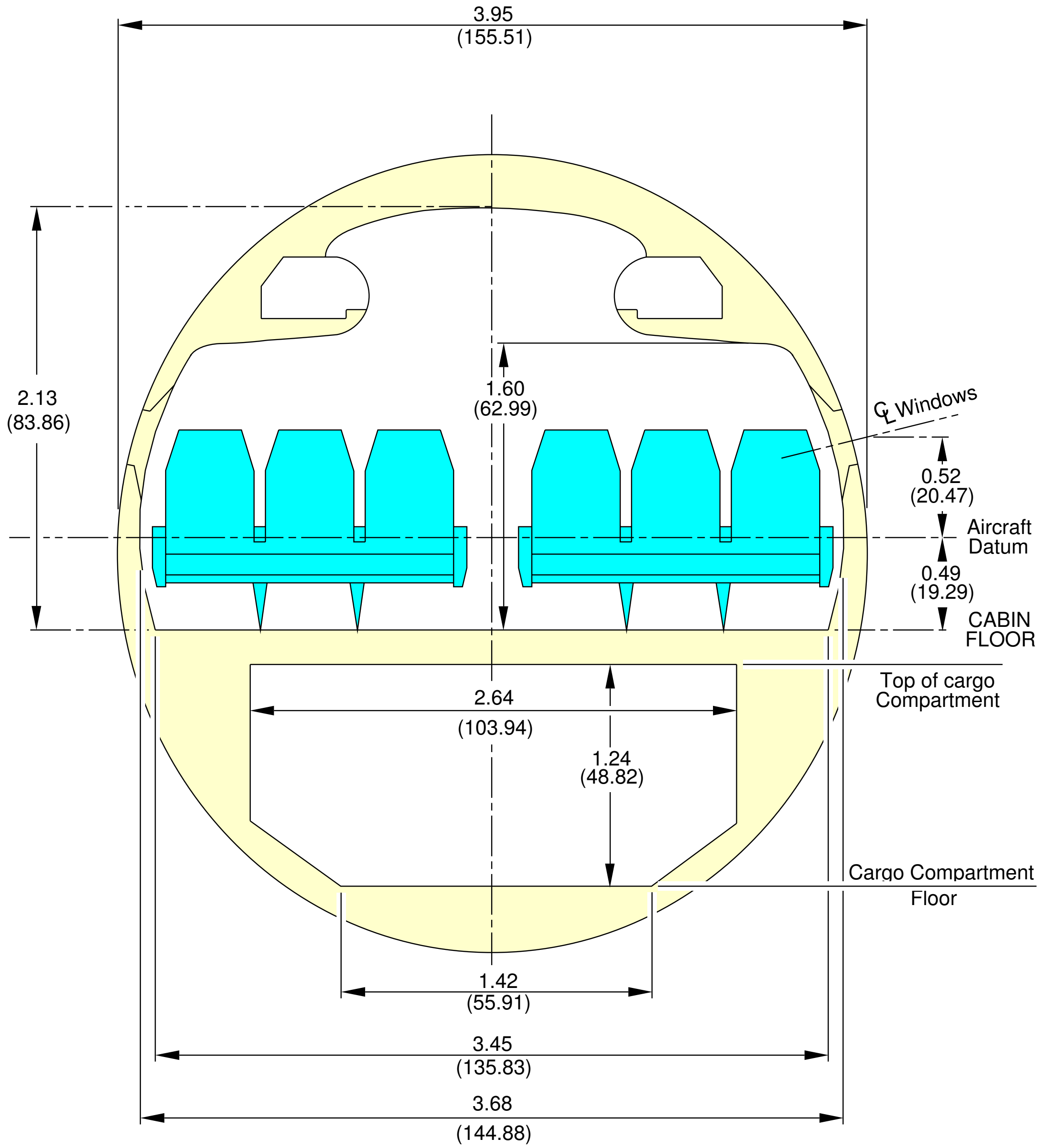
2-5-0 Passenger Compartment Cross Section

****ON A/C A321-100 A321-200**

Passenger Compartment Cross-section

1. This section gives the typical passenger compartment cross-section configuration.

**ON A/C A321-100 A321-200

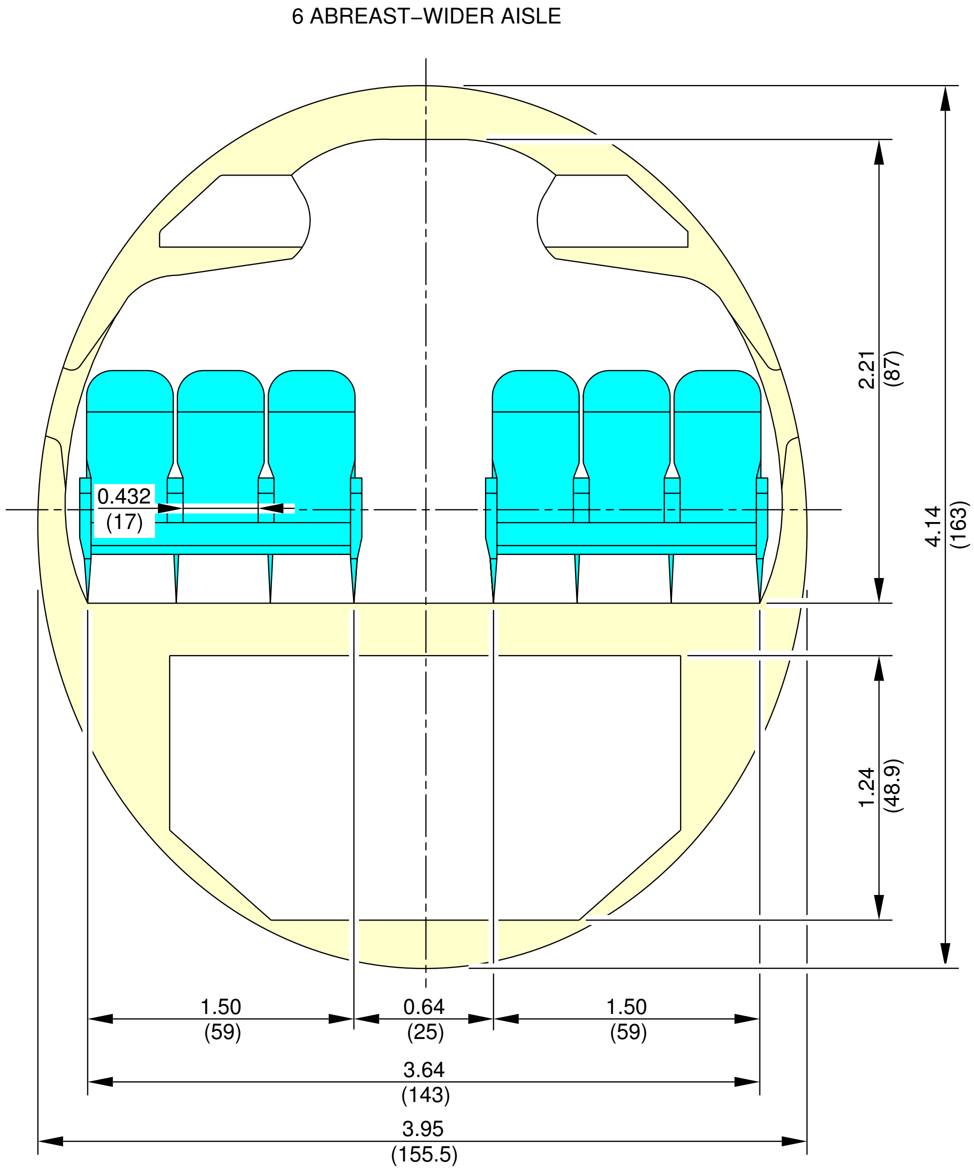


NOTE: DIMENSIONS m (in)

N_AC_020500_1_0010101_01_01

Passenger Compartment Cross-section
FIGURE 1

**ON A/C A321-100 A321-200

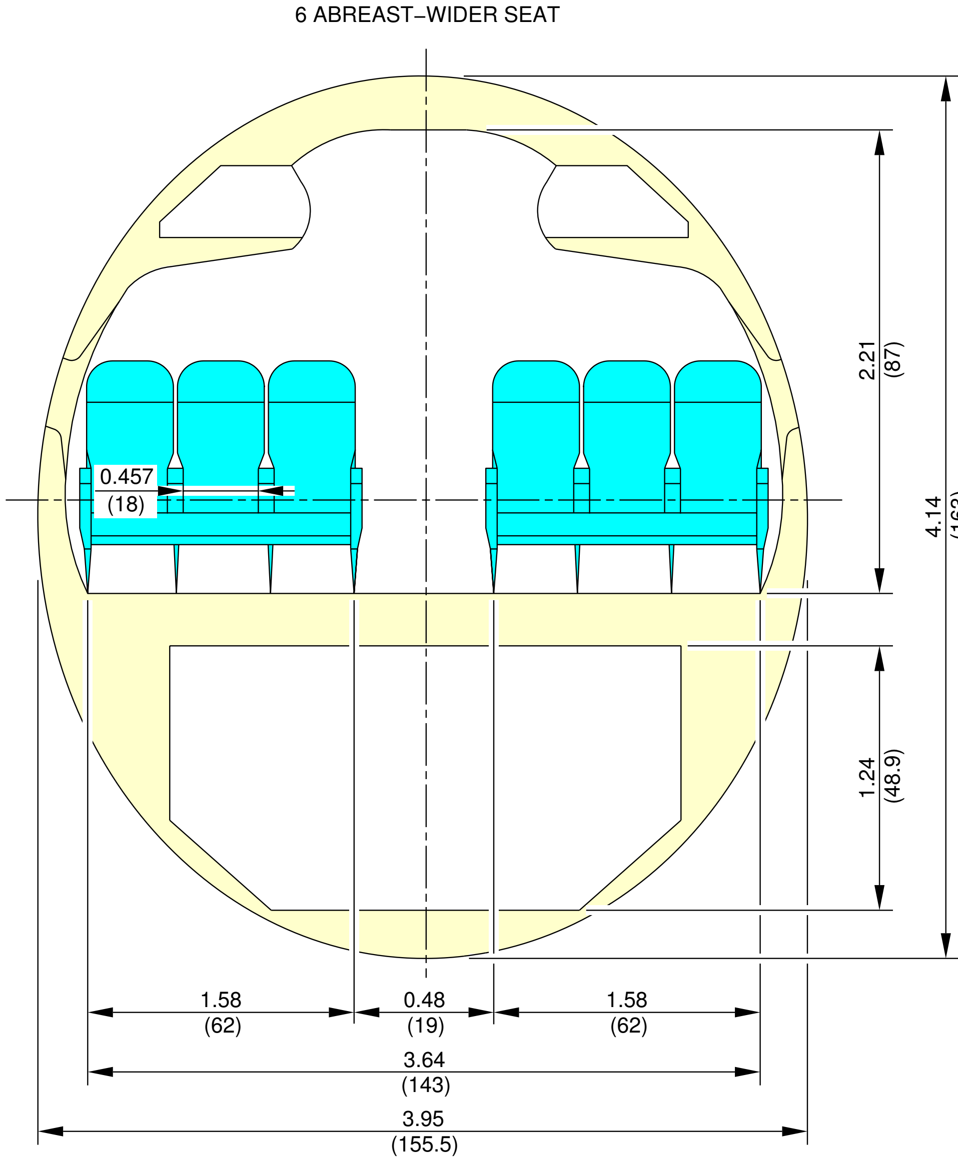


NOTE: DIMENSIONS m (in)

N_AC_020500_1_0050101_01_00

Passenger Compartment Cross-section
Economy Class, 6 Abreast - Wider Aisle (Sheet 1 of 2)
FIGURE 2

**ON A/C A321-100 A321-200

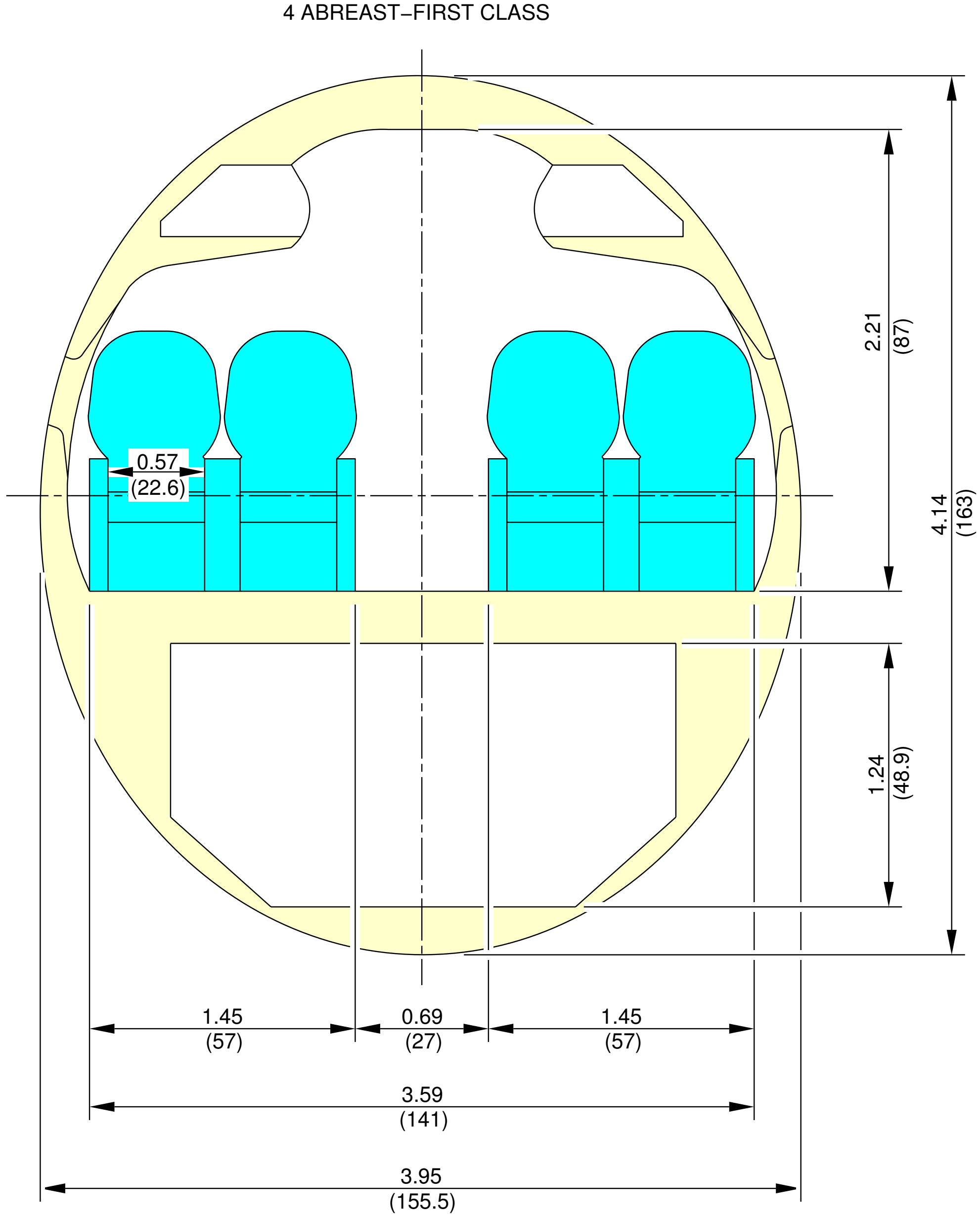


NOTE: DIMENSIONS m (in)

N_AC_020500_1_0050102_01_02

Passenger Compartment Cross-section
Economy Class, 6 Abreast - Wider Seat (Sheet 2 of 2)
FIGURE 3

**ON A/C A321-100 A321-200



NOTE: DIMENSIONS m (in)

N_AC_020500_1_0060101_01_00

Passenger Compartment Cross-section
Passenger Compartment Cross-section, First-class
FIGURE 4

2-6-0 Cargo Compartments

****ON A/C A321-100 A321-200**

Cargo Compartments

1. This section gives the cargo compartments location and dimensions.

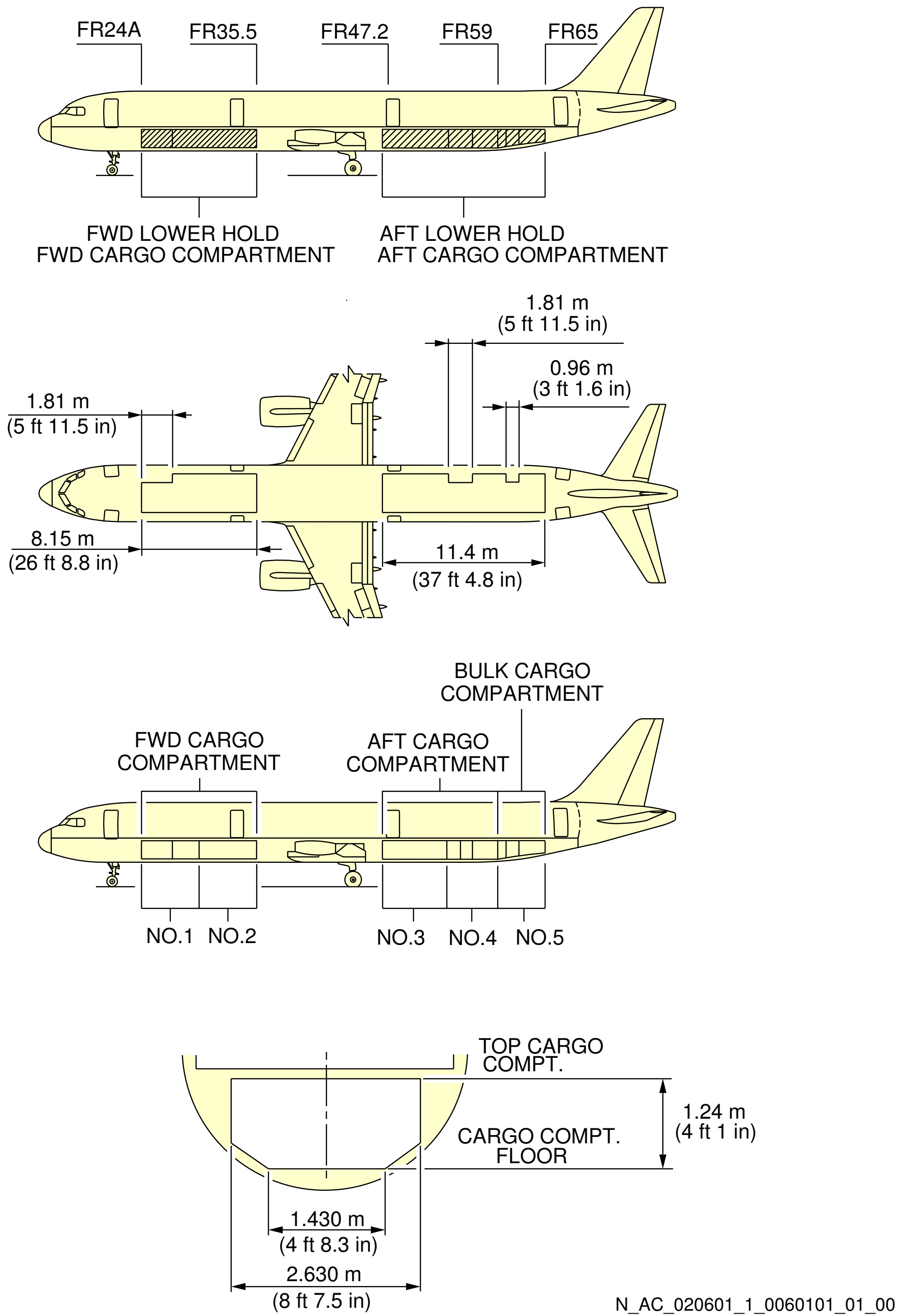
2-6-1 Lower Deck Cargo Compartments

****ON A/C A321-100 A321-200**

Lower Deck Cargo Compartments

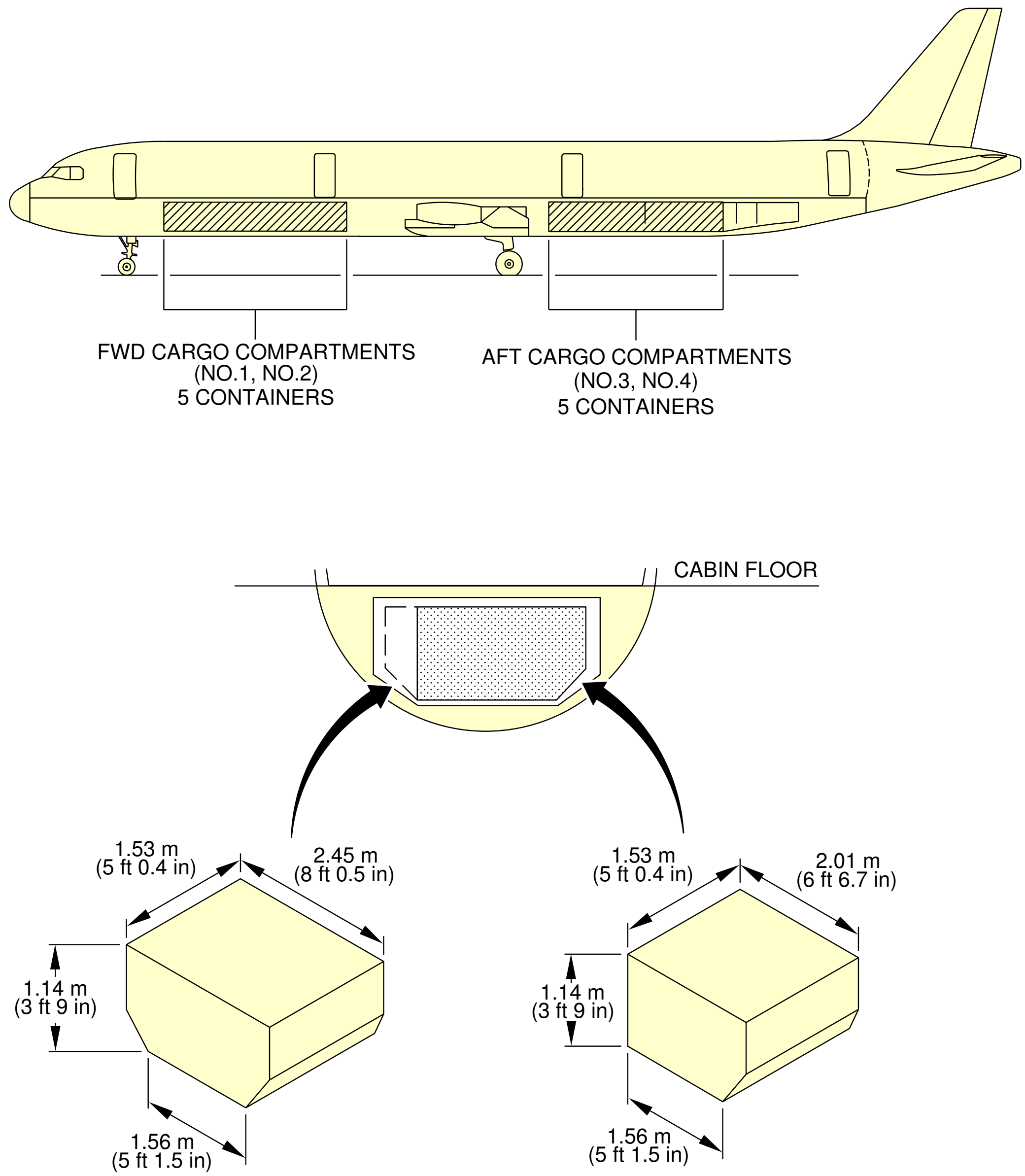
1. This section gives the lower deck cargo compartments.

**ON A/C A321-100 A321-200



Lower Deck Cargo Compartments
Lower Deck Cargo Compartments Dimensions
FIGURE 1

****ON A/C A321-100 A321-200**



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Lower Deck Cargo Compartments
Lower Deck Cargo Compartments Containers
FIGURE 2

2-7-0 Door Clearances

****ON A/C A321-100 A321-200**

Doors Clearances

1. This section gives doors clearances.

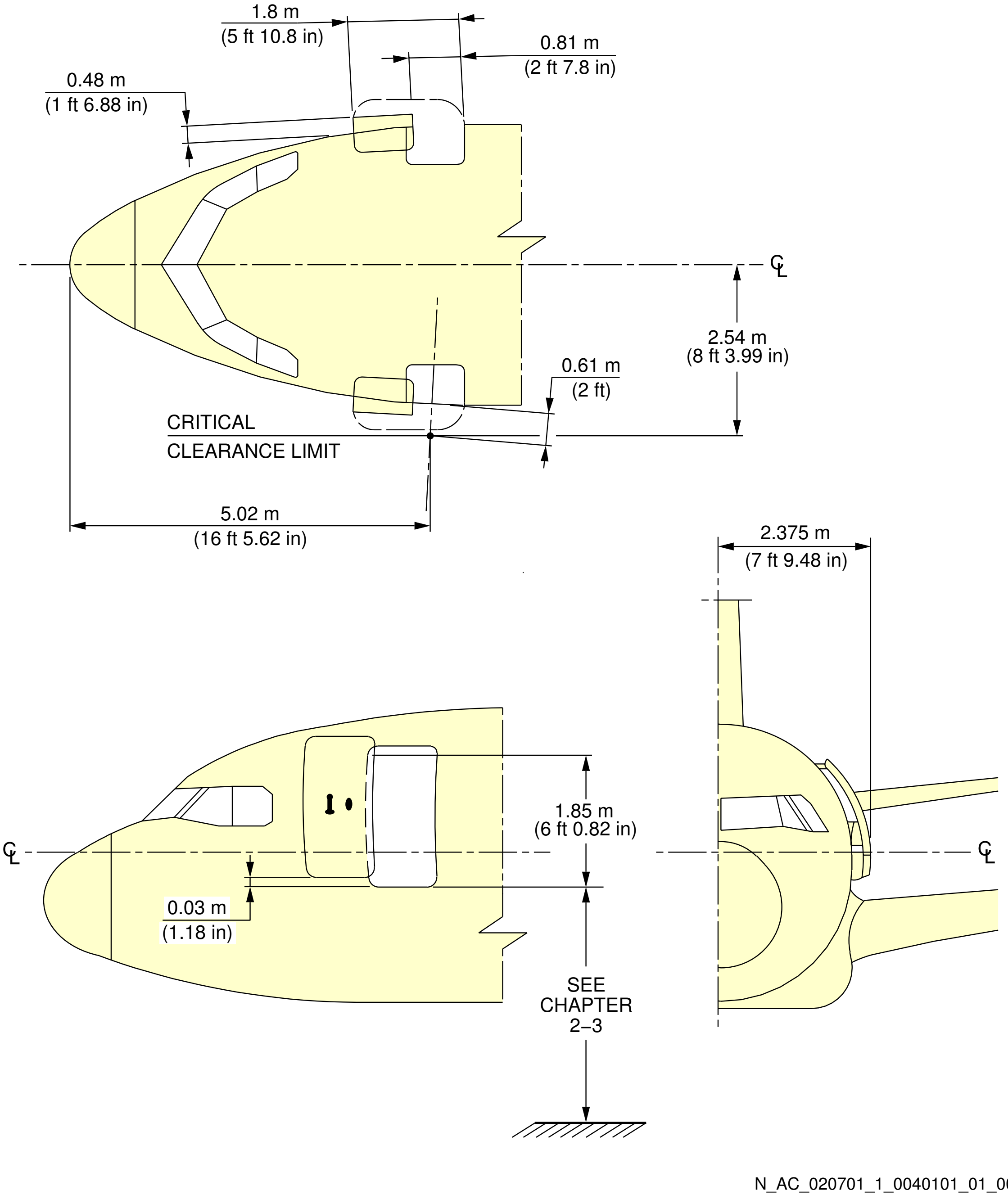
2-7-1 Forward Passenger / Crew Doors

****ON A/C A321-100 A321-200**

Forward Passenger / Crew Doors

1. This section gives forward passenger / crew doors clearances.

**ON A/C A321-100 A321-200



Doors Clearances
Forward Passenger / Crew Doors
FIGURE 1

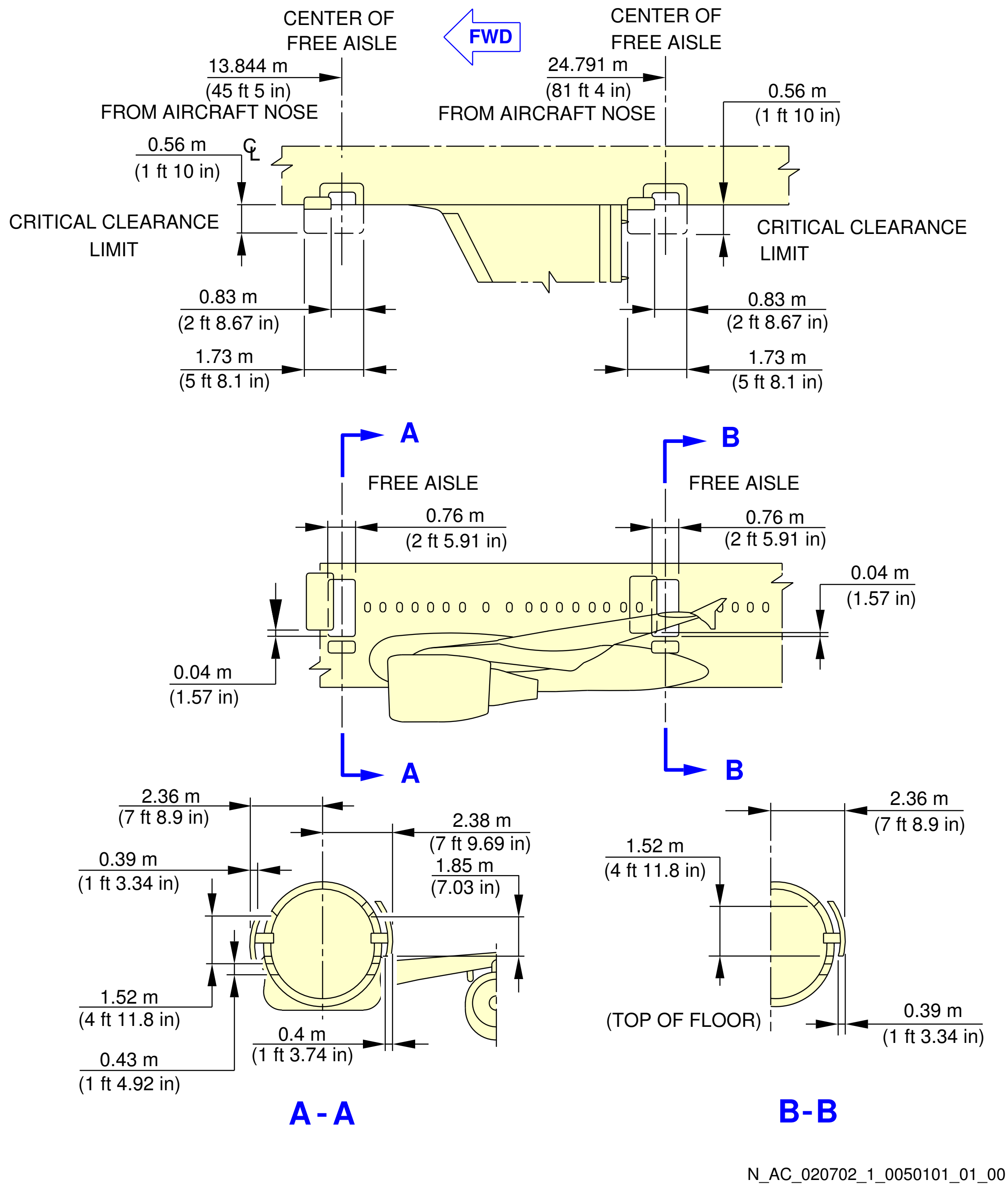
2-7-2 Emergency Exits

****ON A/C A321-100 A321-200**

Emergency Exits

1. This section gives emergency exits doors clearances.

**ON A/C A321-100 A321-200



Doors Clearances
Emergency Exits
FIGURE 1

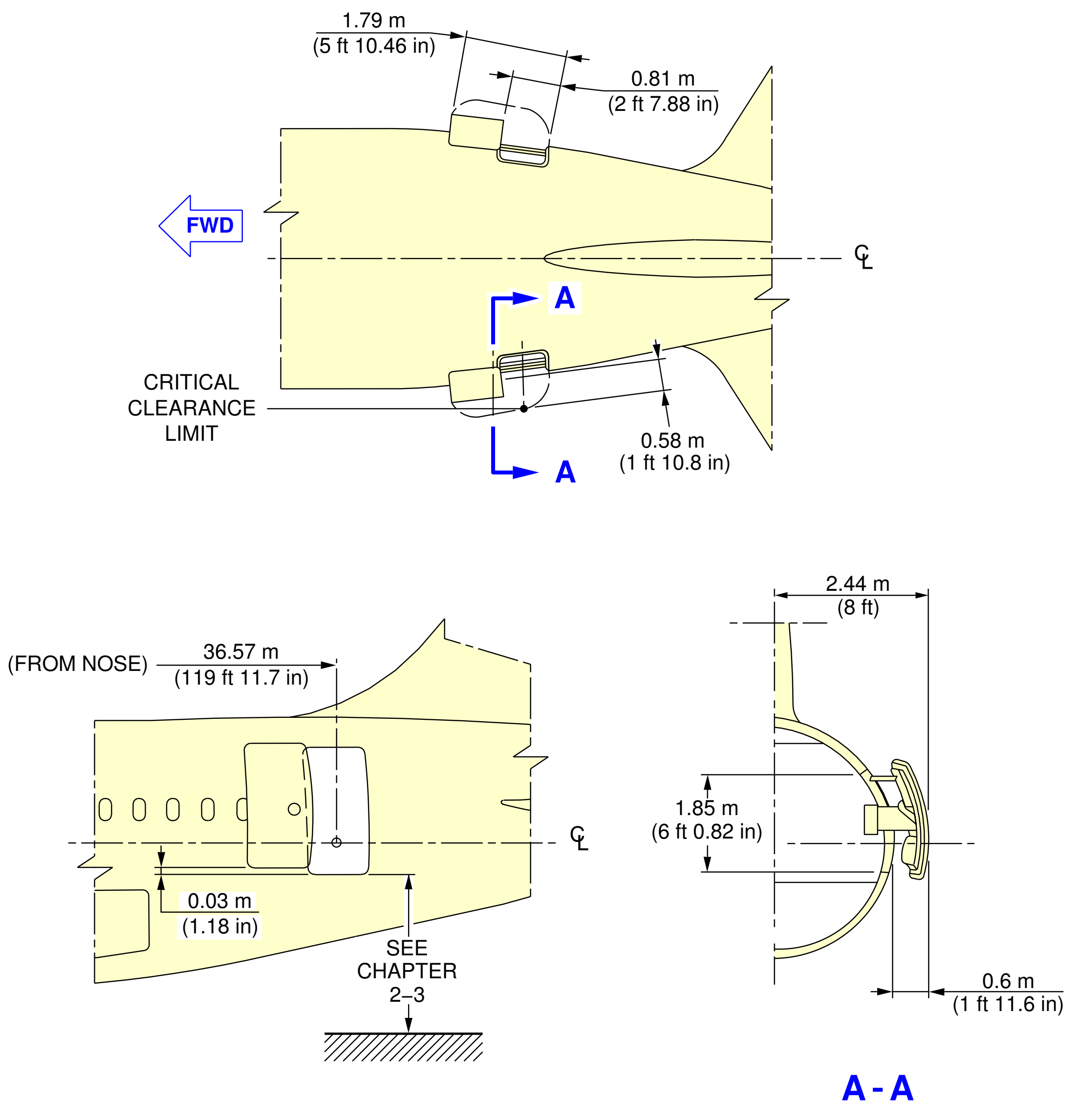
2-7-3 Aft Passenger / Crew Doors

ON A/C A321-100 A321-200

Aft Passenger / Crew Doors

1. This section gives Aft passenger / crew doors clearances.

**ON A/C A321-100 A321-200



N_AC_020703_1_0040101_01_00

Doors Clearances
Aft Passenger / Crew Doors
FIGURE 1

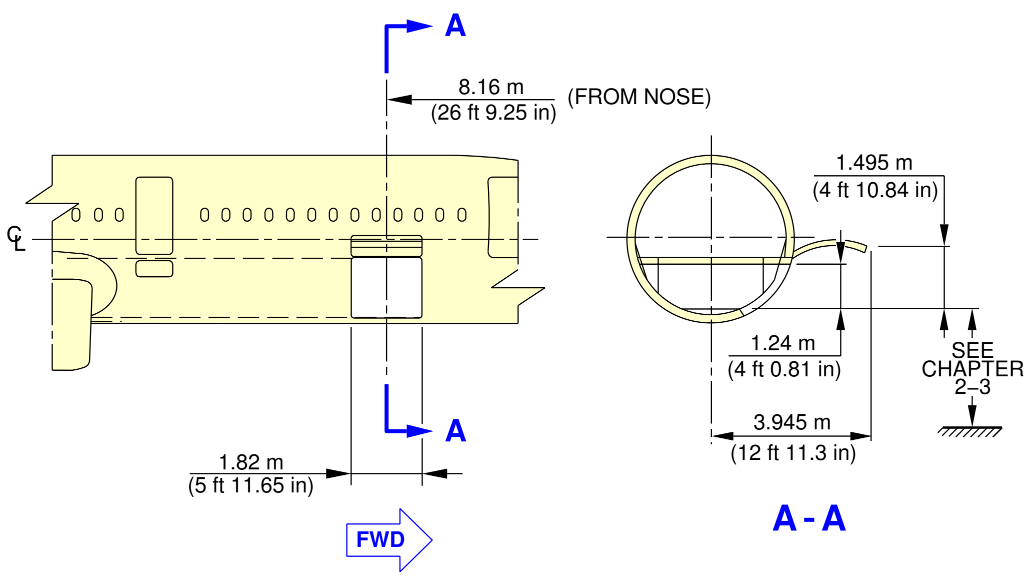
2-7-4 Forward Cargo Compartment Doors

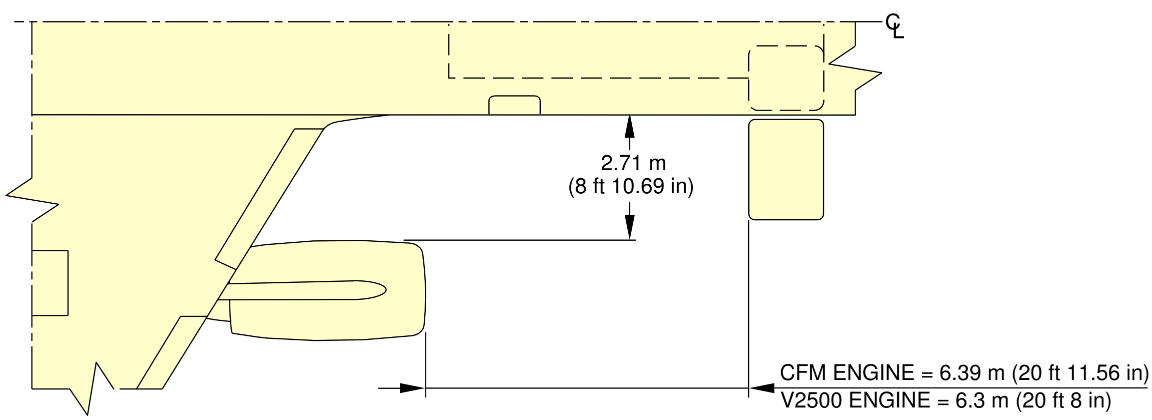
****ON A/C A321-100 A321-200**

Forward Cargo Compartment Door

1. This section gives forward cargo compartment door clearances.

**ON A/C A321-100 A321-200





N_AC_020704_1_0040101_01_01

Doors Clearances
Forward Cargo Compartment Door
FIGURE 1

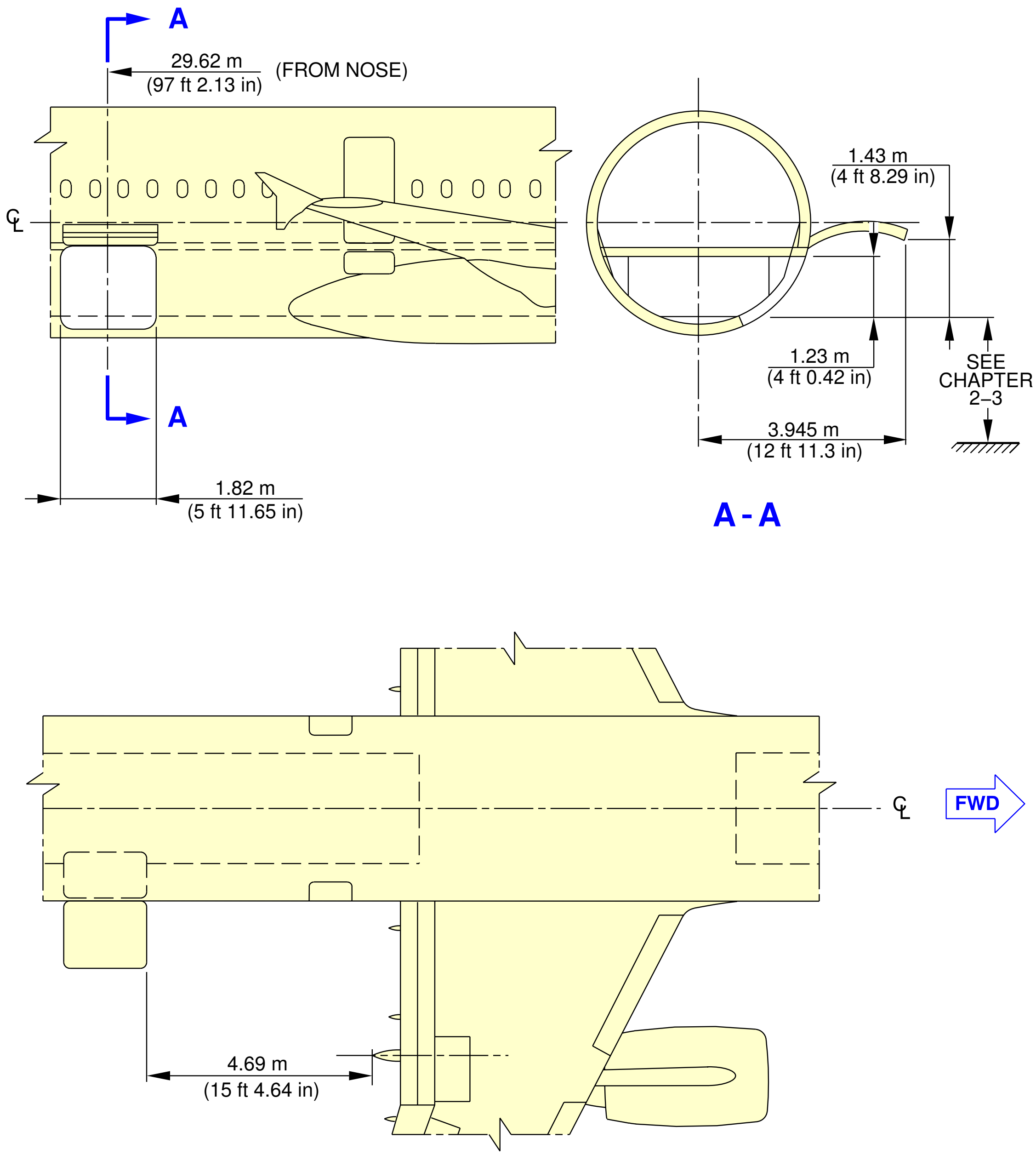
2-7-5 Aft Cargo Compartment Doors

ON A/C A321-100 A321-200

Aft Cargo Compartment Door

1. This section gives Aft cargo compartment door clearances.

**ON A/C A321-100 A321-200



N_AC_020705_1_0040101_01_00

Doors Clearances
Aft Cargo Compartment Door
FIGURE 1

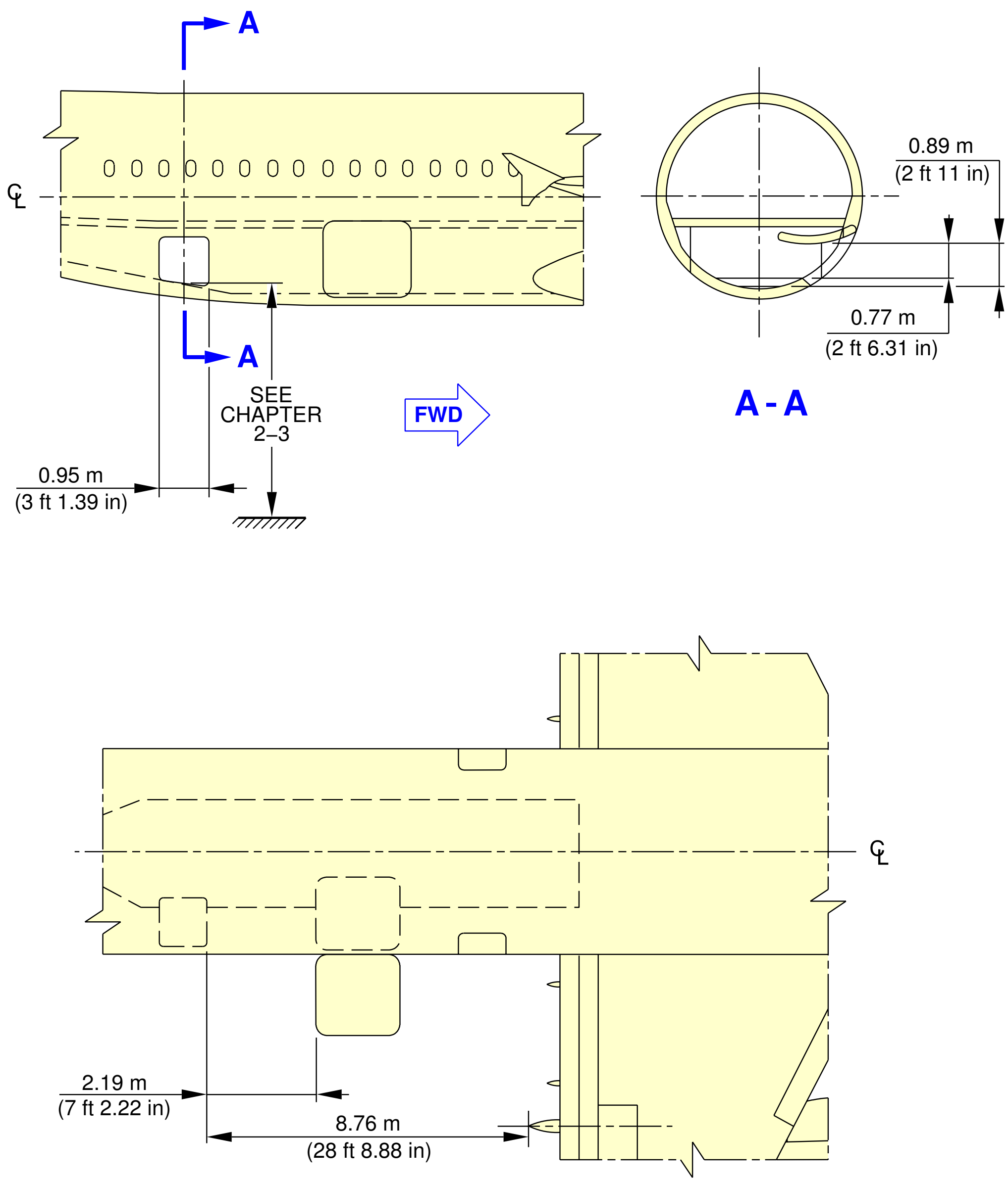
2-7-6 Bulk Cargo Compartment Doors

****ON A/C A321-100 A321-200**

Bulk Cargo Compartment Door

1. This section gives the bulk cargo compartment door clearances.

**ON A/C A321-100 A321-200



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Doors Clearances
Bulk Cargo Compartment Door
FIGURE 1

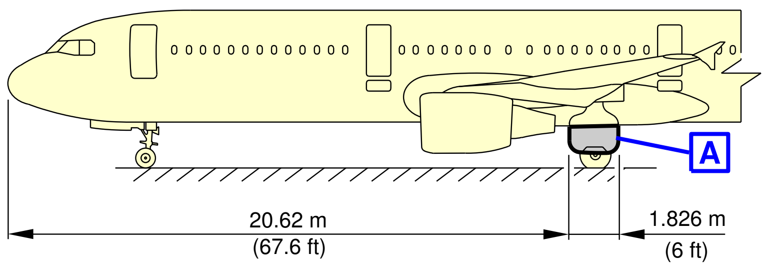
2-7-7 Main Landing Gear Doors

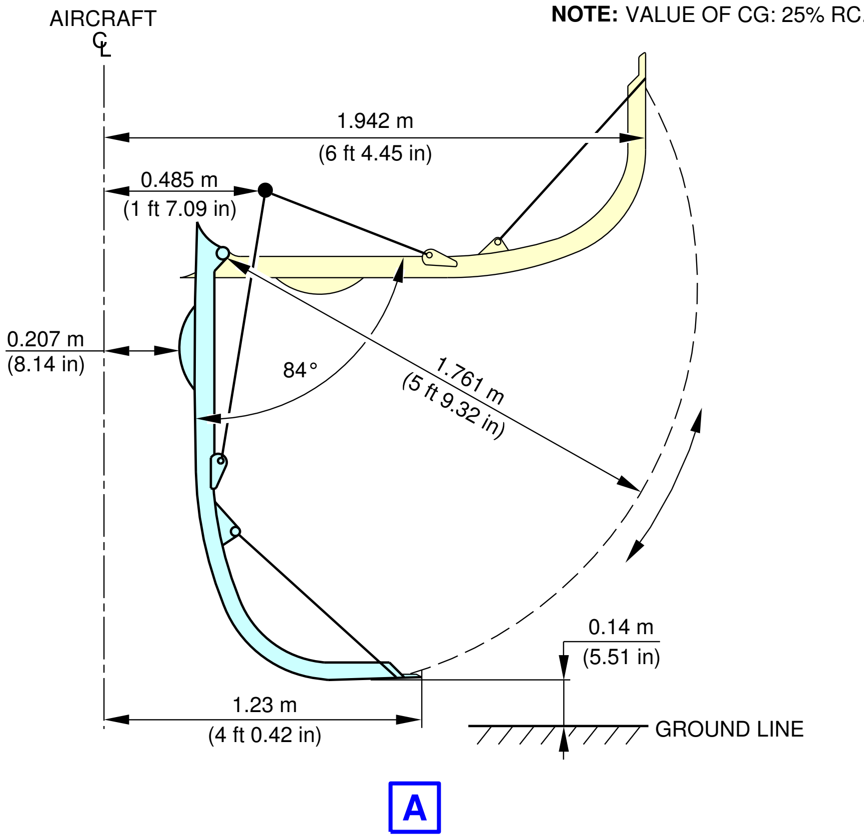
****ON A/C A321-100 A321-200**

Main Landing Gear Doors

1. This section gives the main landing gear doors clearances.

****ON A/C A321-100 A321-200**





N_AC_020707_1_0050101_01_02

Doors Clearances
Main Landing Gear Doors
FIGURE 1

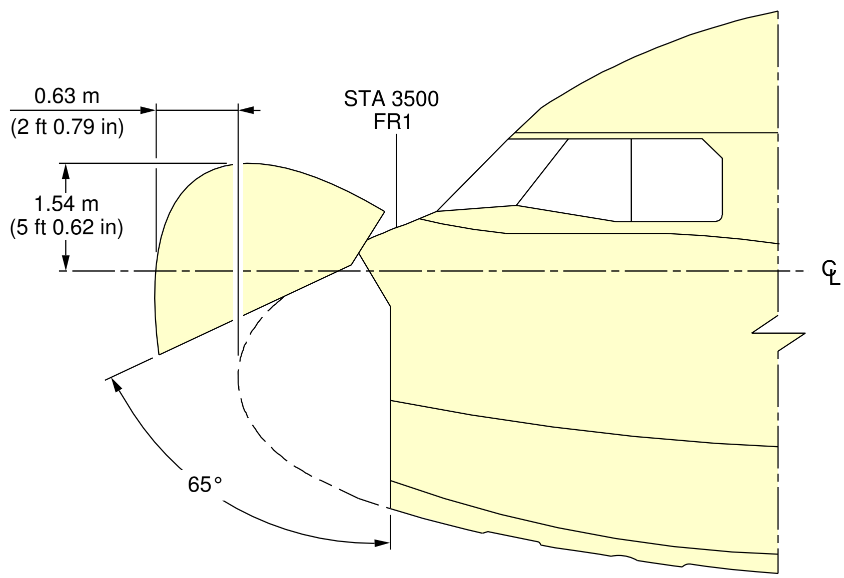
2-7-8 Radome

****ON A/C A321-100 A321-200**

Radome

1. This section gives the radome clearances.

**ON A/C A321-100 A321-200



N_AC_020708_1_0040101_01_00

Doors Clearances
Radome
FIGURE 1

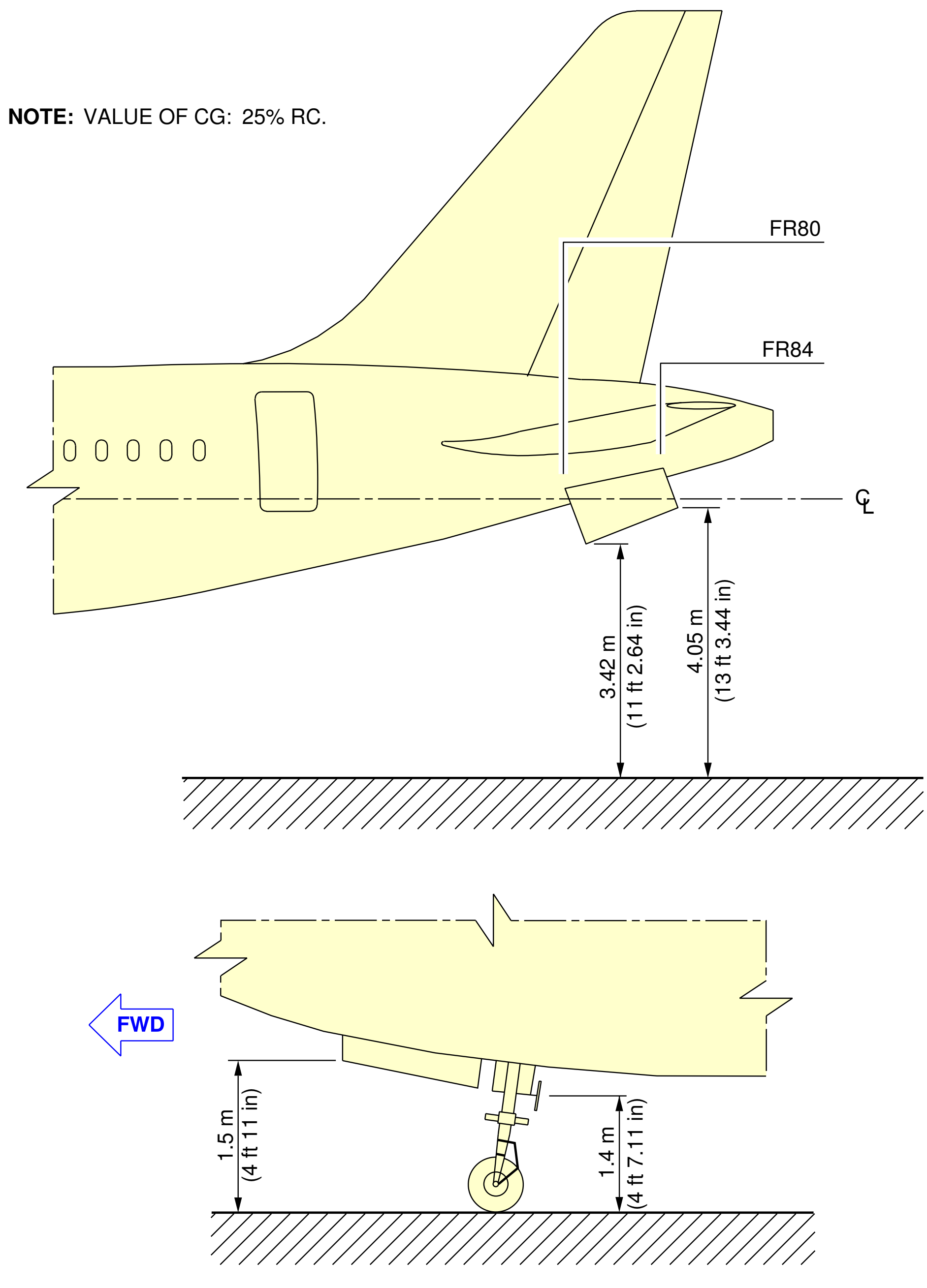
2-7-9 APU and Nose Landing Gear Doors

****ON A/C A321-100 A321-200**

APU and Nose Landing Gear Doors

1. This section gives APU and Nose Landing Gear doors clearances.

**ON A/C A321-100 A321-200



N_AC_020709_1_0040101_01_00

Doors Clearances
APU and Nose Landing Gear Doors
FIGURE 1

AIRPLANE PERFORMANCE

3-1-0 General Information

****ON A/C A321-100 A321-200**

General Information

1. This section gives standard day temperatures.

   Section 3-2 indicates payload range information at specific altitudes recommended for long range cruise with a given fuel reserve condition.

   Section 3-3 represents FAR take-off runway length requirements at ISA and ISA +15˚C (+59˚F) for CFM56 and IAE V2500 series engine conditions for FAA certification.

   Section 3-4 represents FAR landing runway length requirements for FAA certification.

   Section 3-5 indicates final approach speeds.

   Standard day temperatures for the altitudes shown are tabulated below:

Standard day temperatures for the altitude			
Altitude		Standard Day Temperature	
FEET	METERS	˚F	˚C
0	0	59.0	15.0
2000	610	51.9	11.1
4000	1219	44.7	7.1
6000	1829	37.6	3.1
8000	2438	30.5	-0.8

3-2-0 Payload / Range

****ON A/C A321-100 A321-200**

Payload / Range

1. Payload / Range

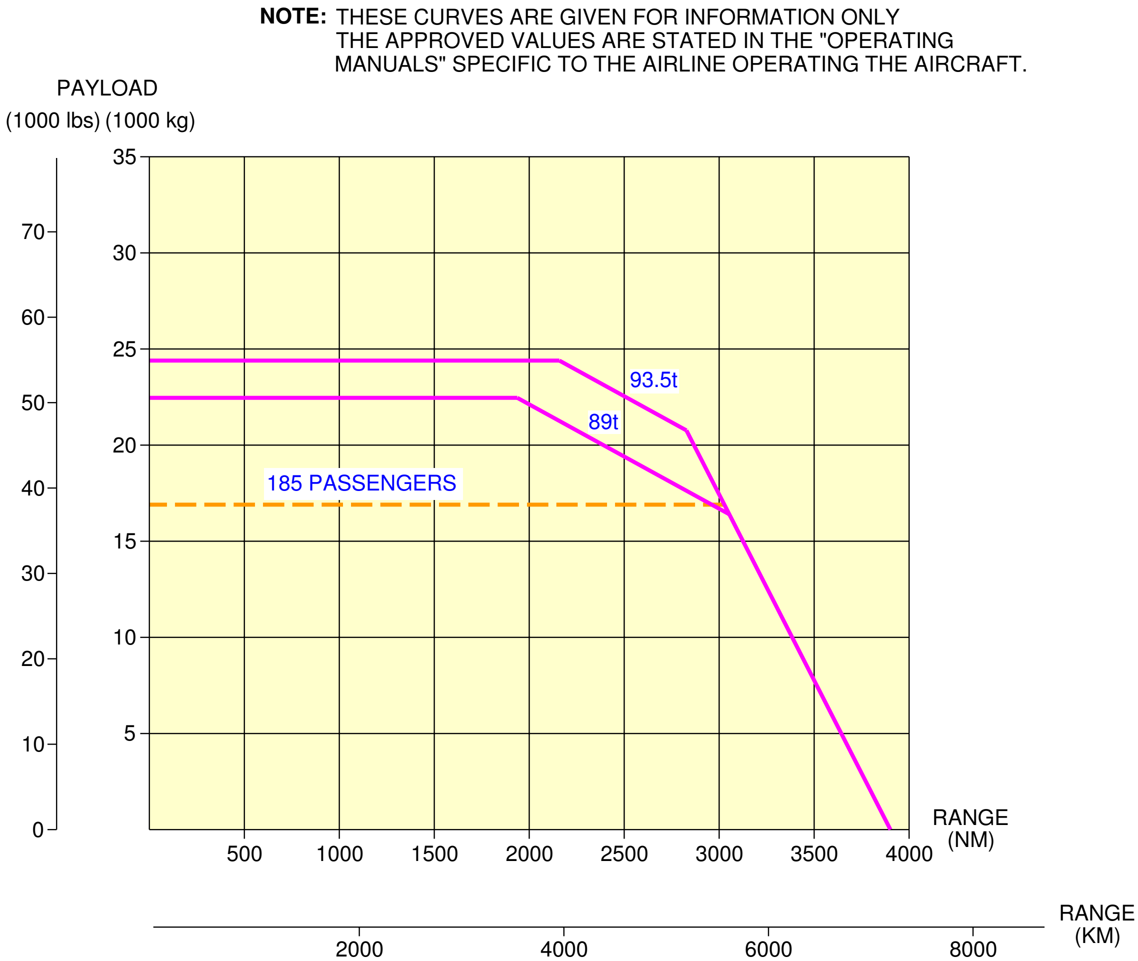
3-2-1 ISA Conditions

****ON A/C A321-100 A321-200**

ISA Conditions

1. This section gives the payload / range at ISA conditions.

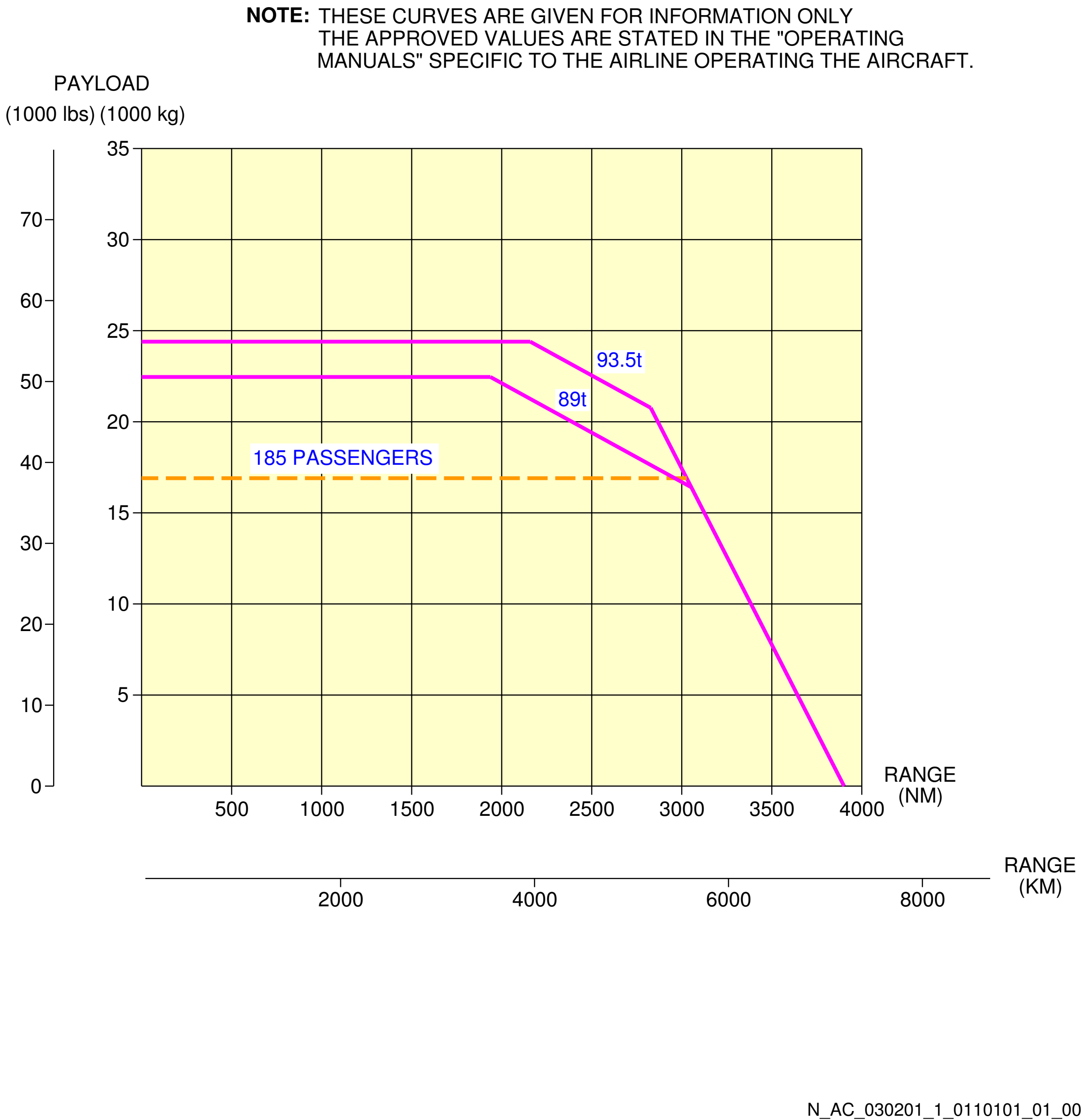
**ON A/C A321-100 A321-200



N_AC_030201_1_0100101_01_00

Payload / Range
CFM56-5B series engine
FIGURE 1

**ON A/C A321-100 A321-200



Payload / Range
IAE V2500-A5 series engine
FIGURE 2

3-3-0 FAR / JAR Takeoff Weight Limitation

****ON A/C A321-100 A321-200**

FAR / JAR Take-off Weight Limitation

1. FAR / JAR Take-off Weight Limitation

3-3-1 ISA Conditions

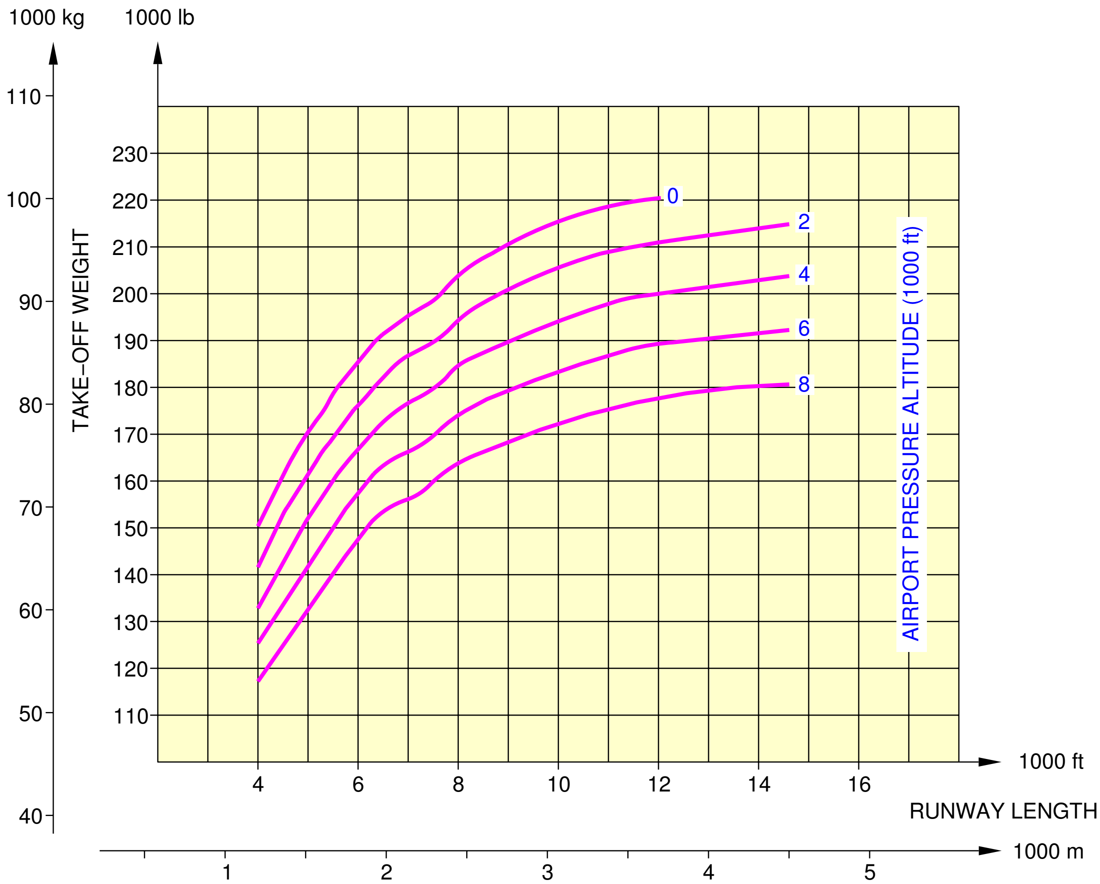
****ON A/C A321-100 A321-200**

ISA Conditions

1. This section gives the take-off weight limitation at ISA conditions.

**ON A/C A321-100 A321-200

NOTE: THESE CURVES ARE GIVEN FOR INFORMATION ONLY THE APPROVED VALUES ARE STATED IN THE "OPERATING MANUALS" SPECIFIC TO THE AIRLINE OPERATING THE AIRCRAFT.

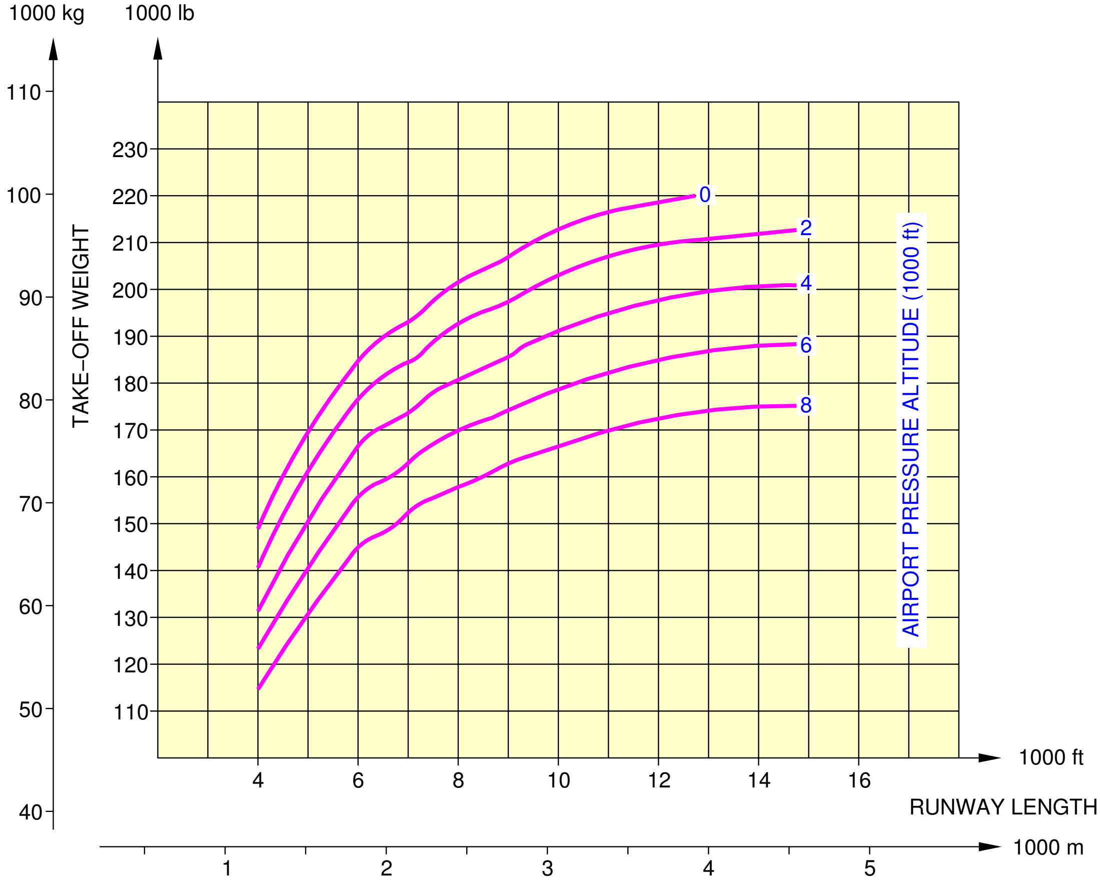


N_AC_030301_1_0070101_01_00

FAR / JAR Take-off Weight Limitation
ISA Conditions – CFM56 series engine
FIGURE 1

**ON A/C A321-100 A321-200

NOTE: THESE CURVES ARE GIVEN FOR INFORMATION ONLY
THE APPROVED VALUES ARE STATED IN THE "OPERATING MANUALS" SPECIFIC TO THE AIRLINE OPERATING THE AIRCRAFT.



N_AC_030301_1_0080101_01_00

FAR / JAR Take-off Weight Limitation
ISA Conditions – IAE V2500 series engine
FIGURE 2

3-3-2 ISA +15 °C (+59 °F) Conditions

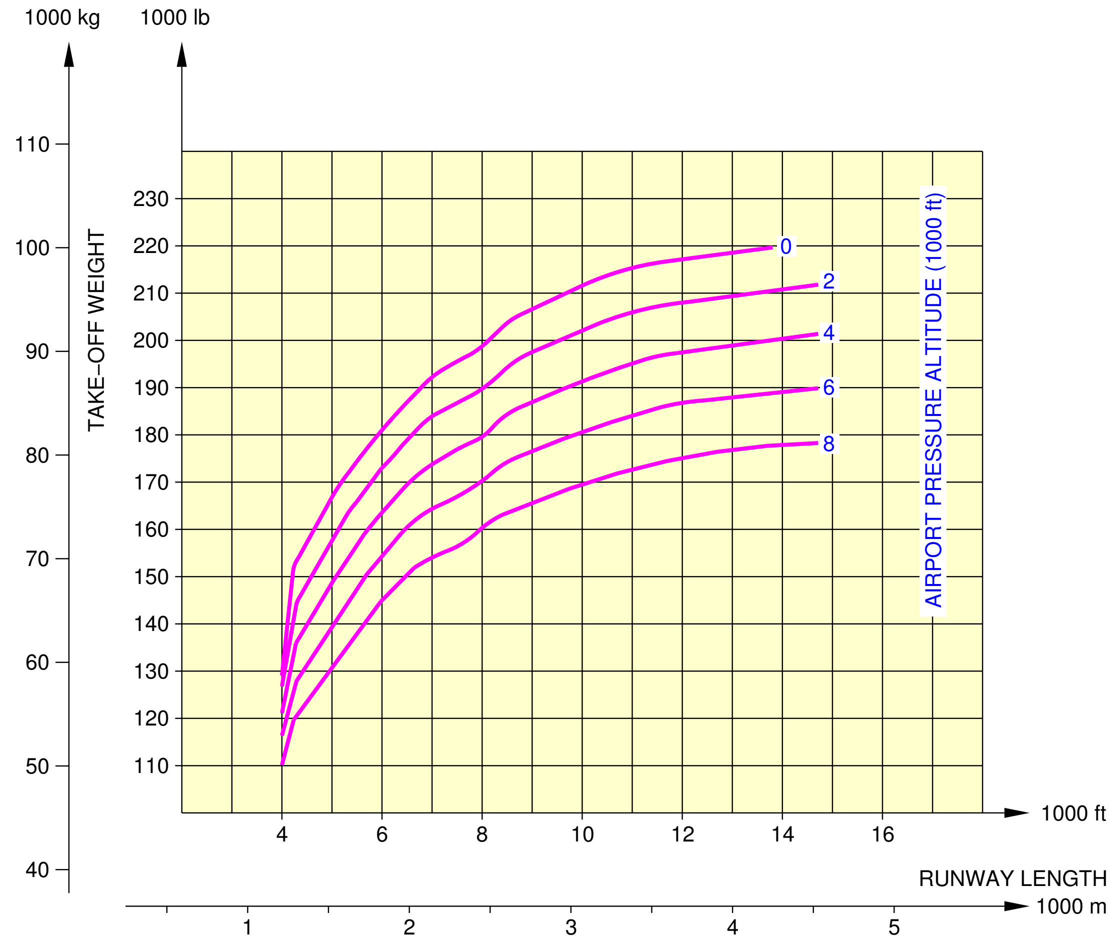
****ON A/C A321-100 A321-200**

ISA +15 °C (+59 °F) Conditions

1. This section gives the take-off weight limitation at ISA +15 °C (+59 °F) conditions.

**ON A/C A321-100 A321-200

NOTE: THESE CURVES ARE GIVEN FOR INFORMATION ONLY
THE APPROVED VALUES ARE STATED IN THE "OPERATING MANUALS" SPECIFIC TO THE AIRLINE OPERATING THE AIRCRAFT.

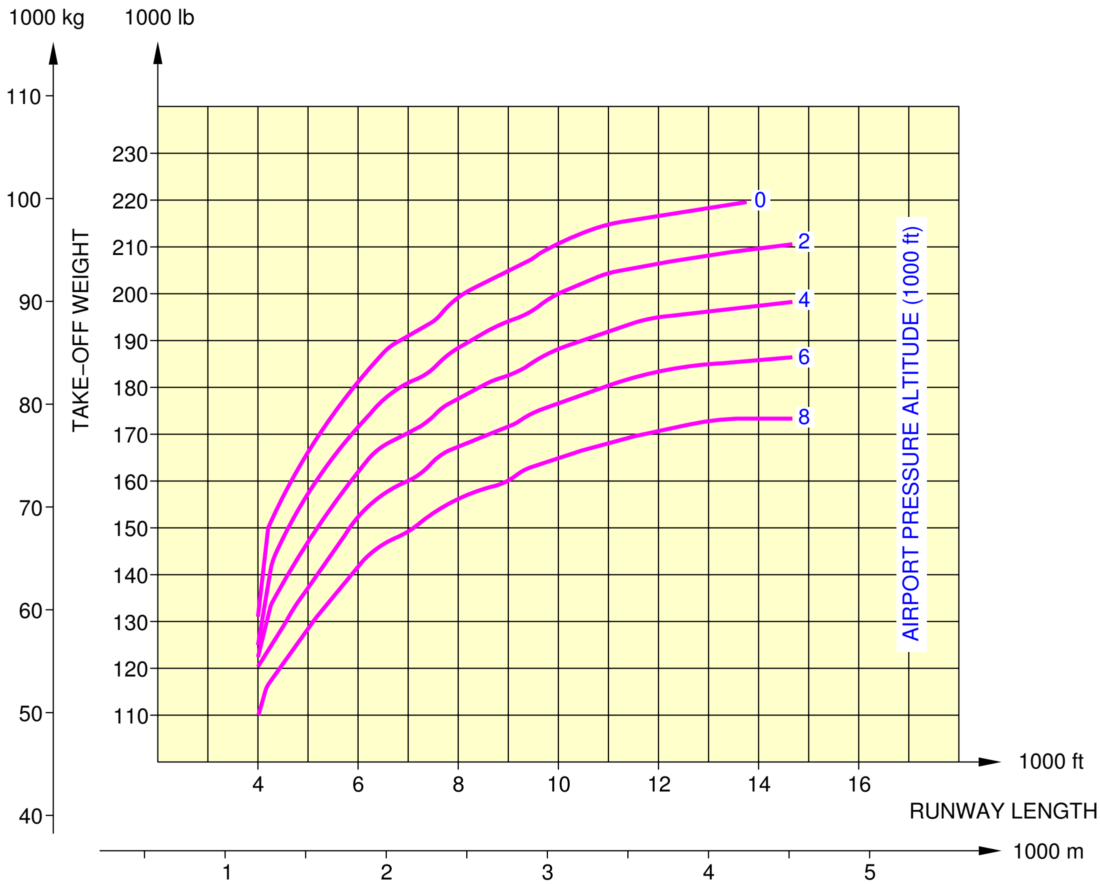


N_AC_030302_1_0070101_01_00

FAR / JAR Take-off Weight Limitation
ISA +15°C (+59°F) Conditions – CFM56 series engine
FIGURE 1

**ON A/C A321-100 A321-200

NOTE: THESE CURVES ARE GIVEN FOR INFORMATION ONLY
THE APPROVED VALUES ARE STATED IN THE "OPERATING MANUALS" SPECIFIC TO THE AIRLINE OPERATING THE AIRCRAFT.



N_AC_030302_1_0080101_01_00

FAR / JAR Take-off Weight Limitation
ISA +15°C (+59°F) Conditions – IAE V2500 series engine
FIGURE 2

3-4-0 FAR / JAR Landing Field Length

**ON A/C A321-100 A321-200

FAR / JAR Landing Field Length

1. FAR / JAR Landing Field Length

3-4-1 ISA Conditions

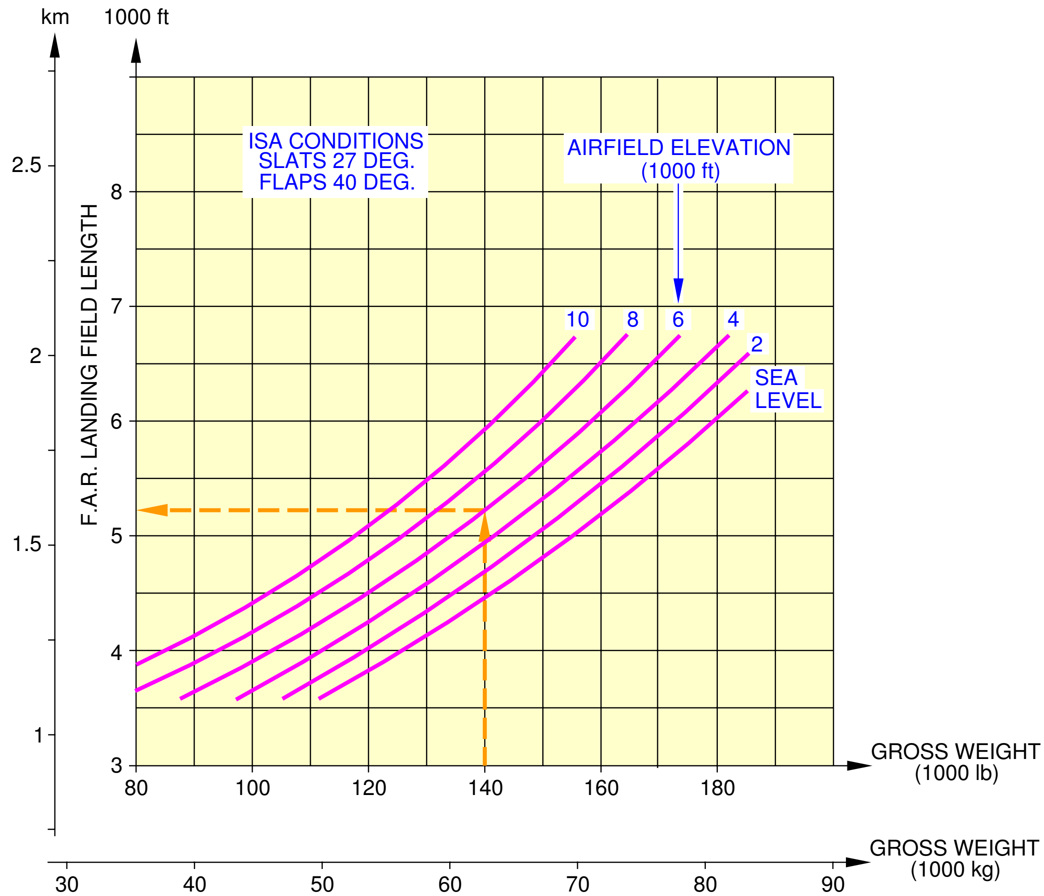
****ON A/C A321-100 A321-200**

ISA Conditions

1. This section gives the landing field length.

**ON A/C A321-100 A321-200

NOTE: THESE CURVES ARE GIVEN FOR INFORMATION ONLY
THE APPROVED VALUES ARE STATED IN THE "OPERATING MANUALS" SPECIFIC TO THE AIRLINE OPERATING THE AIRCRAFT.

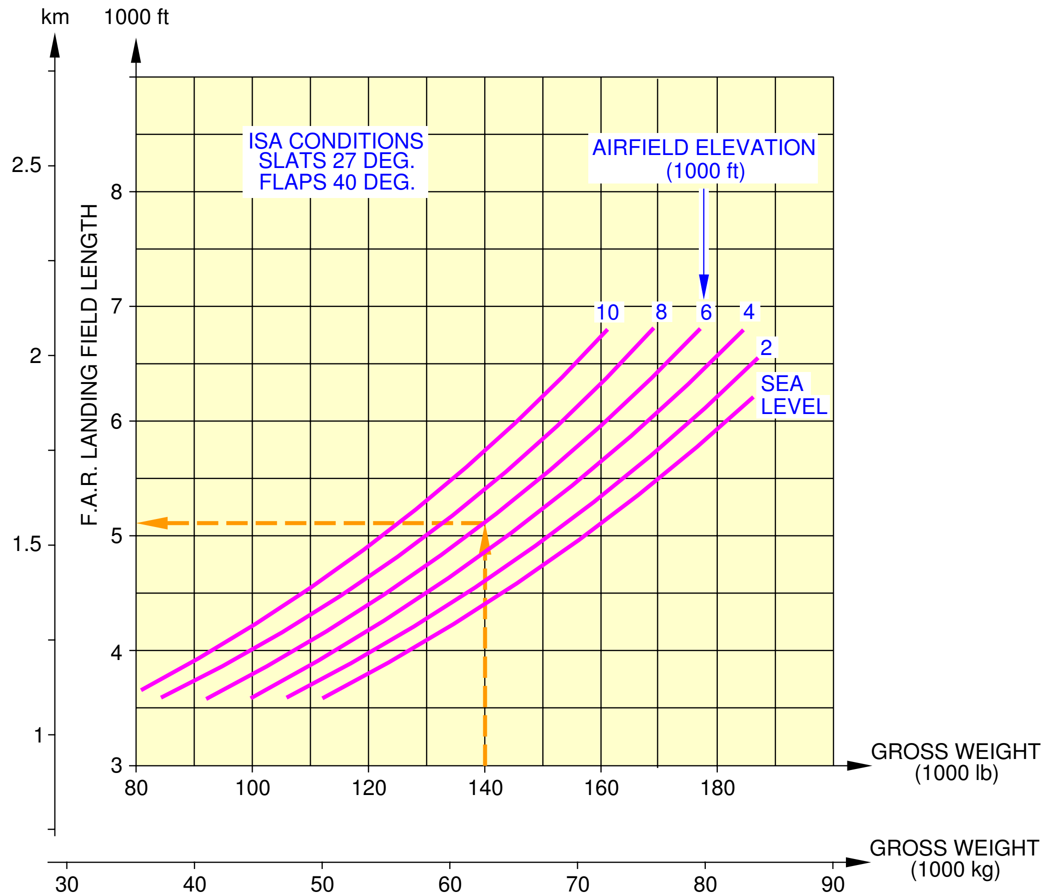


N_AC_030401_1_0070101_01_00

FAR / JAR Landing Field Length
CFM56 series engine
FIGURE 1

**ON A/C A321-100 A321-200

NOTE: THESE CURVES ARE GIVEN FOR INFORMATION ONLY
THE APPROVED VALUES ARE STATED IN THE "OPERATING MANUALS" SPECIFIC TO THE AIRLINE OPERATING THE AIRCRAFT.



N_AC_030401_1_0080101_01_00

FAR / JAR Landing Field Length
IAE V2500 series engine
FIGURE 2

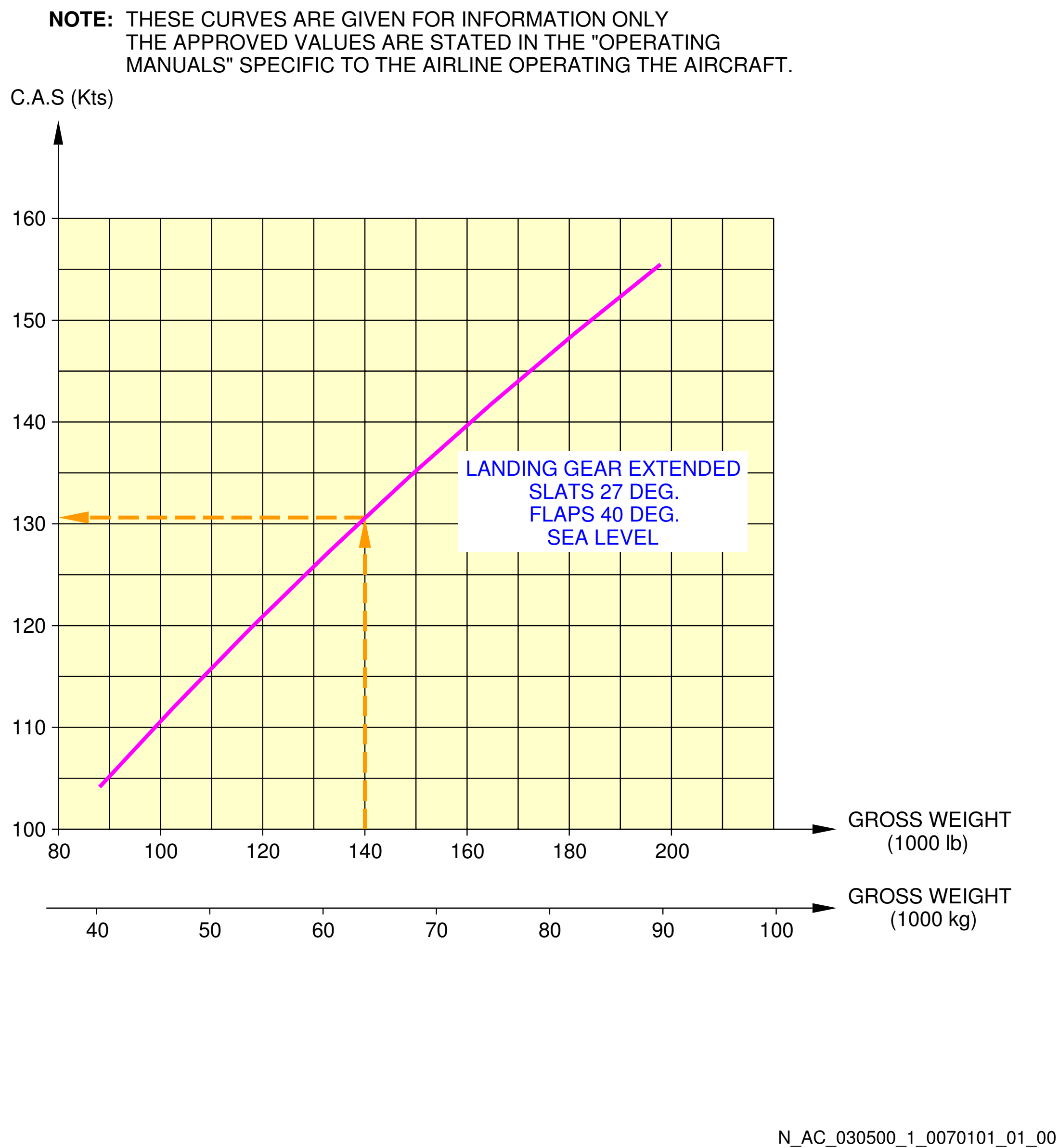
3-5-0 Final Approach Speed

****ON A/C A321-100 A321-200**

Final Approach Speed

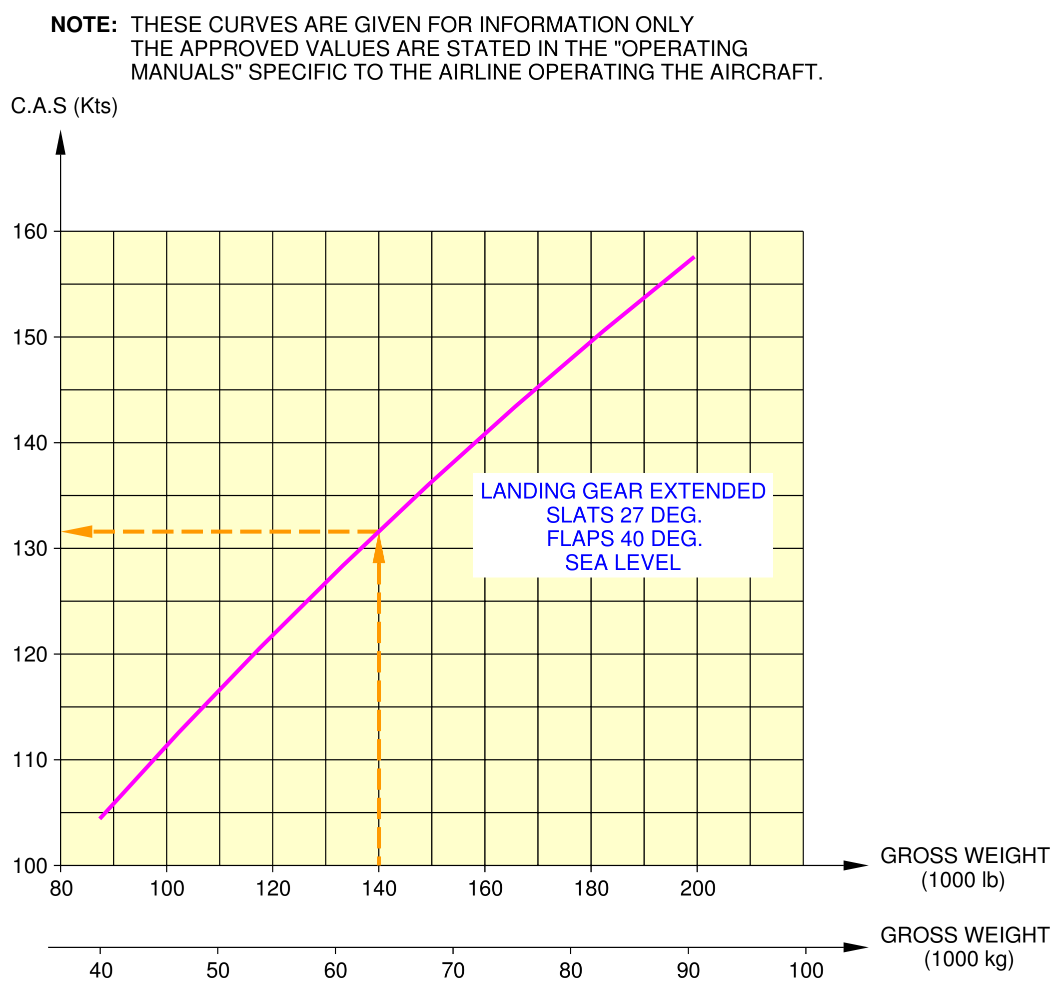
1. This section gives the final approach speed.

**ON A/C A321-100 A321-200



Final Approach Speed
CFM56 series engine
FIGURE 1

**ON A/C A321-100 A321-200



N_AC_030500_1_0080101_01_00

Final Approach Speed
IAE V2500 series engine
FIGURE 2

GROUND MANEUVERING

4-1-0 General Information

****ON A/C A321-100 A321-200**

General Information

1. This section provides airplane turning capability and maneuvering characteristics.

   For ease of presentation, this data has been determined from the theoretical limits imposed by the geometry of the aircraft, and where noted, provides for a normal allowance for tire slippage. As such, it reflects the turning capability of the aircraft in favorable operating circumstances. This data should only be used as guidelines for the method of determination of such parameters and for the maneuvering characteristics of this aircraft type.

   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 techniques 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.

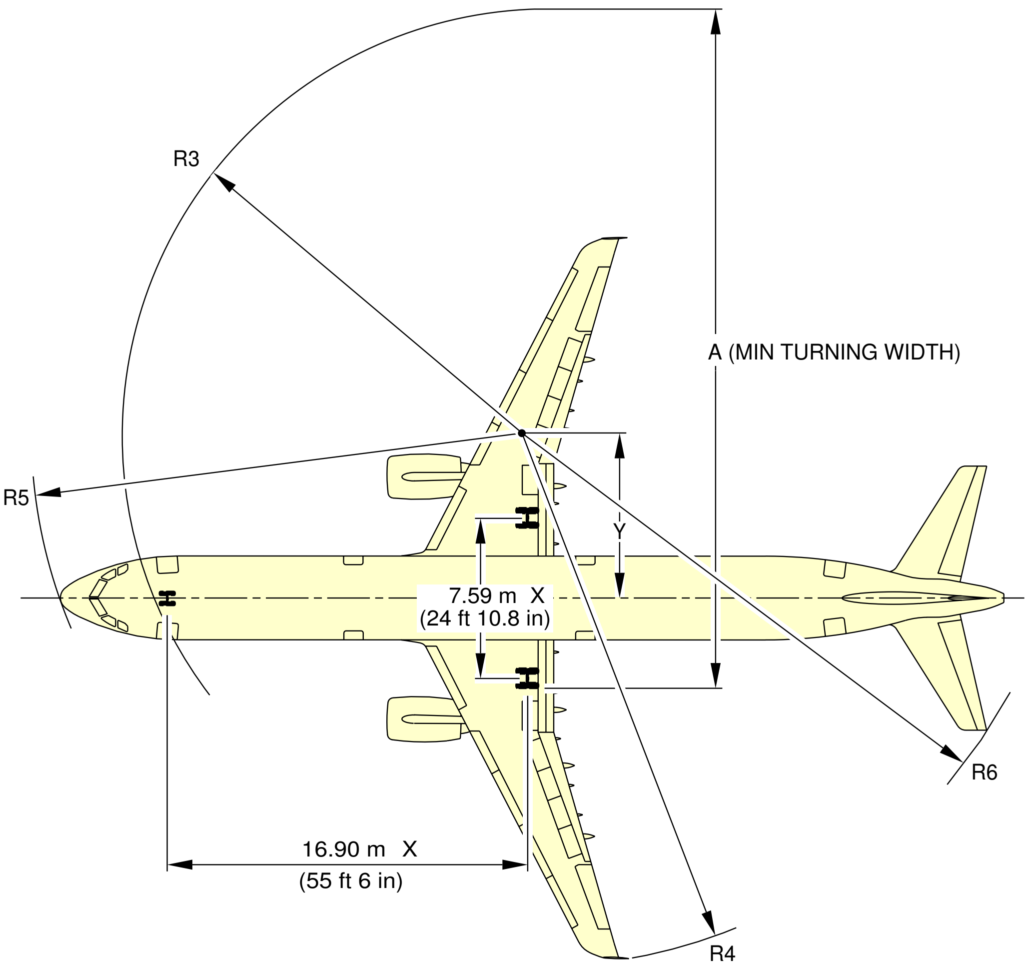
4-2-0 Turning Radii

****ON A/C A321-100 A321-200**

Turning Radii

1. This section gives the turning radii.

**ON A/C A321-100 A321-200



NOTE: FOR STEERING DIMENSION TABLE SEE SHEET 2.
APPLICABLE FOR A321−100 AND A321−200.

TURN TYPE

1. ASYMMETRIC THRUST DIFFERENTIAL BRAKING (PIVOTTING ON ONE MAIN GEAR).
2. SYMMETRIC THRUST NO BRAKING

N_AC_040200_1_0070101_01_01

Turning Radii, no Slip Angle
FIGURE 1

**ON A/C A321-100 A321-200

	A321–100 MAXIMUM RAMP WEIGHT CG 30%		A321–200 MAXIMUM RAMP WEIGHT CG 28%		Y		R3		R4		R5		R6		A	
TURN TYPE	STEERING ANGLE (°)	EFFECTIVE STEERING ANGLE WITH SLIP ON NLG TYRES (°)	STEERING ANGLE (°)	EFFECTIVE STEERING ANGLE WITH SLIP ON NLG TYRES (°)	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft
1	75.00	77.35	75.00	77.35	3.795	12.451	17.694	58.052	21.402	70.216	22.304	73.177	23.913	78.455	25.986	85.256
2	75.00	73.30			5.072	16.640	18.018	59.114	22.647	74.301	22.557	74.004	24.475	80.300	27.586	90.506
2			75.00	73.36	5.053	16.578	18.013	59.096	22.629	74.241	22.552	73.991	24.467	80.272	27.562	90.428
2	71.16	70	71.12	70	6.153	20.188	18.359	60.231	23.705	77.771	22.824	74.882	24.993	81.998	29.009	95.172
2	65.53	65	65.53	65	7.883	25.864	19.021	62.406	25.401	83.335	23.350	76.608	25.894	84.953	31.401	103.023
2	60.44	60	60.44	60	9.761	32.023	19.889	65.252	27.246	89.389	24.049	78.900	26.962	88.460	34.146	112.029
2	55.38	55	55.37	55	11.838	38.838	21.006	68.917	29.292	96.102	24.964	81.903	28.243	92.662	37.340	122.508
2	50.31	50	50.31	50	14.186	46.541	22.437	73.611	31.610	103.707	26.159	85.825	29.800	97.769	41.119	134.906
2	45.25	45	45.25	45	16.906	55.466	24.276	79.646	34.301	112.535	27.729	90.974	31.725	104.085	45.679	149.865
2	40.21	40	40.20	40	20.148	66.102	26.669	87.495	37.513	123.073	29.816	97.822	34.161	112.076	51.313	168.350
2	35.17	35	35.17	35	24.144	79.213	29.842	97.908	41.479	136.085	32.65	107.119	37.333	122.482	58.483	191.874
2	30.13	30	30.13	30	29.282	96.070	34.180	112.138	46.585	152.838	36.613	120.122	41.620	136.547	67.958	222.960
2	25.10	25	25.10	25	36.255	118.947	40.371	132.449	53.525	175.608	42.397	139.098	47.707	156.520	81.122	266.149
2	20.08	20	20.08	20	46.449	152.391	49.797	163.377	63.684	208.936	51.387	168.591	56.973	186.921	100.743	330.521
2	15.06	15	15.06	15	63.094	207.001	65.687	215.510	80.291	263.421	66.813	219.202	72.640	238.320	133.278	437.264

TURN TYPES:
1. ASSYMETRIC THRUST DIFFERENTIAL BRAKING (PIVOTTING ON ONE MAIN GEAR)
2. SYMMETRIC THRUST NO BRAKING.

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Turning Radii, no Slip Angle
FIGURE 2

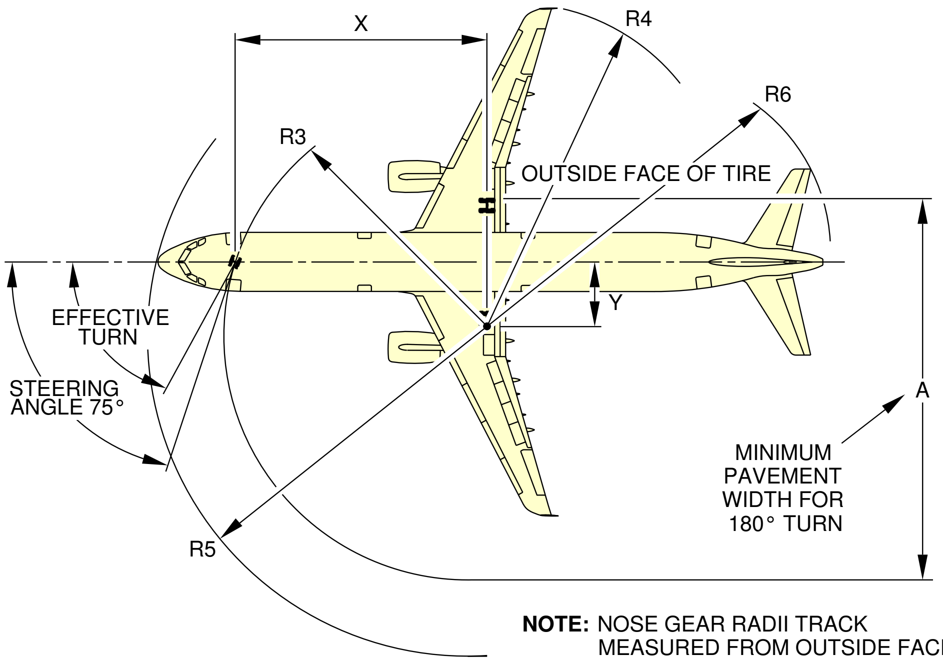
4-3-0 Minimum Turning Radii

****ON A/C A321-100 A321-200**

Minimum Turning Radii

1. This section gives the minimum turning radii.

**ON A/C A321-100 A321-200



NOTE: NOSE GEAR RADII TRACK MEASURED FROM OUTSIDE FACE OF TIRE. THEORETICAL CENTER OF TURN FOR MINIMUM TURNING RADIUS. SLOW CONTINUOUS TURNING, APPROXIMATELY IDLE THRUST ON ALL ENGINES. NO DIFFERENTIAL BRAKING.

EFFECTIVE TURN ANGLE		X	Y	A	R3	R4	R5	R6
73° EFF. 75° STEERED	m	16.91	5.1	27.6	18.0	22.7	22.6	24.5
	(ft)	55.4	16.6	90.5	59.1	74.3	74.0	80.3

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Minimum Turning Radii
FIGURE 1

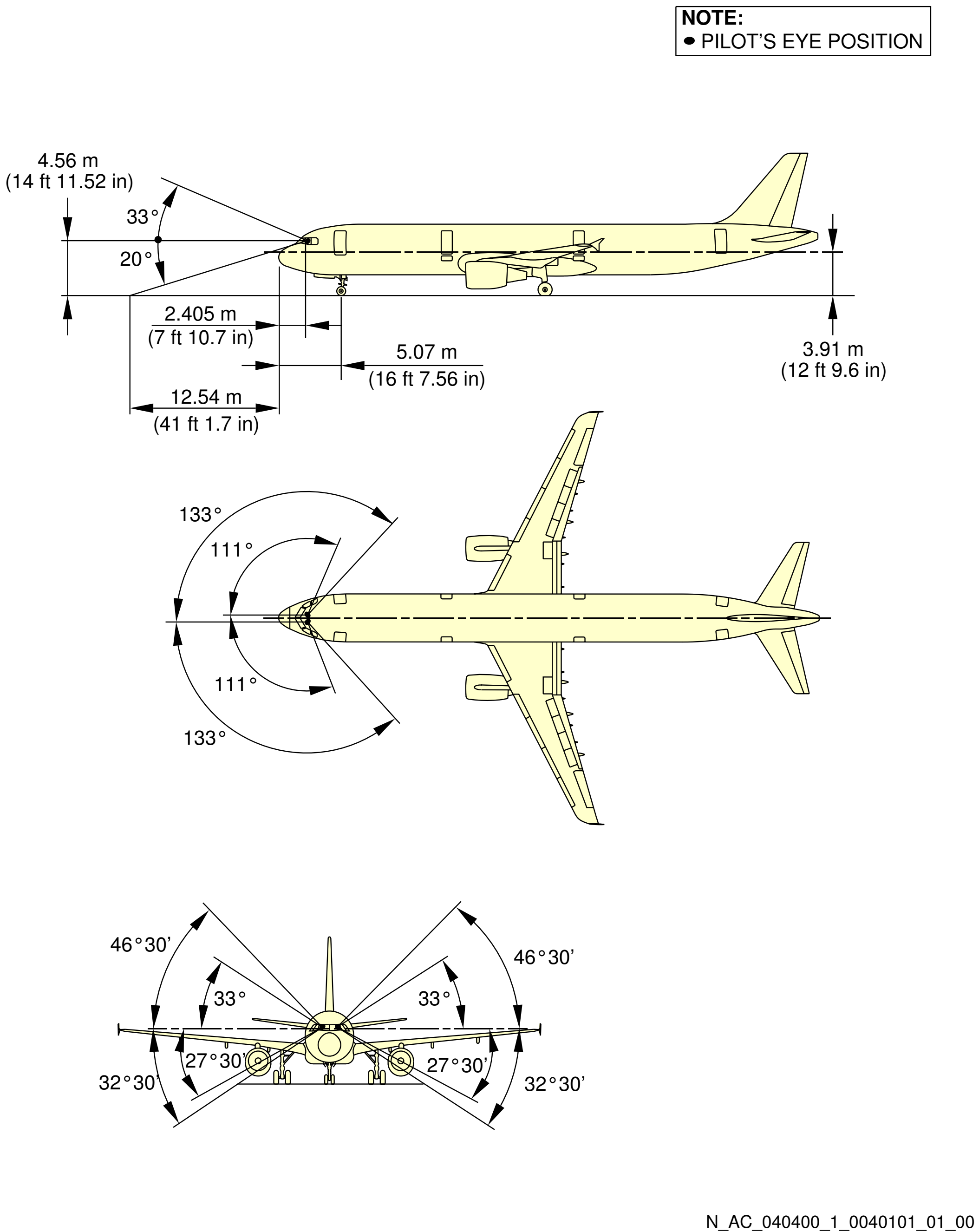
4-4-0 Visibility from Cockpit in Static Position

****ON A/C A321-100 A321-200**

Visibility from Cockpit in Static Position

1. This section gives the visibility from cockpit in static position.

**ON A/C A321-100 A321-200



Visibility from Cockpit in Static Position
FIGURE 1

4-5-0 Runway and Taxiway Turn Paths

****ON A/C A321-100 A321-200**

Runway and Taxiway Turn Paths

1. Runway and Taxiway Turn Paths.

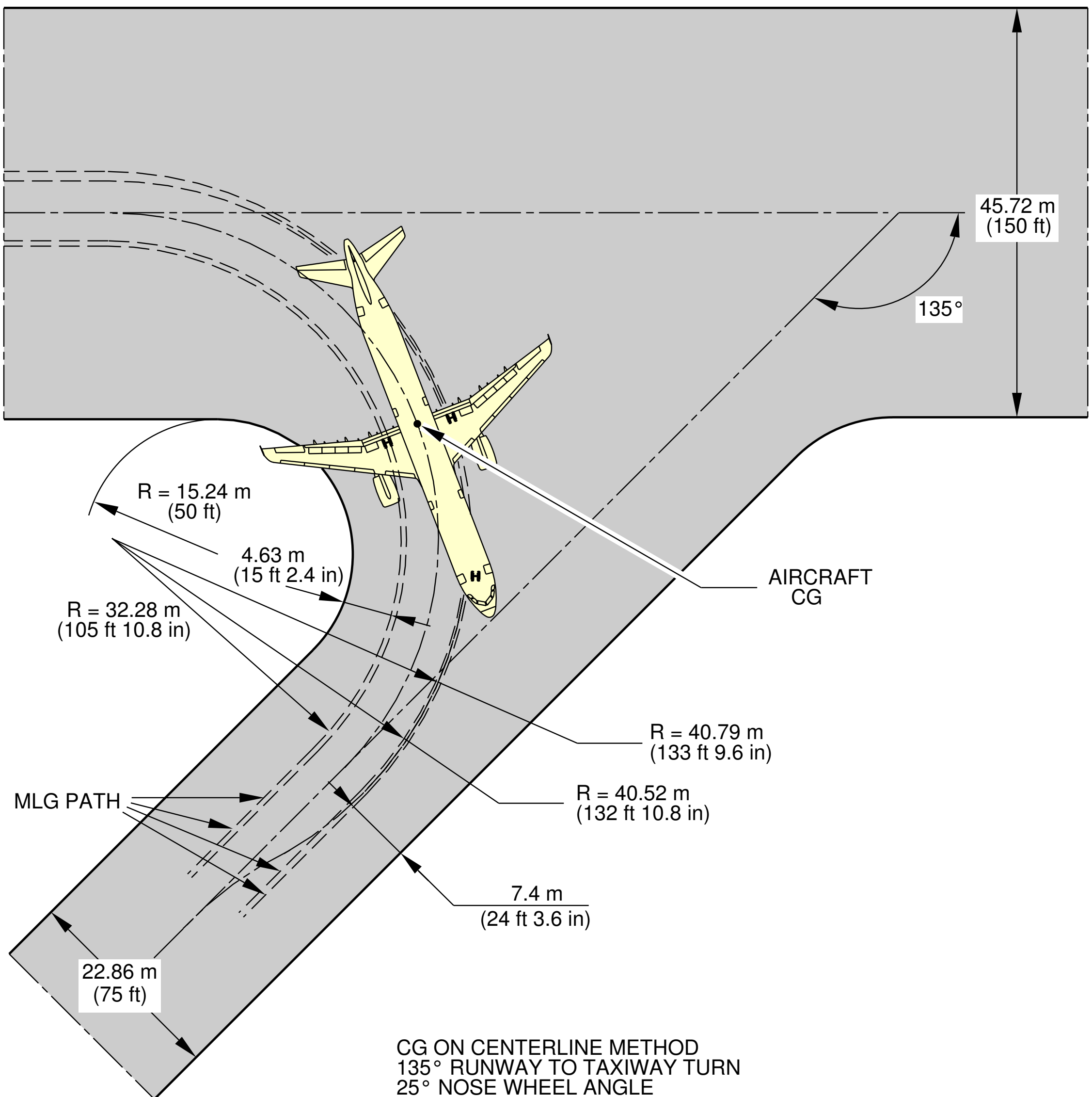
4-5-1 135° Turn - Runway to Taxiway

**ON A/C A321-100 A321-200

135° Turn - Runway to Taxiway

1. This section gives the 135° turn - runway to taxiway.

**ON A/C A321-100 A321-200



NOTE: APPLICABLE FOR A321–100 AND A321–200.

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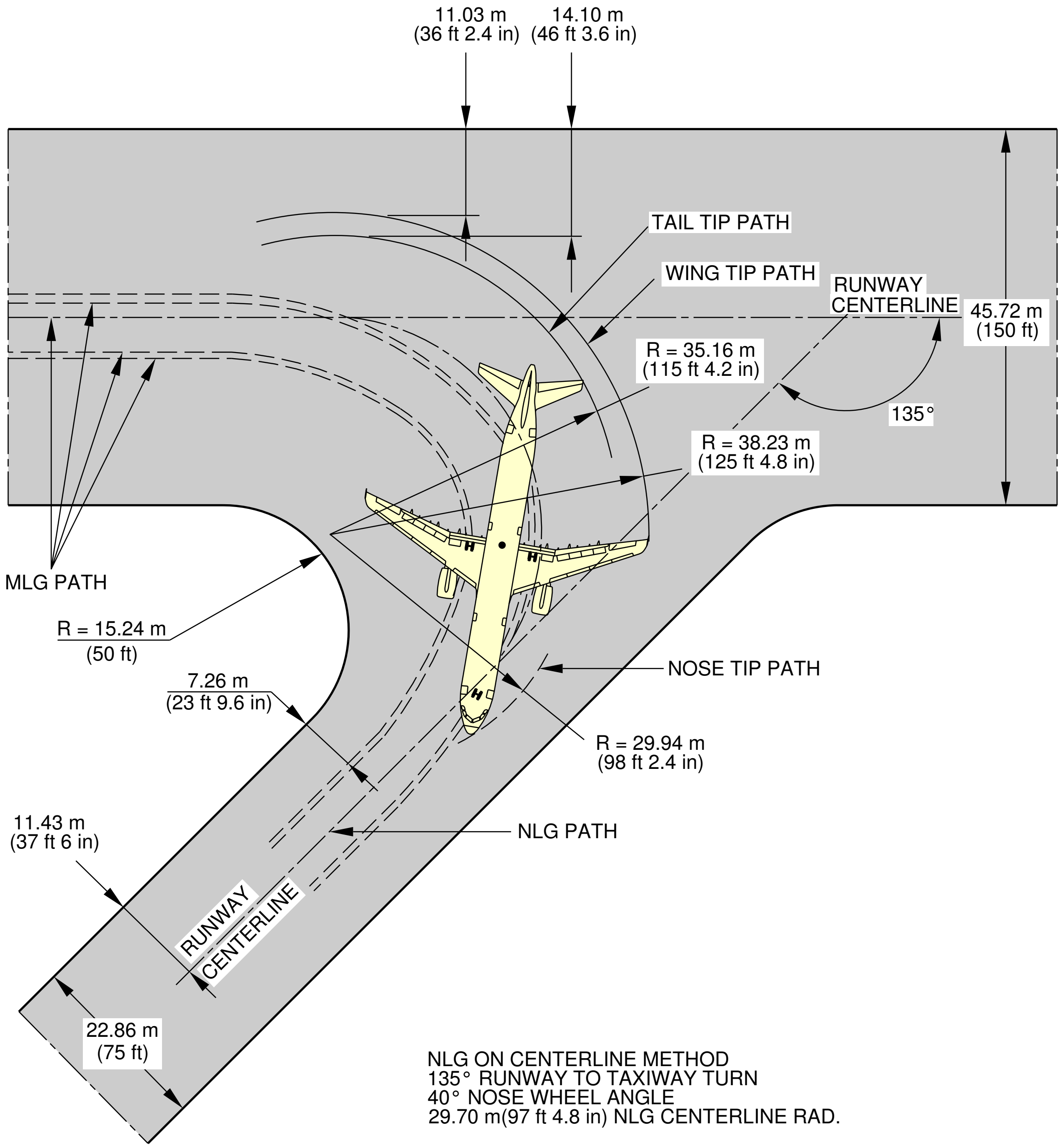
135° Turn - Runway to Taxiway
CG on Centerline Method
FIGURE 1

**ON A/C A321-100 A321-200



NOTE: APPLICABLE FOR A321–100 AND A321–200.

N_AC_040501_1_0070101_01_01

135° Turn - Runway to Taxiway
NLG on Centerline Method
FIGURE 2

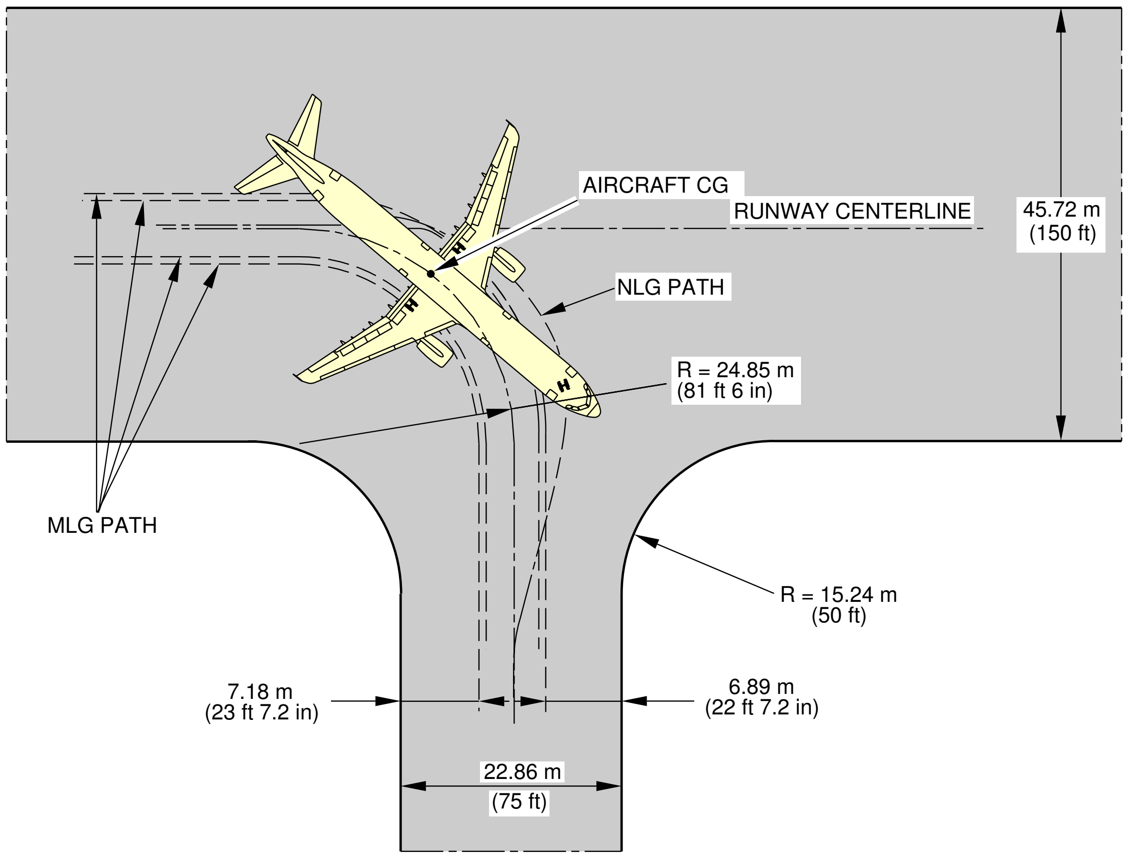
4-5-2 90° Turn - Runway to Taxiway

****ON A/C A321-100 A321-200**

<u>90° Turn - Runway to Taxiway</u>

1. This section gives the 90° turn - runway to taxiway.

**ON A/C A321-100 A321-200



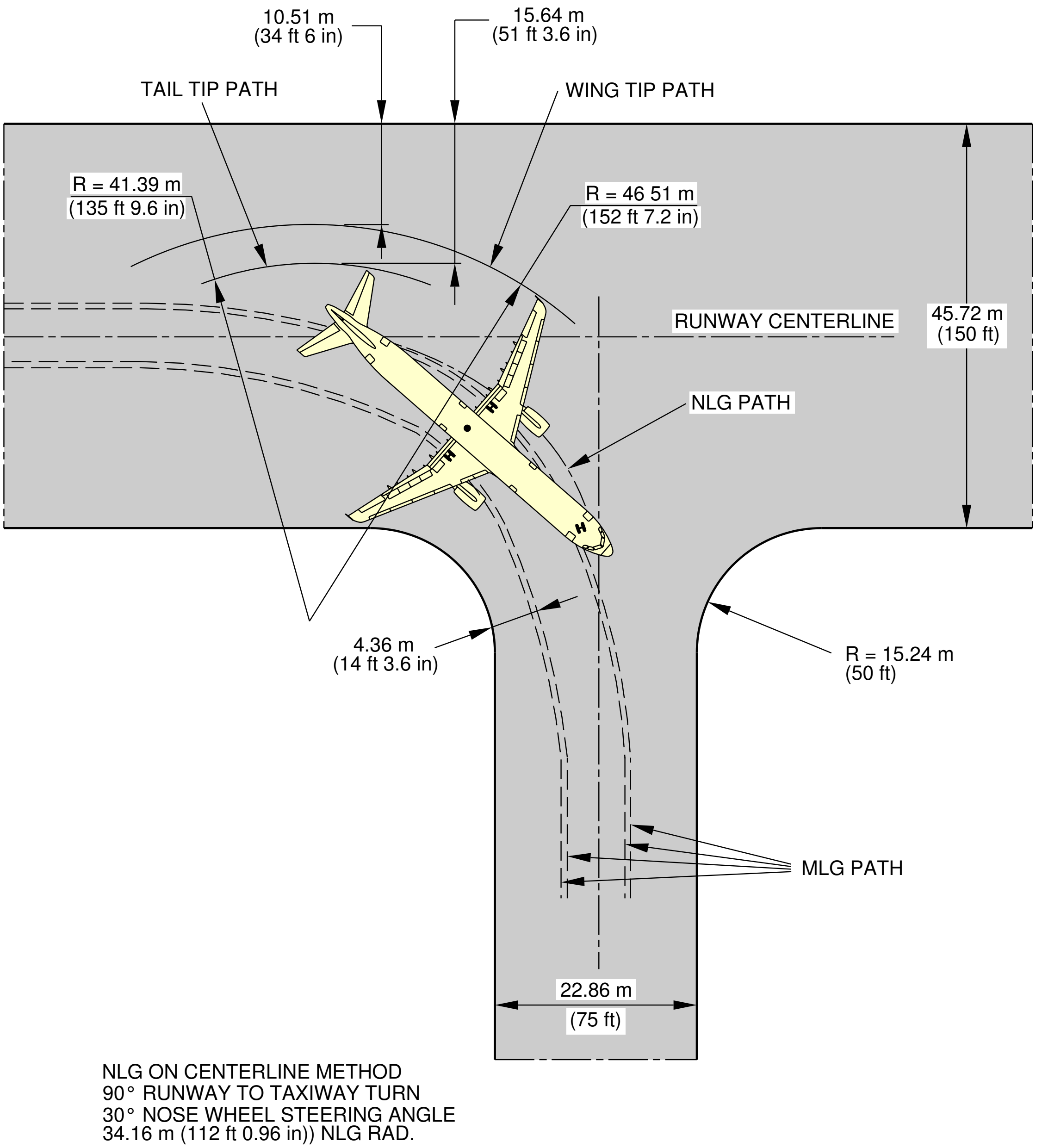
CG ON CENTERLINE METHOD
90° TURN ON A 150 ft RUNWAY
35° NOSE WHEEL ANGLE

NOTE: APPLICABLE FOR A321–100 AND A321–200.

N_AC_040502_1_0060101_01_01

90° Turn - Runway to Taxiway
CG on Centerline Method
FIGURE 1

**ON A/C A321-100 A321-200



NOTE: APPLICABLE FOR A321−100 AND A321−200.

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90° Turn - Runway to Taxiway
NLG on Centerline Method
FIGURE 2

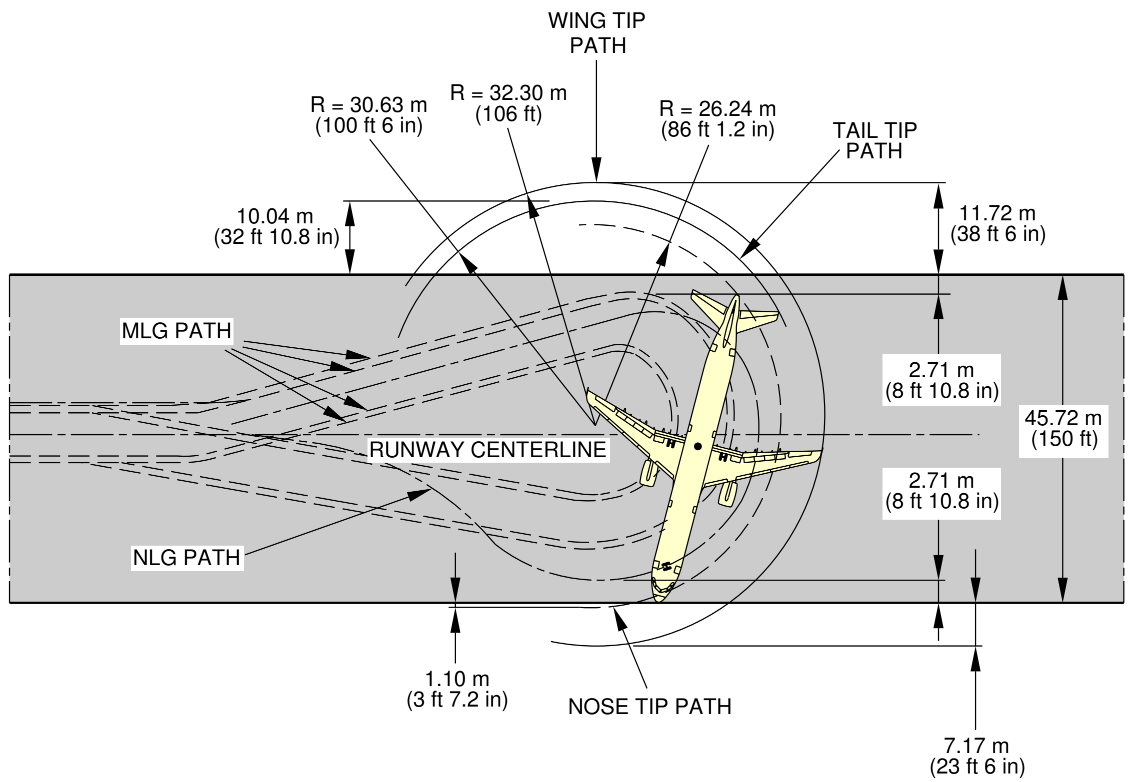
4-5-3 180° Turn on a Runway

**ON A/C A321-100 A321-200

180° Turn on a Runway

1. This section gives the 180° turn on a runway.

**ON A/C A321-100 A321-200



NLG ON CENTERLINE METHOD
180° TURN ON A 150 ft RUNWAY
50° NOSE WHEEL ANGLE
22.43 m (73.58 ft) NLG CENTERLINE RAD.

NOTE: APPLICABLE FOR A321−100 AND A321−200.

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180° Turn on a 150 ft Runway
NLG on Centerline Method
FIGURE 1

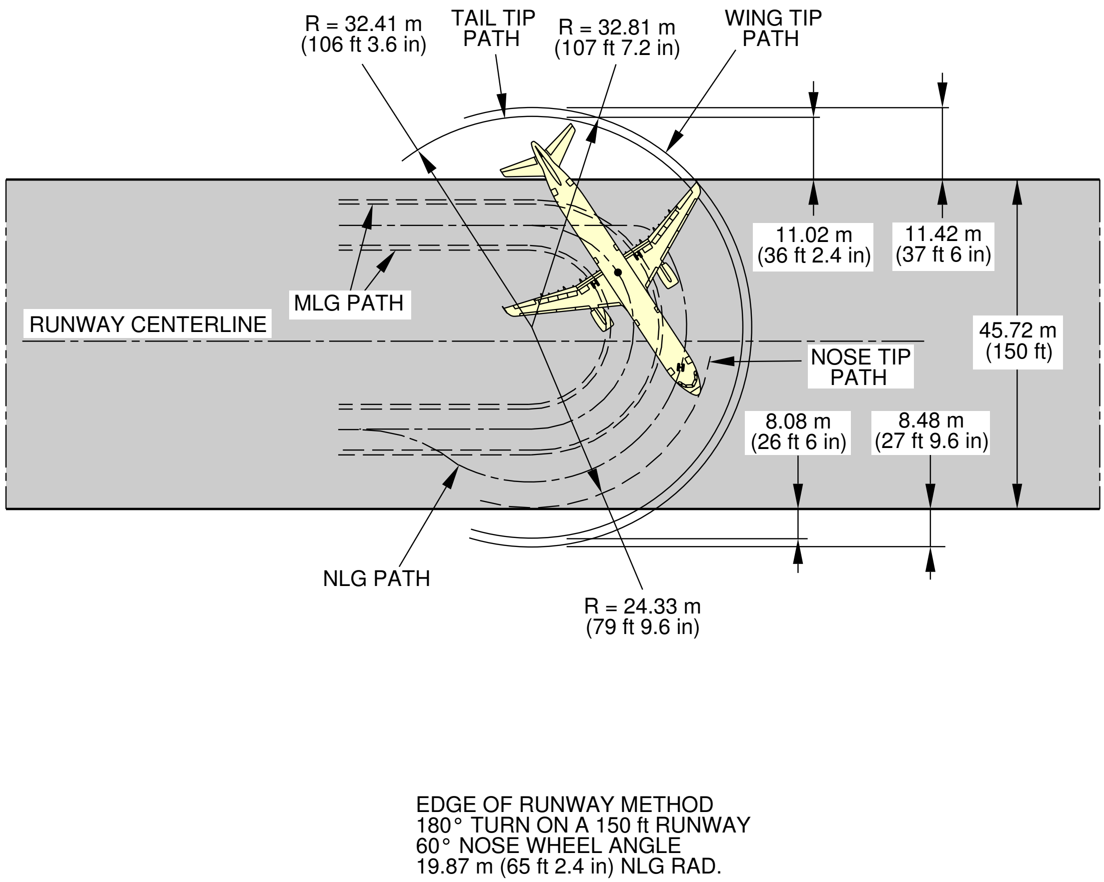
4-5-6 180° Turn on a Wide Runway

****ON A/C A321-100 A321-200**

<u>180° Turn on a Wide Runway</u>

1. This section gives the 180° turn on a wide runway.

**ON A/C A321-100 A321-200



NOTE: APPLICABLE FOR A321−100 AND A321−200.

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180° Turn on a 150 ft Wide Runway
Edge of Runway Method
FIGURE 1

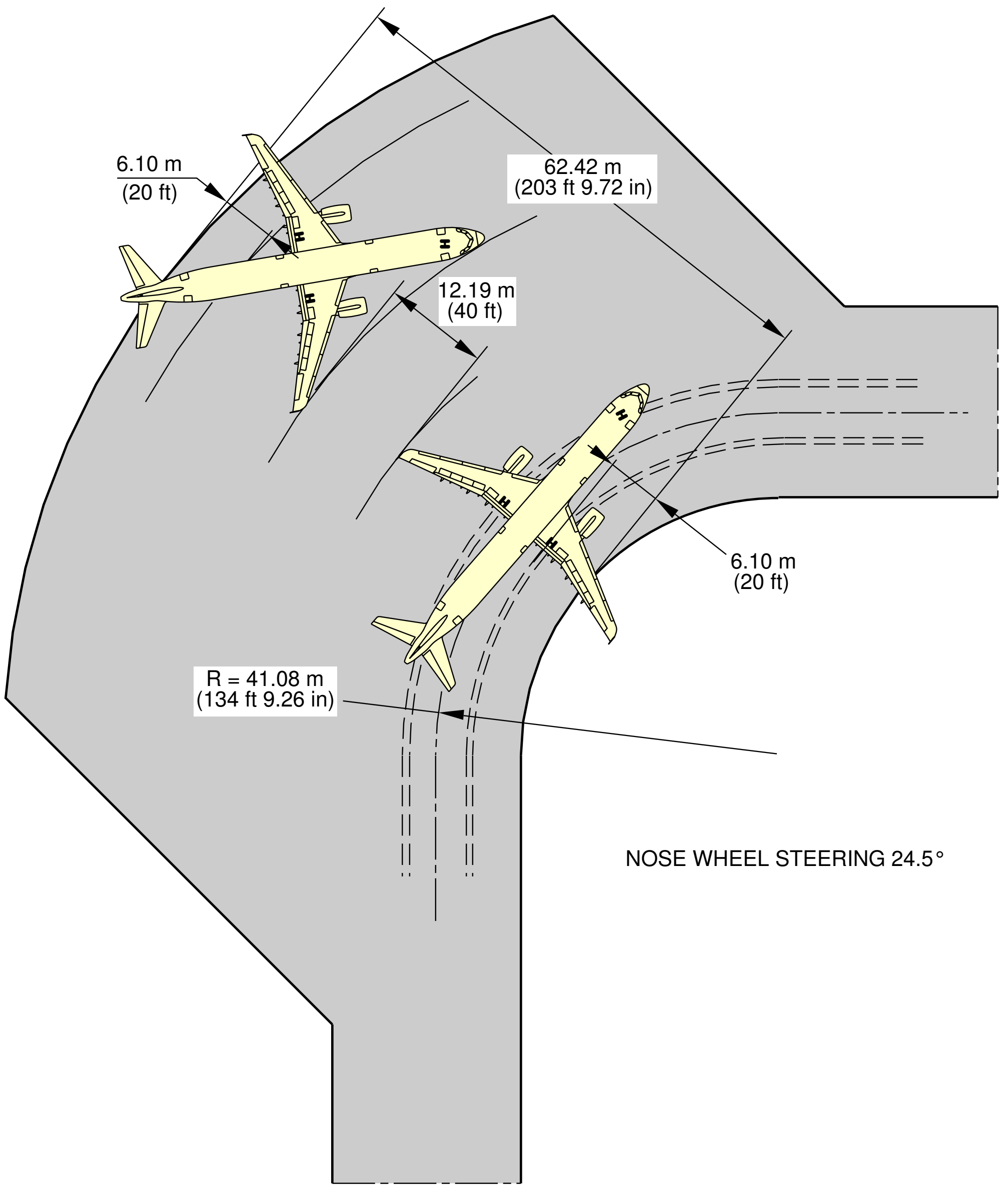
4-6-0 Runway Holding Bay (Apron)

****ON A/C A321-100 A321-200**

Runway Holding Bay (Apron)

1. This section gives the runway holding bay (Apron).

**ON A/C A321-100 A321-200



NOTE: APPLICABLE FOR A321−100 AND A321−200.

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Runway Holding Bay (Apron)
FIGURE 1

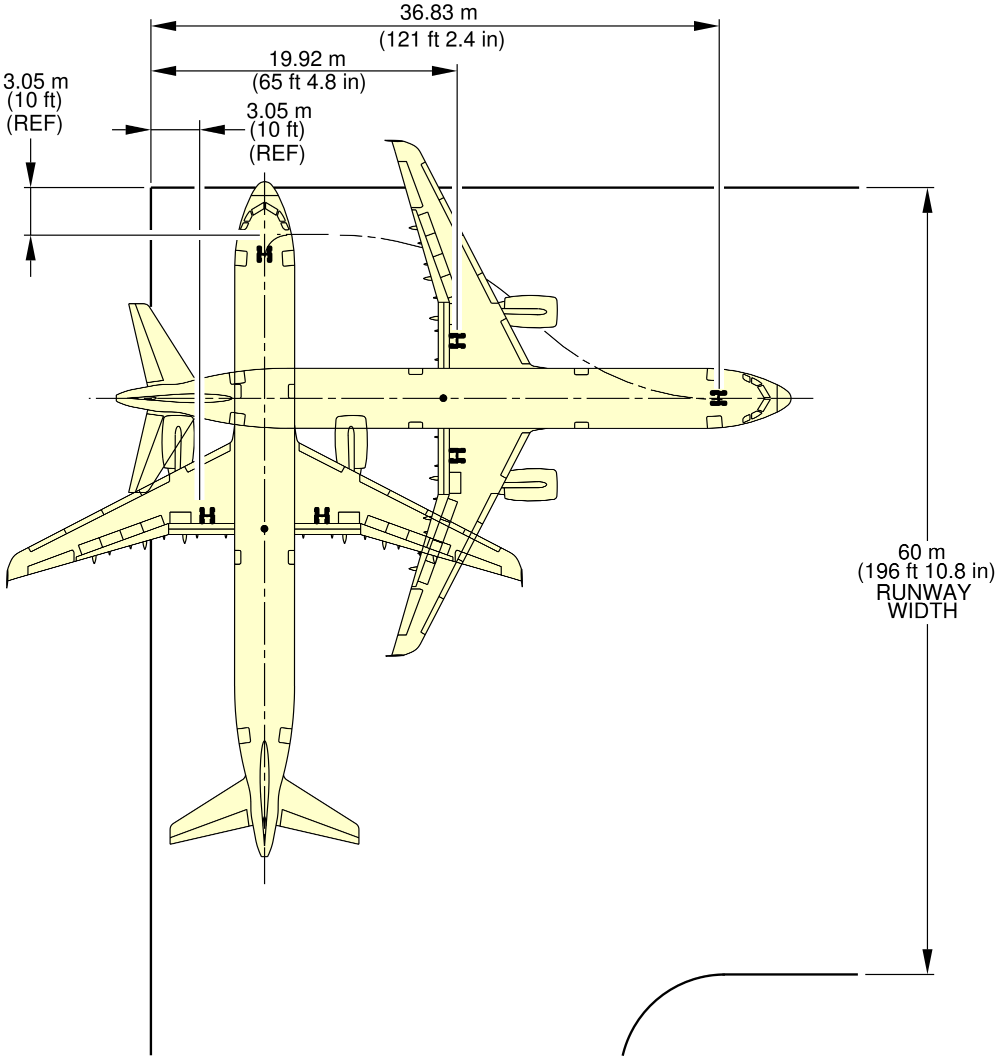
4-7-0 Airplane Parking

****ON A/C A321-100 A321-200**

Airplane Parking

1. The following figures and charts show the rectangular space required for parking against the terminal building.

**ON A/C A321-100 A321-200



LINEUP DISTANCES FOR A321−100 AND A321−200
USING 75° STEERING AND NO SLIP ON NOSE TIRES

AIRPLANE MODEL	MAX. EFF. STEERING ANGLE DEGREES	MIN LINEUP DISTANCE	
90°		TODA m (ft)	ASDA m (ft)
A321−100 AND A321−200	75°	19.9 (65.4)	36.8 (121.2)

ABREVIATIONS TODA (TAKEOFF DISTANCE ADJUSTMENT)
ASDA (ACCELERATE−STOP DISTANCE ADJUSTMENT)

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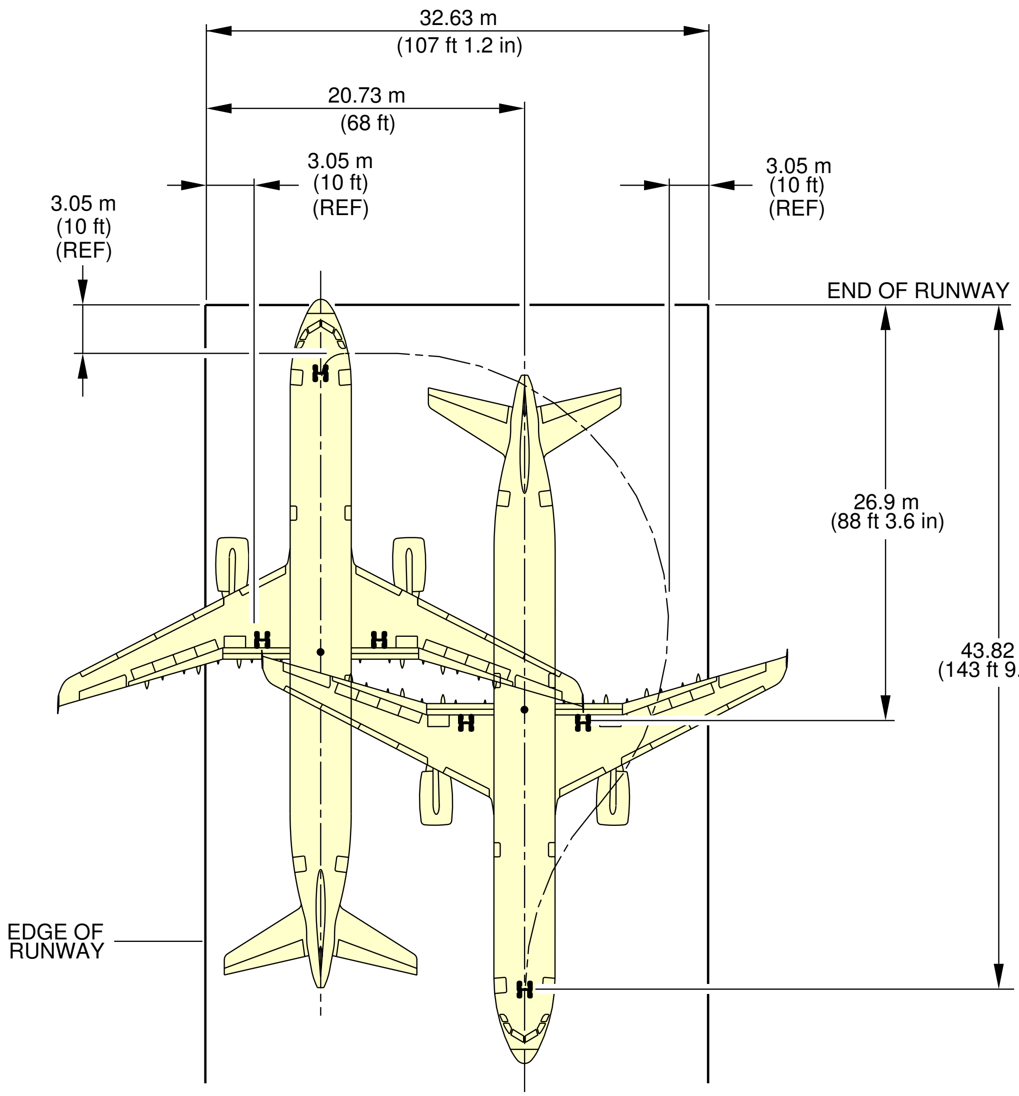
Runway Length Alterations
Line Up Distances – 90° Turn
FIGURE 1

**ON A/C A321-100 A321-200



LINEUP DISTANCES FOR A321−100 AND A321−200
USING 75° STEERING AND NO SLIP ON NOSE TIRES

AIRPLANE MODEL	MIN LINEUP DISTANCE		REQ'D MIN PAVEMENT WIDTH	NOMINAL LINEUP DISTANCE	
180°	TODA m (ft)	ASDA m (ft)	m (ft)	TODA m (ft)	ASDA m (ft)
A321−100 AND A321−200	26.9 (88.3)	43.8 (143.8)	32.6 (107.1)	AS MINIMUM	AS MINIMUM

ABREVIATIONS TODA (TAKEOFF DISTANCE ADJUSTMENT)
ASDA (ACCELERATE−STOP DISTANCE ADJUSTMENT)

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Runway Length Alterations
Line Up Distances – 180° Turn
FIGURE 2

TERMINAL SERVICING

5-0-0 TERMINAL SERVICING

****ON A/C A321-100 A321-200**

Terminal Servicing

1. General
   This chapter provides typical ramp layouts, corresponding minimum turnaround time estimations, locations of ground service points and service requirements.
   The information given in this chapter reflects ideal conditions. Actual ramp layouts and service requirements may vary according to local regulations, airline procedures and the airplane condition.
   - Section 5.1 shows typical ramp layouts for passenger aircraft at the gate or on an open apron.
   - Section 5.2 shows the minimum turnaround schedules for full servicing arrangements.
   - Section 5.3 shows the minimum turnaround schedule for reduced servicing arrangements.
   - Section 5.4 gives the locations of ground service connections, the standard of connections used and typical capacities and requirements.
   - Section 5.5 provides the engine starting pneumatic requirements for different engine types and different ambient temperatures.
   - Section 5.6 provides the air conditioning requirements for heating and cooling (pull-down and pull-up) using ground conditioned air for different ambient temperatures.
   - Section 5.7 provides the air conditioning requirements for heating and cooling to maintain a constant cabin air temperature using low pressure conditioned air.
   - Section 5.8 shows the ground towing requirements taking into account different ground surface and aircraft conditions.

5-1-0 Airplane Servicing Arrangements

**ON A/C A321-100 A321-200

Airplane Servicing Arrangements

1. General

   This chapter provides typical ramp layouts, showing the various GSE items in position during typical turnaround scenarios for the passenger aircraft.

   These ramp layouts show typical arrangements only. Each operator will have its own specific requirements/regulations for the positioning and operation on the ramp.

   The associated turnaround chart for full servicing is given in section 5.2.
   The associated turnaround chart for minimum servicing arrangement is given in section 5.3.

5-1-1 Symbols Used on Servicing Diagrams

**ON A/C A321-100 A321-200

Symbols Used on Servicing Diagrams

1. This table gives the symbols used on servicing diagrams.

Ground Support Equipment	
AC	AIR CONDITIONING UNIT
AS	AIR STARTING UNIT
BULK	BULK TRAIN
CAT	CATERING TRUCK
CB	CONVEYOR BELT
CLEAN	CLEANING TRUCK
FUEL	FUEL HYDRANT DISPENSER or TANKER
GPU	GROUND POWER UNIT
LD CL	LOWER DECK CARGO LOADER
LV	LAVATORY VEHICLE
PBB	PASSENGER BOARDING BRIDGE
PS	PASSENGER STAIRS
TOW	TOW TRACTOR
ULD	ULD TRAIN
WV	POTABLE WATER VEHICLE

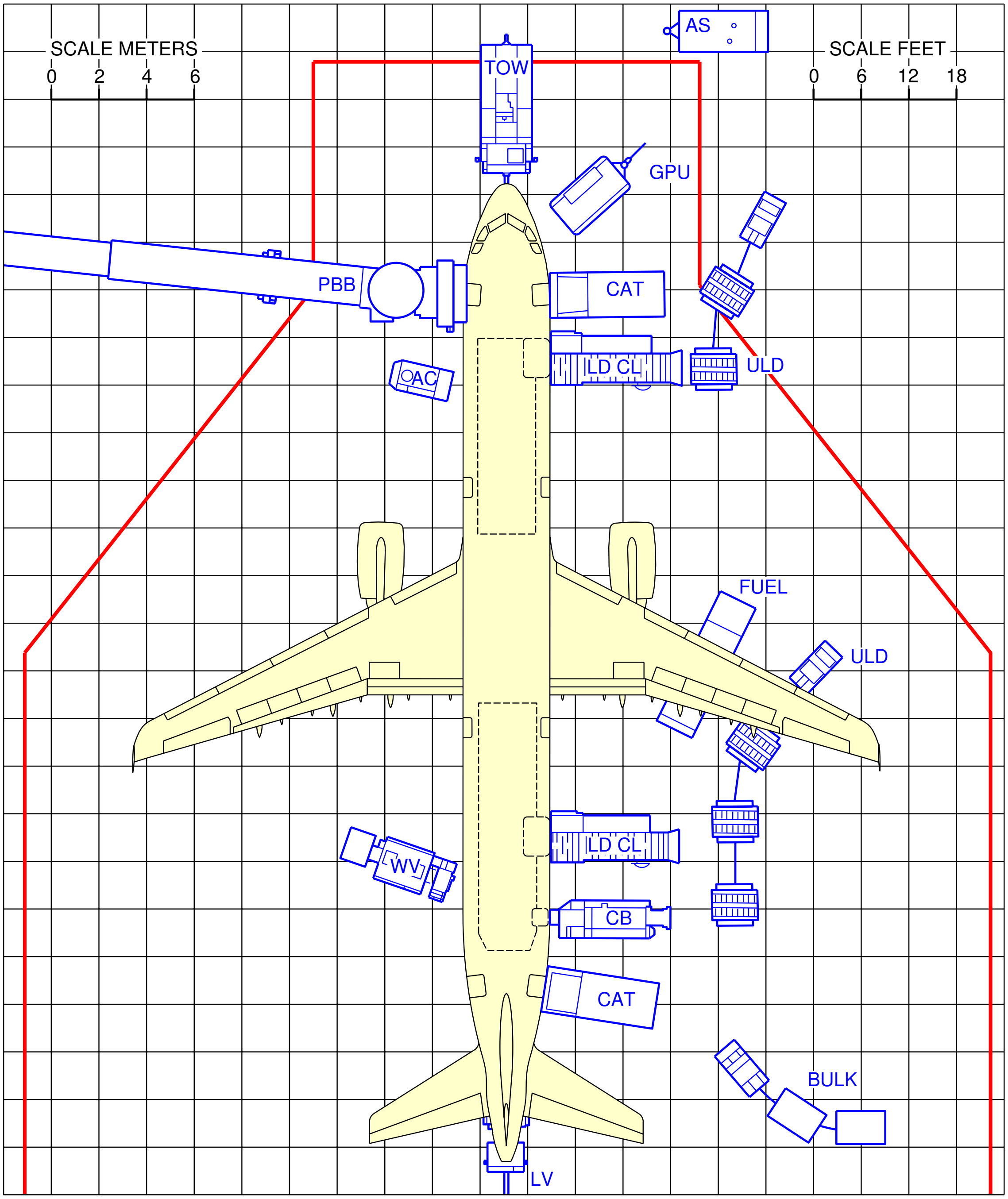
5-1-2 Typical Ramp Layout - Aircraft at the Gate

****ON A/C A321-100 A321-200**

Aircraft at the Gate

1. This section gives the typical servicing arrangement for pax version (Passenger Bridge).

**ON A/C A321-100 A321-200



Aircraft at the Gate
FIGURE 1

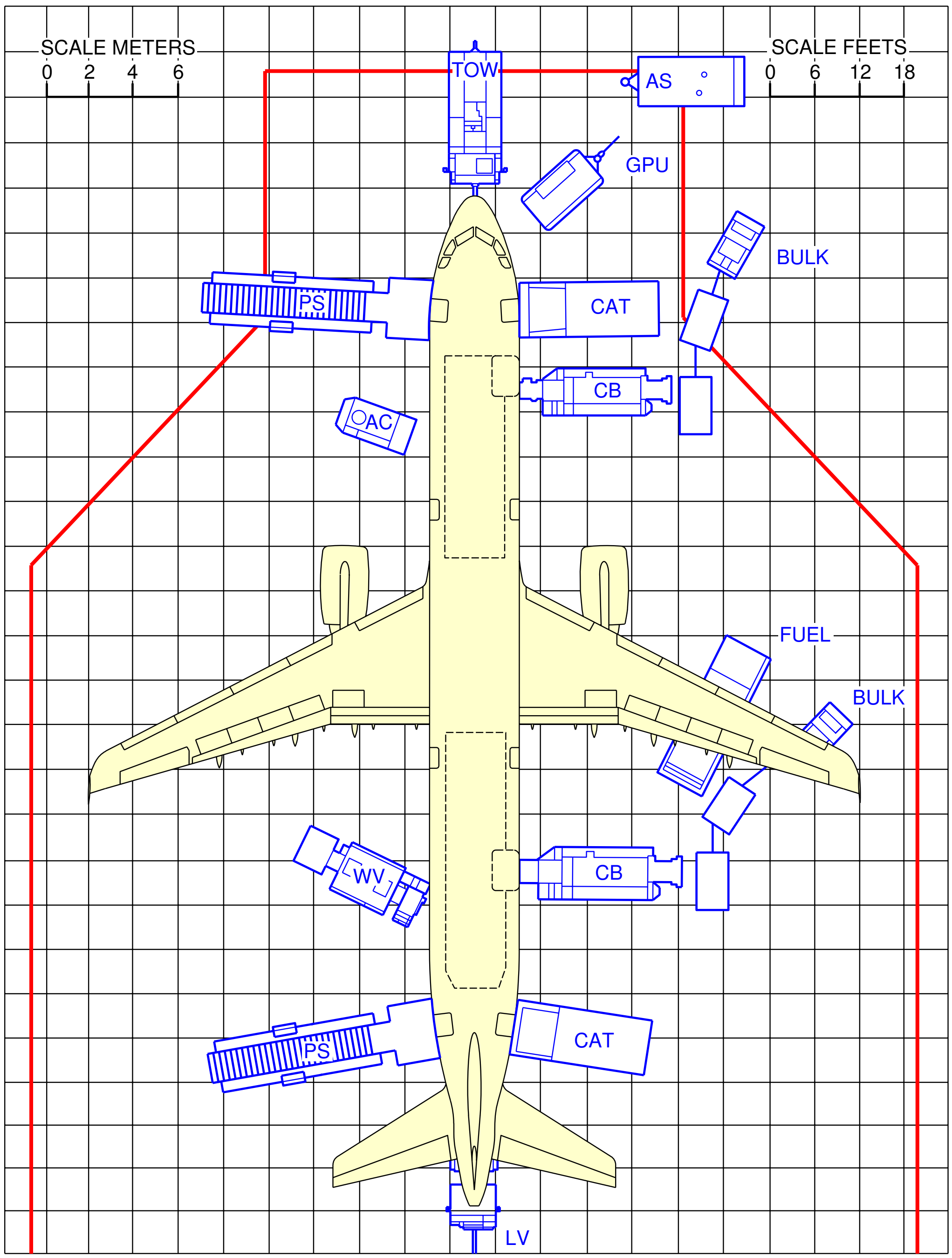
5-1-3 Typical Ramp Layout - Aircraft at an Open Apron

****ON A/C A321-100 A321-200**

<u>Aircraft at an Open Apron</u>

1. This section gives the typical servicing arrangement for pax version (Open Apron).

**ON A/C A321-100 A321-200



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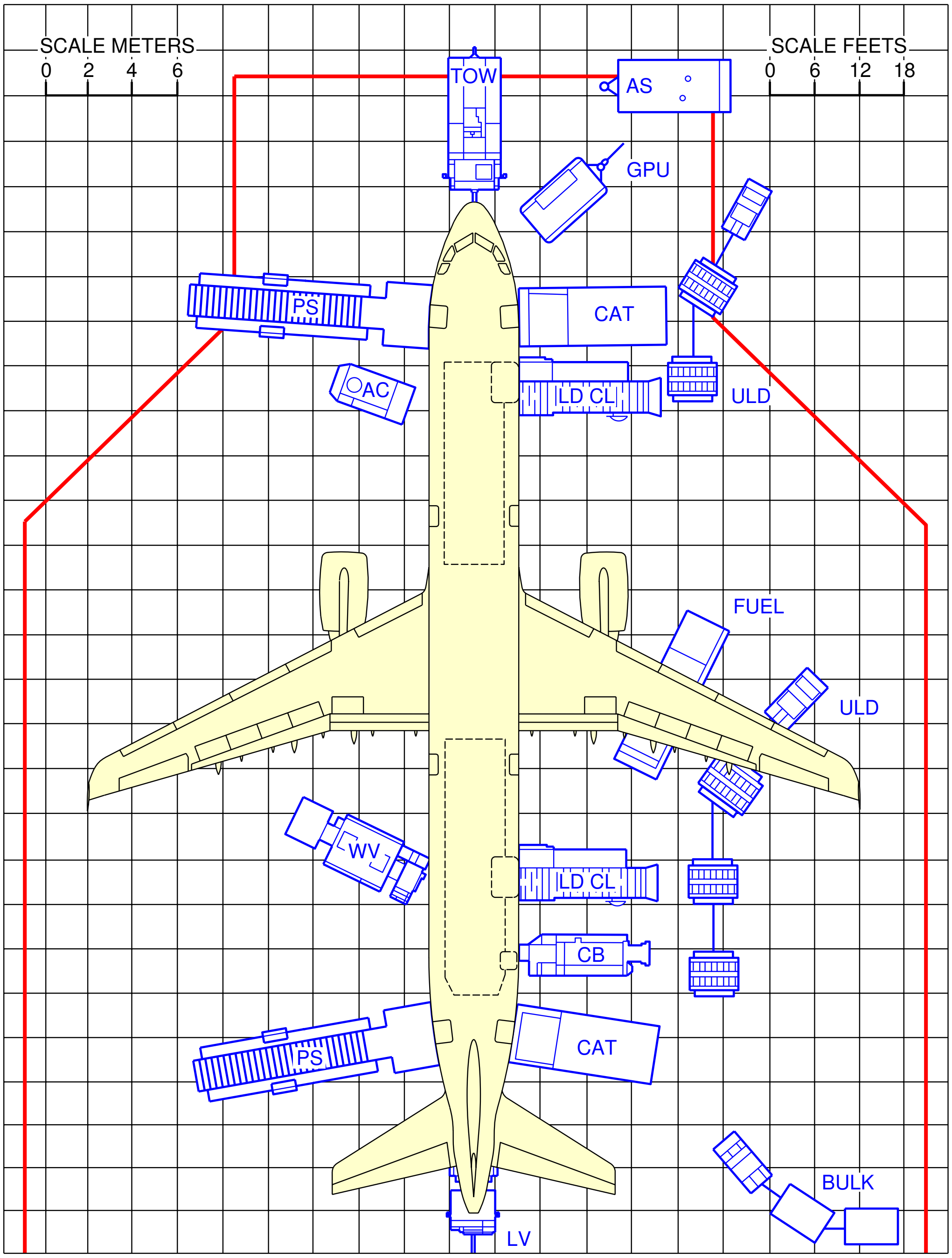
Aircraft at an Open Apron
Aircraft at an Open Apron (Bulk Loading)
FIGURE 1

**ON A/C A321-100 A321-200



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Aircraft at an Open Apron
Aircraft at an Open Apron (ULD Loading)
FIGURE 2

5-2-0 Terminal Operations - Full Servicing Turnaround

****ON A/C A321-100 A321-200**

Terminal Operations - Full Servicing Turnaround

1. This section provides a chart showing typical activities for full servicing turnaround.

   These data are provided to show the general scope and type of activities involved in ramp operations during the turnaround of an aircraft.

   Varying airline practices and operating circumstances may result in different sequences and different time intervals to do the activities shown.

5-2-1 Full Servicing Turnaround Charts

****ON A/C A321-100 A321-200**

Full Servicing Turnaround Charts

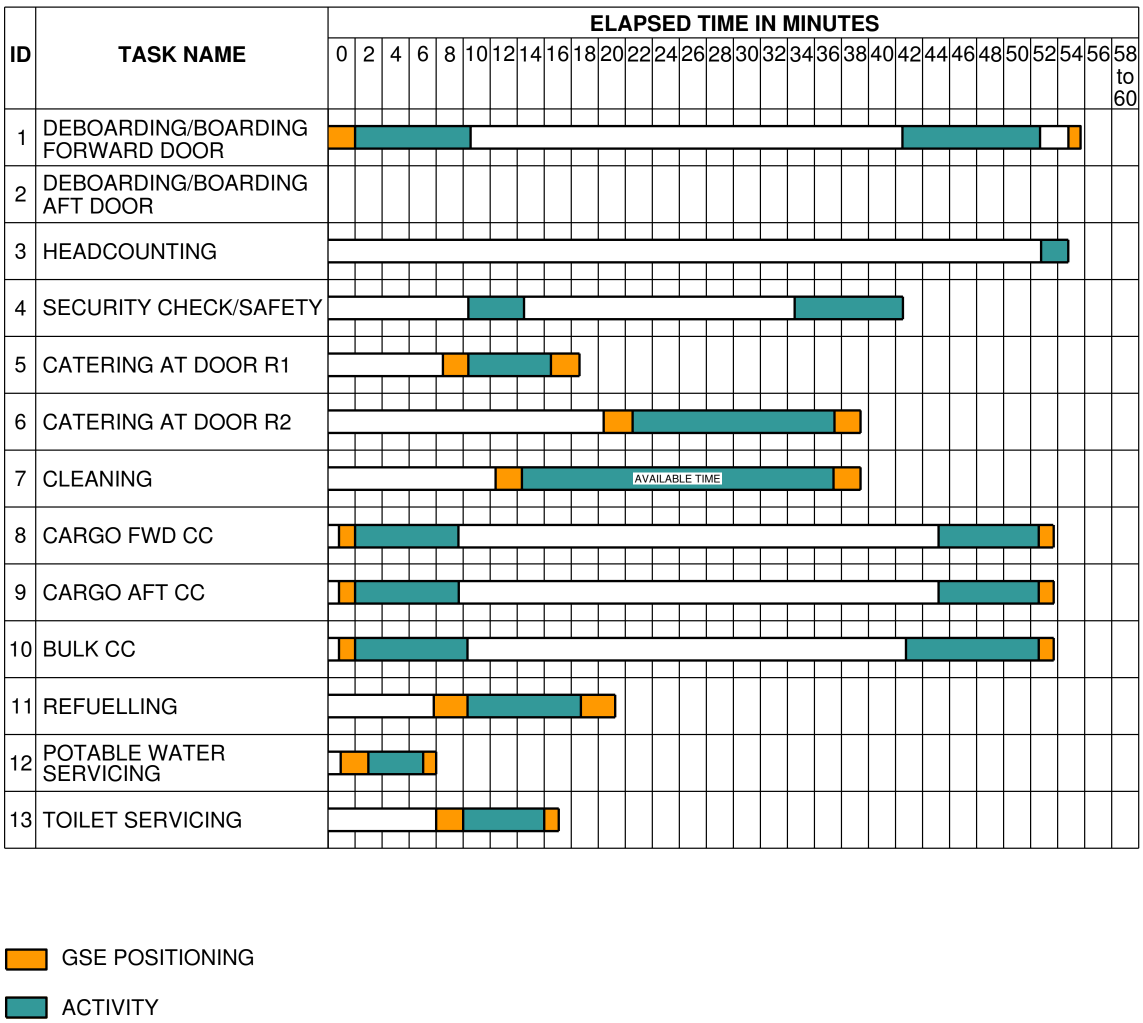
1. Assumptions for 56 minutes turnaround chart - Full Servicing.

   Please note this turnaround time is an assumption regarding a given example.

   A. Passenger handling: 185 pax / 1 bridge
      (1) Deboarding
         - 1L:185
         - 2L:0
         - Deboarding rate: 22 pax / min per door.
         - No PRM
      (2) Boarding
         - 1L:185
         - 2L:0
         - Boarding rate: 18 pax / min per door.
         - No PRM
   B. Catering: R1 - R 2 / sequential
      - Galley M1: 4 FSTE
      - Galley M2: 10 FSTE
   C. Cleaning: Time available
   D. Security/Safety checks: Yes (4 min each)
      - Cabin crew change: Yes (4 min)
   E. Cargo
      - 2 Cargo loaders
      - 1 Belt loader
      - 1 operator / BL
      - No sliding carpet
      - FWD compartment : 5 LD3
      - AFT compartment : 5 LD3
      - Bulk in bulk CC: 200 kg
   F. Refuel: 5.6 tons, 7134 (l), 2 hoses (1 side)
   G. Water servicing: 100%
   H. Toilet servicing: 100%

**ON A/C A321-100 A321-200

TRT: 56 min



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Turnaround Stations
Full Servicing (56 Min.)
FIGURE 1

5-3-0 Terminal Operation - Minimum Servicing Turnaround

****ON A/C A321-100 A321-200**

Terminal Operation

1. This section provides a chart showing typical activities for minimum servicing turnaround.

   These data are provided to show the general scope and type of activities involved in ramp operations during the turnaround of an aircraft.

   Varying airline practices and operating circumstances may result in different sequences and different time intervals to do the activities shown.

5-3-1 Minimum Servicing Turnaround Chart

****ON A/C A321-100 A321-200**

Minimum Servicing Turnaround Chart

1. Assumptions for 25 minutes turnaround chart - Minimum Servicing.

   Please note this turnaround time is an assumption regarding a given example.

   A. Passenger handling: 220 pax / 2 stairways
      (1) Deboarding
         - 1L: 110
         - 2L: 110
         - Deboarding rate: 20 pax / min per door.
         - No PRM
      (2) Boarding
         - 1L: 110
         - 2L: 110
         - Boarding rate: 15 pax / min per door.
         - No PRM

   B. Catering: No
      - Galley M1:
      - Galley M2:

   C. Cleaning: No

   D. Security/Safety checks: Yes (4 min each)
      - Cabin crew change: No

   E. Cargo
      - 2 Cargo loaders
      - 1 Belt loader
      - 1 operator / BL
      - No sliding carpet
      - FWD compartment bulk: 5 LD3
      - AFT compartment bulk: 5 LD3
      - Bulk in bulk CC: 200 kg

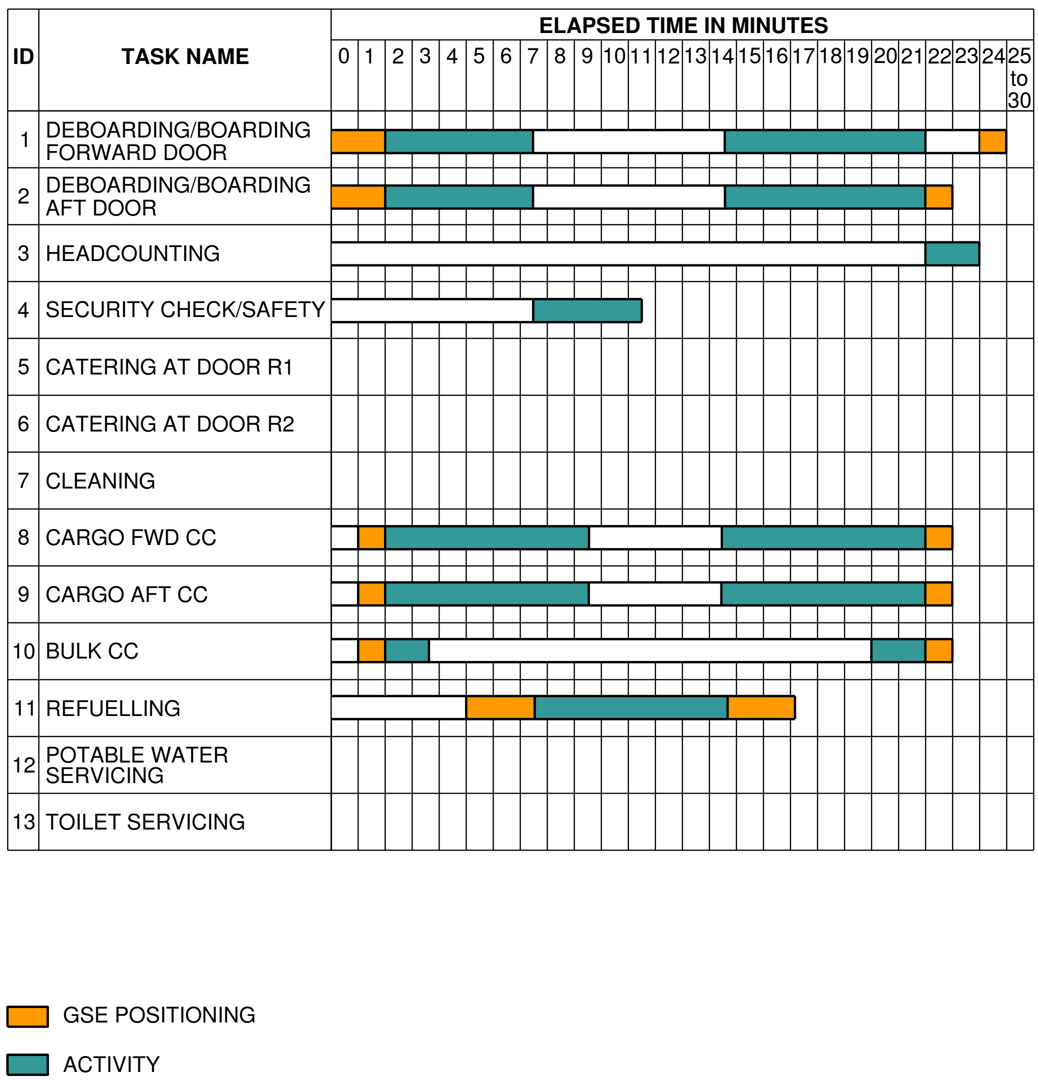
   F. Refuel: 5.6 tons, 7134 (l), 2 hoses (1 side)

   G. Water servicing: 0%:

   H. Toilet servicing: 0%

**ON A/C A321-100 A321-200

TRT: 25 min



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Turnaround Stations
Minimum Servicing (25 Min.)
FIGURE 1

5-4-0 Ground Service Connections

****ON A/C A321-100 A321-200**

Ground Service Connections

1. Ground Service Connections.

5-4-1 Ground Service Connections Layout

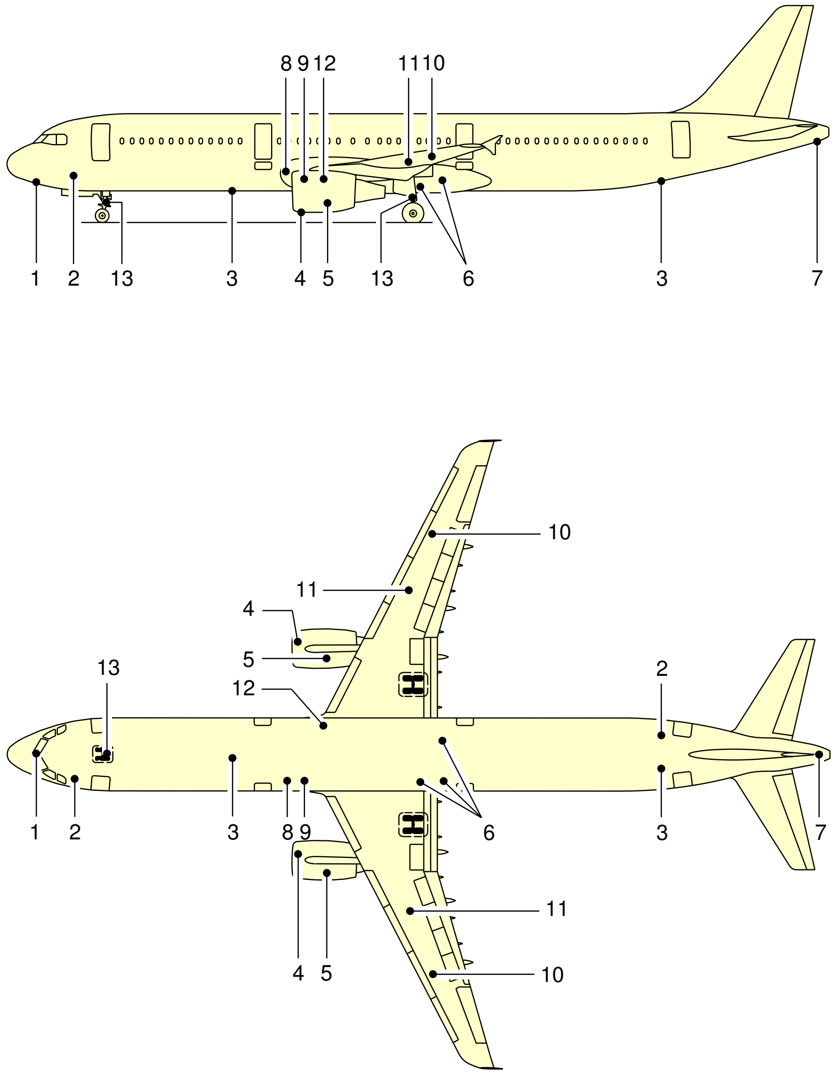
****ON A/C A321-100 A321-200**

Ground Service Connections Layout

1. This section gives the ground service connections layout.

Ground Service Connections Layout	
1	– GROUND ELECTRICAL POWER RECEPTABLE
2	– TOILET SERVICING
3	– WATER FILLING AND DRAINAGE
4	– IDG OIL FILLING CONNECTOR
5	– ENGINE OIL FILLING CONNECTOR
6	– HYDRAULIC
7	– APU OIL FILLING CONNECTOR
8	– GROUND SERVICE CONDITIONED AIR CONNECTOR
9	– GROUND AIR CONDITIONING AND AIR START CONNECTOR
10	– GRAVITY FILLING PANELS
11	– REFUEL/DEFUEL CONNECTOR
12	– REFUEL/DEFUEL PANEL
13	– AIRCRAFT GROUNDING

**ON A/C A321-100 A321-200



Ground Service Connections
Ground Service Connections Layout
FIGURE 1

5-4-2 Grounding Points

****ON A/C A321-100 A321-200**

Grounding Points

1. Grounding Points.

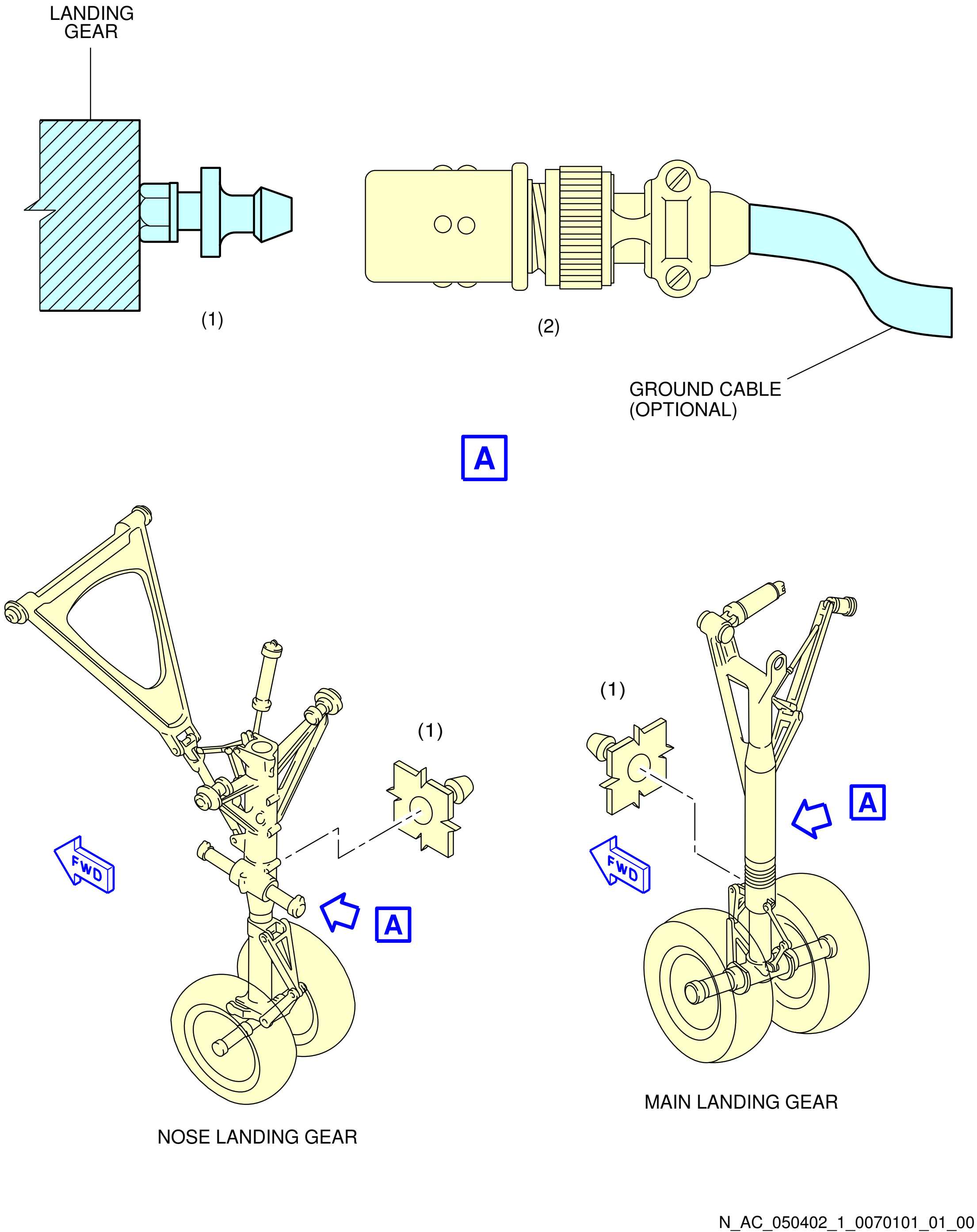
	DISTANCE: Meters (ft)			
	AFT OF NOSE	FROM AIRPLANE CENTERLINE		MEAN HEIGHT FROM GROUND
		R SIDE	L SIDE	
On Nose Landing Gear leg:	5.07 m (16.63 ft)	on centerline		0.94 m (3.08 ft)
On left Main Landing Gear leg:	21.97 m (72.08 ft)		3.79 m (12.43 ft)	1.07 m (3.51 ft)
On right Main Landing Gear leg:	21.97 m (72.08 ft)	3.79 m (12.43 ft)		1.07 m (3.51 ft)

A. The grounding stud on each landing gear leg is designed for use with a clip-on connector (such as Appleton TGR).

B. The grounding studs are used to connect the aircraft to an approved ground connection on the ramp or in the hangar for:
- refuel/defuel operations,
- maintenance operations,
- bad weather conditions.

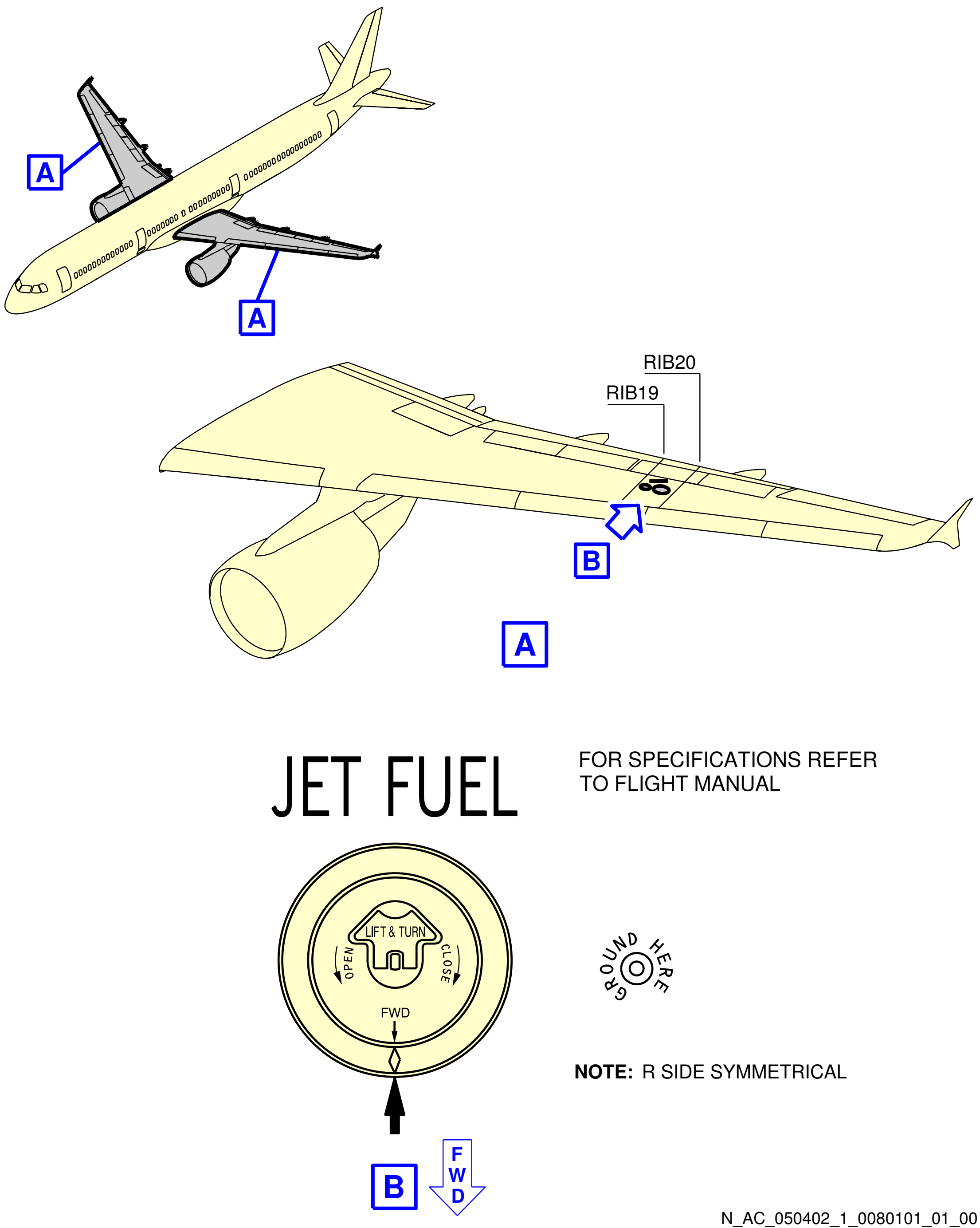
NOTE : In all other conditions, the electrostatic discharge through the tyre is sufficient.

**ON A/C A321-100 A321-200



Ground Service Connections
Grounding Points
FIGURE 1

**ON A/C A321-100 A321-200



Ground Service Connections
Grounding Points
FIGURE 2

5-4-3 Hydraulic System

****ON A/C A321-100 A321-200**

Hydraulic System

1. Access.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
Green System: Access door 197CB	23.44 (76.9)	1.27 (4.17)		1.76 (5.77)
Yellow System: Access door 198CB	23.44 (76.9)		1.27 (4.17)	1.76 (5.77)
Blue System: Access door 197EB	24.49 (80.35)	1.27 (4.17)		1.76 (5.77)

NOTE : Distances are approximate.

2. Reservoir Pressurization.
   On the air pressurization manifold:

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
Access door 195AB	19.92 (65.35)		0.25 (0.82)	1.74 (5.71)

NOTE : Distances are approximate.
- One 1/4 in. AEROQUIP AE 96994E self-sealing connection common to the 3 reservoirs.

3. Accumulator Charging.
   Four (MS28889-1) connections (one for each accumulator) for:

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
Yellow System accumulator: Access door 196BB	20.1 (65.94)	0.25 (0.82)		1.99 (6.53)
Green System accumulator: Left MLG door	21.04 (69.03)		0.25 (0.82)	3.2 (10.5)
Blue System accumulator: Access door 195BB	22.3 (72.51)		0.25 (0.82)	1.99 (6.53)
Yellow System braking accumulator: Access door 196BB	20.1 65.94)	0.76 (2.49)		1.74 (5.71)

NOTE : Distances are approximate.

4. Reservoir Filling.
On the Green system ground service panel:

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
Access door 197CB	23.44 (76.9)	1.27 (4.17)		1.76 (5.77)

NOTE : Distances are approximate.
One 1/4 in. AEROQUIP AE96993E self-sealing connection for pressurized supply.
One handpump filling connection for unpressurized (suction) supply.

5. Reservoir Drain.
On 3/8 in. self-sealing connection on reservoir for:

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
Yellow System: Access door 196 BB - 198 CB	20.1 (65.94)	1.43 (4.69)		1.90 (6.23)
Green System: Left MLG door	21.04 (69.03)		1.27 (4.17)	2.61 (8.56)
Blue System Access door 197 EB	24.49 (80.35)	1.27 (4.17)		1.76 (5.77)

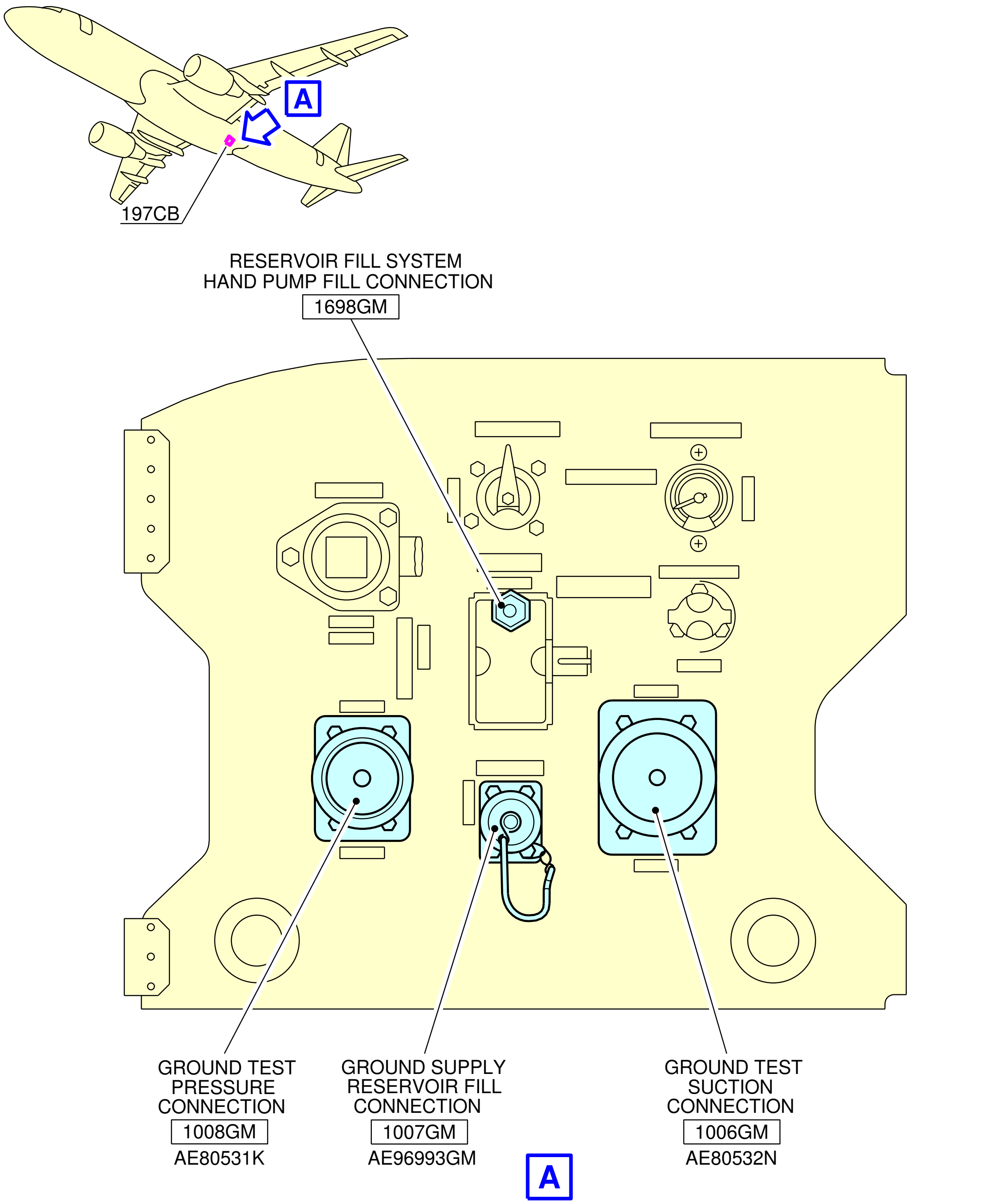
NOTE : Distances are approximate.

On 3/8 in. self-sealing connection for the Blue system on:
- Blue system ground service panel.

6. Ground Test.

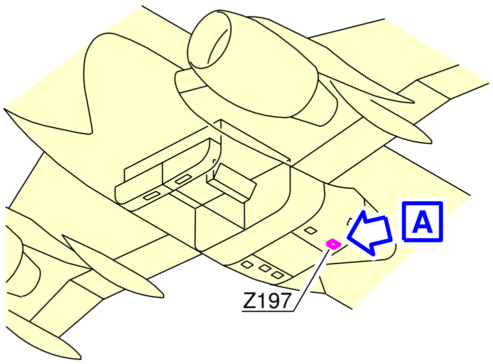
On each ground service panel:
- One self-sealing connector AE80532N (suction).
- One self-sealing connector AE80531K (delivery).

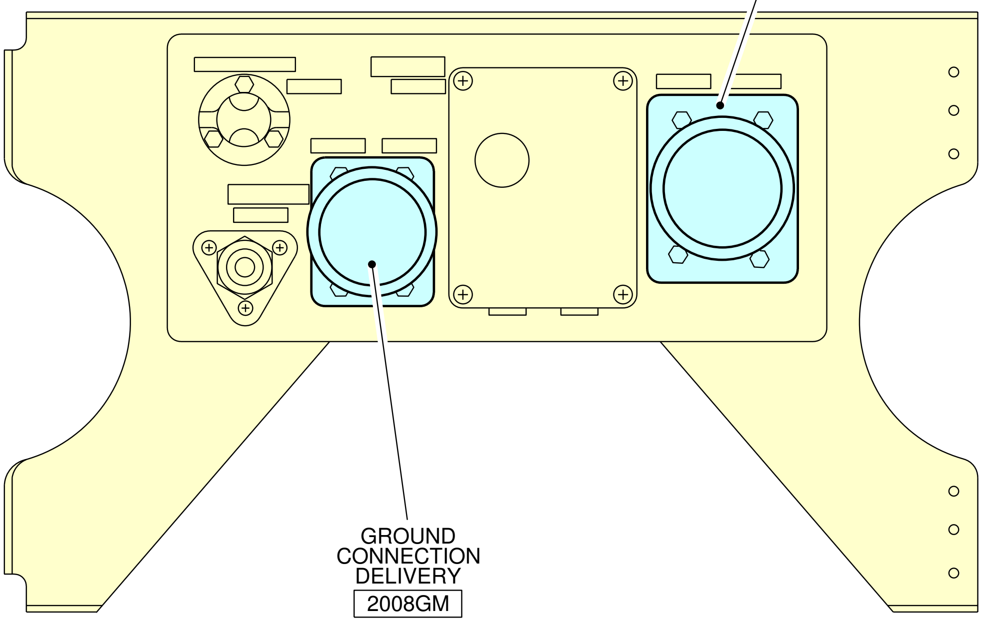
**ON A/C A321-100 A321-200



Hydraulic System
Green System Ground Service Panel
FIGURE 1

**ON A/C A321-100 A321-200





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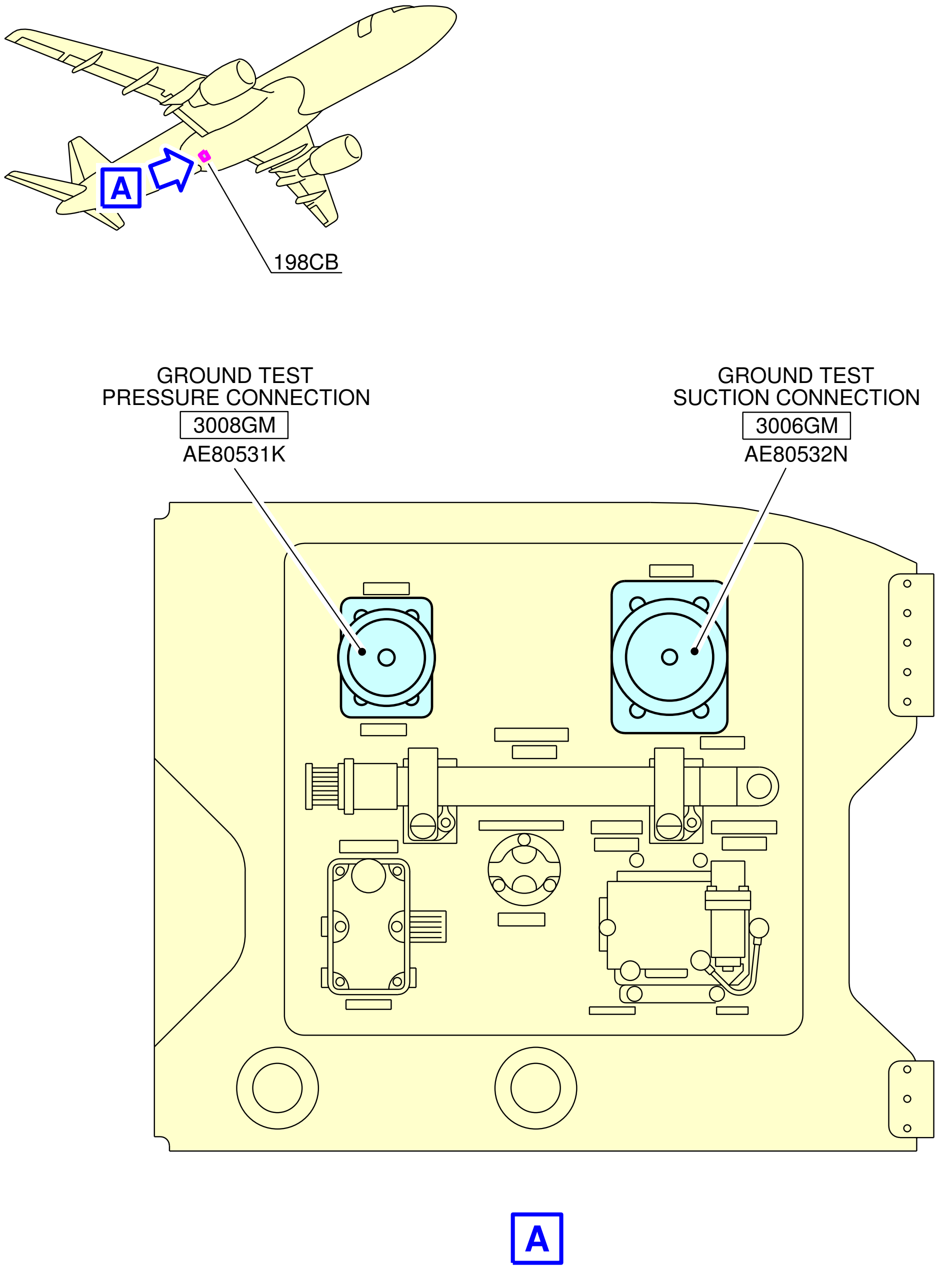
Hydraulic System
Blue System Ground Service Panel
FIGURE 2

**ON A/C A321-100 A321-200



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Hydraulic System
Yellow System Ground Service Panel
FIGURE 3

5-4-4 Electrical System

****ON A/C A321-100 A321-200**

Electrical System

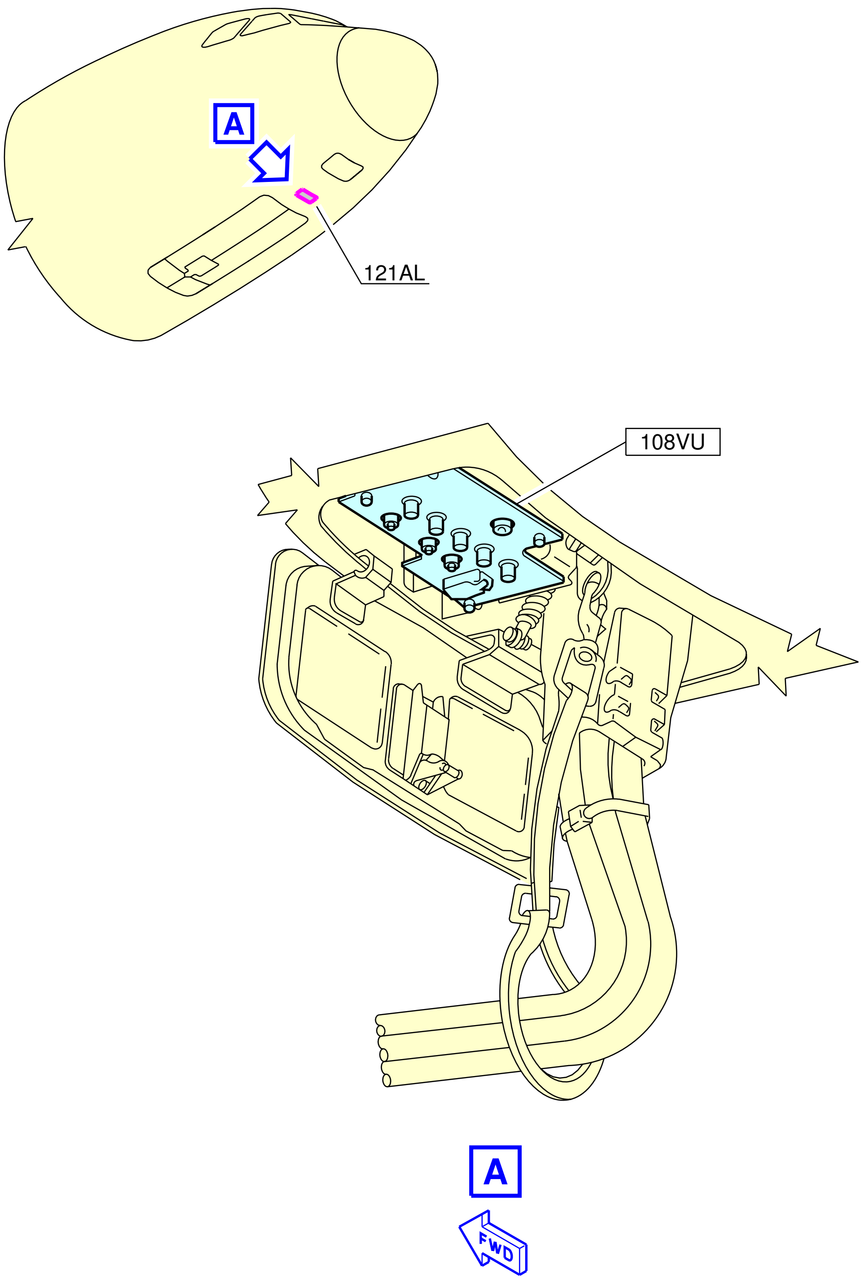
1. Electrical System.
   This chapter gives data related to the location of the ground service connections.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
A/C External Power: Access door 121AL	2.55 (8.37)	on centerline		2 (6.56)

NOTE : Distances are approximate.

2. Technical Specifications
   This chapter gives data related to the location of the ground service connections.
   A. External Power Receptacle:
      - One MS90362-3 receptacle - 90 KVA.
   B. Power Supply:
      - Three-phase, 400 Hz, 115/200V
   C. Electrical connectors for servicing
      - AC outlets: Hubbel 5258
      - DC outlets: Hubbel 7472
      - Vacuum cleaner outlets: Hubbel 5258

**ON A/C A321-100 A321-200



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Ground Service Connections
External Power Receptacles
FIGURE 1

5-4-5 Oxygen System

****ON A/C A321-100 A321-200**

Oxygen System

1. Oxygen System.

	DISTANCE: Meters (ft)			
	AFT OF NOSE	FROM AIRPLANE CENTERLINE		MEAN HEIGHT FROM GROUND
		R SIDE	L SIDE	
One service connection (external charging in the avionics compartment) MS22066 Std.	3.45 m (11.32 ft)		1.15 m (3.77 ft)	2.60 m (8.53 ft)

3/8" UNF × 24 TPI

Nominal pressure: 1850 psi (127.55 bar)

Max fill pressure: 2035 psi (140.31 bar)

NOTE : Internal charging connection provided.

5-4-6 Fuel System

**ON A/C A321-100 A321-200

Fuel System

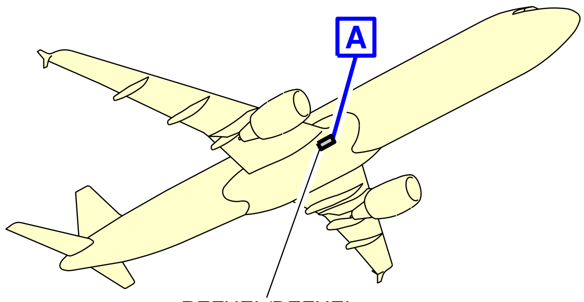
1. Refuel/Defuel Couplings.
   This chapter gives data related to the location of the ground service connections.

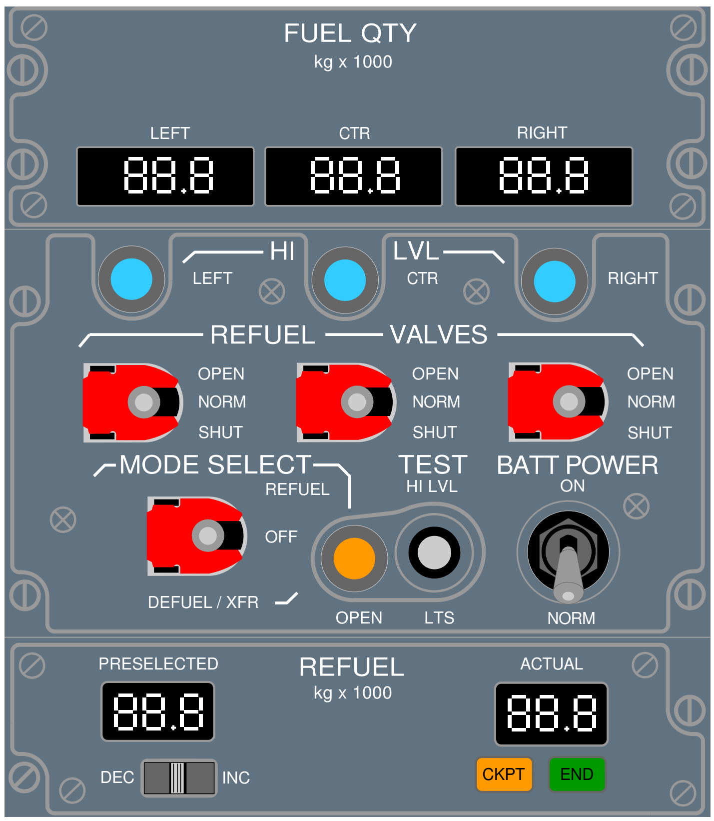
ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
Refuel/Defuel Integrated Panel: Access door 192MB	20.6 (67.59)		1.8 (5.91	1.8 (5.91)
Refuel/defuel coupling, Left Access Door 522HB (Optional)	21.5 (70.54)	10 (32.81)		3.5 (11.48)
Refuel/defuel coupling, Right Access Door 622HB	21.5 (70.54)		10 (32.81)	3.5 (11.48)
Gravity Refuel Coupling	23.4 (76.77)	12.4 (40.68)	12.4 (40.68)	3.7 (12.14)

NOTE : Distances are approximate.

2. Technical Specifications
   This chapter gives data related to the specifications of the ground service connections.
   A. Refuel/defuel couplings:
      - Right wing: one standard ISO R45, 2.5in.
      - Left wing: one optional standard ISO R45, 2.5 in.
   B. Refuel pressure:
      - Maximum pressure: 3.45 bar (50 psi)
   C. Refuel Flow:
      - 1400 l/minute (369.84 US gal/minute)

**ON A/C A321-100 A321-200





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NOTE: STANDARD CONFIGURATION OF REFUEL/DEFUEL PANEL.

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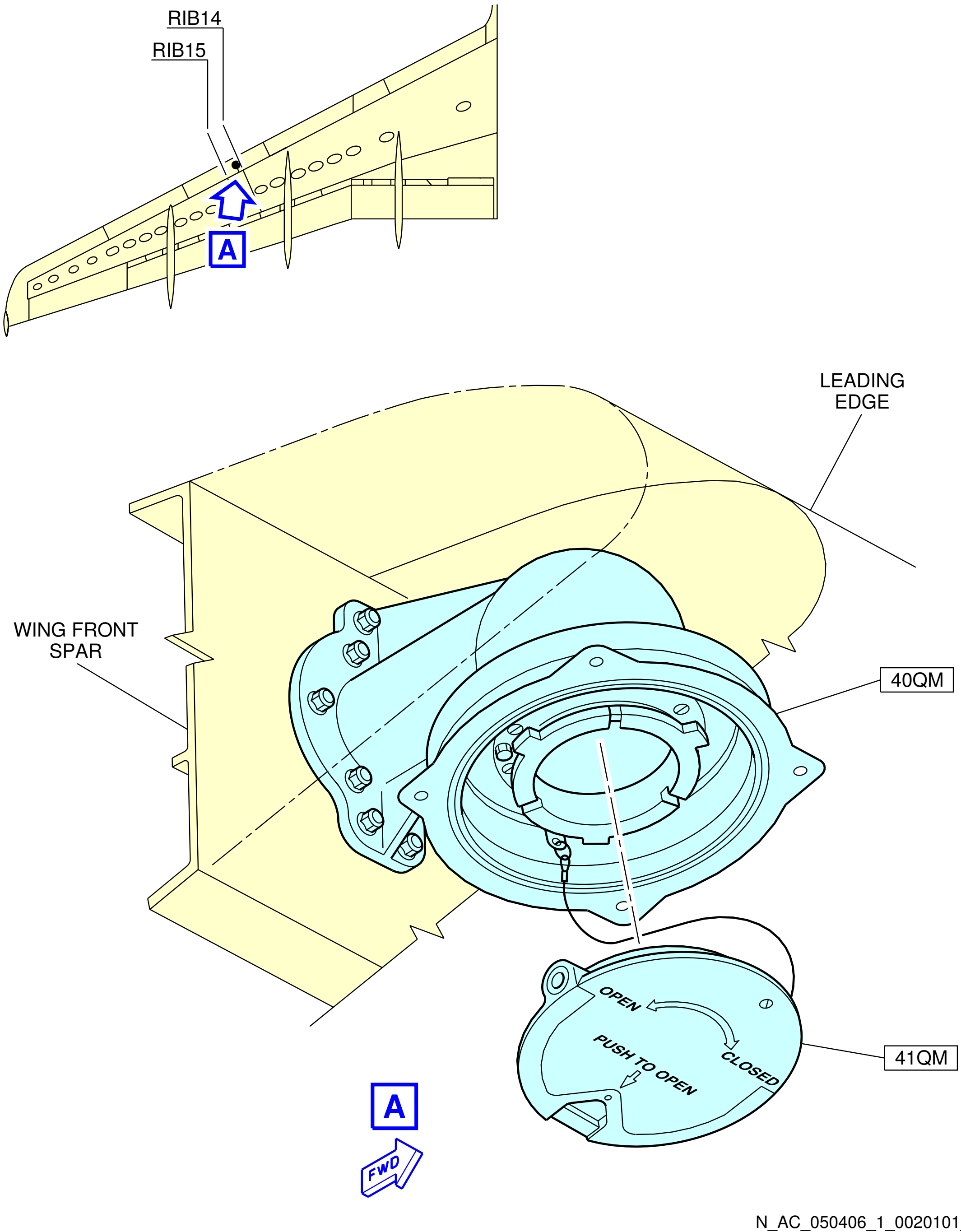
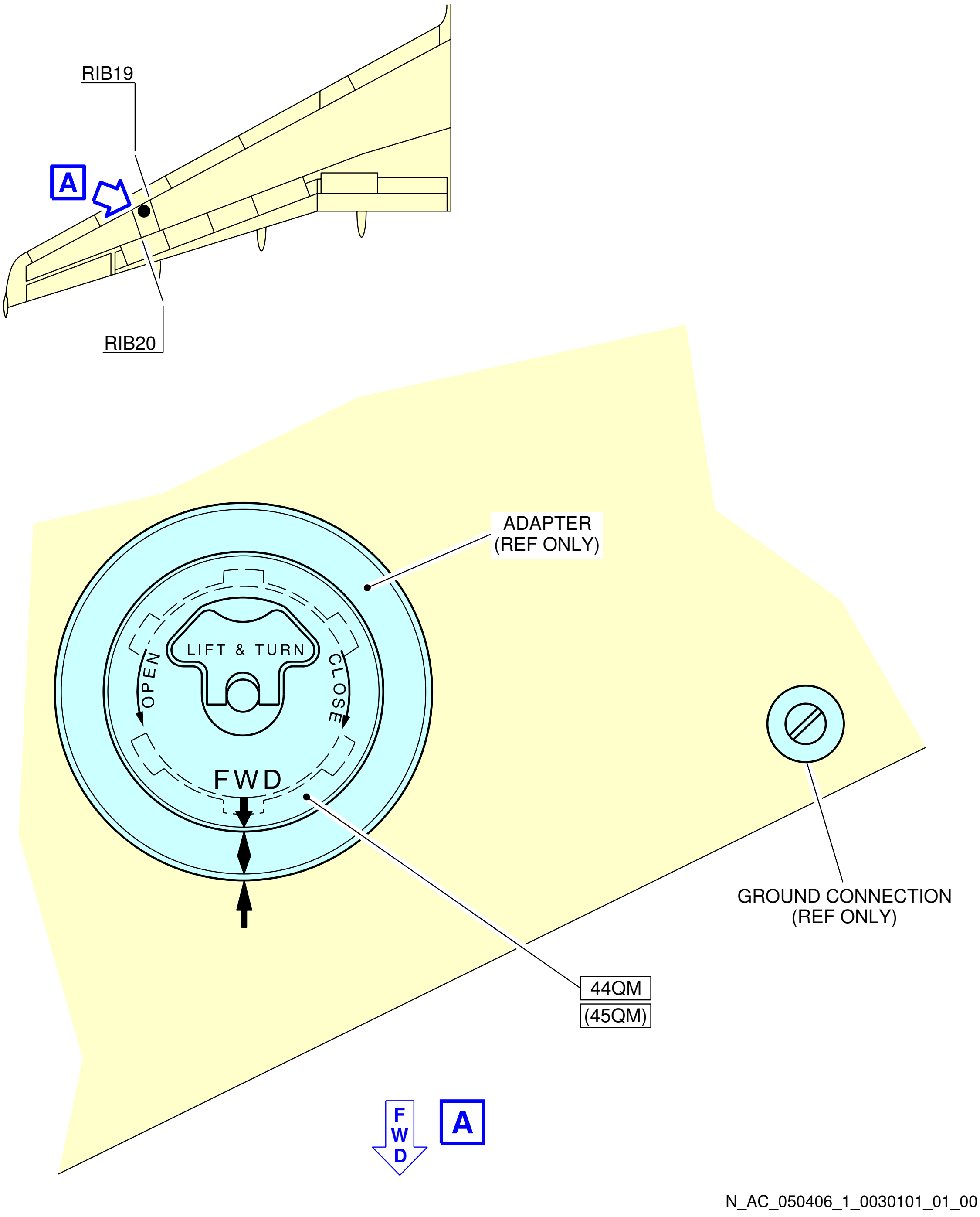
Ground Service Connections
Refuel/Defuel Panel
FIGURE 1

**ON A/C A321-100 A321-200



Ground Service Connections
Refuel/Defuel Couplings
FIGURE 2

**ON A/C A321-100 A321-200



Ground Service Connections
Gravity Refuel Couplings
FIGURE 3

5-4-7 Pneumatic System

****ON A/C A321-100 A321-200**

Pneumatic System

1. High Pressure Air Connectors.
This chapter gives data related to the location of the ground service connections.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
HP Connector Access door 191DB	17.25 (56.59)		0.84 (2.76)	1.76 (5.77)

NOTE : Distances are approximate.

A. Connector:
- One standard 3 in. ISO TC20 connection (MS33740) for engine starting and cabin air preconditioning (HP) installed on the left side of the belly fairing

2. Low Pressure Air Connectors.
This chapter gives data related to the location of the ground service connections.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
LP Connector Access door 191CB	16.72 (54.86)		1.11 (3.64)	1.73 (5.68)

NOTE : Distances are approximate.

A. Connector:
- One standard 8 in. connection (SAE AS4262 type B) for cabin air preconditioning (LP);

5-4-8 Potable Water System

**ON A/C A321-100 A321-200

Potable Water System

1. Potable Water Ground Service Panel.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
Access door 171AL:	38.2 (125.33)		0.3 (0.98)	2.6 (8.53)

NOTE : Distances are approximate

A. Connector:
- Fill/Drain Nipple 3/4 in. (ISO 17775)

B. Usable capacity
- Standard configuration - one tank:2000 l (52.83 US gal)

C. Filling pressure:
- 3.45 bar (50 psi)

D. Typical flow rate:
- 50 l/min (13.21 US gal/min)

2. Potable Water Ground Drain Panel.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		RH SIDE m (ft)	LH SIDE m (ft)	
Potable Water Ground Service Panel: Access door 133AL:	11.8 (38.71)		0.15 (0.49)	1.75 (5.74)

NOTE : Distances are approximate

3. Technical Specifications

A. Connectors:

(1) On the potable ground service panel (Access Door 171AL)
- Fill/Drain Nipple 3/4 in (ISO 17775).

- One ground pressurization connector.

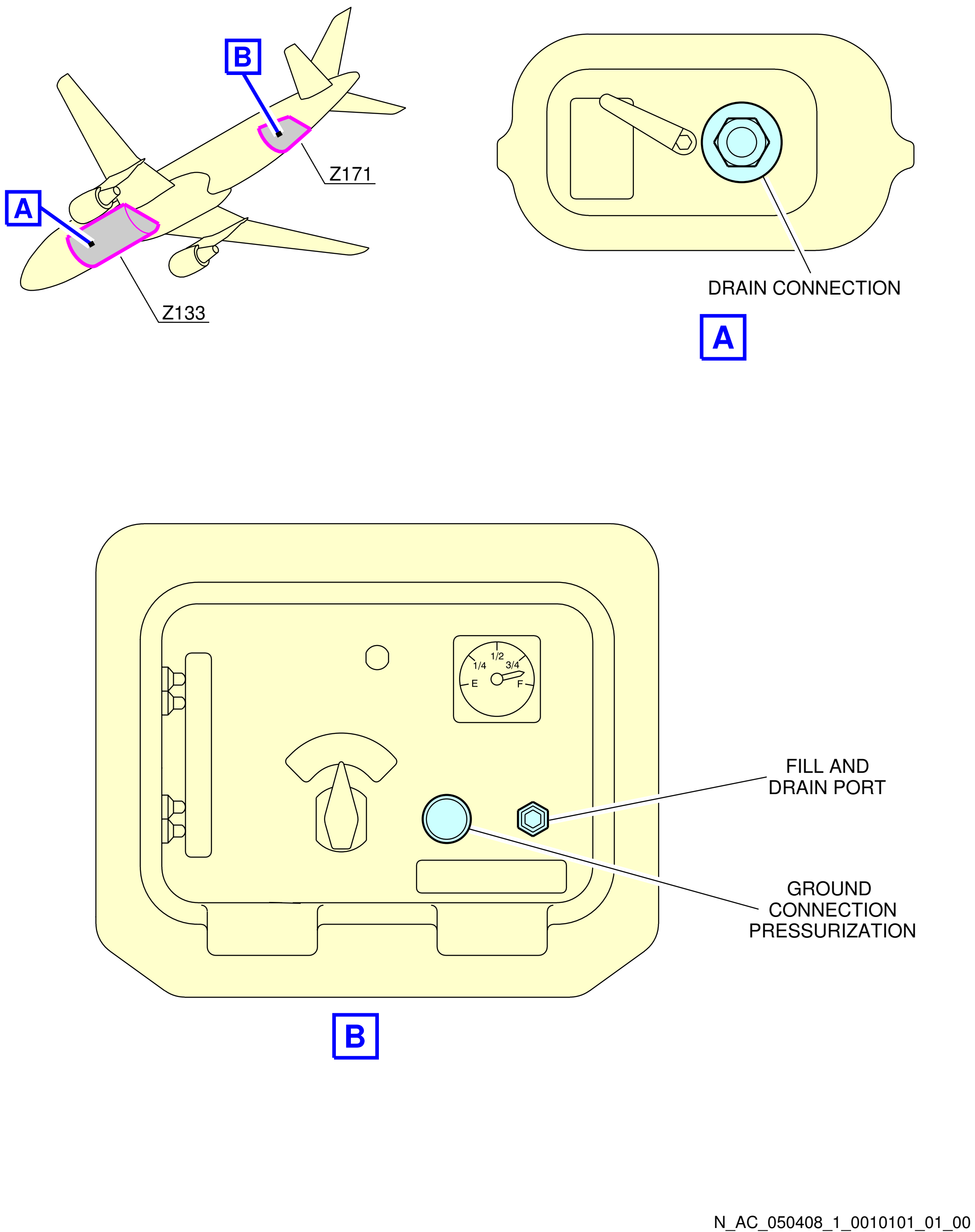
(2) On drain panel (Access Door 133AL)
- Drain Nipple 3/4 in (ISO 17775)

B. Usable capacity:
- Standard configuration - one tank:200 l (52.83 US gal)

C. Filling pressure:
- 3.45 bar (50 psi).

D. Typical flow rate:
- 50 l/min (13.21 US gal/min).

**ON A/C A321-100 A321-200



Ground Service Connections
Potable Water Ground Service Panel
FIGURE 1

5-4-9 Oil System

**ON A/C A321-100 A321-200

Oil System

1. Engine Oil Replenishment for CFM56 Series Engine (See FIGURE 5-4-9-991-001-A):
One gravity filling cap and one pressure filling connection per engine.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		ENGINE 1 (LH) m (ft)	ENGINE 2 (RH) m (ft)	
Engine Oil Gravity Filling Cap: Access door: 437BL (LH), 447BL (RH)	17.38 (57.02)	6.63 (21.75)	4.82 (15.81)	1.46 (4.79)
Engine Oil Pressure Filling Port:	17.26 (56.62)	6.49 (21.29)	4.74 (15.55)	1.42 (4.66)

NOTE : Distances are approximate

A. Tank capacity:
- Full level: 19.6 l (5.18 US gal)
- Usable: 9.46 l (2.50 US gal)

B. Maximum delivery pressure required: 25 psi (1.72 bar)
Maximum delivery flow required: 180 l/h (47.55 US gal/h)

2. IDG Oil Replenishment for CFM56 Series Engine (SeeFIGURE 5-4-9-991-002-A):
One pressure filling connection per engine: OMP 2506-18 plus one connection overflow: OMP 2505-18.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		ENGINE 1 (LH) m (ft)	ENGINE 2 (RH) m (ft)	
IDG Oil Pressure Filling Connection: Access door 438DR (LH), 448DR (RH)	16.46 (54)	6.9 (22.64)	5.52 (18.11)	0.68 (2.23)

NOTE : Distances are approximate

A. Tank capacity: 5 l (1.32 US gal)

B. Delivery pressure required: 5 to 40 psi (0.34 to 2.76 bar) at the IDG inlet.

3. Starter Oil Replenishment for CFM56 Series Engine (See FIGURE 5-4-9-991-003-A:
One gravity filling cap per engine.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		ENGINE 1 (LH) m (ft)	ENGINE 2 (RH) m (ft)	
Starter Oil Filling Connection:	16.81 (55.15)	5.3 (17.39)	6.2 (20.34)	0.76 (2.49)

NOTE : Distances are approximate

A. Tank capacity: 0.8 l (0.21 US gal)

4. Engine Oil Replenishment for IAE V2500 Series Engine (See FIGURE 5-4-9-991-004-B):
One gravity filling cap per engine.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		ENGINE 1 (LH) m (ft)	ENGINE 2 (RH) m (ft)	
Engine Oil Gravity Filling Cap: Access door 437BL (LH), 447BL (RH)	16.5 (54.13)	6.56 (21.52)	4.92 (16.14)	1.22 (4)

NOTE : Distances are approximate

A. Tank capacity:
- Full level: 28 l (7.39 US gal)
- Usable: 23.50 l (6.21 US gal)

1. IDG Oil Replenishment for IAE V2500 Series Engine:
One pressure filling connection per engine: 2506-2 plus one overflow connection: 2505-2..

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		ENGINE 1 (LH) m (ft)	ENGINE 2 (RH) m (ft)	
IDG Oil Pressure Filling Connection:	17.06 (55.97)	5.42 (17.78)	6.04 (19.81)	0.8 (2.62)

NOTE : Distances are approximate

A. Tank capacity: 4.1 l (1.08 US gal)

5. Starter Oil Replenishment for IAE V2500 Series Engine (See FIGURE 5-4-9-991-006-B):
One gravity filling cap per engine.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		ENGINE 1 (LH) m (ft)	ENGINE 2 (RH) m (ft)	
Starter Oil Filling Connection:	19.66 (64.5)	5.3 (17.39)	6.14 (20.14)	0.75 (2.46)

NOTE : Distances are approximate

A. Tank capacity: 0.35 l (0.09 US gal)

6. APU Oil System (See FIGURE 5-4-9-991-007-A):
APU oil gravity filling cap.

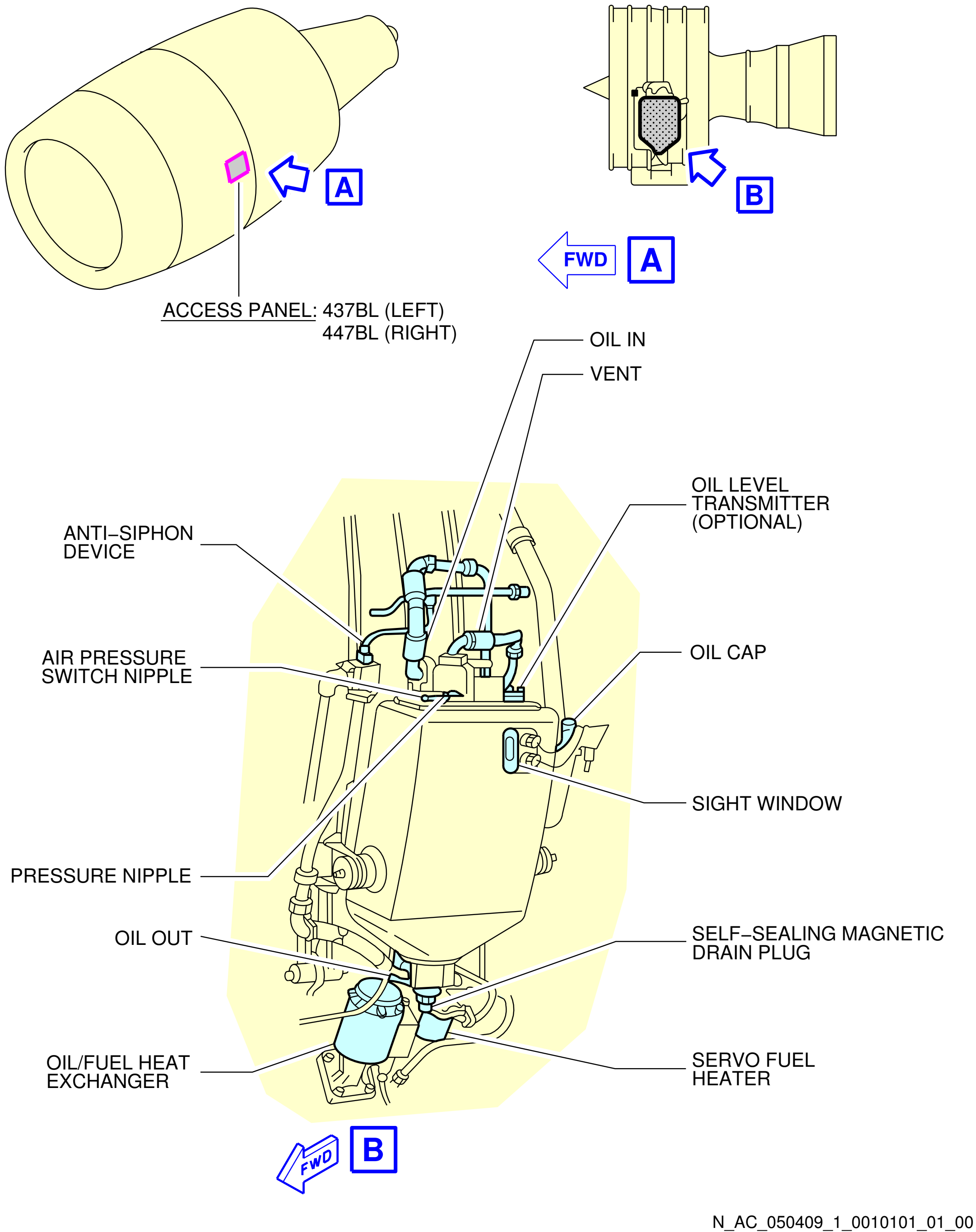
	AFT OF NOSE m (ft)	FROM AIRPLANE CENTERLINE (LEFT HAND) m (ft)	MEAN HEIGHT FROM GROUND m (ft)
GTCP 36-300	42.42 (139.17)	0.3 (0.98)	4.83 (15.85)
APS 3200	42.42 (139.17)	0.3 (0.98)	4.78 (15.68)
131-9	42.32 (138.84)	0.35 (1.15)	4.32 (14.17)

NOTE : Distances are approximate

A. Tank capacity (usable):
   - APU type GTCP 36-300: 6.20 l (1.64 US gal)
   - APU type APS 3200: 5.40 l (1.43 US gal)

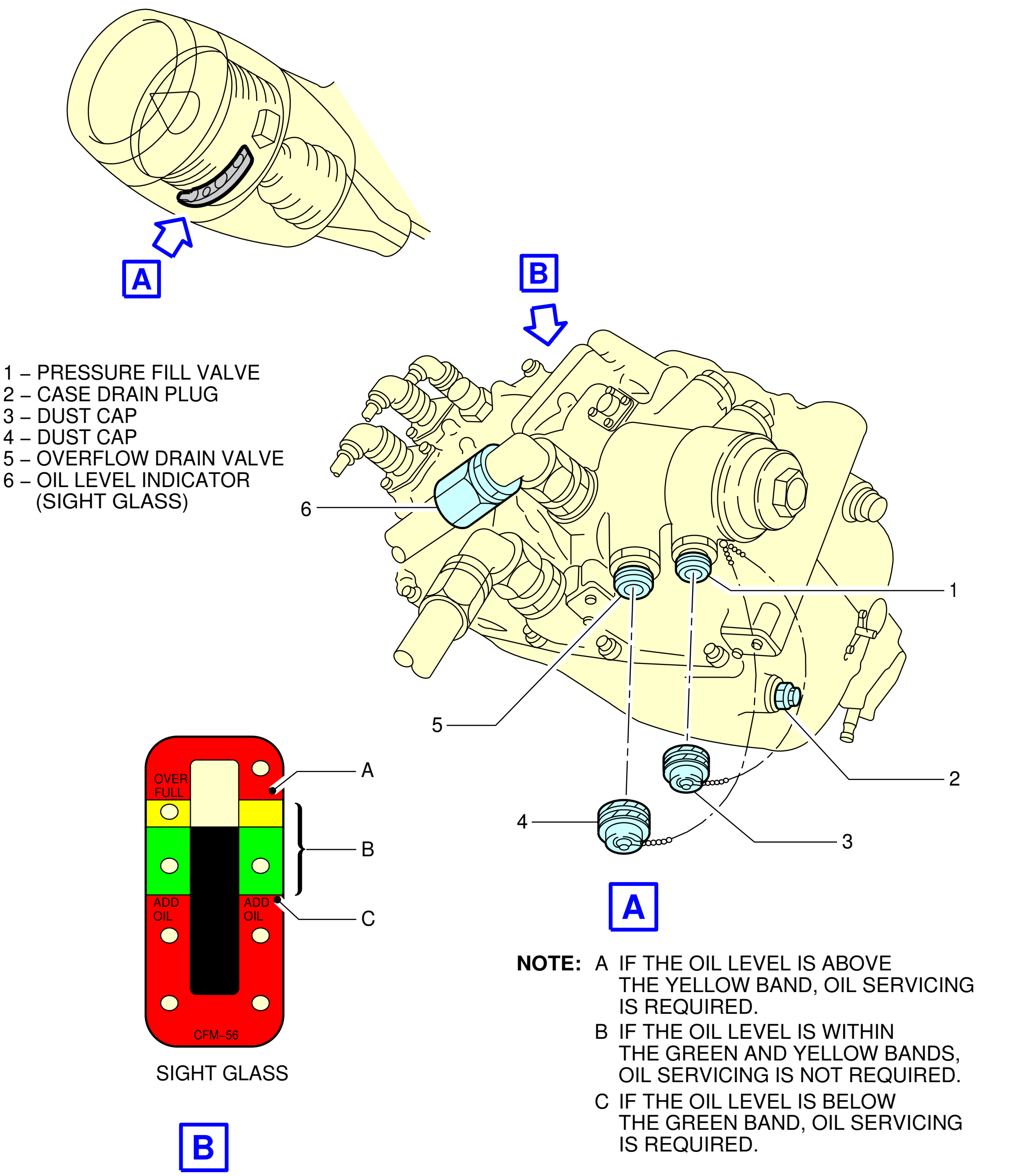
- APU type 131-9: 6.25 l (1.65 US gal)

**ON A/C A321-100 A321-200



Ground Service Connections
Engine Oil Tank – CFM56 Series Engine
FIGURE 1

**ON A/C A321-100 A321-200



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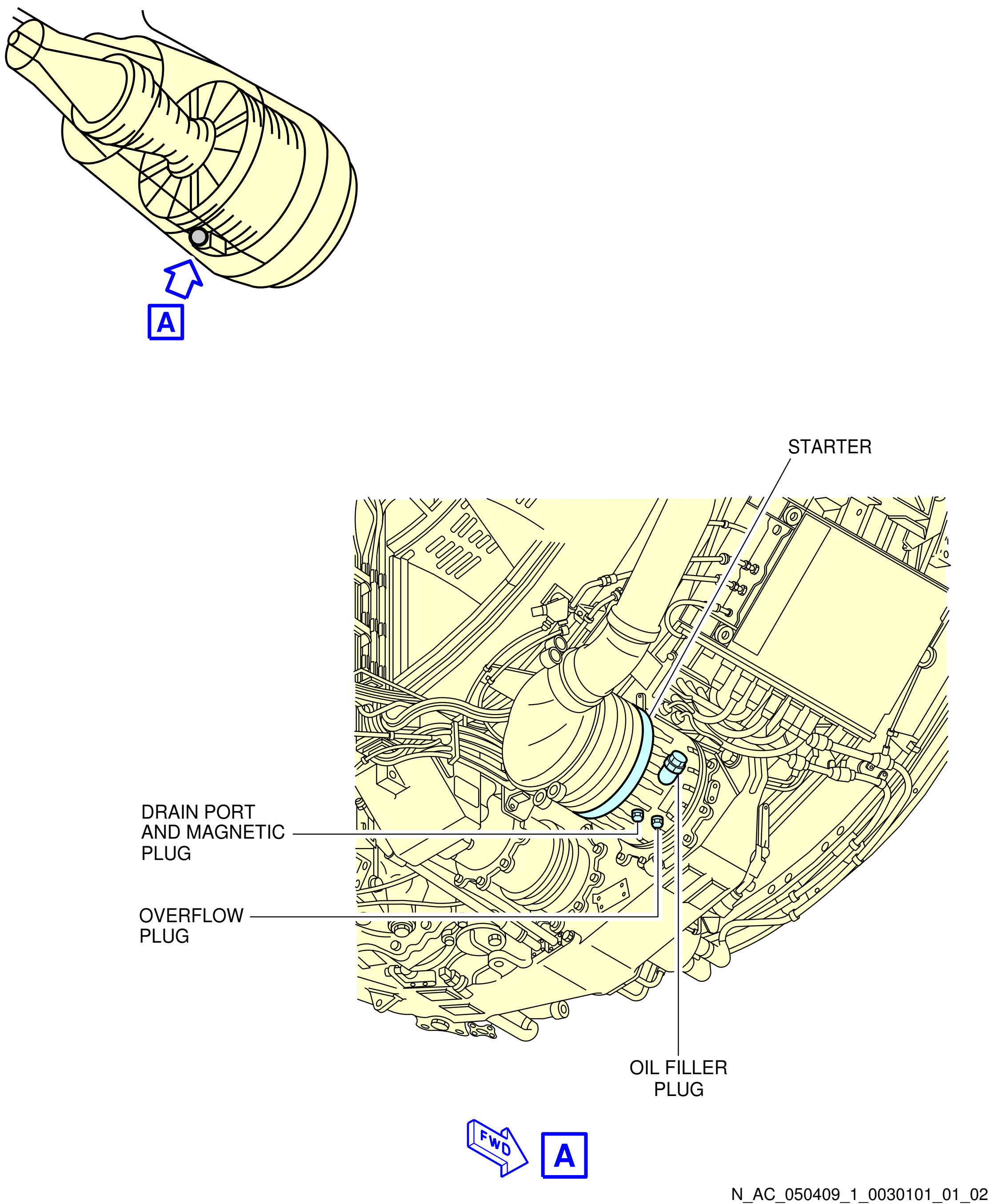
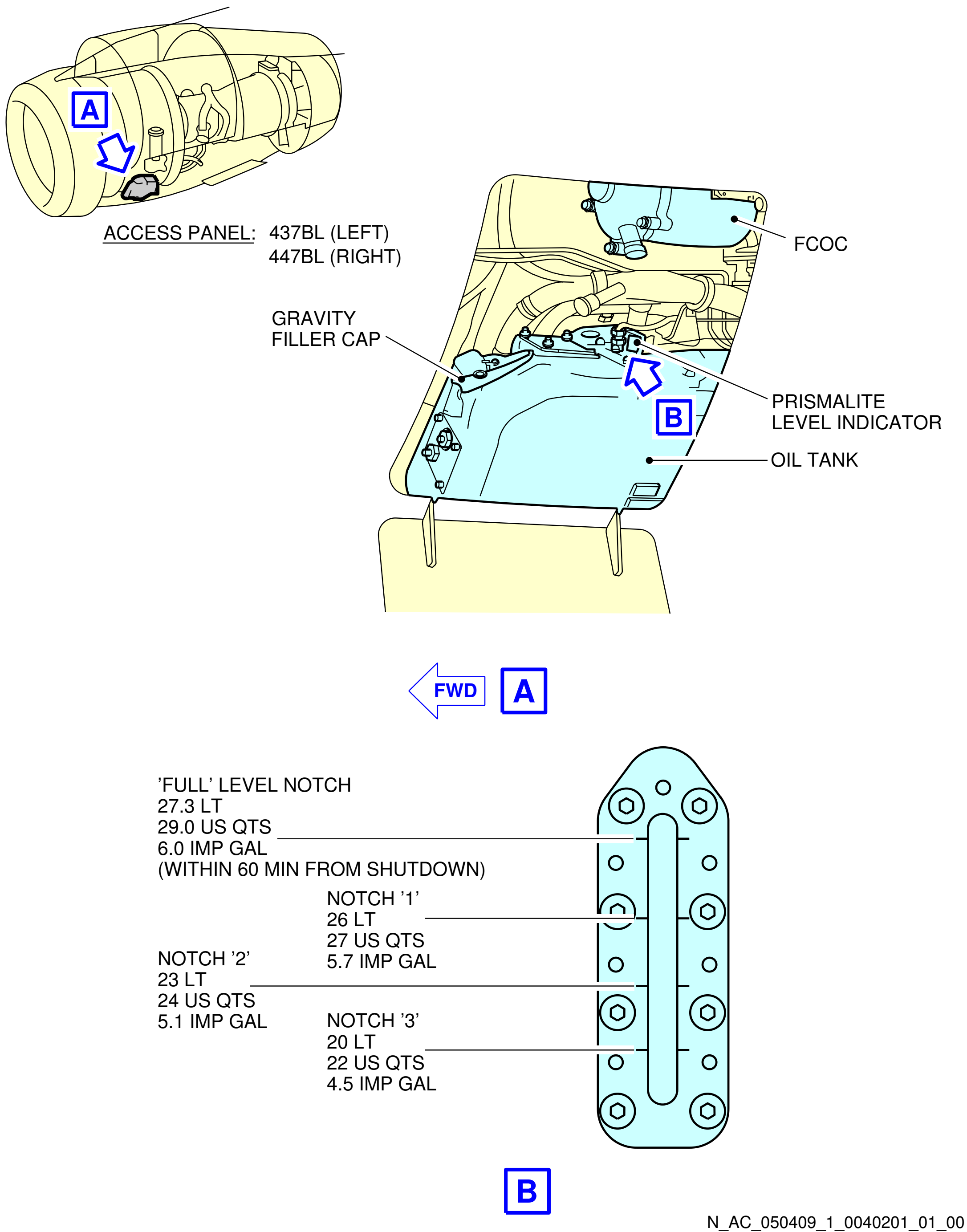
Ground Service Connections
IDG Oil Tank – CFM56 Series Engine
FIGURE 2

**ON A/C A321-100 A321-200



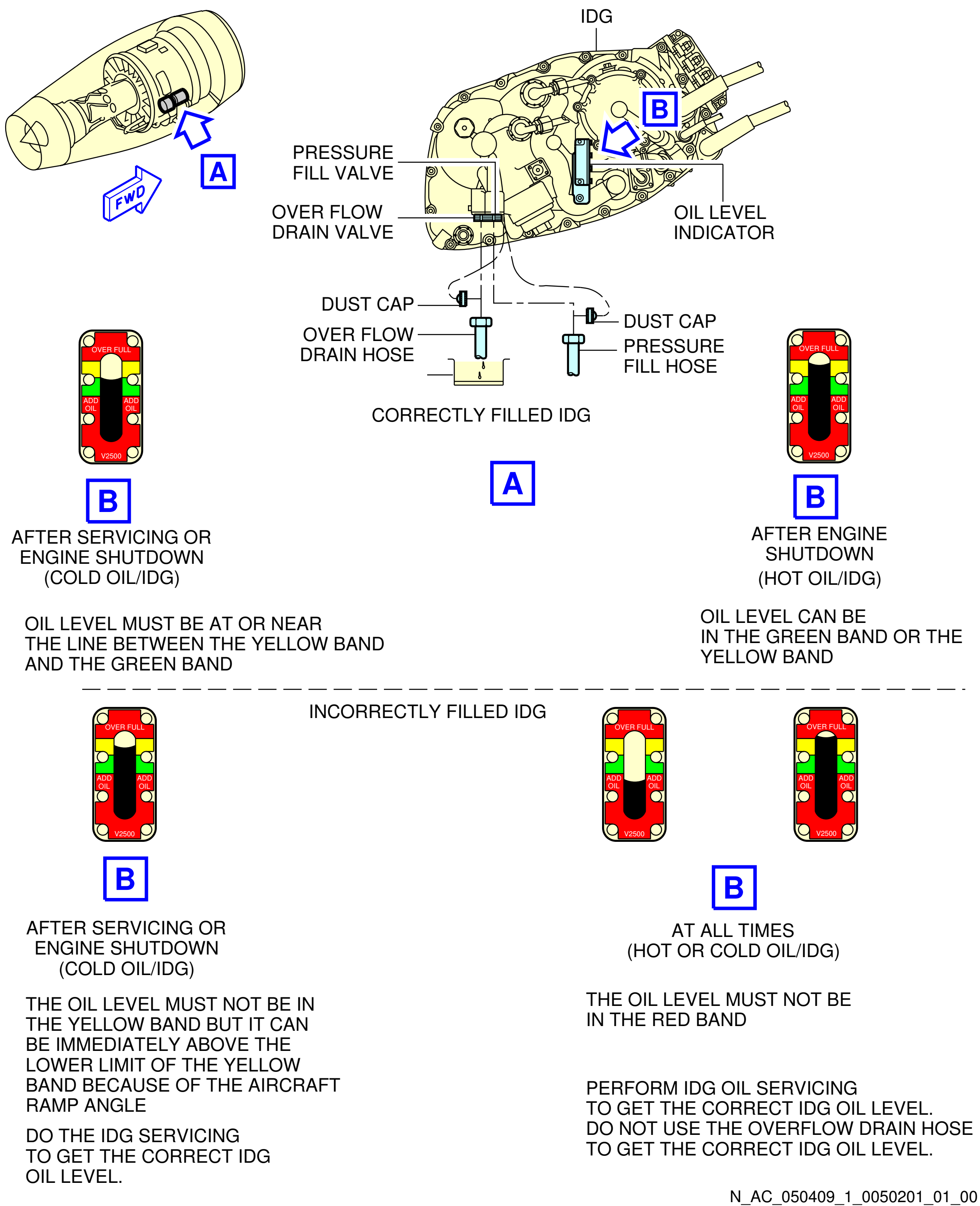
Ground Service Connections
Starter Oil Tank – CFM56 Series Engine
FIGURE 3

**ON A/C A321-100 A321-200



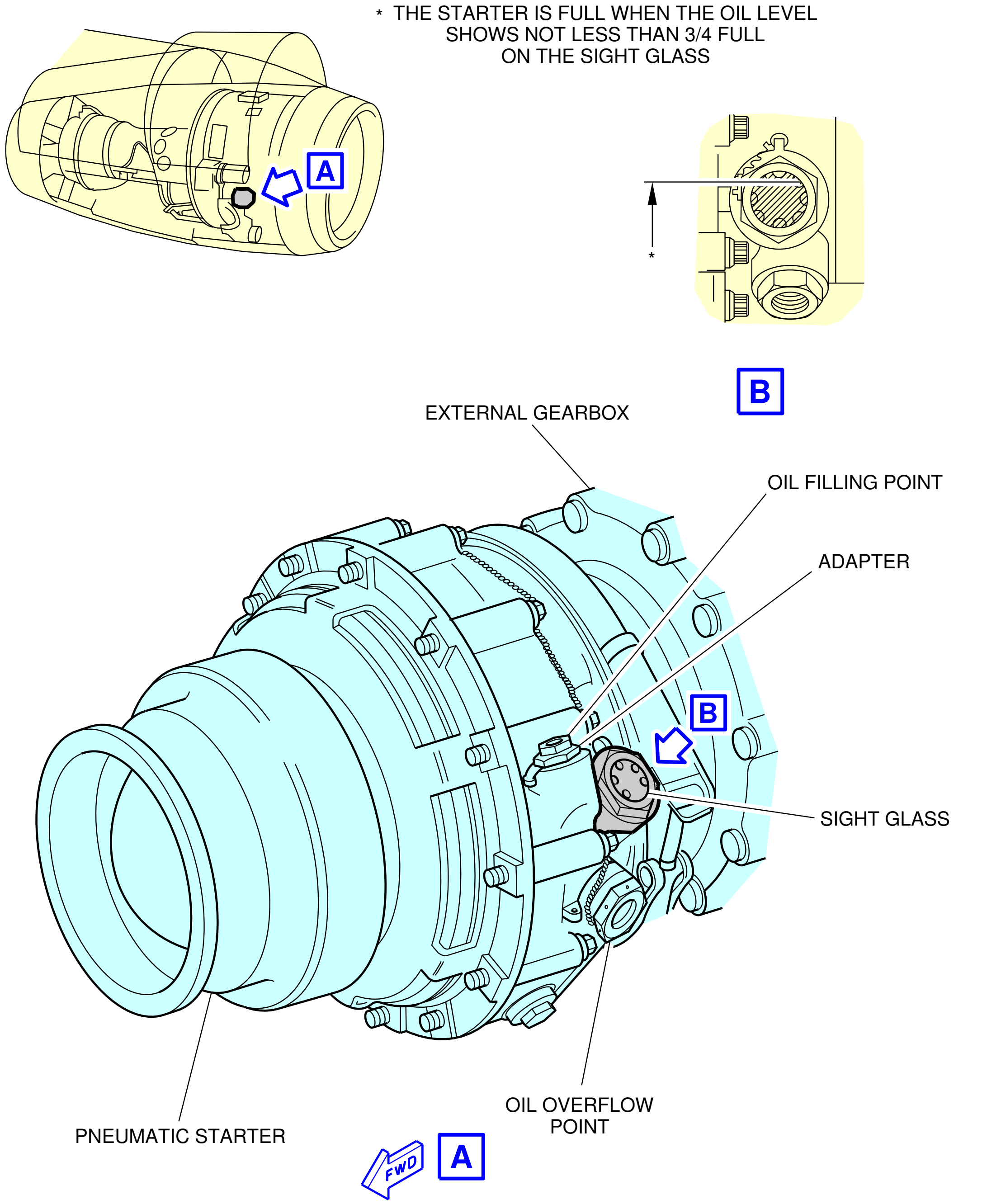
Ground Service Connections
Engine Oil Tank – IAE V2500 Series Engine
FIGURE 4

**ON A/C A321-100 A321-200



Ground Service Connections
IDG Oil Tank – IAE V2500 Series Engine
FIGURE 5

**ON A/C A321-100 A321-200



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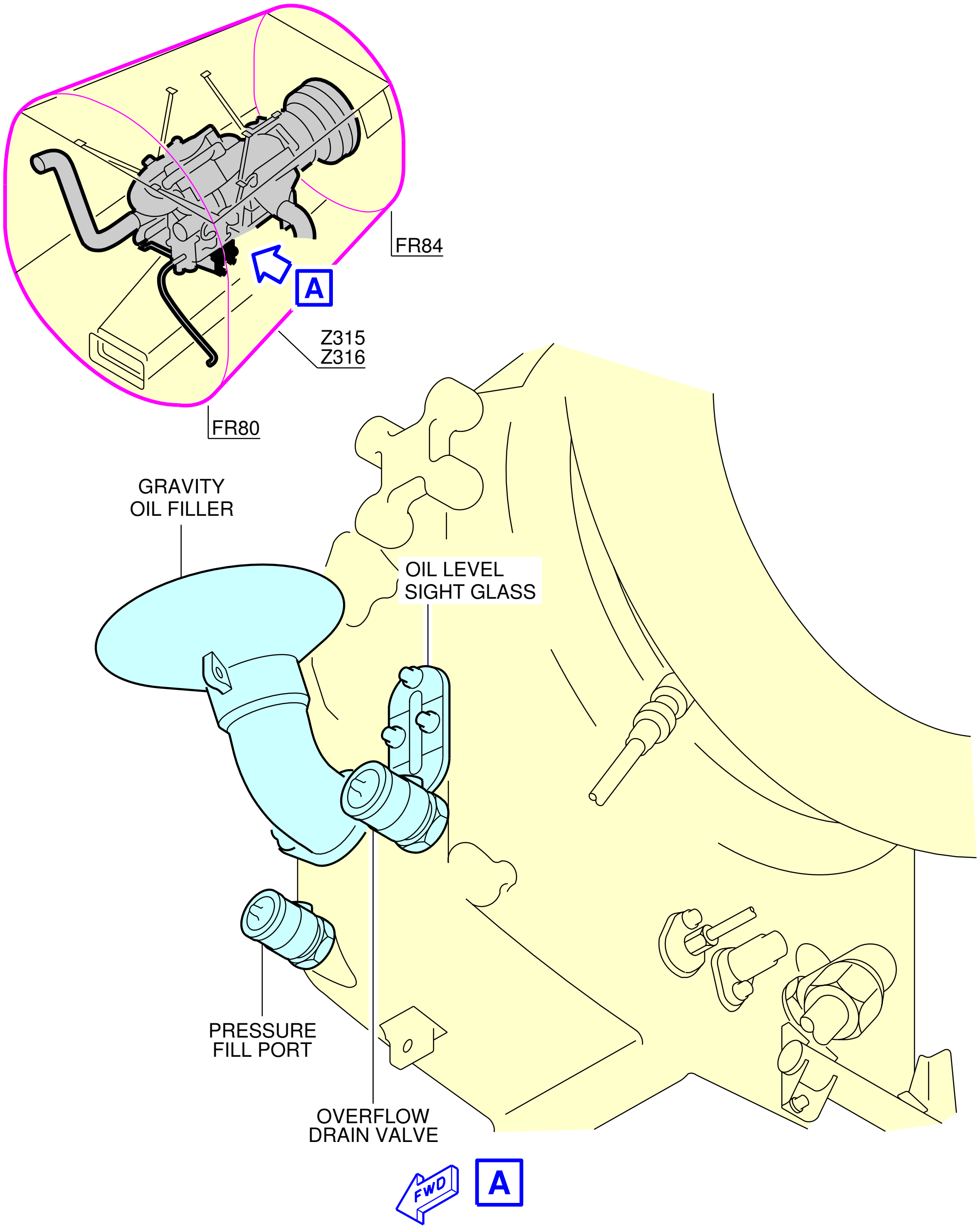
Ground Service Connections
Starter Oil Tank – IAE V2500 Series Engine
FIGURE 6

**ON A/C A321-100 A321-200



Ground Service Connections
APU Oil Tank
FIGURE 7

5-4-10 Vacuum Toilet System

****ON A/C A321-100 A321-200**

Vacuum Toilet System

1. Vacuum Toilet System.

ACCESS	AFT OF NOSE m (ft)	POSITION FROM AIRCRAFT CENTERLINE		MEAN HEIGHT FROM GROUND m (ft)
		R SIDE m (ft)	L SIDE m (ft)	
Waste Water Ground Service Panel: Access door 172AR	38.2 (125.33)	0.8 (2.62)		2.8 (9.18)

NOTE : Distances are approximate

2. Technical Specifications

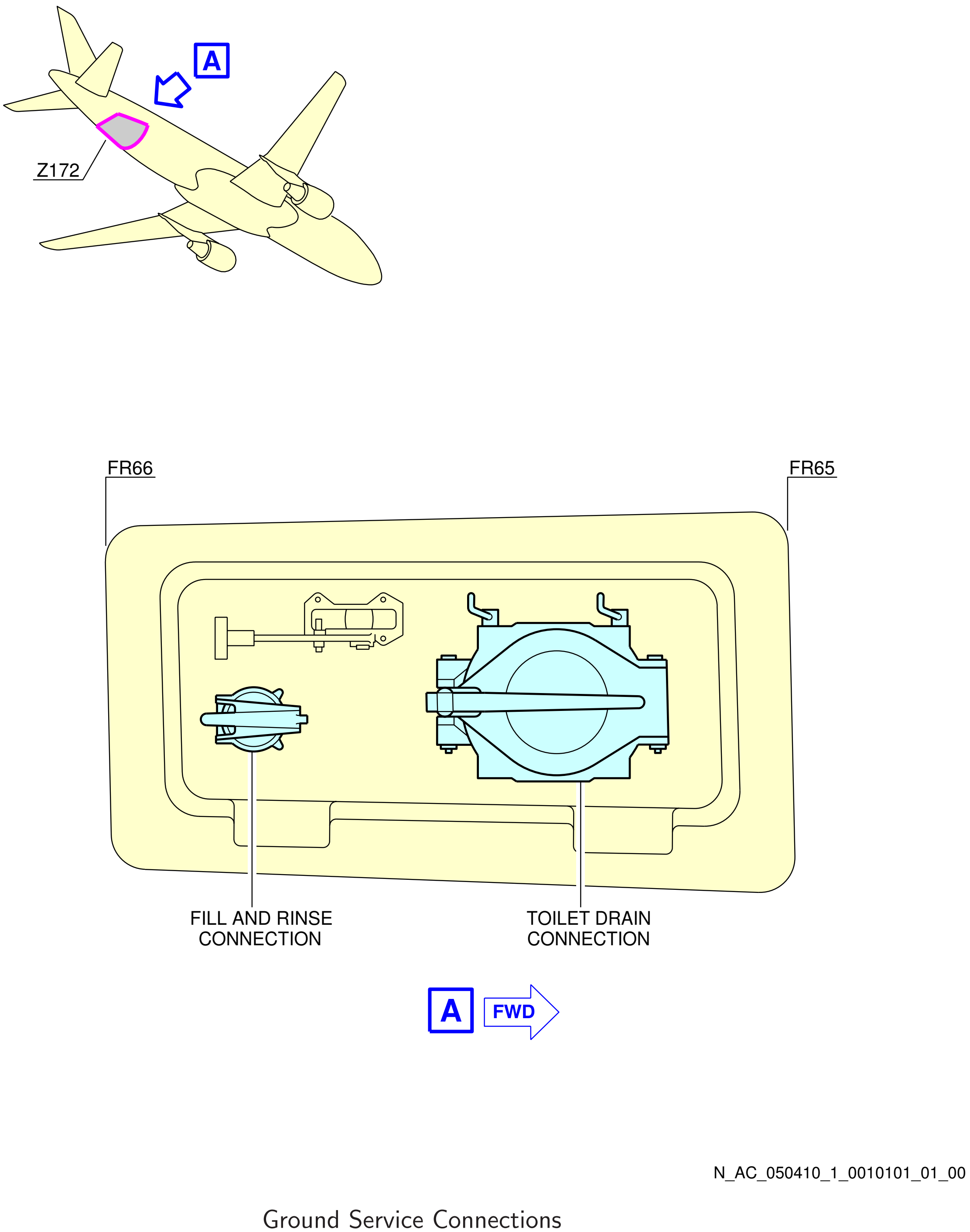
   A. Connectors:
      - Draining: 4 in (ISO 17775).
      - Flushing and filling: 1 in (ISO 17775).

   B. Usable waste tank capacity:
      - Standard configuration - on tank: 177 l (30.91 US gal).

   C. Waste tank - Rinsing:
      - Operating pressure: 3.45 bar (50 psi).

   D. Waste tank - Precharge:
      - 10 l (2.64 US gal).

**ON A/C A321-100 A321-200



Ground Service Connections
Waste Water Ground Service Panel
FIGURE 1

5-5-0 Engine Starting Pneumatic Requirements

****ON A/C A321-100 A321-200**

Engine Starting Pneumatic Requirements

1. Engine Starting Pneumatic Requirements.

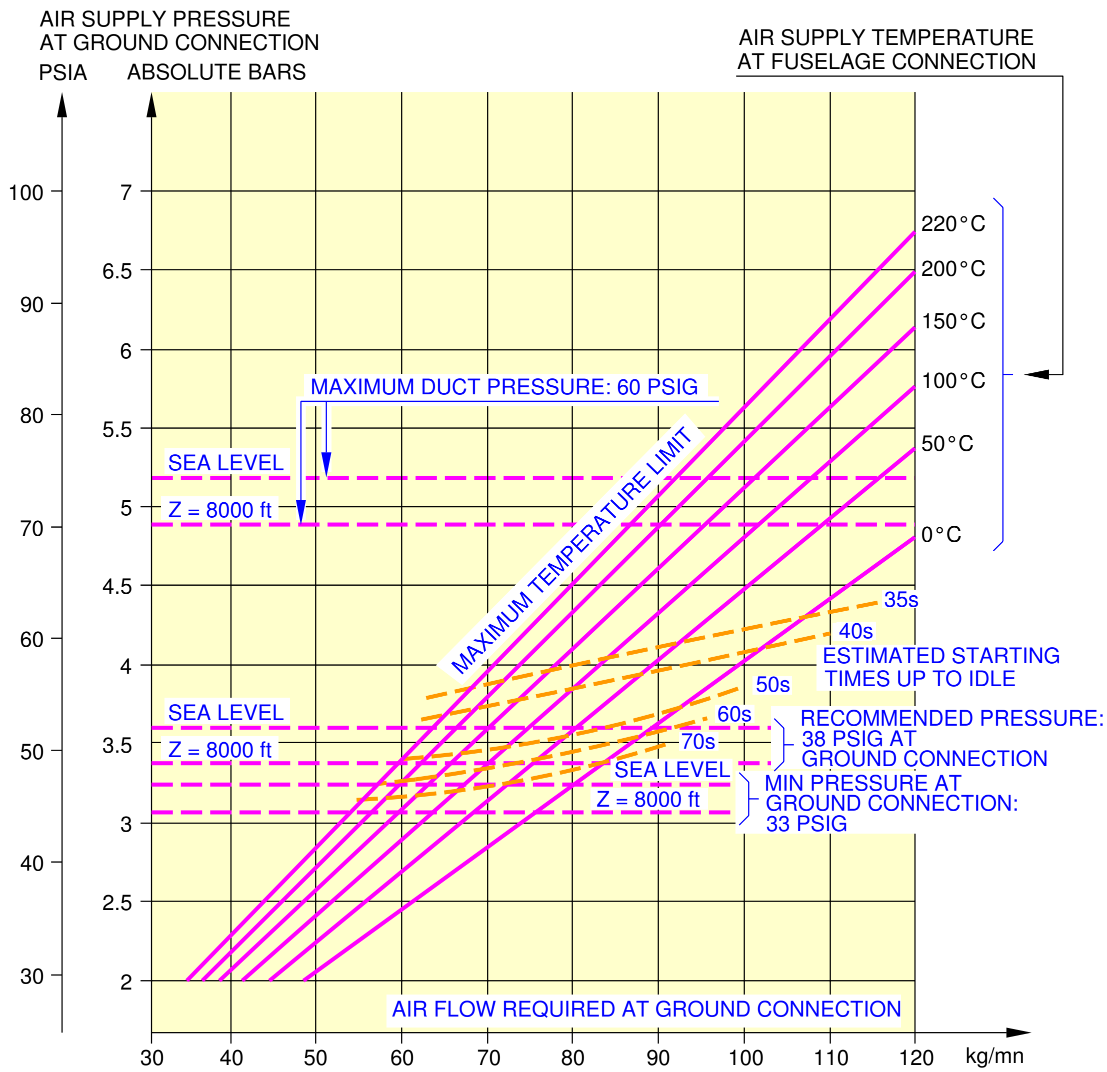
5-5-1 Low Temperatures

****ON A/C A321-100 A321-200**

<u>Low Temperature -40°C (-40°F)</u>

1. This section provides the engine starting pneumatic requirements for a temperature of -40°C (-40°F).

**ON A/C A321-100 A321-200



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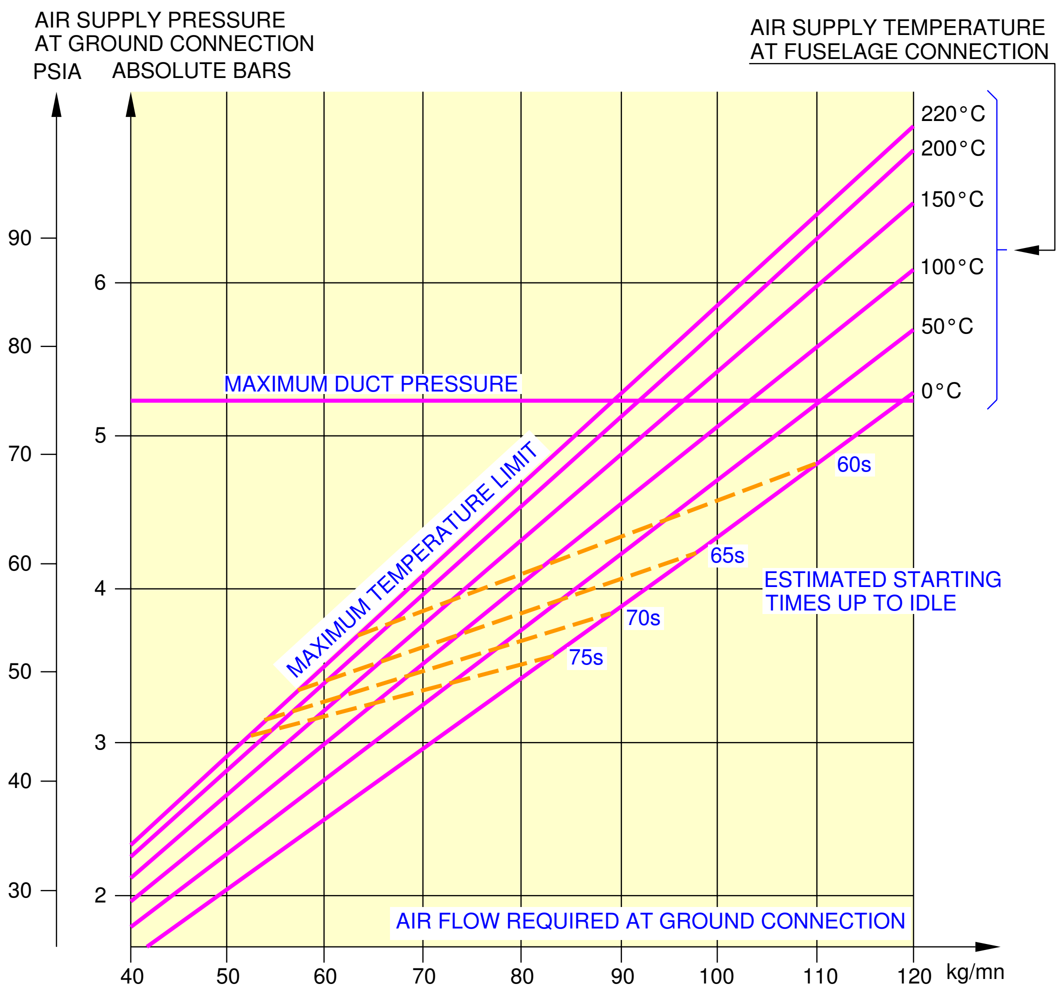
Engine Starting Pneumatic Requirements
Temperature -40°C (-40°F) – CFM56 series engine
FIGURE 1

**ON A/C A321-100 A321-200



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Engine Starting Pneumatic Requirements
Temperature -40 ° C (-40 ° F) – IAE V2500 series engine
FIGURE 2

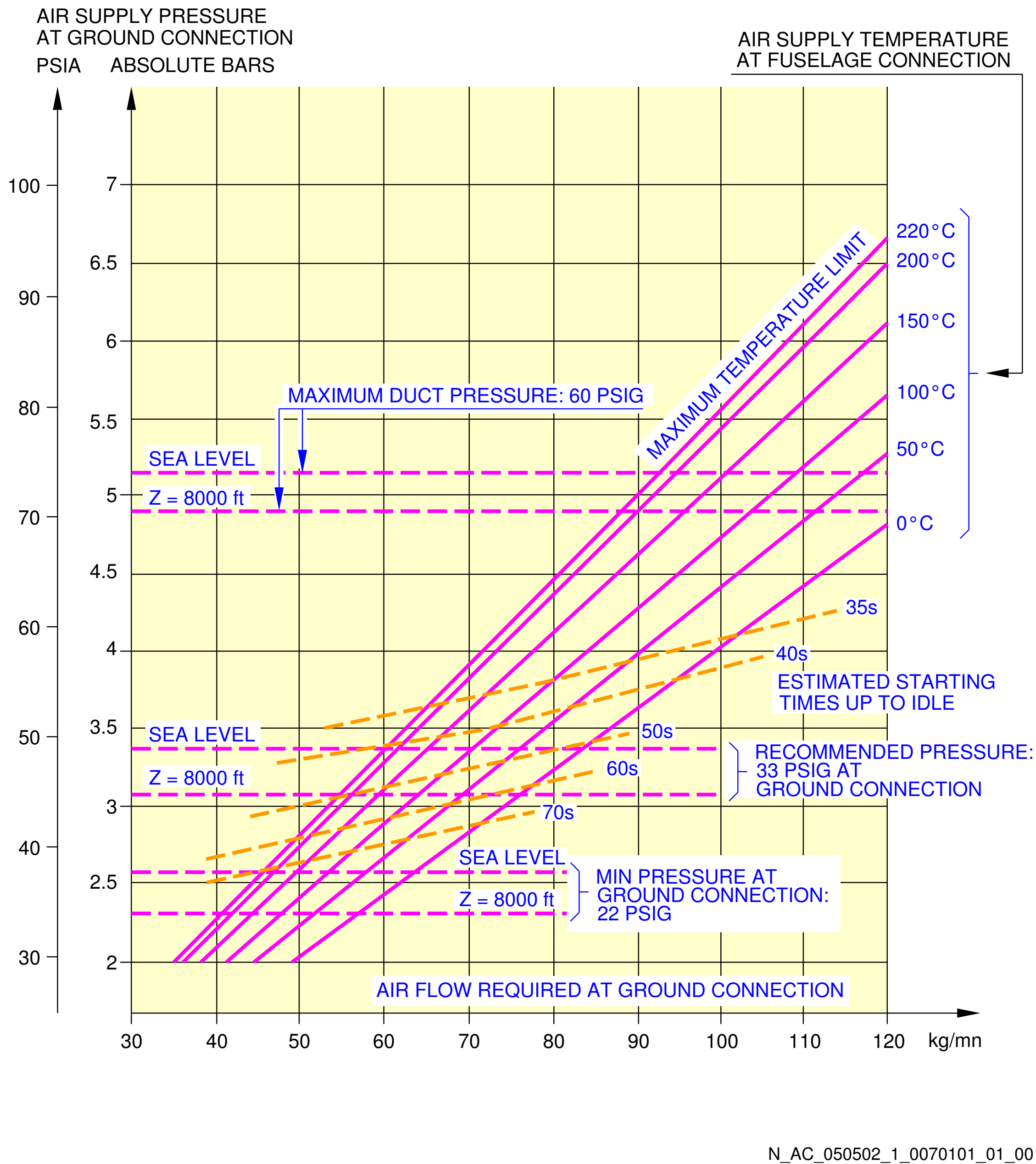
5-5-2 Ambient Temperatures

****ON A/C A321-100 A321-200**

Ambient Temperature +15°C (+59°F)

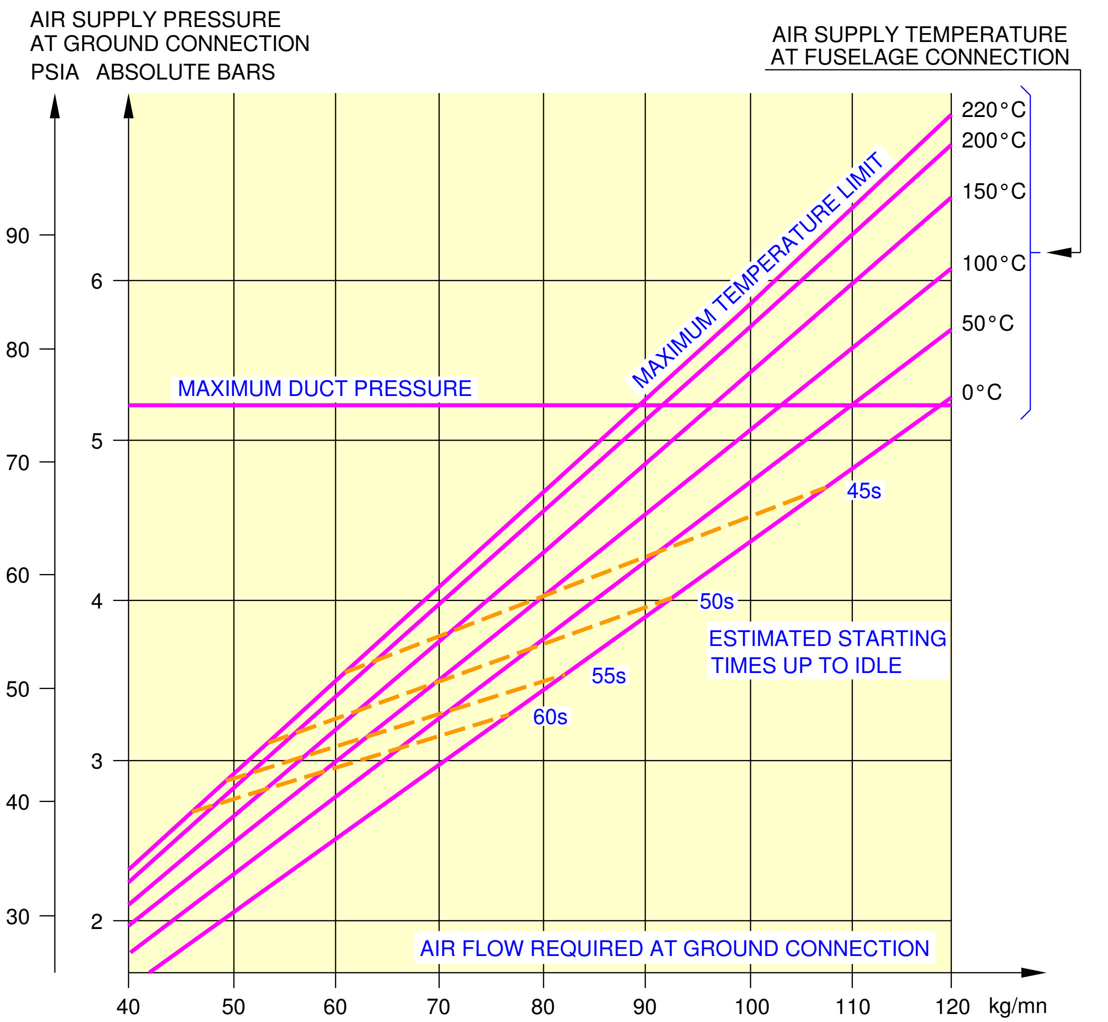
1. This section provides the engine starting pneumatic requirements for a temperature of +15°C (+59°F).

**ON A/C A321-100 A321-200



Engine Starting Pneumatic Requirements
Temperature +15°C (+59°F) – CFM56 series engine
FIGURE 1

**ON A/C A321-100 A321-200



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Engine Starting Pneumatic Requirements
Temperature +15°C (+59°F) – IAE V2500 series engine
FIGURE 2

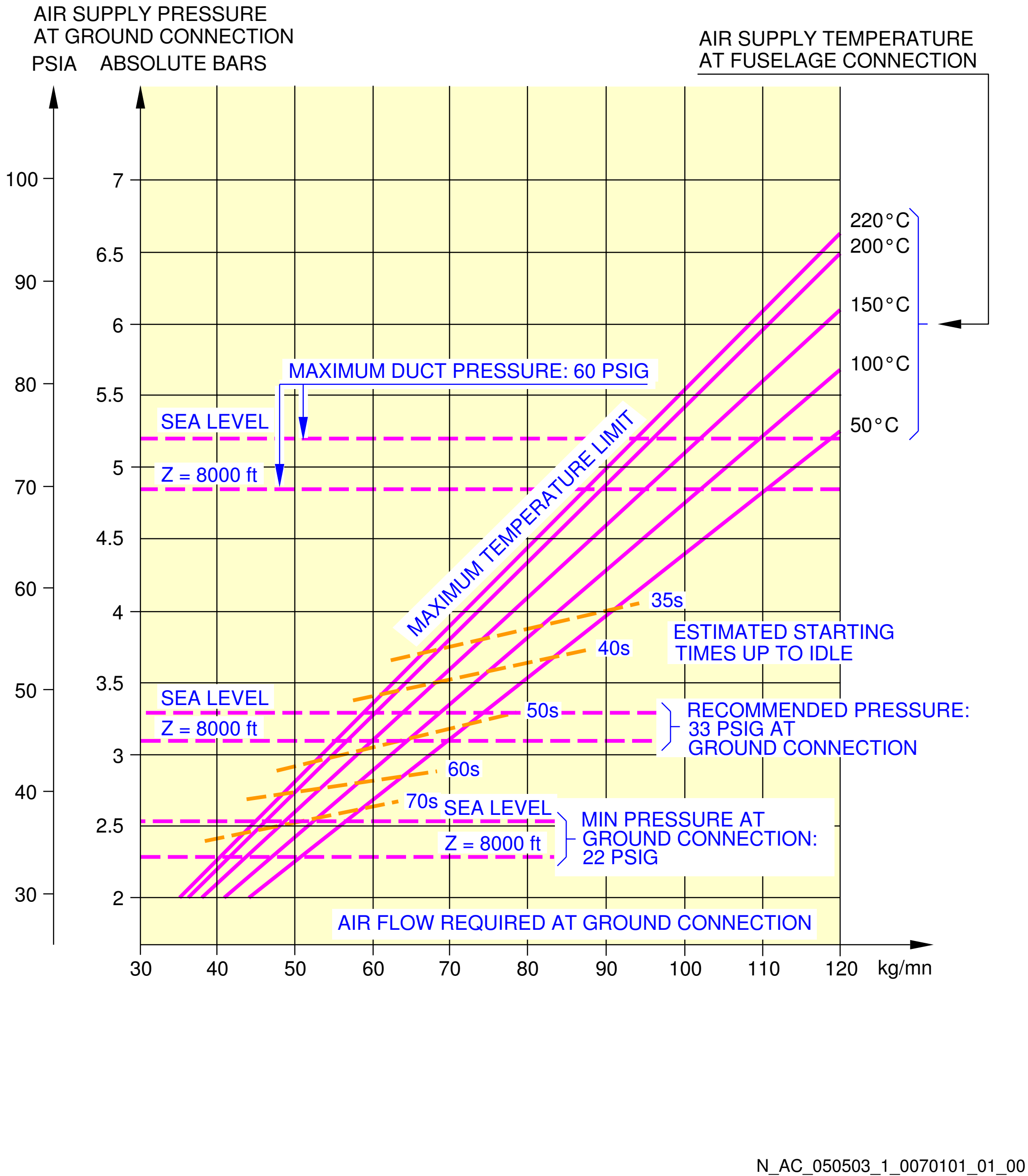
5-5-3 High Temperatures

****ON A/C A321-100 A321-200**

High Temperature +50°C (+122°F) and +55°C (+131°F)

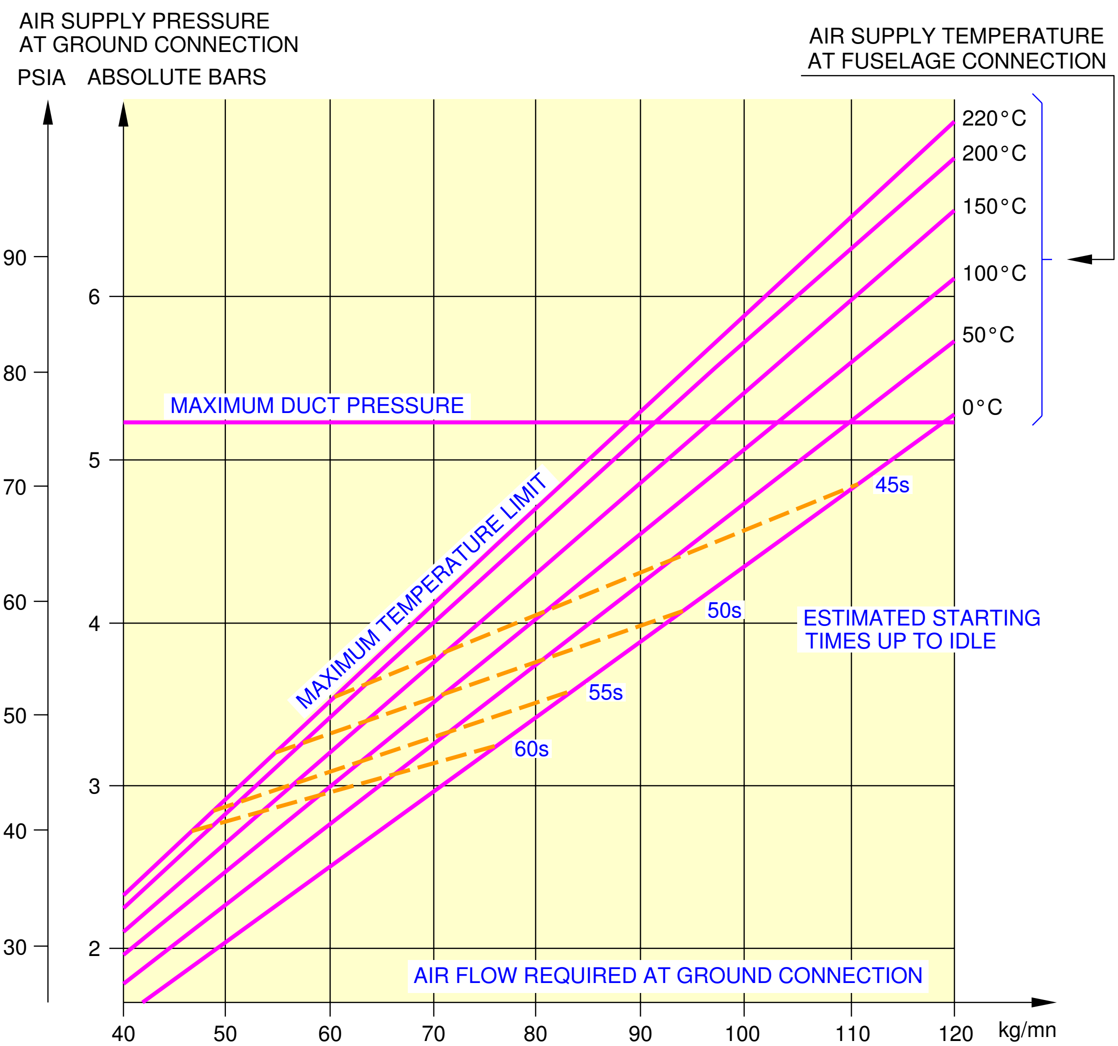
1. This section provides the engine starting pneumatic requirements for a temperature upper:
   - +50°C (+122°F) – IAE V2500
   - +55°C (+131°F) – CFM56

**ON A/C A321-100 A321-200



Engine Starting Pneumatic Requirements
Temperature +55 °C (+131 °F) – CFM56 series engine
FIGURE 1

**ON A/C A321-100 A321-200



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Engine Starting Pneumatic Requirements
Temperature +50°C (+122°F) – IAE V2500 series engine
FIGURE 2

5-6-0 Ground Pneumatic Power Requirements

****ON A/C A321-100 A321-200**

Ground Pneumatic Power Requirements

1. Ground Pneumatic Power Requirements.

FRESH AIRFLOW				PULL UP	PULL DOWN
TOTAL		CABIN		TIME T	TIME T
(kg/s)	(lb/s)	(kg/s)	(lb/s)	(min.)	(min.)
0.5	1.10	0.449	0.990	after 60 min. 8.0 °C	–
0.6	1.32	0.539	1.188	after 60 min. 11.9 °C	–
0.7	1.54	0.628	1.385	after 60 min. 15.5 °C	–
0.8	1.76	0.718	1.583	after 60 min. 18.8 °C	–
0.9	1.98	0.808	1.781	58.0	after 60 min. 31.1 °C
1.0	2.20	0.898	1.980	51.0	after 60 min. 29.6 °C
1.1	2.43	0.988	2.178	45.0	after 60 min. 28.2 °C
1.2	2.65	1.077	2.374	40.5	58.5
1.3	2.87	1.167	2.573	36.5	46.0
1.4	3.09	1.257	2.771	33.0	37.5
1.5	3.31	1.347	2.970	30.0	31.0

NOTE : Data for unstabilized conditions see 5-6-1 and 5-6-2.

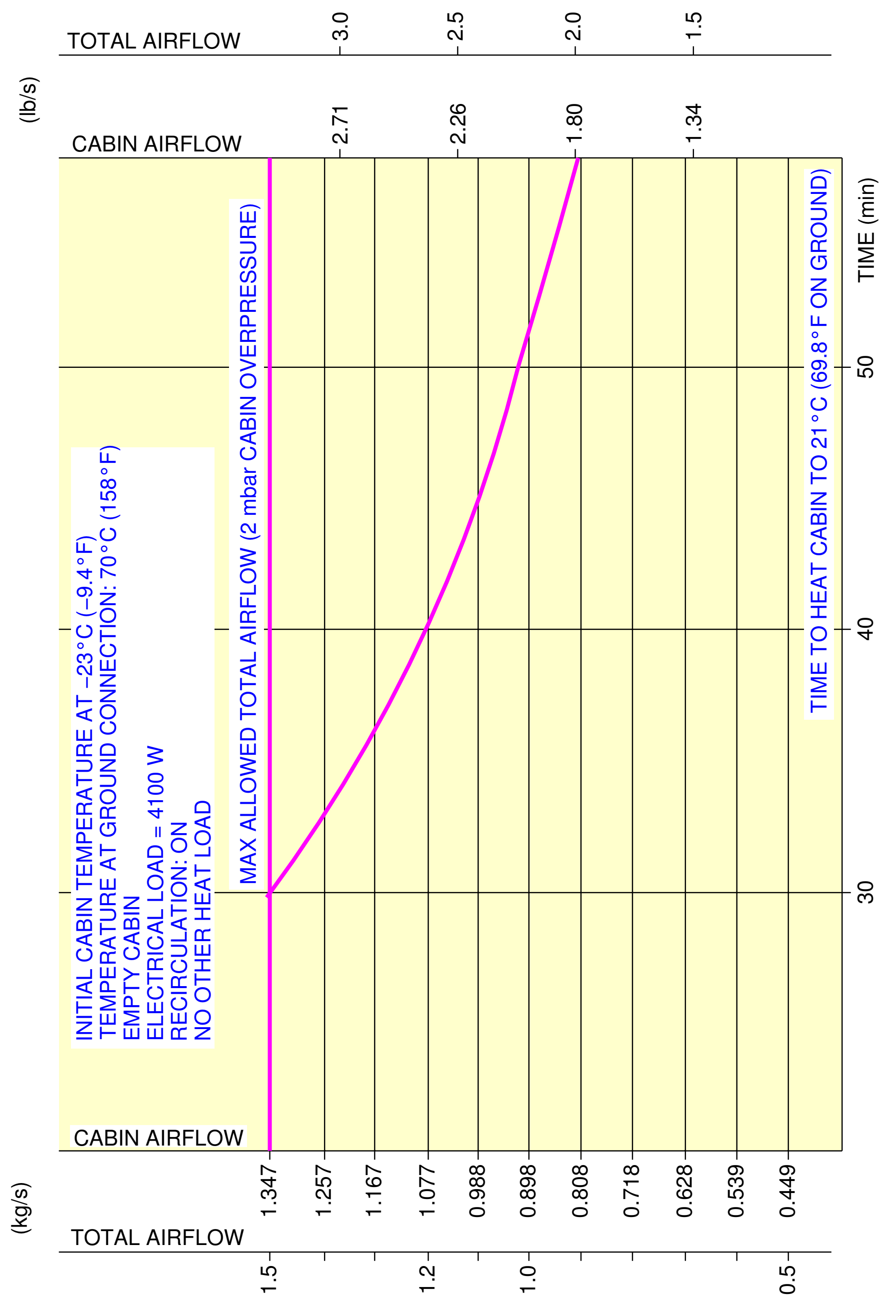
5-6-1 Heating

****ON A/C A321-100 A321-200**

Heating

1. This section provides the ground pneumatic power requirements heating.

**ON A/C A321-100 A321-200



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Ground Pneumatic Power Requirements
Heating
FIGURE 1

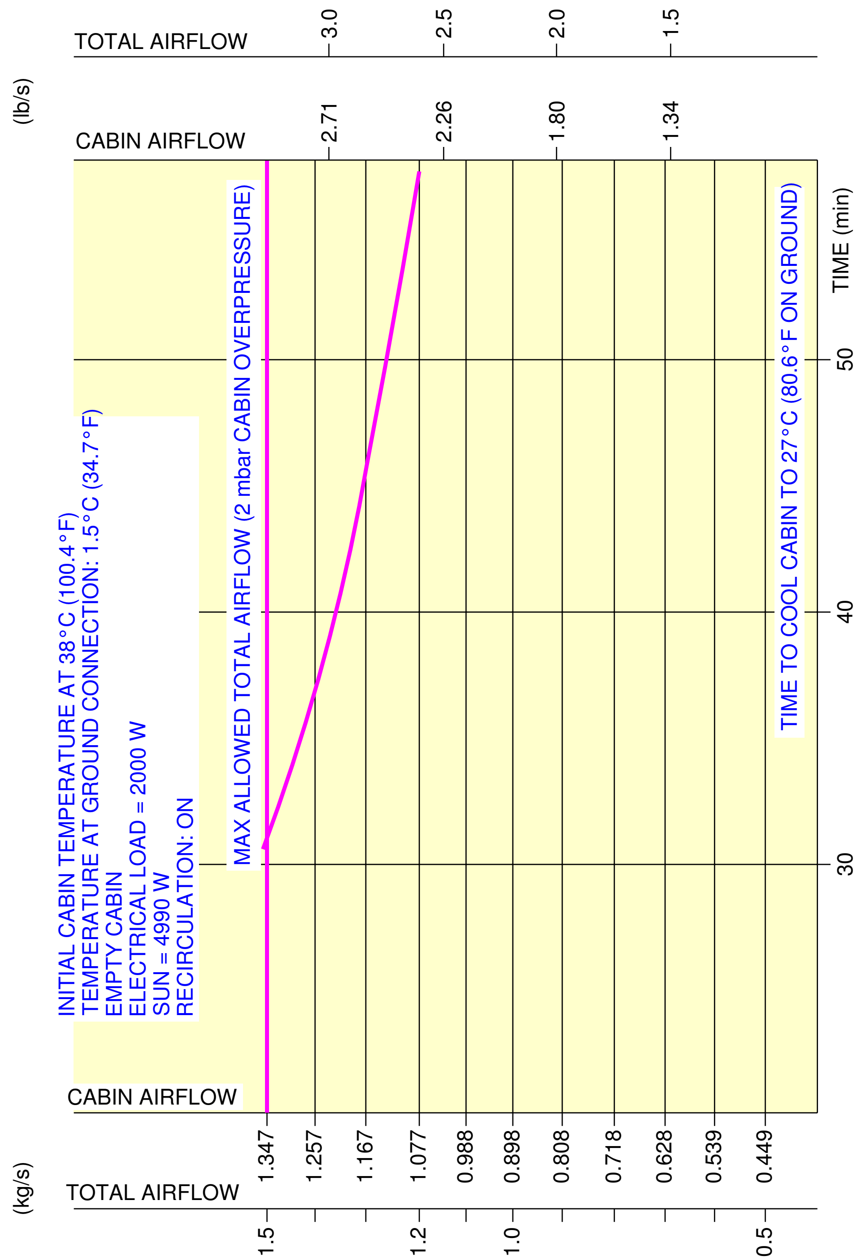
5-6-2 Cooling

ON A/C A321-100 A321-200

Cooling

1. This section provides the ground pneumatic power requirements cooling.

****ON A/C A321-100 A321-200**



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Ground Pneumatic Power Requirements
Cooling
FIGURE 1

5-7-0 Preconditioned Airflow Requirements

****ON A/C A321-100 A321-200**

Preconditioned Airflow Requirements

1. This section gives the preconditioned airflow requirements for cabin air conditioning.
   A. Preconditioned Airflow Requirements.

FRESH AIRFLOW				CURVE 1	
TOTAL		CABIN		T FL	
(kg/s)	(lb/s)	(kg/s)	(lb/s)	(˚C)	(˚F)
0.5	1.10	0.449	0.990	-56.4	-69.5
0.6	1.32	0.539	1.188	-41.8	-43.2
0.7	1.54	0.628	1.385	-31.3	-24.3
0.8	1.76	0.718	1.583	-23.5	-10.3
0.9	1.98	0.808	1.781	-17.5	0.5
1.0	2.20	0.898	1.980	-12.7	9.1
1.1	2.43	0.988	2.178	-8.8	16.2
1.2	2.65	1.077	2.374	-5.5	22.1
1.3	2.87	1.167	2.573	-2.7	27.1
1.4	3.09	1.257	2.771	-0.4	31.3
1.5	3.31	1.347	2.970	1.7	35.1

NOTE : Data for stabilized conditions see 5-7-0.

   B. Preconditioned Airflow Requirements.

FRESH AIRFLOW				CURVE 2	
TOTAL		CABIN		T FL	
(kg/s)	(lb/s)	(kg/s)	(lb/s)	(˚C)	(˚F)
0.5	1.10	0.449	0.990	32.6	90.7
0.6	1.32	0.539	1.188	30.5	86.9
0.7	1.54	0.628	1.385	29.0	84.2
0.8	1.76	0.718	1.583	27.9	82.2
0.9	1.98	0.808	1.781	27.1	80.8
1.0	2.20	0.898	1.980	26.4	79.5
1.1	2.43	0.988	2.178	25.9	78.6
1.2	2.65	1.077	2.374	25.4	77.7
1.3	2.87	1.167	2.573	25.0	77.0
1.4	3.09	1.257	2.771	24.7	76.5

FRESH AIRFLOW				CURVE 2	
TOTAL		CABIN		T FL	
(kg/s)	(lb/s)	(kg/s)	(lb/s)	(˚C)	(˚F)
1.5	3.31	1.347	2.970	24.4	75.9

NOTE : Data for stabilized conditions see 5-7-0.

C. Preconditioned Airflow Requirements.

FRESH AIRFLOW				CURVE 3	
TOTAL		CABIN		T FL	
(kg/s)	(lb/s)	(kg/s)	(lb/s)	(˚C)	(˚F)
0.5	1.10	0.449	0.990	38.4	101.1
0.6	1.32	0.539	1.188	35.3	95.5
0.7	1.54	0.628	1.385	33.1	91.6
0.8	1.76	0.718	1.583	31.5	88.7
0.9	1.98	0.808	1.781	30.2	86.4
1.0	2.20	0.898	1.980	29.2	84.6
1.1	2.43	0.988	2.178	28.4	83.1
1.2	2.65	1.077	2.374	27.7	81.9
1.3	2.87	1.167	2.573	27.1	80.8
1.4	3.09	1.257	2.771	26.6	79.9
1.5	3.31	1.347	2.970	26.2	79.2

NOTE : Data for stabilized conditions see 5-7-0.

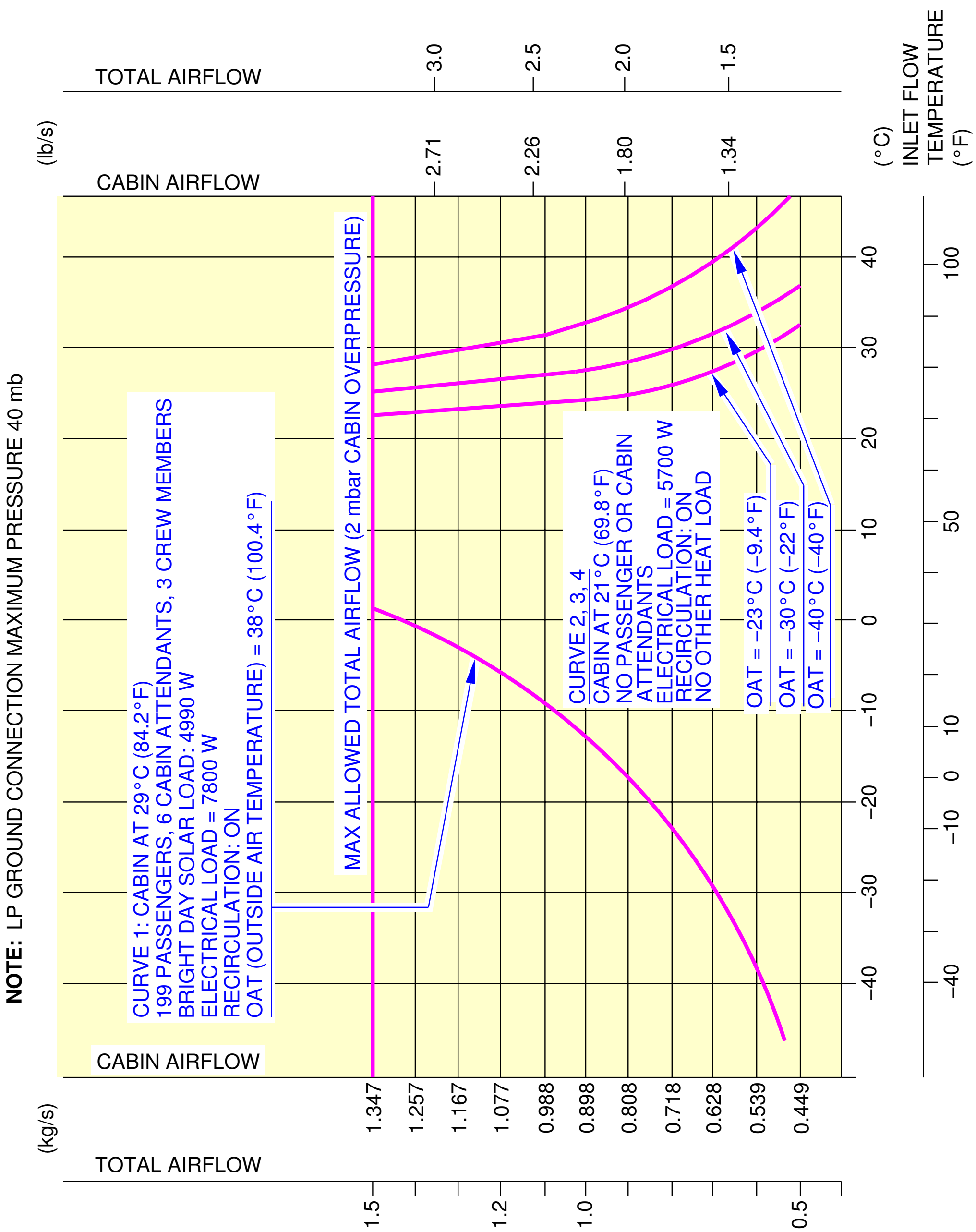
D. Preconditioned Airflow Requirements.

FRESH AIRFLOW				CURVE 4	
TOTAL		CABIN		T FL	
(kg/s)	(lb/s)	(kg/s)	(lb/s)	(˚C)	(˚F)
0.5	1.10	0.449	0.990	46.6	115.9
0.6	1.32	0.539	1.188	42.2	108.0
0.7	1.54	0.628	1.385	39.0	102.2
0.8	1.76	0.718	1.583	36.6	97.9
0.9	1.98	0.808	1.781	34.7	94.5
1.0	2.20	0.898	1.980	33.2	91.8
1.1	2.43	0.988	2.178	32.0	89.6
1.2	2.65	1.077	2.374	31.0	87.8
1.3	2.87	1.167	2.573	30.2	86.4
1.4	3.09	1.257	2.771	29.5	85.1

FRESH AIRFLOW				CURVE 4	
TOTAL		CABIN		T FL	
(kg/s)	(lb/s)	(kg/s)	(lb/s)	(°C)	(°F)
1.5	3.31	1.347	2.970	28.8	83.8

NOTE : Data for stabilized conditions see 5-7-0.

**ON A/C A321-100 A321-200



Preconditioned Airflow Requirements
FIGURE 1

5-8-0 Ground Towing Requirements

****ON A/C A321-100 A321-200**

Ground Towing Requirements

1. General

This section provides information on aircraft towing.
This aircraft is designed with means for conventional or towbarless towing.
Information/procedures can be found for both in chapter 9 of the Aircraft Maintenance Manual.
Status on towbarless towing equipment qualification can be found in SIL 09-002.
It is possible to tow or push the aircraft, at maximum ramp weight with engines at zero or up to idle thrust, using a tow bar attached to the nose gear leg (refer to AMM chap 9 for conditions and limitations).
One tow bar fitting is installed at the front of the leg.
The main landing gears have attachment points for towing or debogging (for details, refer to chapter 07 of the Aircraft Recovery Manual).

A. The first part of this section shows the chart to determine the draw bar pull and tow tractor mass requirements as function of the following physical characteristics:
   - Aircraft weight
   - Number of engines at idle
   - Slope.

   The chart is based on the engine type with the highest idle thrust level.

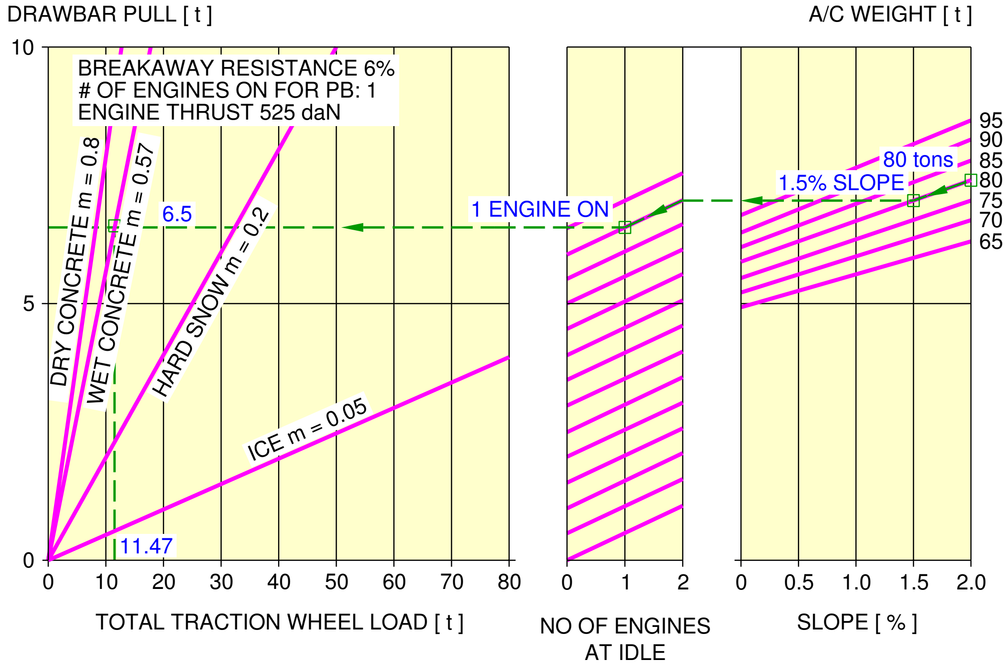
B. The second part of this section supplies guidelines for the tow bar.
   The aircraft tow bar shall respect the following norms:
   - SAE AS 1614, "Main Line Aircraft Tow Bar Attach Fitting Interface"
   - SAE ARP1915 Revision C, "Aircraft Tow Bar"
   - ISO 8267-1, "Aircraft - Tow bar attachment fitting - Interface requirements - Part 1: Main line aircraft"
   - ISO 9667, "Aircraft ground support equipment - Tow bars"
   - IATA Airport Handling Manual AHM 958, "Functional Specification for an Aircraft Tow bar".

   A conventional type tow bar is required which should be equipped with a damping system to protect the nose gear against jerks and with towing shear pins:
   - A traction shear pin calibrated at 9425 daN (21188 lbf)
   - A torsion pin calibrated at 826 m.daN (7311 lbf.in).

   The towing head is designed according to SAE/AS 1614 (issue C) cat. I.

   NOTE : Information on aircraft towing procedures and corresponding aircraft limitations are given in chapter 9 on the Aircraft Maintenance Manual.

**ON A/C A321-100 A321-200



EXAMPLE HOW TO DETERMINE THE MASS REQUIREMENT TO TOW A A321 AT 80 t, AT 1.5% SLOPE, 1 ENGINE AT IDLE AND FOR WET TARMAC CONDITIONS:

- ON THE RIGHT HAND SIDE OF THE GRAPH, CHOOSE THE RELEVANT AIRCRAFT WEIGHT (80 t)
- FROM THIS POINT DRAW A PARALLEL LINE TO THE REQUIRED SLOPE PERCENTAGE (1.5%)
- FROM THE POINT OBTAINED DRAW A STRAIGHT HORIZONTAL LINE UNTIL NO OF ENGINES AT IDLE = 2
- FROM THIS POINT DRAW A PARALLEL LINE TO THE REQUESTED NUMBER OF ENGINES (1)
- FROM THIS POINT DRAW A STRAIGHT HORIZONTAL LINE TO THE DRAWBAR PULL AXIS
- THE Y–COORDINATE OBTAINED IS THE NECESSARY DRAWBAR PULL FOR THE TRACTOR (6.5 t)
- SEARCH THE INTERSECTION WITH THE "WET CONCRETE" LINE. THE OBTAINED X–COORDINATE IS THE RECOMMENDED MINIMUM TRACTOR WEIGHT (11.5 t)

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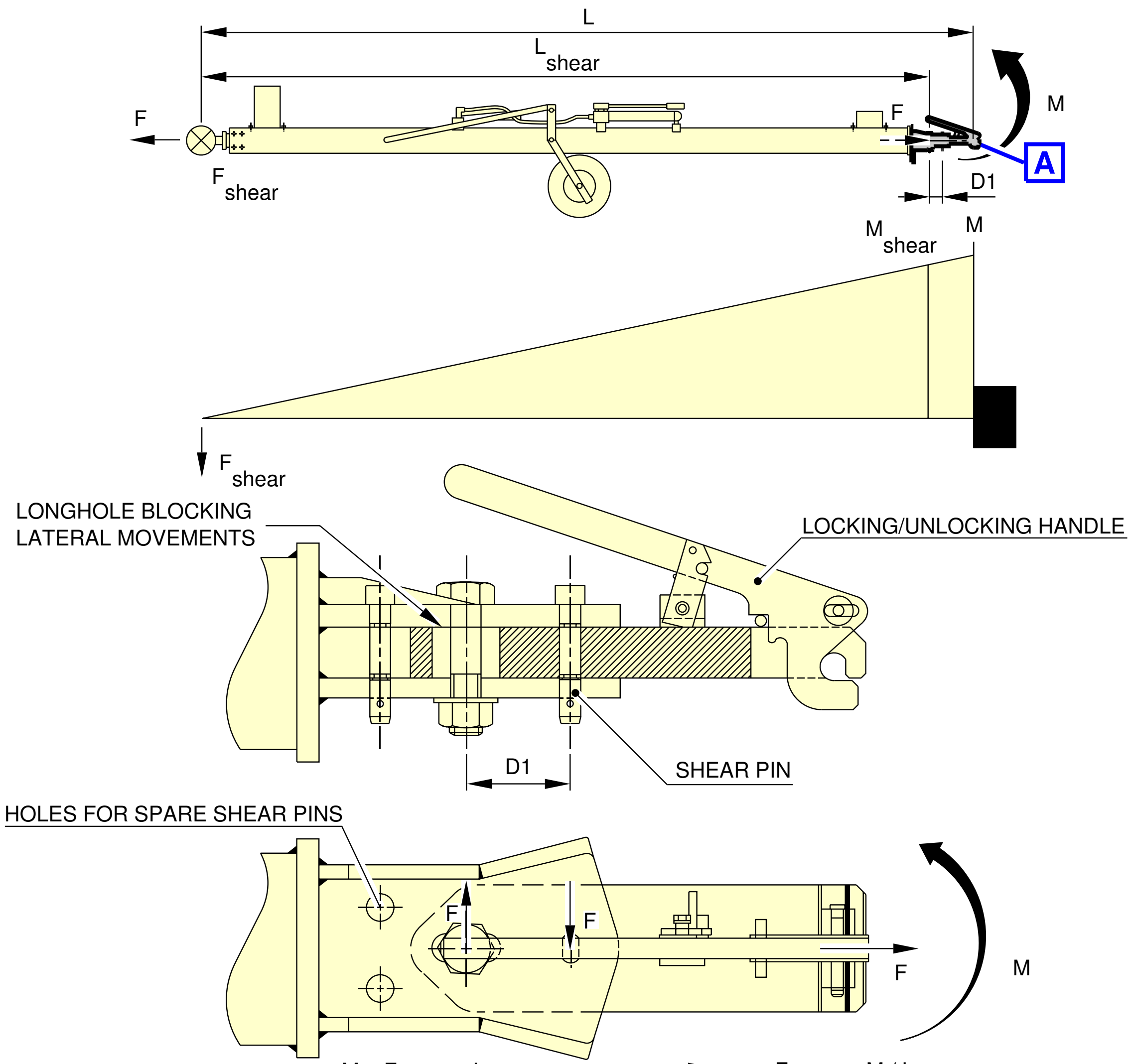
Ground Towing Requirements
FIGURE 1

**ON A/C A321-100 A321-200



$M = F_{shear} \times L \rightarrow F_{shear} = M / L$

$M_{shear} = F_{shear} \times L_{shear} \rightarrow M_{shear} = (M/L) \times L_{shear}$

$M_{shear} = F \times D1 \; (M_{shear} < M)$

$D1 = (M/L) \times L_{shear} / F \rightarrow D1 = (M \times L_{shear} / (F \times L)$

A

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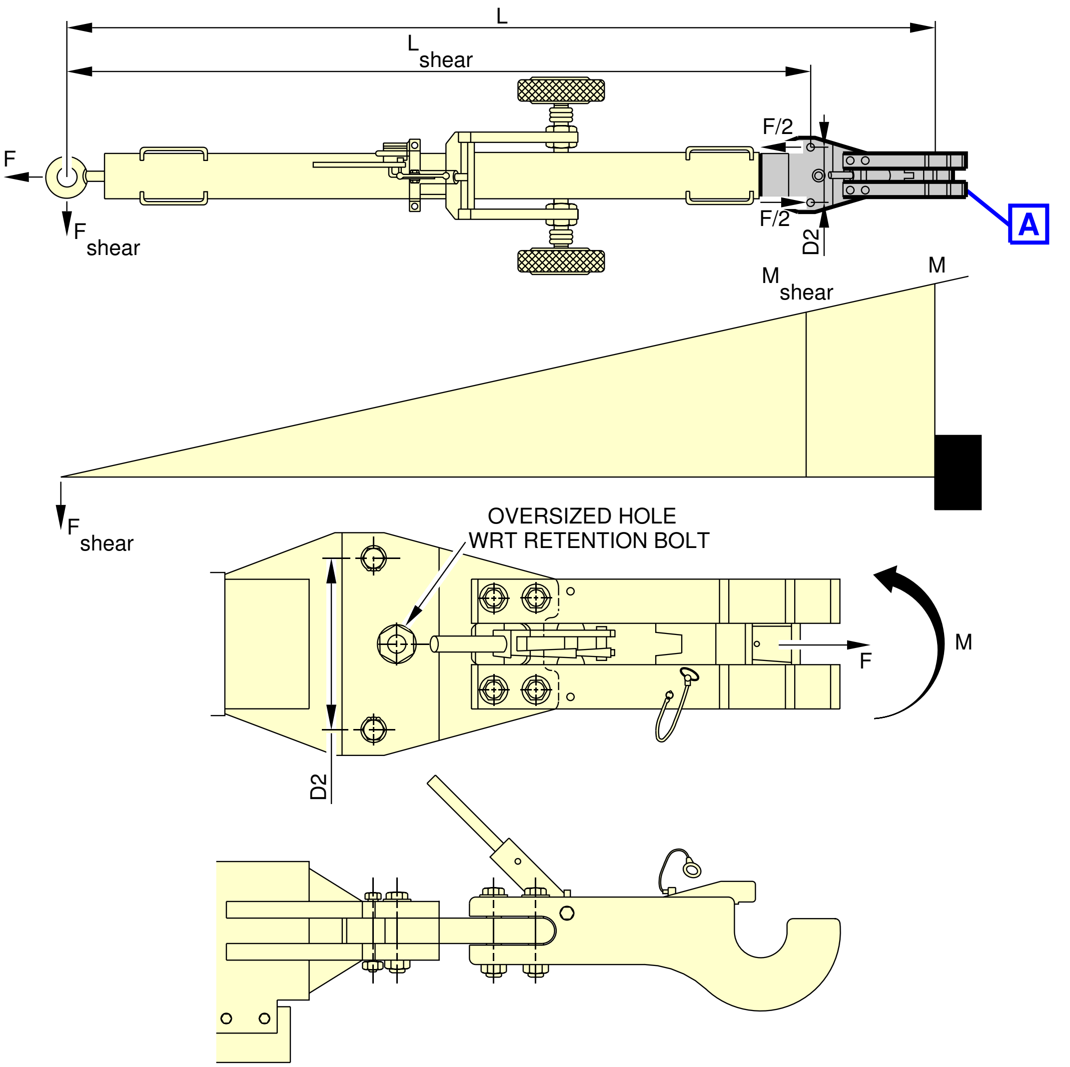
Ground Towing Requirements
Typical Tow Bar Configuration 1
FIGURE 2

**ON A/C A321-100 A321-200



$M = F_{shear} \times L \rightarrow F_{shear} = M / L$

$M_{shear} = F_{shear} \times L_{shear} \rightarrow M_{shear} = (M / L) \times L_{shear}$

$M_{shear} = F/2 \times D2$ ($M_{shear} < M$)

$D2 = (2 \times M_{shear}) / F \rightarrow D2 = (2 \times M \times L_{shear}) / (F \times L)$

F [daN]	M [m.daN]	D1 [mm]	D2 [mm]
9425	826	78.9	168.3

RESULTS FOR A TOWBAR LENGTH OF $L_{shear}/L = 0.90$

A

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Ground Towing Requirements
Typical Tow Bar Configuration 2
FIGURE 3

OPERATING CONDITIONS

6-1-0 Engine Exhaust Velocities and Temperatures

****ON A/C A321-100 A321-200**

Engine Exhaust Velocities and Temperatures

1. General
   This section shows the estimated engine exhaust efflux velocities and temperatures contours for Ground Idle, Breakaway, Maximum Takeoff conditions.

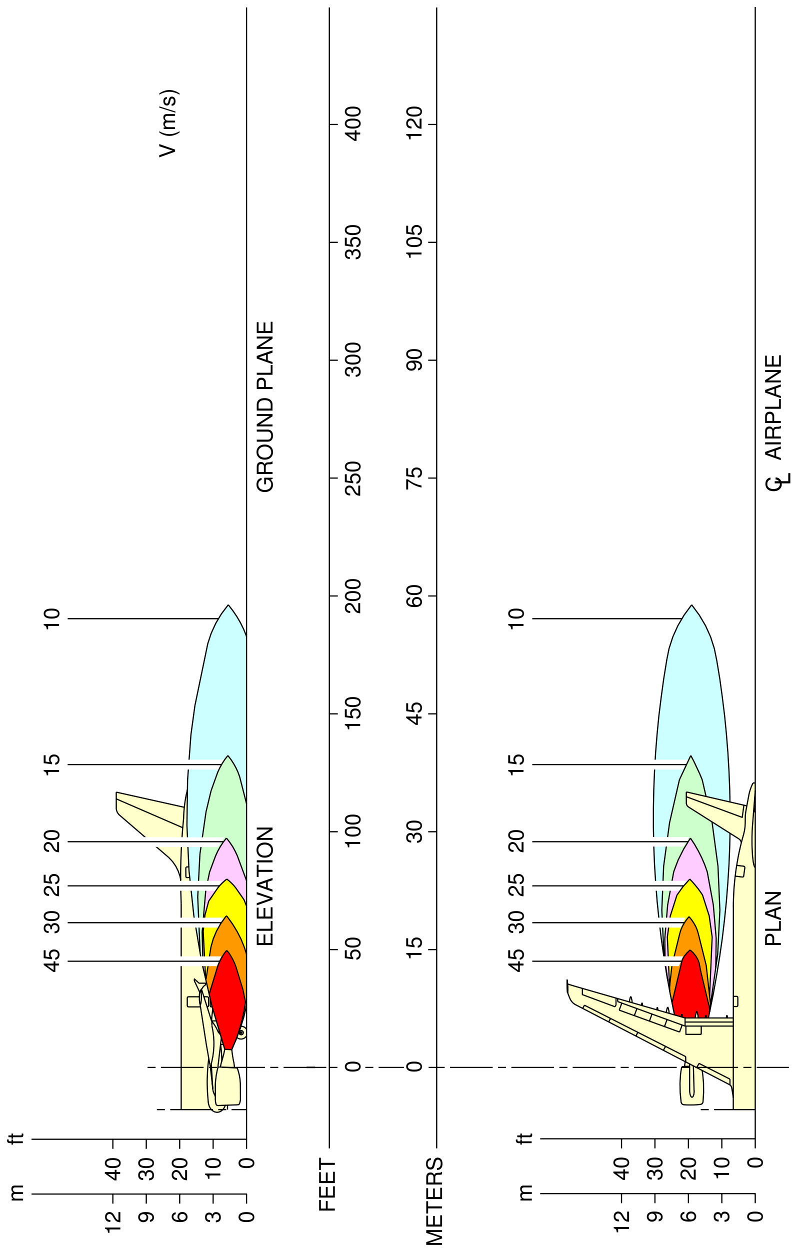
6-1-1 Engine Exhaust Velocities Contours - Ground Idle Power

****ON A/C A321-100 A321-200**

Engine Exhaust Velocities Contours - Ground Idle Power

1. This section gives engine exhaust velocities contours at ground idle power.

**ON A/C A321-100 A321-200



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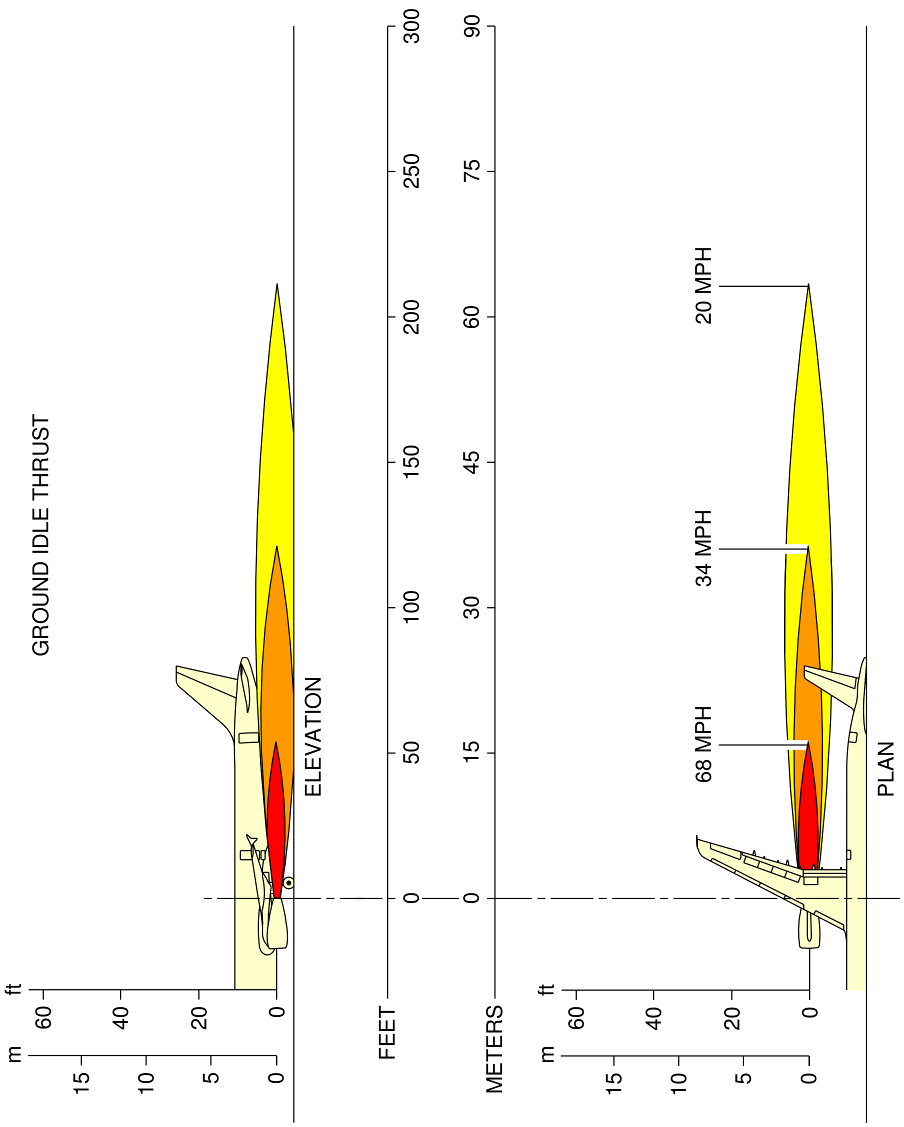
Engine Exhaust Velocities
Ground Idle Power – CFM56-5B series engine
FIGURE 1

**ON A/C A321-100 A321-200



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Engine Exhaust Velocities
Ground Idle Power – IAE V2500 series engine
FIGURE 2

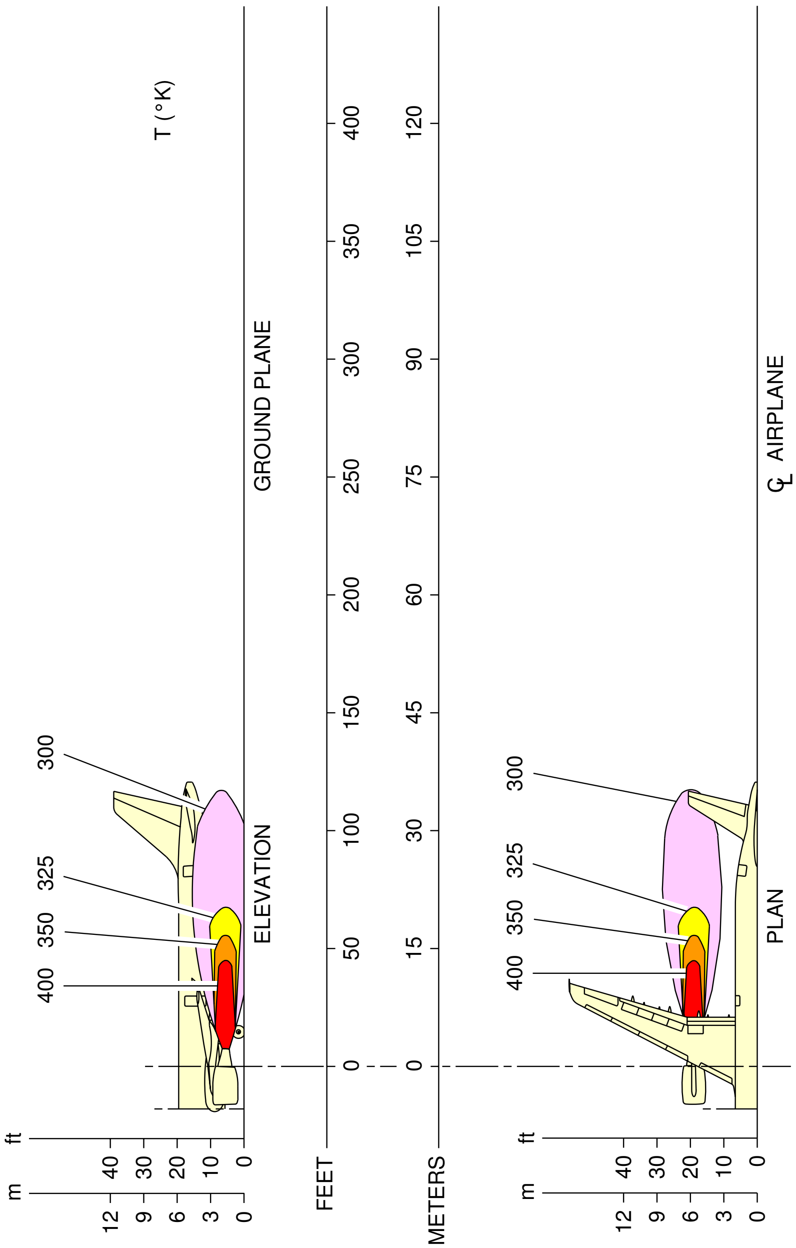
6-1-2 Engine Exhaust Temperatures Contours - Ground Idle Power

****ON A/C A321-100 A321-200**

Engine Exhaust Temperatures Contours - Ground Idle Power

1. This section gives engine exhaust temperatures contours at ground idle power.

****ON A/C A321-100 A321-200**



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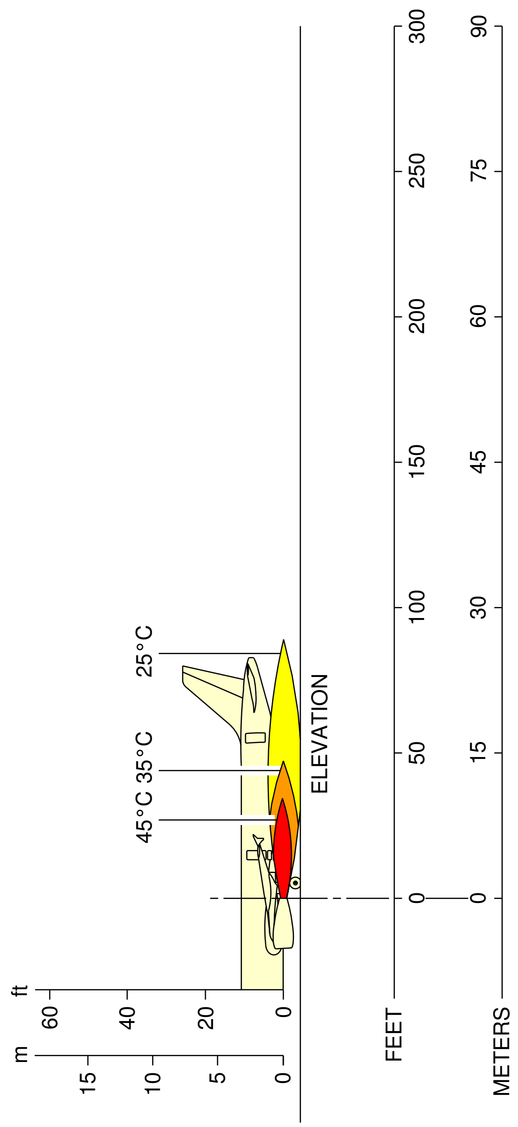
Engine Exhaust Temperatures
Ground Idle Power – CFM56-5B series engine
FIGURE 1

**ON A/C A321-100 A321-200



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Engine Exhaust Temperatures
Ground Idle Power – IAE V2500 series engine
FIGURE 2

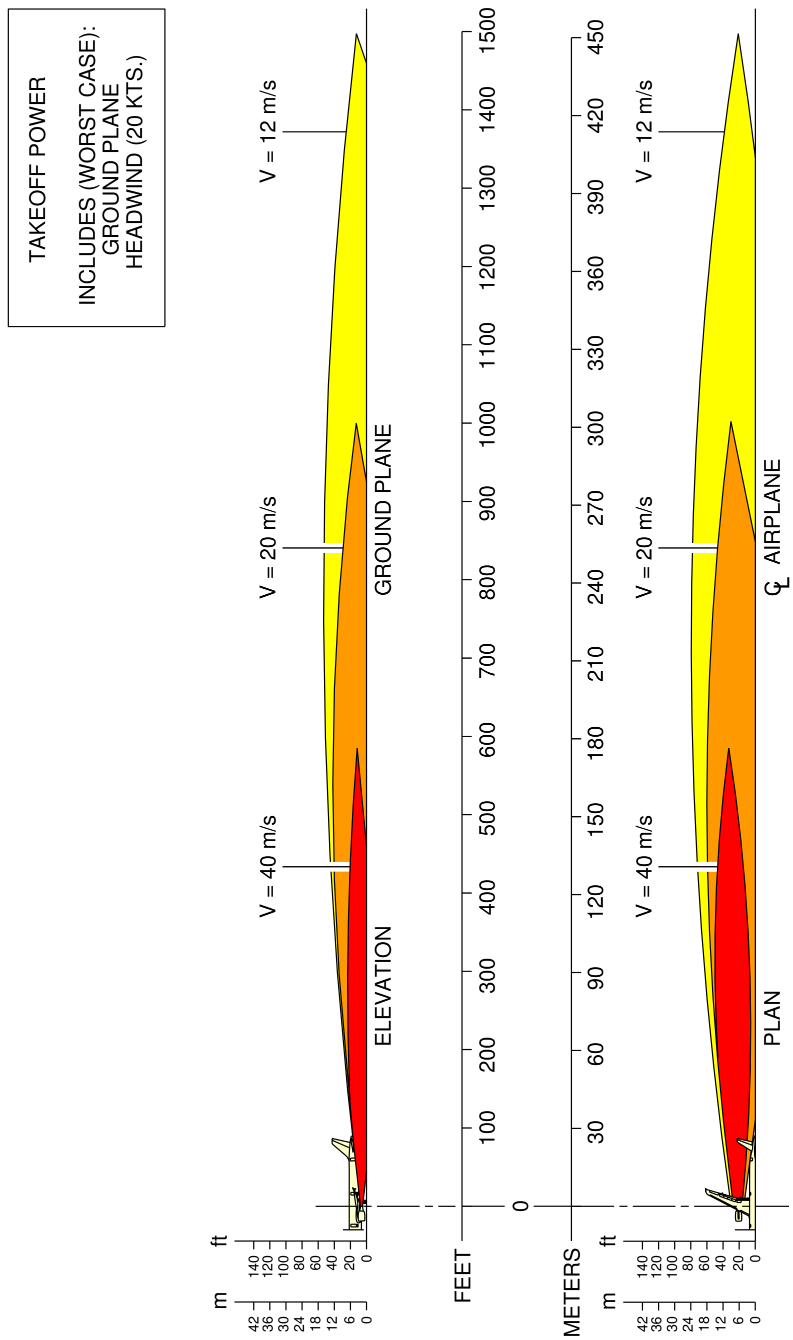
6-1-5 Engine Exhaust Velocities Contours - Takeoff Power

****ON A/C A321-100 A321-200**

Engine Exhaust Velocities Contours - Takeoff Power

1. This section gives engine exhaust velocities contours at takeoff power.

**ON A/C A321-100 A321-200



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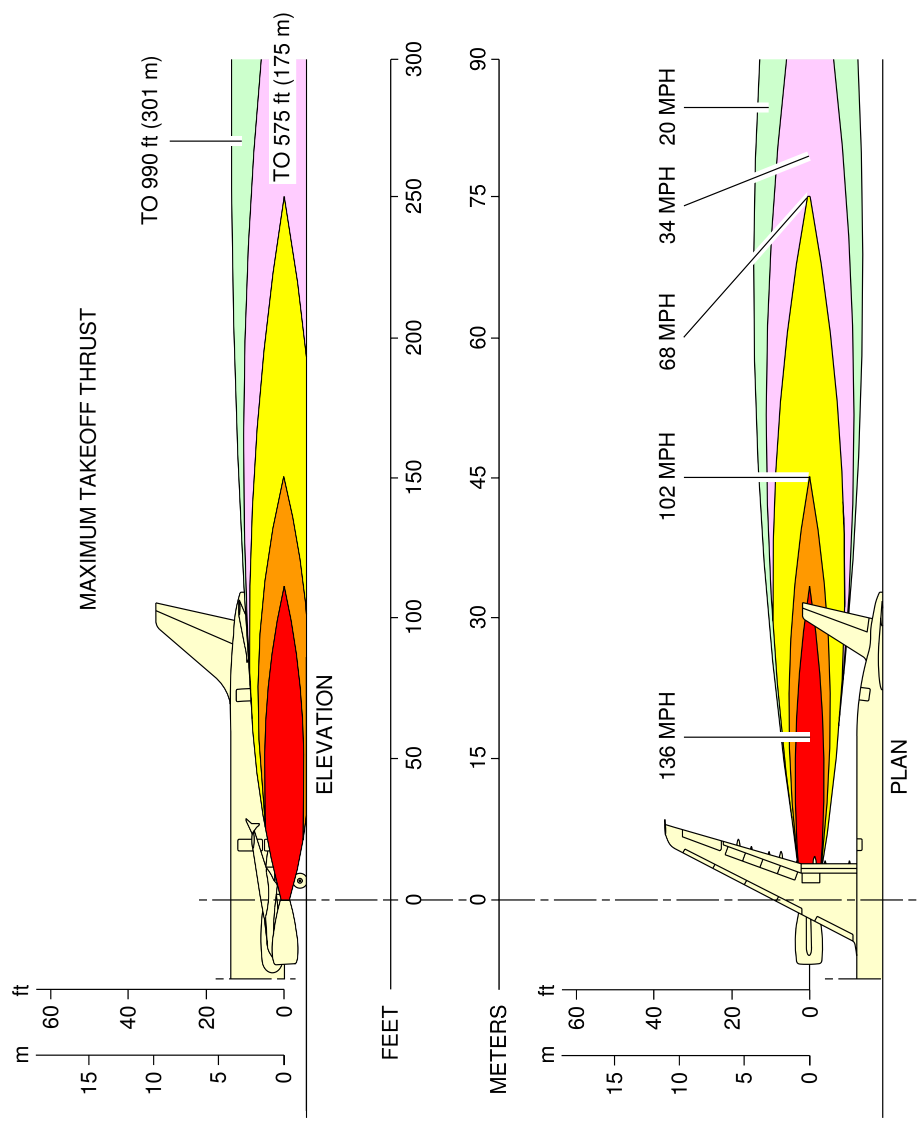
Engine Exhaust Velocities
Takeoff Power – CFM56-5B series engine
FIGURE 1

**ON A/C A321-100 A321-200



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Engine Exhaust Velocities
Takeoff Power – IAE V2500 series engine
FIGURE 2

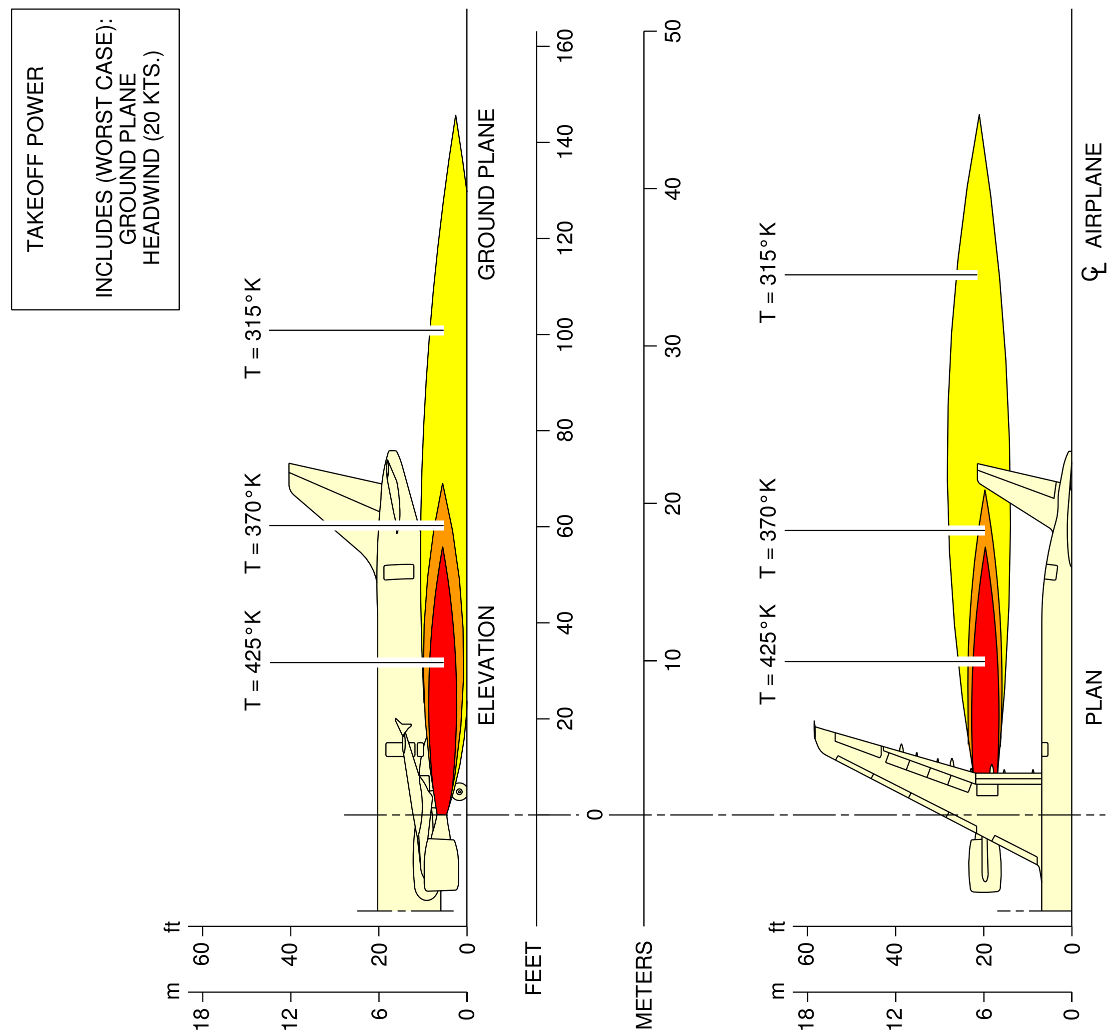
6-1-6 Engine Exhaust Temperatures Contours - Takeoff Power

****ON A/C A321-100 A321-200**

Engine Exhaust Temperatures Contours - Takeoff Power

1. This section gives engine exhaust temperatures contours at takeoff power.

**ON A/C A321-100 A321-200



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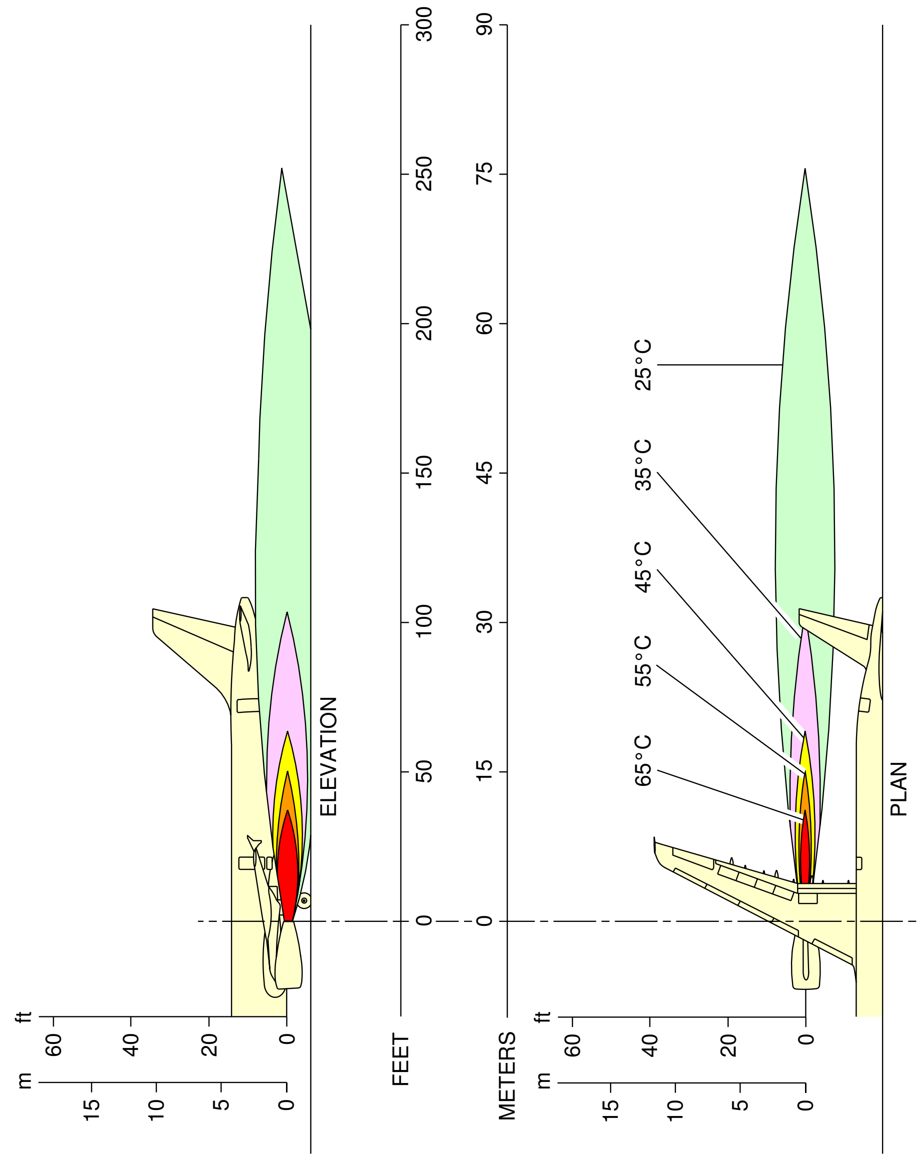
Engine Exhaust Temperatures
Takeoff Power – CFM56-5B series engine
FIGURE 1

**ON A/C A321-100 A321-200



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Engine Exhaust Temperatures
Takeoff Power – IAE V2500 series engine
FIGURE 2

6-2-0 Airport and Community Noise

****ON A/C A321-100 A321-200**

Airport and Community Noise

1. Airport and Community Noise Data

   This section gives data concerning engine maintenance run-up noise to permit evaluation of possible attenuation requirements.

6-2-1 Noise Data

****ON A/C A321-100 A321-200**

Noise Data

1. Noise Data for CFM56-5B series engine

   A. Description of test conditions:

      The arc of circle (radius = 60 m (196.85 ft)), with microphones 1.2 m (3.94 ft) high, is centered on the position of the noise reference point.
      A.P.U.: off; E.C.S.: Packs off.

   B. Engine parameters: 2 engines running

   C. Meteorological data:

      The meteorological parameters measured 1.6 m (5.25 ft) from the ground on the day of test were as follows:
      - Temperature: 20.3°C (69°F)
      - Relative humidity: 43%
      - Atmospheric pressure: 988 hPa
      - Wind speed: Negligible
      - No rain

2. Noise Data for IAE V2500 series engine

   A. Description of test conditions:

      The arc of circle (radius = 60 m (196.85 ft)), with microphones 1.2 m (3.94 ft) high, is centered on the position of the noise reference point.
      A.P.U.: off; E.C.S.: Packs off.

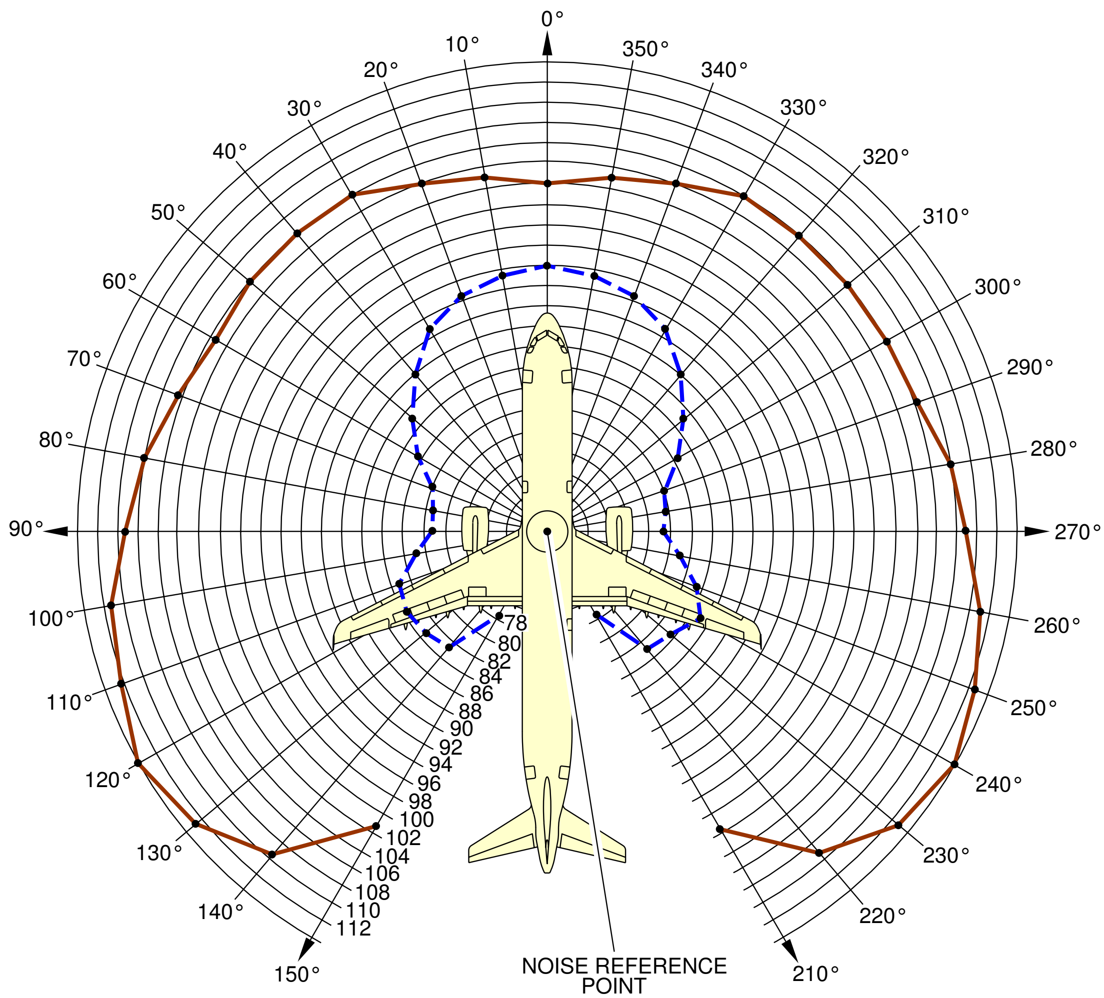
   B. Engine parameters: 2 engines running

   C. Meteorological data:

      The meteorological parameters measured 1.6 m (5.25 ft) from the ground on the day of test were as follows:
      - Temperature: 12°C (54°F)
      - Relative humidity: 62.5%
      - Atmospheric pressure: 1000 hPa
      - Wind speed: Negligible
      - No rain

**ON A/C A321-100 A321-200

	GROUND IDLE	MAX THRUST POSSIBLE ON BRAKES
N1	21.6%	96%
CURVE		



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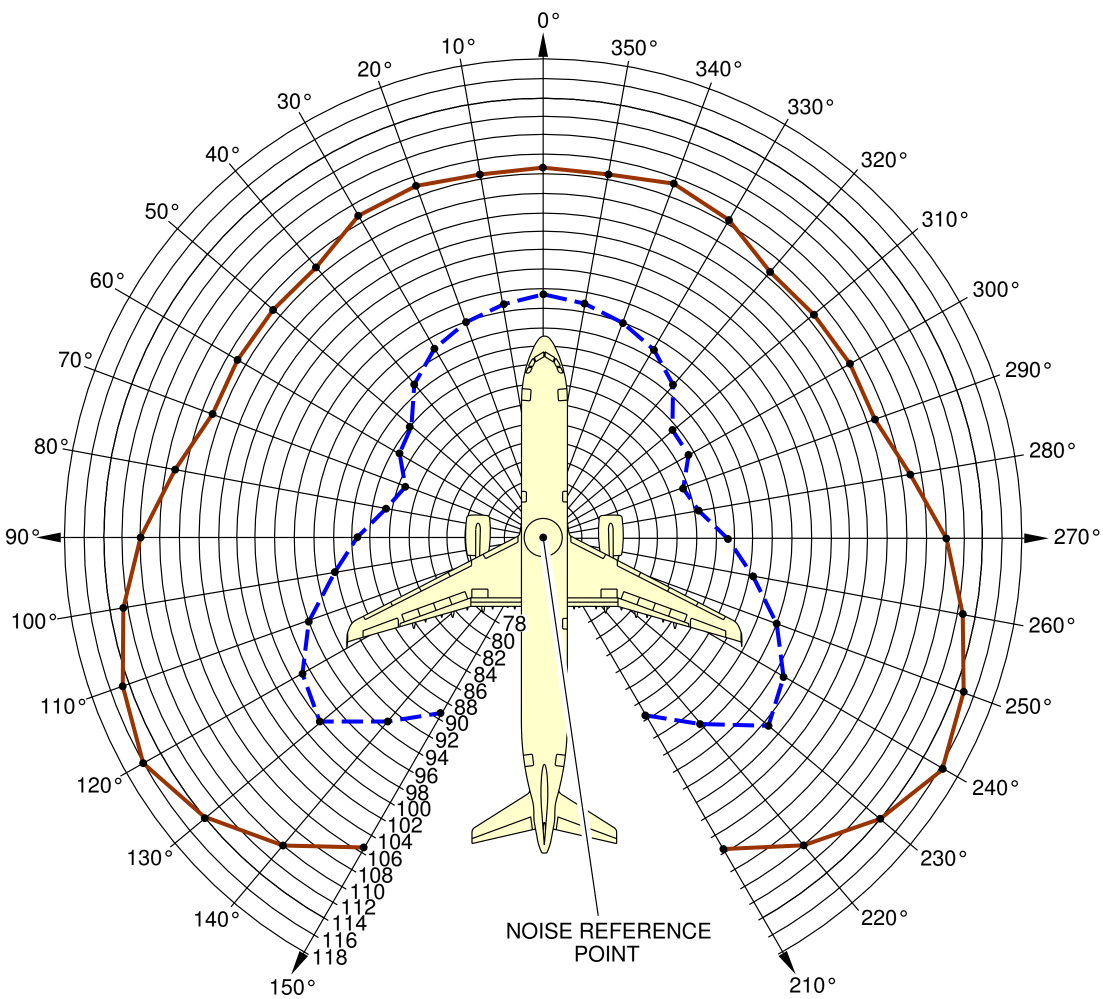
Airport and Community Noise
CFM56-5B series engine
FIGURE 1

****ON A/C A321-100 A321-200**

	GROUND IDLE	MAX THRUST POSSIBLE ON BRAKES
E.P.R	1.007	1.397
N2	57.7%	92.5%
CURVE		



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Airport and Community Noise
IAE V2500 series engine
FIGURE 2

6-3-0 Danger Areas of Engines

****ON A/C A321-100 A321-200**

Danger Areas of Engines

1. Danger Areas of the Engines.

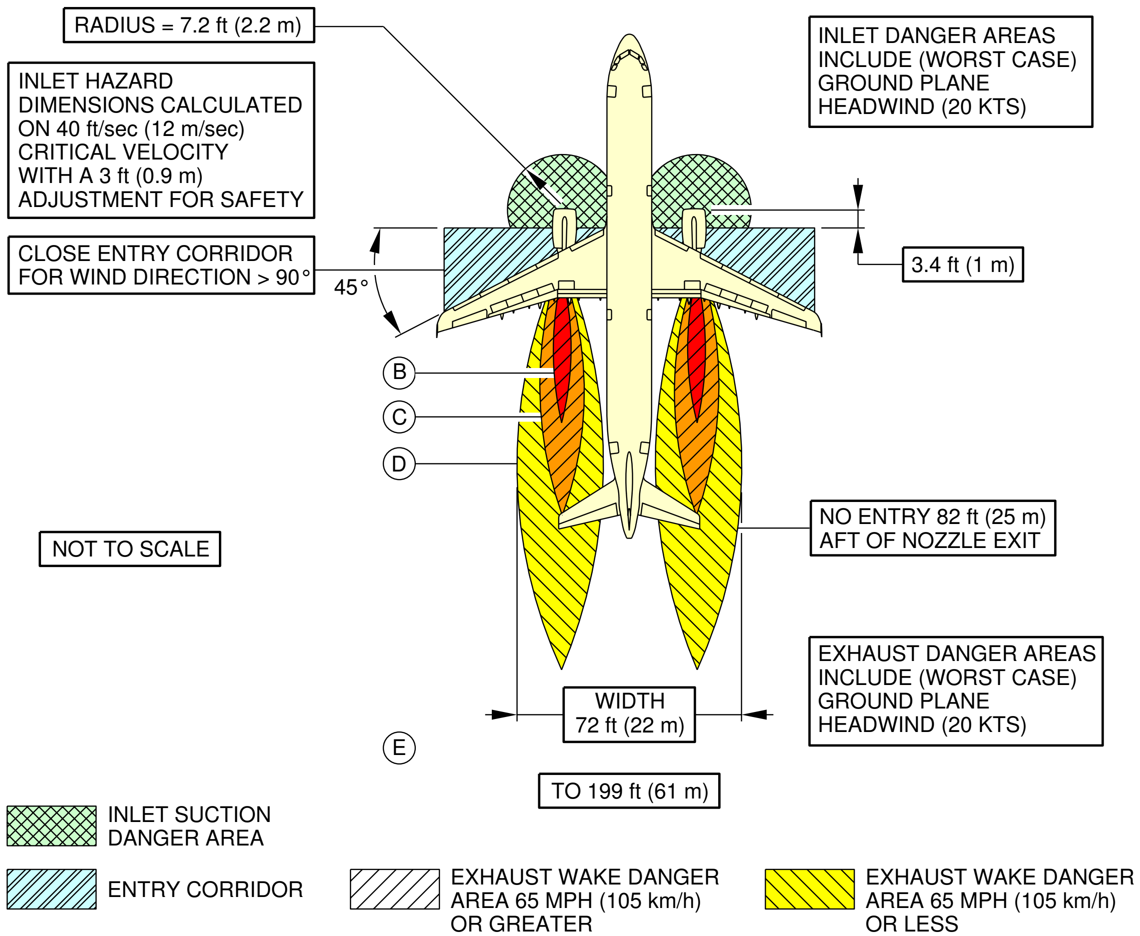
6-3-1 Ground Idle Power

****ON A/C A321-100 A321-200**

Ground Idle Power

1. This section gives danger areas of the engines at ground idle power conditions.

**ON A/C A321-100 A321-200



AREA	APPROX. WIND VELOCITY MPH (km/h)	POSSIBLE EFFECTS WITHIN DANGER ZONE BASED ON "RADIOLOGICAL DEFENSE" VOL. II, ARMED FORCES SPECIAL WEAPONS PROJECT, NOV. 1951
A	210–145 (338–233)	A MAN STANDING WILL BE PICKED UP AND THROWN; AIRCRAFT WILL BE COMPLETELY DESTROYED OR DAMAGED BEYOND ECONOMICAL REPAIR; COMPLETE DESTRUCTION OF FRAME OR BRICK HOMES.
B	145–105 (233–169)	A MAN STANDING FACE–ON WILL BE PICKED UP AND THROWN; DAMAGE NEARING TOTAL DESTRUCTION TO LIGHT INDUSTRIAL BUILDINGS OR RIGID STEEL FRAMING; CORRUGATED STEEL STRUCTURES LESS SEVERELY.
C	105–65 (169–105)	MODERATE DAMAGE TO LIGHT INDUSTRIAL BUILDINGS AND TRANSPORT–TYPE AIRCRAFT.
D	65–20 (105–32)	LIGHT TO MODERATE DAMAGE TO TRANSPORT–TYPE AIRCRAFT
E	< 20 (32)	BEYOND DANGER AREA

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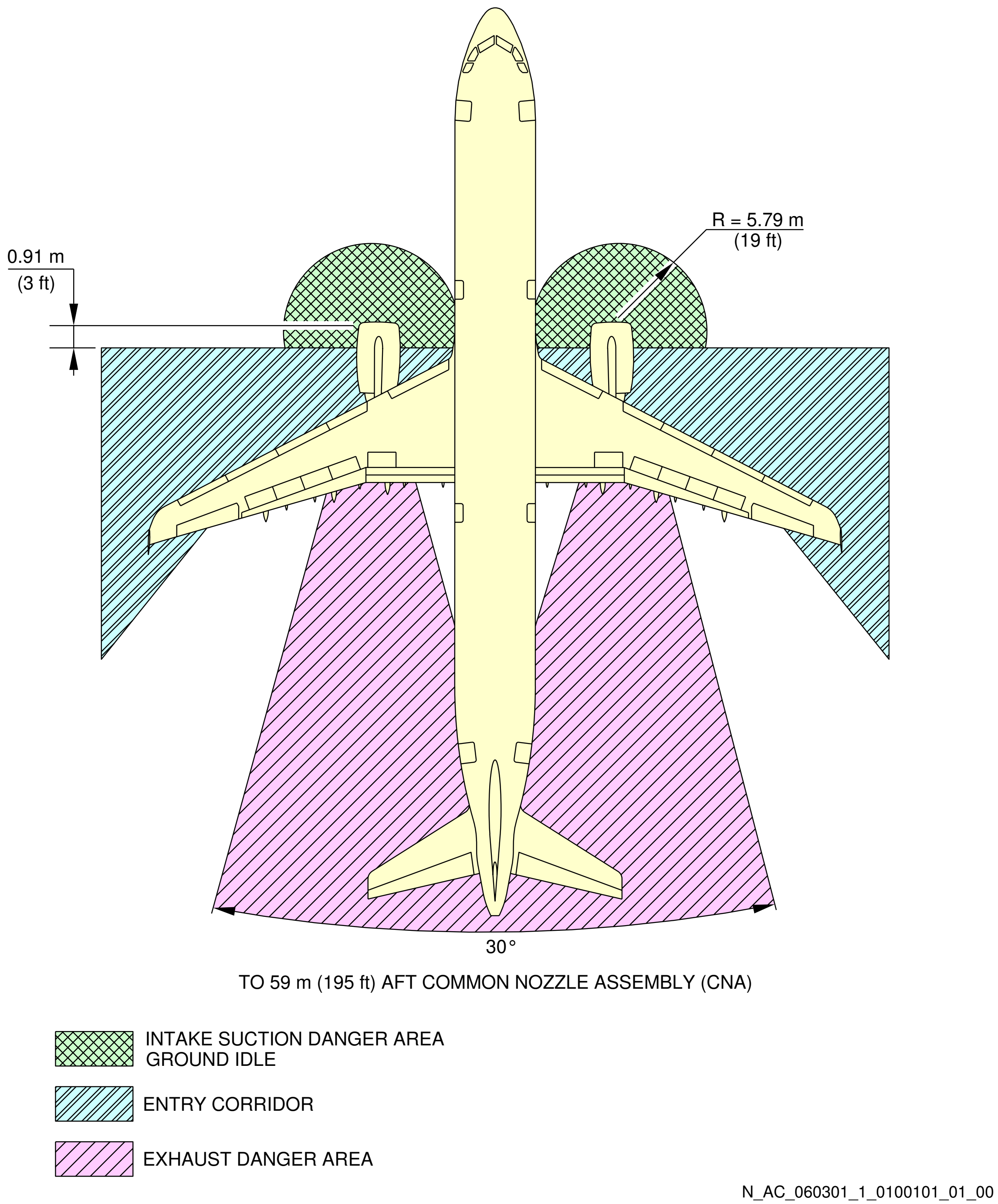
Danger Areas of Engines
CFM56-5B series engine
FIGURE 1

**ON A/C A321-100 A321-200



Danger Areas of Engines
IAE V2500 series engine
FIGURE 2

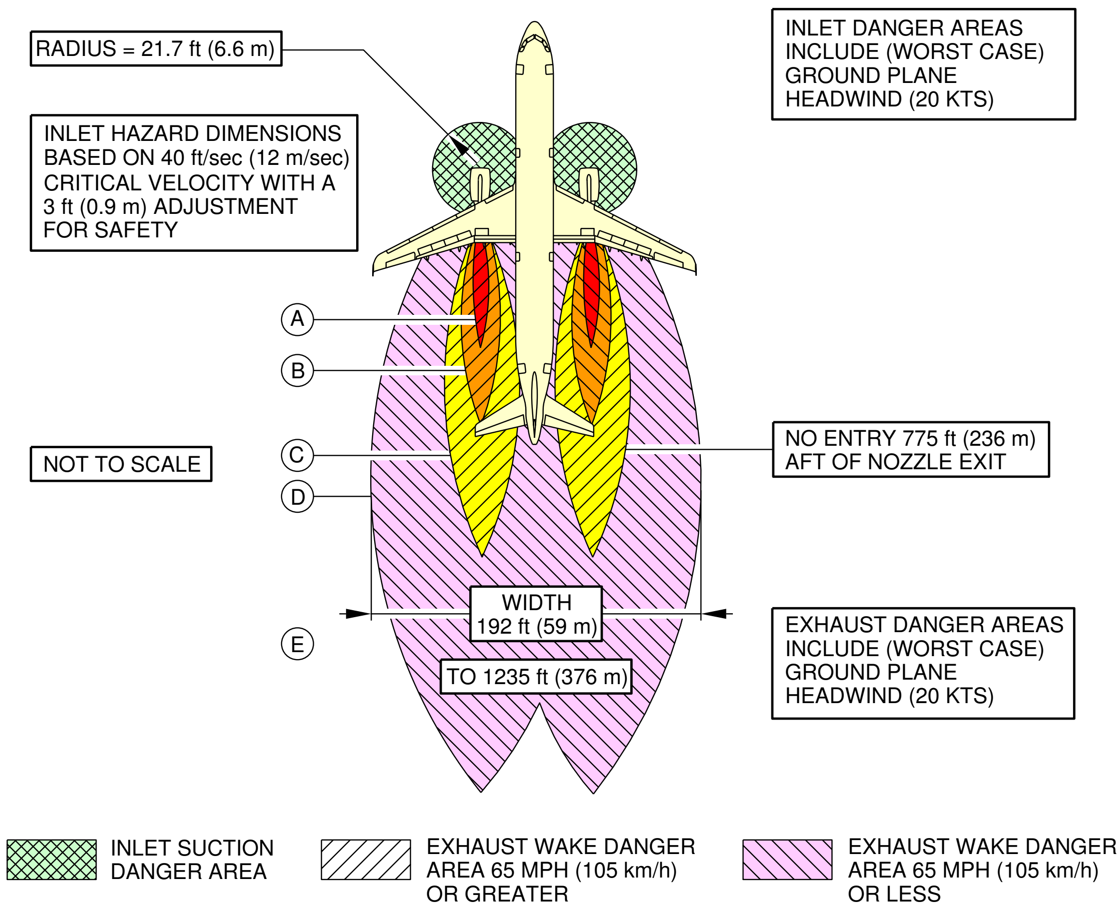
6-3-2 Takeoff Power

**ON A/C A321-100 A321-200

Takeoff Power

1. This section gives danger areas of the engines at max takeoff conditions.

**ON A/C A321-100 A321-200



AREA	APPROX. WIND VELOCITY MPH (km/h)	POSSIBLE EFFECTS WITHIN DANGER ZONE BASED ON "RADIOLOGICAL DEFENSE" VOL. II, ARMED FORCES SPECIAL WEAPONS PROJECT, NOV. 1951
A	210–145 (338–233)	A MAN STANDING WILL BE PICKED UP AND THROWN; AIRCRAFT WILL BE COMPLETELY DESTROYED OR DAMAGED BEYOND ECONOMICAL REPAIR; COMPLETE DESTRUCTION OF FRAME OR BRICK HOMES.
B	145–105 (233–169)	A MAN STANDING FACE–ON WILL BE PICKED UP AND THROWN; DAMAGE NEARING TOTAL DESTRUCTION TO LIGHT INDUSTRIAL BUILDINGS OR RIGID STEEL FRAMING; CORRUGATED STEEL STRUCTURES LESS SEVERELY.
C	105–65 (169–105)	MODERATE DAMAGE TO LIGHT INDUSTRIAL BUILDINGS AND TRANSPORT–TYPE AIRCRAFT.
D	65–20 (105–32)	LIGHT TO MODERATE DAMAGE TO TRANSPORT–TYPE AIRCRAFT
E	< 20 (32)	BEYOND DANGER AREA

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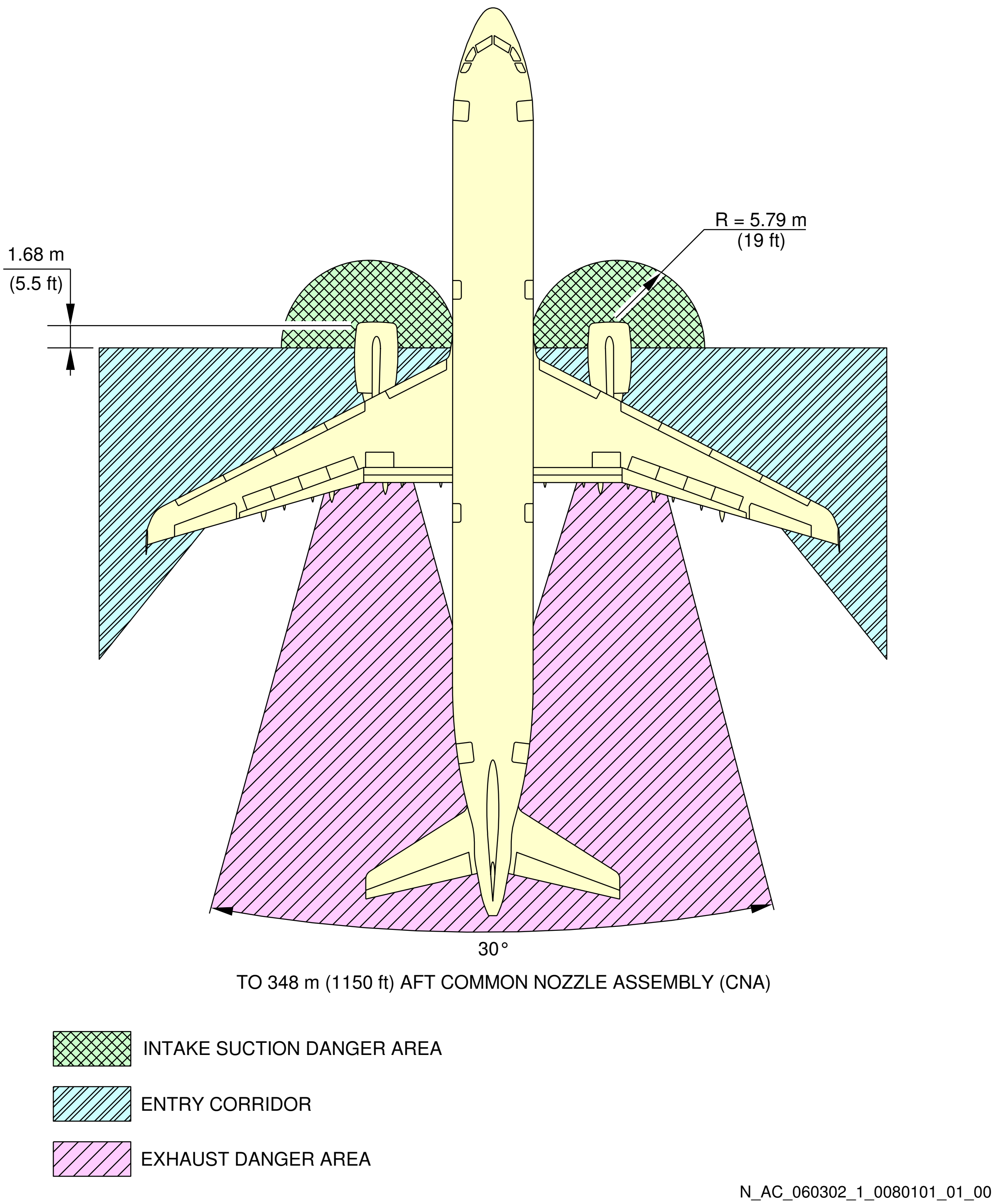
Danger Areas of Engines
CFM56-5B series engine
FIGURE 1

**ON A/C A321-100 A321-200



Danger Areas of Engines
IAE V2500 series engine
FIGURE 2

6-4-0 APU Exhaust Velocities and Temperatures

****ON A/C A321-100 A321-200**

APU Exhaust Velocities and Temperatures

1. APU Exhaust Velocities and Temperatures.

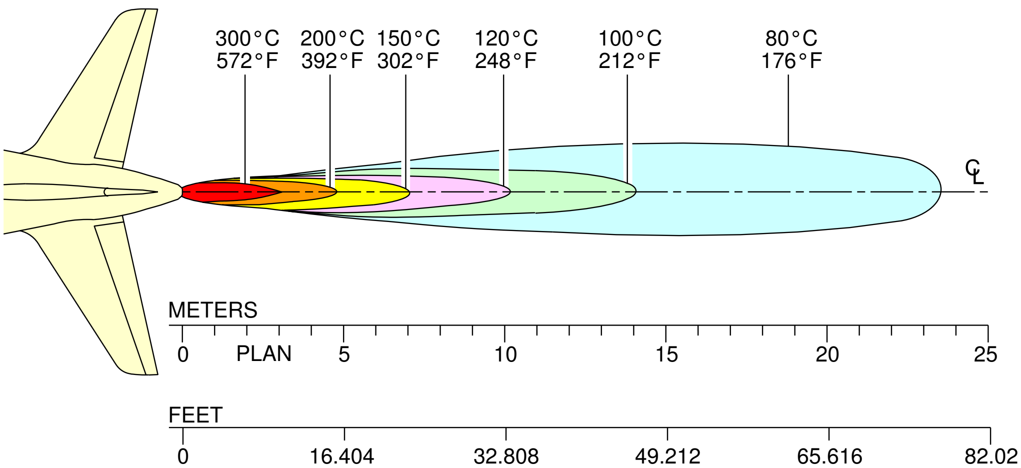
6-4-1 APU

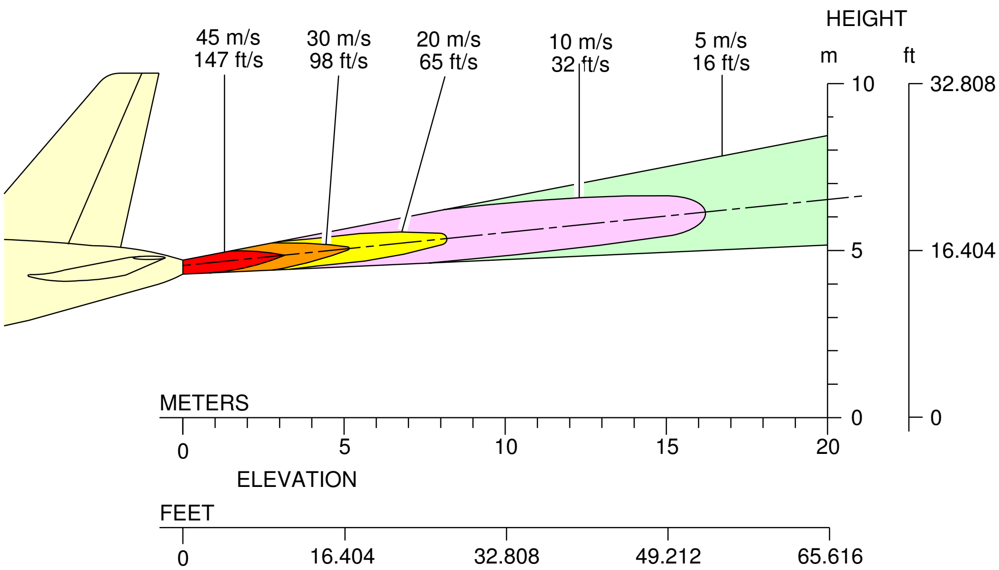
****ON A/C A321-100 A321-200**

APU - APIC & GARRETT

1. This section gives APU exhaust velocities and temperatures.

**ON A/C A321-100 A321-200





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Exhaust Velocities and Temperatures
APU – APIC & GARRETT
FIGURE 1

PAVEMENT DATA

7-1-0 General Information

****ON A/C A321-100 A321-200**

General Information

****ON A/C A321-100**

1. General Information

A brief description of the pavement charts that follow will help in airport planning.

To aid in the interpolation between the discrete values shown, each airplane configuration is shown with a minimum range of five loads on the main landing gear.

All curves on the charts represent data at a constant specified tire pressure with:
- the airplane loaded to the maximum ramp weight
- the CG at its maximum permissible aft position.

Pavement requirements for commercial airplanes are derived from the static analysis of loads imposed on the main landing gear struts.

Section 7-2 presents basic data on the landing gear footprint configuration, maximum ramp weights and tire sizes and pressures.

Section 7-2 pages 1 to 2: Model 100.

Section 7-3 shows maximum vertical and horizontal pavement loads for certain critical conditions at the tire-ground interfaces.

Section 7-3 pages 1 to 2: Model 100.

Section 7-4 contains charts to find these loads throughout the stability limits of the airplane at rest on the pavement.

Section 7-4-1 pages 1 to 4: Model 100.

These main landing gear loads are used as the point of entry to the pavement design charts which follow, interpolating load values where necessary.

All Load Classification Number (LCN) curves shown in Section 7-6-1 and Section 7-8-2 have been developed from a computer program based on data provided in International Civil Aviation Organisation (ICAO) document 7920-AN/865/2, Aerodrome Manual, Part 2, "Aerodrome Physical Characteristics", Second Edition, 1965.

The flexible pavement charts in Section 7-6-1 show LCN against equivalent single wheel load, and equivalent single wheel load against pavement thickness.

Section 7-6-1 pages 1 to 4: Model 100.

The rigid pavement charts in Section 7-8-2 show LCN against equivalent single wheel load, and equivalent single wheel load against radius of relative stiffness.

Section 7-8-2 pages 1 to 4: Model 100.

Section 7-9 provides ACN data prepared according to the ACN/PCN system as referenced in ICAO Annex 14, "Aerodromes", Volume 1 Third Edition July 1999, incorporating Amendments 1 to 3.

The ACN/PCN system 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 corresponding Pavement Classification Number.

An aircraft having an ACN equal to or less than the PCN can operate without restriction on the pavement.

Numerically the ACN is two times the derived single wheel load expressed in thousands of kilograms.

The derived single wheel load is defined as the load on a single tire inflated to 1.25 Mpa (181 psi) that would have the same pavement requirements as the aircraft.

Computationally the ACN/PCN system uses PCA program PDILB for rigid pavements, and S-77-1 for flexible pavements, to calculate ACN values. The Airport Authority must decide on the method of pavement analysis and the results of their evaluation shown as follows:

PCN			
PAVEMENT TYPE	SUBGRADE CATEGORY	TIRE PRESSURE CATEGORY	EVALUATION 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)	

PCN			
PAVEMENT TYPE	SUBGRADE CATEGORY	TIRE PRESSURE CATEGORY	EVALUATION METHOD
	D – Ultra Low	Z – To 0.5 Mpa (73 psi)	

Section 7-9-1 pages 1 to 4: Model 100 shows the aircraft ACN values for flexible pavements.

The four subgrade categories are:
- A. High Strength CBR 15
- B. Medium Strength CBR 10
- C. Low Strength CBR 6
- D. Ultra Low Strength CBR 3

Section 7-9-2 pages 1 to 4: Model 100 shows the aircraft ACN for rigid pavements.

The four subgrade categories are:
- A. High Strength Subgrade k = 150 MN/m^3 (550 pci)
- B. Medium Strength Subgrade k = 80 MN/m^3 (300 pci)
- C. Low Strength Subgrade k = 40 MN/m^3 (150 pci)
- D. Ultra Low Strength Subgrade k = 20 MN/m^3 (75 pci)

A. Flexible Pavement

Section 7-5-1 uses procedures in Instruction Report N° S-77-1 "Procedures for Development of CBR Design Curves", dated June 1977 to show flexible pavement design curves.

The report was prepared by the U.S. Army Corps Engineers Waterways Experiment Station, Soils and Pavement Laboratory, Vicksburg, Mississippi.

Section 7-5-1 pages 1 to 4: Model 100.

The line showing 10000 coverages is used to calculate Aircraft Classification Number (ACN).

The procedure that follows is used to develop flexible pavement design curves such as shown in Section 7-5-1.
- With the scale for pavement thickness at the bottom and the scale for CBR at the top, an arbitrary line is drawn representing 10000 coverages.
- Incremental values of the weight on the main landing gear are then plotted.
- Annual departure lines are drawn based on the load lines of the weight on the main landing gear that is shown on the graph.

B. Rigid pavement

Section 7-7-1 gives the rigid pavement design curves that have been prepared with the use of the Westergaard Equation. This is in general accordance with the procedures outlined in the Portland Cement Association publications, "Design of Concrete Airport Pavement", 1973 and "Computer Program for Airport Pavement Design", (Program PDILB), 1967 both by Robert G. Packard.

Section 7-7-1 pages 1 to 4: Model 100.

The procedure that follows is used to develop rigid pavement design curves such as those shown in Section 7-7-1.

- With the scale for thickness on the left and the scale for allowable working stress on the right, an arbitrary load line is drawn. This represents the maximum weight to be shown for the main landing gear.
- 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 drawn on the basis of the curve for k = 80 MN/m^3 already shown on the graph.

****ON A/C A321-200**

2. General Information

A brief description of the pavement charts that follow will help in airport planning.

To aid in the interpolation between the discrete values shown, each airplane configuration is shown with a minimum range of five loads on the main landing gear.

All curves on the charts represent data at a constant specified tire pressure with:

- the airplane loaded to the maximum ramp weight
- the CG at its maximum permissible aft position.

Pavement requirements for commercial airplanes are derived from the static analysis of loads imposed on the main landing gear struts.

Section 7-2 presents basic data on the landing gear footprint configuration, maximum ramp weights and tire sizes and pressures.

Section 7-2 pages 3-6: Model 200.

Section 7-3 shows maximum vertical and horizontal pavement loads for certain critical conditions at the tire-ground interfaces.

Section 7-3 pages 3 to 5: Model 200.

Section 7-4 contains charts to find these loads throughout the stability limits of the airplane at rest on the pavement.

Section 7-4-1 pages 5 to 8: Model 200.

These main landing gear loads are used as the point of entry to the pavement design charts which follow, interpolating load values where necessary.

All Load Classification Number (LCN) curves shown in Section 7-6-1 and Section 7-8-2 have been developed from a computer program based on data provided in International Civil Aviation Organisation (ICAO) document 7920-AN/865/2, Aerodrome Manual, Part 2, "Aerodrome Physical Characteristics", Second Edition, 1965.

The flexible pavement charts in Section 7-6-1 show LCN against equivalent single wheel load, and equivalent single wheel load against pavement thickness.

Section 7-6-1 pages 5 to 9: Model 200.

The rigid pavement charts in Section 7-8-2 show LCN against equivalent single wheel load, and equivalent single wheel load against radius of relative stiffness.

Section 7-8-2 pages 5 to 9: Model 200.

Section 7-9 provides ACN data prepared according to the ACN/PCN system as referenced in ICAO Annex 14, "Aerodromes", Volume 1 Third Edition July 1999, incorporating Amendments 1 to 3.

The ACN/PCN system 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 corresponding Pavement Classification Number.

An aircraft having an ACN equal to or less than the PCN can operate without restriction on the pavement.

Numerically the ACN is two times the derived single wheel load expressed in thousands of kilograms.

The derived single wheel load is defined as the load on a single tire inflated to 1.25 Mpa (181 psi) that would have the same pavement requirements as the aircraft.

Computationally the ACN/PCN system uses PCA program PDILB for rigid pavements, and S-77-1 for flexible pavements, to calculate ACN values. The Airport Authority must decide on the method of pavement analysis and the results of their evaluation shown as follows:

PCN			
PAVEMENT TYPE	SUBGRADE CATEGORY	TIRE PRESSURE CATEGORY	EVALUATION 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)	

Section 7-9-1 pages 5 to 11: Model 200 shows the aircraft ACN values for flexible pavements.

The four subgrade categories are:
- A. High Strength CBR 15
- B. Medium Strength CBR 10
- C. Low Strength CBR 6
- D. Ultra Low Strength CBR 3

Section 7-9-2 pages 5 to 11: Model 200 shows the aircraft ACN for rigid pavements.

The four subgrade categories are:
- A. High Strength Subgrade k = 150 MN/m^3 (550 pci)
- B. Medium Strength Subgrade k = 80 MN/m^3 (300 pci)
- C. Low Strength Subgrade k = 40 MN/m^3 (150 pci)
- D. Ultra Low Strength Subgrade k = 20 MN/m^3 (75 pci)

A. Flexible Pavement

Section 7-5-1 uses procedures in Instruction Report N° S-77-1 "Procedures for Development of CBR Design Curves", dated June 1977 to show flexible pavement design curves.

The report was prepared by the U.S. Army Corps Engineers Waterways Experiment Station, Soils and Pavement Laboratory, Vicksburg, Mississippi.

Section 7-5-1 pages 5 to 9: Model 200.

The line showing 10000 coverages is used to calculate Aircraft Classification Number (ACN).

The procedure that follows is used to develop flexible pavement design curves such as shown in Section 7-5-1.
- With the scale for pavement thickness at the bottom and the scale for CBR at the top, an arbitrary line is drawn representing 10000 coverages.

- Incremental values of the weight on the main landing gear are then plotted.
- Annual departure lines are drawn based on the load lines of the weight on the main landing gear that is shown on the graph.

B. Rigid pavement

Section 7-7-1 gives the rigid pavement design curves that have been prepared with the use of the Westergaard Equation. This is in general accordance with the procedures outlined in the Portland Cement Association publications, "Design of Concrete Airport Pavement", 1973 and "Computer Program for Airport Pavement Design", (Program PDILB), 1967 both by Robert G. Packard.

Section 7-7-1 pages 5 to 9: Model 200.

The procedure that follows is used to develop rigid pavement design curves such as those shown in Section 7-7-1.

- With the scale for thickness on the left and the scale for allowable working stress on the right, an arbitrary load line is drawn. This represents the maximum weight to be shown for the main landing gear.
- 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 drawn on the basis of the curve for $k = 80\ MN/m^3$ already shown on the graph.

7-2-0 Landing Gear Footprint

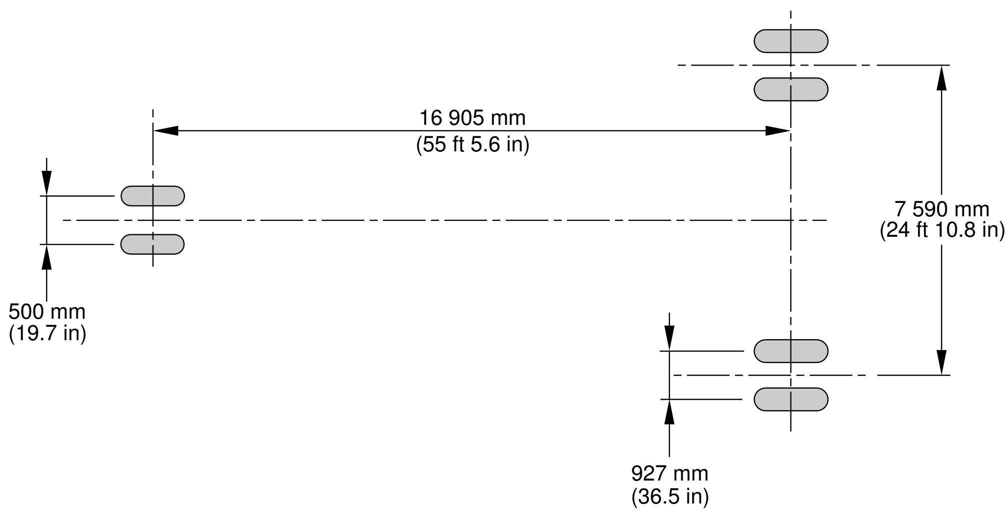
****ON A/C A321-100 A321-200**

Landing Gear Footprint

1. This section gives Landing Gear Footprint.

**ON A/C A321-100

MAXIMUM RAMP WEIGHT	78 400 kg (172 850 lb)	83 400 kg (183 875 lb)
PERCENTAGE OF WEIGHT ON MAIN GEAR GROUP	SEE SHEET 7–4–1 PAGE 1 & PAGE 3	SEE SHEET 7–4–1 PAGE 1, PAGE 2, PAGE 3
NOSE GEAR TIRE SIZE	30 x 8.8 R15 (30 x 8.8 – 15)	
NOSE GEAR TIRE PRESSURE	10.1 bar (146 psi)	10.8 bar (157 psi)
MAIN GEAR TIRE SIZE	1 270 x 455 R22 (49 x 18 – 22)	
MAIN GEAR TIRE PRESSURE	12.8 bar (186 psi)	13.6 bar (197 psi)



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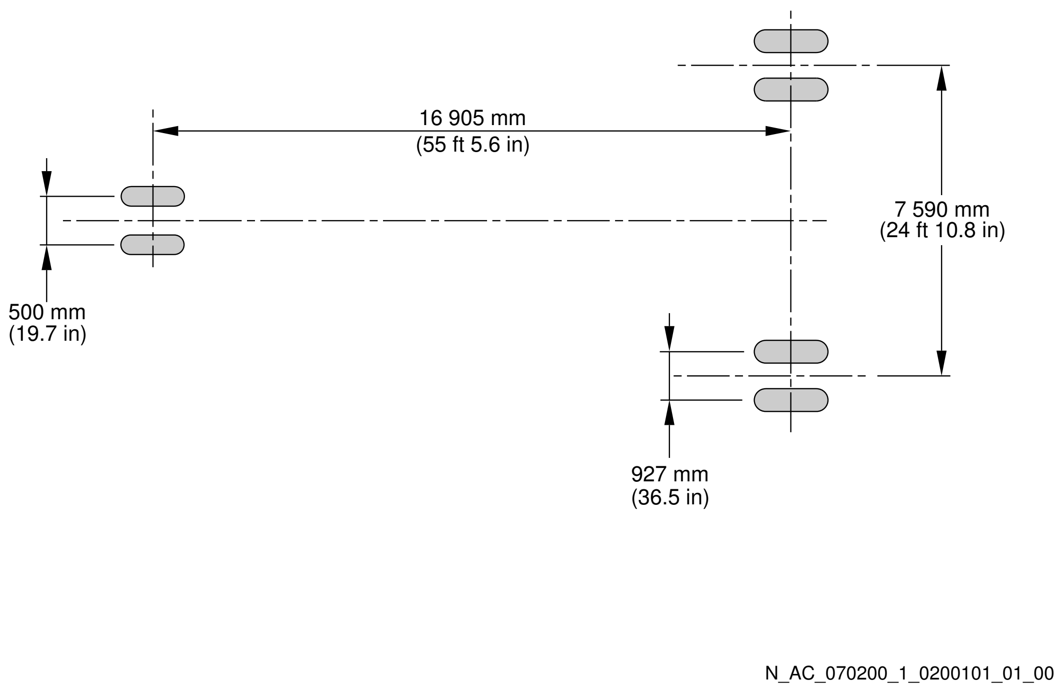
Landing Gear Footprint
MTOW 78 T/83 T
FIGURE 1

**ON A/C A321-100

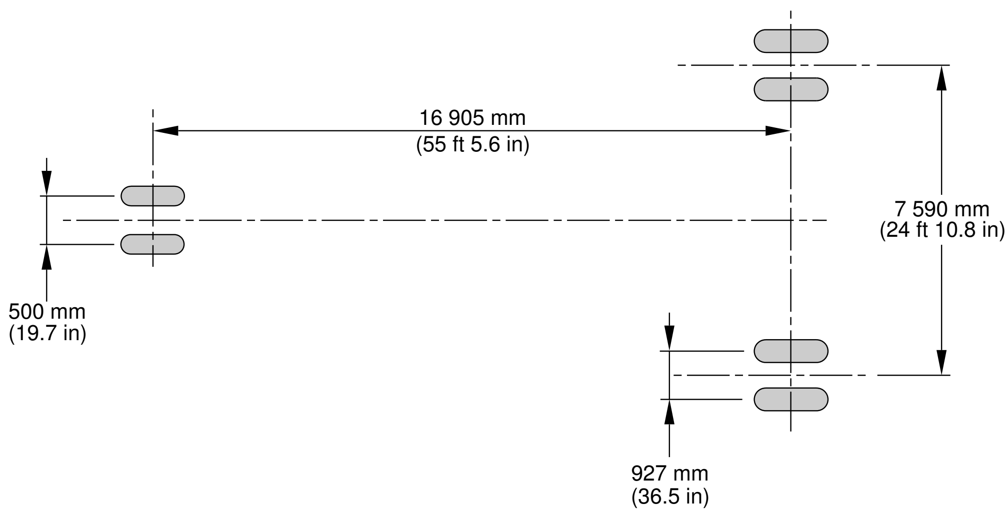
MAXIMUM RAMP WEIGHT	85 400 kg (188 275 lb)	89 400 kg (197 100 lb)
PERCENTAGE OF WEIGHT ON MAIN GEAR GROUP	SEE SHEET 7–4–1 PAGE 3	SEE SHEET 7–4–1 PAGE 4
NOSE GEAR TIRE SIZE	30 x 8.8 R15 (30 x 8.8 – 15)	
NOSE GEAR TIRE PRESSURE	11 bar (160 psi)	11.6 bar (168 psi)
MAIN GEAR TIRE SIZE	1 270 x 455 R22 (49 x 18 – 22)	
MAIN GEAR TIRE PRESSURE	13.9 bar (202 psi)	14.6 bar (212 psi)



Landing Gear Footprint
MTOW 85 T/89 T
FIGURE 2

**ON A/C A321-200

MAXIMUM RAMP WEIGHT	78 400 kg (172 850 lb)	80 400 kg (177 250 lb)
PERCENTAGE OF WEIGHT ON MAIN GEAR GROUP	SEE SHEET 7–4–1 PAGE 5	SEE SHEET 7–4–1 PAGE 5
NOSE GEAR TIRE SIZE	30 x 8.8 R15 (30 x 8.8 – 15)	
NOSE GEAR TIRE PRESSURE	10.1 bar (146 psi)	10.8 bar (157 psi)
MAIN GEAR TIRE SIZE	1 270 x 455 R22 (49 x 18 – 22)	
MAIN GEAR TIRE PRESSURE	12.8 bar (186 psi)	13.6 bar (197 psi)



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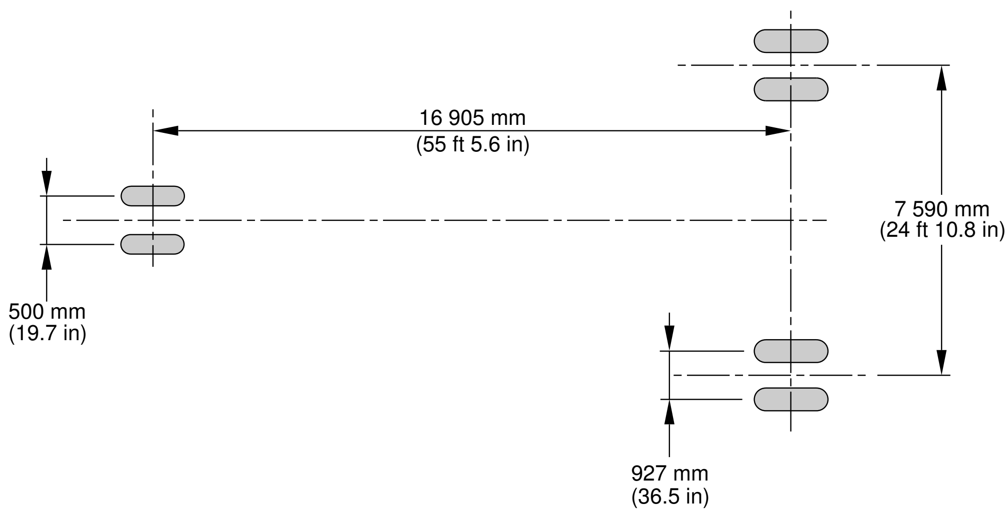
Landing Gear Footprint
MTOW 78 T/80 T
FIGURE 3

**ON A/C A321-200

MAXIMUM RAMP WEIGHT	83 400 kg (183 875 lb)	85 400 kg (188 275 lb)
PERCENTAGE OF WEIGHT ON MAIN GEAR GROUP	SEE SHEET 7–4–1 PAGE 5 & PAGE 6	SEE SHEET 7–4–1 PAGE 6 & PAGE 8
NOSE GEAR TIRE SIZE	30 x 8.8 R15 (30 x 8.8 – 15)	
NOSE GEAR TIRE PRESSURE	10.8 bar (157 psi)	11 bar (160 psi)
MAIN GEAR TIRE SIZE	1 270 x 455 R22 (49 x 18 – 22)	
MAIN GEAR TIRE PRESSURE	13.6 bar (197 psi)	13.9 bar (202 psi)



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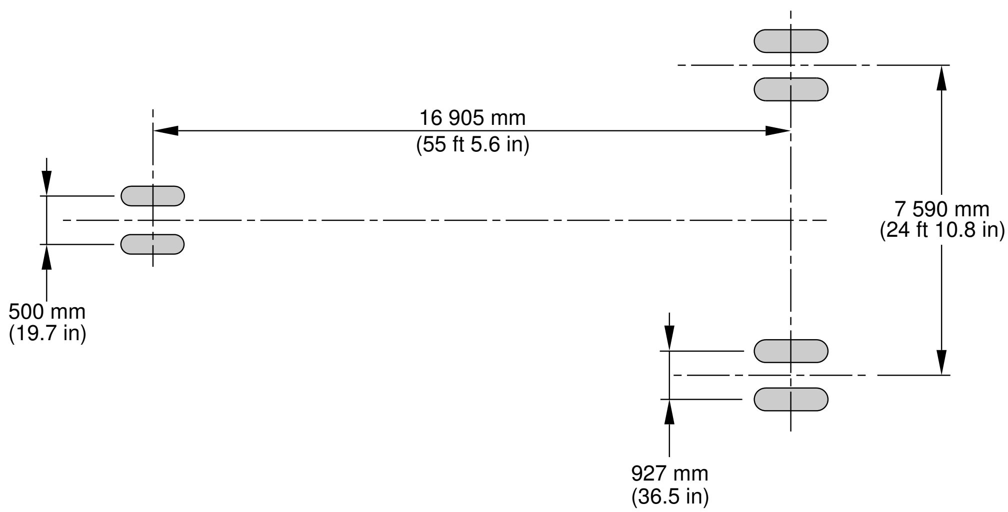
Landing Gear Footprint
MTOW 83 T/85 T
FIGURE 4

**ON A/C A321-200

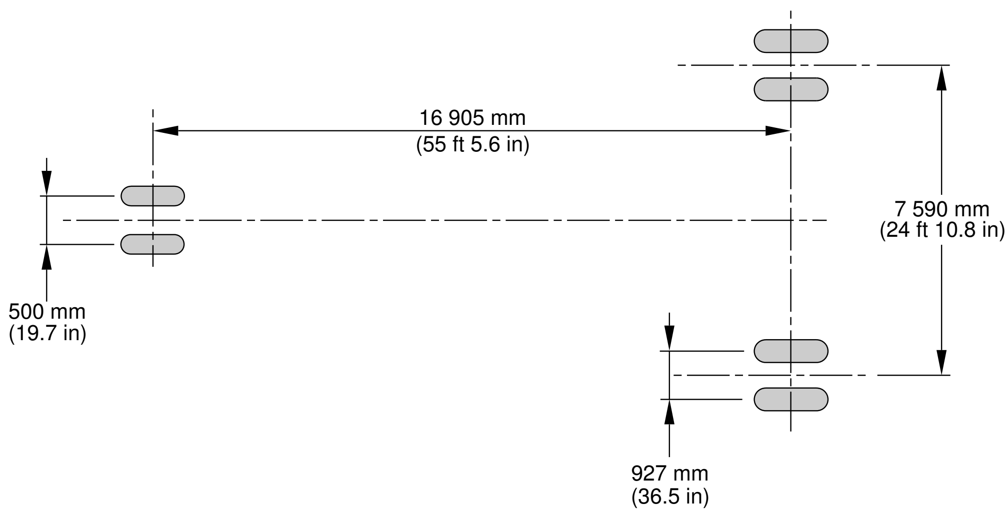
MAXIMUM RAMP WEIGHT	89 400 kg (197 100 lb)
PERCENTAGE OF WEIGHT ON MAIN GEAR GROUP	SEE SHEET 7–4–1 PAGE 6 & PAGE 7
NOSE GEAR TIRE SIZE	30 x 8.8 R15 (30 x 8.8 – 15)
NOSE GEAR TIRE PRESSURE	11.6 bar (168 psi)
MAIN GEAR TIRE SIZE	1 270 x 455 R22 (49 x 18 – 22)
MAIN GEAR TIRE PRESSURE	14.6 bar (212 psi)



Landing Gear Footprint
MTOW 89 T
FIGURE 5

**ON A/C A321-200

MAXIMUM RAMP WEIGHT	93 400 kg (205 912 lb)	93 900 kg (207 025 lb)
PERCENTAGE OF WEIGHT ON MAIN GEAR GROUP	SEE PAGE 7–4–1 PAGE 8	
NOSE GEAR TIRE SIZE	30 x 8.8 R15 (30 x 8.8 – 15)	
NOSE GEAR TIRE PRESSURE	11.6 bar (168 psi)	
MAIN GEAR TIRE SIZE	1 270 x 455 R22 (49 x 18 – 22)	
MAIN GEAR TIRE PRESSURE	15 bar (218 psi)	



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Landing Gear Footprint
MTOW 93 T/93.5 T
FIGURE 6

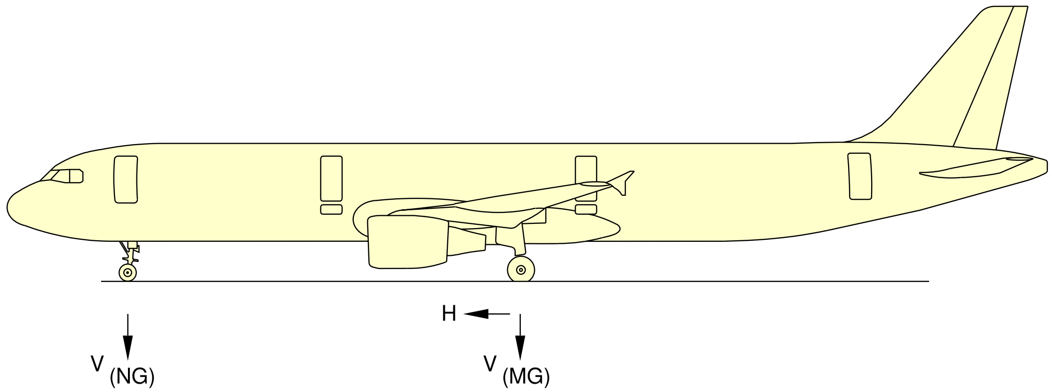
7-3-0 Maximum Pavement Loads

****ON A/C A321-100 A321-200**

Maximum Pavement Loads

1. This section gives Maximum Pavement Loads.

**ON A/C A321-100



1	2		3		4		5		6			
			VNG				VMG (PER STRUT)		H (PER STRUT)			
MODEL	MAXIMUM RAMP WEIGHT		STATIC LOAD AT MOST FWD CG		STATIC BRAKING @ 10 ft/s² DECELERATION		STATIC LOAD AT MAX AFT CG (3)		STEADY BRAKING @ 10 ft/s² DECELERATION		AT INSTANTANEOUS BRAKING COEFFICIENT = 0.8	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
–100	172 850	78 400	18 700 (1)	8 480 (1)	29 400	13 340	82 700	37 510	26 850	12 180	66 150	30 010
–100	183 875	83 400	18 900 (2)	8 570 (2)	30 250	13 730	87 975	39 910	28 575	12 960	70 375	31 920

$V_{(NG)}$ MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD CG
$V_{(MG)}$ MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST AFT CG
H MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

(1) FWD CG = 15.4 % MAC
(2) AFT CG = 17.5 % MAC
(3) AFT CG = 41 % MAC

NOTE: ALL LOADS CALCULATED USING AIRPLANE MAXIMUM RAMP WEIGHT

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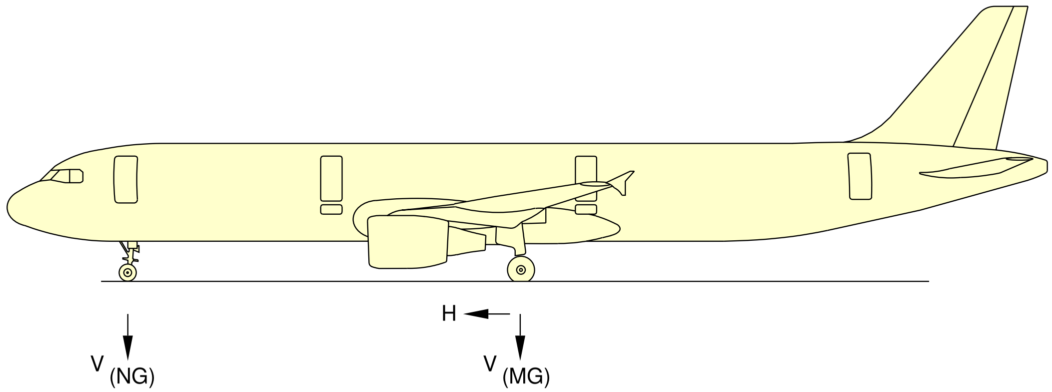
Maximum Pavement Loads
MTOW 78 T/83 T
FIGURE 1

**ON A/C A321-100



1	2		3		4		5		6			
			VNG				VMG (PER STRUT)		H (PER STRUT)			
MODEL	MAXIMUM RAMP WEIGHT		STATIC LOAD AT MOST FWD CG		STATIC BRAKING @ 10 ft/s² DECELERATION		STATIC LOAD AT MAX AFT CG		STEADY BRAKING @ 10 ft/s² DECELERATION		AT INSTANTANEOUS BRAKING COEFFICIENT = 0.8	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
–100	188 275	85 400	18 950 (1)	8 600 (1)	30 575	13 870	90 100 (3)	40 860 (3)	29 250	13 270	72 075	32 690
–100	197 100	89 400	20 225 (2)	9 180 (2)	32 375	14 690	93 550 (4)	42 430 (4)	30 625	13 890	74 850	33 950

$V_{(NG)}$ MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD CG
$V_{(MG)}$ MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST AFT CG
H MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

(1) FWD CG = 18.3 % MAC
(2) FWD CG = 17.5 % MAC
(3) AFT CG = 41 % MAC
(4) AFT CG = 38 % MAC

NOTE: ALL LOADS CALCULATED USING AIRPLANE MAXIMUM RAMP WEIGHT

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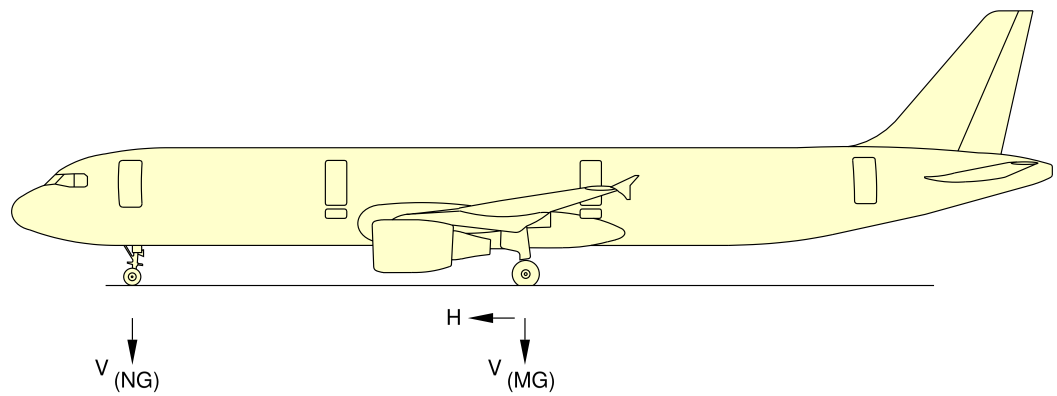
Maximum Pavement Loads
MTOW 85 T/89 T
FIGURE 2

**ON A/C A321-200



1	2		3		4		5		6			
			VNG				VMG (PER STRUT)		H (PER STRUT)			
MODEL	MAXIMUM RAMP WEIGHT		STATIC LOAD AT MOST FWD CG		STATIC BRAKING @ 10 ft/s² DECELERATION		STATIC LOAD AT MAX AFT CG		STEADY BRAKING @ 10 ft/s² DECELERATION		AT INSTANTANEOUS BRAKING COEFFICIENT = 0.8	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
–200	172 850	78 400	18 675 (1)	8 470 (1)	29 375	13 320	82 700 (3)	37 510 (3)	26 850	12 180	66 150	30 010
–200	177 250	80 400	18 750 (2)	8 510 (2)	29 700	13 470	84 750 (4)	38 440 (4)	27 550	12 490	67 800	30 750

$V_{(NG)}$ MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD CG
$V_{(MG)}$ MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST AFT CG
H MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

(1) FWD CG = 15.41 % MAC
(2) FWD CG = 16.28 % MAC
(3) AFT CG = 41 % MAC
(4) AFT CG = 40.7 % MAC

NOTE: ALL LOADS CALCULATED USING AIRPLANE MAXIMUM RAMP WEIGHT

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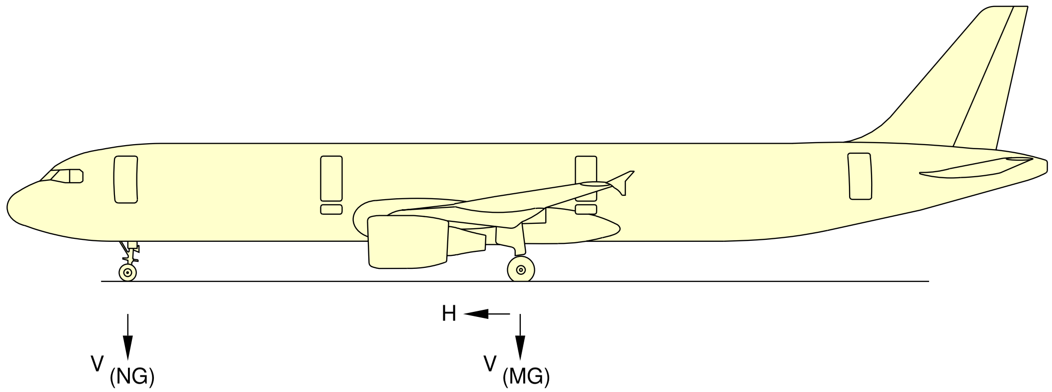
Maximum Pavement Loads
MTOW 78 T/80 T
FIGURE 3

**ON A/C A321-200



1	2		3		4		5		6			
			VNG				VMG (PER STRUT)		H (PER STRUT)			
MODEL	MAXIMUM RAMP WEIGHT		STATIC LOAD AT MOST FWD CG (1)		STATIC BRAKING @ 10 ft/s² DECELERATION		STATIC LOAD AT MAX AFT CG		STEADY BRAKING @ 10 ft/s² DECELERATION		AT INSTANTANEOUS BRAKING COEFFICIENT = 0.8	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
–200	183 875	83 400	18 875	8 560	30 225	13 710	87 675 (2)	39 770 (2)	28 575	12 960	70 150	31 820
–200	188 275	85 400	19 325	8 770	30 925	14 020	89 650 (3)	40 660 (3)	29 250	13 270	71 700	32 530

$V_{(NG)}$ MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD CG
$V_{(MG)}$ MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST AFT CG
H MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

(1) FWD CG = 17.5 % MAC
(2) AFT CG = 39.7 % MAC
(3) AFT CG = 39.1 % MAC

NOTE: ALL LOADS CALCULATED USING AIRPLANE MAXIMUM RAMP WEIGHT

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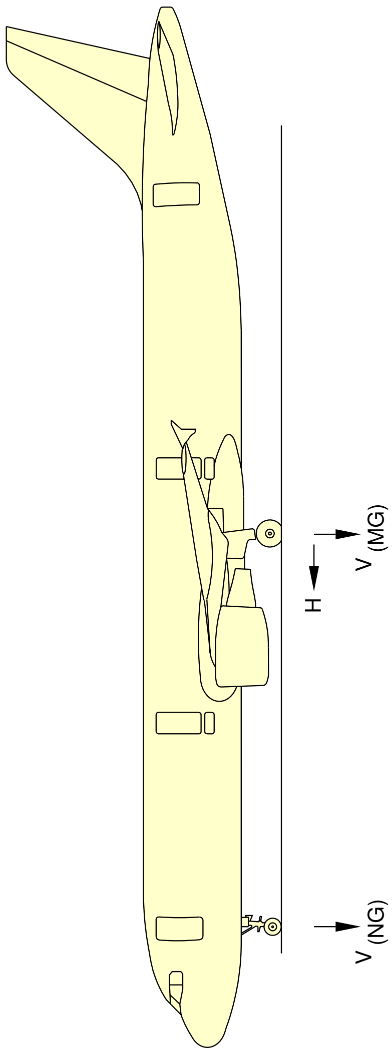
Maximum Pavement Loads
MTOW 83 T/85 T
FIGURE 4

**ON A/C A321-200



1	2		3		4		5		6			
			VNG				VMG (PER STRUT)		H (PER STRUT)			
MODEL	MAXIMUM RAMP WEIGHT		STATIC LOAD AT MOST FWD CG		STATIC BRAKING @ 10 ft/s² DECELERATION		STATIC LOAD AT MAX AFT CG		STEADY BRAKING @ 10 ft/s² DECELERATION		AT INSTANTANEOUS BRAKING COEFFICIENT = 0.8	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
-200	197 100	89 400	20 200 (1)	9 170 (1)	32 325	14 660	93 550 (3)	42 440 (3)	30 625	13 890	74 850	33 950
-200	205 900	93 400	19 950 (2)	9 050 (2)	32 325	14 670	97 475 (4)	44 210 (4)	32 000	14 510	77 975	35 370
-200	207 025	93 900	19 950 (2)	9 050 (2)	32 400	14 700	98 575 (5)	44 710 (5)	32 175	14 590	78 875	35 770

$V_{(NG)}$ MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD CG
$V_{(MG)}$ MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST AFT CG
H MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

(1) FWD CG = 17.5 % MAC
(2) FWD CG = 19 % MAC AT A/C WEIGHT = 91 500 kg
(3) AFT CG = 38 % MAC
(4) AFT CG = 37 % MAC
(5) AFT CG = 36.88 % MAC

NOTE: ALL LOADS CALCULATED USING AIRPLANE MAXIMUM RAMP WEIGHT

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Maximum Pavement Loads
MTOW 89 T/93 T/93.5 T
FIGURE 5

7-4-0 Landing Gear Loading on Pavement

****ON A/C A321-100 A321-200**

Landing Gear Loading on Pavement

****ON A/C A321-100**

1. General

   In the example shown in Section 7-4-1, page 1, the Gross Aircraft Weight is 58 tonnes (127868 lb) and the percentage of weight on the Main Landing Gear is 95.69 %.

   For these conditions the total weight on the Main Landing Gear Group is 55.5 tonnes (122357 lb).

****ON A/C A321-200**

2. General

   In the example shown in Section 7-4-1, page 5, the Gross Aircraft Weight is 58 tonnes (127868 lb) and the percentage of weight on the Main Landing Gear is 95.33 %.

   For these conditions the total weight on the Main Landing Gear Group is 55.29 tonnes (121894 lb).

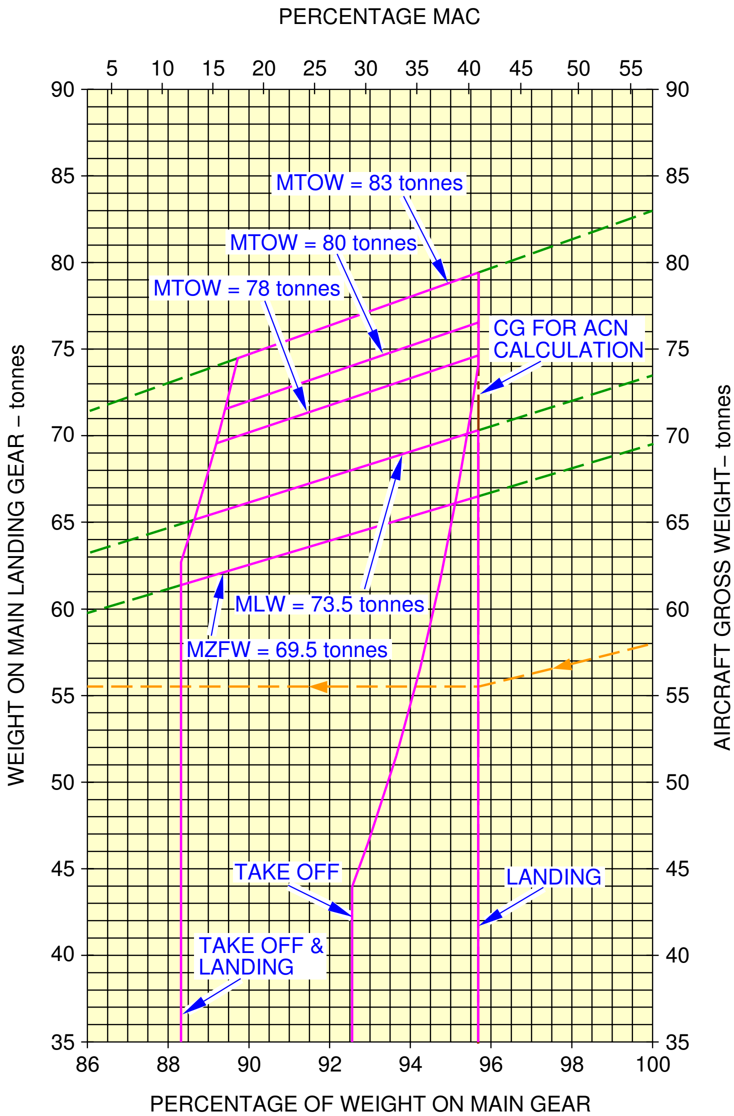
7-4-1 Landing Gear Loading on Pavement

****ON A/C A321-100 A321-200**

Landing Gear Loading on Pavement

1. This section gives Landing Gear Loading on Pavement.

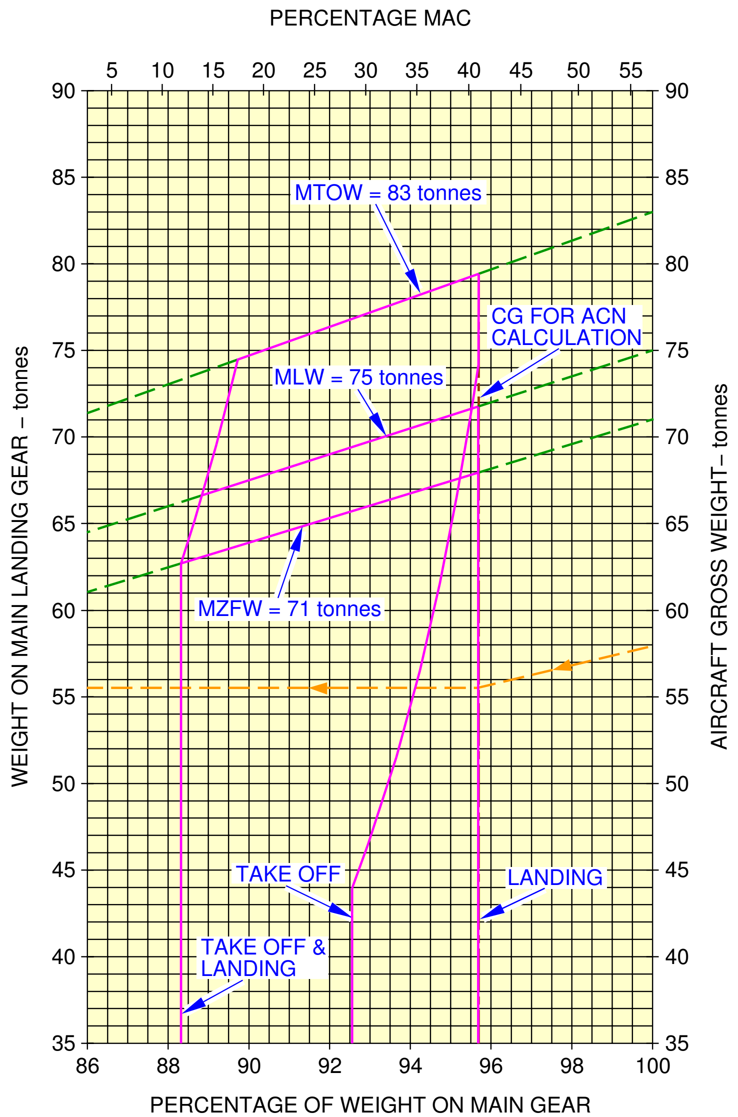
**ON A/C A321-100



N_AC_070401_1_0210101_01_01

Landing Gear Loading on Pavement
MTOW 83 T
FIGURE 1

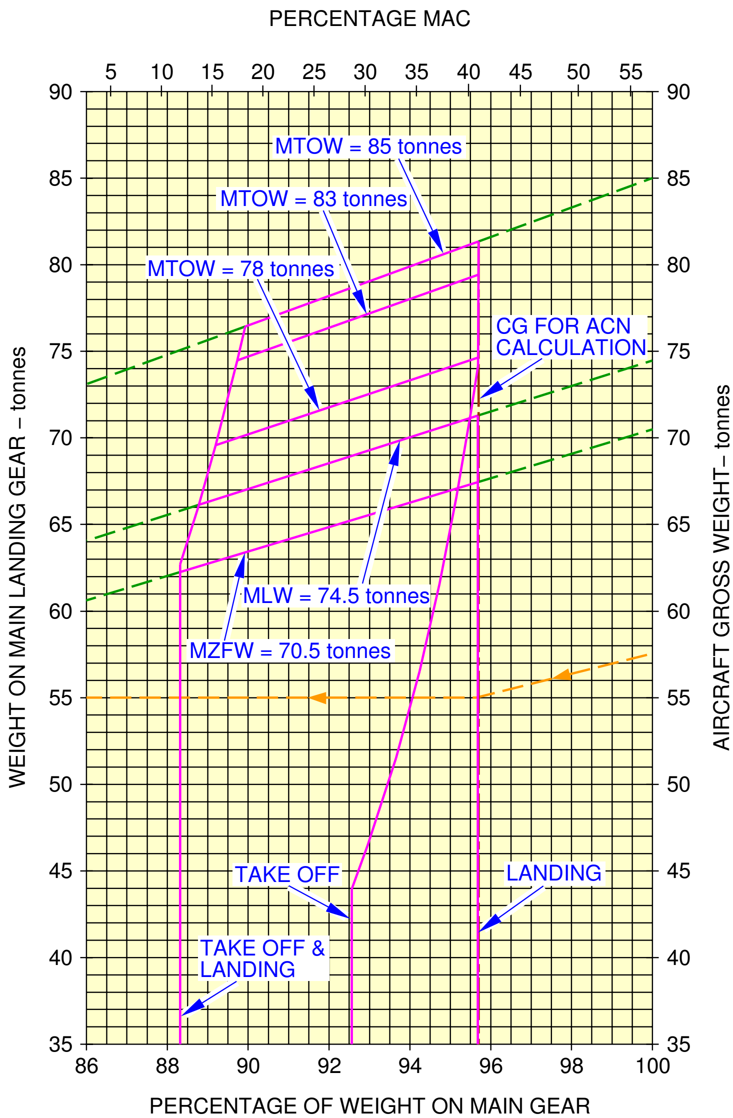
**ON A/C A321-100



N_AC_070401_1_0220101_01_01

Landing Gear Loading on Pavement
MTOW 83 T
FIGURE 2

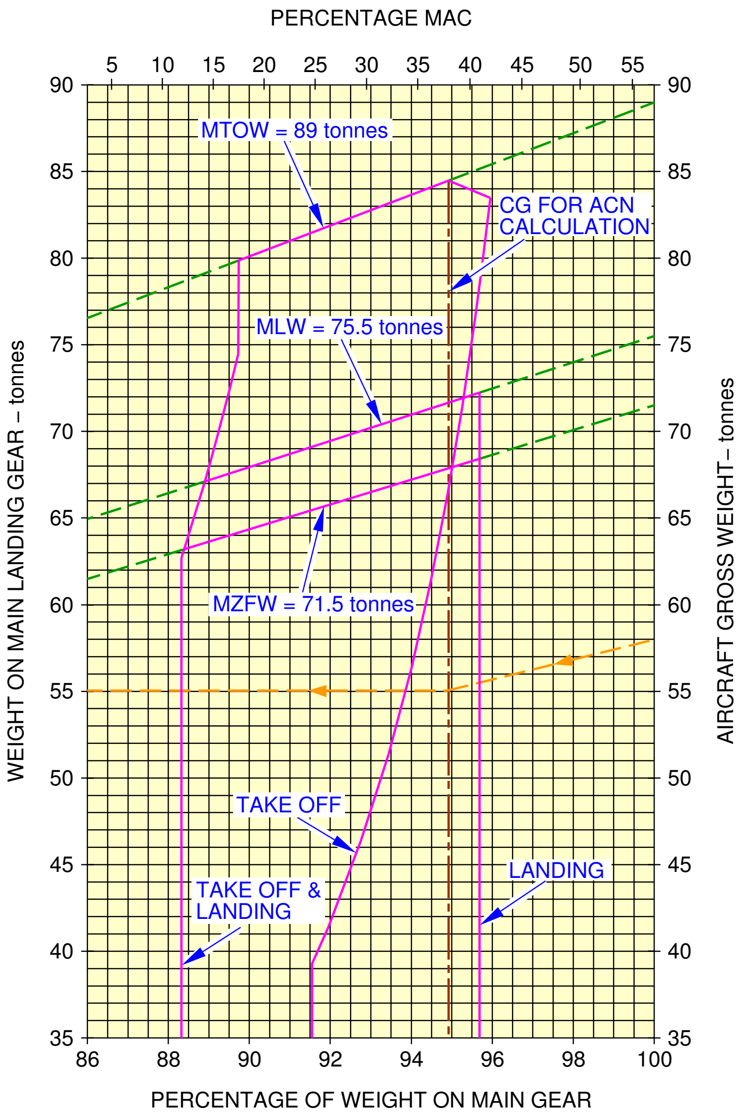
**ON A/C A321-100



N_AC_070401_1_0230101_01_01

Landing Gear Loading on Pavement
MTOW 85 T
FIGURE 3

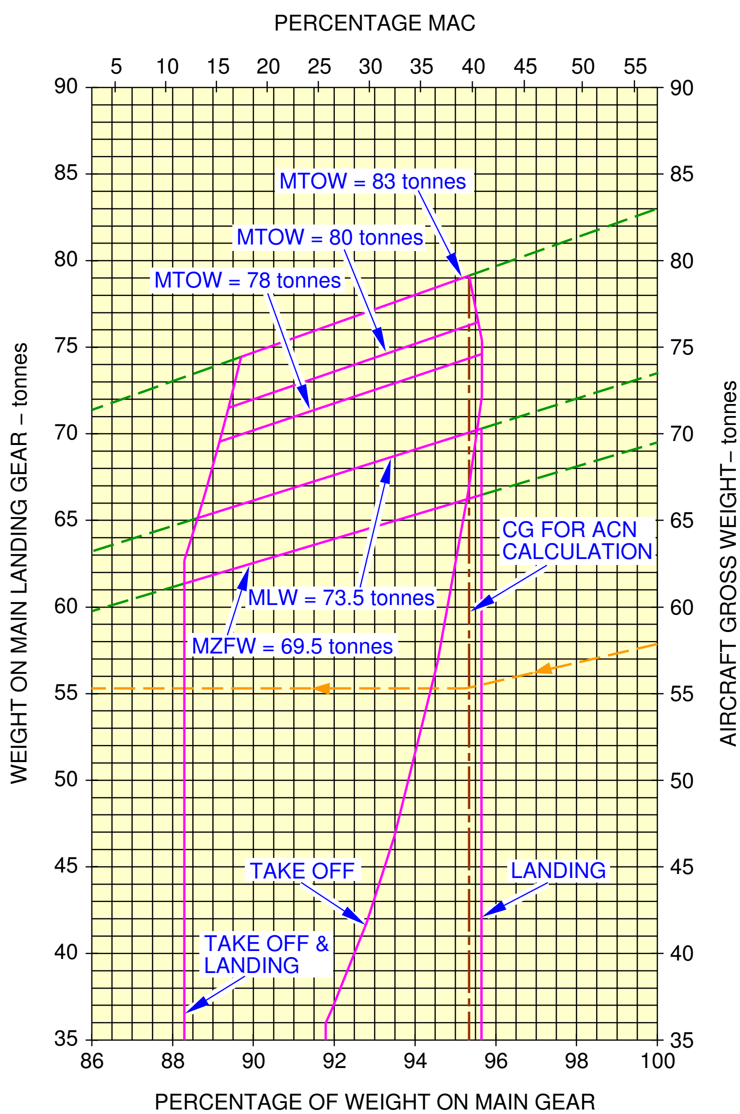
**ON A/C A321-100



N_AC_070401_1_0240101_01_01

Landing Gear Loading on Pavement
MTOW 89 T
FIGURE 4

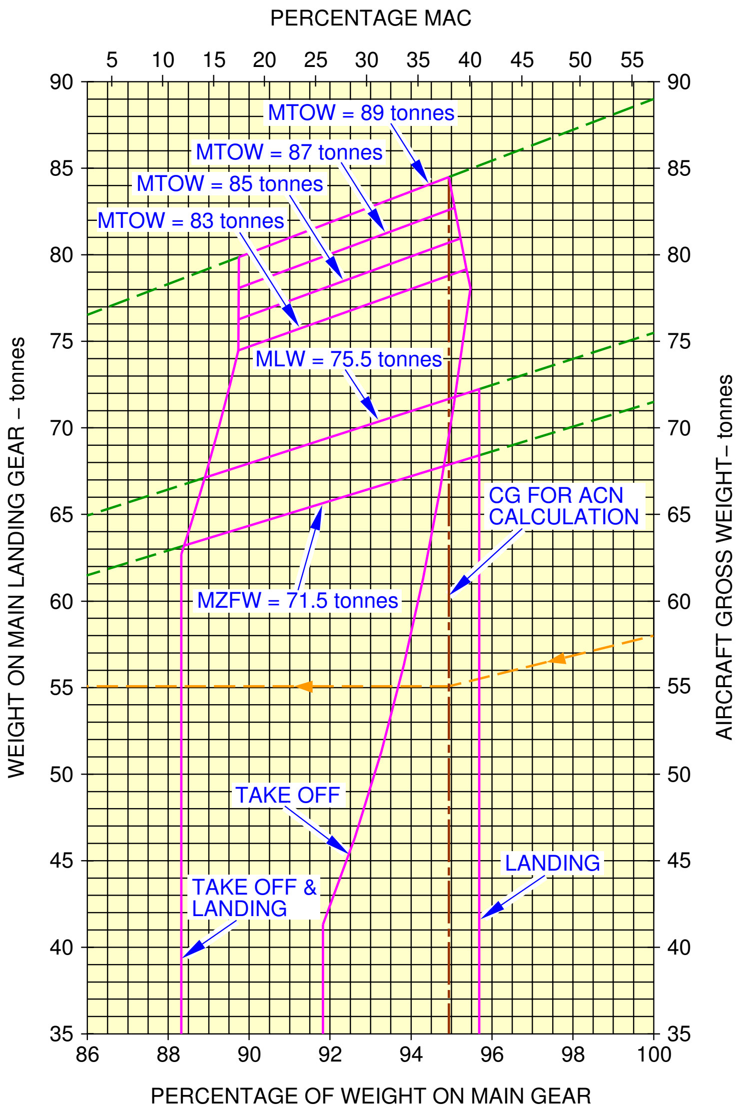
**ON A/C A321-200



N_AC_070401_1_0250101_01_01

Landing Gear Loading on Pavement
MTOW 83 T
FIGURE 5

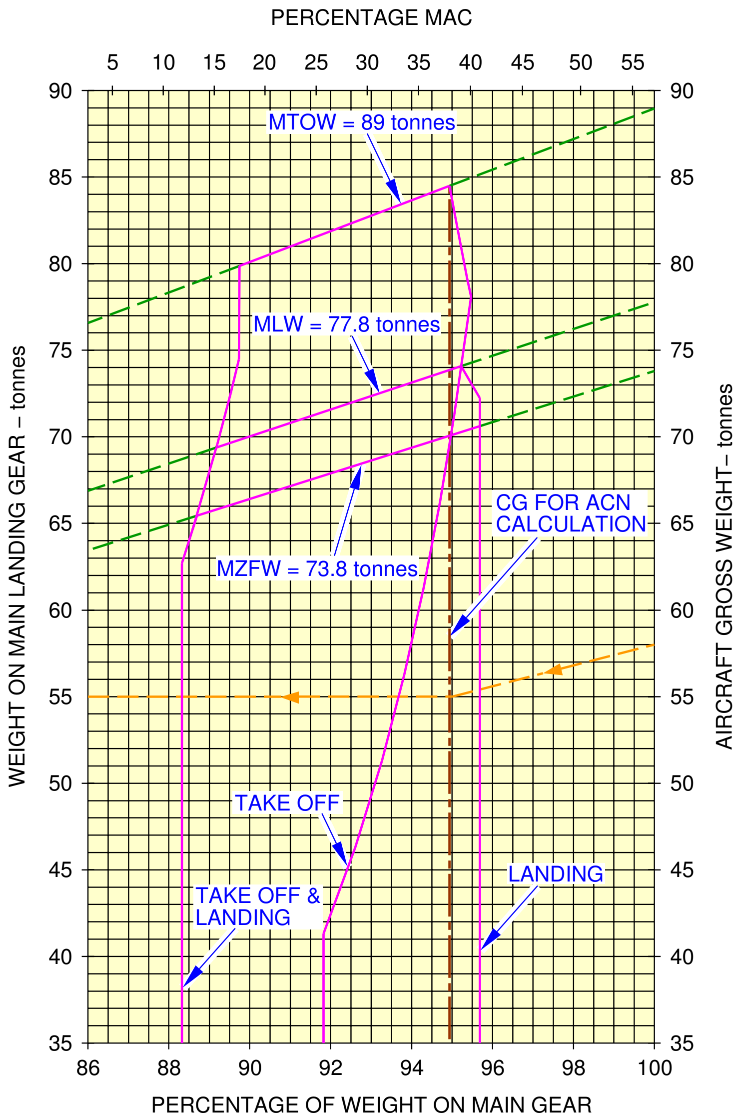
**ON A/C A321-200



N_AC_070401_1_0260101_01_01

Landing Gear Loading on Pavement
MTOW 89 T
FIGURE 6

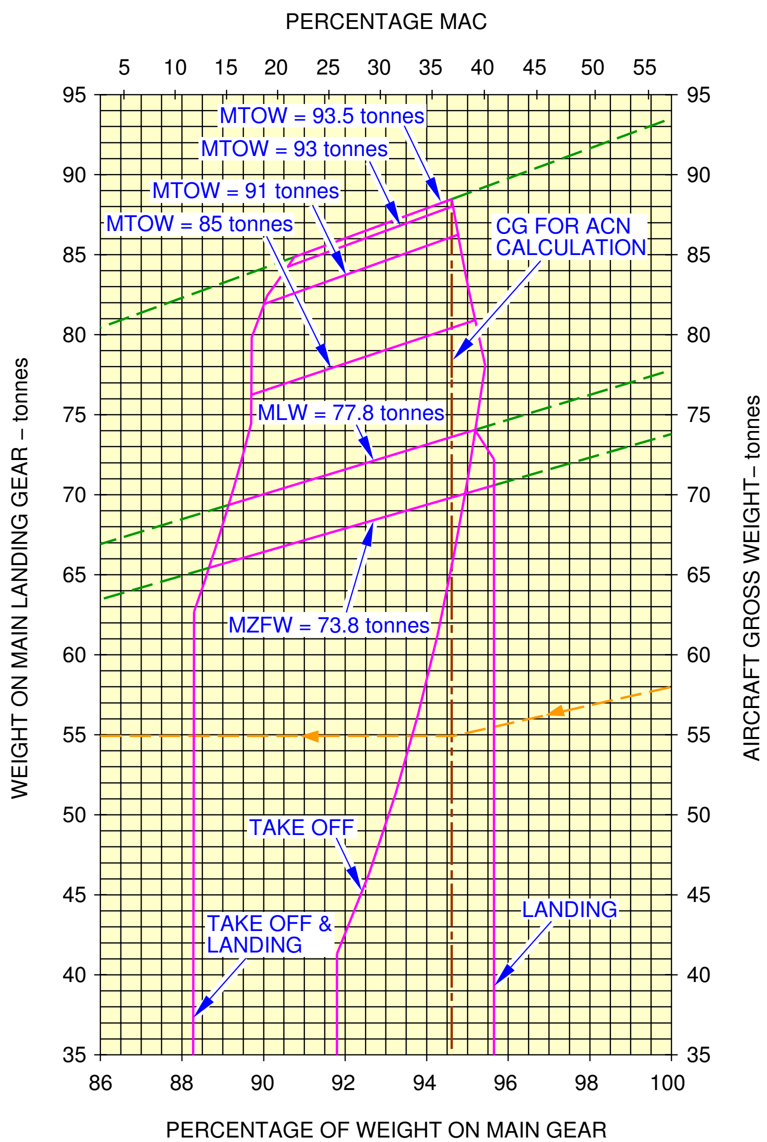
**ON A/C A321-200



N_AC_070401_1_0270101_01_01

Landing Gear Loading on Pavement
MTOW 89 T
FIGURE 7

**ON A/C A321-200



N_AC_070401_1_0280101_01_01

Landing Gear Loading on Pavement
MTOW 93.5 T
FIGURE 8

7-5-0 Flexible Pavement Requirements - U.S. Army Corps of Engineers Design Method

**ON A/C A321-100 A321-200

Flexible Pavement Requirements - U.S. Army Corps of Engineers Design Method

1. General

In order to determine a particular Flexible Pavement Thickness, the Subgrade Strength (CBR), the Annual Departure Level and the weight on one Main Landing Gear must be known.

In the example shown in Section 7-5-1 page 1 for:
- a CBR value of 10
- an Annual Departure Level of 25000
- the Load on one MLG of 20000 kg (44092 lb).

For these conditions the Flexible Pavement Thickness is 41.4 cm (16.3 in).

In the example shown in Section 7-5-1 page 9 for:
- a CBR value of 10
- an Annual Departure Level of 25000
- the Load on one MLG of 20000 kg (44092 lb).

For these conditions the Flexible Pavement Thickness is 41.8 cm (16.5 in).

The line showing 10000 Coverages is used to calculate Aircraft Classification Number (ACN).

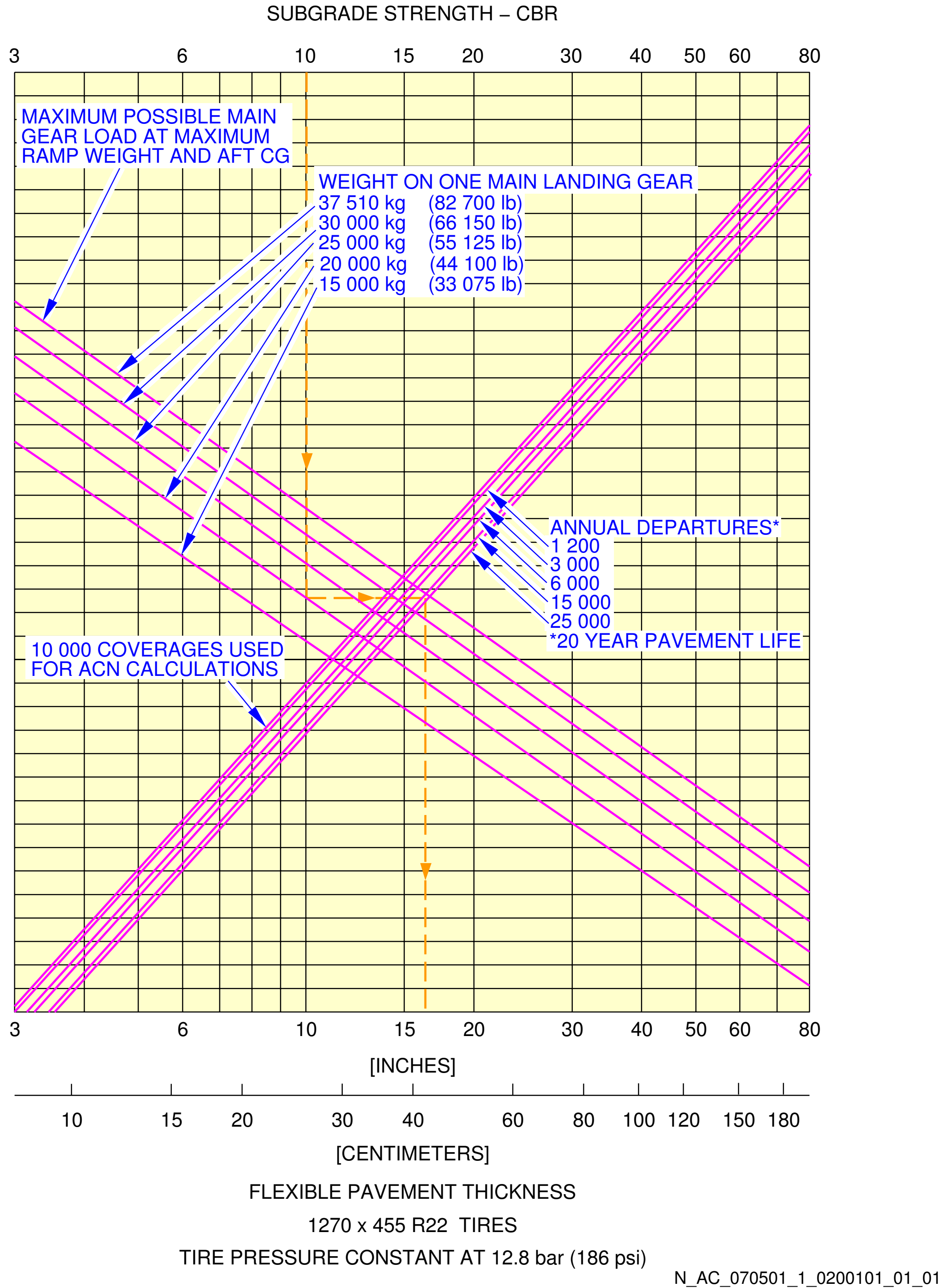
7-5-1 Flexible Pavement Requirements - U.S. Army Corps of Engineers Design Method

****ON A/C A321-100 A321-200**

Flexible Pavement Requirements - U.S. Army Corps of Engineers Design Method

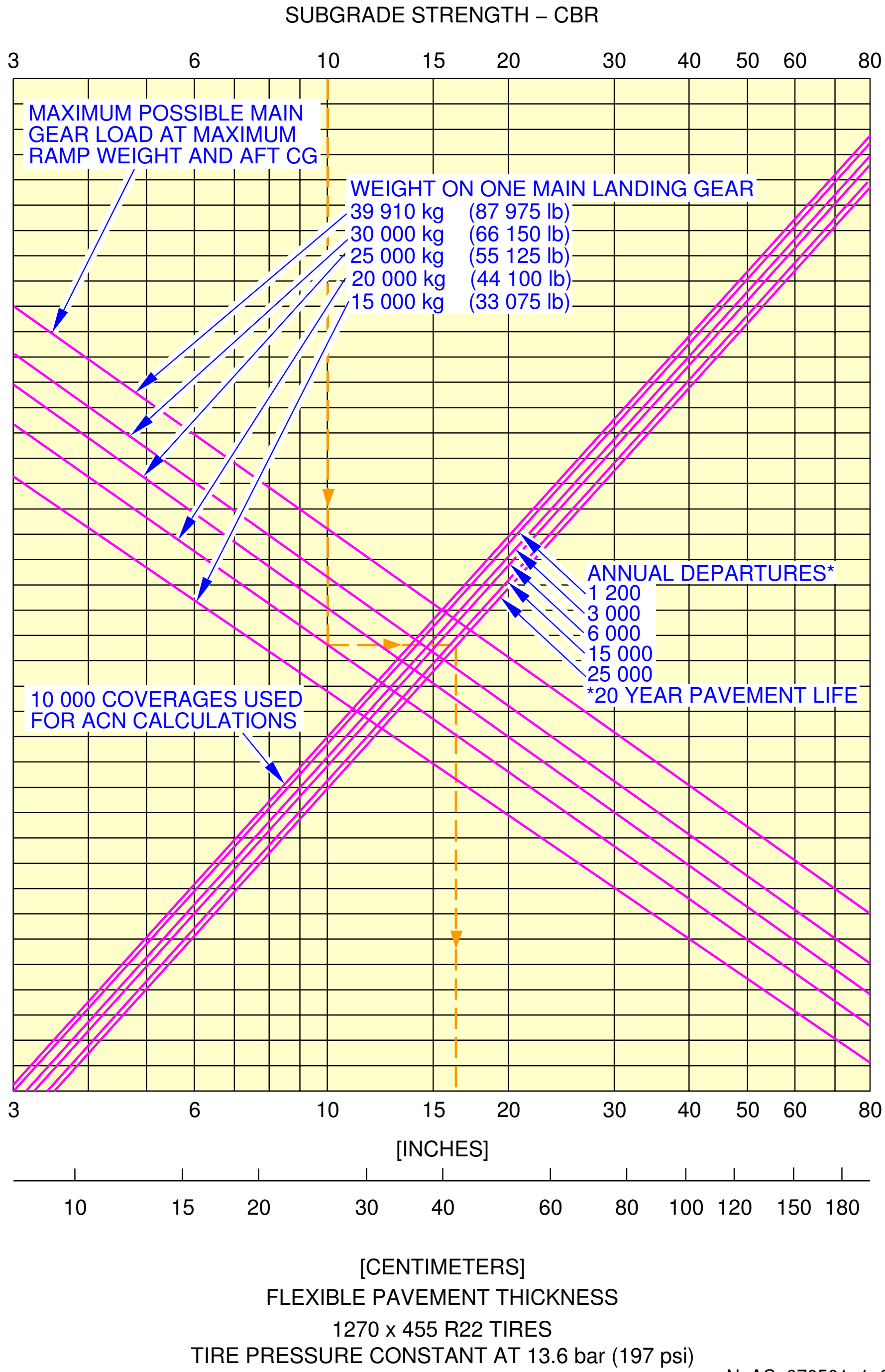
1. This section gives Flexible Pavement Requirements.

**ON A/C A321-100



Flexible Pavement Requirements
MTOW 78 T
FIGURE 1

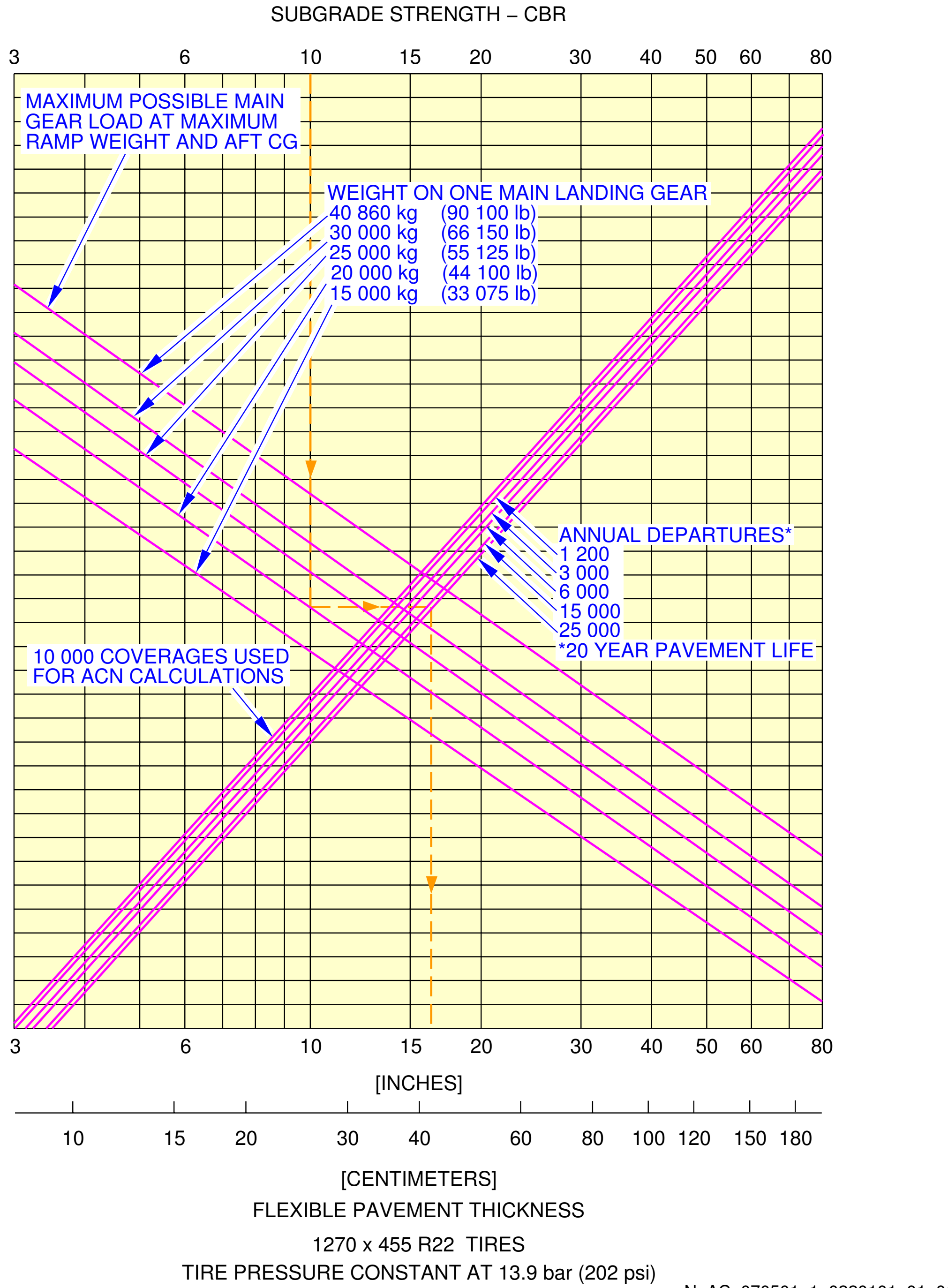
**ON A/C A321-100



N_AC_070501_1_0210101_01_01

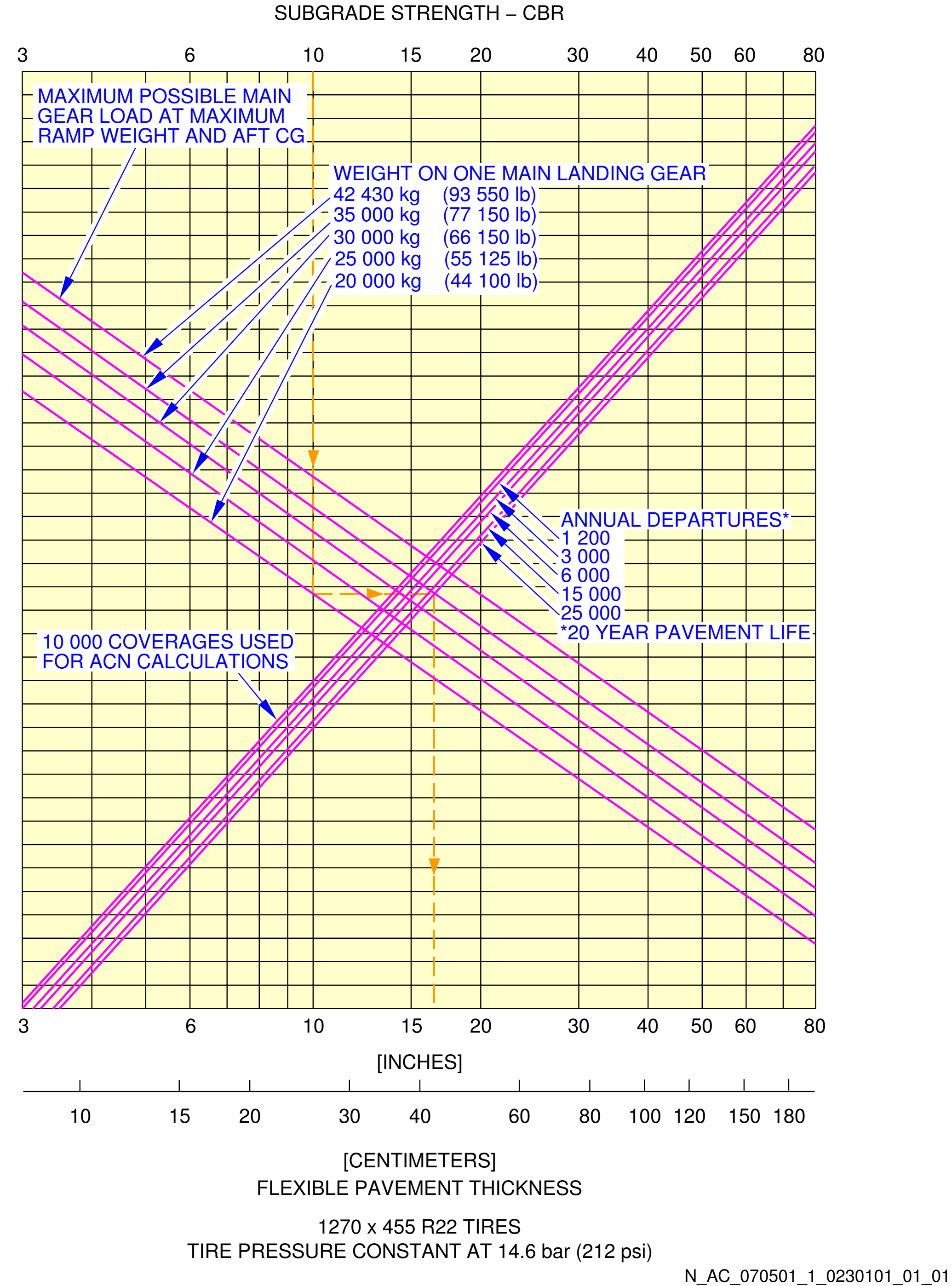
Flexible Pavement Requirements
MTOW 83 T
FIGURE 2

**ON A/C A321-100



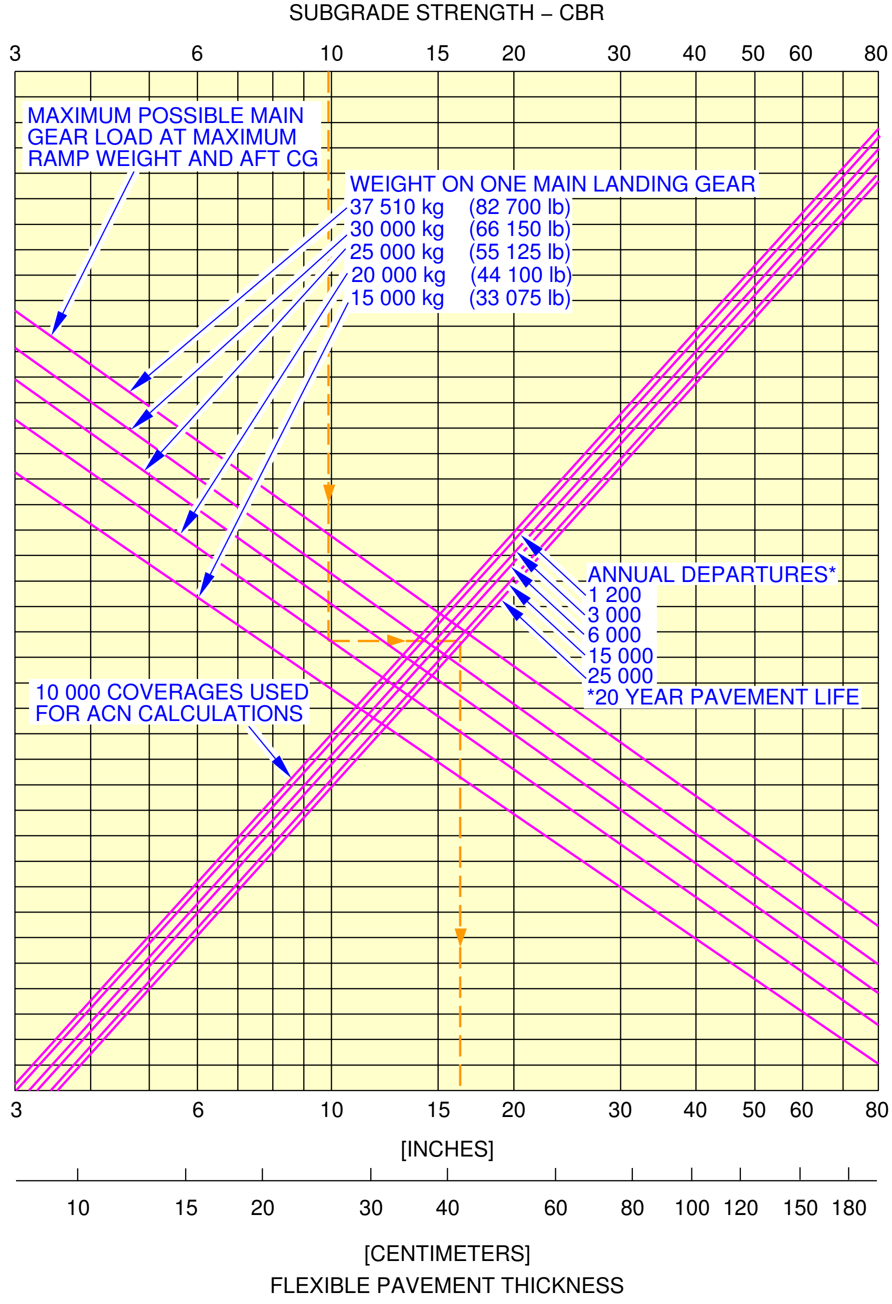
Flexible Pavement Requirements
MTOW 85 T
FIGURE 3

**ON A/C A321-100



Flexible Pavement Requirements
MTOW 89 T
FIGURE 4

**ON A/C A321-200

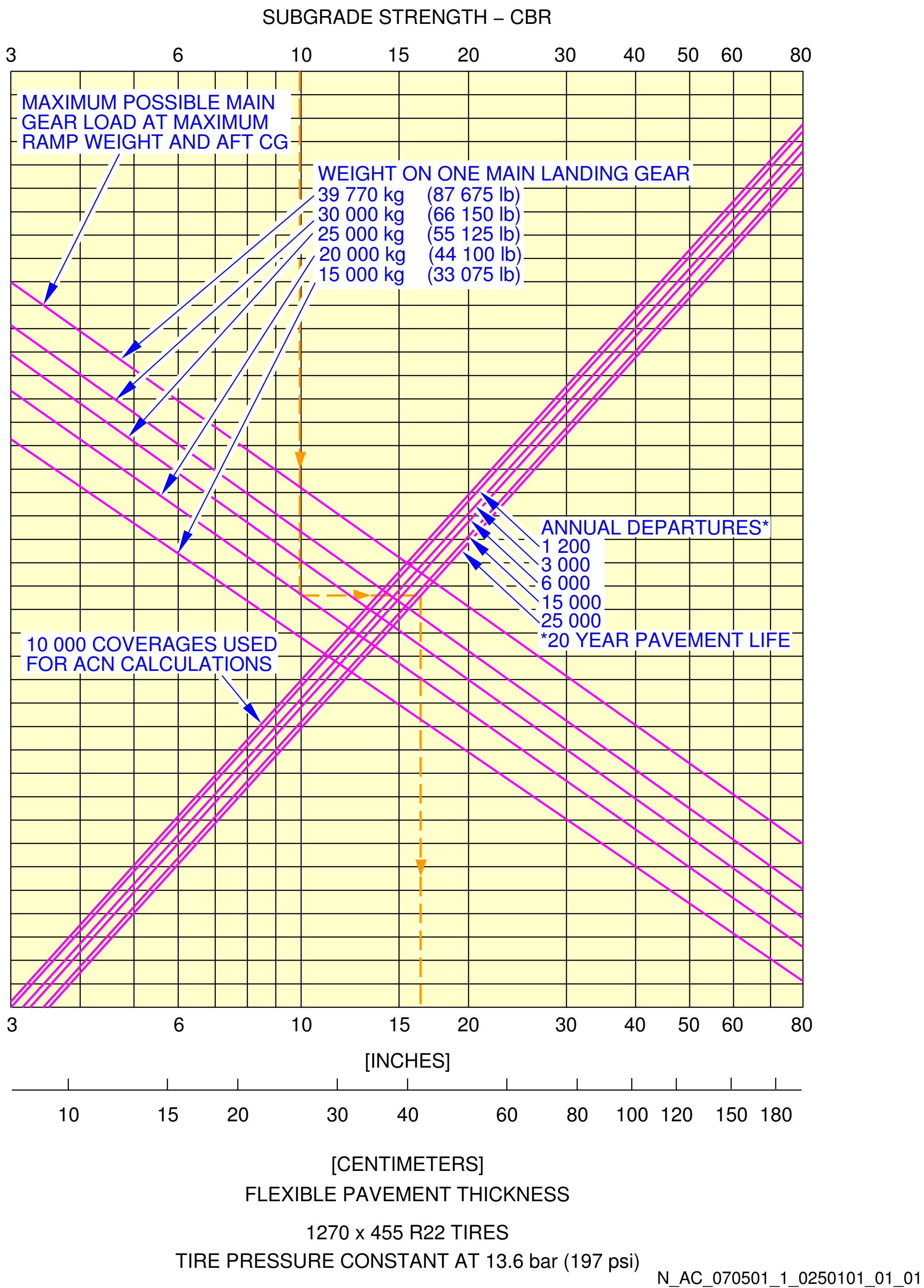


1270 x 455 R22 TIRES
TIRE PRESSURE CONSTANT AT 12.8 bar (186 psi)

N_AC_070501_1_0240101_01_01

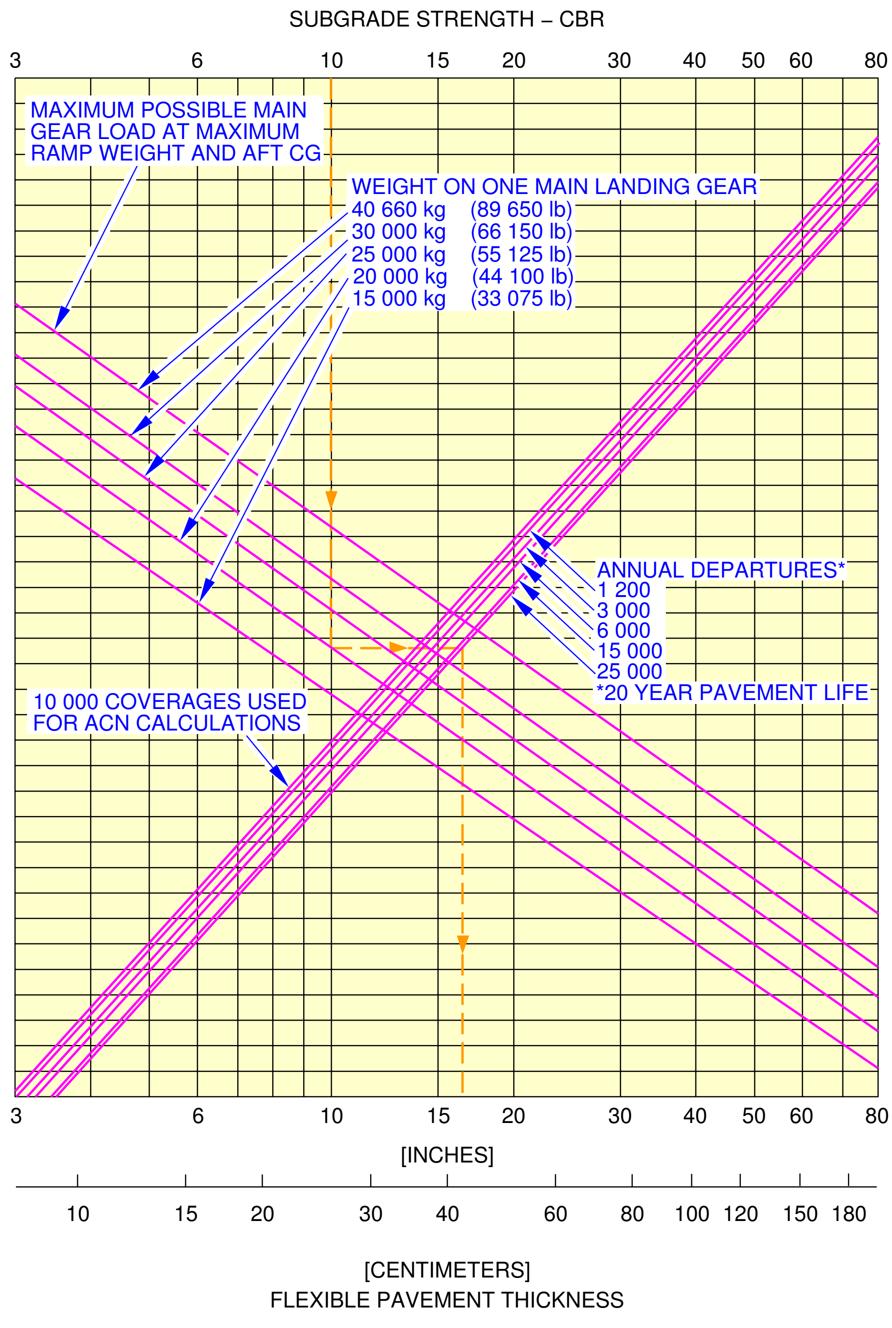
Flexible Pavement Requirements
MTOW 78 T
FIGURE 5

**ON A/C A321-200



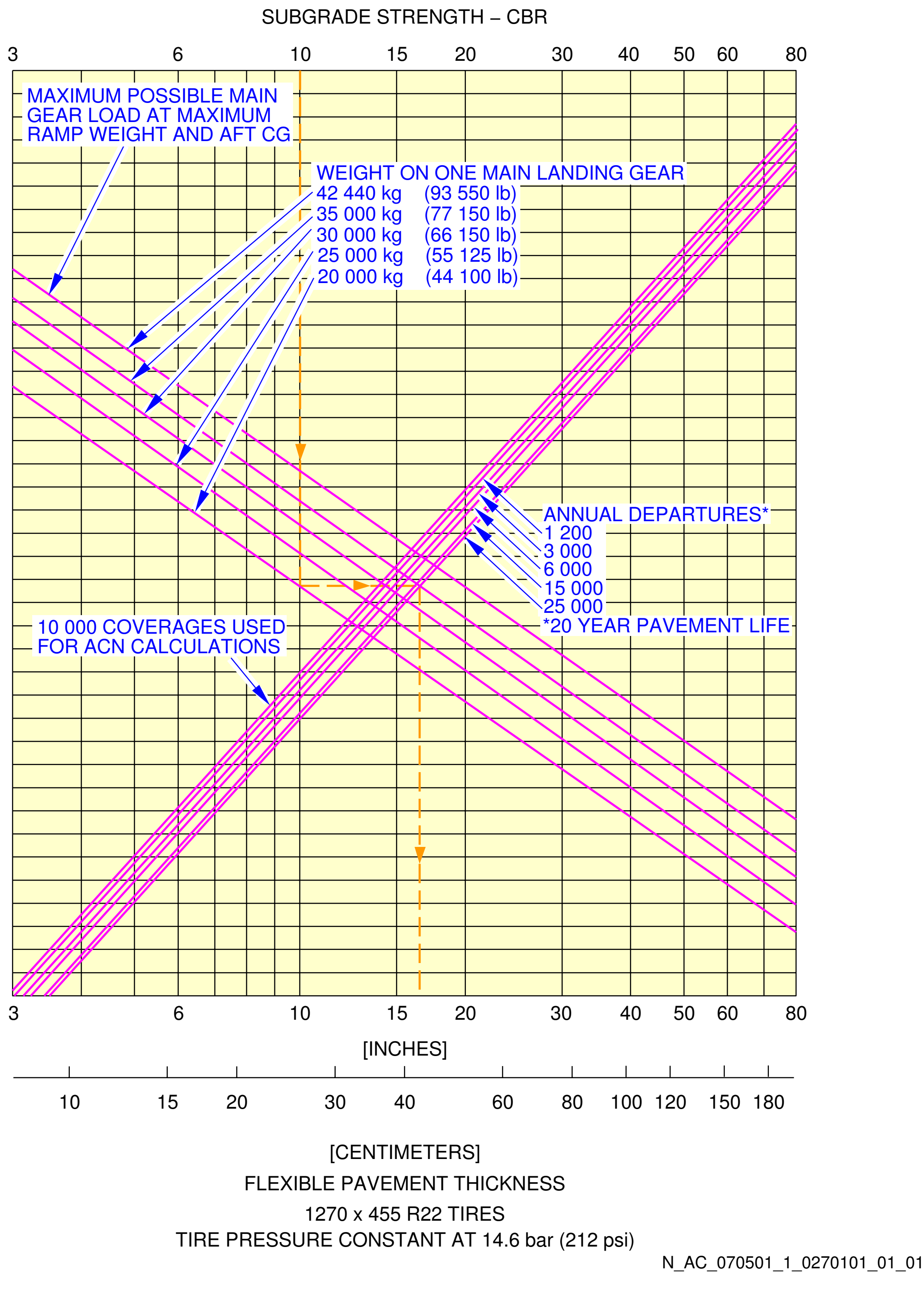
Flexible Pavement Requirements
MTOW 83 T
FIGURE 6

**ON A/C A321-200



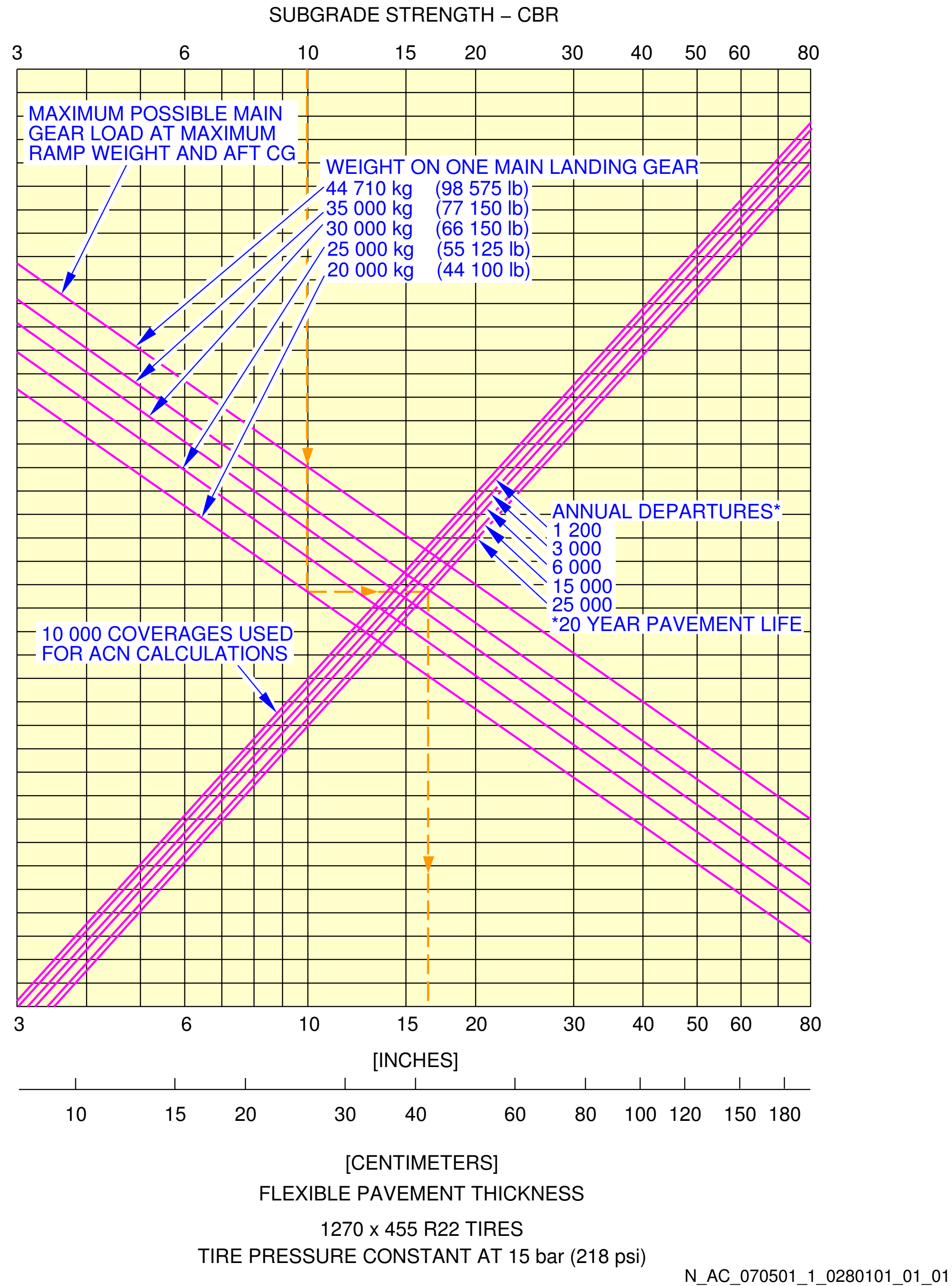
Flexible Pavement Requirements
MTOW 85 T
FIGURE 7

**ON A/C A321-200



Flexible Pavement Requirements
MTOW 89 T
FIGURE 8

**ON A/C A321-200



Flexible Pavement Requirements
MTOW 93.5 T
FIGURE 9

7-6-0 Flexible Pavement Requirements - LCN Conversion

**ON A/C A321-100 A321-200

Flexible Pavement Requirements - LCN Conversion

1. General

In order to determine the airplane weight that can be accommodated on a particular Flexible Pavement, both the LCN of the pavement and the thickness (h) must be known.

In the example shown in Section 7-6-1, page 1, for a Flexible Pavement, the thickness (h) is shown at 20 inches with an LCN of 54.

For these conditions the weight on one Main Landing Gear is 25000 kg (55116 lb).

In the example shown in Section 7-6-1, page 9, for a Flexible Pavement, the thickness (h) is shown at 20 inches with an LCN of 58.

For these conditions the weight on one Main Landing Gear is 25000 kg (55116 lb).

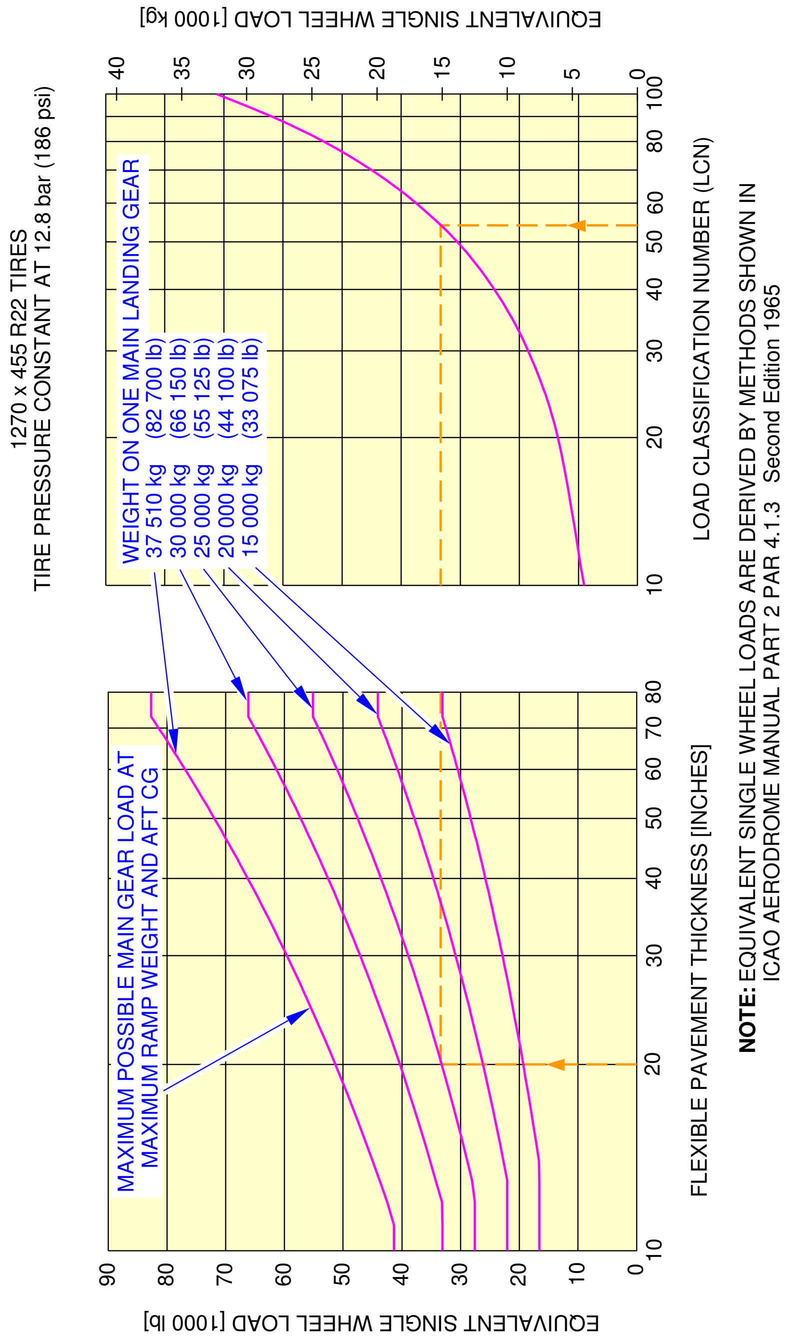
7-6-1 Flexible Pavement Requirements - LCN Conversion

****ON A/C A321-100 A321-200**

Flexible Pavement Requirements - LCN Conversion

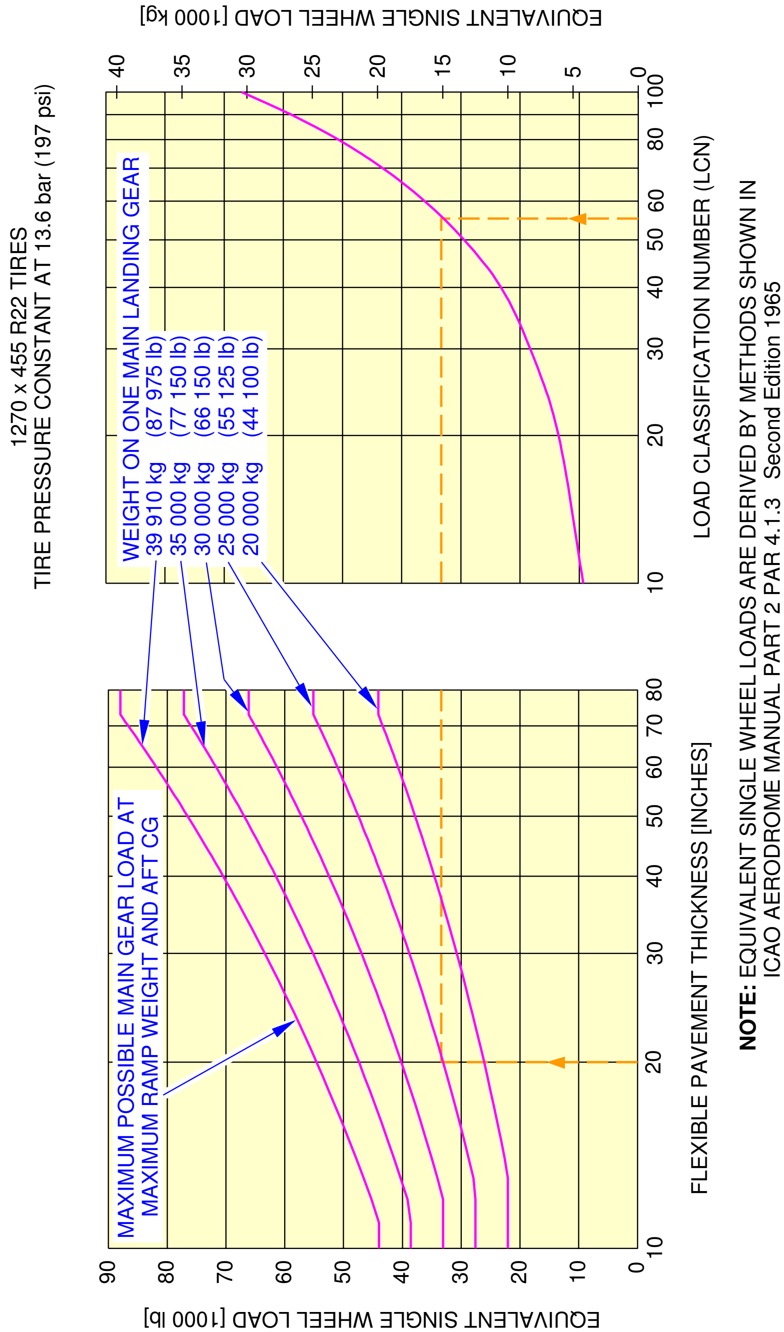
1. This section gives Flexible Pavement Requirements - LCN Conversion.

**ON A/C A321-100



Flexible Pavement Requirements - LCN Conversion
MTOW 78 T
FIGURE 1

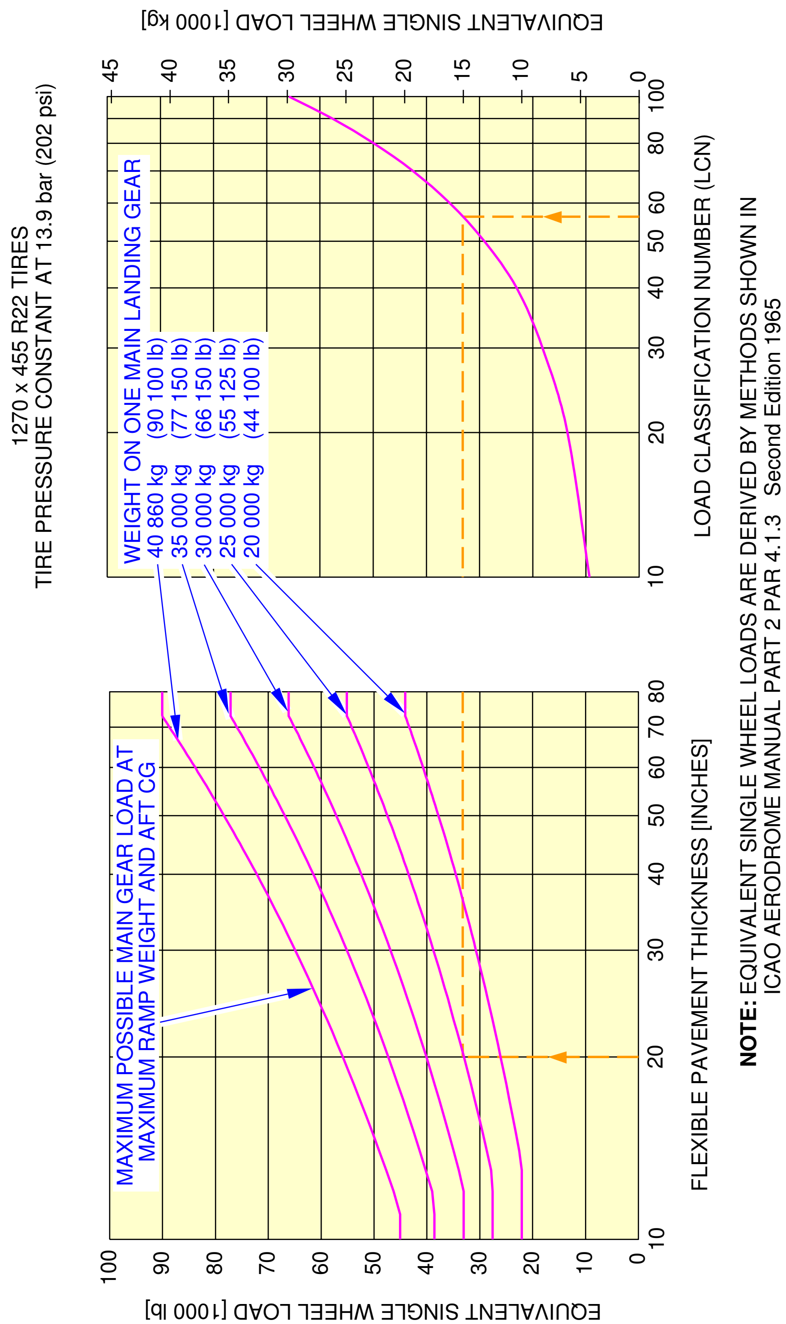
**ON A/C A321-100



N_AC_070601_1_0240101_01_01

Flexible Pavement Requirements - LCN Conversion
MTOW 83 T
FIGURE 2

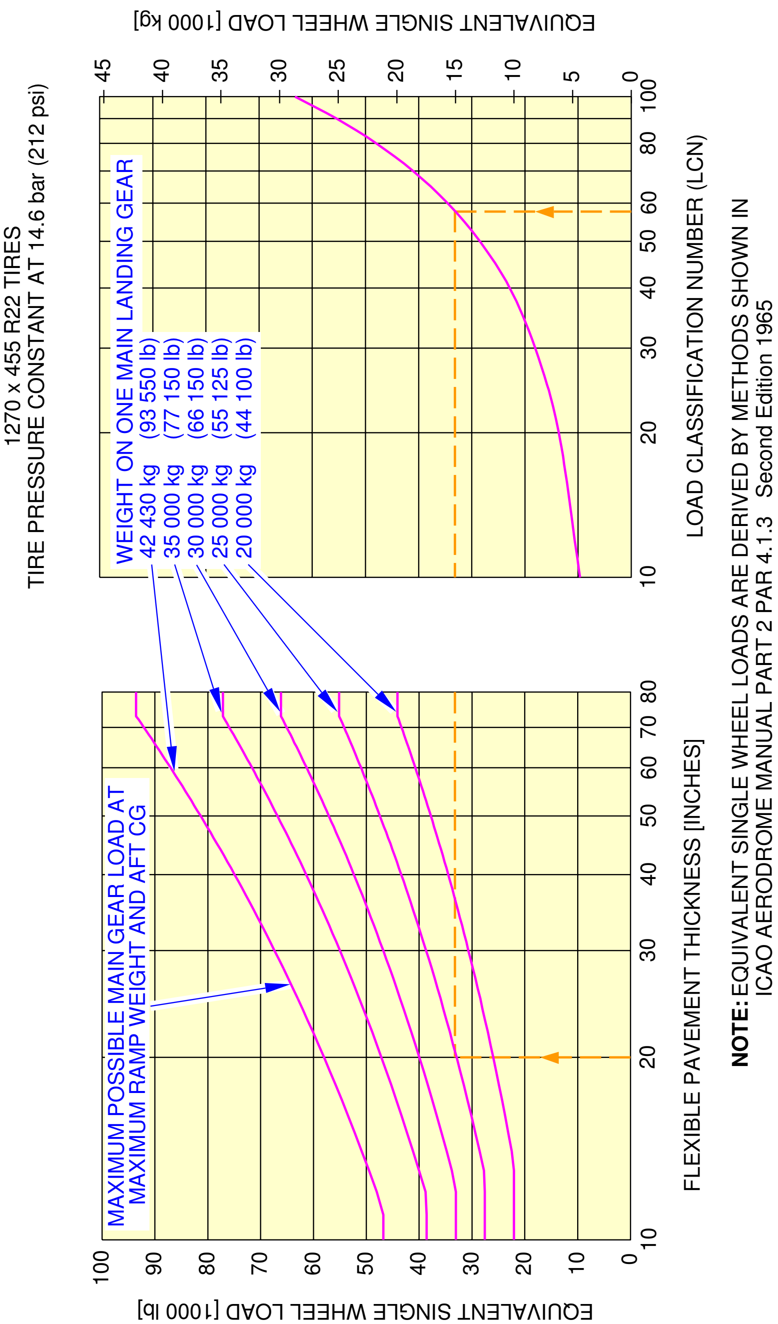
**ON A/C A321-100



N_AC_070601_1_0250101_01_01

Flexible Pavement Requirements - LCN Conversion
MTOW 85 T
FIGURE 3

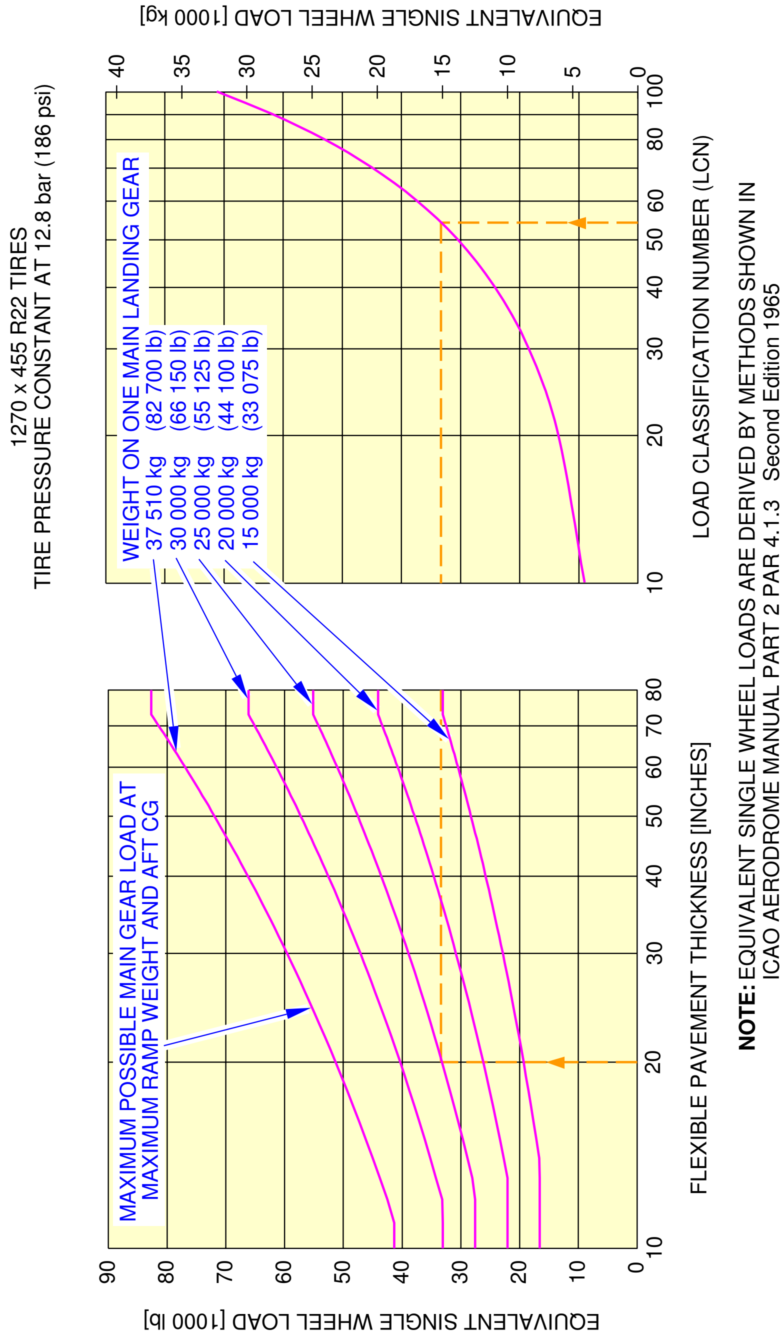
**ON A/C A321-100



N_AC_070601_1_0260101_01_01

Flexible Pavement Requirements - LCN Conversion
MTOW 89 T
FIGURE 4

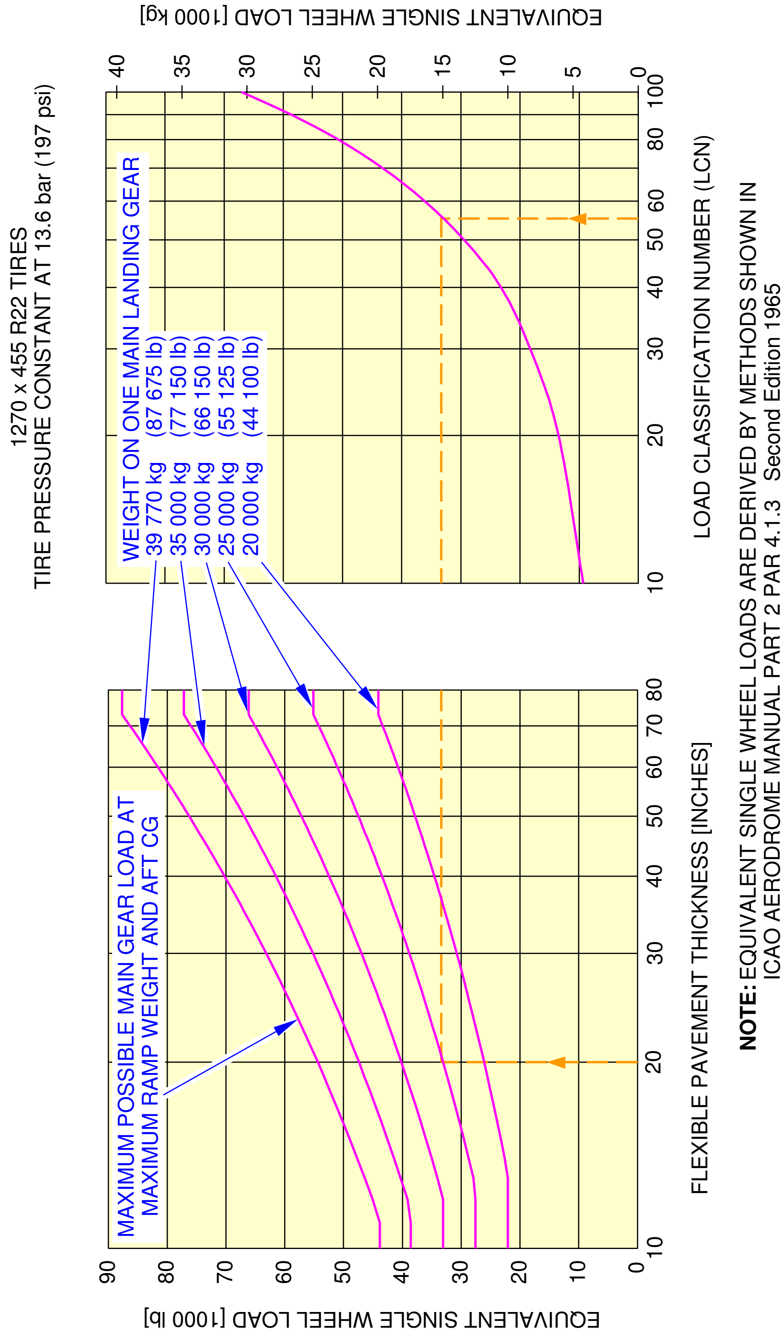
**ON A/C A321-200



N_AC_070601_1_0270101_01_01

Flexible Pavement Requirements - LCN Conversion
MTOW 78 T
FIGURE 5

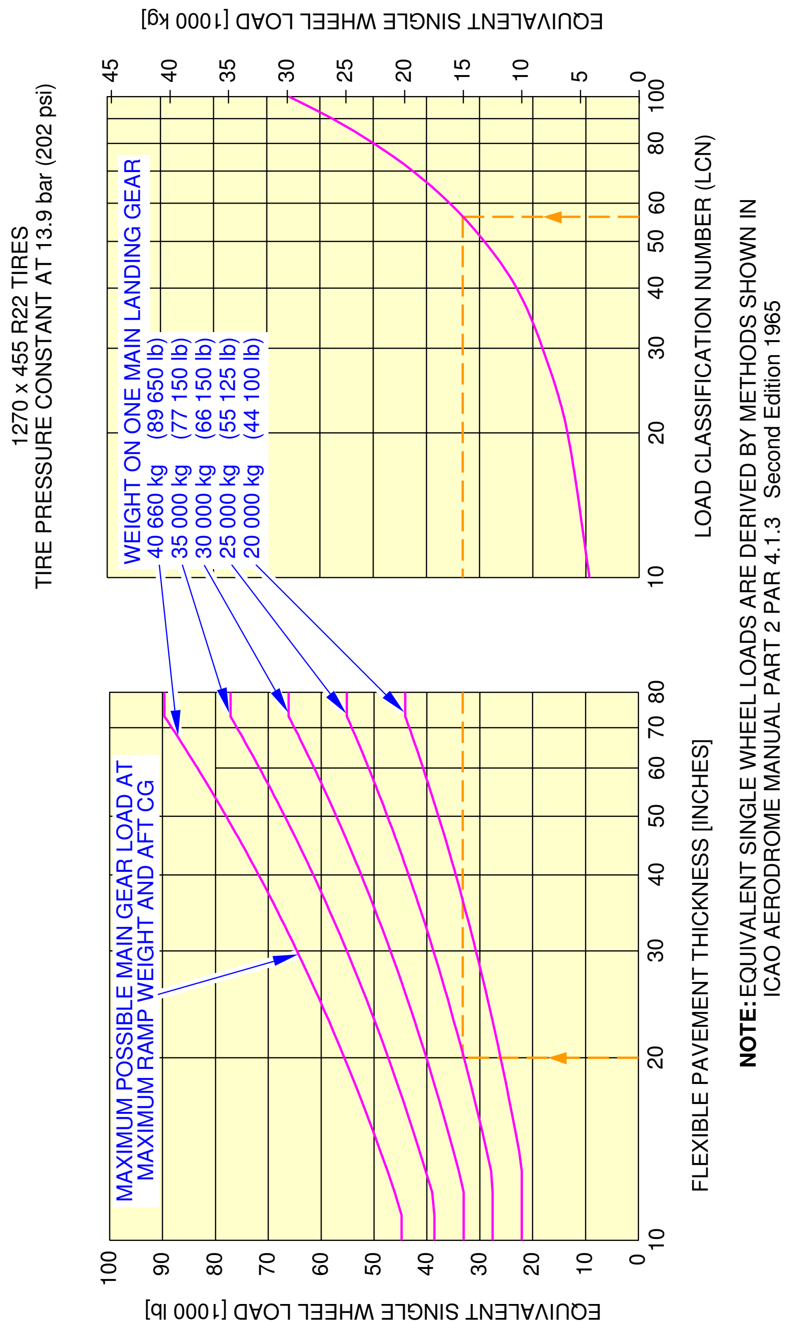
**ON A/C A321-200



N_AC_070601_1_0280101_01_01

Flexible Pavement Requirements - LCN Conversion
MTOW 83 T
FIGURE 6

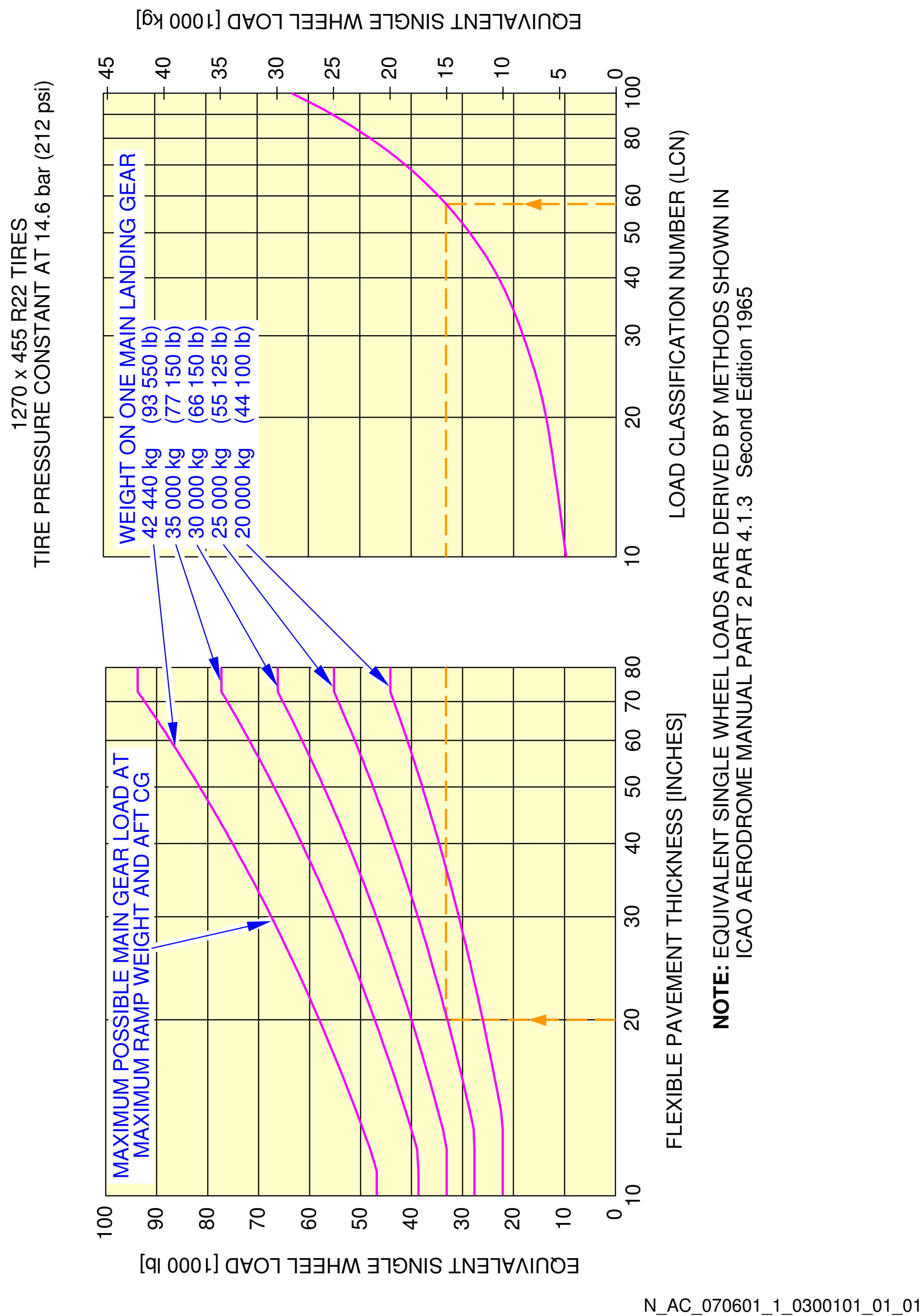
**ON A/C A321-200



N_AC_070601_1_0290101_01_01

Flexible Pavement Requirements - LCN Conversion
MTOW 85 T
FIGURE 7

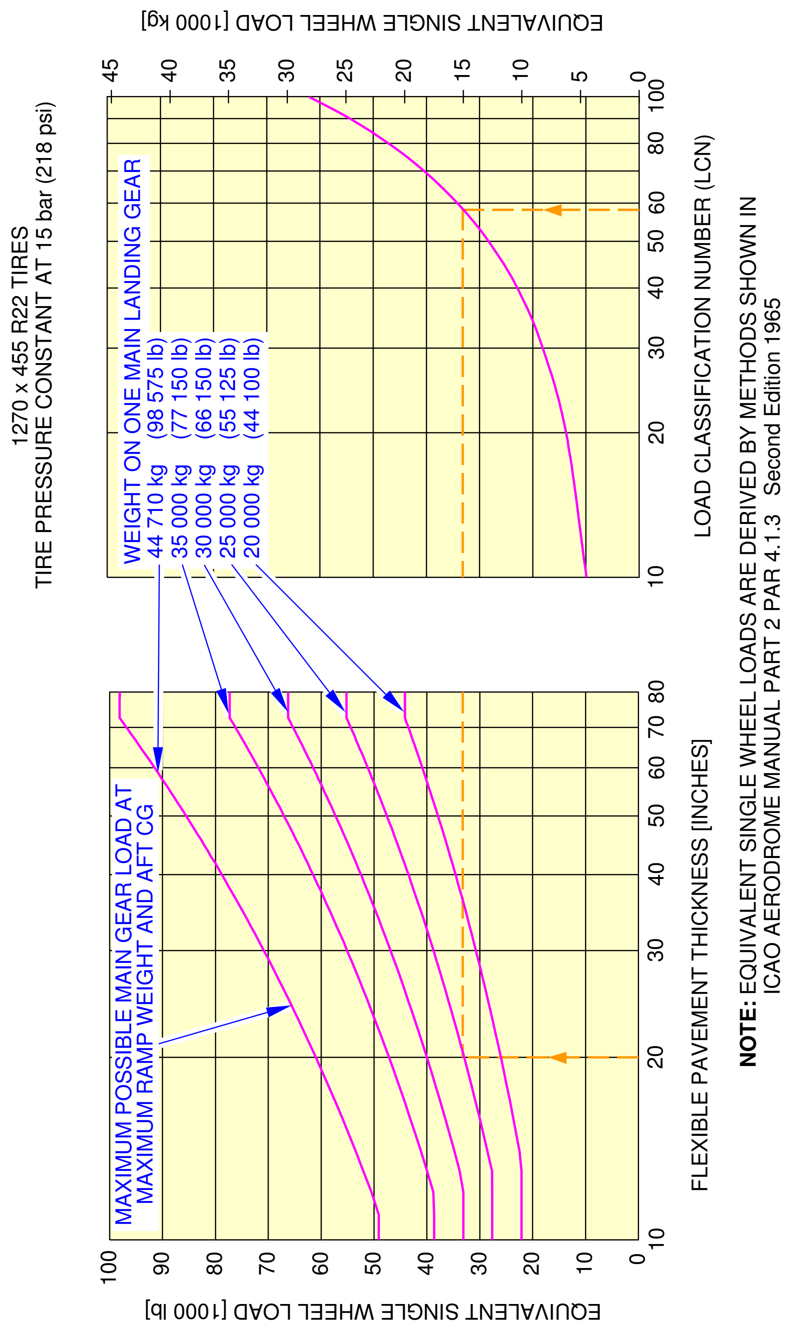
**ON A/C A321-200



N_AC_070601_1_0300101_01_01

Flexible Pavement Requirements - LCN Conversion
MTOW 89 T
FIGURE 8

**ON A/C A321-200



N_AC_070601_1_0310101_01_01

Flexible Pavement Requirements - LCN Conversion
MTOW 93.5 T
FIGURE 9

7-7-0 Rigid Pavement Requirements - Portland Cement Association Design Method

****ON A/C A321-100 A321-200**

Rigid Pavement Requirements - Portland Cement Association Design Method

1. General

To determine a Rigid Pavement Thickness, the Subgrade Modules (k), the allowable working stress and the weight on one Main Landing Gear must be known.

In the example shown in Section 7-7-1, page 1 for:
- a k value of 80 MN/m^3 (300 lb/in^3)
- an allowable working stress of 33.5 kgf/cm^2 (476.6 lbf/in^2)
- the Load on one Main Landing Gear of 20000 kg (44092 lb).

The required Rigid Pavement Thickness is 19 cm (7.5 in).

In the example shown in Section 7-7-1, page 8 for:
- a k value of 80 MN/m^3 (300 lb/in^3)
- an allowable working stress of 33.8 kgf/cm^2 (481 lbf/in^2)
- the Load on one Main Landing Gear of 20000 kg (44092 lb).

The required Rigid Pavement Thickness is 19 cm (7.5 in).

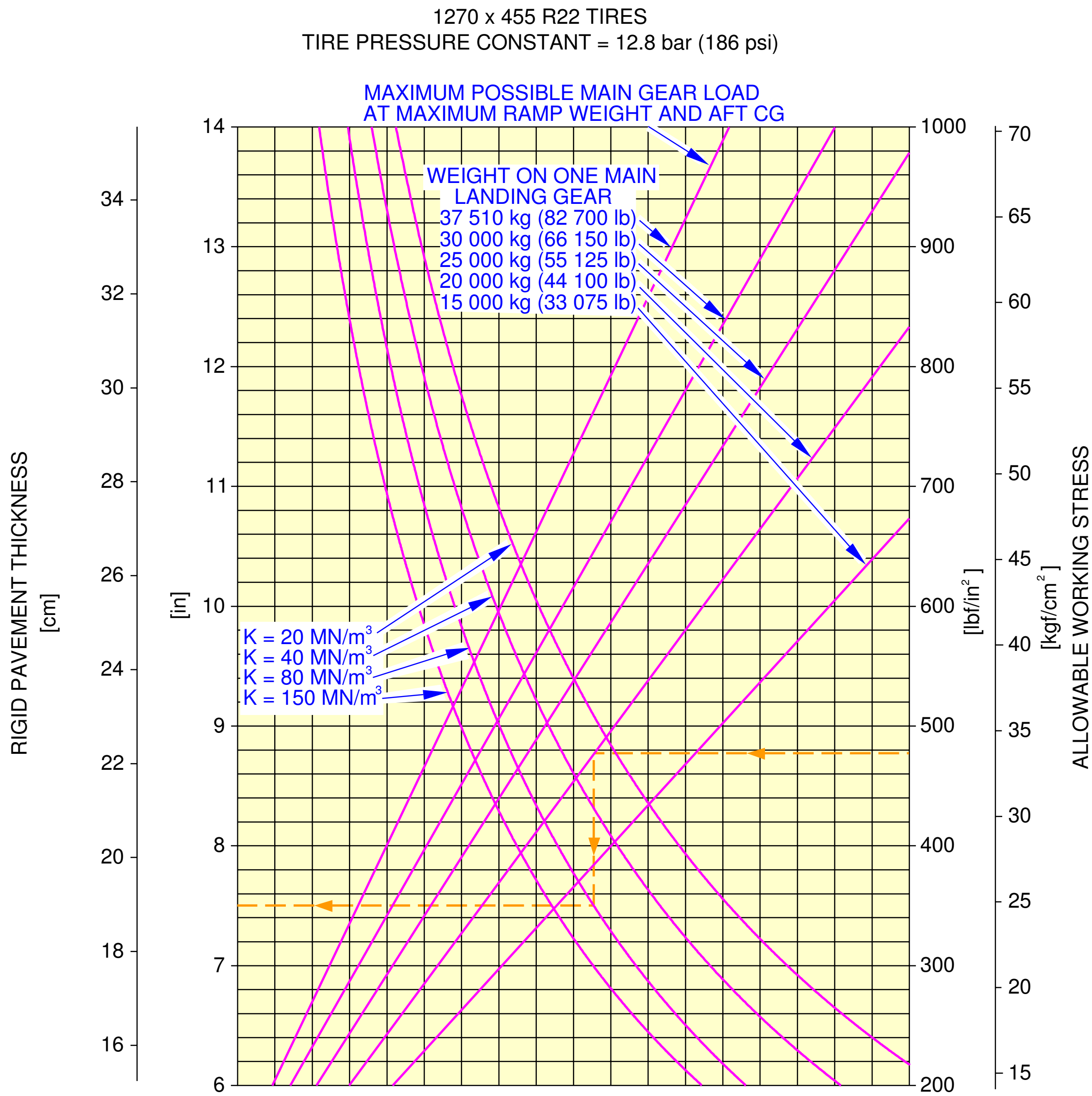
7-7-1 Rigid Pavement Requirements - Portland Cement Association Design Method

****ON A/C A321-100 A321-200**

Rigid Pavement Requirements - Portland Cement Association Design Method

1. This section gives Rigid Pavement Requirements.

**ON A/C A321-100



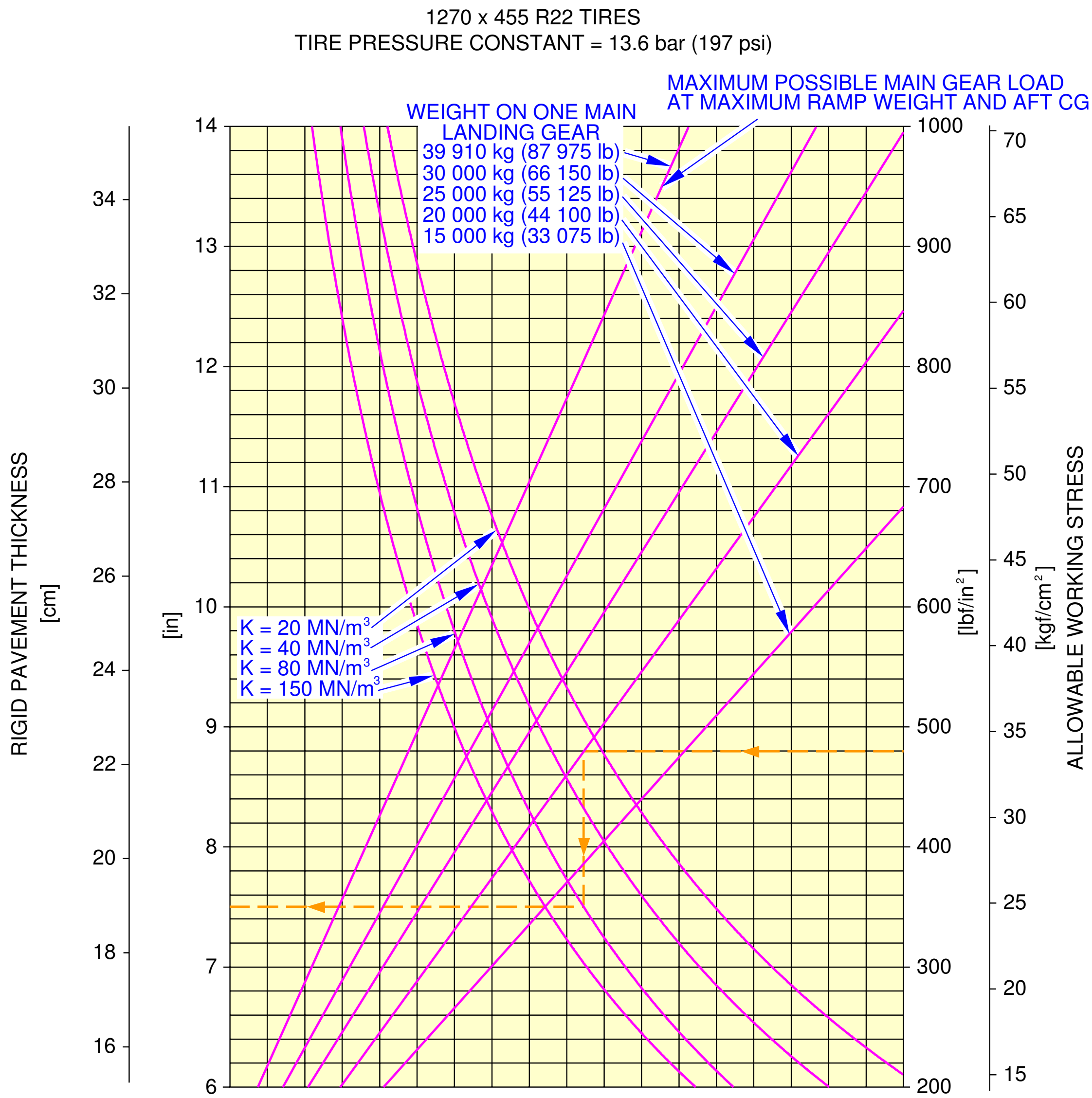
NOTE:
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUES FOR K ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR K = 80 MN/m³ BUT DEVIATE SLIGHTLY FOR ANY OTHER VALUES OF K

REFERENCE:
"DESIGN OF CONCRETE AIRPORT PAVEMENTS" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN – PROGRAM PDILB" PORTLAND CEMENT ASSOCIATION

N_AC_070701_1_0200101_01_01

Rigid Pavement Requirements (PCA)
MTOW 78 T
FIGURE 1

**ON A/C A321-100



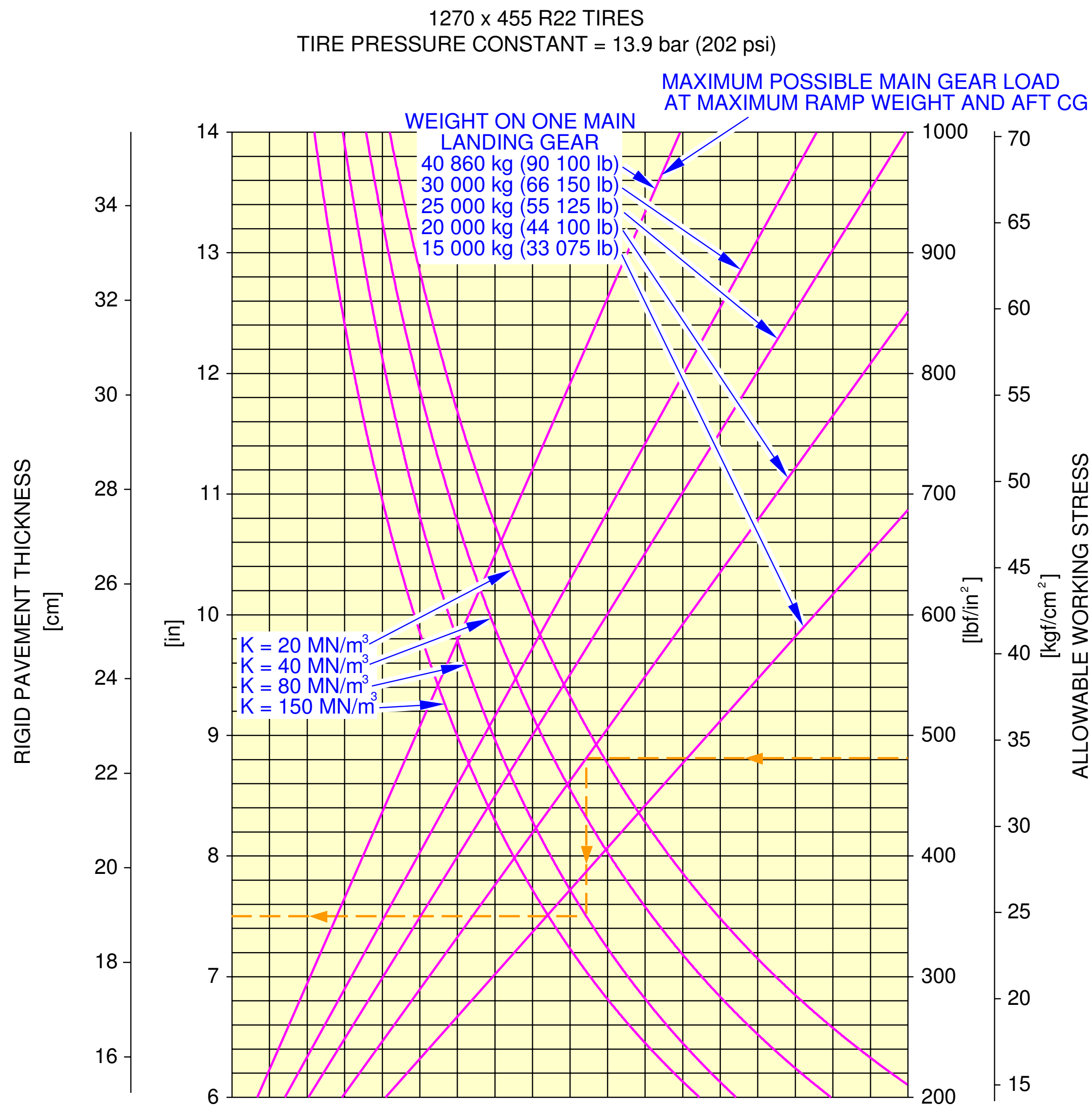
NOTE:
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUES FOR K ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR K = 80 MN/m^3 BUT DEVIATE SLIGHTLY FOR ANY OTHER VALUES OF K

REFERENCE:
"DESIGN OF CONCRETE AIRPORT PAVEMENTS" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN – PROGRAM PDILB" PORTLAND CEMENT ASSOCIATION

N_AC_070701_1_0210101_01_01

Rigid Pavement Requirements (PCA)
MTOW 83 T
FIGURE 2

**ON A/C A321-100



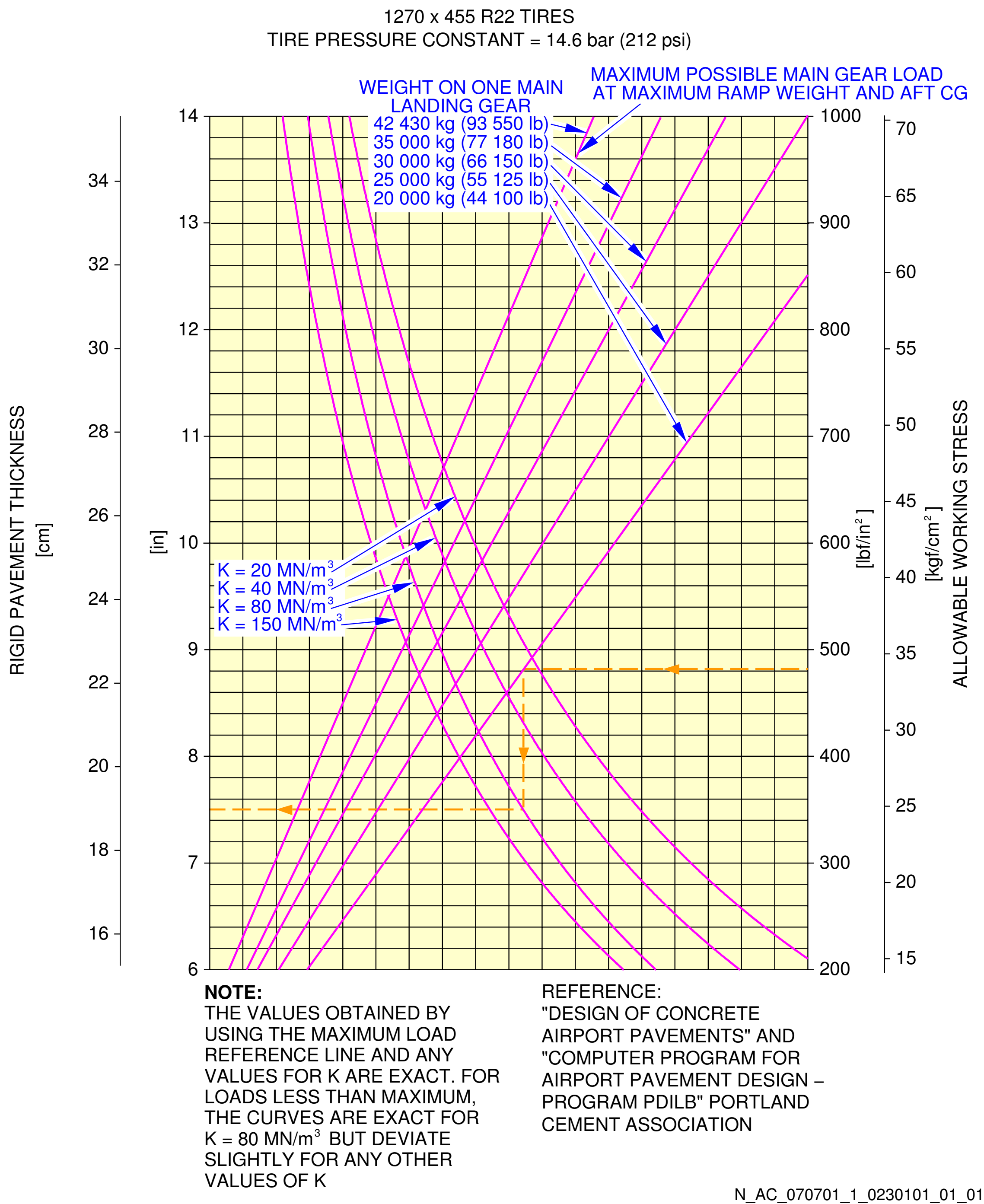
NOTE:
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUES FOR K ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR K = 80 MN/m^3 BUT DEVIATE SLIGHTLY FOR ANY OTHER VALUES OF K

REFERENCE:
"DESIGN OF CONCRETE AIRPORT PAVEMENTS" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN – PROGRAM PDILB" PORTLAND CEMENT ASSOCIATION

N_AC_070701_1_0220101_01_01

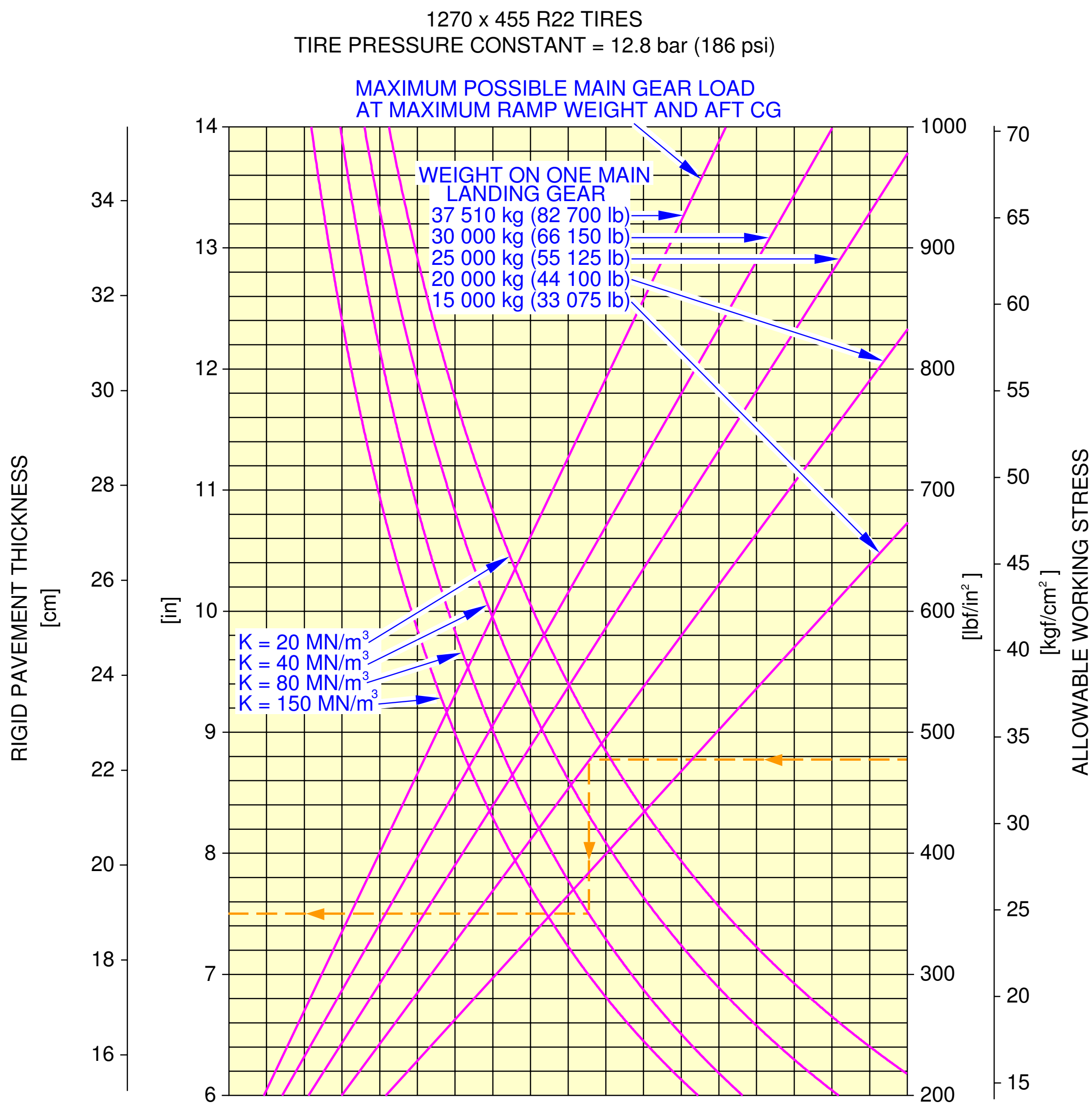
Rigid Pavement Requirements (PCA)
MTOW 85 T
FIGURE 3

**ON A/C A321-100



Rigid Pavement Requirements (PCA)
MTOW 89 T
FIGURE 4

**ON A/C A321-200



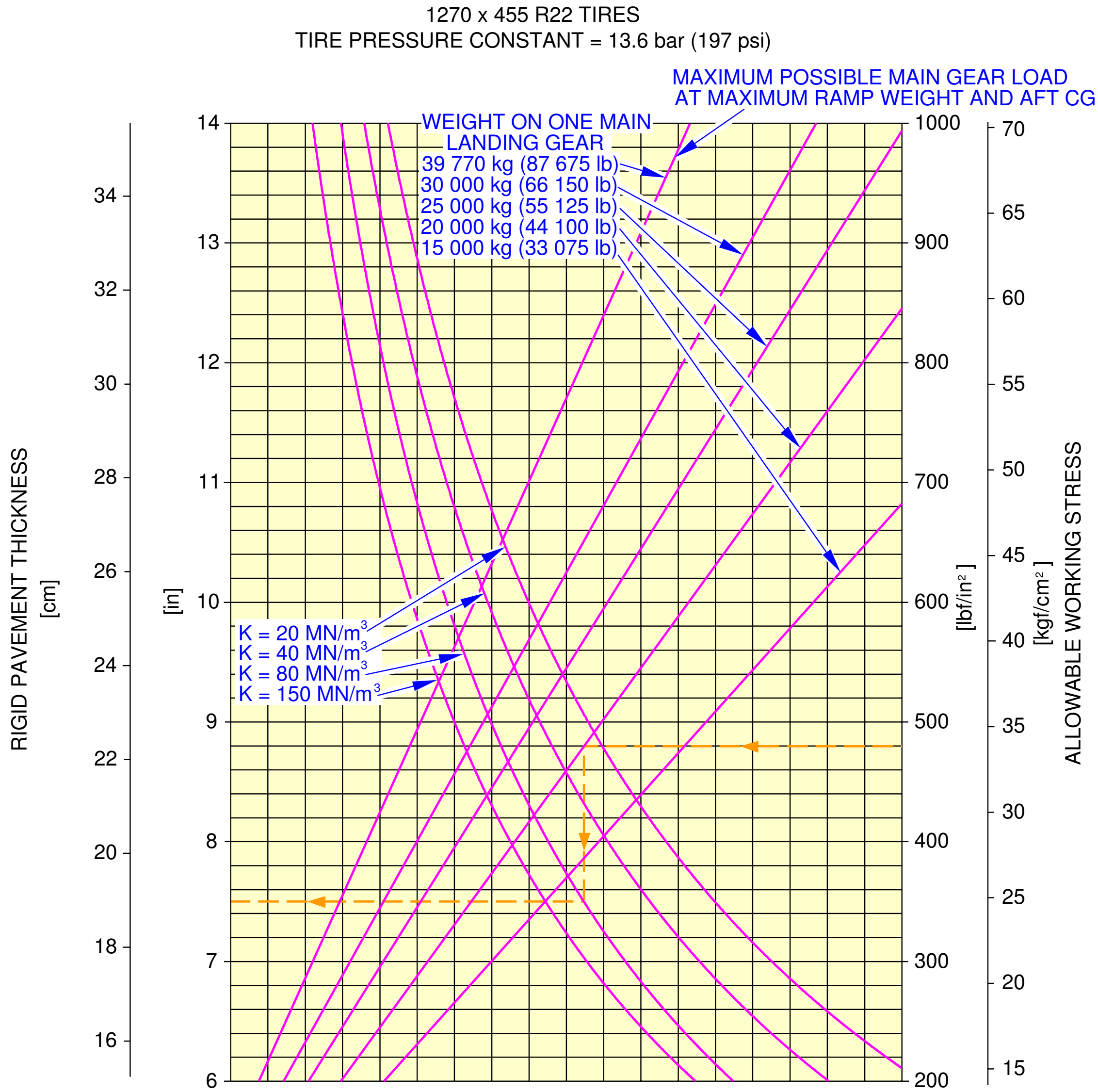
NOTE:
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUES FOR K ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR K = 80 MN/m^3 BUT DEVIATE SLIGHTLY FOR ANY OTHER VALUES OF K

REFERENCE:
"DESIGN OF CONCRETE AIRPORT PAVEMENTS" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN – PROGRAM PDILB" PORTLAND CEMENT ASSOCIATION

N_AC_070701_1_0240101_01_01

Rigid Pavement Requirements (PCA)
MTOW 78 T
FIGURE 5

**ON A/C A321-200



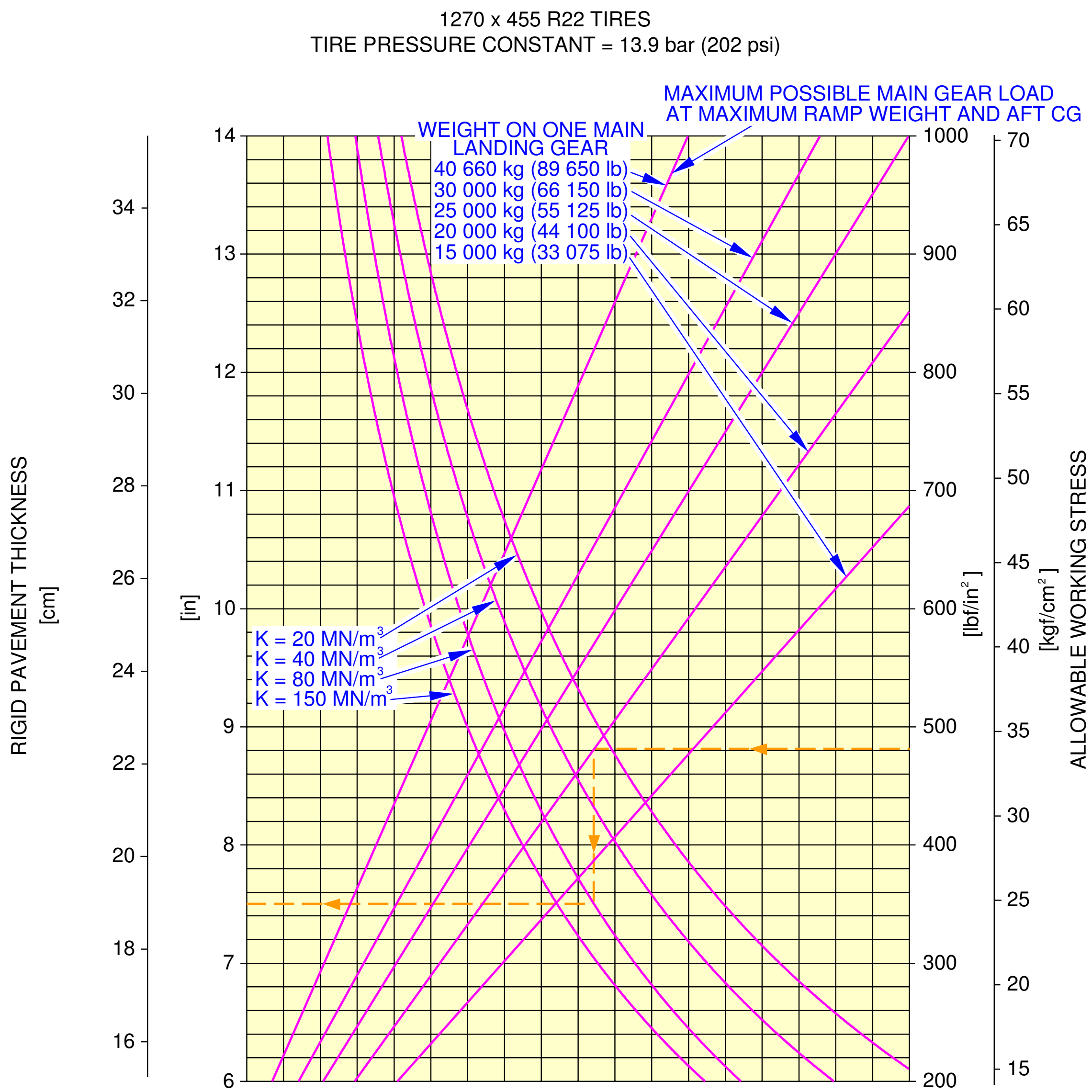
NOTE:
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUES FOR K ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR K = 80 MN/m³ BUT DEVIATE SLIGHTLY FOR ANY OTHER VALUES OF K

REFERENCE:
"DESIGN OF CONCRETE AIRPORT PAVEMENTS" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN – PROGRAM PDILB" PORTLAND CEMENT ASSOCIATION

N_AC_070701_1_0250101_01_01

Rigid Pavement Requirements (PCA)
MTOW 83 T
FIGURE 6

**ON A/C A321-200



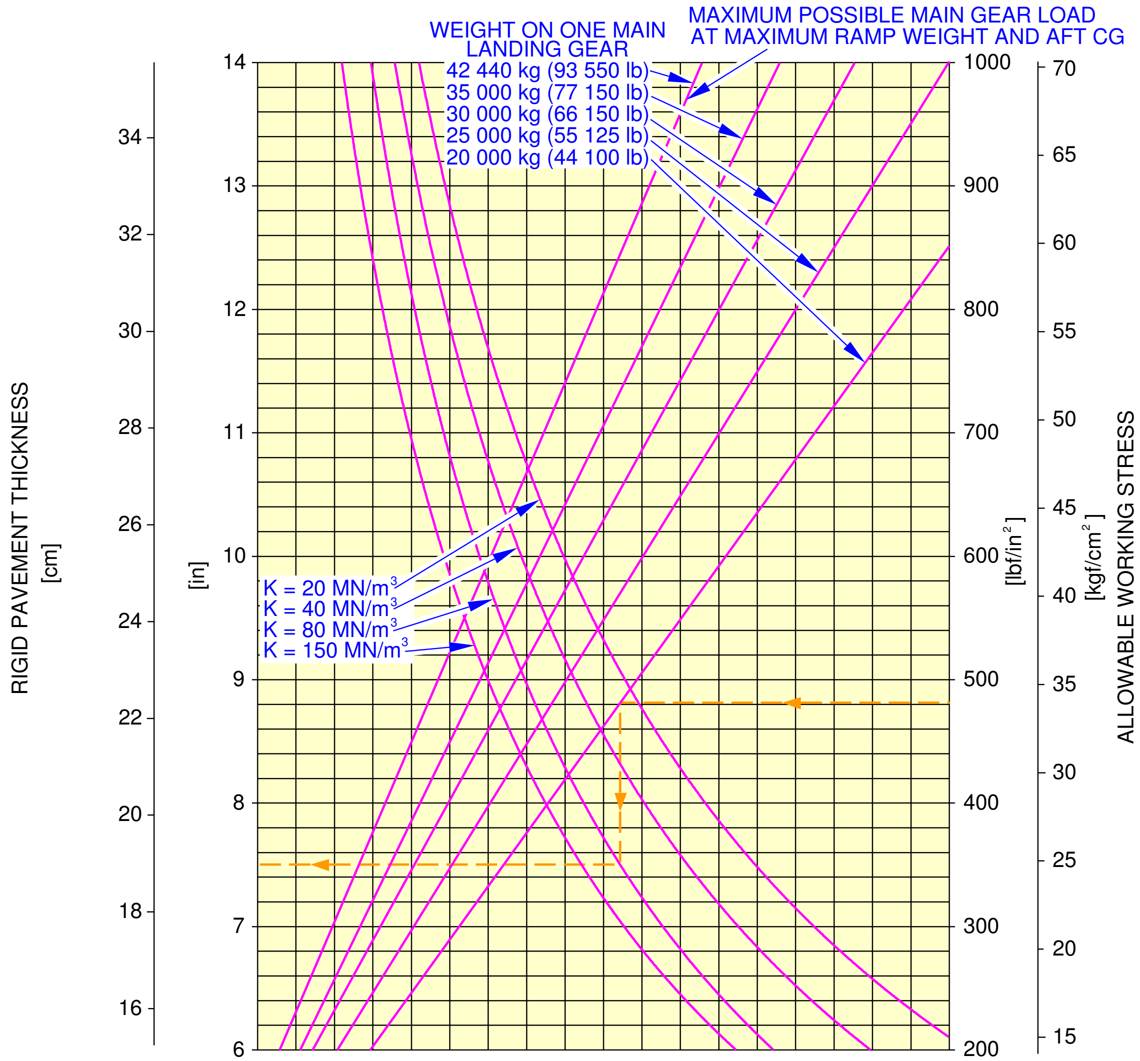
NOTE:
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUES FOR K ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR K = 80 MN/m^3 BUT DEVIATE SLIGHTLY FOR ANY OTHER VALUES OF K

REFERENCE:
"DESIGN OF CONCRETE AIRPORT PAVEMENTS" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN – PROGRAM PDILB" PORTLAND CEMENT ASSOCIATION

N_AC_070701_1_0260101_01_01

Rigid Pavement Requirements (PCA)
MTOW 85 T
FIGURE 7

**ON A/C A321-200



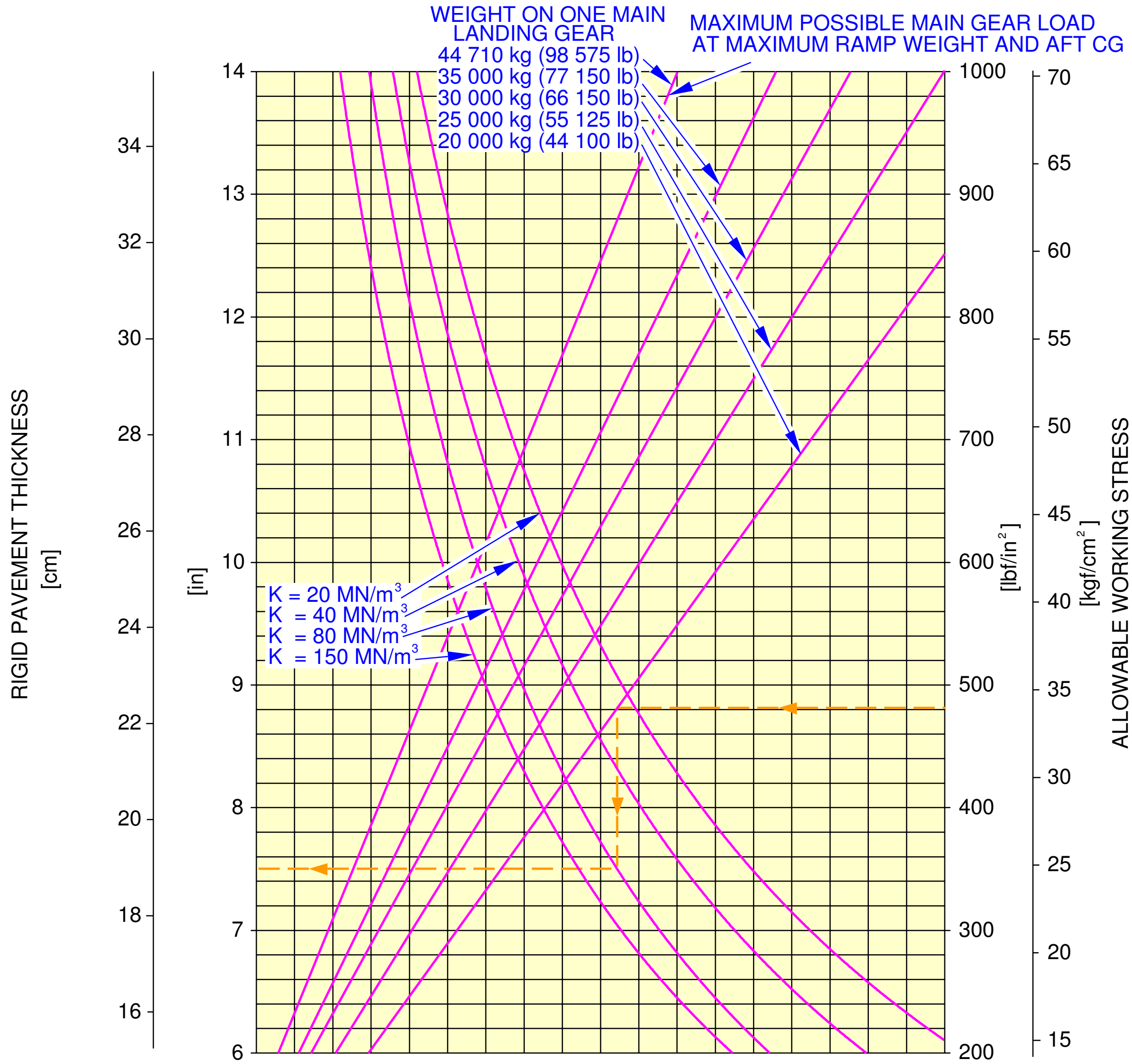
NOTE:
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUES FOR K ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR K = 80 MN/m^3 BUT DEVIATE SLIGHTLY FOR ANY OTHER VALUES OF K

REFERENCE:
"DESIGN OF CONCRETE AIRPORT PAVEMENTS" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN – PROGRAM PDILB" PORTLAND CEMENT ASSOCIATION

N_AC_070701_1_0270101_01_01

Rigid Pavement Requirements (PCA)
MTOW 89 T
FIGURE 8

**ON A/C A321-200



NOTE:
THE VALUES OBTAINED BY USING THE MAXIMUM LOAD REFERENCE LINE AND ANY VALUES FOR K ARE EXACT. FOR LOADS LESS THAN MAXIMUM, THE CURVES ARE EXACT FOR K = 80 MN/m^3 BUT DEVIATE SLIGHTLY FOR ANY OTHER VALUES OF K

REFERENCE:
"DESIGN OF CONCRETE AIRPORT PAVEMENTS" AND "COMPUTER PROGRAM FOR AIRPORT PAVEMENT DESIGN – PROGRAM PDILB" PORTLAND CEMENT ASSOCIATION

N_AC_070701_1_0280101_01_01

Rigid Pavement Requirements (PCA)
MTOW 93.5 T
FIGURE 9

7-8-0 Rigid Pavement Requirements - LCN Conversion

****ON A/C A321-100 A321-200**

Rigid Pavement Requirements - LCN Conversion

1. General

In order 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) must be known.

In the example shown in Section 7-8-2, page 1:

The radius of Relative Stiffness is shown at 30 inches with an LCN of 58.
For these conditions the weight on one Main Landing Gear is 25000 kg (55116 lb).

In the example shown in Section 7-8-2, page 9:

The radius of Relative Stiffness is shown at 30 inches with an LCN of 61.
For these conditions the weight on one Main Landing Gear is 25000 kg (55116 lb).

7-8-1 Radius of Relative Stiffness

****ON A/C A321-100 A321-200**

Radius of Relative Stiffness

1. This section gives Radius of Relative Stiffness.

**ON A/C A321-100 A321-200

RADIUS OF RELATIVE STIFFNESS (L)
VALUES IN INCHES

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

WHERE E = Young's Modulus = 4×10^6 psi

k = Subgrade Modulus, lbf/in^3

d = Rigid Pavement Thickness, inches

μ = Poisson's Ratio = 0.15

d	k=75	k=100	k=150	k=200	k=250	k=300	k=350	k=400	k=550
6.0	31.48	29.30	26.47	24.63	23.30	22.26	21.42	20.72	19.13
6.5	33.43	31.11	28.11	26.16	24.74	23.64	22.74	22.00	20.31
7.0	35.34	32.89	29.72	27.65	26.15	24.99	24.04	23.25	21.47
7.5	37.22	34.63	31.29	29.12	27.54	26.32	25.32	24.49	22.61
8.0	39.06	36.35	32.85	30.57	28.91	27.62	26.58	25.70	23.74
8.5	40.88	38.04	34.37	31.99	30.25	28.91	27.81	26.90	24.84
9.0	42.67	39.71	35.88	33.39	31.58	30.17	29.03	28.08	25.93
9.5	44.43	41.35	37.36	34.77	32.89	31.42	30.23	29.24	27.00
10.0	46.18	42.97	38.83	36.14	34.17	32.65	31.42	30.39	28.06
10.5	47.90	44.57	40.28	37.48	35.45	33.87	32.59	31.52	29.11
11.0	49.60	46.16	41.71	38.81	36.71	35.07	33.75	32.64	30.14
11.5	51.28	47.72	43.12	40.13	37.95	36.26	34.89	33.74	32.16
12.0	52.94	49.27	44.52	41.43	39.18	37.44	36.02	34.84	32.17
12.5	54.59	50.80	45.90	42.72	40.40	38.60	37.14	35.92	33.17
13.0	56.22	52.32	47.27	43.99	41.61	39.75	38.25	36.99	34.16
13.5	57.83	53.82	48.63	45.26	42.80	40.89	39.35	38.06	35.14
14.0	59.43	55.31	49.98	46.51	43.98	42.02	40.44	39.11	36.12
14.5	61.02	56.78	51.31	47.75	45.16	43.15	41.51	40.15	37.08
15.0	62.59	58.25	52.63	48.98	46.32	44.26	42.58	41.19	38.03
15.5	64.15	59.70	53.94	50.20	47.47	45.36	43.64	42.21	38.98
16.0	65.69	61.13	55.24	51.41	48.62	46.45	44.70	43.23	39.92
16.5	67.23	62.56	56.53	52.61	49.75	47.54	45.74	44.24	40.85
17.0	68.75	63.98	57.81	53.80	50.88	48.61	46.77	45.24	41.78
17.5	70.26	65.38	59.08	54.98	52.00	49.68	47.80	46.23	42.70
18.0	71.76	66.78	60.34	56.15	53.11	50.74	48.82	47.22	43.61
19.0	74.73	69.54	62.84	58.48	55.31	52.84	50.84	49.17	45.41
20.0	77.66	72.27	65.30	60.77	57.47	54.91	52.84	51.10	47.19
21.0	80.55	74.96	67.74	63.04	59.62	56.96	54.81	53.01	48.95
22.0	83.41	77.63	70.14	65.28	61.73	58.98	56.75	54.89	50.69
23.0	86.24	80.26	72.52	67.49	63.83	60.98	58.68	56.75	52.41
24.0	89.04	82.86	74.87	69.68	65.90	62.96	60.58	58.59	54.11
25.0	91.81	85.44	77.20	71.84	67.95	64.92	62.46	60.41	55.79

N_AC_070801_1_0040101_01_00

Radius of Relative Stiffness
(Reference: Portland Cement Association)
FIGURE 1

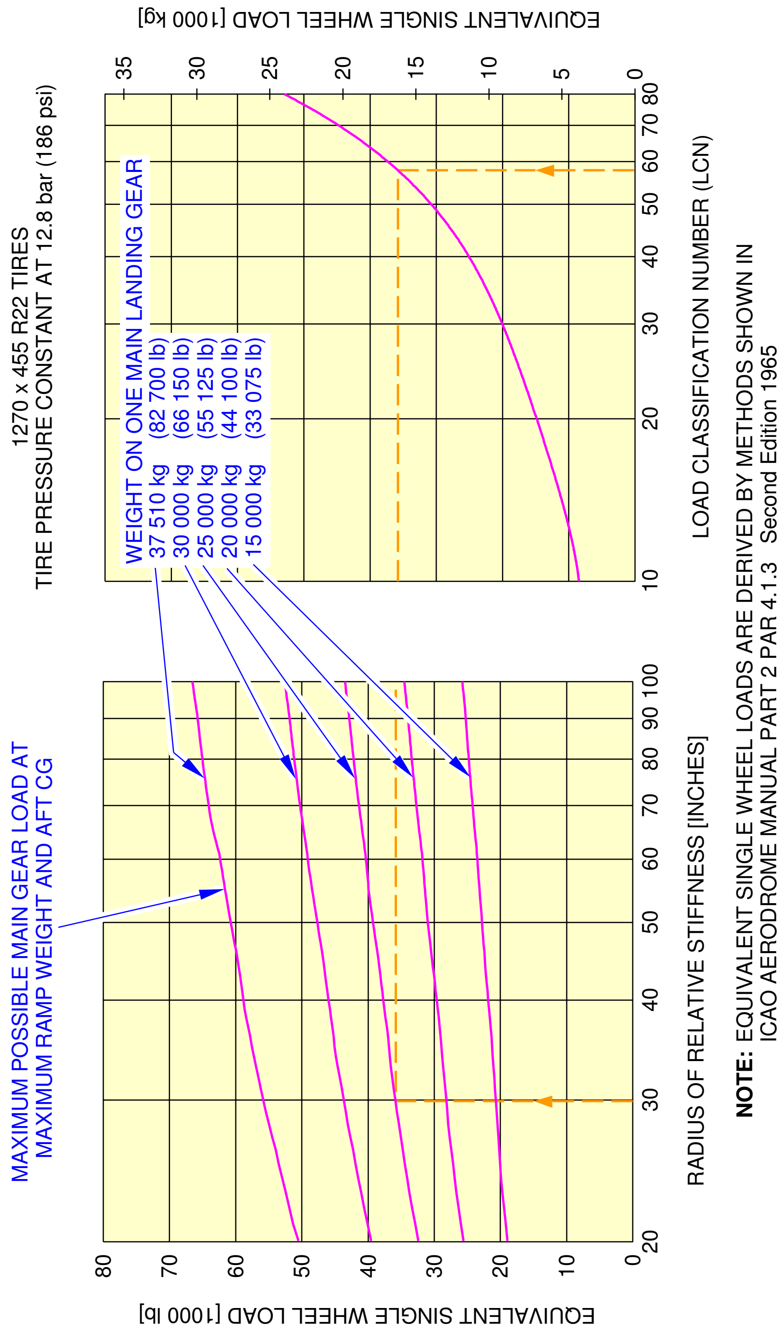
7-8-2 Rigid Pavement Requirements - LCN Conversion

****ON A/C A321-100 A321-200**

Rigid Pavement Requirements - LCN Conversion

1. This section gives Rigid Pavement Requirements - LCN Conversion.

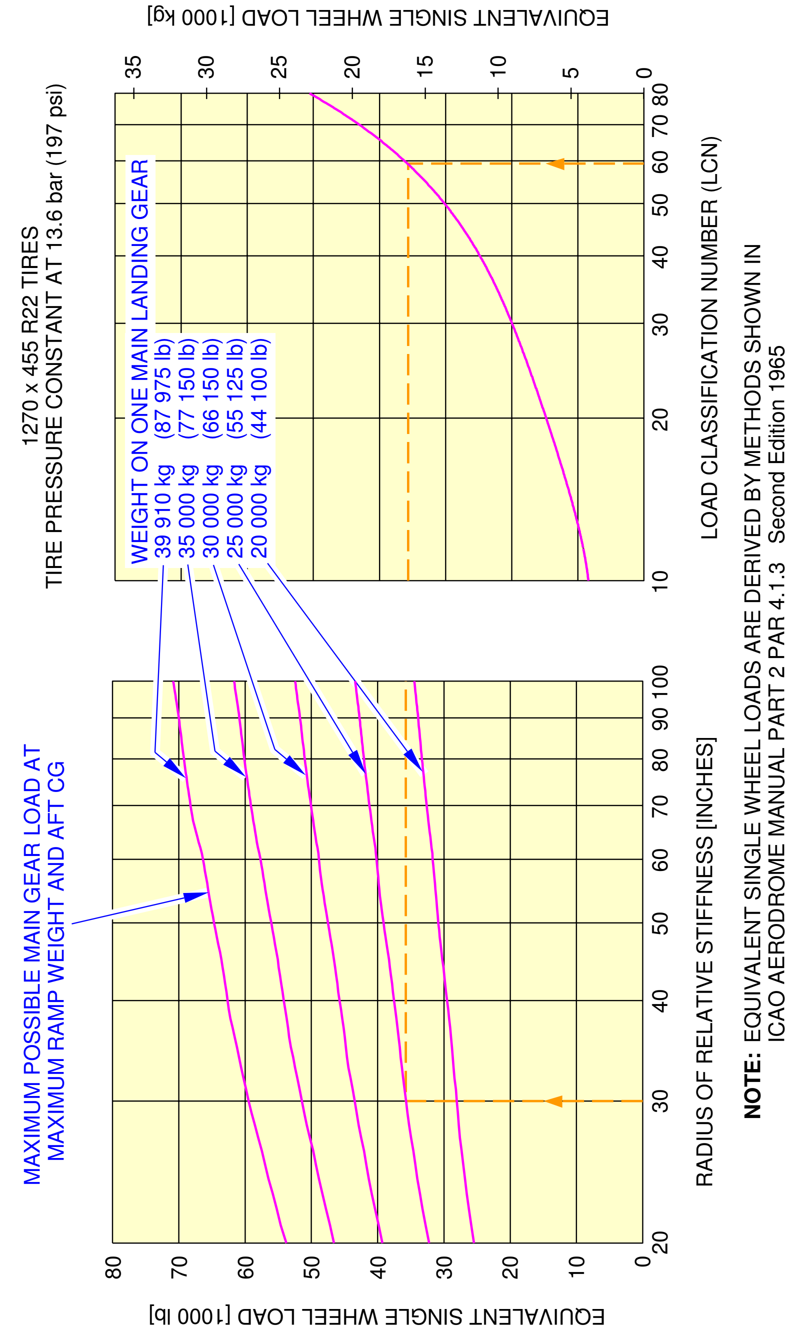
**ON A/C A321-100



N_AC_070802_1_0230101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 78 T
FIGURE 1

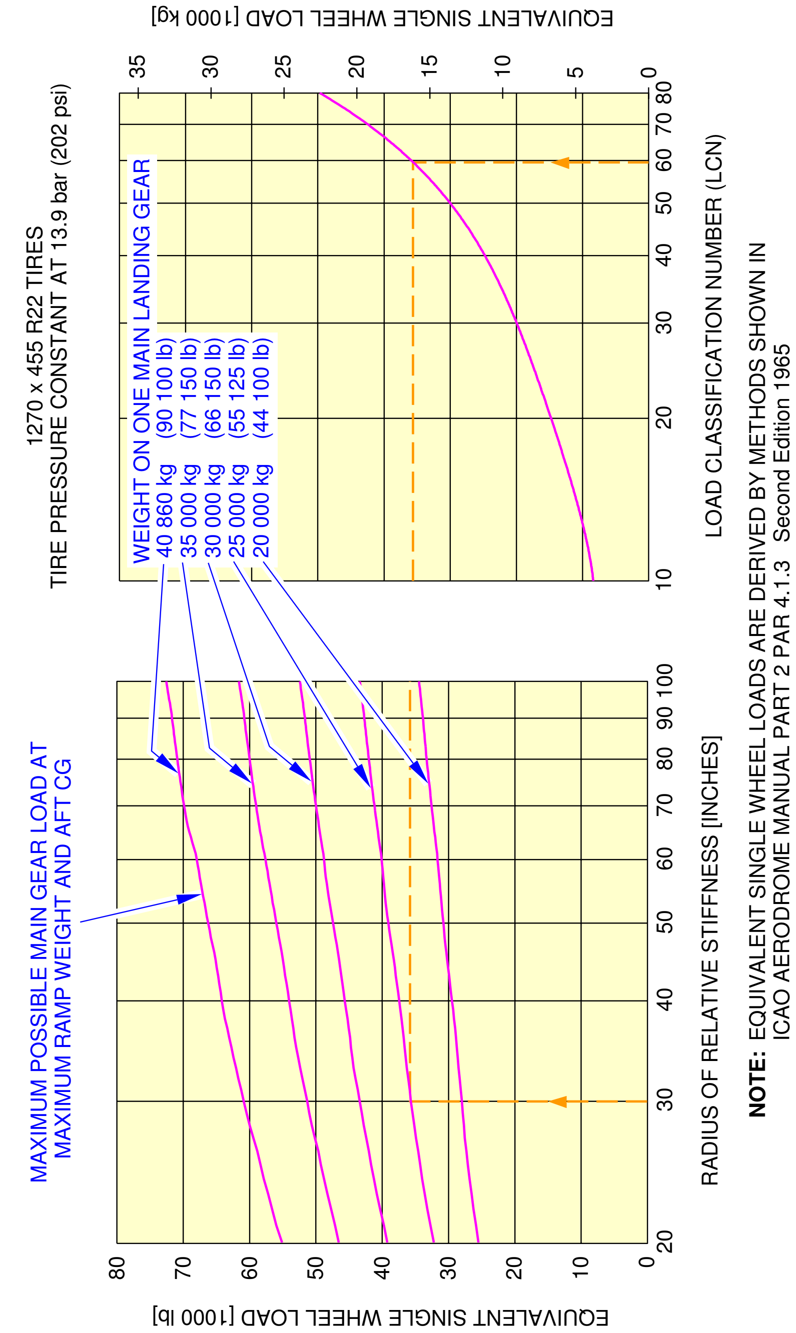
****ON A/C A321-100**



N_AC_070802_1_0240101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 83 T
FIGURE 2

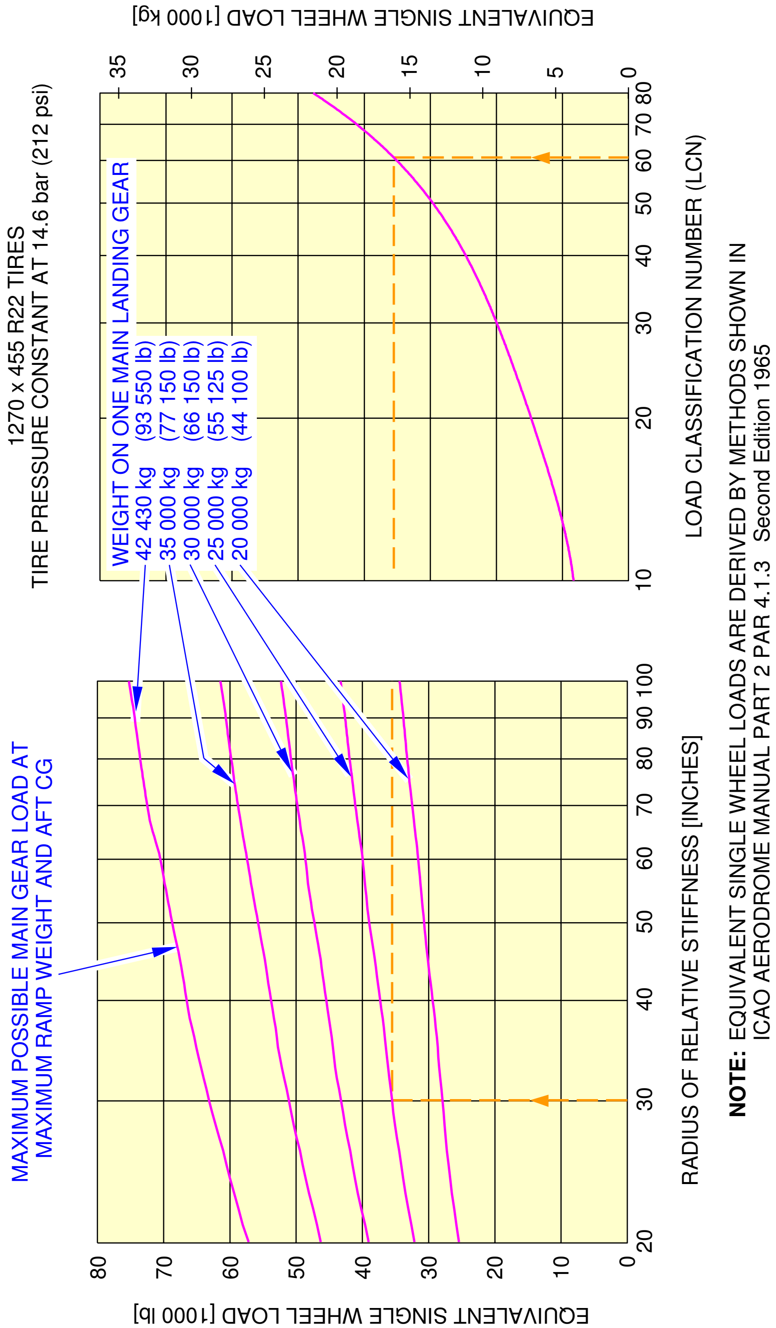
**ON A/C A321-100



N_AC_070802_1_0250101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 85 T
FIGURE 3

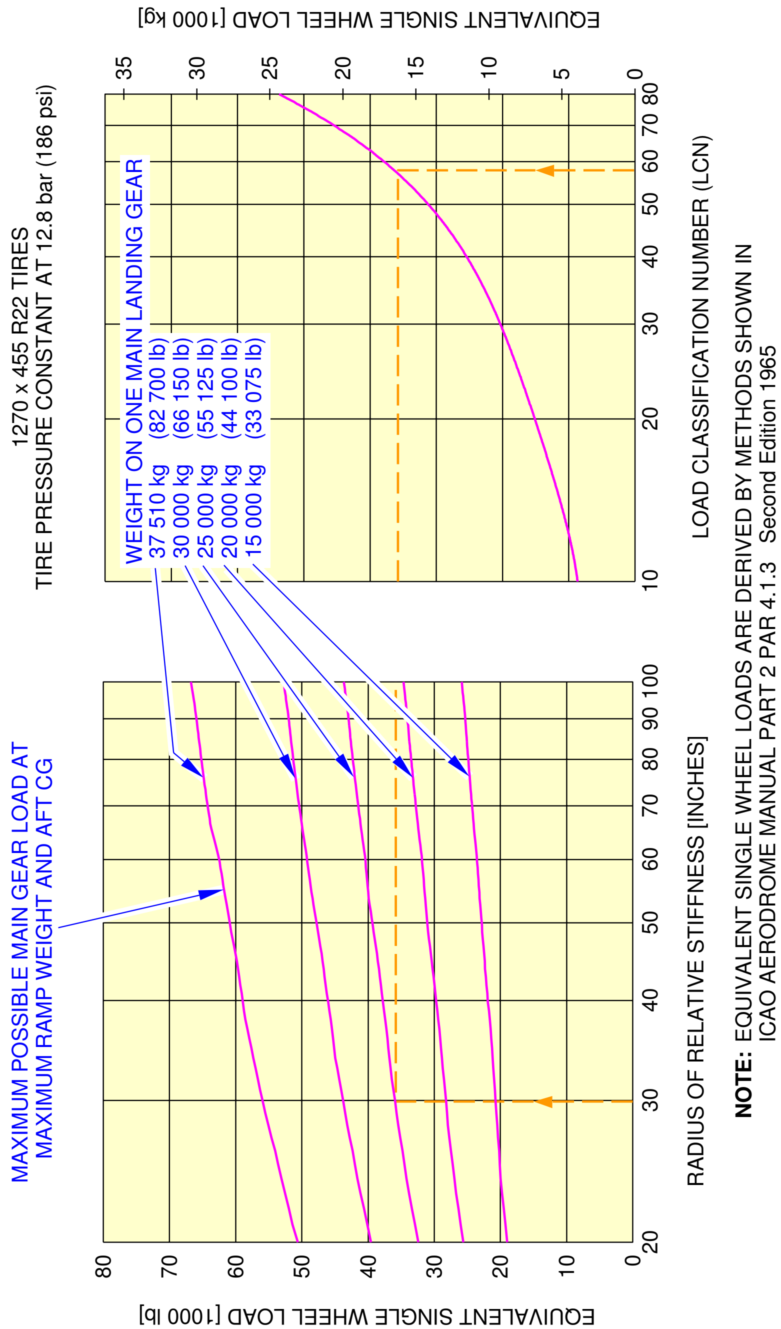
**ON A/C A321-100



N_AC_070802_1_0260101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 89 T
FIGURE 4

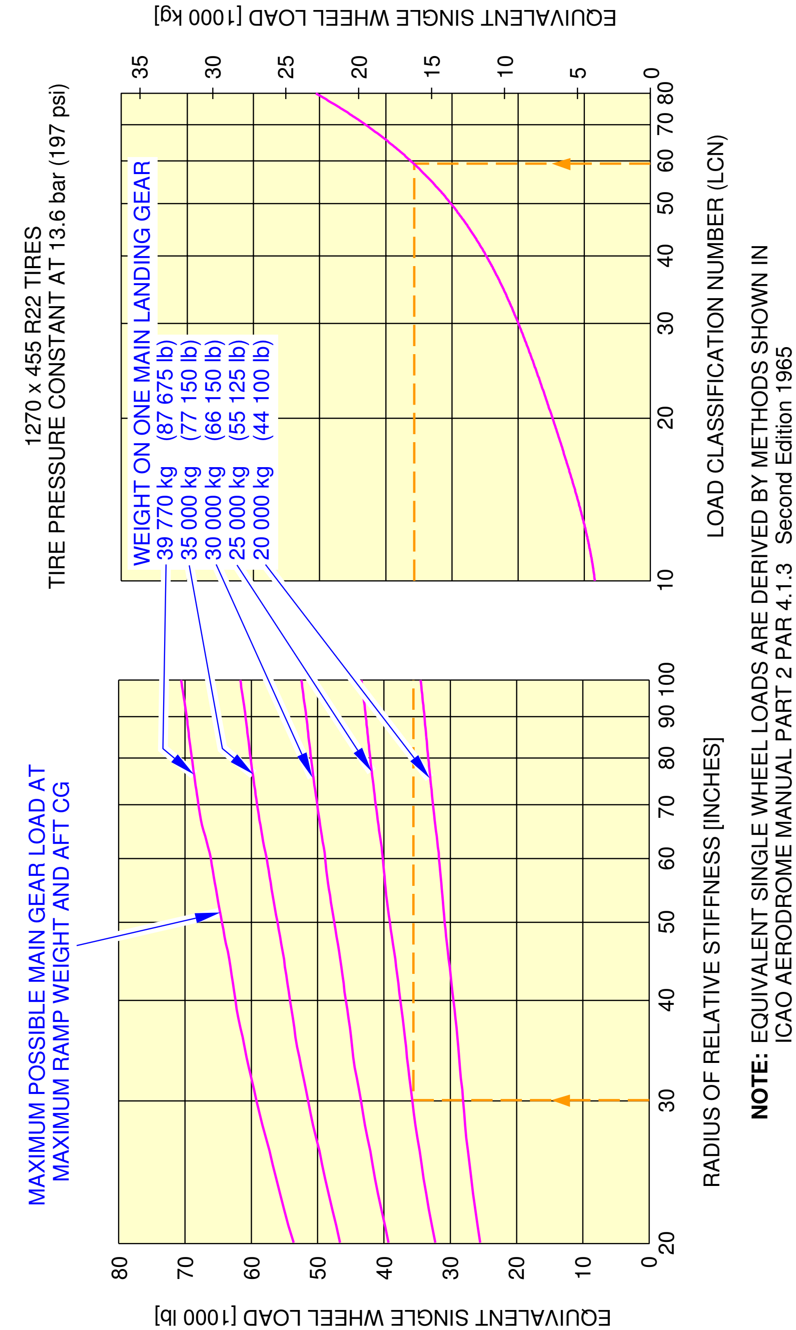
**ON A/C A321-200



N_AC_070802_1_0270101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 78 T
FIGURE 5

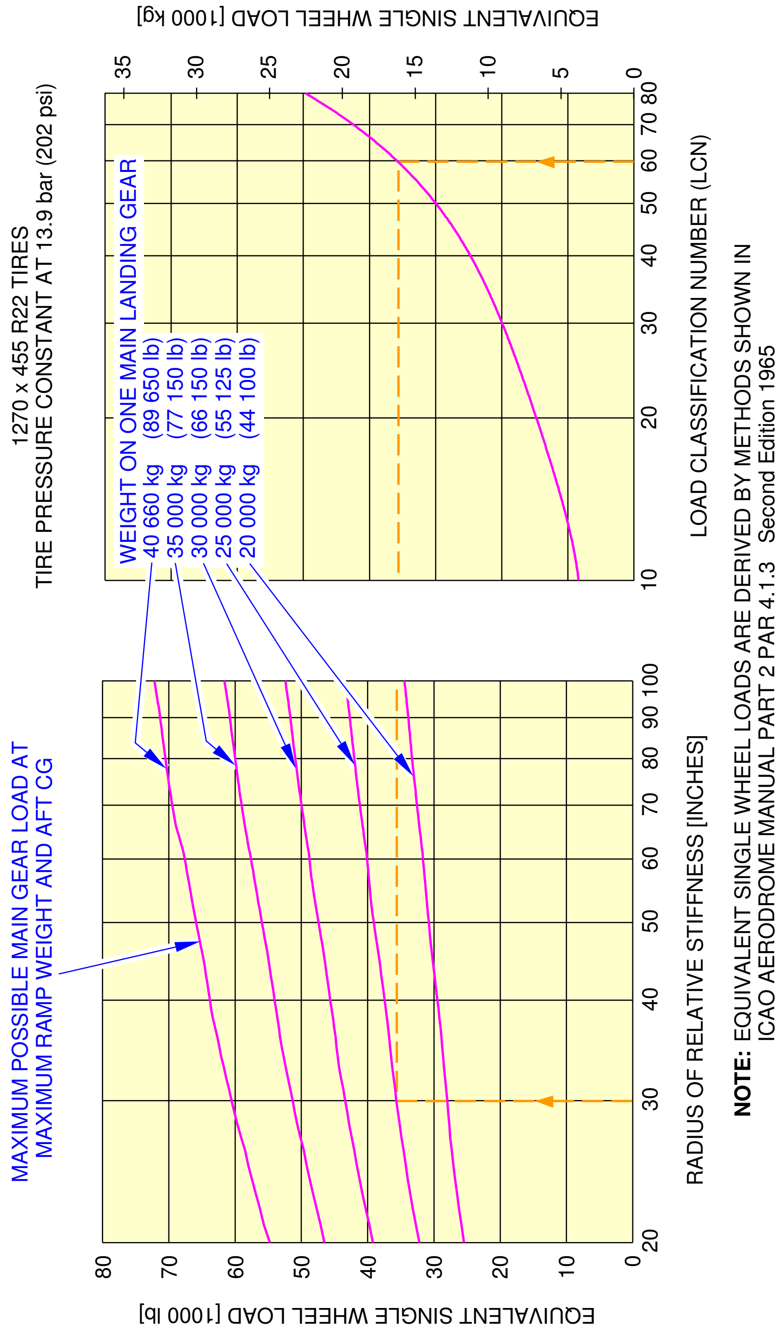
**ON A/C A321-200



N_AC_070802_1_0280101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 83 T
FIGURE 6

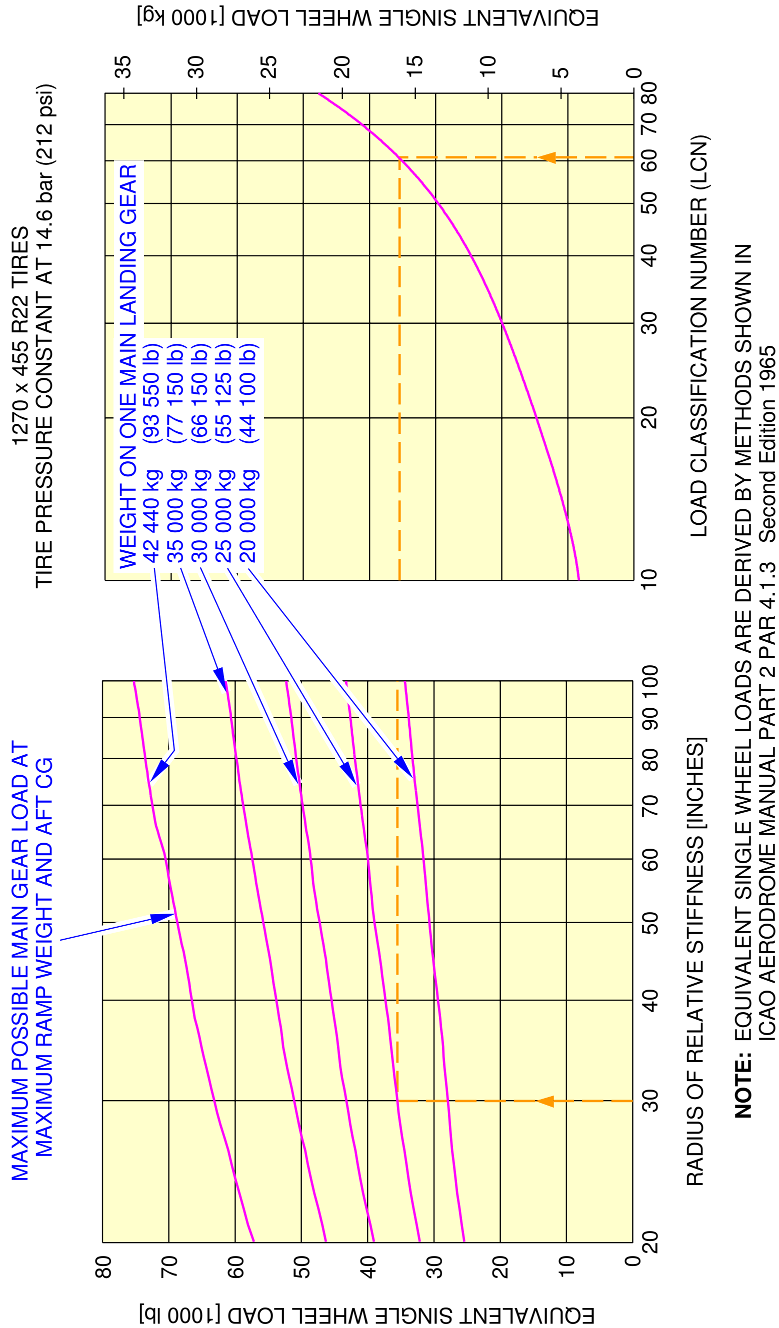
**ON A/C A321-200



N_AC_070802_1_0290101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 85 T
FIGURE 7

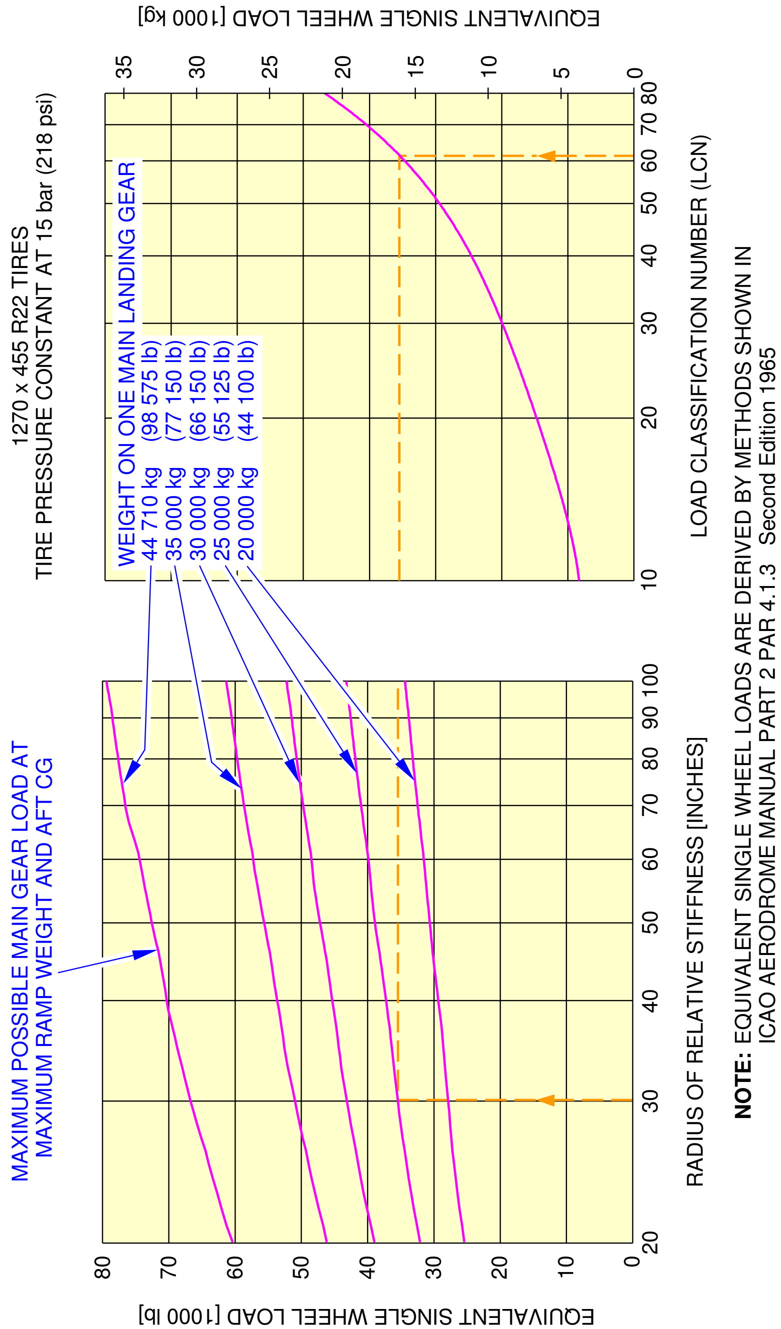
**ON A/C A321-200



N_AC_070802_1_0300101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 89 T
FIGURE 8

**ON A/C A321-200



N_AC_070802_1_0310101_01_01

Rigid Pavement Requirements - LCN Conversion
MTOW 93.5 T
FIGURE 9

7-8-3 Radius of Relative Stiffness (Other values of E and L)

****ON A/C A321-100 A321-200**

Radius of Relative Stiffness (Other values of "E" and "L")

1. General

The chart of Section 7-8-1, page 1 presents "L" values based on Young's Modulus (E) of 4 000 000 psi and Poisson's Radio (μ) of 0.15.

For convenience in finding "L" values based on other values of "E" and "μ", the curves of Section 7-8-4 are included.

For example, to find an "L" value based on an "E" of 3 000 000 psi, the "E" factor of 0.931 is multiplied by the "L" value found in the table of Section 7-8-1, page 1.

The effect of variations of "μ" on the "L" value is treated in a similar manner.

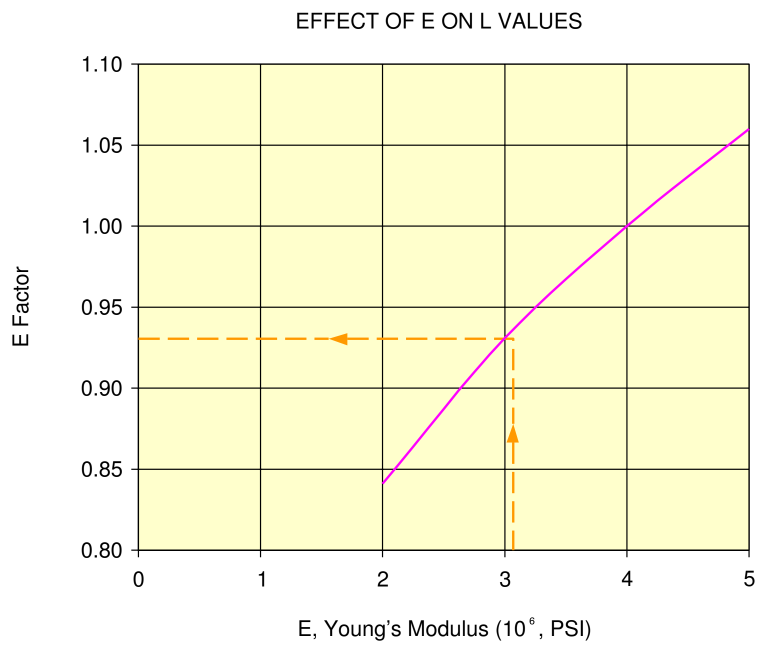
7-8-4 Radius of Relative Stiffness

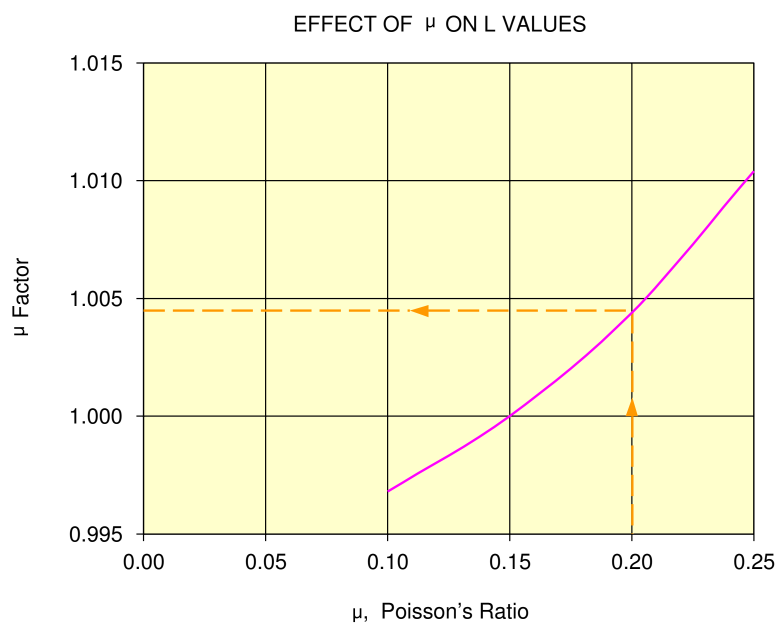
****ON A/C A321-100 A321-200**

Radius of Relative Stiffness

1. This section gives Radius of Relative Stiffness.

**ON A/C A321-100 A321-200





NOTE: BOTH CURVES ON THIS PAGE ARE USED TO ADJUST THE L VALUES OF TABLE 7–8–1

N_AC_070804_1_0040101_01_01

Radius of Relative Stiffness
(Other Values of "E" and "L")
FIGURE 1

7-9-0 ACN/PCN Reporting System

****ON A/C A321-100 A321-200**

ACN/PCN Reporting System

****ON A/C A321-100**

1. General

To find the ACN of an aircraft on flexible or rigid pavement, the aircraft gross weight and the subgrade strength must be known.

In the example shown in Section 7-9-1, page 1, for an Aircraft Gross Weight of 60 tonnes (132277 lb) and medium subgrade strength (code C), the ACN for the flexible pavement is 35.

In the example shown in Section 7-9-2, page 1, for the same Aircraft Gross Weight and medium subgrade strength (code C), the ACN for the rigid pavement is 38.

NOTE : An aircraft with an ACN equal to or less than the reported PCN can operate on that pavement, subject to any limitation on the tire pressure.
(Ref.: ICAO Aerodrome Design Manual Part 3, Chapter 1, Second Edition 1983).

****ON A/C A321-200**

2. General

To find the ACN of an aircraft on flexible or rigid pavement, the aircraft gross weight and the subgrade strength must be known.

In the example shown in Section 7-9-1, page 5, for an Aircraft Gross Weight of 65 tonnes (143300 lb) and medium subgrade strength (code C), the ACN for the flexible pavement is 38.5.

In the example shown in Section 7-9-2, page 5, for the same Aircraft Gross Weight and medium subgrade strength (code C), the ACN for the rigid pavement is 42.

NOTE : An aircraft with an ACN equal to or less than the reported PCN can operate on that pavement, subject to any limitation on the tire pressure.
(Ref.: ICAO Aerodrome Design Manual Part 3, Chapter 1, Second Edition 1983).

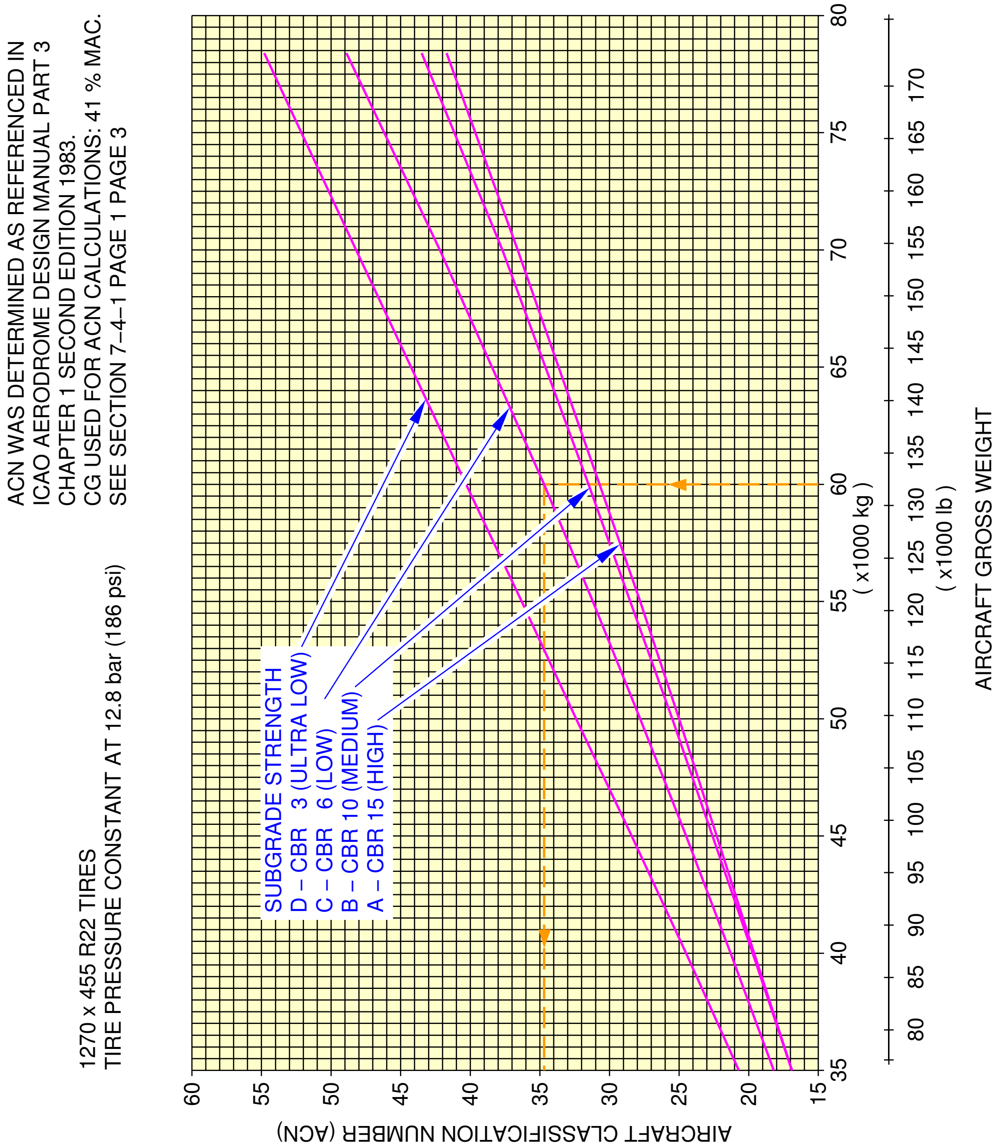
7-9-1 Aircraft Classification Number - Flexible Pavement

****ON A/C A321-100 A321-200**

Aircraft Classification Number - Flexible Pavement

1. This section gives the Aircraft Classification Number - Flexible Pavement.

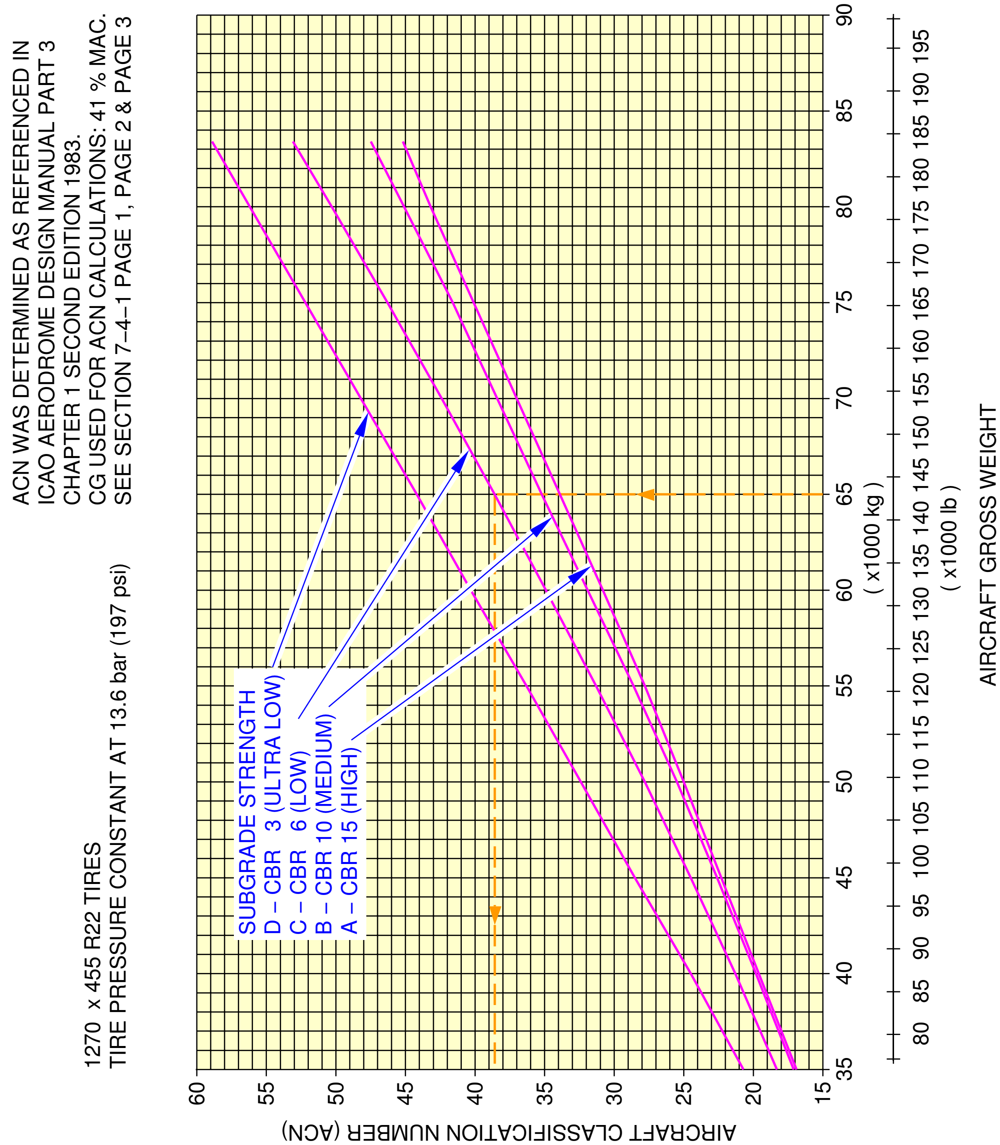
****ON A/C A321-100**



N_AC_070901_1_0300101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 78 T
FIGURE 1

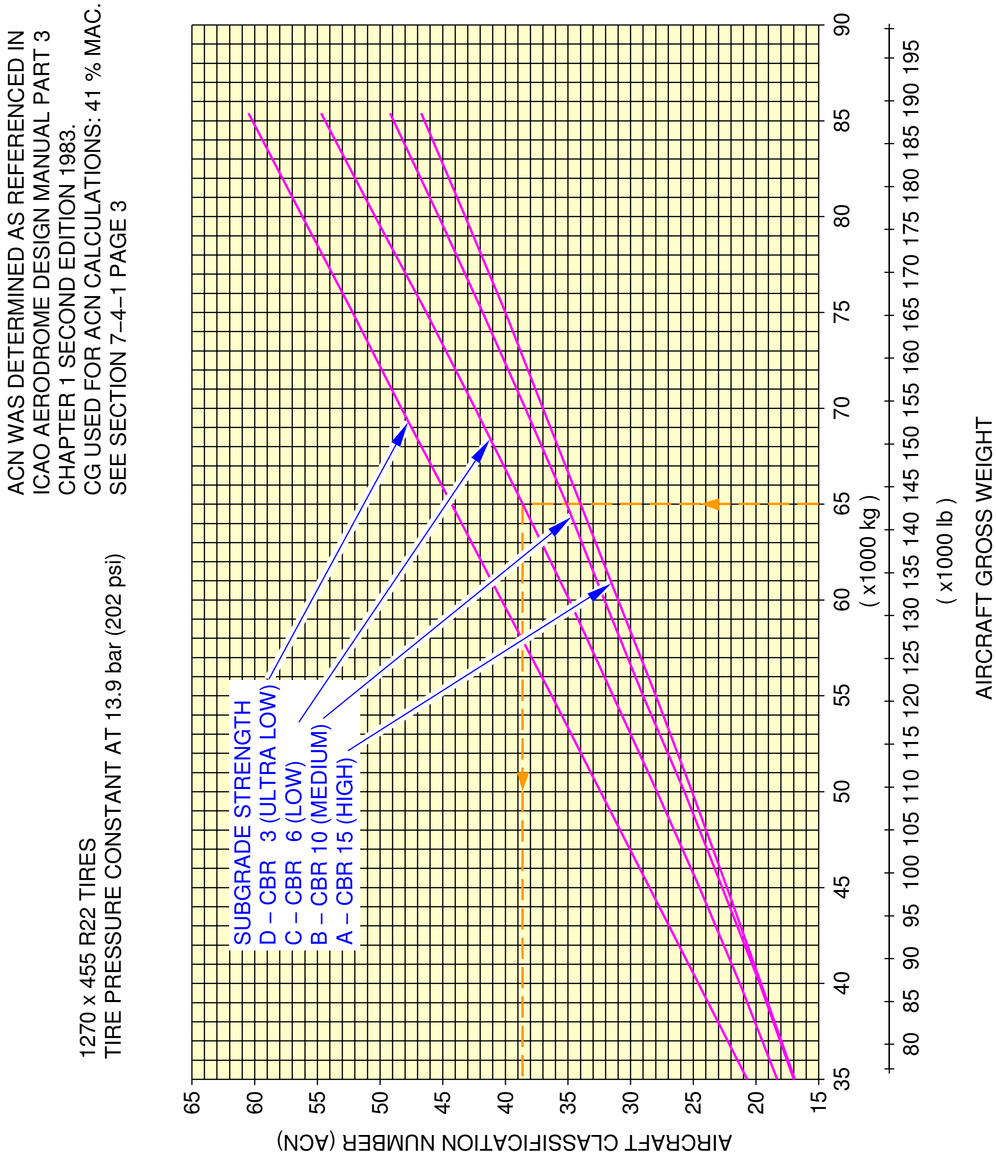
****ON A/C A321-100**



N_AC_070901_1_0310101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 83 T
FIGURE 2

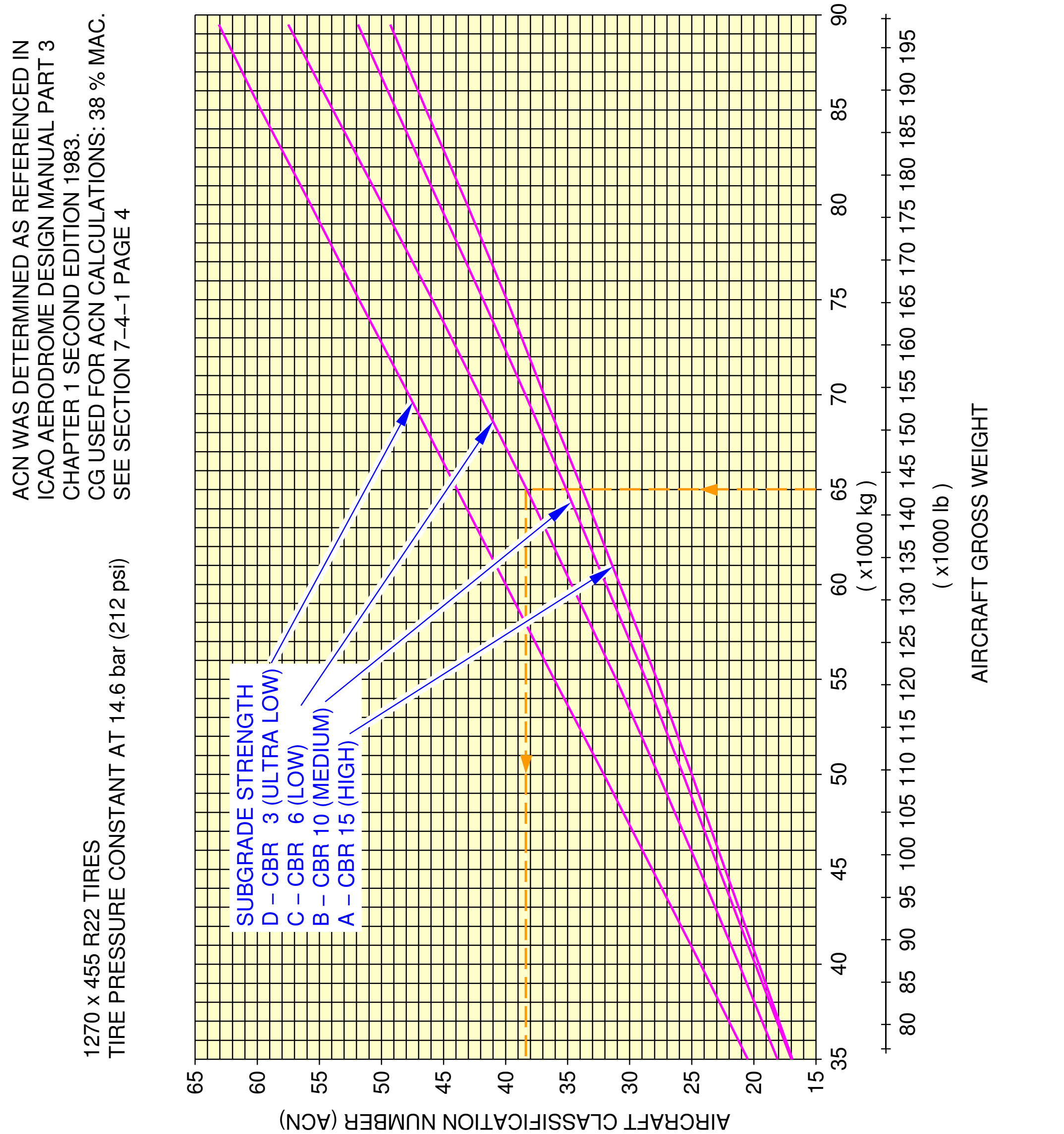
**ON A/C A321-100



N_AC_070901_1_0320101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 85 T
FIGURE 3

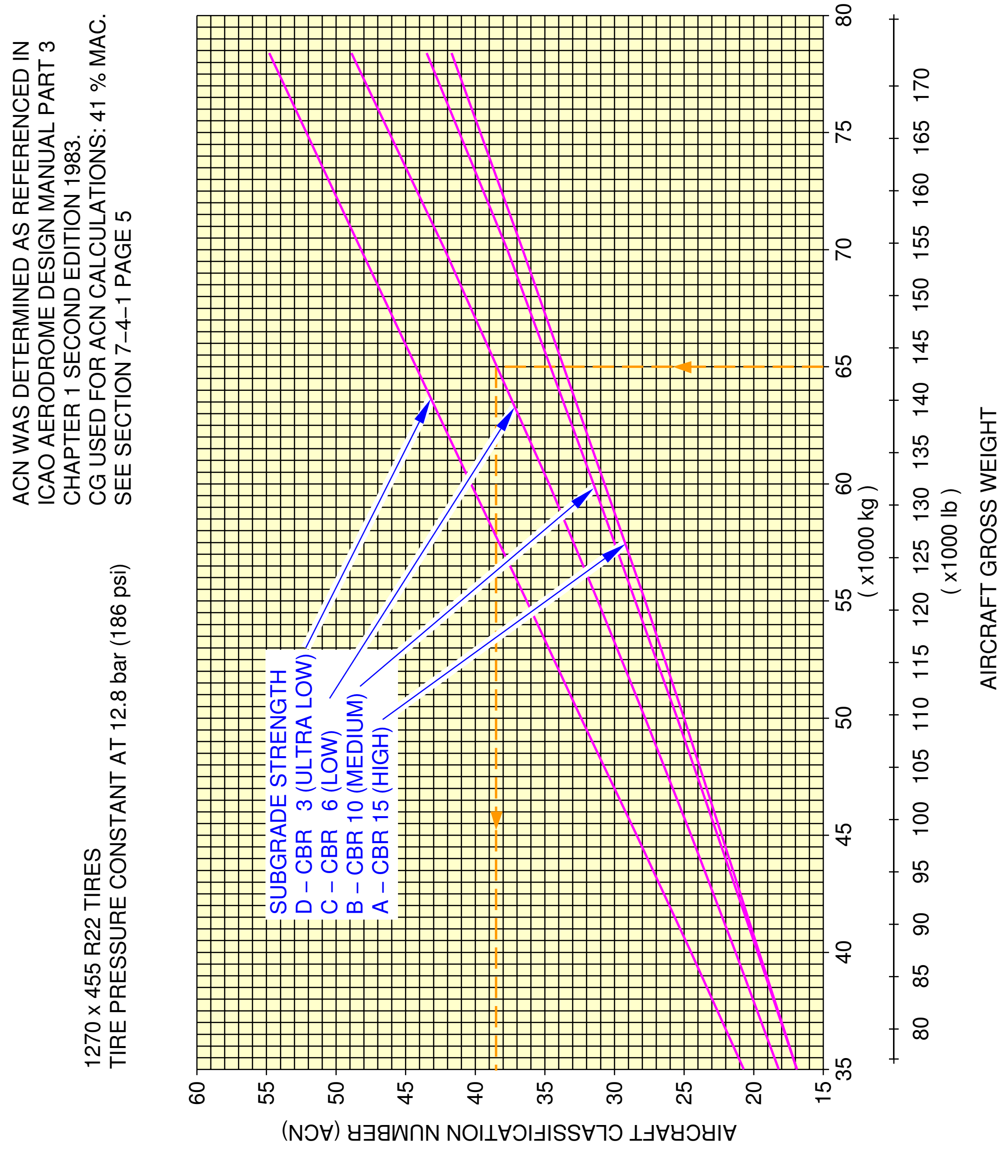
****ON A/C A321-100**



N_AC_070901_1_0330101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 89 T
FIGURE 4

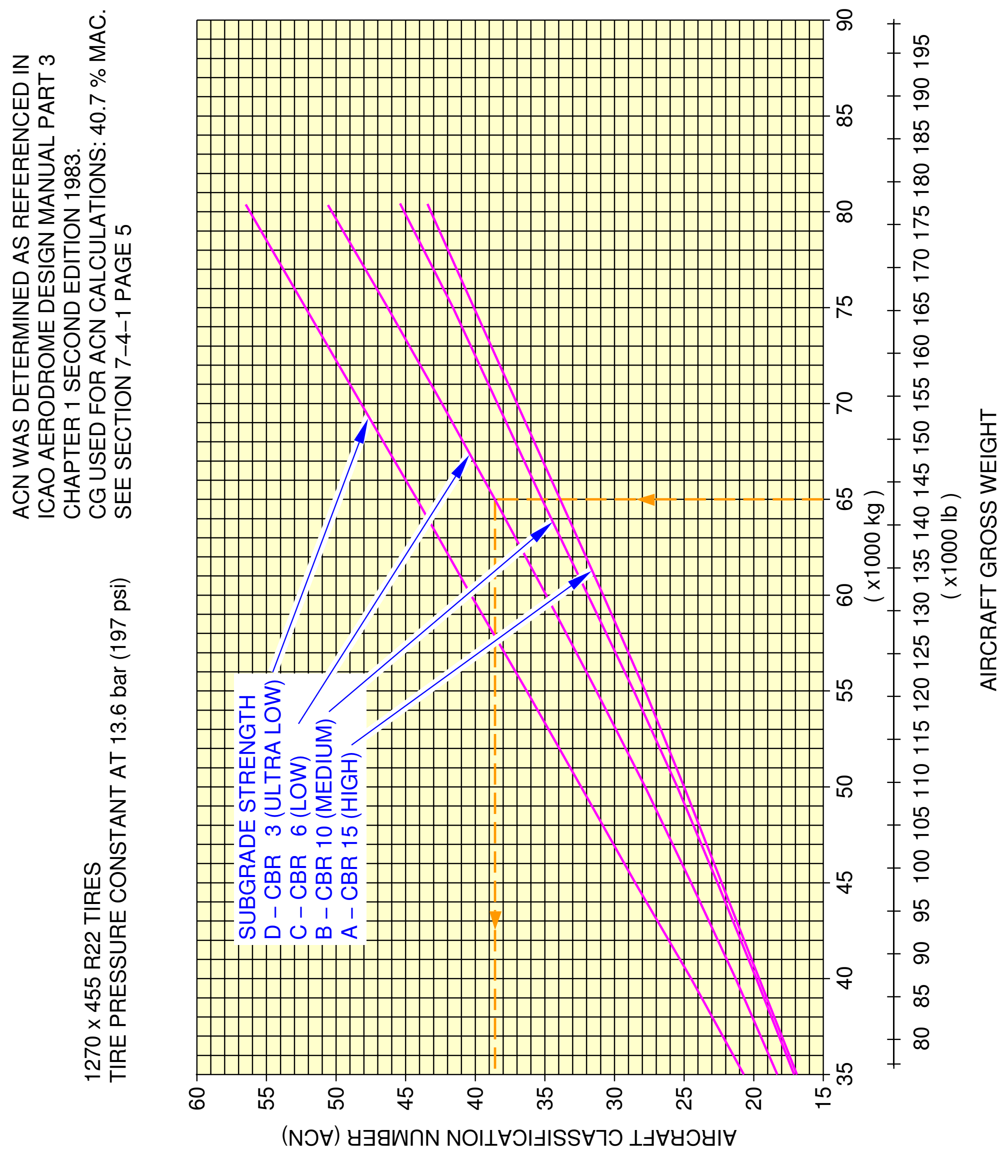
**ON A/C A321-200



N_AC_070901_1_0340101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 78 T
FIGURE 5

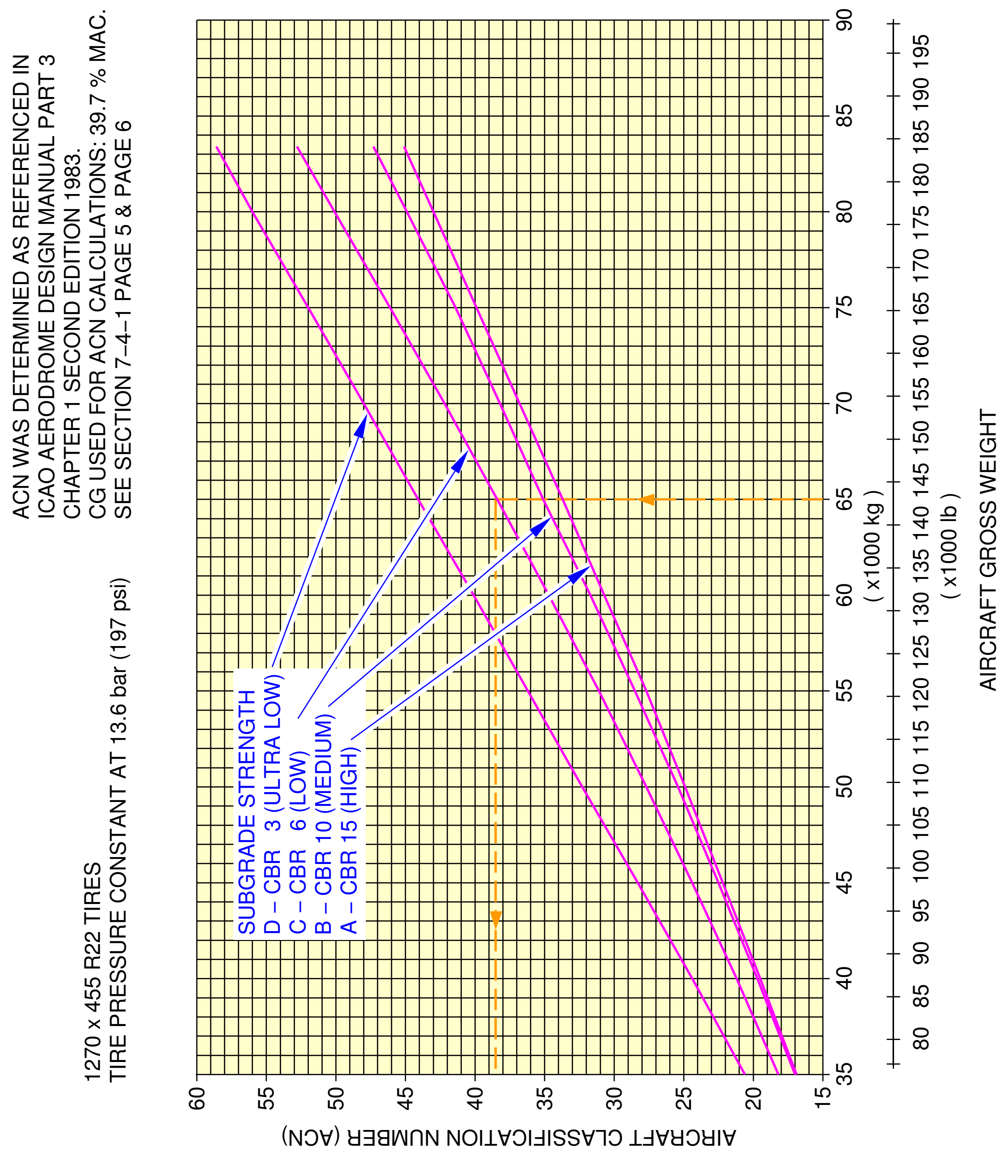
**ON A/C A321-200



N_AC_070901_1_0350101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 80 T
FIGURE 6

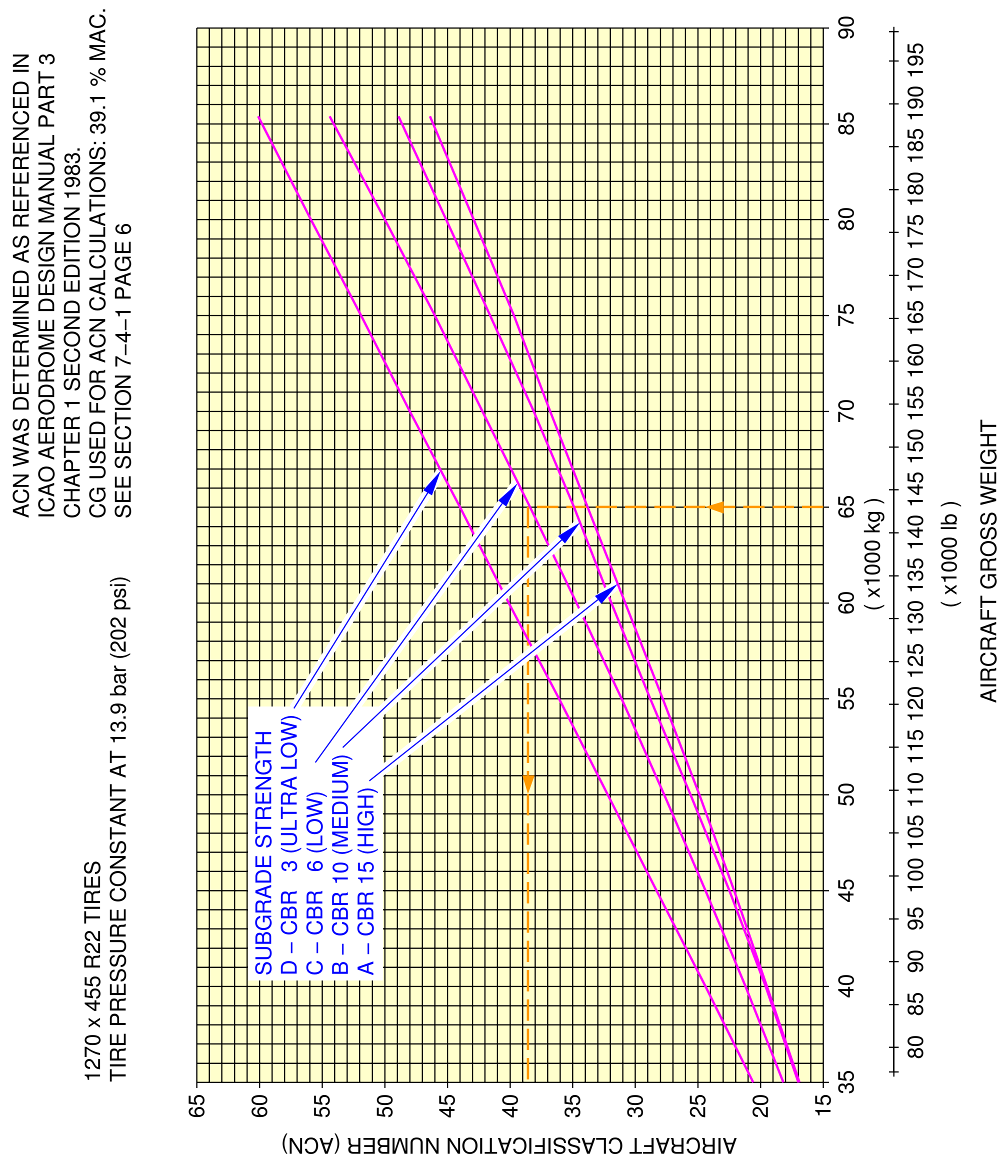
****ON A/C A321-200**



N_AC_070901_1_0360101_01_01

Aircraft Classification Number − Flexible Pavement
MTOW 83 T
FIGURE 7

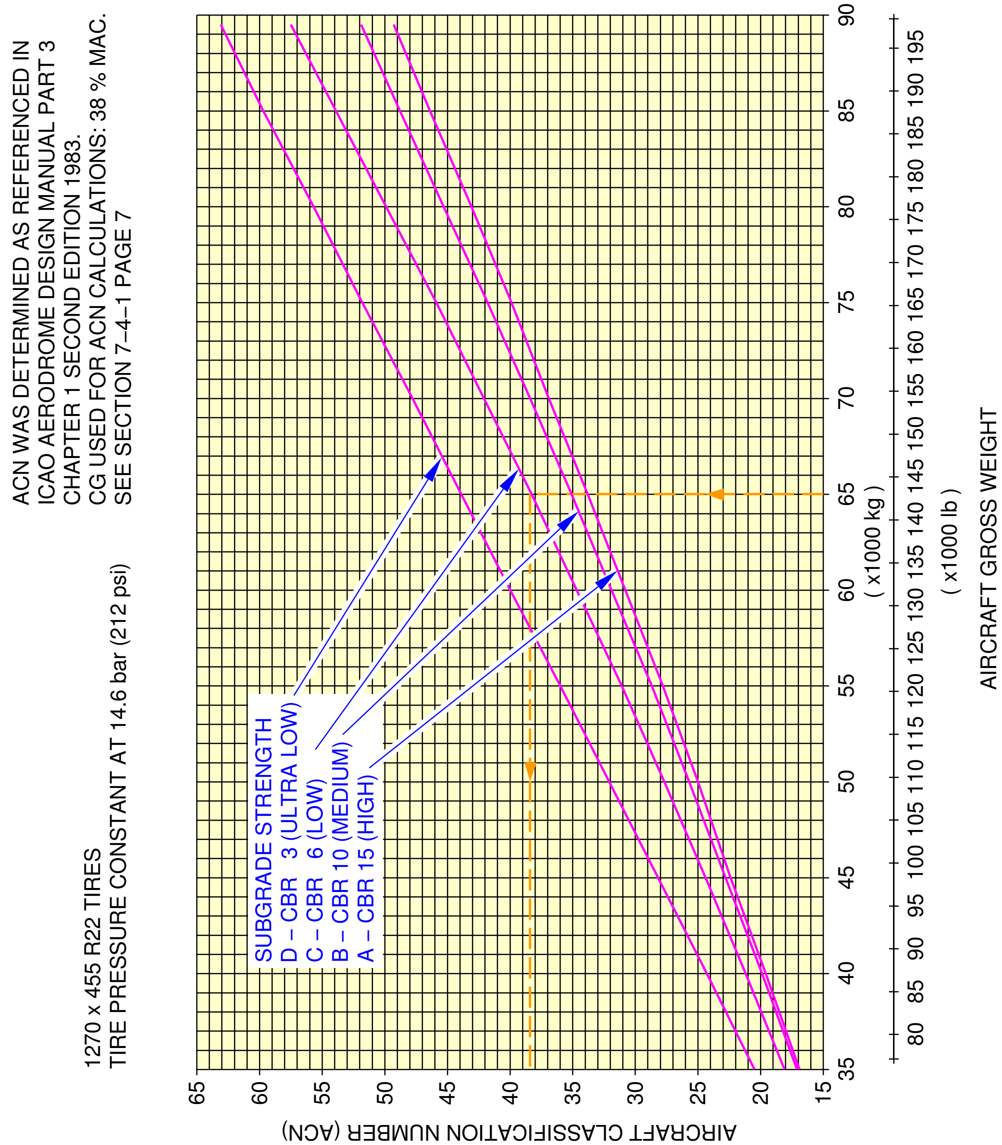
**ON A/C A321-200



N_AC_070901_1_0370101_01_01

Aircraft Classification Number − Flexible Pavement
MTOW 85 T
FIGURE 8

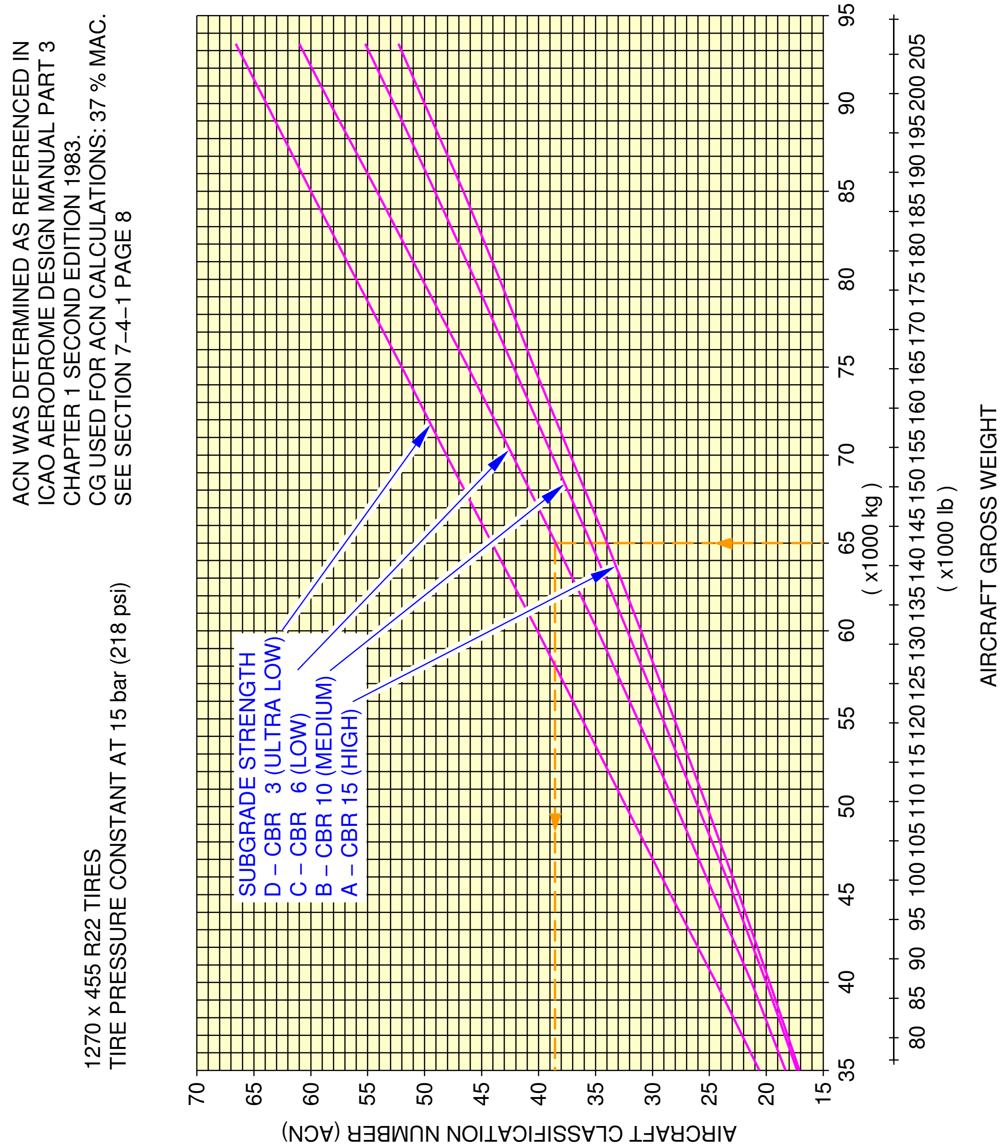
**ON A/C A321-200



N_AC_070901_1_0380101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 89 T
FIGURE 9

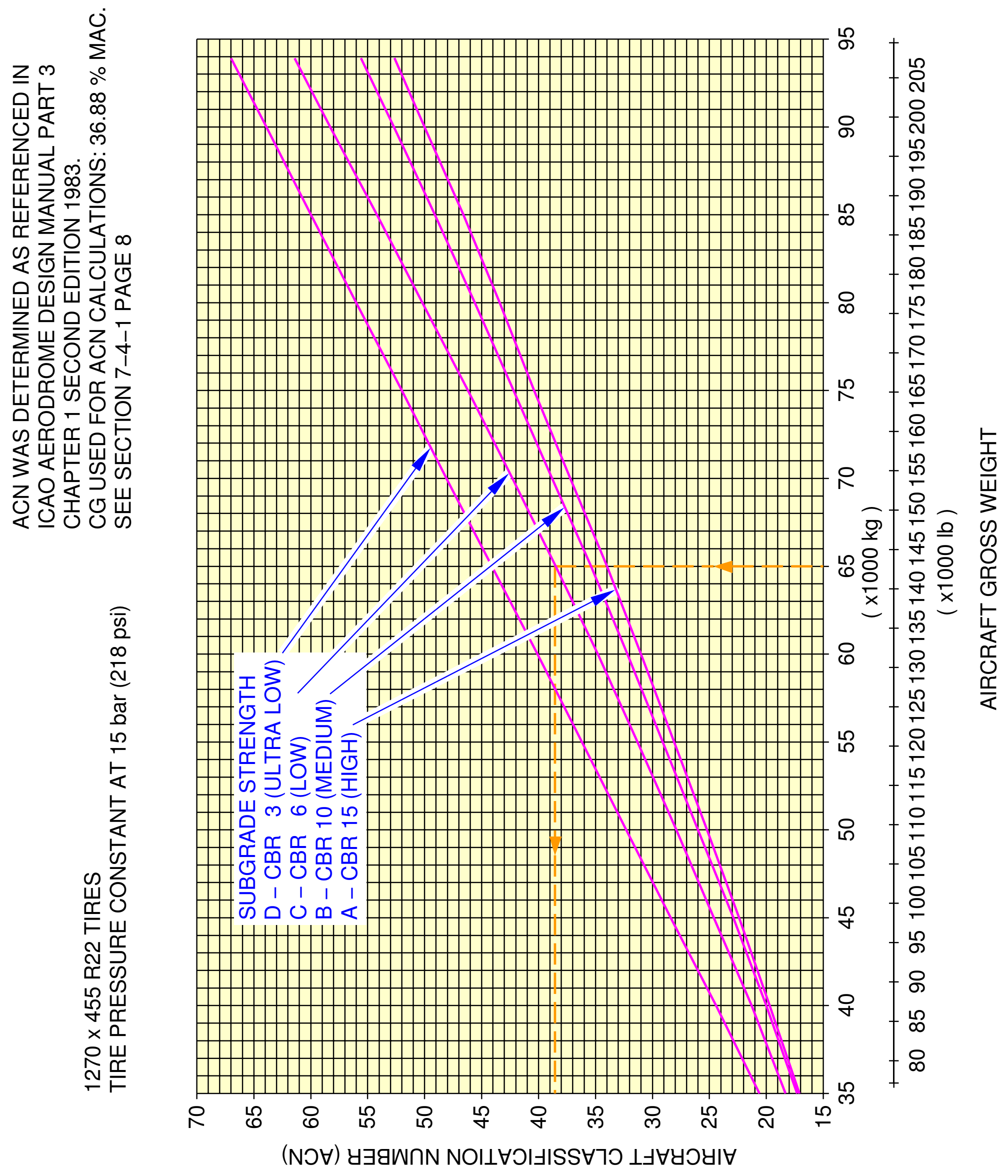
**ON A/C A321-200



N_AC_070901_1_0390101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 93 T
FIGURE 10

**ON A/C A321-200



N_AC_070901_1_0400101_01_01

Aircraft Classification Number – Flexible Pavement
MTOW 93.5 T
FIGURE 11

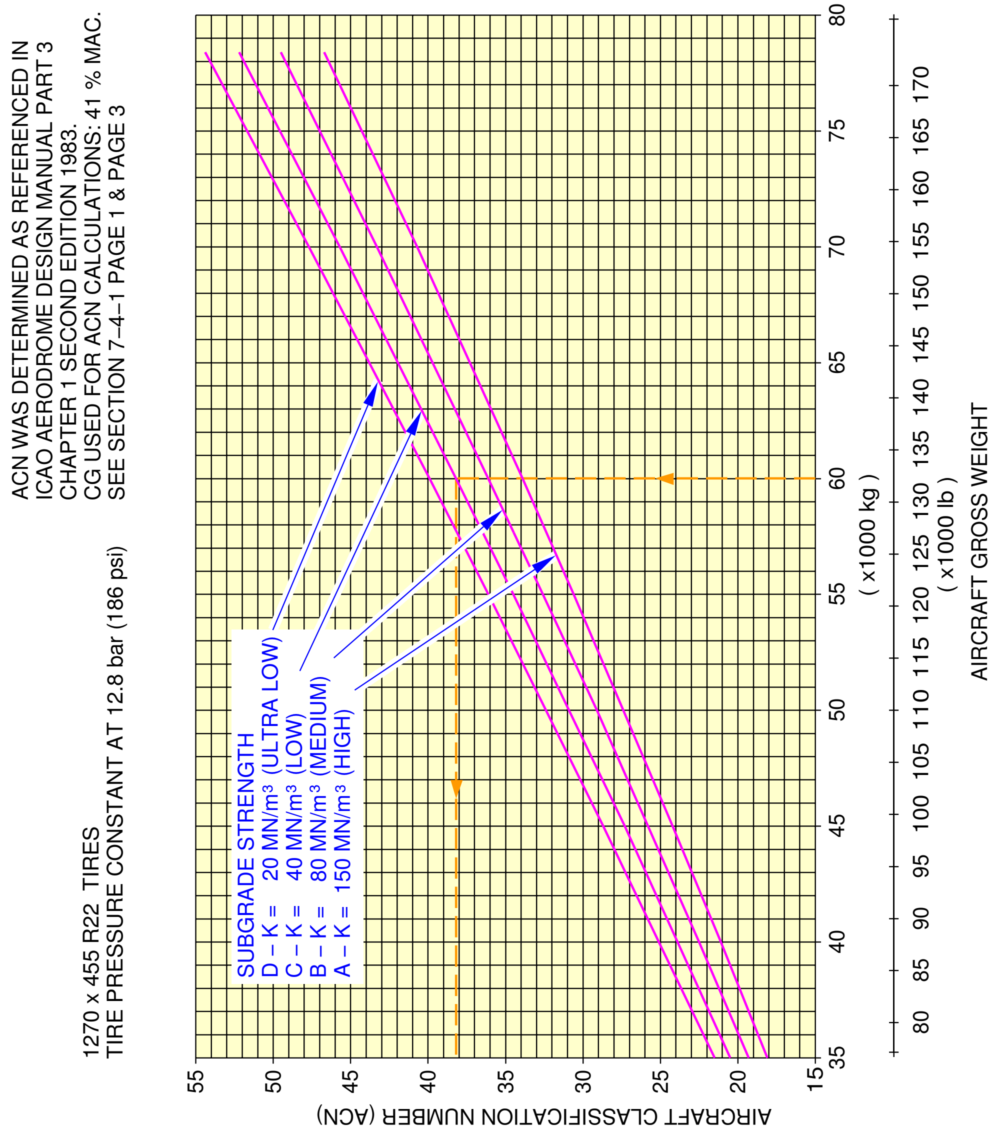
7-9-2 Aircraft Classification Number - Rigid Pavement

****ON A/C A321-100 A321-200**

Aircraft Classification Number - Rigid Pavement

1. This section gives the Aircraft Classification Number - Rigid Pavement.

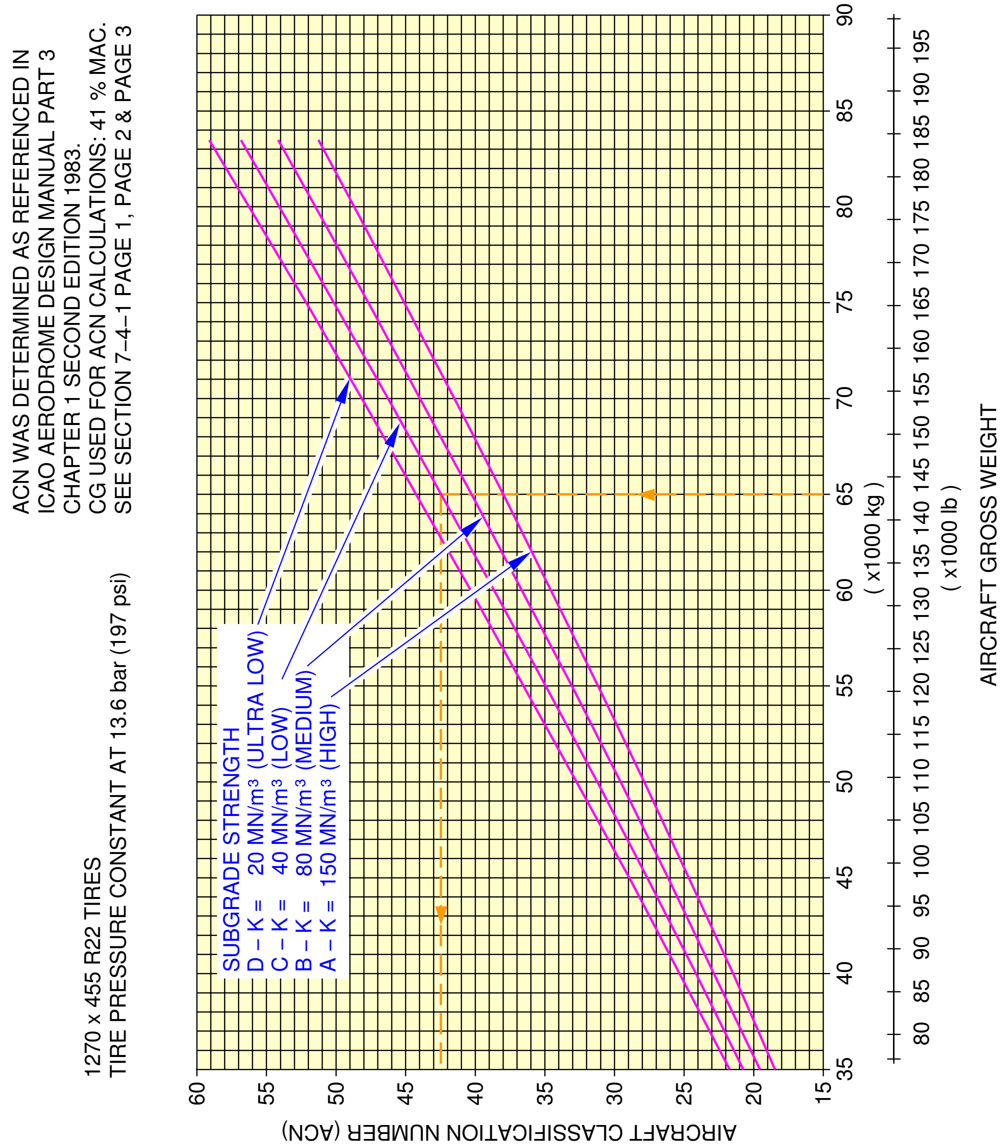
****ON A/C A321-100**



N_AC_070902_1_0300101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 78 T
FIGURE 1

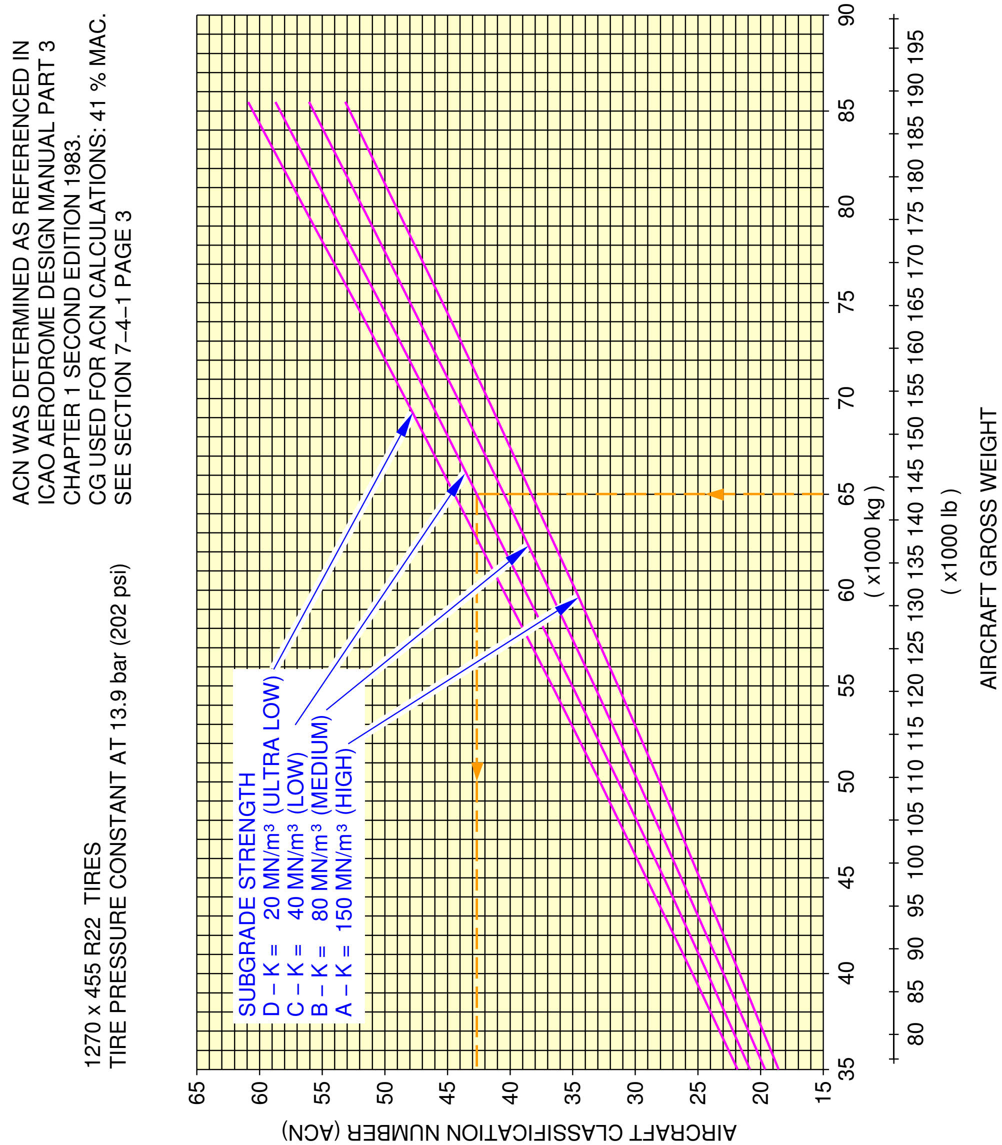
**ON A/C A321-100



N_AC_070902_1_0310101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 83 T
FIGURE 2

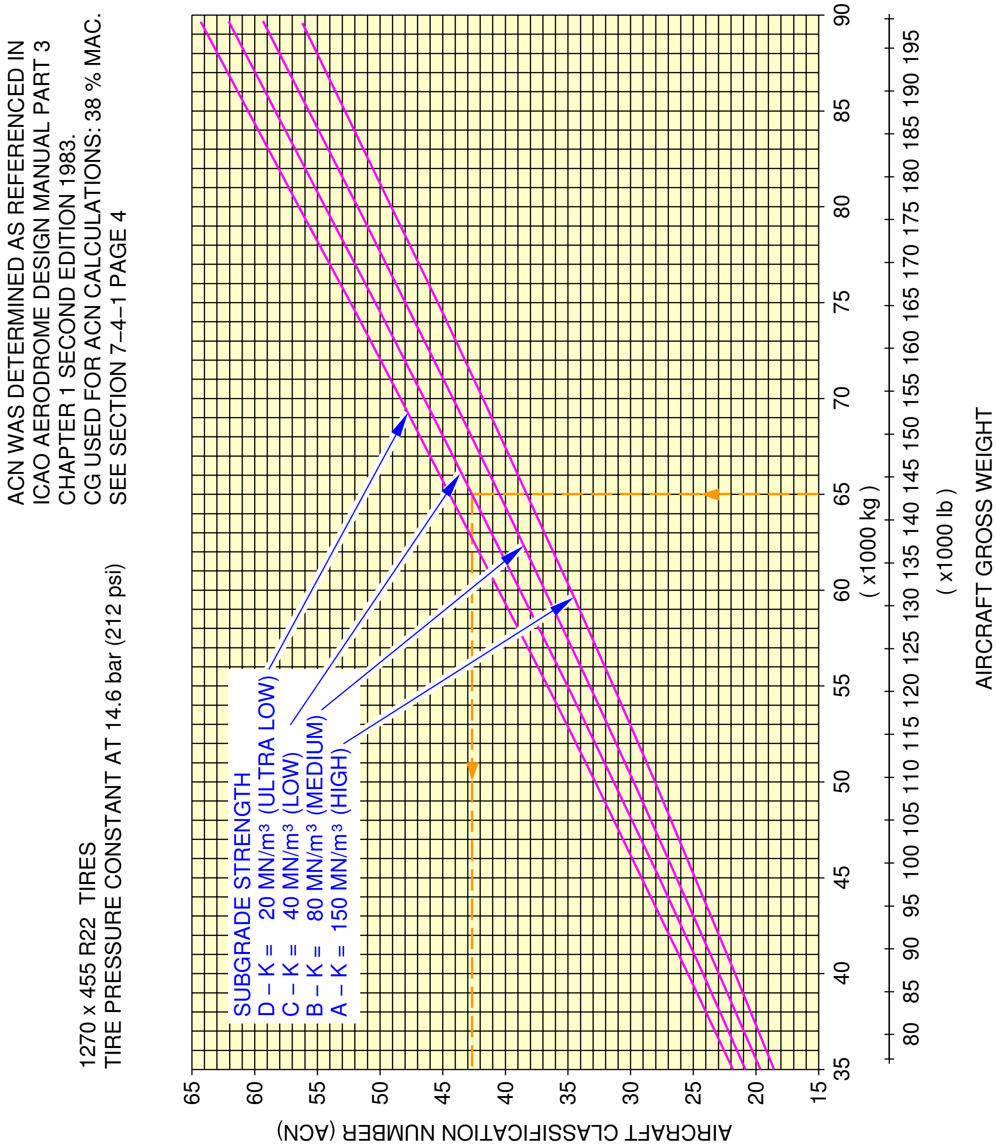
**ON A/C A321-100



N_AC_070902_1_0320101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 85 T
FIGURE 3

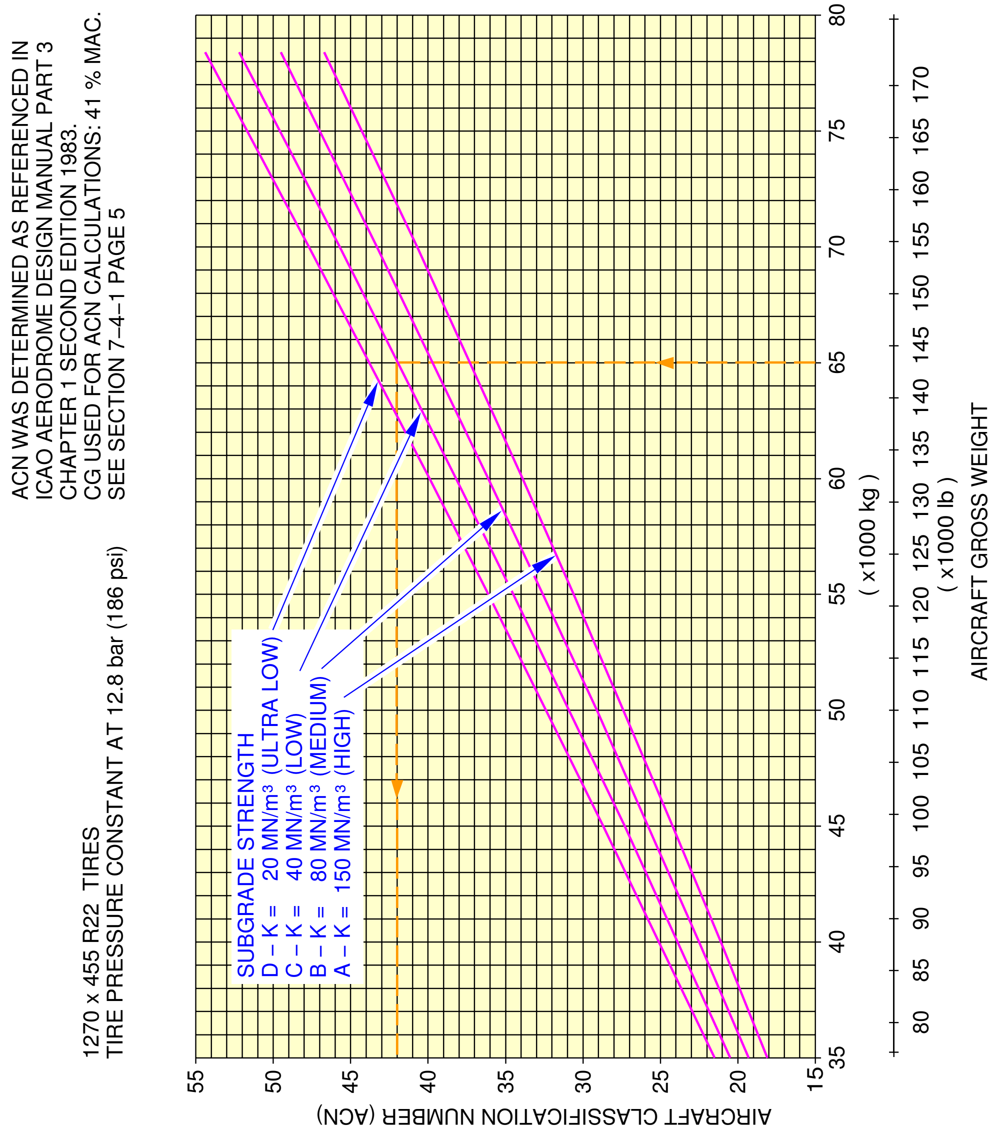
**ON A/C A321-100



N_AC_070902_1_0330101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 89 T
FIGURE 4

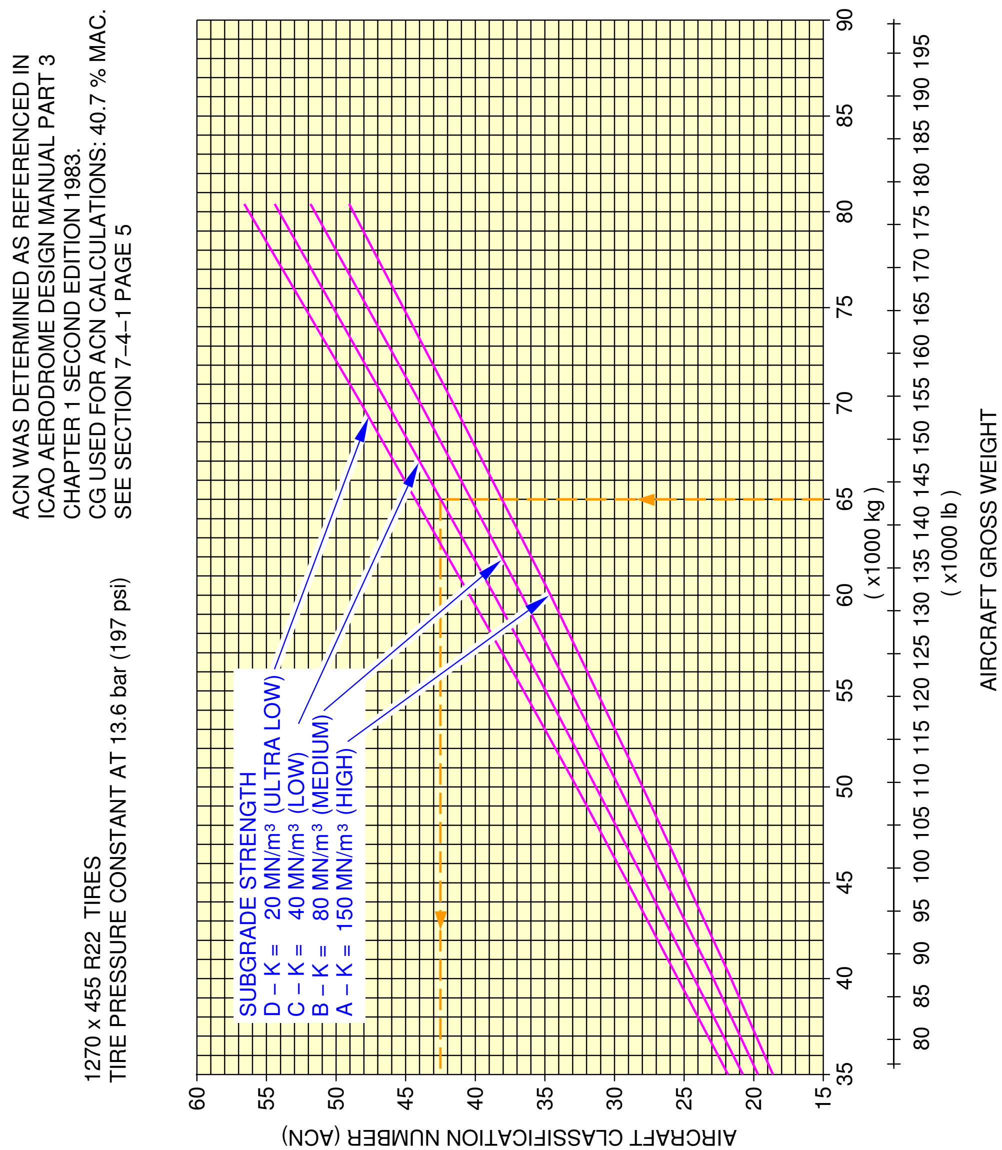
**ON A/C A321-200



N_AC_070902_1_0340101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 78 T
FIGURE 5

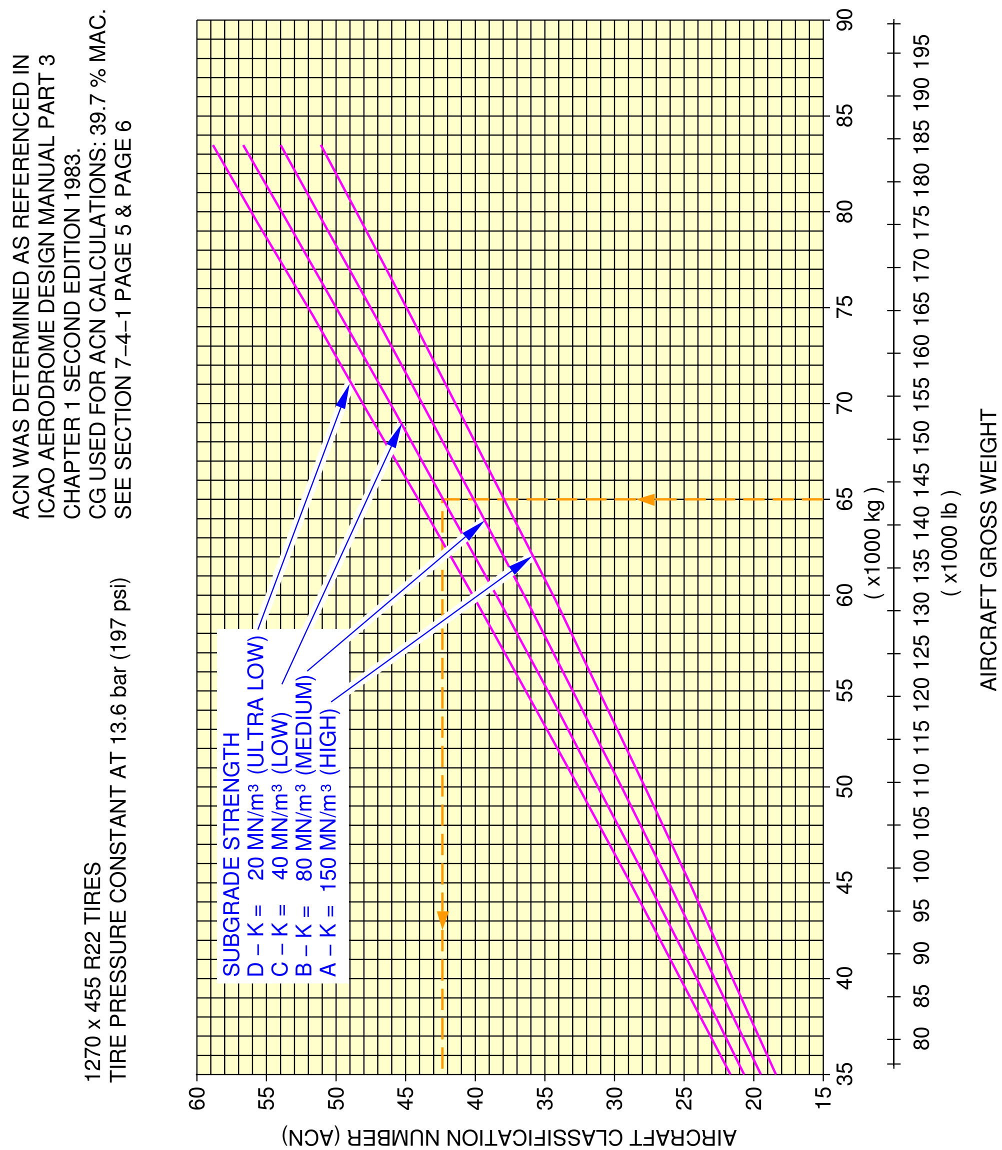
**ON A/C A321-200



N_AC_070902_1_0350101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 80 T
FIGURE 6

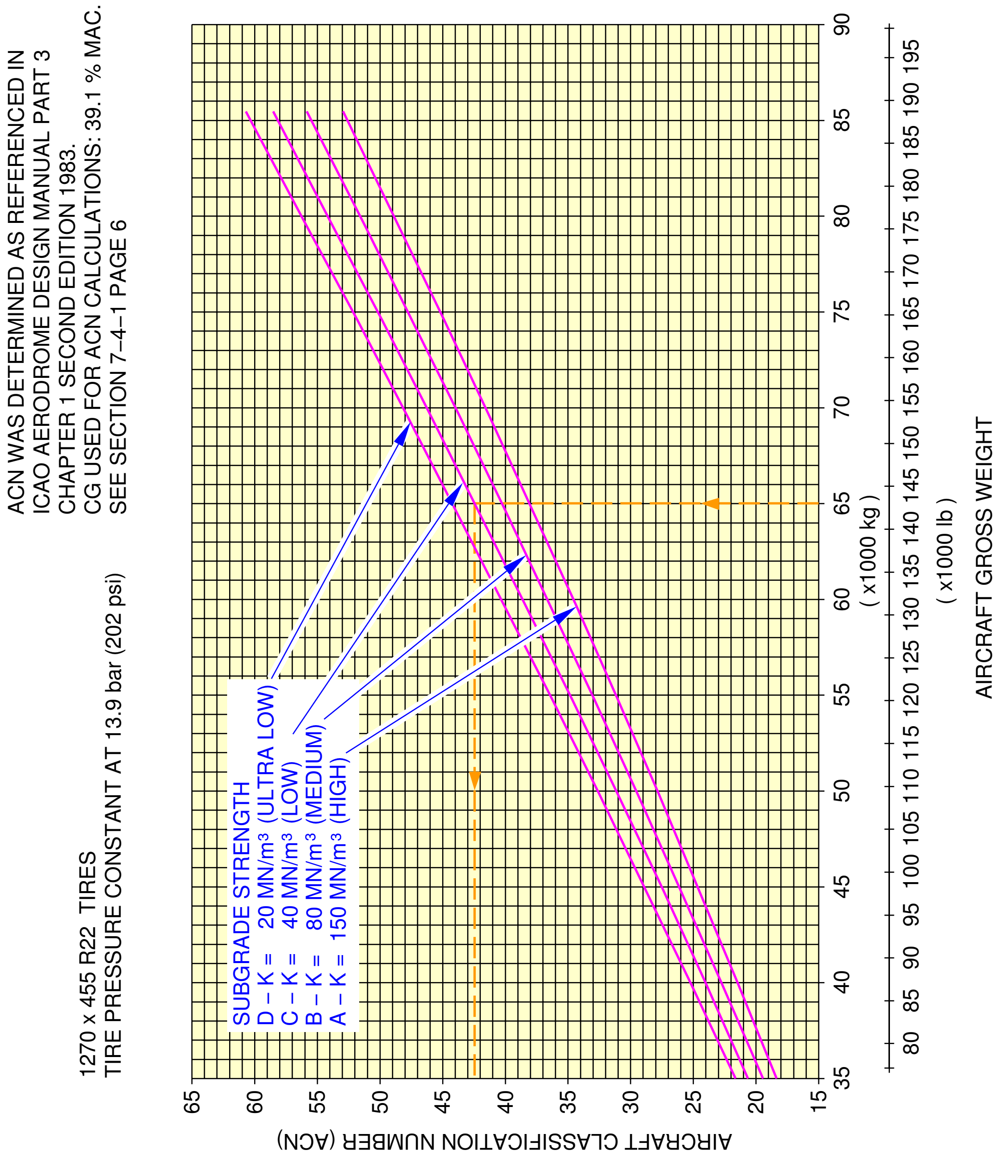
****ON A/C A321-200**



N_AC_070902_1_0360101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 83 T
FIGURE 7

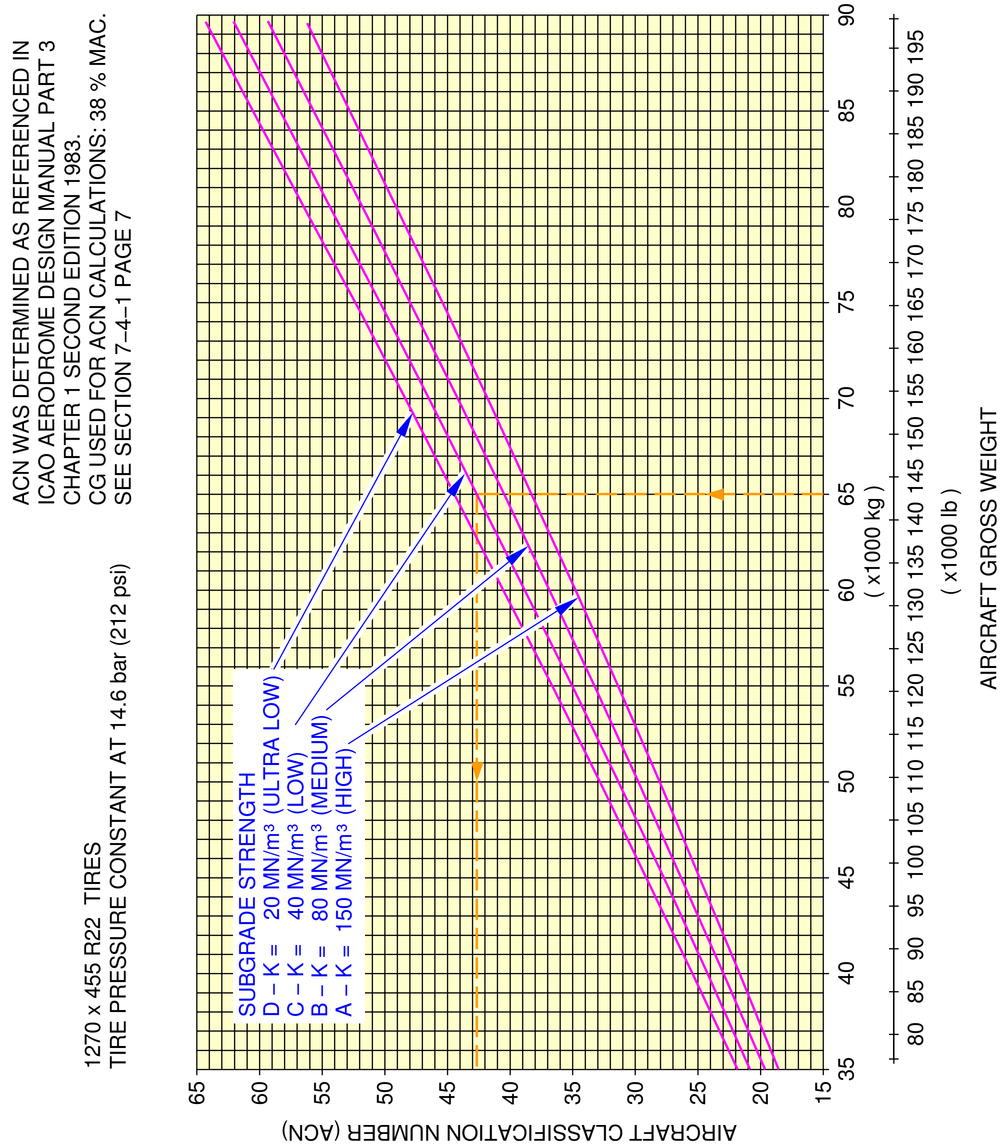
****ON A/C A321-200**



N_AC_070902_1_0370101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 85 T
FIGURE 8

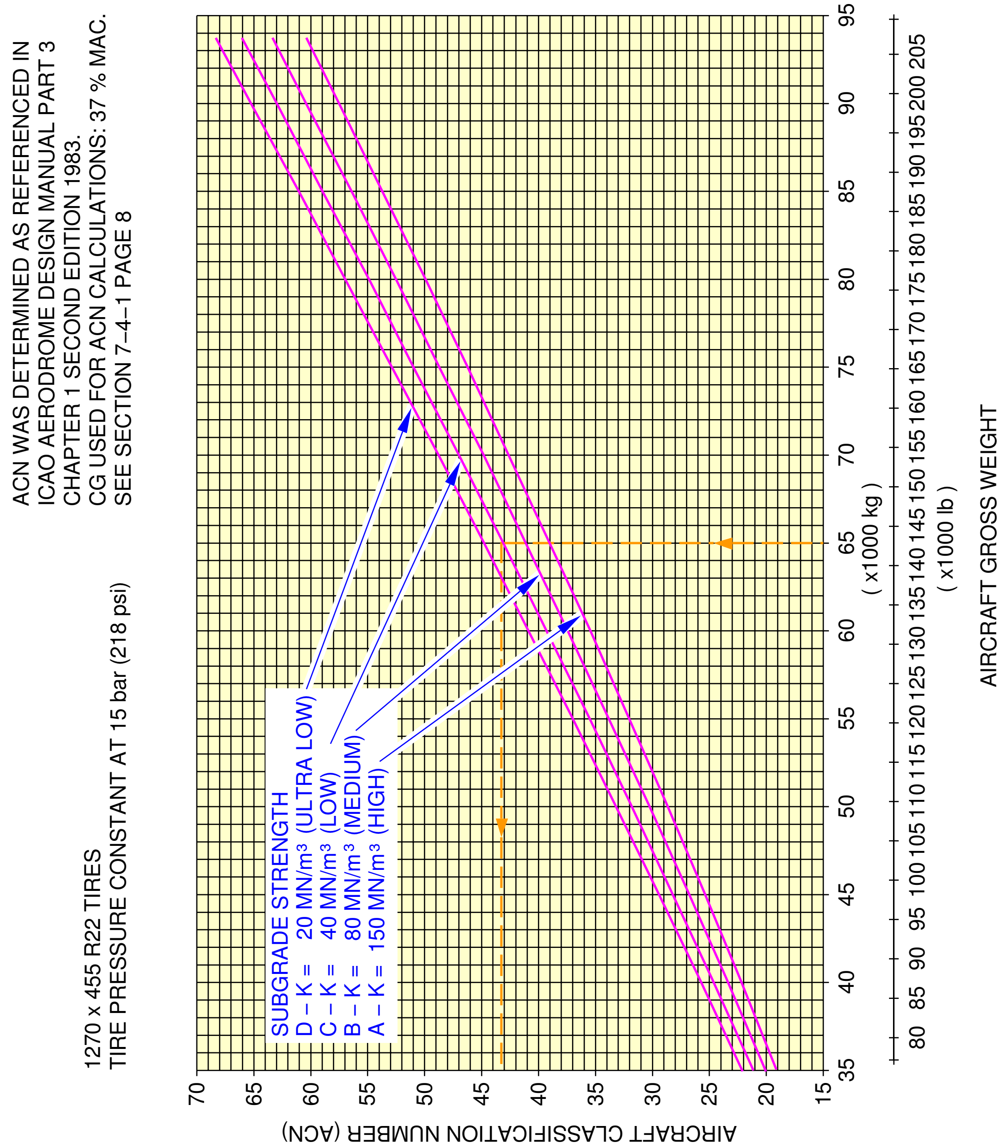
****ON A/C A321-200**



N_AC_070902_1_0380101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 89 T
FIGURE 9

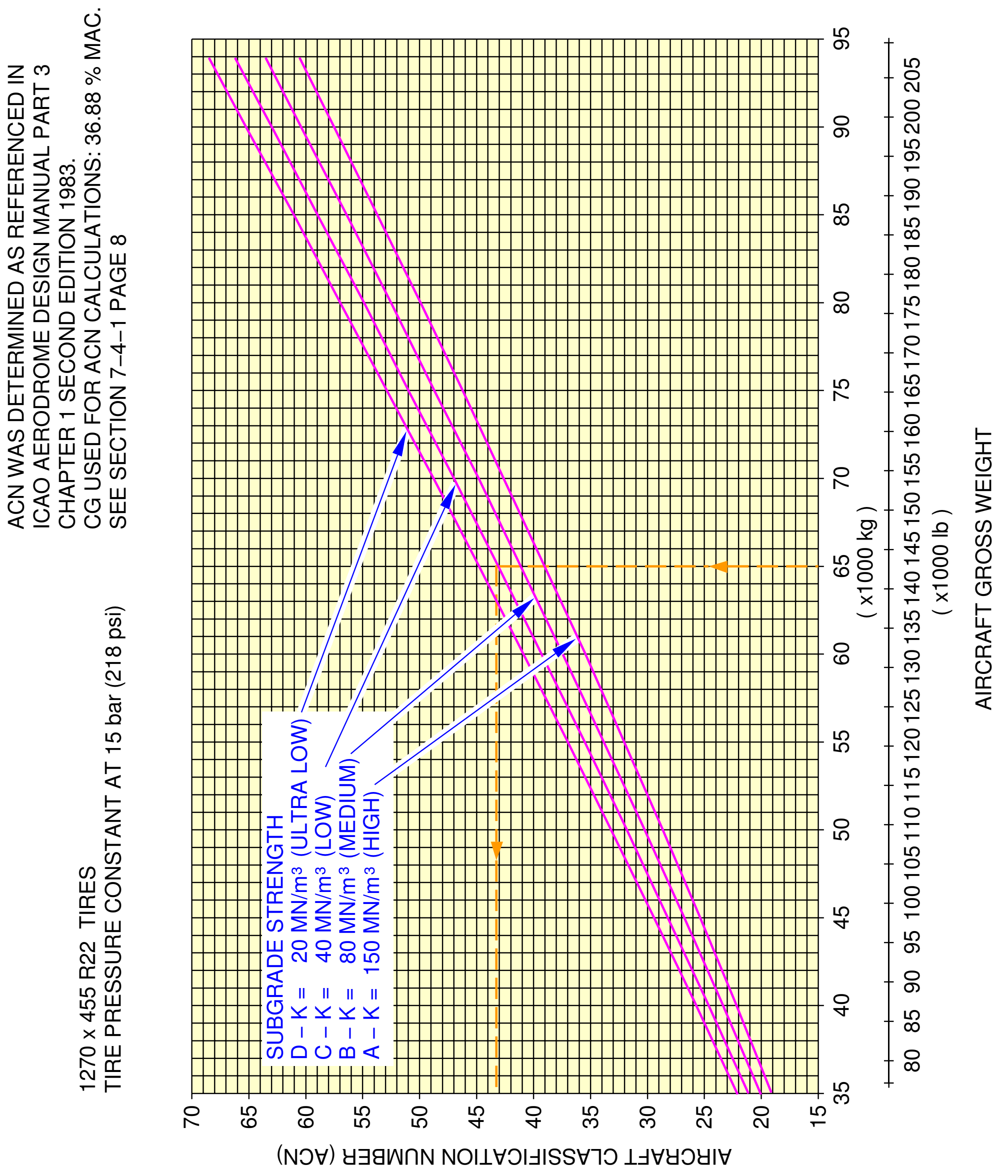
**ON A/C A321-200



N_AC_070902_1_0390101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 93 T
FIGURE 10

**ON A/C A321-200



N_AC_070902_1_0400101_01_01

Aircraft Classification Number – Rigid Pavement
MTOW 93.5 T
FIGURE 11

DERIVATIVE AIRPLANES

8-1-0 Possible Future Derivative Airplane

****ON A/C A321-100 A321-200**

Possible Future Derivative Airplane

1. General

   Derivative versions of the A321 are planned. All product line airplanes are studied for possible size changes that might be required for fulfilling future airline needs. History has proved that derivative airplanes of a given model can encompass both increases and decreases in linear dimensions and weight.

SCALED DRAWINGS

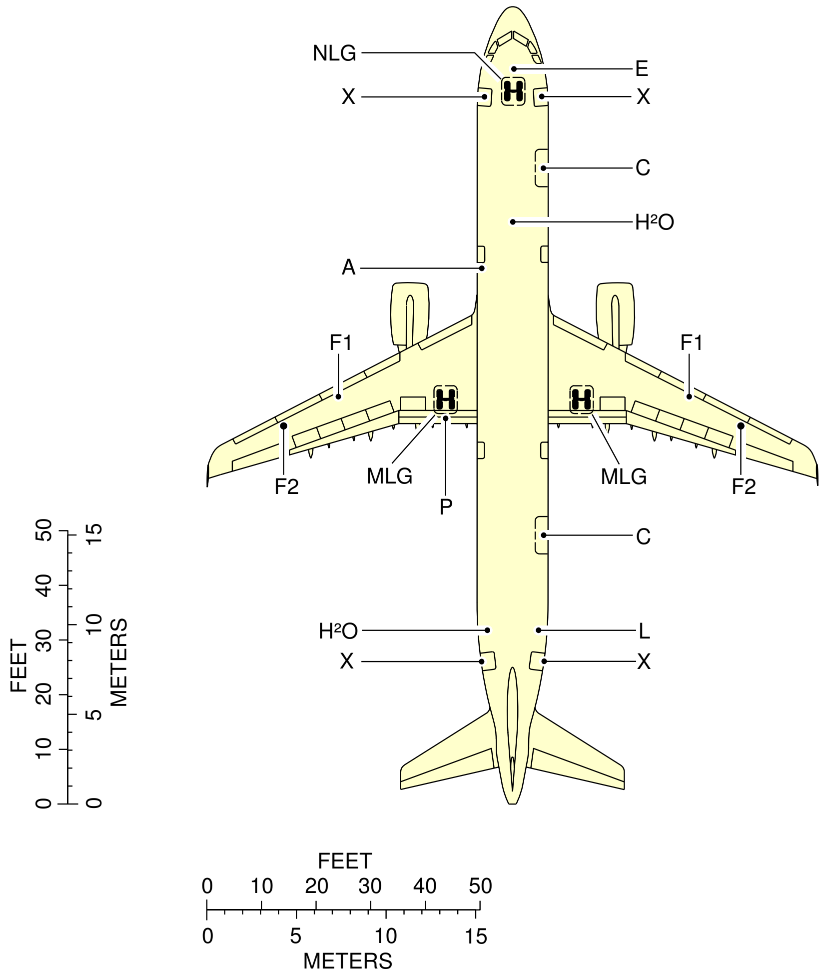
9-1-0 Scaled Drawings

****ON A/C A321-100 A321-200**

Scaled Drawings

1. This section gives scaled drawing of the aircraft.

**ON A/C A321-100 A321-200



LEGEND:

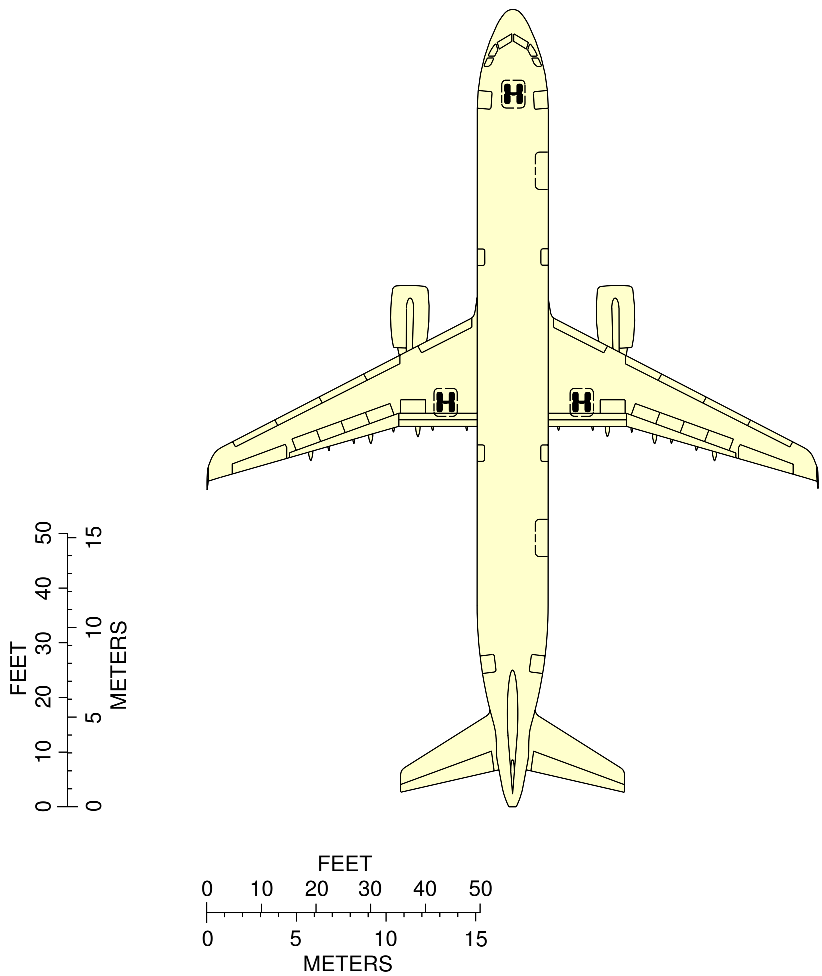
A	AIR CONDITIONING		
C	CARGO COMPT DOOR	L	LAVATORY
E	ELECTRICAL	MLG	MAIN LANDING GEAR
F1	FUEL (COUPLING)	NLG	NOSE LANDING GEAR
F2	FUEL (GRAVITY)	P	PNEUMATIC
H^2O	POTABLE WATER	X	PASSENGER/CREW DOOR

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

N_AC_090100_1_0070101_01_03

Scaled Drawing
FIGURE 1

**ON A/C A321-100 A321-200



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

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Scaled Drawing
FIGURE 2