

MD-80 SERIES
AIRPLANE
CHARACTERISTICS
FOR
AIRPORT PLANNING
1990

To Whom It May Concern:

This document is intended for airport planning purposes. Specific aircraft performance and operational requirements are established by the airline that will use the airport under consideration.

Questions concerning the use of this document should be addressed to:

**Airport Compatibility Group
Douglas Aircraft Company
3855 Lakewood Blvd
Long Beach, CA 90846 USA**

MCDONNELL DOUGLAS

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MD-80 AIRPLANE CHARACTERISTICS

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1.0 SCOPE

1.1 Purpose

1.2 Introduction

1.0 SCOPE

1.1 Purpose

This document provides, in a standardized format, airplane characteristics data for general airport planning. These are various models of the MD-80 series. The MD-80 series data in this document are for the MD-81, -82, -83, -88, and -87. Since operational practices vary among airlines, specific data should be coordinated with the using airline prior to facility design. Douglas Aircraft Company should be contacted for any additional information required.

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

Aerospace Industries Association of America
Airport Operators' Council International
Air Transport Association of America
International Air Transport Association

1.2 Introduction

This document conforms to NAS 3601. It provides Douglas Model MD-80 series characteristics for airport operators, airlines, and engineering consultant organizations. Since airplane changes and available options may alter the information, the data presented herein must be regarded as subject to change. Similarly, for airplanes not yet certified, changes can be expected to occur.

For further information contact:

Douglas Aircraft Company
3855 Lakewood Blvd.
Long Beach, California 90846

Attention: Airport/Aircraft Compatibility Group
Department E17
Mail Code 212-21

2.0 AIRPLANE DESCRIPTION

- 2.1 General Airplane Characteristics**
- 2.2 General Airplane Dimensions**
- 2.3 Ground Clearances**
- 2.4 Interior Arrangements**
- 2.5 Passenger Cabin Cross Section**
- 2.6 Lower Compartments (No Containers)**
- 2.7 Door Clearances**

2.0 AIRPLANE DESCRIPTION

2.1 General Airplane Characteristics – MD-80 (Definitions Refer to Items in Figure 2.1).

Maximum Ramp Weight. Maximum weight authorized for ground maneuver by applicable government regulations, including taxi and runup fuel. Also designated in some manuals as maximum design taxi weight.

Maximum Landing Weight. Maximum weight authorized at touchdown by the applicable government regulations.

Maximum Takeoff Weight. Maximum weight authorized at takeoff brake release by the applicable government regulations and excludes taxi and runup fuel.

Operating Weight Empty. Weight of structure, power plant, furnishings, systems, unusable fuel and other unusable propulsion agents, and other items of equipment that are considered an integral part of a particular aircraft configuration. Also included are certain standard items, personnel, equipment, and supplies necessary for full operation, excluding fuel and payload. Described as “Operating Empty Weight” in some manuals.

Zero Fuel Weight. Maximum airplane weight less usable fuel, engine injection fluid, and other consumable propulsion agents. It may include usable fuel in specified tanks when carried in lieu of payload. The addition of usable and consumable items to the Zero Fuel Weight must be in accordance with the applicable government regulations so that airplane structure and airworthiness requirements are not exceeded.

Maximum Structural Payload. Consists of the maximum design payload weight of passengers, passenger baggage and/or cargo.

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

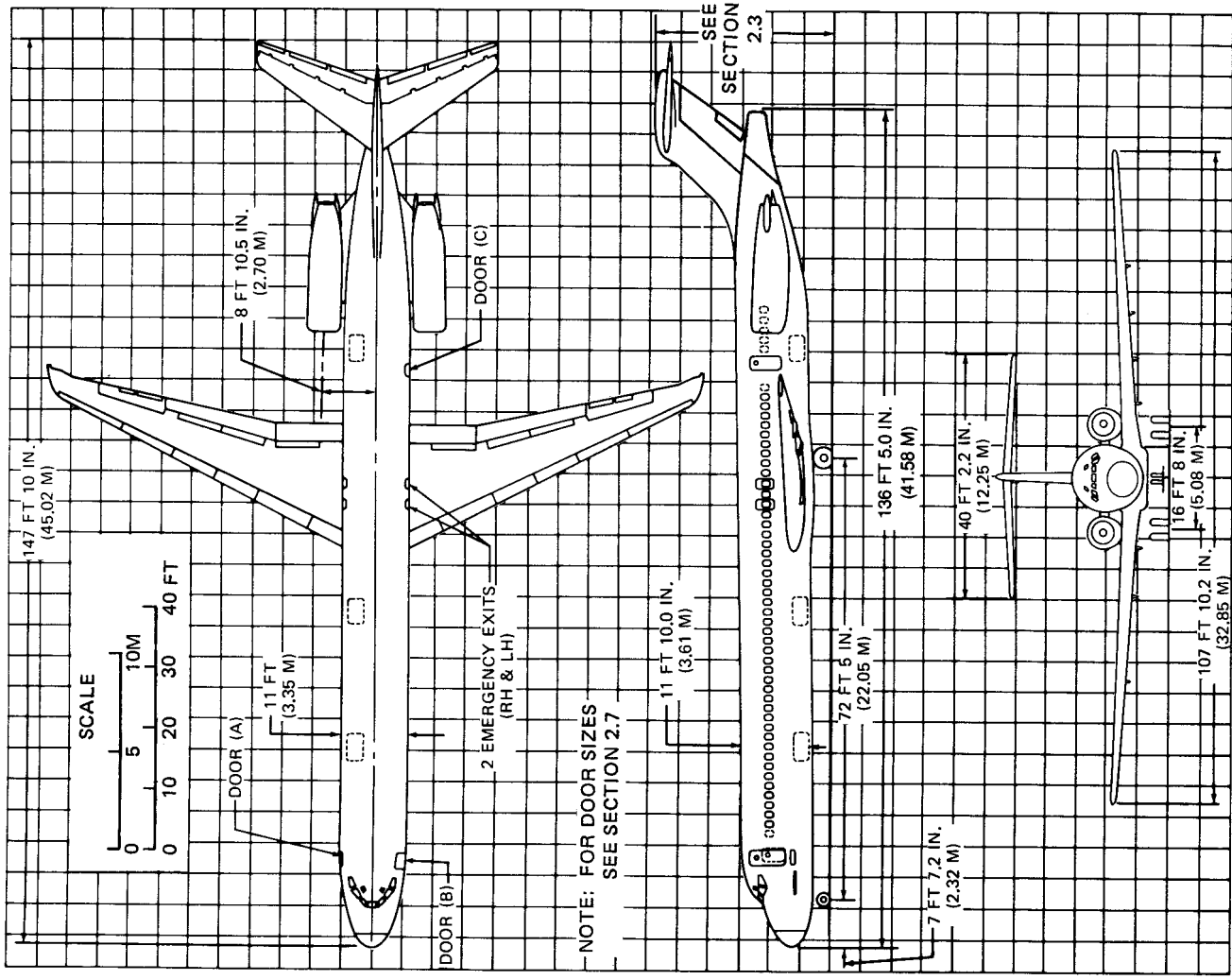
Maximum Cargo Volume. The maximum space available for cargo.

Usable Fuel Capacity. The volume of fuel carried for a particular operation, less drainable unusable fuel and trapped fuel remaining after a fuel runout test has been accomplished.

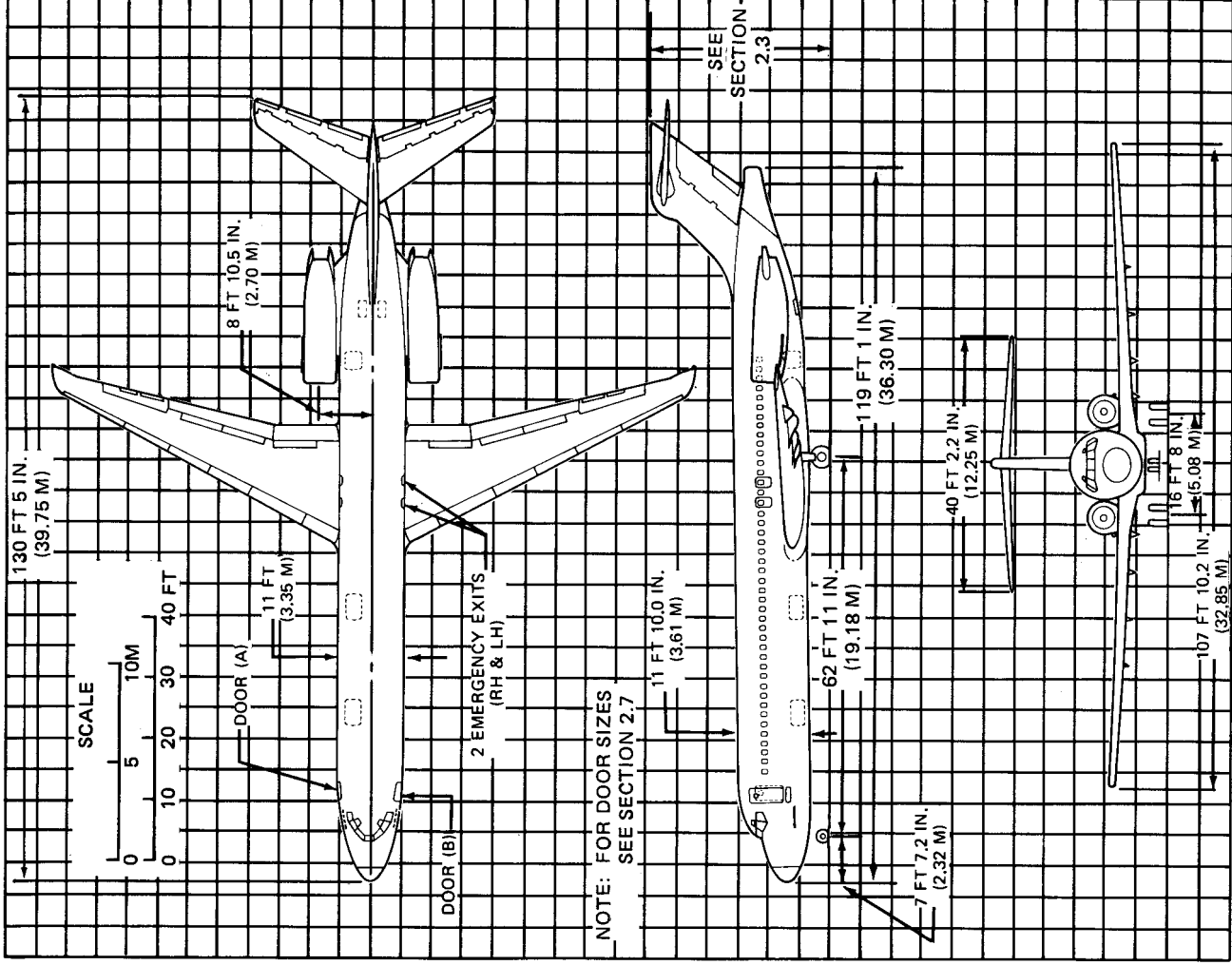
| | MODEL MD-81 | MODEL MD-82, -88 | MODEL MD-83* | MODEL MD-87 | MODEL MD-87* | |
|--|--------------|------------------|--------------|-------------|--------------|---------|
| MAXIMUM RAMP WEIGHT | POUNDS | 141,000 | 150,500 | 161,000 | 141,000 | 150,500 |
| | KILOGRAMS | 63,958 | 68,266 | 73,028 | 63,957 | 68,266 |
| MAXIMUM LANDING WEIGHT | POUNDS | 128,000 | 130,000 | 139,500 | 128,000 | 130,000 |
| | KILOGRAMS | 58,061 | 58,967 | 63,276 | 58,060 | 58,967 |
| MAXIMUM TAKEOFF WEIGHT | POUNDS | 140,000 | 149,500 | 160,000 | 140,000 | 149,500 |
| | KILOGRAMS | 63,504 | 67,812 | 72,575 | 63,503 | 67,812 |
| OPERATING WEIGHT EMPTY | POUNDS | 77,888 | 77,976 | 79,686 | 73,274 | 74,880 |
| | KILOGRAMS | 35,330 | 35,369 | 36,145 | 33,237 | 33,965 |
| ZERO FUEL WEIGHT | POUNDS | 118,000 | 122,000 | 122,000 | 112,000 | 112,000 |
| | KILOGRAMS | 53,525 | 55,338 | 55,338 | 50,802 | 50,802 |
| MAXIMUM STRUCTURAL PAYLOAD | POUNDS | 40,112 | 44,024 | 42,314 | 38,726 | 37,120 |
| | KILOGRAMS | 18,195 | 19,969 | 19,193 | 17,566 | 16,837 |
| MAXIMUM SEATING CAPACITY | PASSENGERS | 172 | 172 | 172 | 139 | 139 |
| MAXIMUM CARGO VOLUME | CUBIC FEET | 1,253 | 1,253 | 1,013 | 938 | 695 |
| | CUBIC METERS | 35.5 | 35.5 | 28.7 | 26.6 | 19.7 |
| USABLE FUEL CAPACITY (6.7 LB PER GAL) | U.S. GALLONS | 5,846 | 5,846 | 6,981 | 5,845 | 6,980 |
| | LITERS | 22,129 | 22,129 | 26,426 | 22,126 | 26,422 |
| | POUNDS | 39,168 | 39,168 | 46,773 | 39,162 | 46,766 |
| | KILOGRAMS | 17,766 | 17,766 | 21,216 | 17,764 | 21,213 |

*WITH 1,130-GALLON FUSELAGE AUXILIARY FUEL TANKS

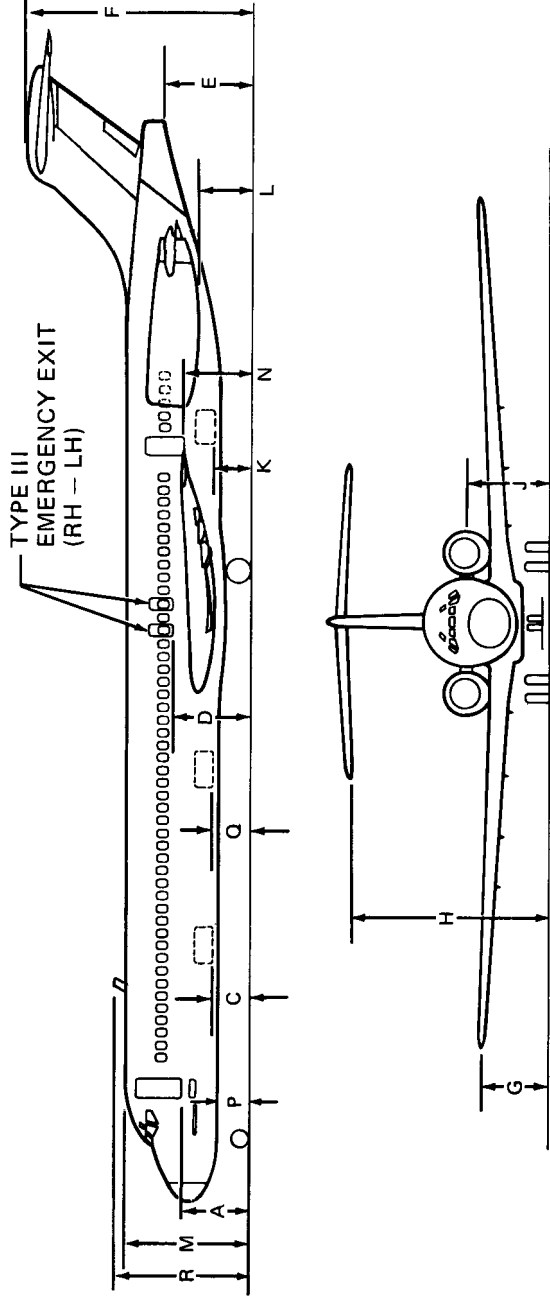
2.1 GENERAL AIRPLANE CHARACTERISTICS MODEL MD-80 SERIES



2.2 GENERAL AIRPLANE DIMENSIONS MODEL MD-81, -82, -83, AND -88



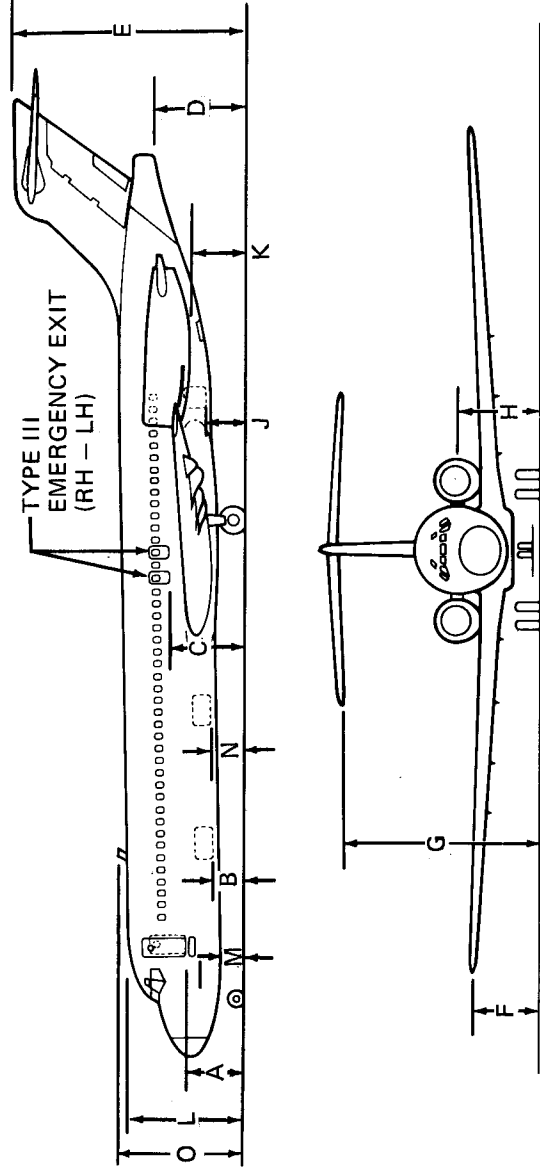
2.2 GENERAL AIRPLANE DIMENSIONS MODEL MD-87



| VERTICAL CLEARANCES | | | |
|---------------------|----------|--------|-----------------|
| | MAXIMUM | | MINIMUM |
| | FT - IN. | METERS | FT - IN. METERS |
| A | 7 - 10 | 2.4 | 7 - 3 2.2 |
| B | - | - | - |
| C | 4 - 3 | 1.3 | 3 - 7 1.1 |
| D | 10 - 2 | 3.1 | 9 - 9 3.0 |
| E | 12 - 1 | 3.7 | 11 - 5 3.5 |
| F | 30 - 2 | 9.2 | 29 - 7 9.0 |
| G | 9 - 1 | 2.8 | 8 - 7 2.6 |
| H | 27 - 6 | 8.4 | 26 - 9 8.2 |
| J | 11 - 8 | 3.6 | 11 - 2 3.4 |
| K | 5 - 5 | 1.7 | 4 - 9 1.4 |
| L | 8 - 2 | 2.5 | 7 - 6 2.3 |
| M | 15 - 7 | 4.8 | 15 - 1 4.6 |
| N | 9 - 3 | 2.8 | 8 - 10 2.7 |
| P | 3 - 7 | 1.1 | 3 - 0 0.9 |
| Q | 4 - 8 | 1.4 | 4 - 0 1.2 |
| R | 17 - 1 | 5.2 | 16 - 7 5.0 |

- VALUES SHOWN ARE FOR CERTIFIED WEIGHTS AND CG LIMITS SPECIFIED FOR GROUND OPERATIONS.
- VALUES APPLY TO STATIC AIRCRAFT ON A FLAT, LEVEL SURFACE.
- IT IS RECOMMENDED THAT ±3 INCHES BE ALLOWED FOR VERTICAL EXCURSIONS DUE TO LOADING, VARYING STRUT AND TIRE INFLATIONS, PAVEMENT UNEVENNESS, ETC.

2.3 GROUND CLEARANCES MODEL MD-81, -82, -83, AND -88



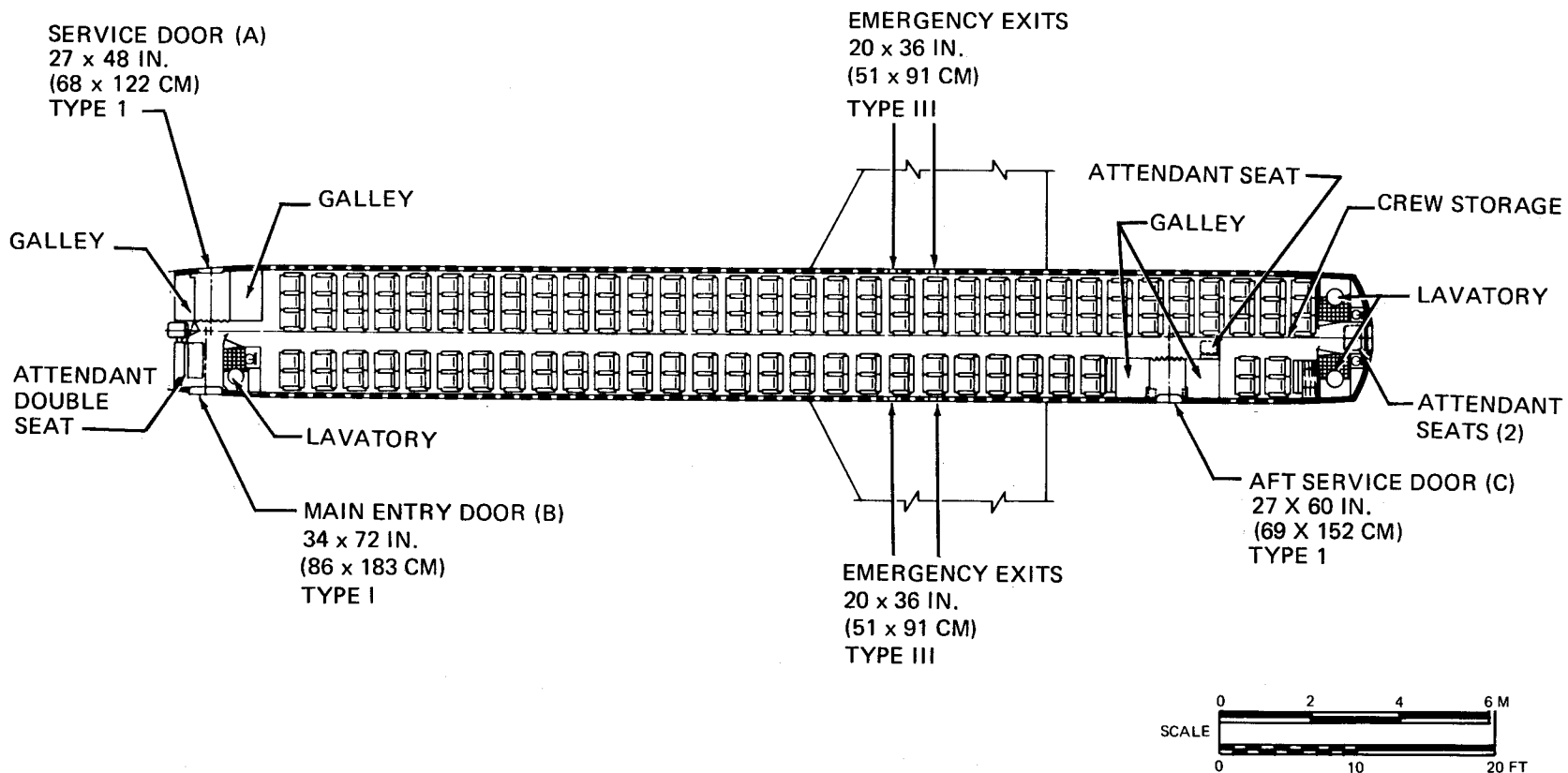
| VERTICAL CLEARANCES | | | | |
|---------------------|----------|--------|----------|--------|
| | MAXIMUM | | MINIMUM | |
| | FT - IN. | METERS | FT - IN. | METERS |
| A | 7 - 9 | 2.4 | 7 - 3 | 2.2 |
| B | 4 - 1 | 1.3 | 3 - 8 | 1.1 |
| C | 10 - 3 | 3.1 | 9 - 10 | 3.0 |
| D | 12 - 7 | 3.8 | 11 - 8 | 3.6 |
| E | 31 - 2 | 9.5 | 30 - 4 | 9.2 |
| F | 9 - 3 | 2.8 | 8 - 8 | 2.6 |
| G | 28 - 1 | 8.6 | 27 - 2 | 8.3 |
| H | 11 - 8 | 3.6 | 11 - 1 | 3.4 |
| J | 5 - 5 | 1.6 | 4 - 10 | 1.5 |
| K | 8 - 1 | 2.5 | 7 - 6 | 2.3 |
| L | 15 - 8 | 4.8 | 15 - 2 | 4.6 |
| M | 3 - 6 | 1.1 | 3 - 0 | 0.9 |
| N | 4 - 7 | 1.4 | 4 - 2 | 1.3 |
| O | 17 - 1 | 5.2 | 16 - 8 | 5.1 |

- VALUES SHOWN ARE FOR CERTIFIED WEIGHTS AND CG LIMITS SPECIFIED FOR GROUND OPERATIONS.
- VALUES APPLY TO STATIC AIRCRAFT ON A FLAT, LEVEL SURFACE.
- IT IS RECOMMENDED THAT ± 3 INCHES BE ALLOWED FOR VERTICAL EXCURSIONS DUE TO LOADING, VARYING STRUT AND TIRE INFLATIONS, PAVEMENT UNEVENNESS, ETC.

2.3 GROUND CLEARANCES MODEL MD-87

155 PASSENGERS, 5-ABREAST SEATING

100 SEATS ON 32-IN. (81.2 CM) PITCH
 50 SEATS ON 33-IN. (83.8 CM) PITCH
 5 SEATS ON 34-IN. (86.4 CM) PITCH

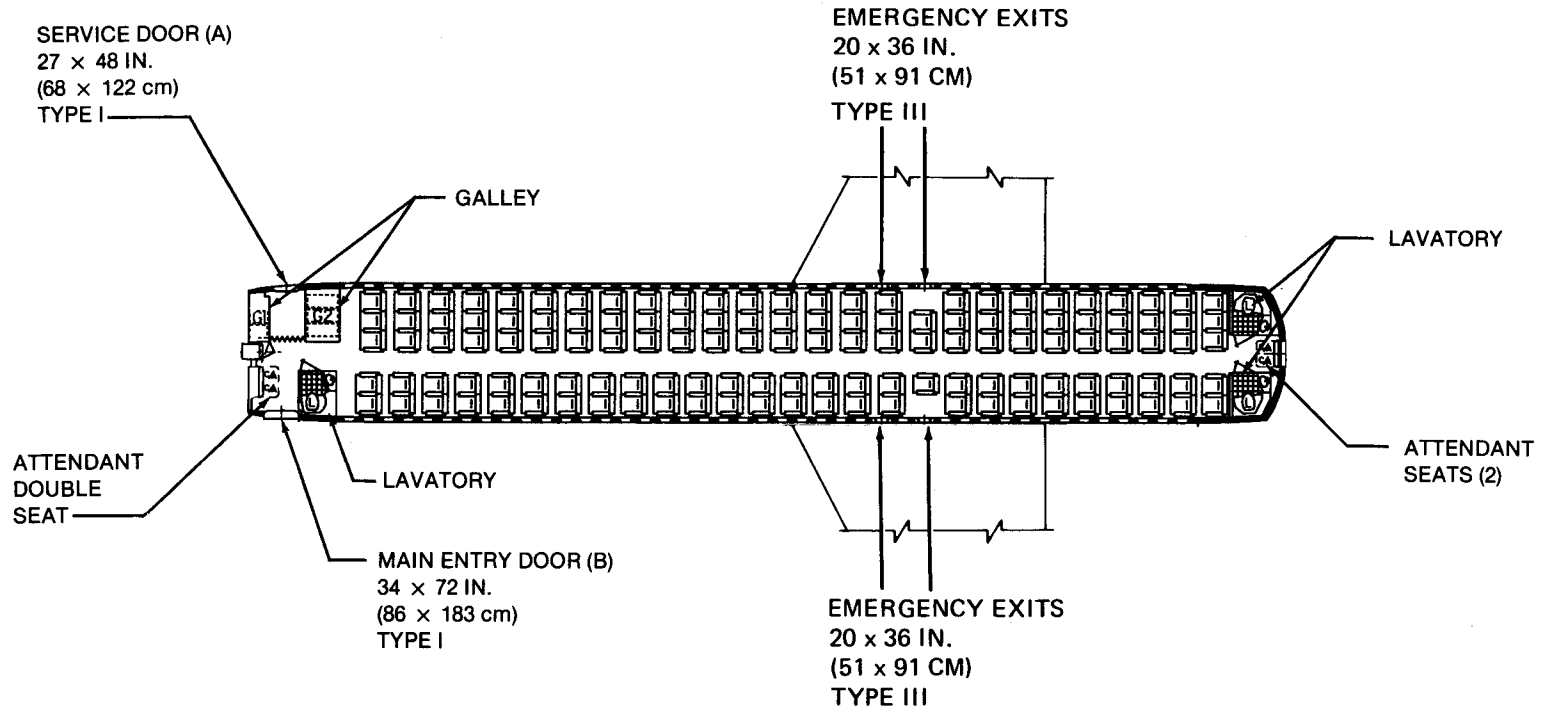


NOTE: MAXIMUM OF 172 PASSENGERS, 5-ABREAST SEATING AVAILABLE

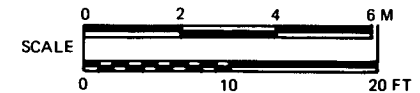
2.4 INTERIOR ARRANGEMENTS
2.4.1 PASSENGERS
MODEL MD-81, -82, -83, AND -88

130 PASSENGERS, 5-ABREAST SEATING

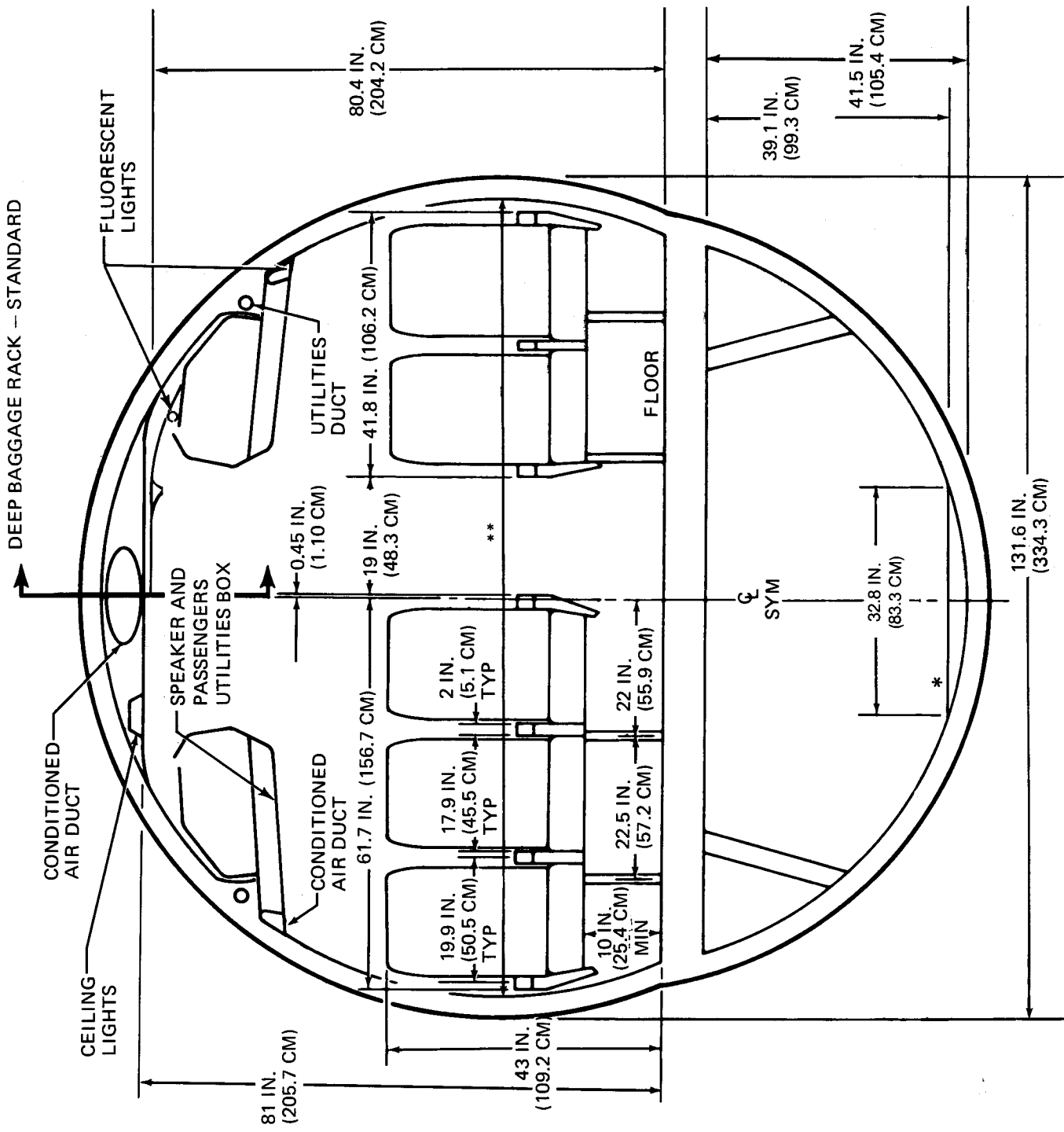
- 43 SEATS ON 31-IN. (78.7 cm) PITCH
- 34 SEATS ON 32-IN. (81.3 cm) PITCH
- 47 SEATS ON 33-IN. (83.8 cm) PITCH
- 6 SEATS ON 34-IN. (86.4 cm) PITCH



NOTE: MAXIMUM OF 139 PASSENGERS, 5-ABREAST SEATING AVAILABLE



2.4 INTERIOR ARRANGEMENTS
2.4.1 PASSENGERS
MODEL MD-87

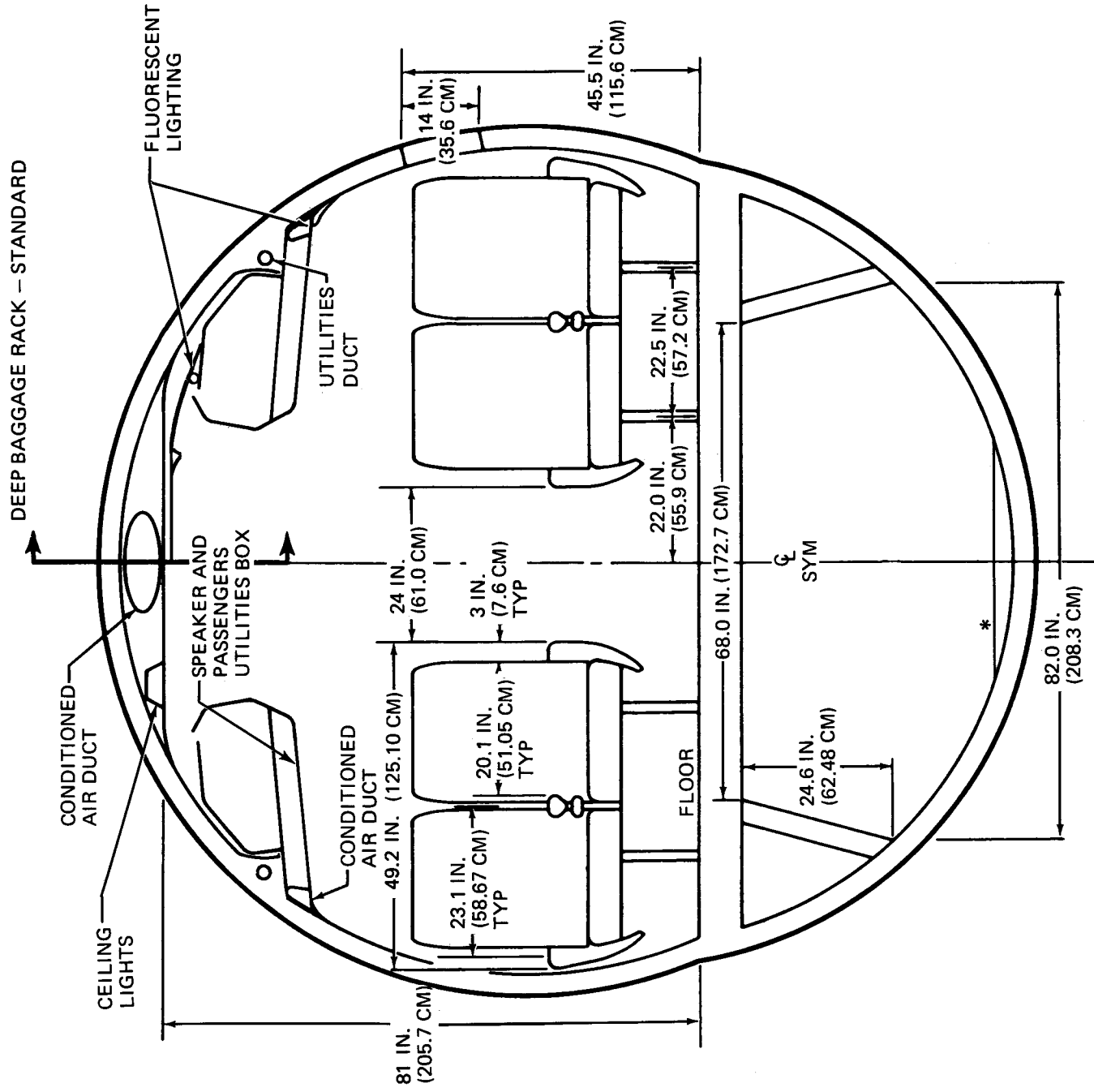


* FLAT FLOOR STANDARD ON MD-80 SERIES IN THE CONSTANT FUSELAGE SECTION (EXCEPT MD-87 AFT CARGO COMPARTMENT)

** TRIM TO TRIM 123.7 IN. (314.2 CM)

2.5 PASSENGER CABIN CROSS SECTION

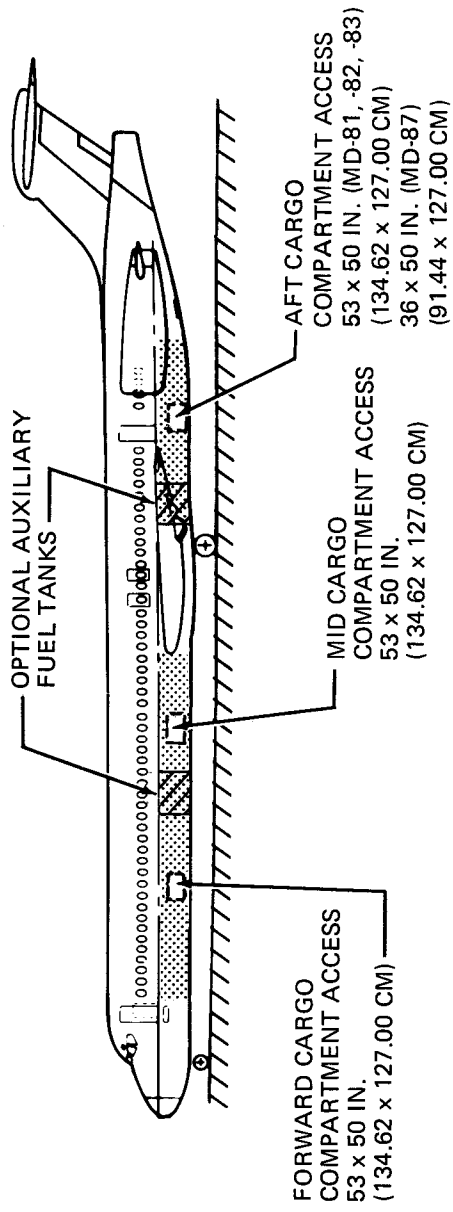
2.5.1 COACH - MODEL MD-80 SERIES



*FLAT FLOOR STANDARD ON MD-80 SERIES IN THE CONSTANT FUSELAGE SECTION (EXCEPT MD-87 AFT CARGO COMPARTMENT)

2.5 PASSENGER CABIN CROSS SECTION

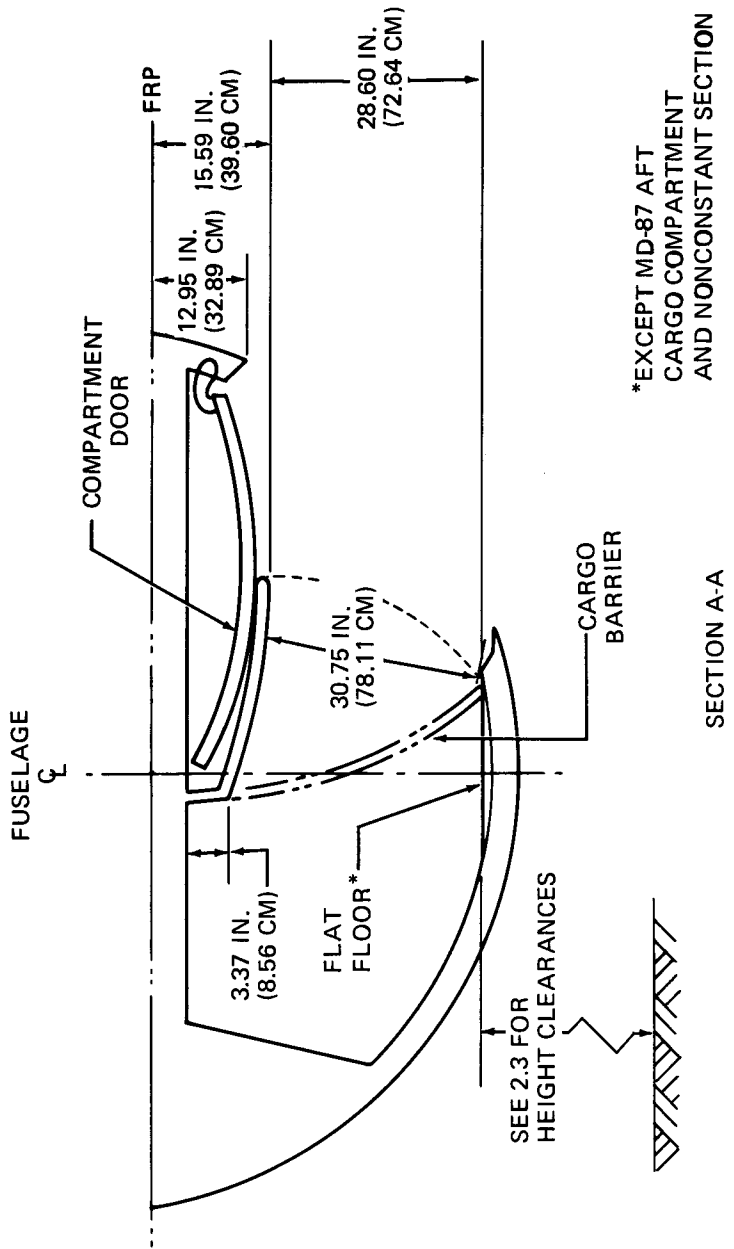
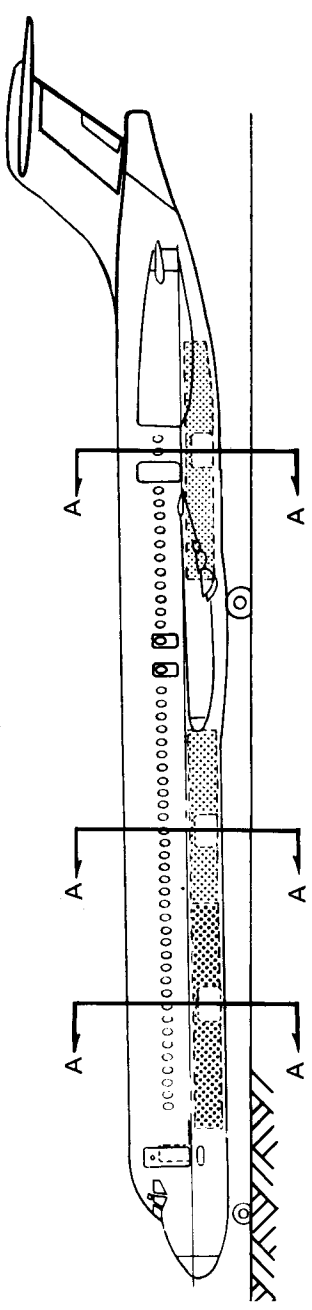
2.5.2 FIRST CLASS - MODEL MD-80 SERIES



| MODEL MD-80 | FORWARD CARGO COMPARTMENT | MID CARGO COMPARTMENT | AFT CARGO COMPARTMENT | TOTAL CARGO |
|---------------------------------------|---|---|---|--|
| -81, -82 PRIOR TO FUSELAGE 1174 | 464 FT ³ (13.1 M ³) | 346 FT ³ (9.8 M ³) | 443 FT ³ (12.5 M ³) | 1253 FT ³ (35.5 M ³) |
| -81, -82, -88 FUSELAGE 1174 + | 434 FT ³ (12.3 M ³) | 376 FT ³ (10.6 M ³) | 443 FT ³ (12.5 M ³) | 1253 FT ³ (35.5 M ³) |
| -83* | 434 FT ³ (12.3 M ³) | 253 FT ³ (7.2 M ³) | 326 FT ³ (9.2 M ³) | 1013 FT ³ (28.7 M ³) |
| -87 | 252 FT ³ (7.1 M ³) | 376 FT ³ (10.7 M ³) | 310 FT ³ (8.8 M ³) | 938 FT ³ (26.6 M ³) |
| -87* | 252 FT ³ (7.1 M ³) | 253 FT ³ (7.2 M ³) | 190 FT ³ (5.4 M ³) | 695 FT ³ (19.7 M ³) |

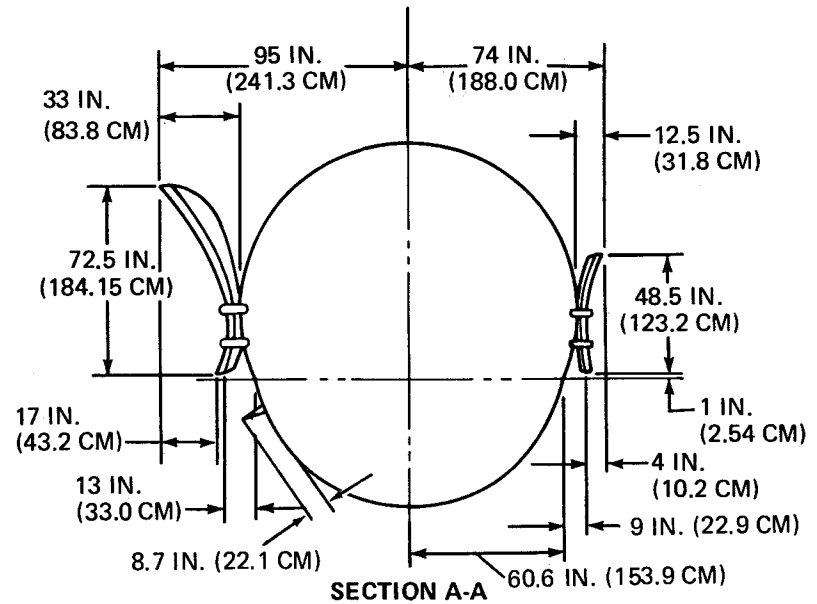
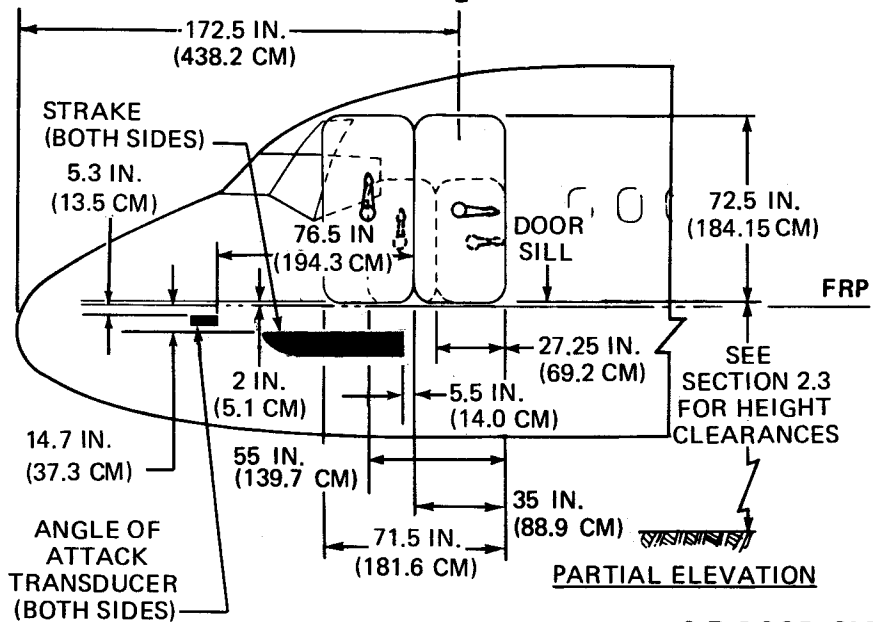
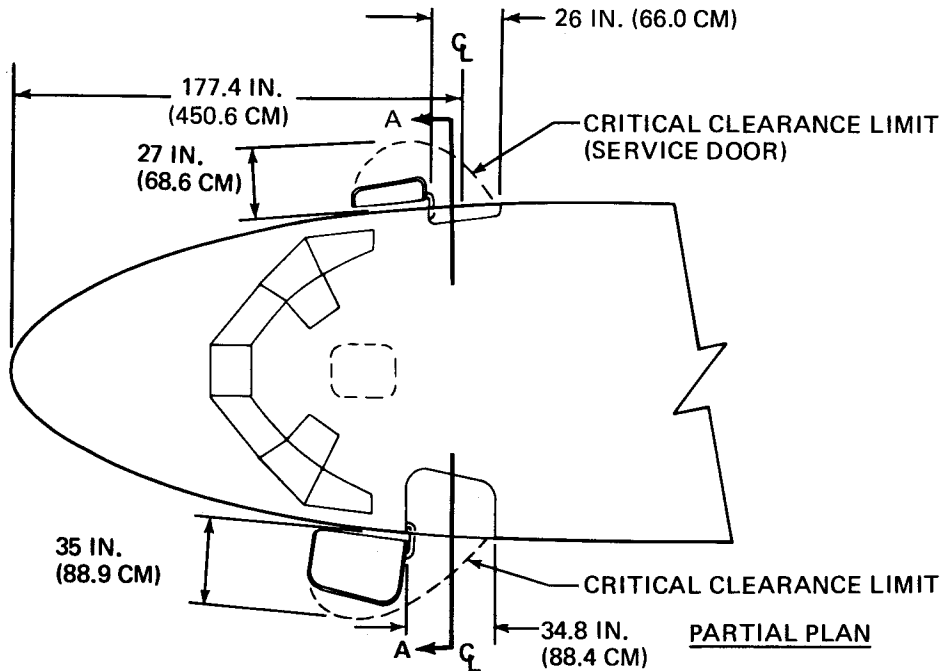
*WITH FUSELAGE AUXILIARY FUEL TANKS

2.6 LOWER COMPARTMENTS (BULK CARGO) MODEL MD-80 SERIES

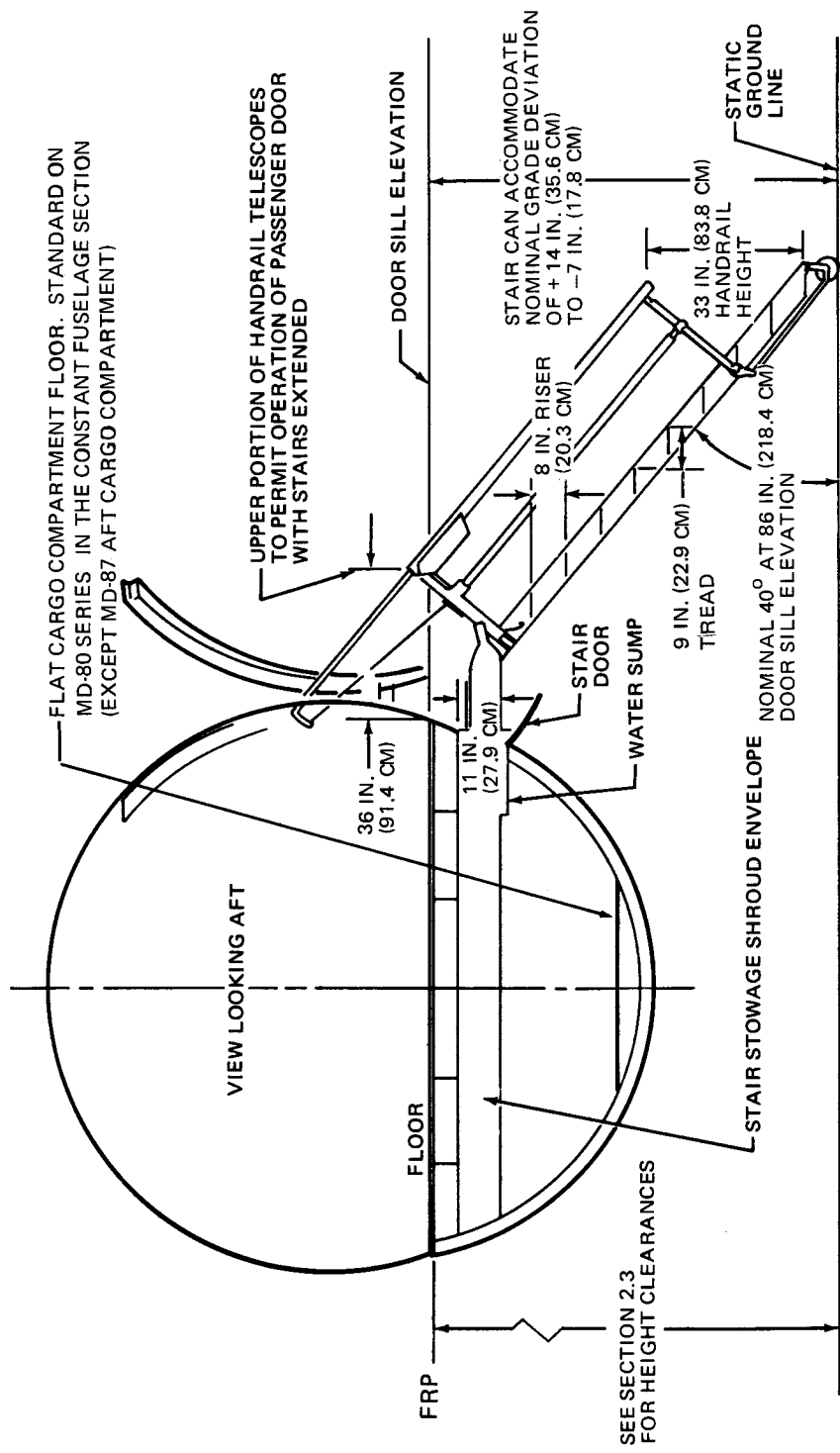


*EXCEPT MD-87 AFT CARGO COMPARTMENT AND NONCONSTANT SECTION

2.7 DOOR CLEARANCES
2.7.1 LOWER FORWARD, MID, AND AFT CARGO DOOR CLEARANCES
MODEL MD-80 SERIES



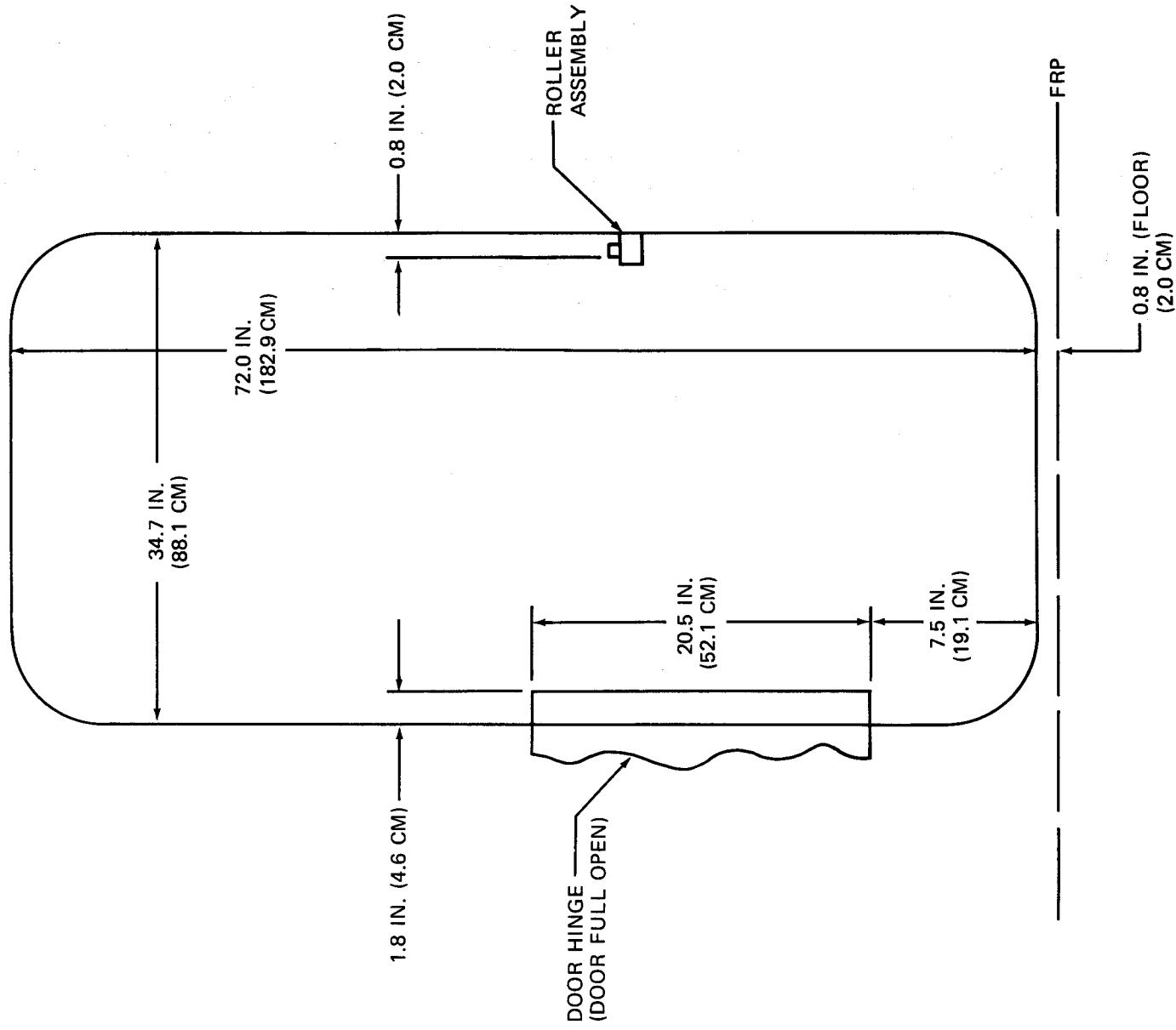
2.7 DOOR CLEARANCES
2.7.2 PASSENGER ENTRANCE AND SERVICE DOOR CLEARANCES
MODEL MD-80 SERIES



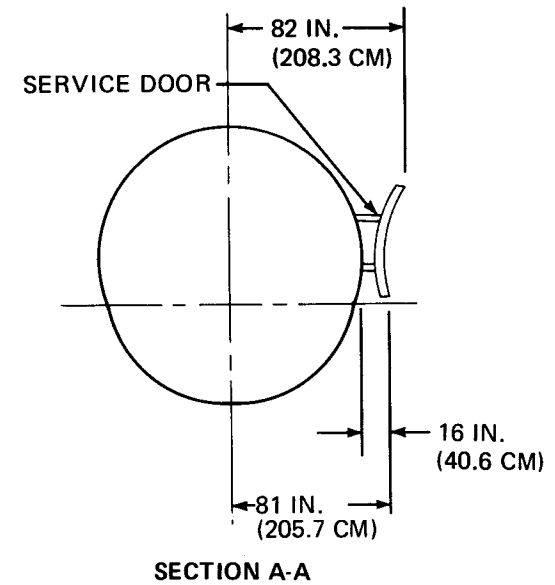
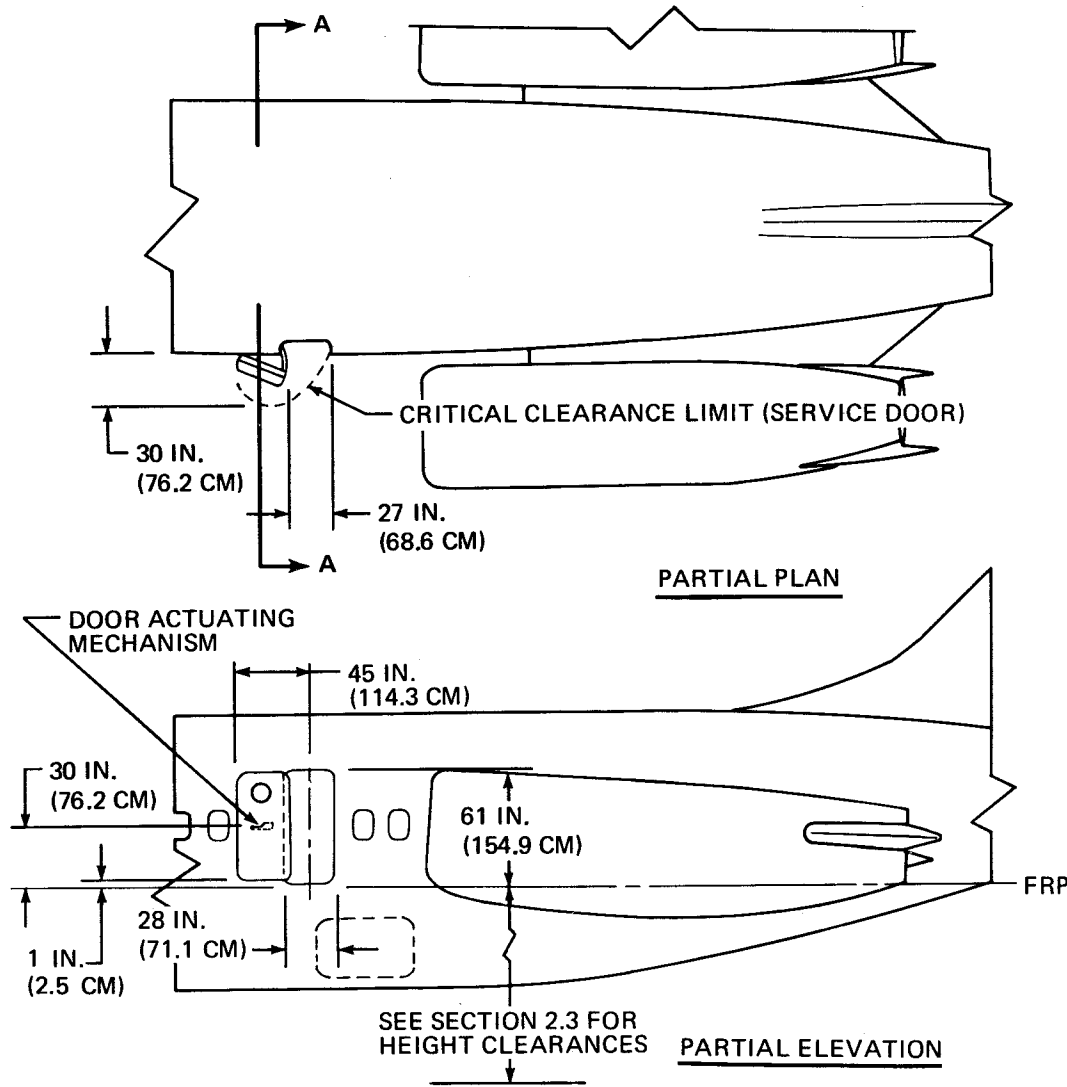
2.7 DOOR CLEARANCES

2.7.3 MAIN ENTRANCE STAIRWAY CLEARANCES

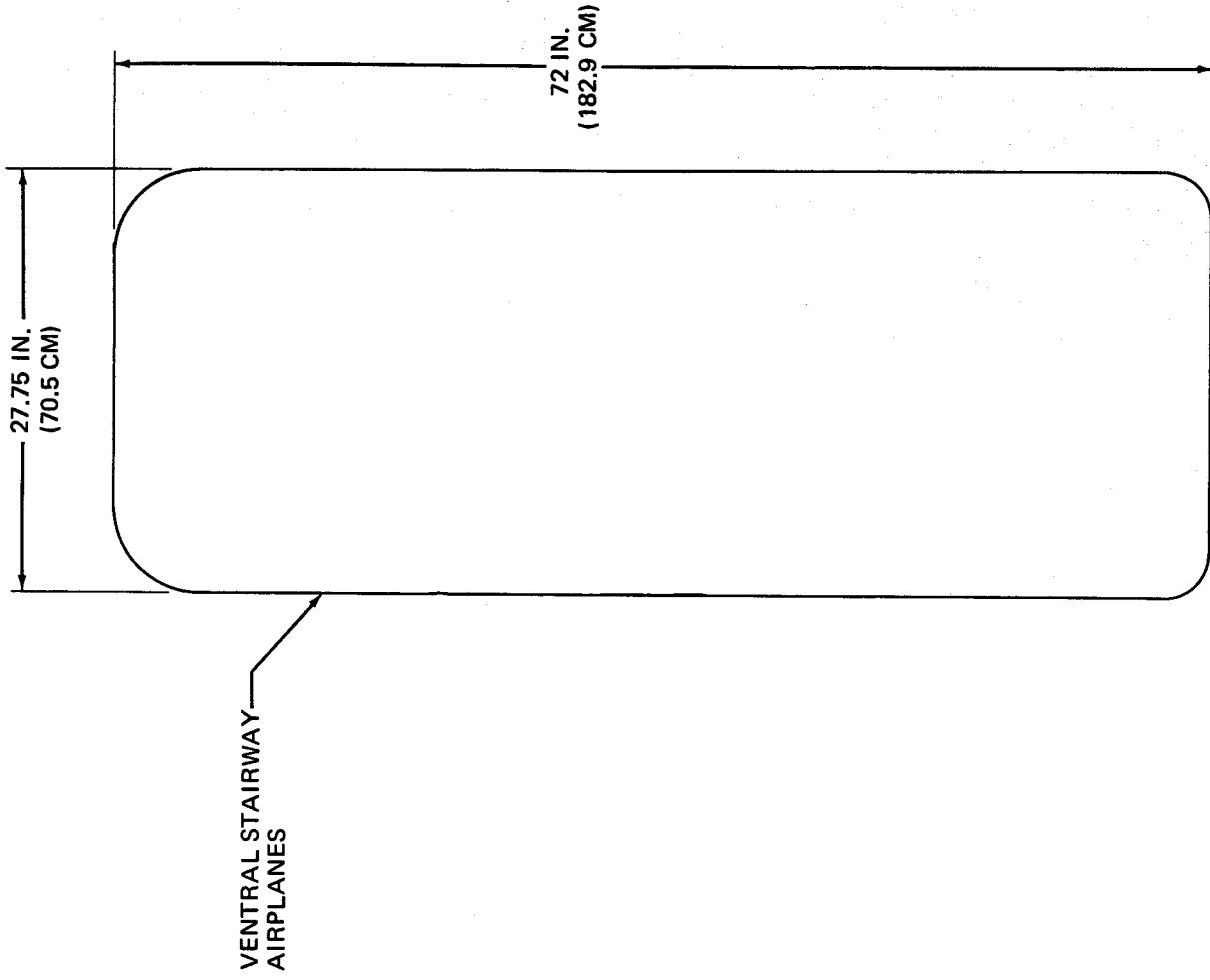
MODEL MD-80 SERIES



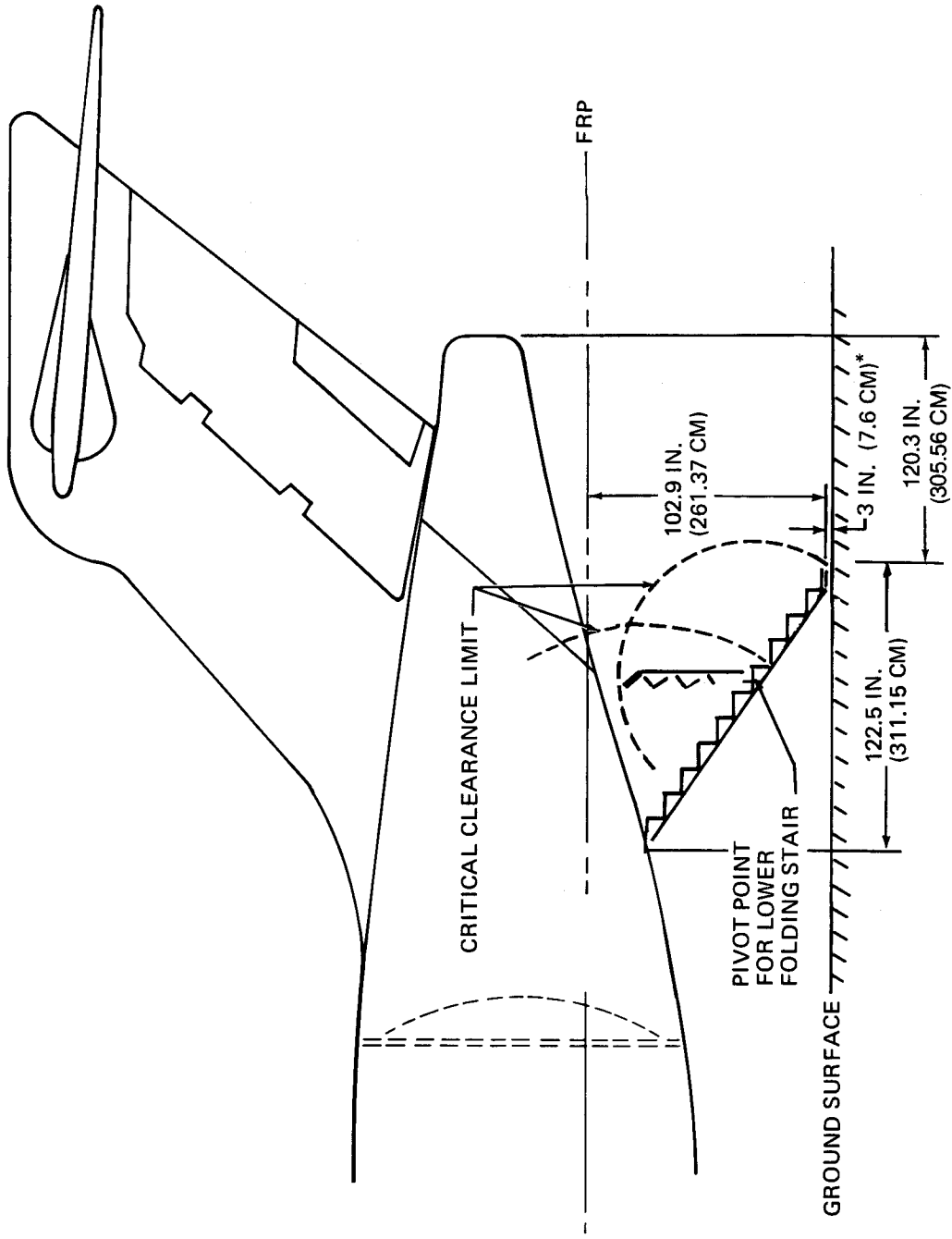
2.7 DOOR CLEARANCES
2.7.4 FORWARD PASSENGER DOOR OPENING CLEARANCES
MODEL MD-80 SERIES



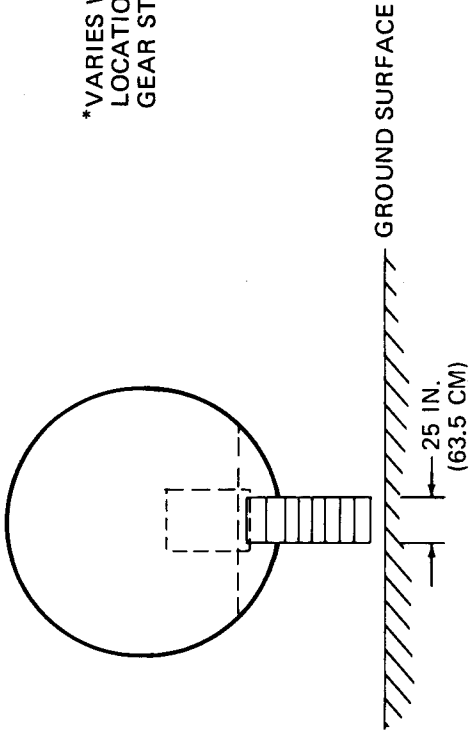
2.7 DOOR CLEARANCES
2.7.5 AFT SERVICE DOOR CLEARANCES
MODEL MD-81, -82, -83, AND -88



2.7 DOOR CLEARANCES
2.7.6 AFT PRESSURE BULKHEAD DOOR OPENING CLEARANCES
MODEL MD-80 SERIES



*VARIES WITH WEIGHT, CG LOCATION, AND LANDING GEAR STRUT COMPRESSION



2.7 DOOR CLEARANCES

2.7.7 VENTRAL STAIR CLEARANCES MODEL MD-80 SERIES

3.0 AIRPLANE PERFORMANCE

- 3.1 General Information**
- 3.2 Payload Range**
- 3.3 FAR Takeoff Runway Length Requirements**
- 3.4 FAR Landing Runway Length Requirements**

3.0 AIRPLANE PERFORMANCE

3.1 General Information

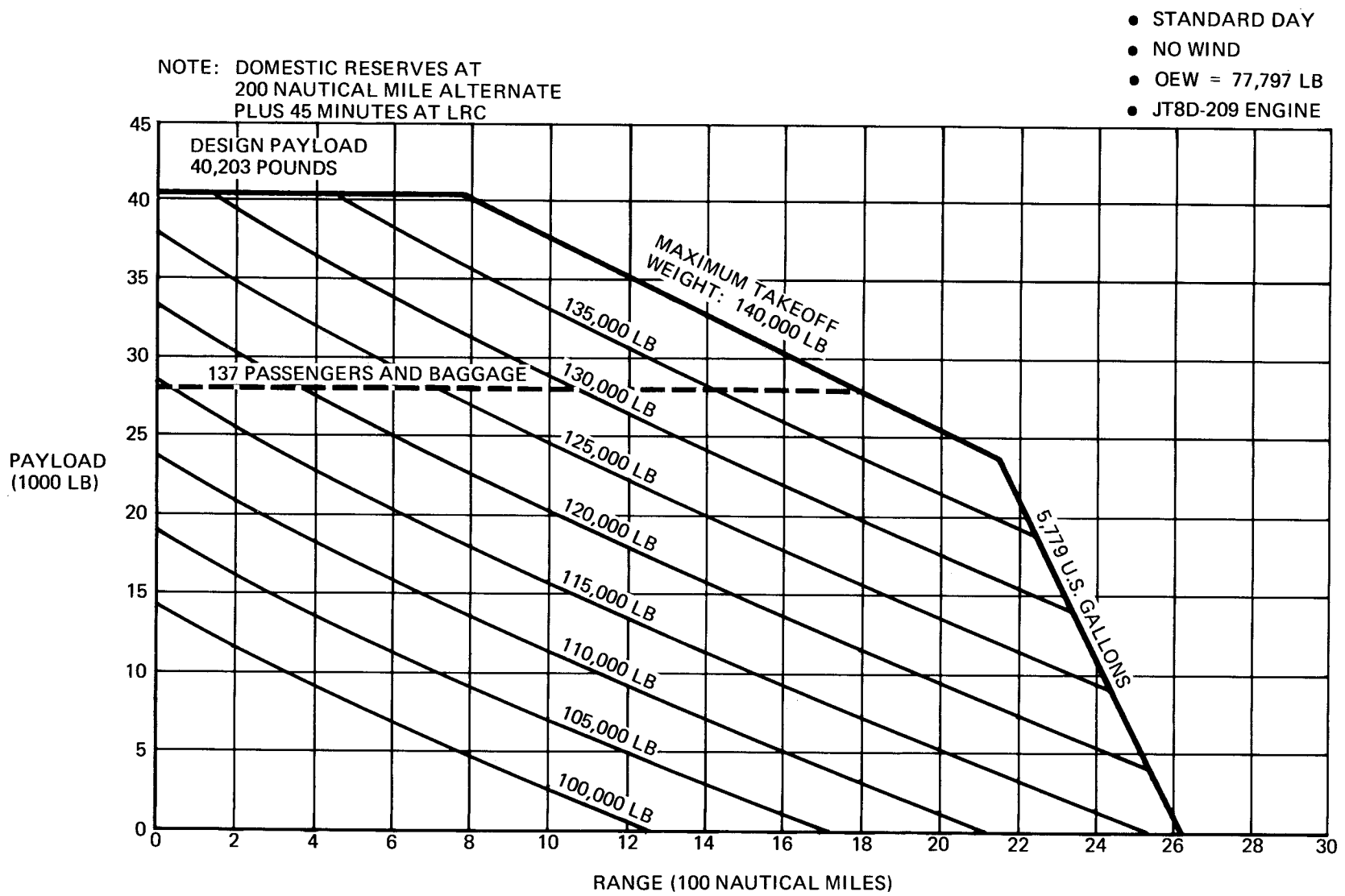
Figure 3.2 presents payload-range information for a specific long-range cruise altitude and at the fuel reserve condition shown.

Figures 3.3 and 3.4 represent FAR takeoff and landing field length requirements for FAA certification.

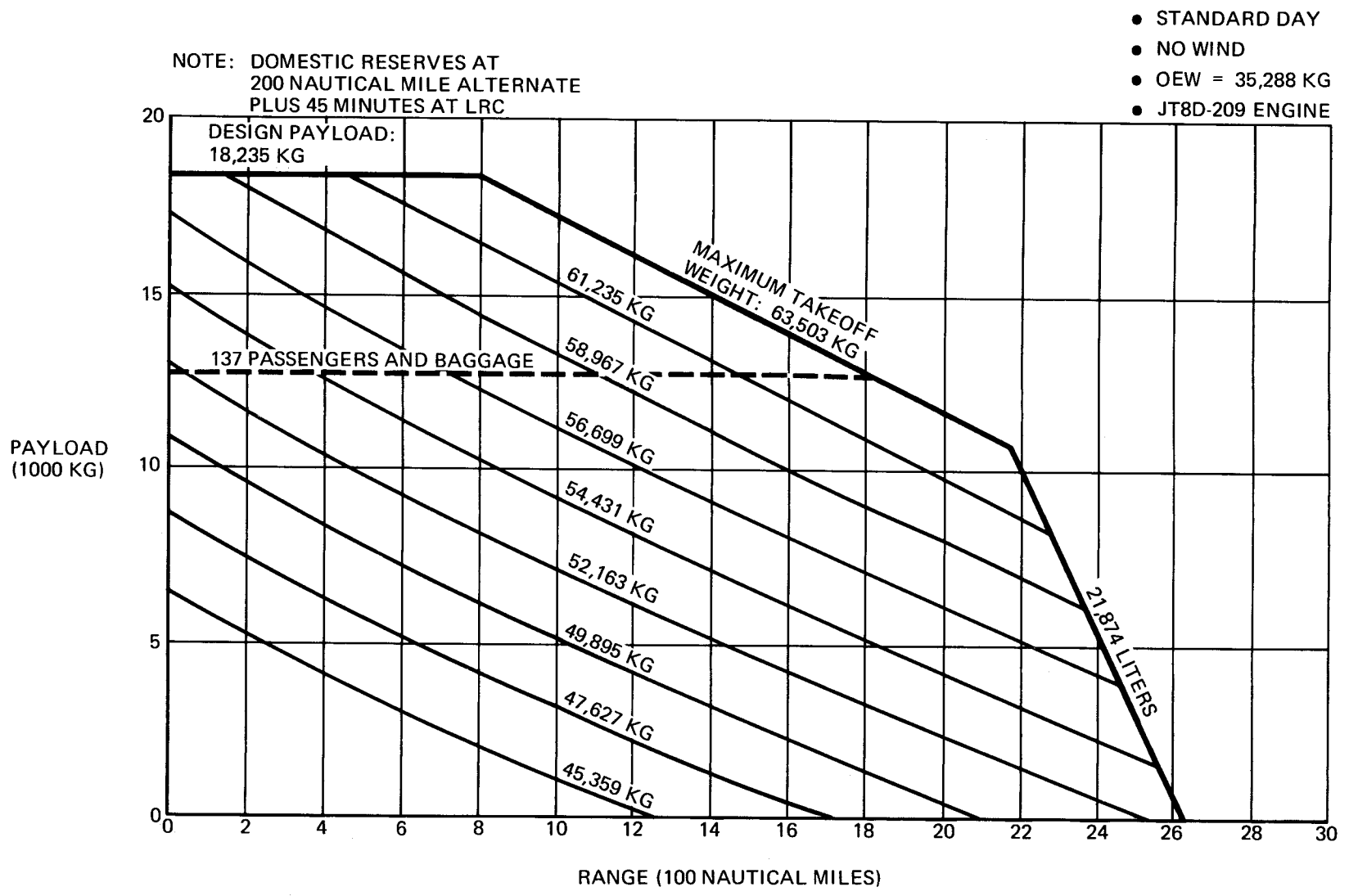
Standard day temperatures for the altitudes shown are tabulated below:

| ELEVATION | | STANDARD DAY TEMP | |
|-----------|--------|-------------------|------|
| 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 |

NOTE: Information presented for standard engines for given model. Engine options are available.



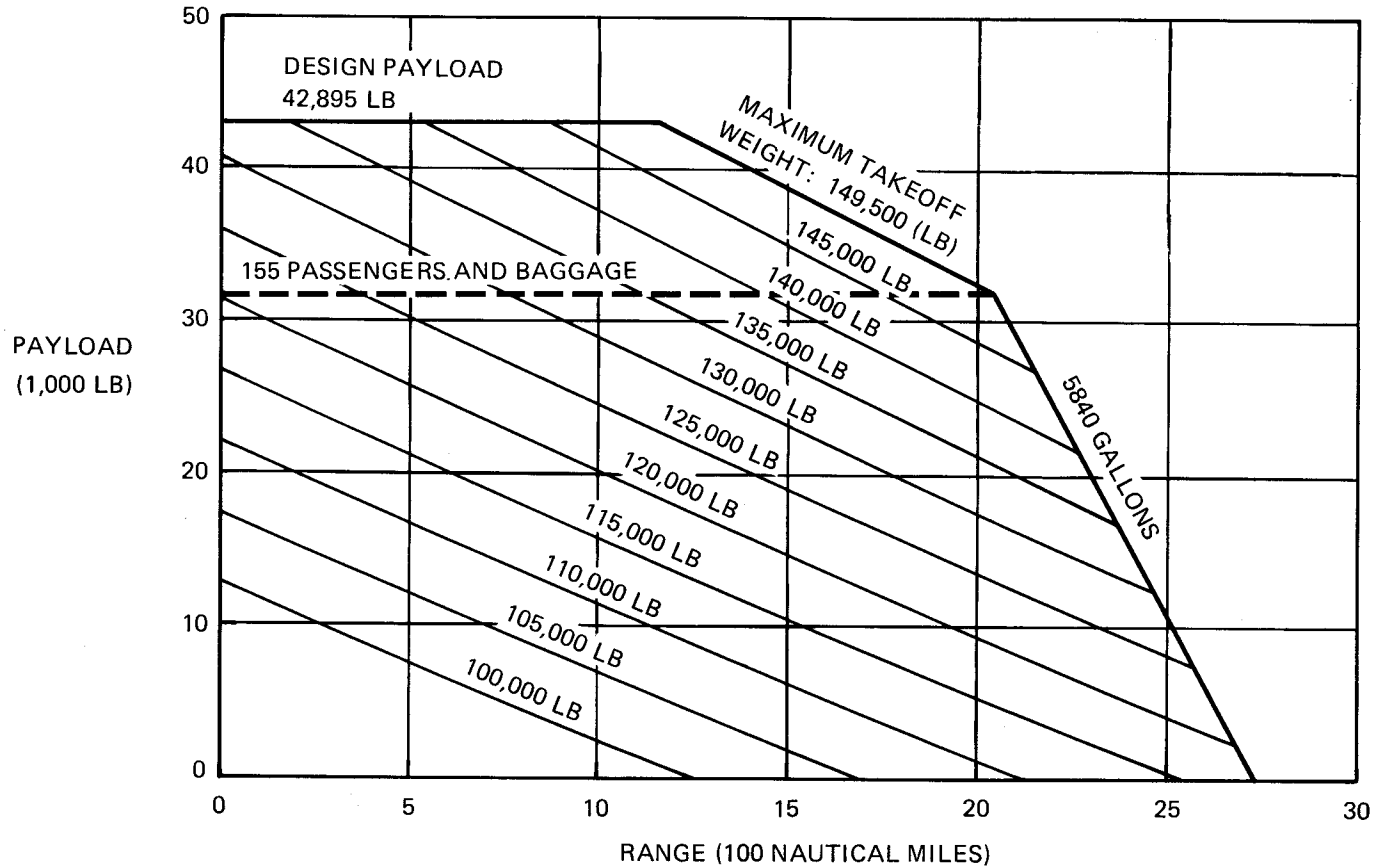
3.2 PAYLOAD-RANGE
PAYLOAD-RANGE FOR TYPICAL LONG-RANGE CRUISE AT 31,000/35,000-FT STEP
MODEL MD-81



3.2 PAYLOAD-RANGE
PAYLOAD-RANGE FOR TYPICAL LONG-RANGE CRUISE AT 9,455/10,675-METER STEP
MODEL MD-81

NOTE: RESERVES BASED ON
 FAR 121.639
 200 N MI DISTANCE
 TO ALTERNATE

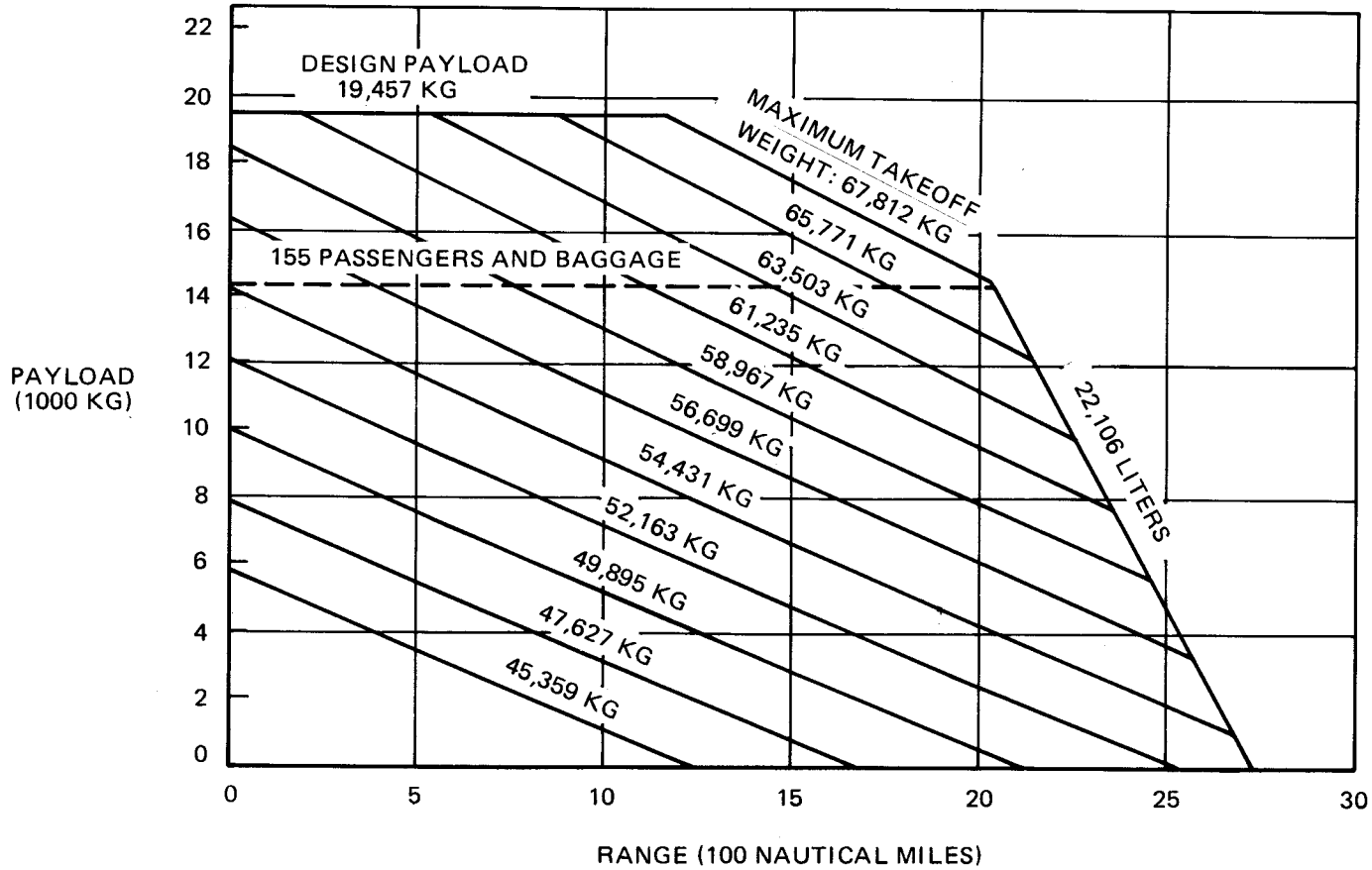
- STANDARD DAY
- NO WIND
- OEW = 78,549 LB
- JT8D-217/217A ENGINES



3.2 PAYLOAD-RANGE
PAYLOAD-RANGE FOR TYPICAL LONG-RANGE CRUISE AT 31,000 FT/35,000 FT STEP
MODEL MD-82 AND -88

NOTE: RESERVES BASED ON
 FAR 121.639
 200 N MI DISTANCE
 TO ALTERNATE

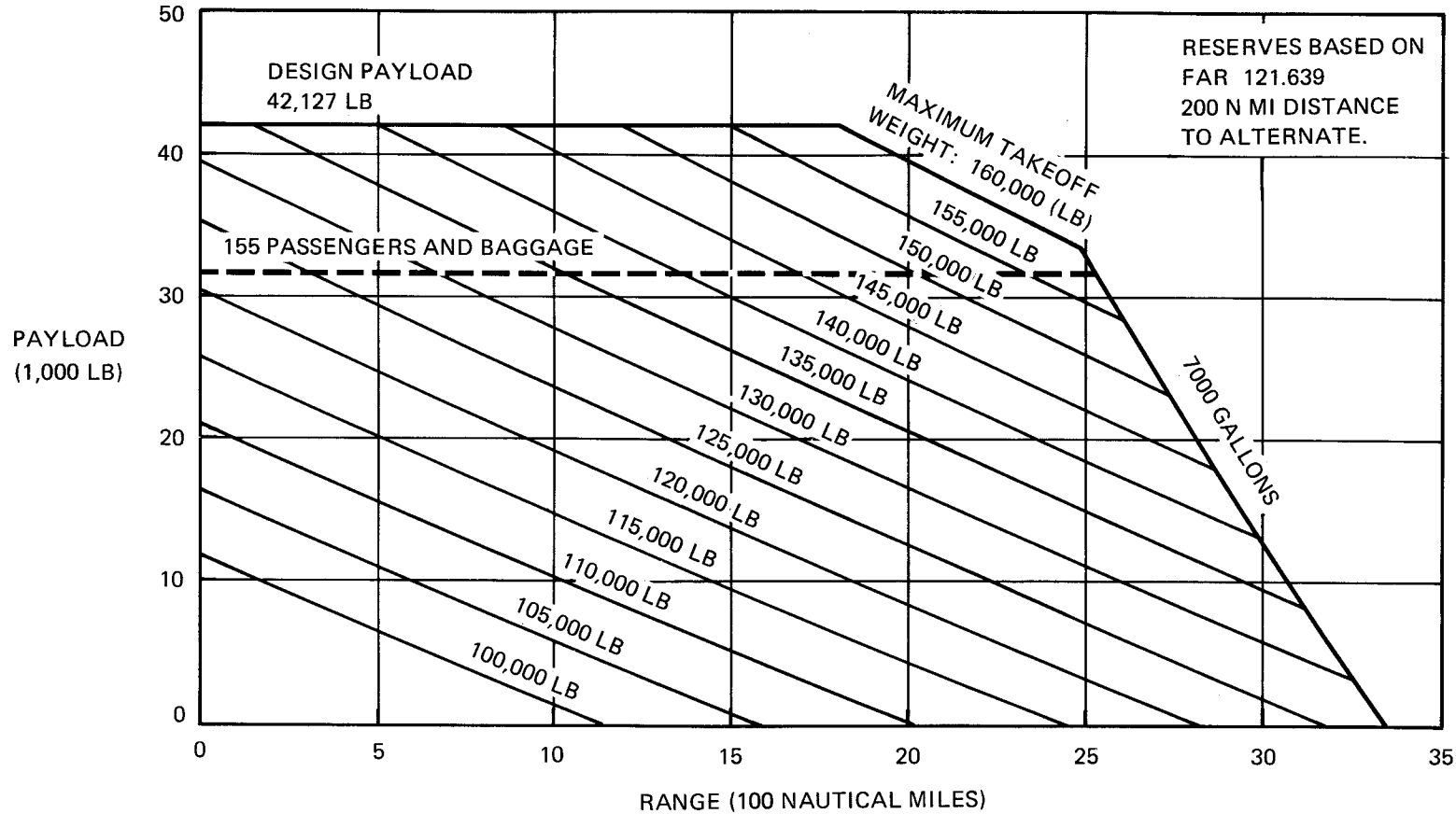
- STANDARD DAY
- NO WIND
- OEW = 35,629 KG
- JT8D-217/217A ENGINES



3.2 PAYLOAD-RANGE
PAYLOAD-RANGE FOR TYPICAL LONG-RANGE CRUISE AT 9,449/10,668 METER STEP
MODEL MD-82 AND -88

NOTE: RESERVES BASED ON
 FAR 121.639
 200 N MI DISTANCE
 TO ALTERNATE

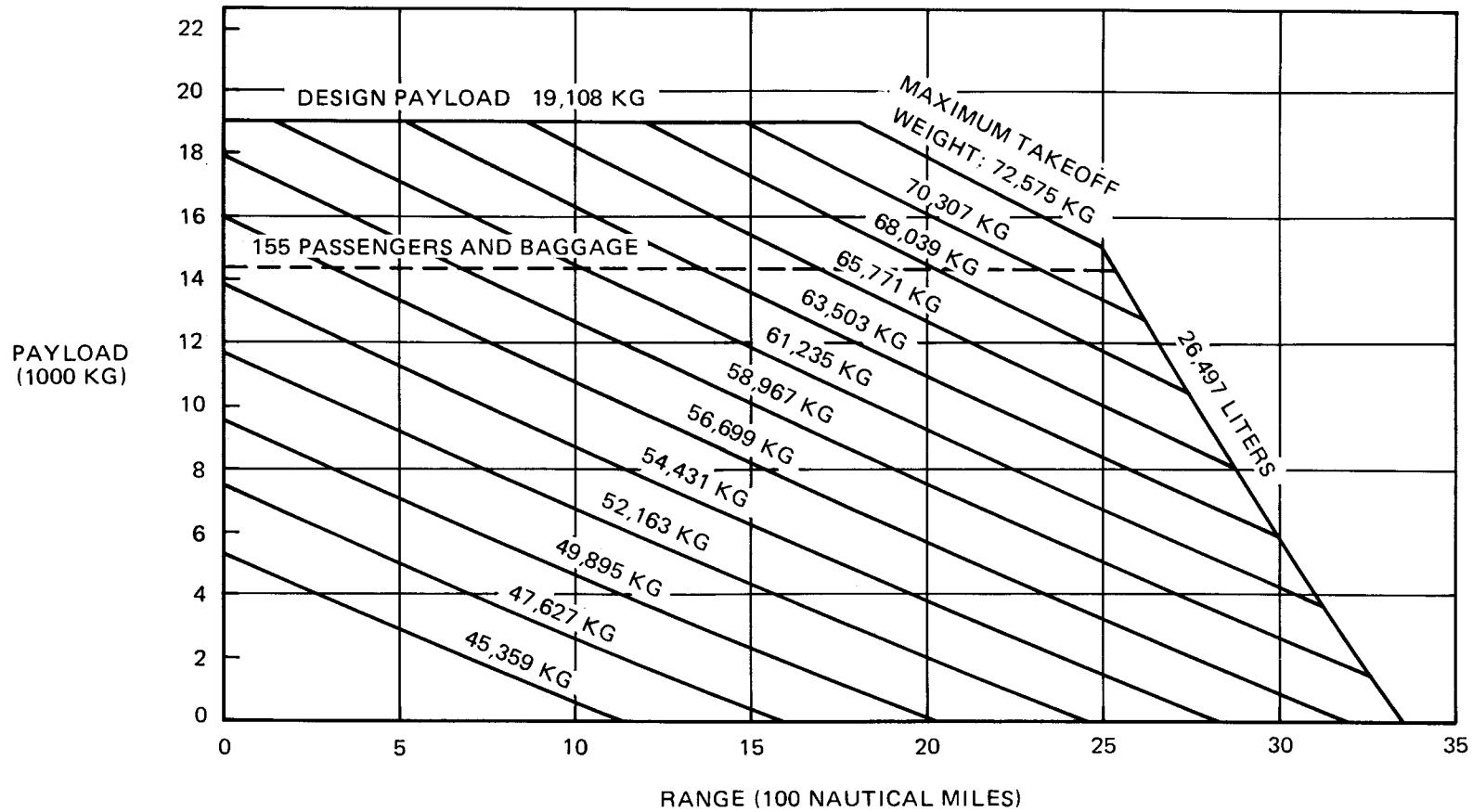
- STANDARD DAY
- NO WIND
- OEW 79, 873 LB
- JT8D-219 ENGINES



3.2 PAYLOAD-RANGE
PAYLOAD-RANGE FOR TYPICAL LONG-RANGE CRUISE AT 31,000 FT/35,000 FT STEP
MODEL MD-83

NOTE: RESERVES BASED ON
 FAR 121.639
 200 N MI DISTANCE
 TO ALTERNATE

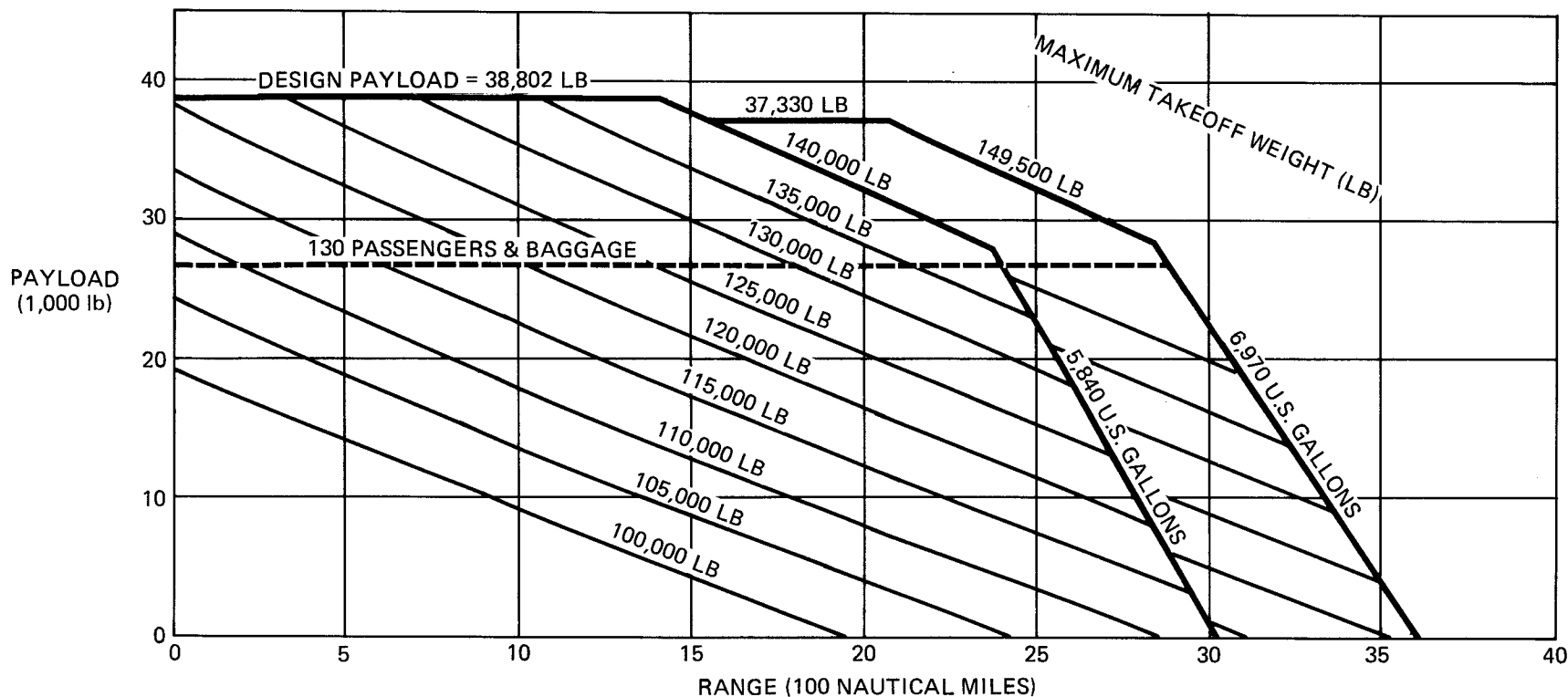
- STANDARD DAY
- NO WIND
- OEW = 36,230 KG
- JT8D-219 ENGINE



3.2 PAYLOAD-RANGE
PAYLOAD-RANGE FOR TYPICAL LONG-RANGE CRUISE AT 9,449/10,668 METER STEP
MODEL MD-83

NOTE: DOMESTIC RESERVES AT
200-NAUTICAL-MILE ALTERNATE
PLUS 45 MINUTES AT LRC

- STANDARD DAY
- NO WIND
- OEW = 73,198 LB
- OEW = 74,670 LB WITH
AUXILIARY FUEL TANKS
- JT8D-217C ENGINE

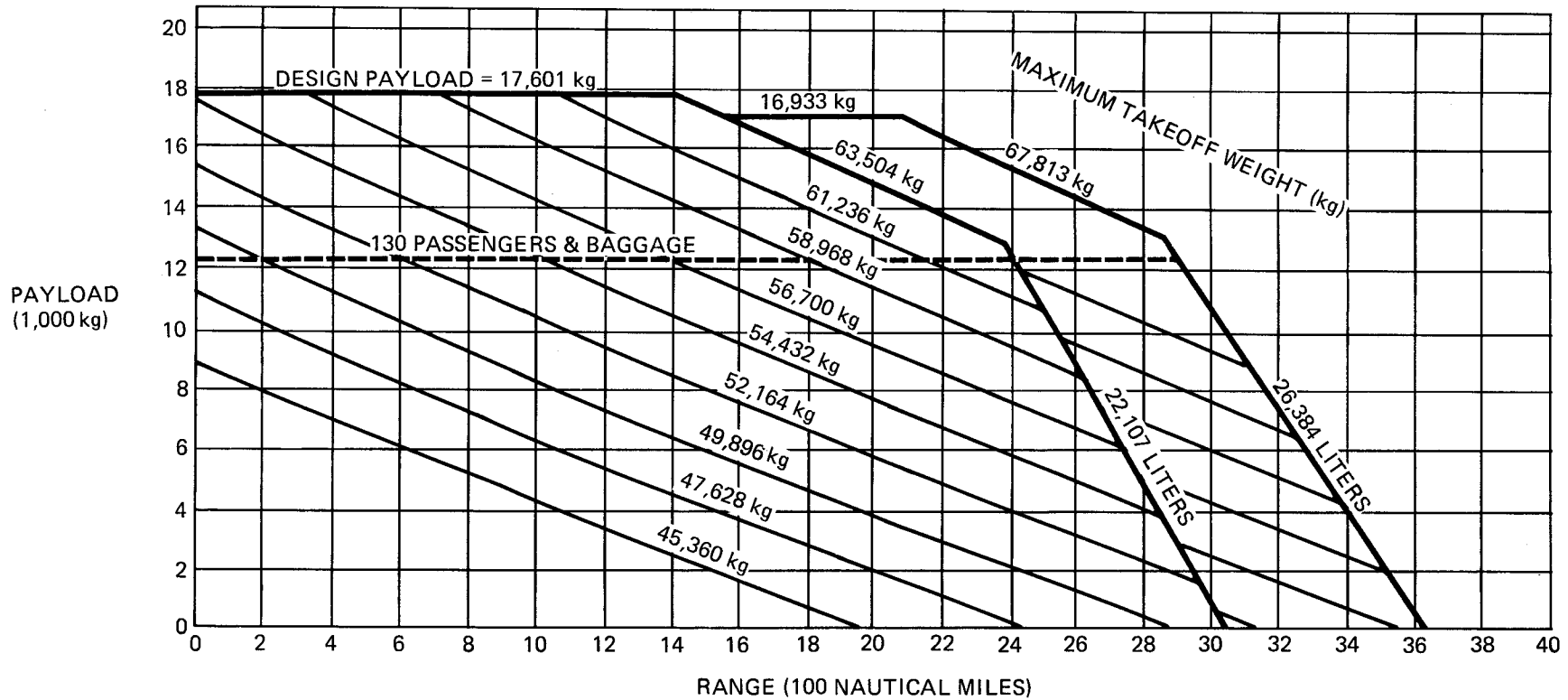


3.2 PAYLOAD-RANGE
PAYLOAD-RANGE FOR TYPICAL LONG-RANGE CRUISE AT 31,000 FT/35,000 FT STEP
MODEL MD-87

PRELIMINARY MD-87 DATA

NOTE: DOMESTIC RESERVES AT
200-NAUTICAL-MILE ALTERNATE
PLUS 45 MINUTES AT LRC

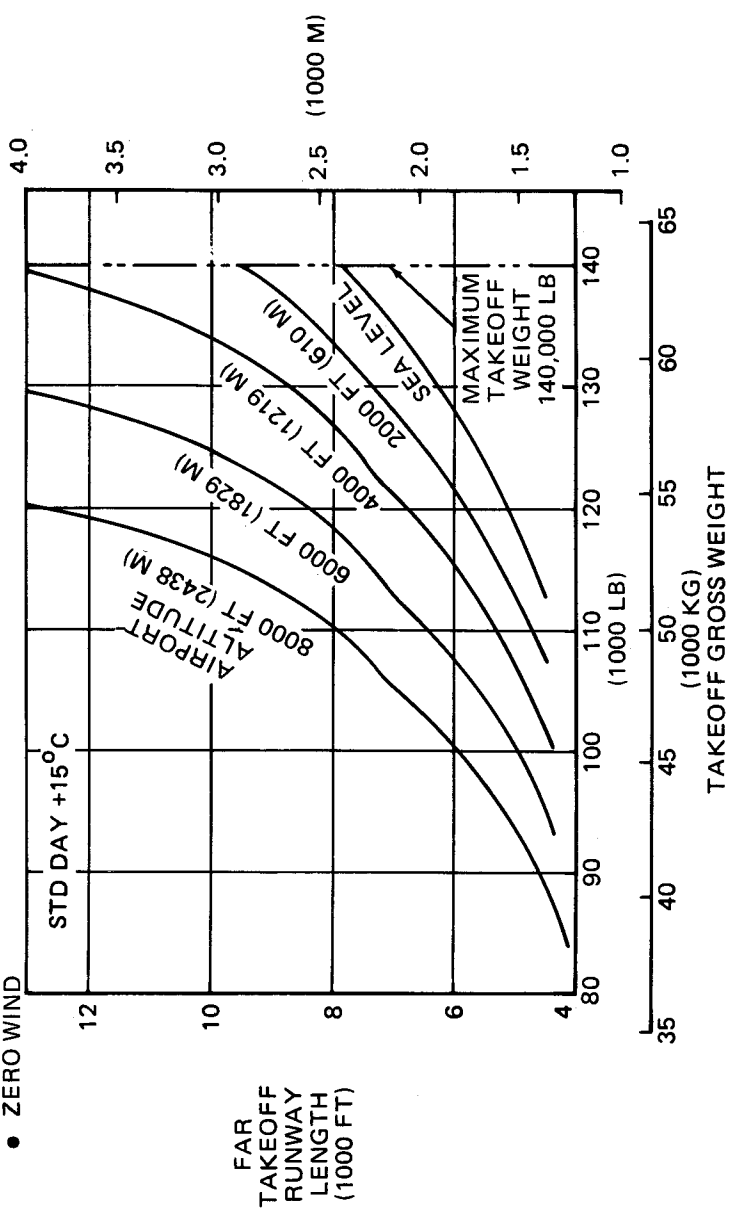
- STANDARD DAY
- NO WIND
- OEW = 33,203 KG
- OEW = 33,870 KG WITH
AUXILIARY FUEL TANKS
- JT8D-217C



3.2 PAYLOAD-RANGE
PAYLOAD-RANGE FOR TYPICAL LONG-RANGE CRUISE AT 9,455/10,675-METER STEP
MODEL MD-87

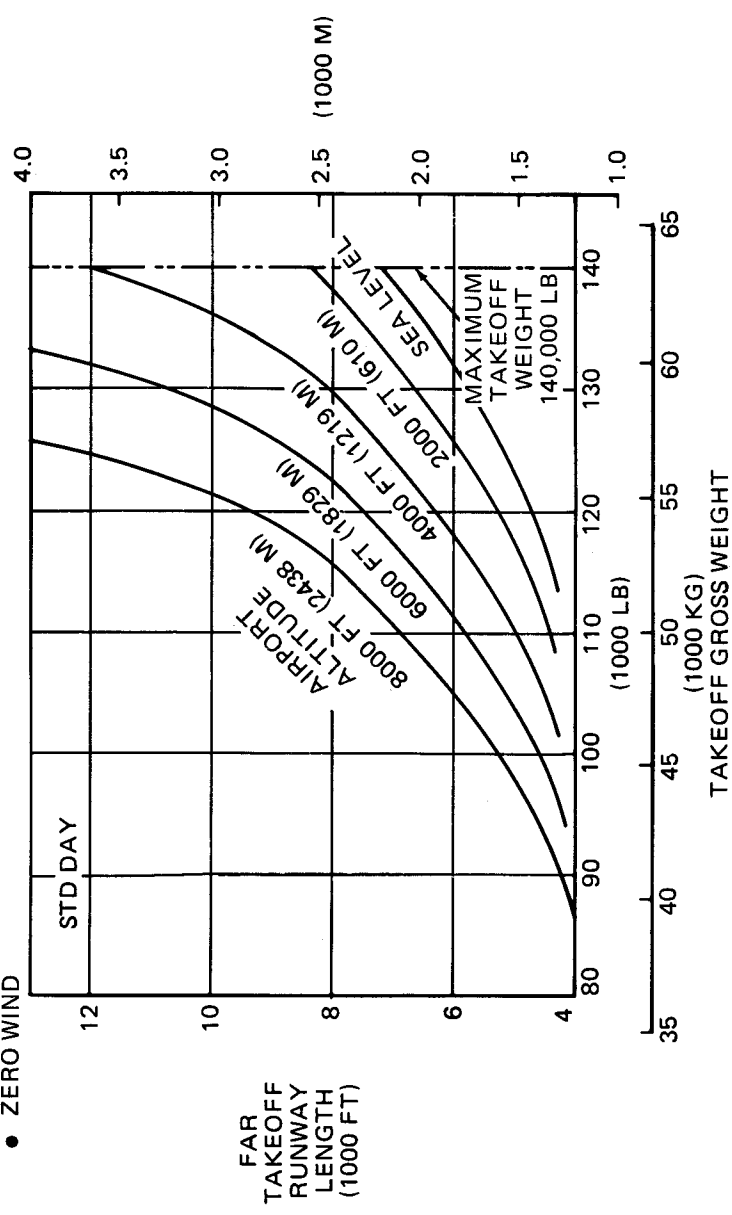
NOTES:

- JT8D-209 ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



NOTES:

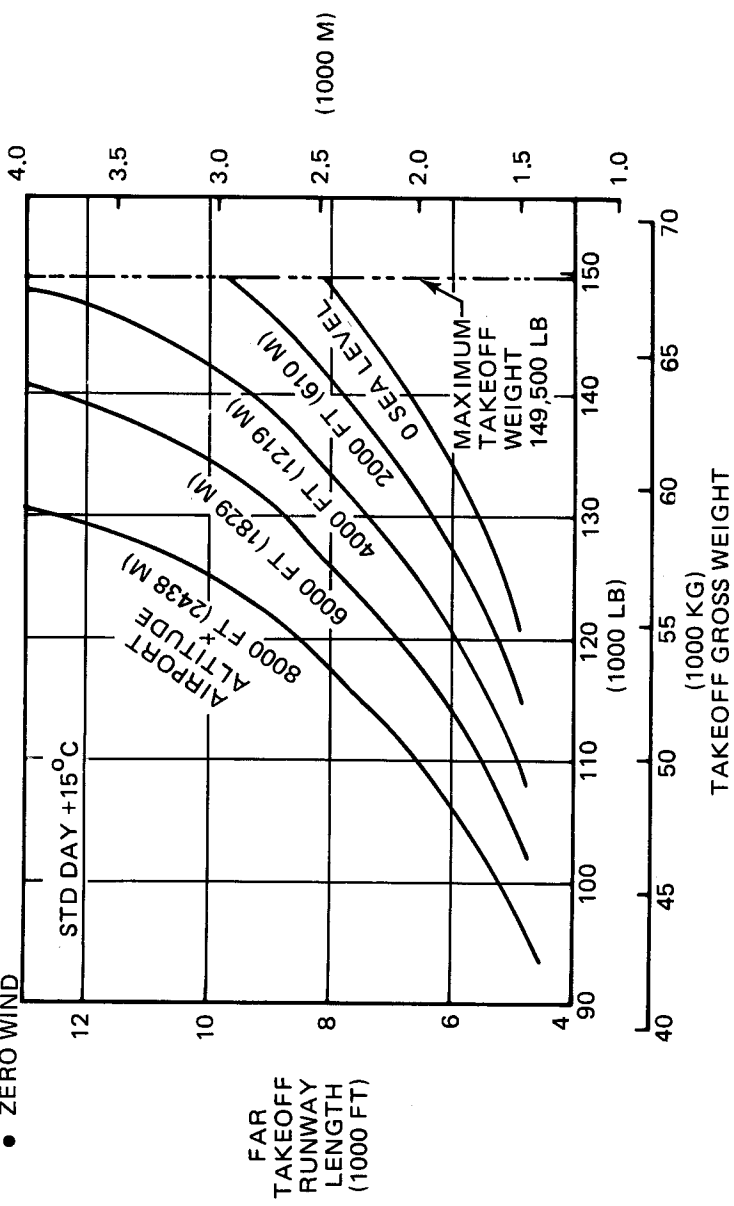
- JT8D-209 ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



3.3 FAR TAKEOFF RUNWAY LENGTH REQUIREMENTS MODEL MD-81

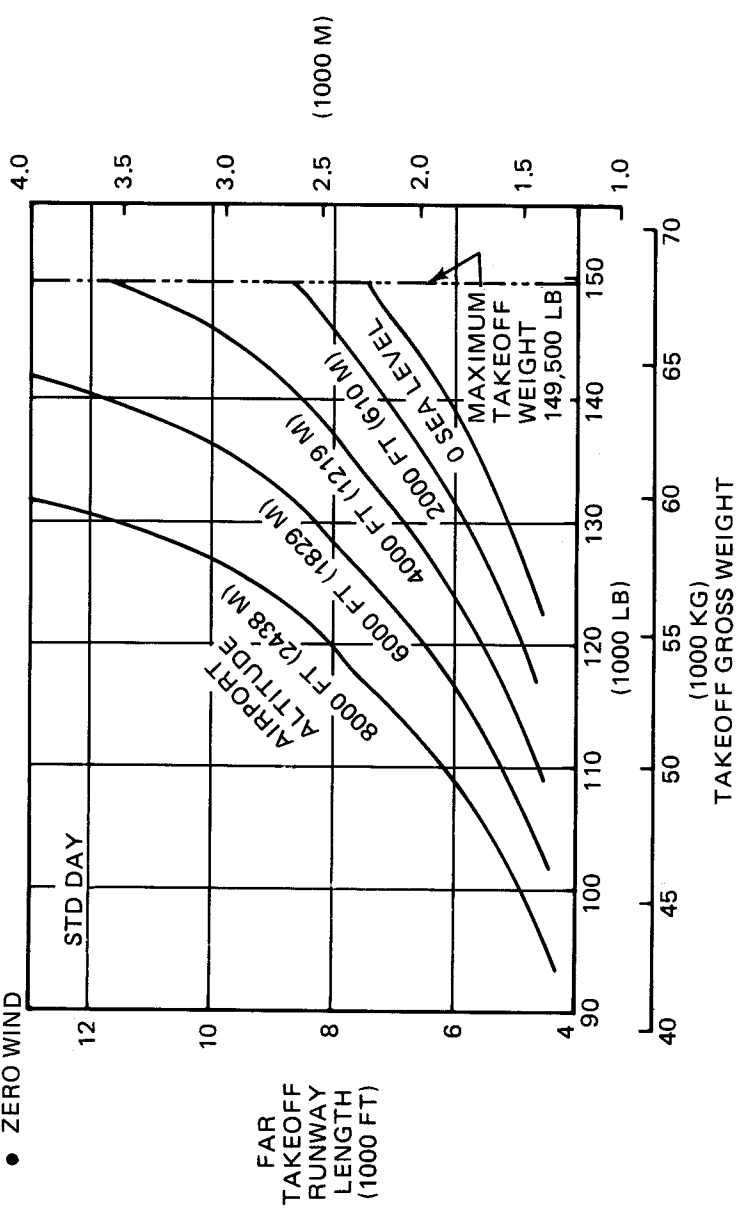
NOTES:

- JT8D-217 ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



NOTES:

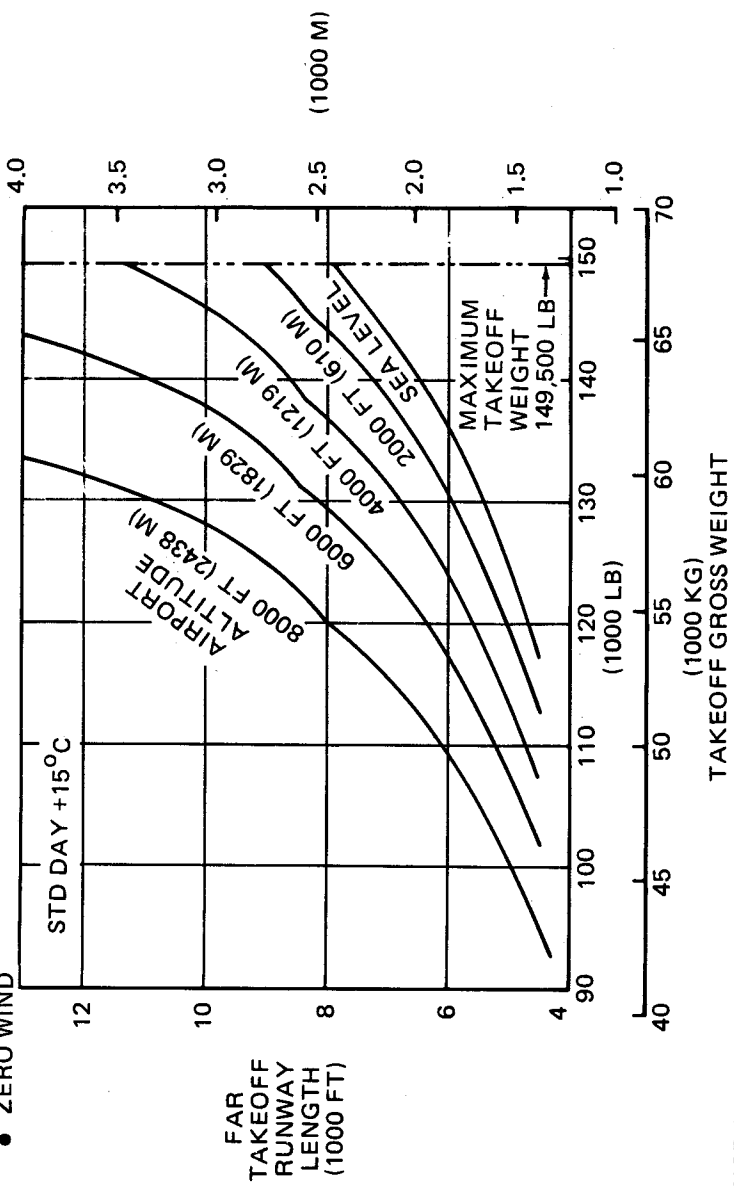
- JT8D-217 ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



3.3 FAR TAKEOFF RUNWAY LENGTH REQUIREMENTS MODEL MD-82

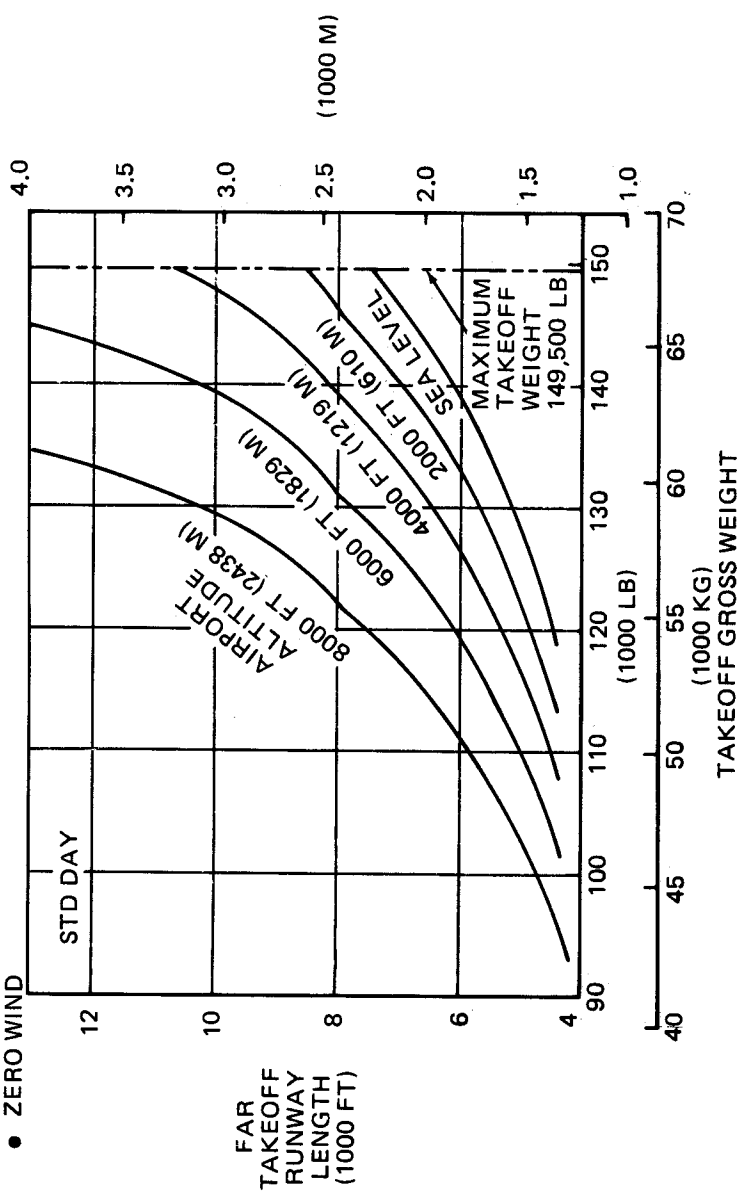
NOTES:

- JT8D-217A ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



NOTES:

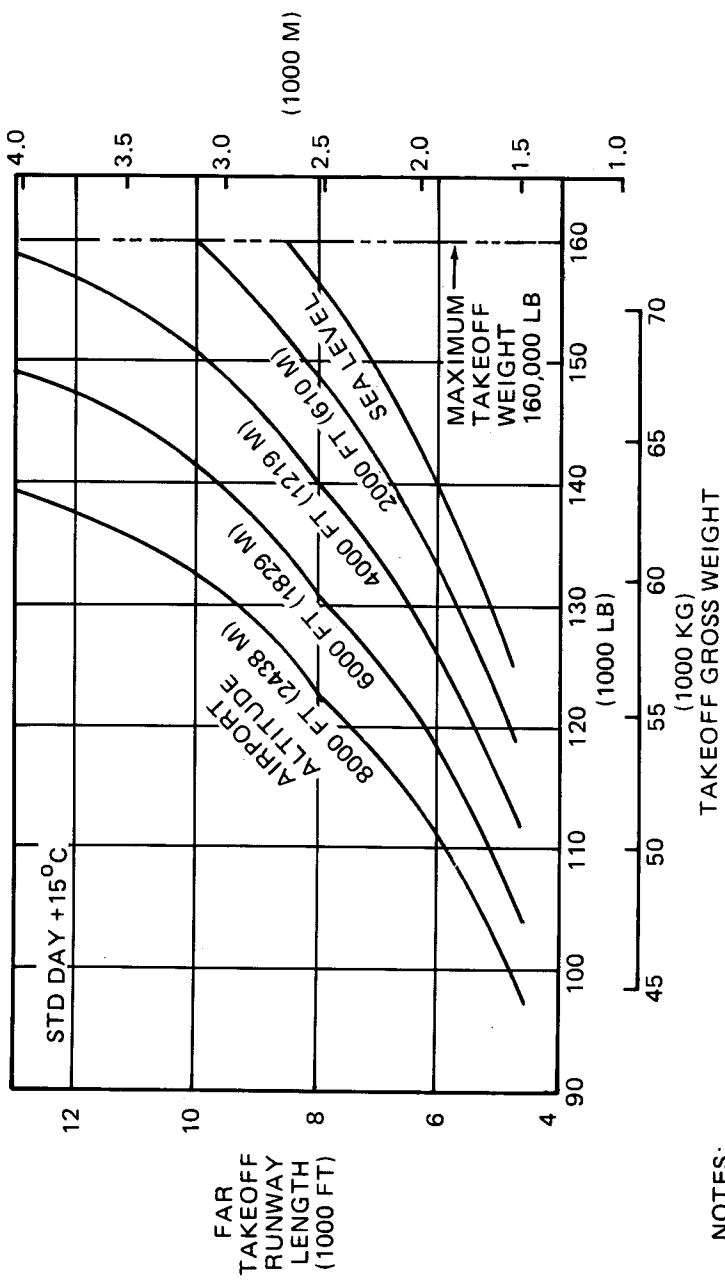
- JT8D-217A ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



3.3 FAR TAKEOFF RUNWAY LENGTH REQUIREMENTS MODEL MD-82 AND -88

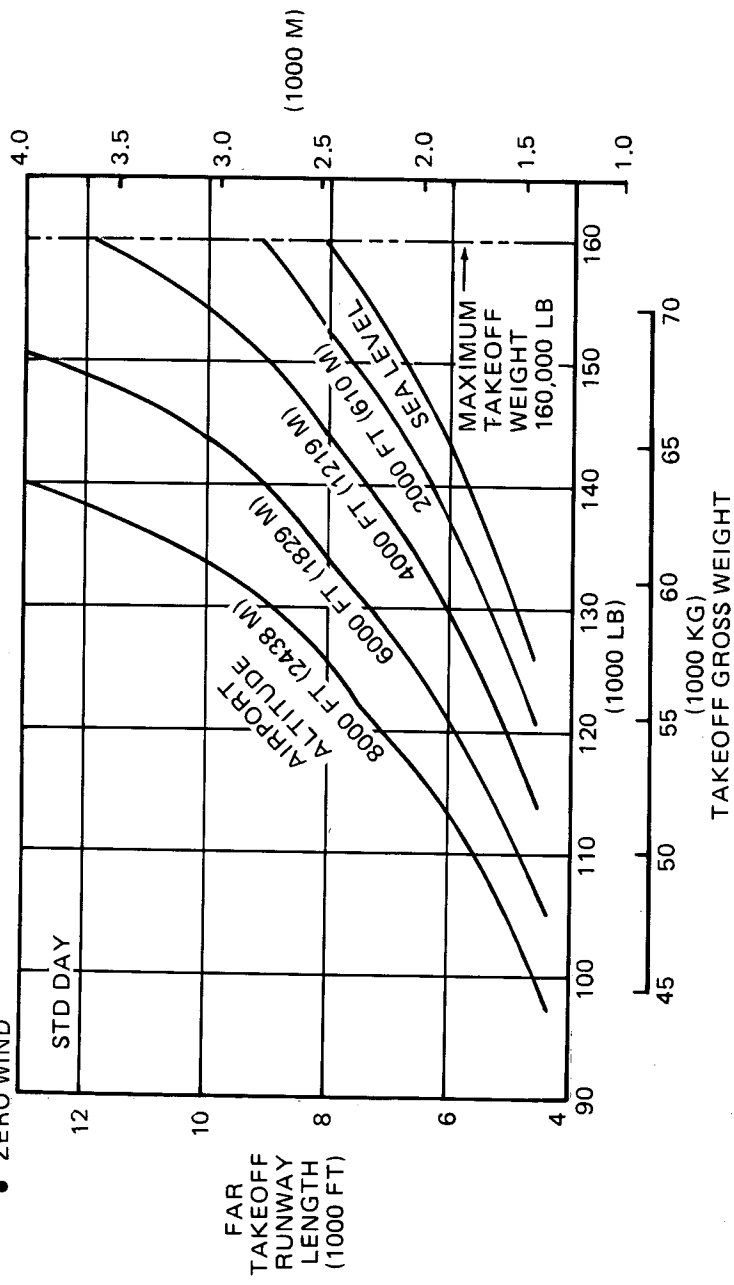
NOTES:

- JT8D-219 ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



NOTES:

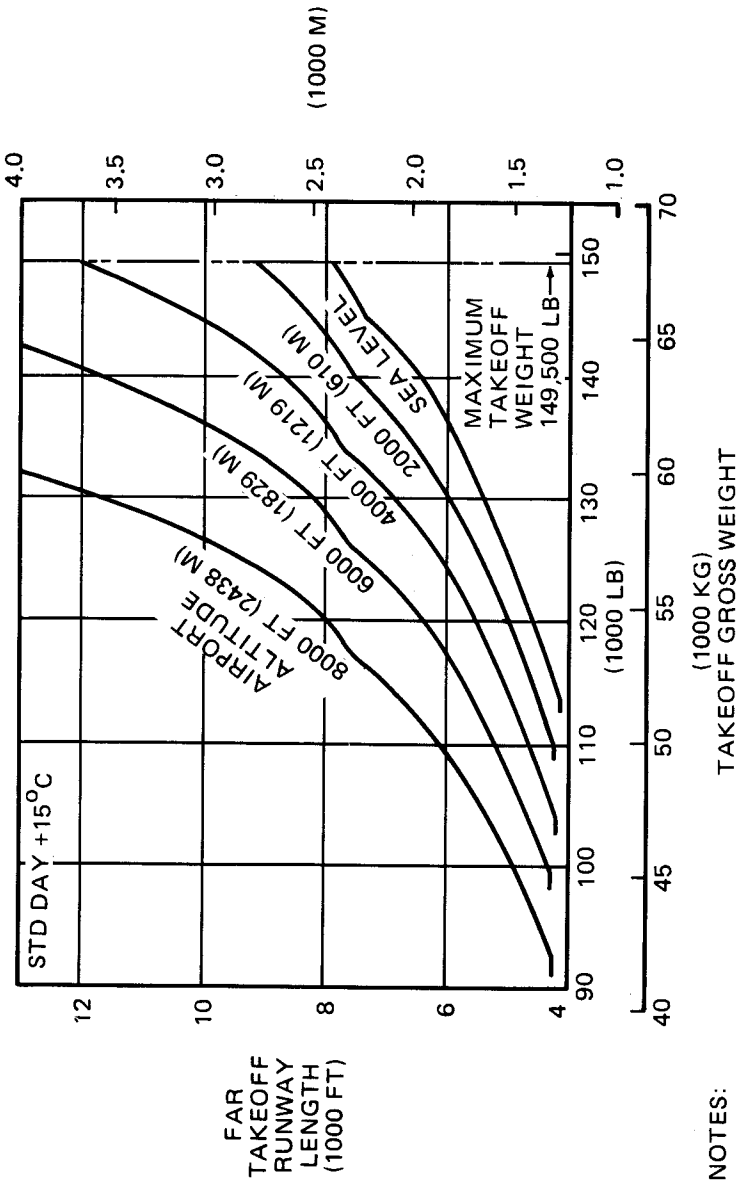
- JT8D-219 ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



3.3 FAR TAKEOFF RUNWAY LENGTH REQUIREMENTS MODEL MD-83

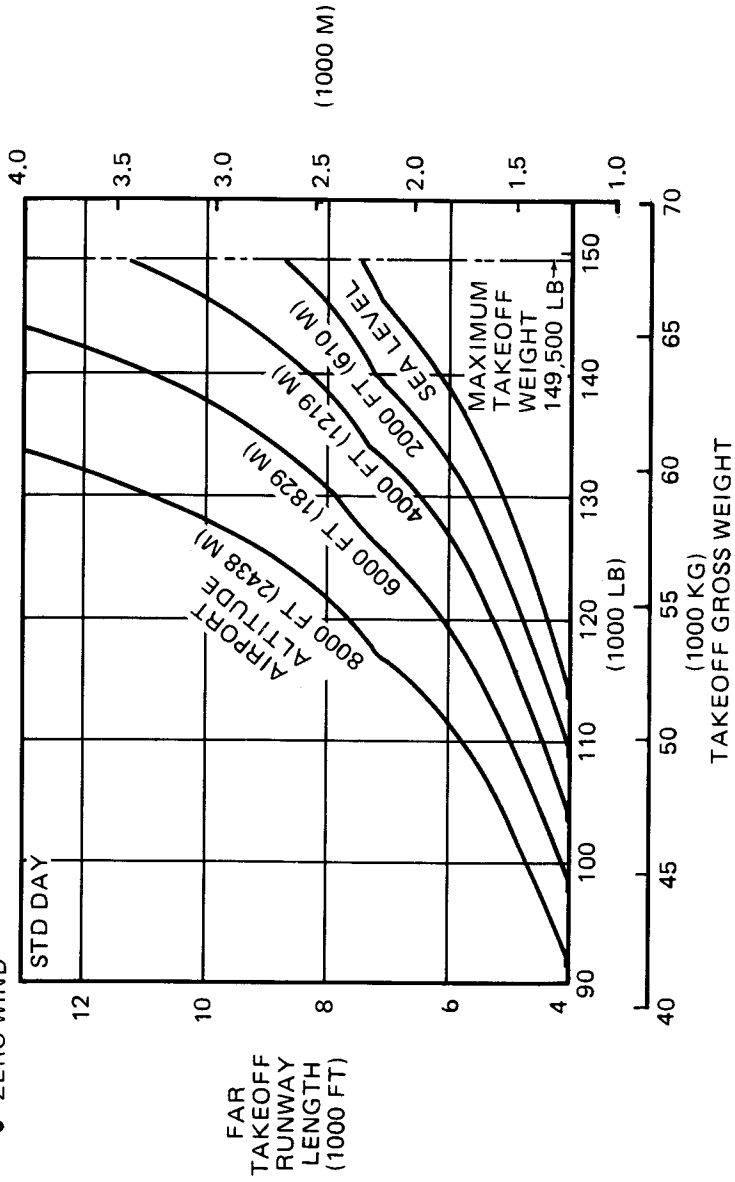
NOTES:

- JT8D-217C ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



NOTES:

- JT8D-217C ENGINES
- NORMAL TAKEOFF THRUST AND ART
- ZERO RUNWAY GRADIENT
- ZERO WIND
- COORDINATE WITH USING AIRLINE FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN



3.3 FAR TAKEOFF RUNWAY LENGTH REQUIREMENTS MODEL MD-87

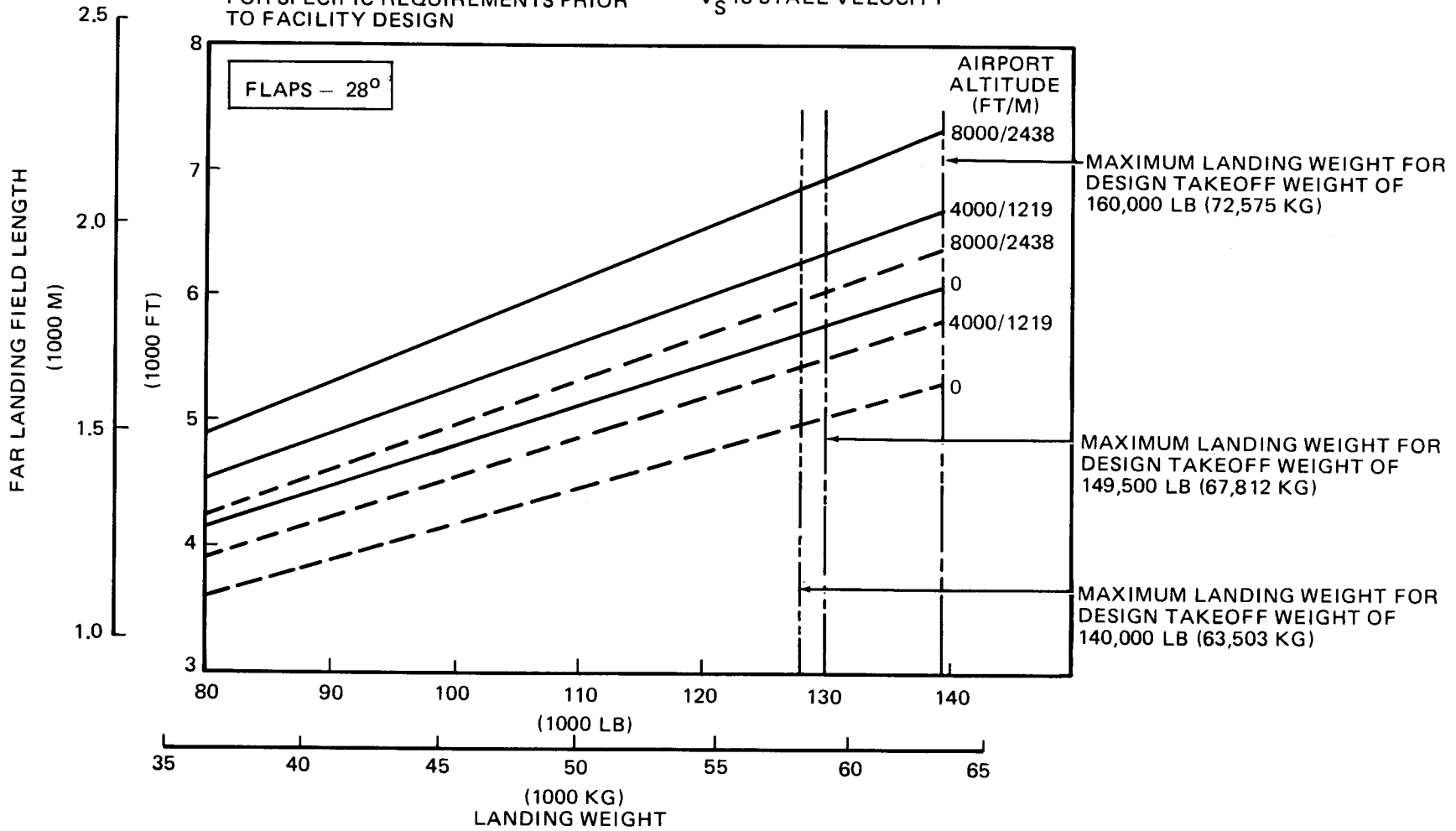
NOTES:

- STANDARD DAY
- 3-DEG GLIDESLOPE
- SLATS EXTENDED
- ZERO WIND AT 50-FOOT HEIGHT
- ZERO RUNWAY GRADIENT
- COORDINATE WITH USING AIRLINES FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN

- $V_{APP} = 1.3 V_S$ FAR (DRY AND WET RUNWAY)
- V_{APP} IS APPROACH VELOCITY
- V_S IS STALL VELOCITY

LEGEND

- WET RUNWAY
- - - DRY RUNWAY



**3.4 FAR LANDING RUNWAY LENGTH REQUIREMENTS
MODEL MD-81, -82, -83, AND -88**

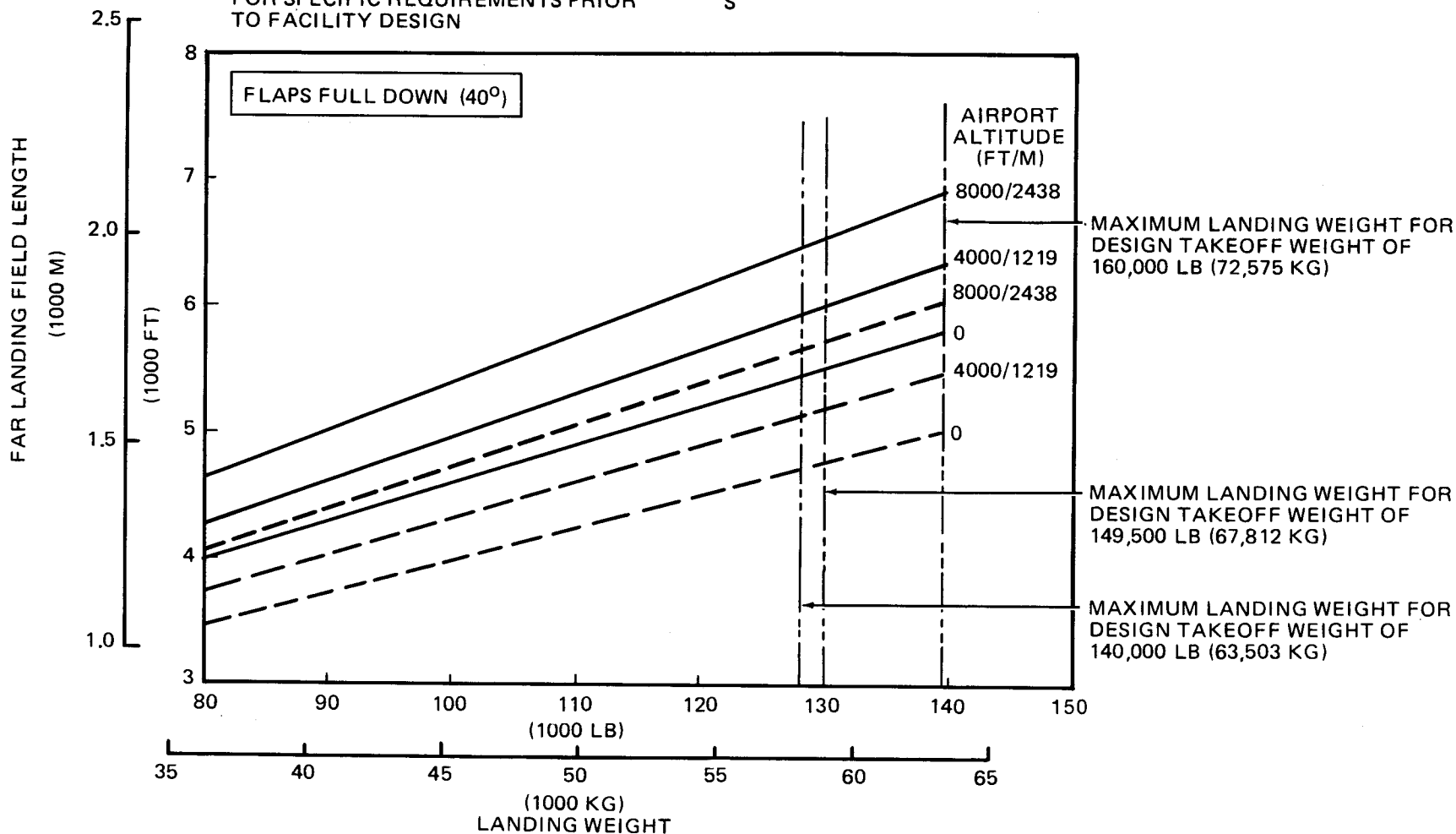
NOTES:

- STANDARD DAY
- 3-DEG GLIDESLOPE
- SLATS EXTENDED
- ZERO WIND AT 50-FOOT HEIGHT
- ZERO RUNWAY GRADIENT
- COORDINATE WITH USING AIRLINES FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN

- $V_{APP} = 1.3 V_S$ FAR
- = (DRY AND WET RUNWAY)
- V_{APP} IS APPROACH VELOCITY
- V_S IS STALL VELOCITY

LEGEND

- WET RUNWAY
- - - - DRY RUNWAY



**3.4 FAR LANDING RUNWAY LENGTH REQUIREMENTS
MODEL MD-81, -82, -83, AND -88**

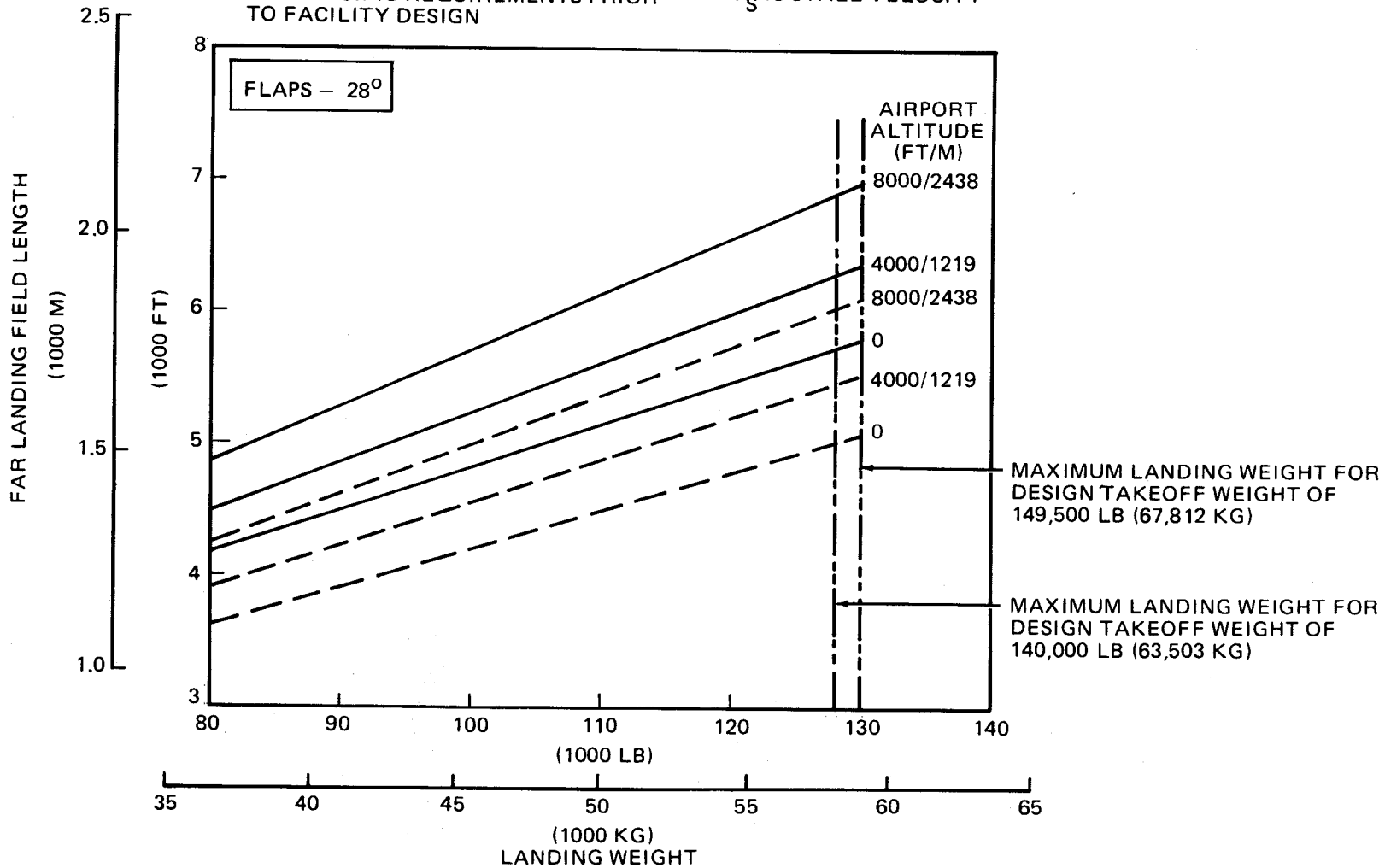
NOTES:

- STANDARD DAY
- 3-DEG GLIDESLOPE
- SLATS EXTENDED
- ZERO WIND AT 50-FOOT HEIGHT
- ZERO RUNWAY GRADIENT
- COORDINATE WITH USING AIRLINES FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN

- $V_{APP} = 1.3 V_S$ FAR
(DRY AND WET RUNWAY)
- V_{APP} IS APPROACH VELOCITY
- V_S IS STALL VELOCITY

LEGEND

- WET RUNWAY
- - - - DRY RUNWAY



**3.4 FAR LANDING RUNWAY LENGTH REQUIREMENTS
MODEL MD-87**

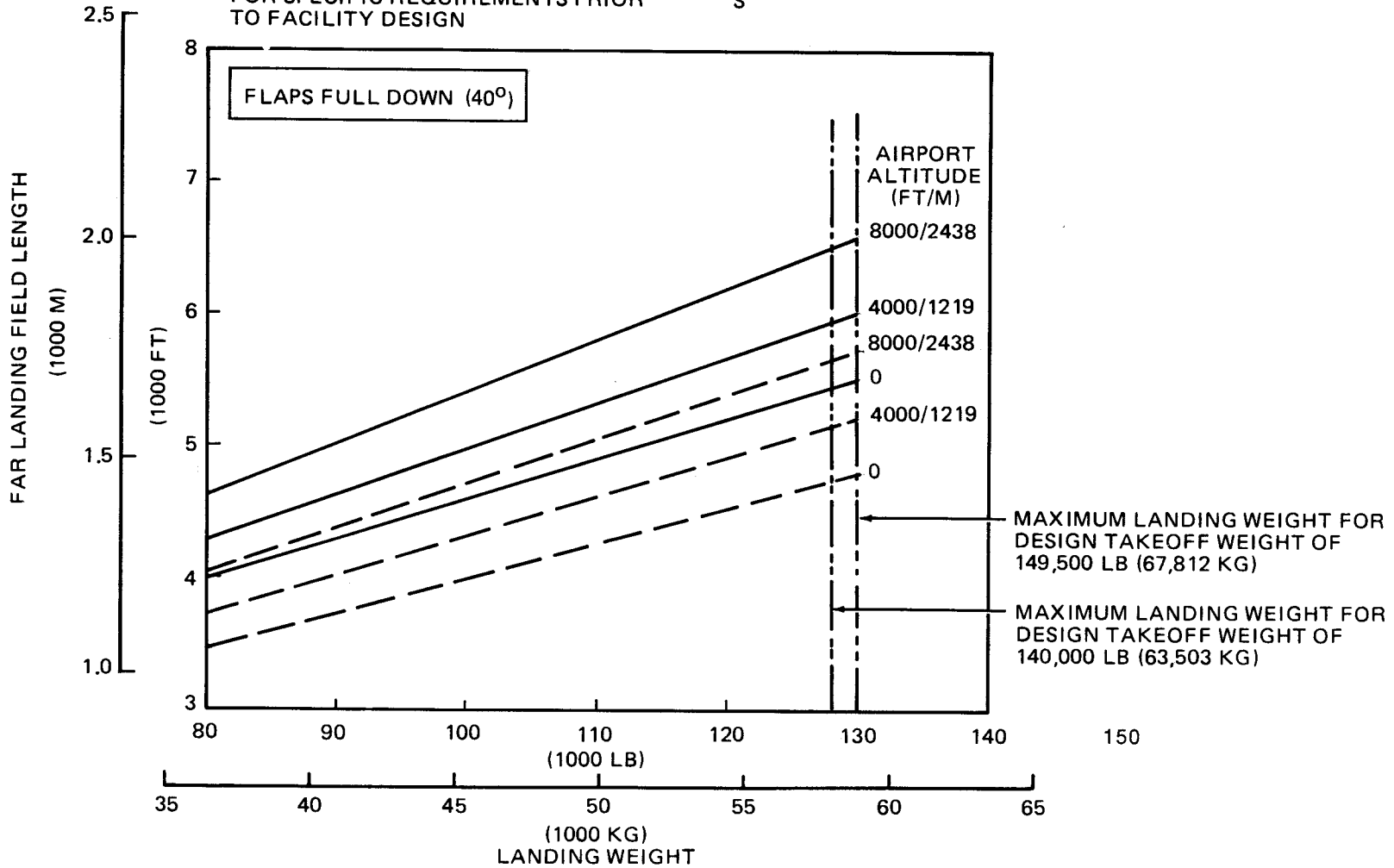
NOTES:

- STANDARD DAY
- 3-DEG GLIDESLOPE
- SLATS EXTENDED
- ZERO WIND AT 50-FOOT HEIGHT
- ZERO RUNWAY GRADIENT
- COORDINATE WITH USING AIRLINES FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN

- $V_{APP} = 1.3 V_S$ FAR
= (DRY AND WET RUNWAY)
- V_{APP} IS APPROACH VELOCITY
- V_S IS STALL VELOCITY

LEGEND

- WET RUNWAY
- - - DRY RUNWAY



**3.4 FAR LANDING RUNWAY LENGTH REQUIREMENTS
MODEL MD-87**

4.0 GROUND MANEUVERING

- 4.1 General Information**
- 4.2 Turning Radii, No Slip Angle**
- 4.3 Minimum Turning Radii**
- 4.4 Visibility From Cockpit**
- 4.5 Runway and Taxiway Turn Paths**
- 4.6 Runway Holding Bay (Apron)**

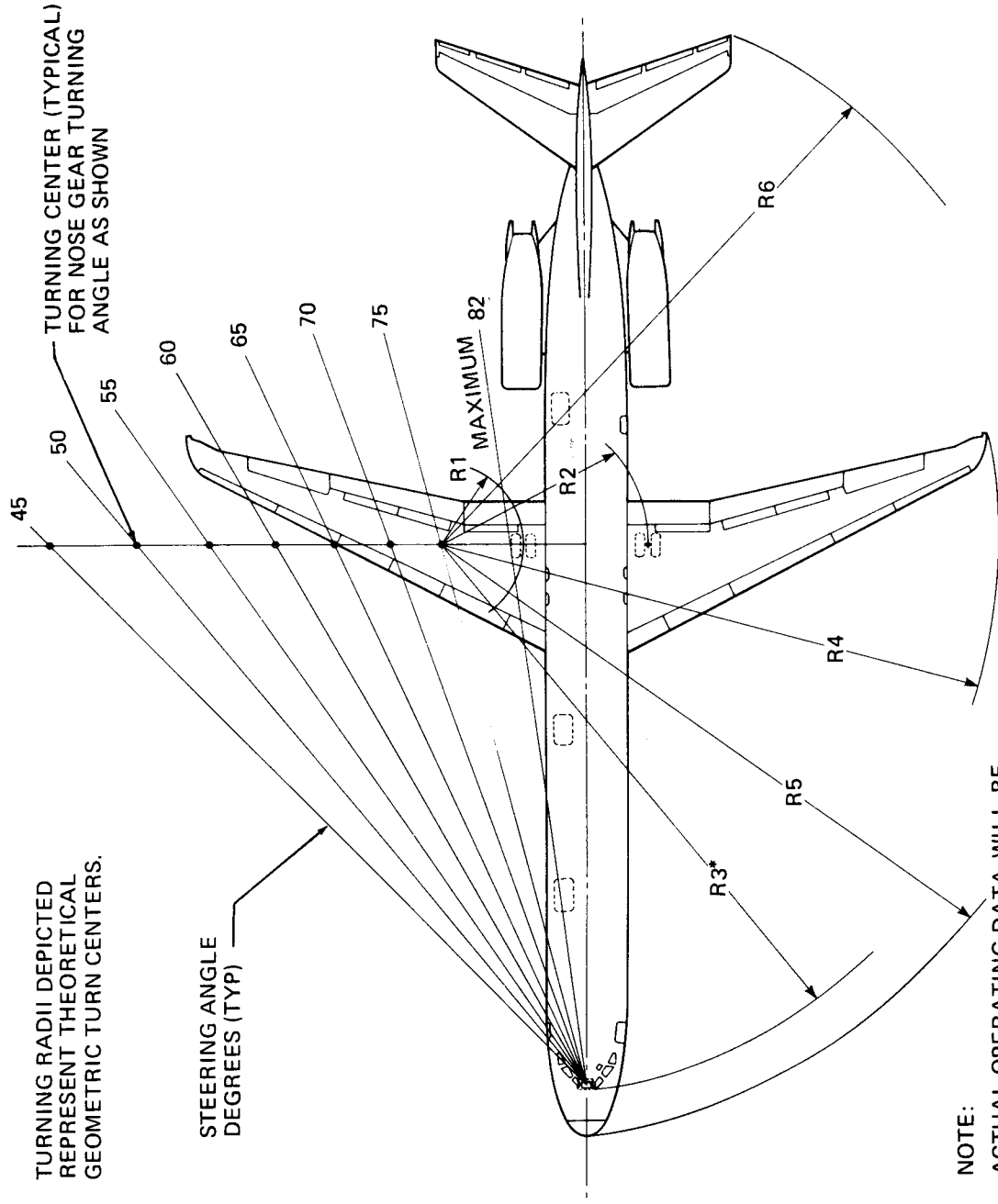
4.0 GROUND MANEUVERING

4.1 General Information

This section provides airplane turning capability and maneuvering characteristics.

For ease of presentation, these data have been determined from the theoretical limits imposed by the geometry of the aircraft, and where noted, provide for a normal allowance of tire slippage. As such, it reflects the turning capability of the aircraft in favorable operating circumstances. These 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.



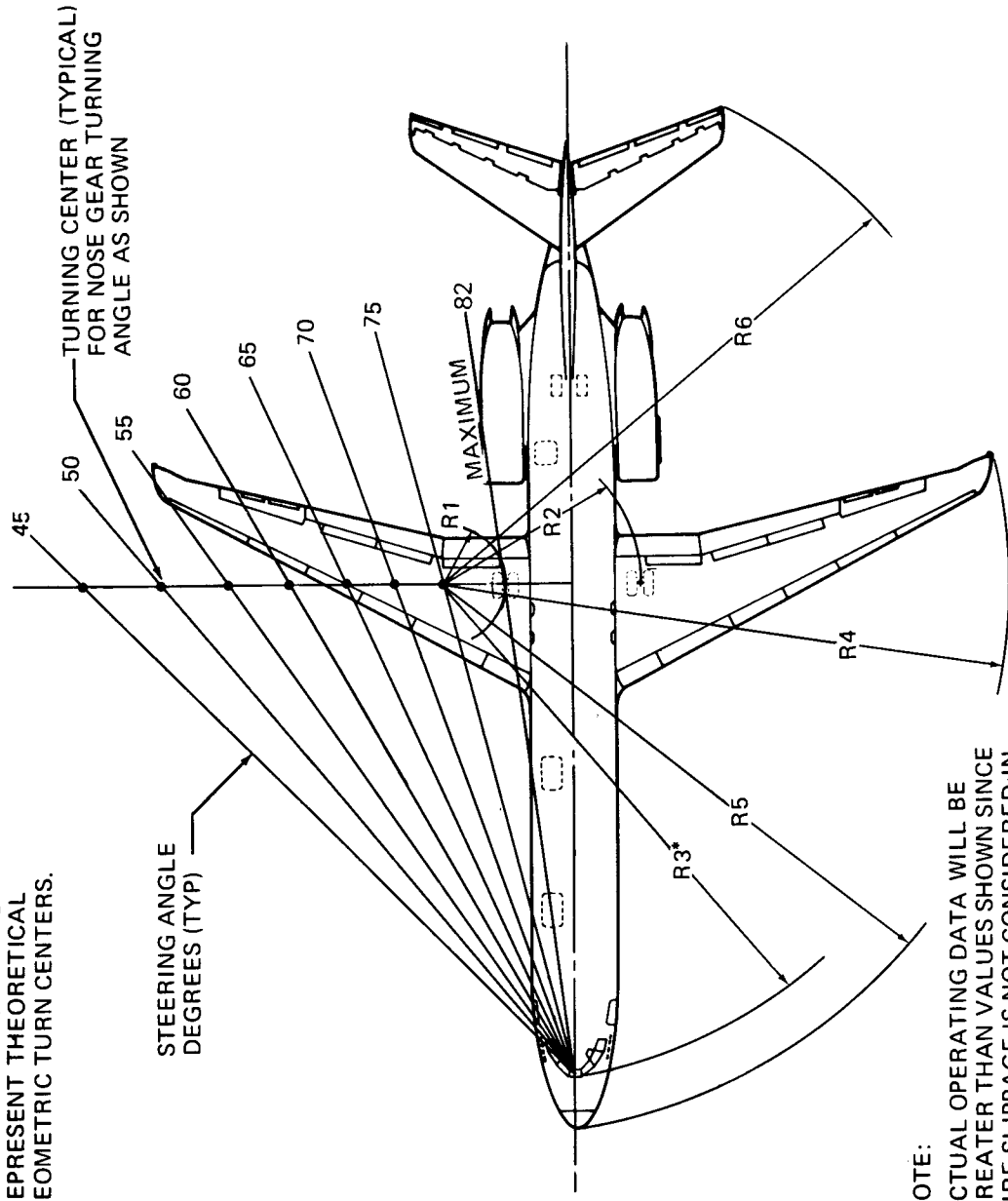
NOTE:
 ACTUAL OPERATING DATA WILL BE GREATER THAN VALUES SHOWN SINCE TIRE SLIPPAGE IS NOT CONSIDERED IN THESE CALCULATIONS. CONSULT AIRLINE FOR OPERATING PROCEDURES.

*R-3 IS MEASURED TO OUTSIDE TIRE FACE

| STEERING ANGLE (DEGREES) | R-1 | | R-2 | | R-3* | | R-4 | | R-5 | | R-6 | |
|--------------------------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|
| | FT | M | FT | M | FT | M | FT | M | FT | M | FT | M |
| 30 | 117.1 | 35.7 | 133.8 | 40.8 | 145.7 | 44.4 | 180.0 | 54.9 | 148.8 | 45.4 | 160.6 | 48.9 |
| 45 | 64.1 | 19.5 | 80.8 | 24.6 | 103.3 | 31.5 | 127.3 | 38.8 | 107.9 | 32.9 | 114.7 | 35.0 |
| 50 | 52.4 | 16.0 | 69.1 | 21.1 | 95.4 | 29.1 | 115.7 | 35.3 | 100.5 | 30.6 | 105.6 | 32.2 |
| 55 | 42.4 | 12.9 | 59.0 | 18.0 | 89.3 | 27.2 | 105.7 | 32.2 | 94.7 | 28.9 | 98.1 | 29.9 |
| 60 | 33.5 | 10.2 | 50.1 | 15.3 | 84.5 | 25.8 | 97.0 | 29.5 | 90.3 | 27.5 | 91.8 | 28.0 |
| 65 | 25.4 | 7.7 | 42.1 | 12.8 | 80.8 | 24.6 | 89.0 | 27.1 | 86.8 | 26.5 | 86.6 | 26.4 |
| 70 | 18.0 | 5.5 | 34.7 | 10.6 | 78.0 | 23.8 | 81.7 | 24.9 | 84.2 | 25.7 | 82.2 | 25.1 |
| 75 | 11.1 | 3.4 | 27.7 | 8.4 | 75.9 | 23.1 | 74.9 | 22.8 | 82.3 | 25.1 | 78.5 | 23.9 |
| 82 MAXIMUM | 1.9 | 0.6 | 18.5 | 5.6 | 74.0 | 22.6 | 65.9 | 20.1 | 80.7 | 24.6 | 74.3 | 22.6 |

4.2 TURNING RADII, NO SLIP ANGLE MODEL MD-81, -82, -83, AND -88

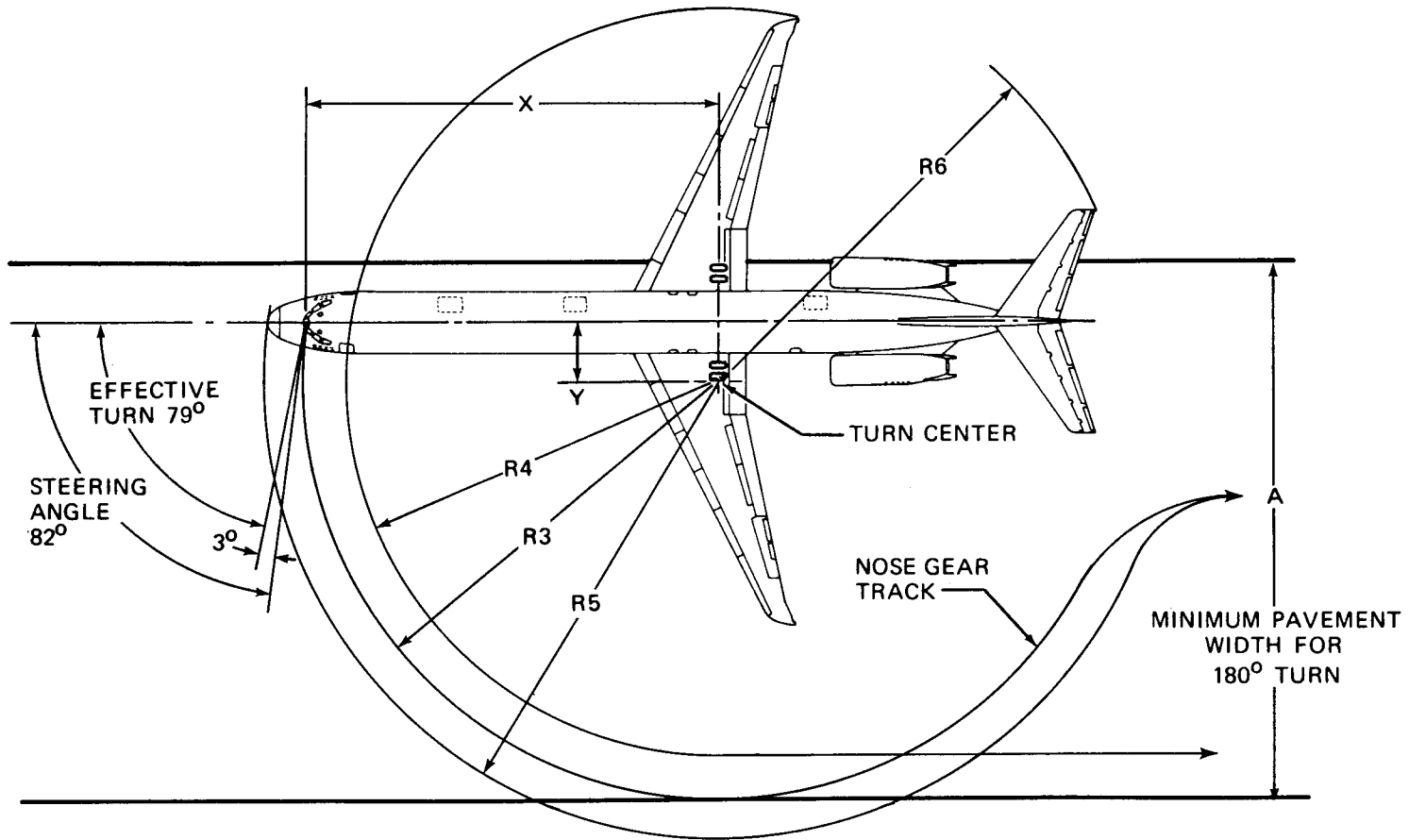
TURNING RADII DEPICTED REPRESENT THEORETICAL GEOMETRIC TURN CENTERS.



*R-3 IS MEASURED TO OUTSIDE TIRE FACE

| STEERING ANGLE (DEGREES) | R-1 | | R-2 | | R-3* | | R-4 | | R-5 | | R-6 | |
|--------------------------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|
| | FT | M | FT | M | FT | M | FT | M | FT | M | FT | M |
| 30 | 100.6 | 30.7 | 117.3 | 35.8 | 126.7 | 38.6 | 163.6 | 49.9 | 129.8 | 39.6 | 142.3 | 43.4 |
| 45 | 54.6 | 16.6 | 71.3 | 21.7 | 89.8 | 27.4 | 117.8 | 35.9 | 94.5 | 28.8 | 102.4 | 31.2 |
| 50 | 44.5 | 13.6 | 61.1 | 18.6 | 83.0 | 25.3 | 107.7 | 32.8 | 88.1 | 26.8 | 94.4 | 28.8 |
| 55 | 35.7 | 10.9 | 52.4 | 16.0 | 77.7 | 23.7 | 99.1 | 30.2 | 83.1 | 25.3 | 87.8 | 26.8 |
| 60 | 28.0 | 8.5 | 44.7 | 13.6 | 73.5 | 22.4 | 91.4 | 27.9 | 79.3 | 24.2 | 82.3 | 25.1 |
| 65 | 21.0 | 6.4 | 37.7 | 11.5 | 70.3 | 21.4 | 84.6 | 25.8 | 76.4 | 23.3 | 77.7 | 23.7 |
| 70 | 14.6 | 4.4 | 31.3 | 9.5 | 67.8 | 20.7 | 78.2 | 27.9 | 74.2 | 22.6 | 73.8 | 22.5 |
| 75 | 8.5 | 2.6 | 25.3 | 7.7 | 66.0 | 20.1 | 72.2 | 22.0 | 72.5 | 22.1 | 70.4 | 21.5 |
| 82 MAXIMUM | 0.5 | 0.2 | 17.2 | 5.3 | 64.4 | 19.6 | 64.5 | 19.7 | 71.1 | 21.7 | 66.6 | 20.4 |

4.2 TURNING RADII, NO SLIP ANGLE MODEL MD-87

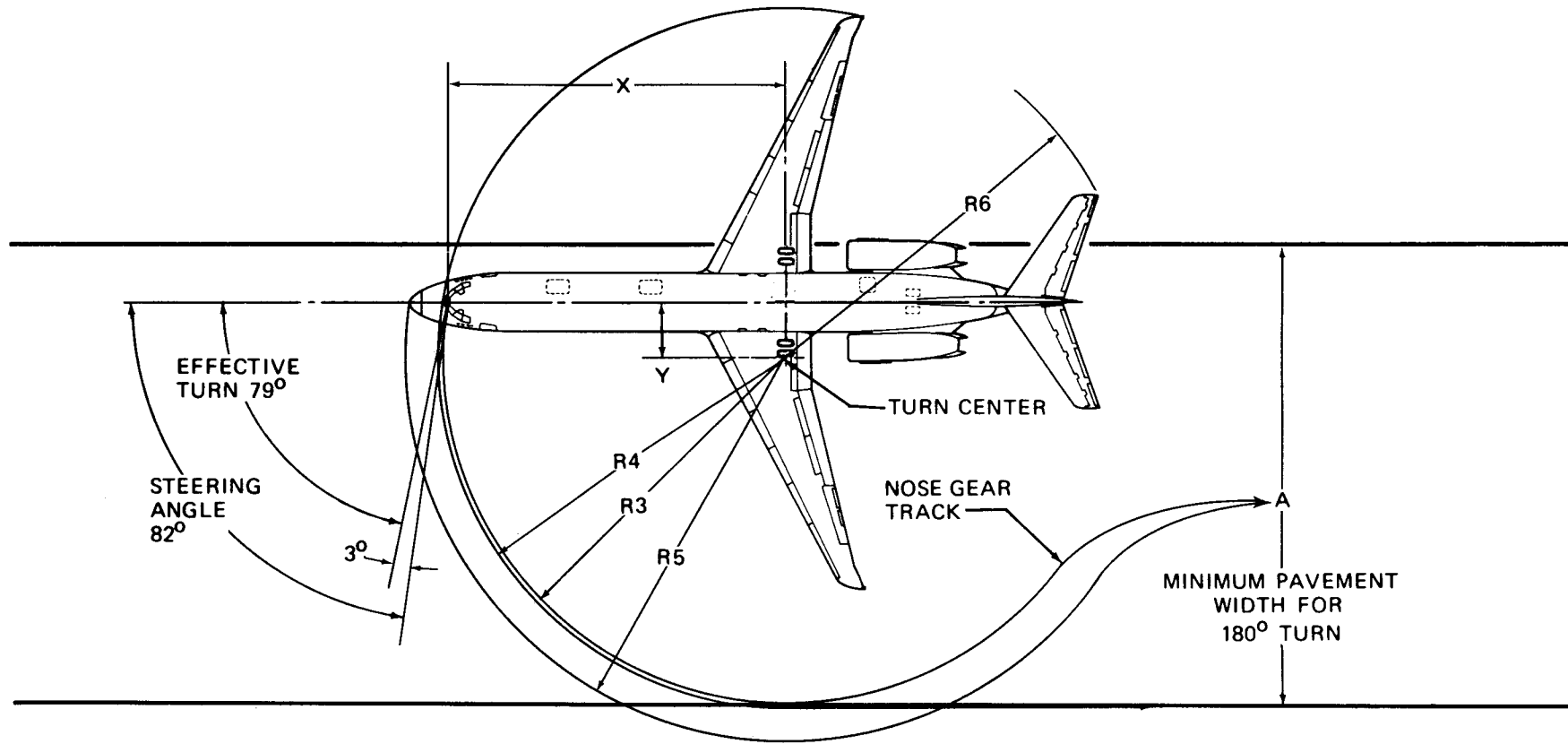


NOTE:

- 3° TIRE SLIP ANGLE ASSUMES 82° NOSE WHEEL DEFLECTION DURING VERY SLOW TURNING
- CONSULT AIRLINE FOR ACTUAL OPERATING DATA
- NO DIFFERENTIAL BRAKING OR UNSYMMETRICAL THRUST

| MD-80 | EFFECTIVE TURN ANGLE | X | | Y | | A | | R3 | | R4 | | R5 | | R6 | |
|-------|----------------------|------|------|------|-----|------|------|------|------|------|------|------|------|------|------|
| | | FT | M | FT | M | FT | M | FT | M | FT | M | FT | M | FT | M |
| -80 | 79° | 72.4 | 22.1 | 14.0 | 4.3 | 98.8 | 30.1 | 73.6 | 22.4 | 69.6 | 21.2 | 81.2 | 24.7 | 75.9 | 23.1 |

**4.3 MINIMUM TURNING RADII
MODEL MD-81, -82, -83, AND -88**



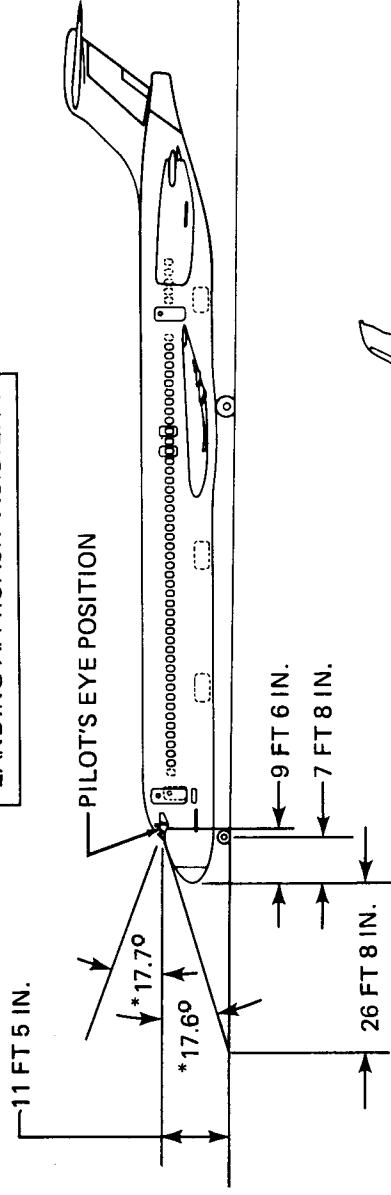
NOTE:

- 3° TIRE SLIP ANGLE ASSUMES 82° NOSE WHEEL DEFLECTION DURING VERY SLOW TURNING
- CONSULT AIRLINE FOR ACTUAL OPERATING DATA
- NO DIFFERENTIAL BRAKING OR UNSYMMETRICAL THRUST

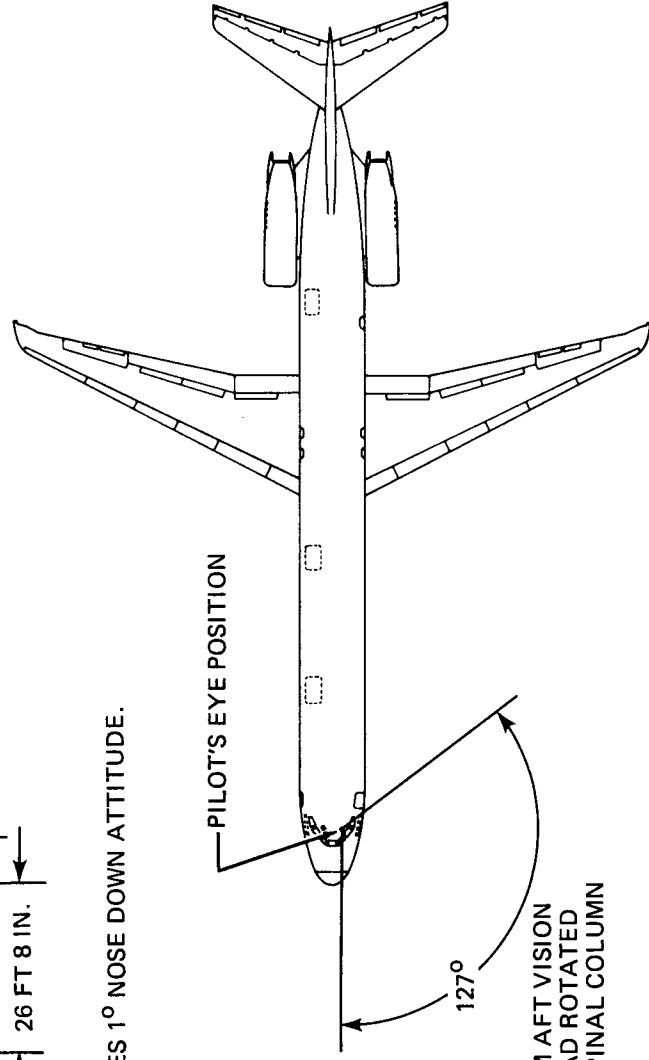
| MD-87 | EFFECTIVE TURN ANGLE | X | | Y | | A | | R3 | | R4 | | R5 | | R6 | |
|-------|----------------------|------|------|------|-----|------|------|------|------|------|------|------|------|------|------|
| | | FT | M | FT | M | FT | M | FT | M | FT | M | FT | M | FT | M |
| -87 | 79° | 62.9 | 19.2 | 12.2 | 3.7 | 87.4 | 26.6 | 64.1 | 19.5 | 67.7 | 20.6 | 71.6 | 21.8 | 68.1 | 20.8 |

**4.3 MINIMUM TURNING RADII
MODEL MD-87**

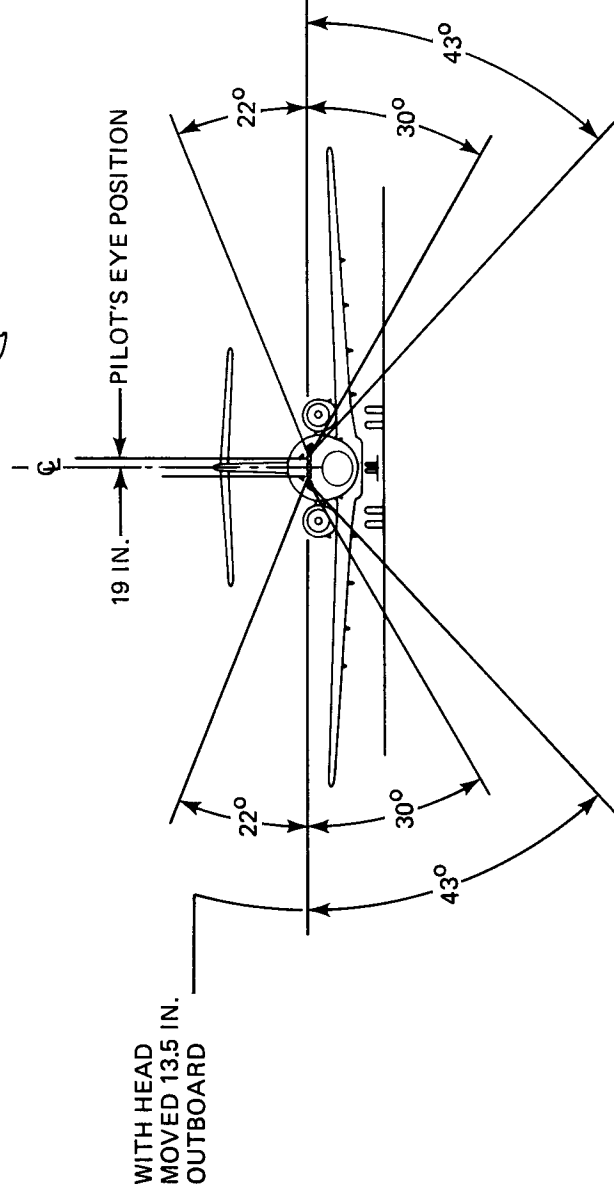
NOT TO BE USED FOR
LANDING APPROACH VISIBILITY



*INCLUDES 1° NOSE DOWN ATTITUDE.



MAXIMUM AFT VISION
WITH HEAD ROTATED
ABOUT SPINAL COLUMN

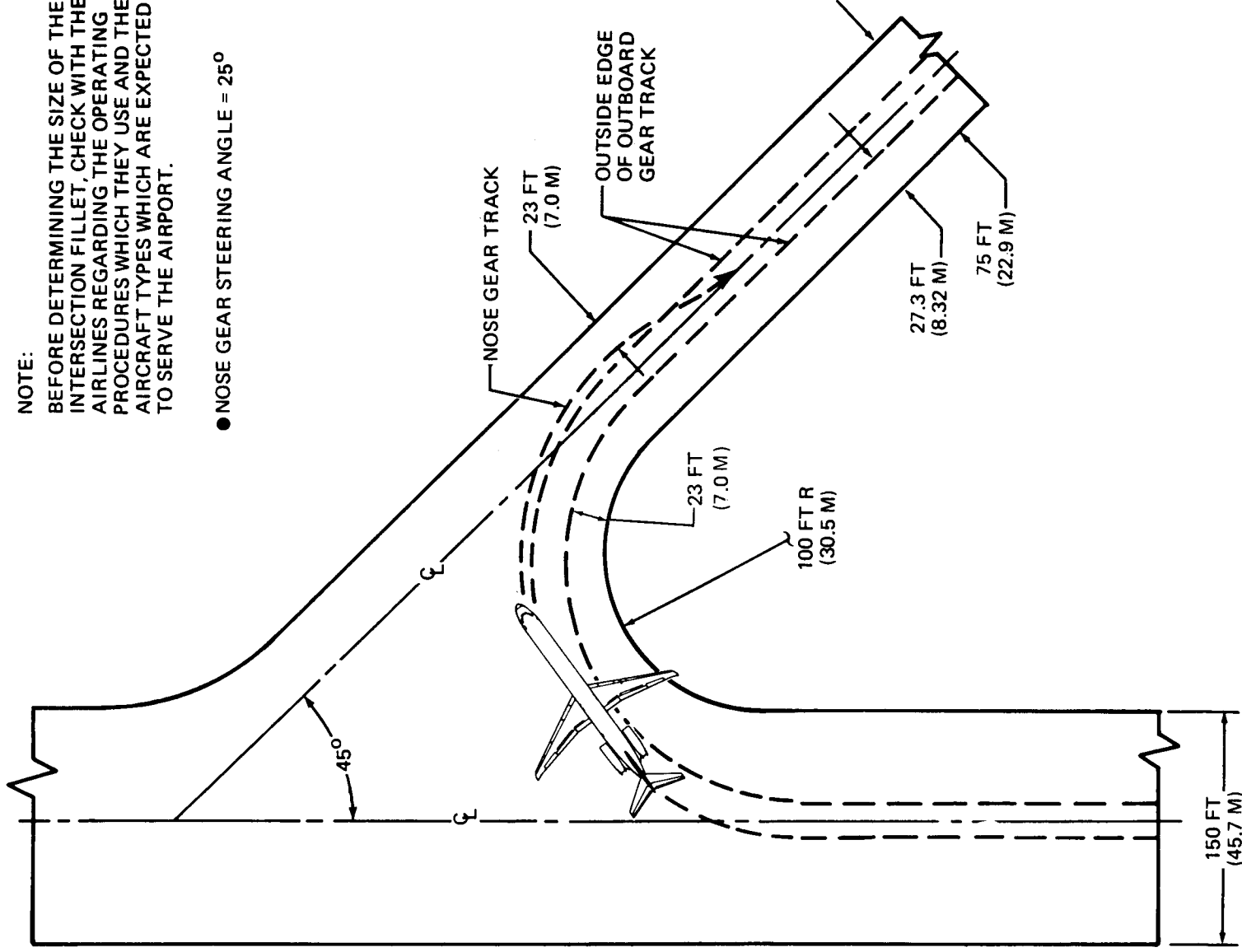


WITH HEAD
MOVED 13.5 IN.
OUTBOARD

4.4 VISIBILITY FROM COCKPIT IN STATIC POSITION MODEL MD-80 SERIES

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

● NOSE GEAR STEERING ANGLE = 25°



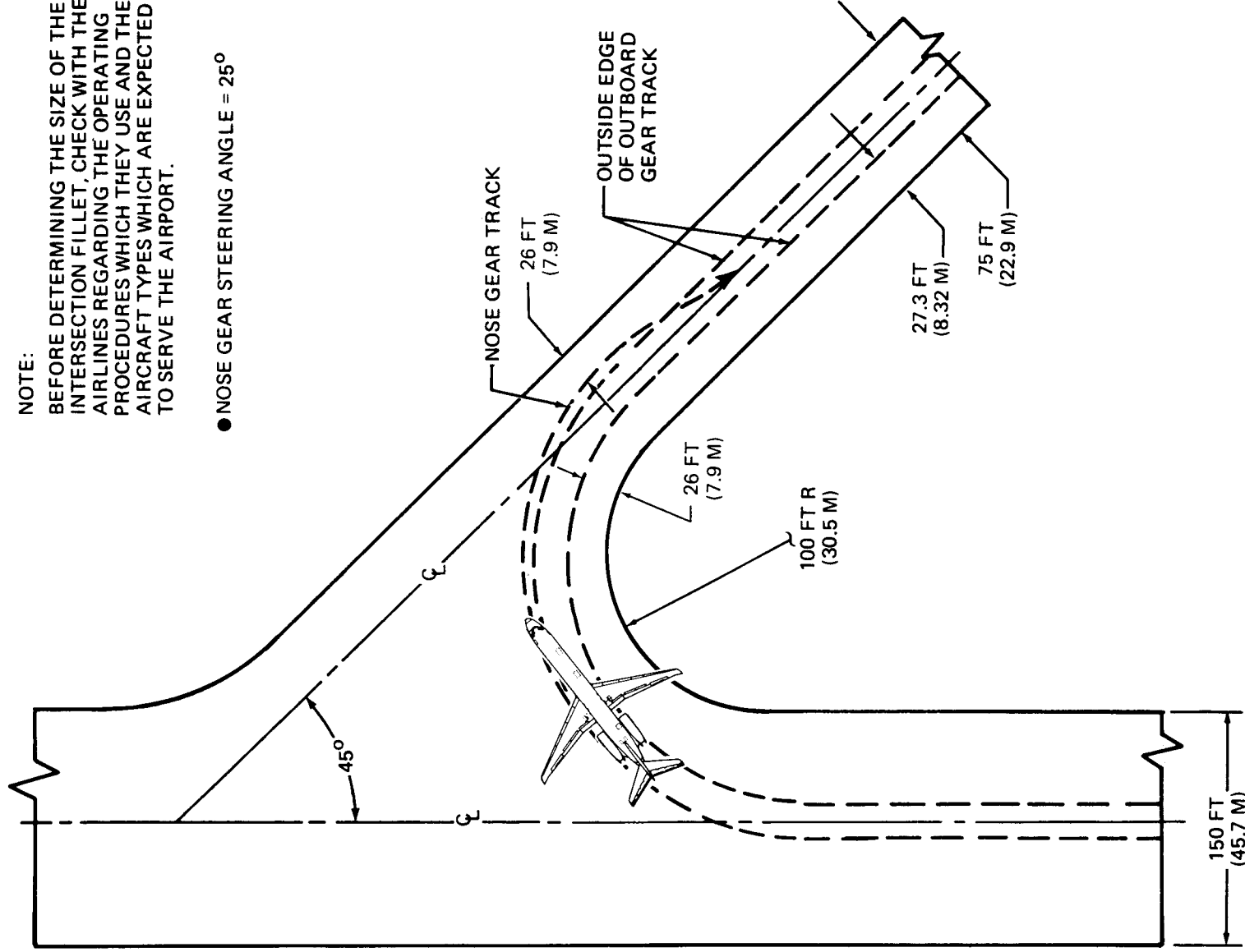
4.5 RUNWAY AND TAXIWAY TURN PATHS

4.5.1 MORE THAN 90-DEG TURN – RUNWAY TO TAXIWAY TURN MODEL MD-81, -82, -83, AND -88

NOSE GEAR TRACKING BEYOND
 TAXIWAY CENTERLINE

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

● NOSE GEAR STEERING ANGLE = 25°

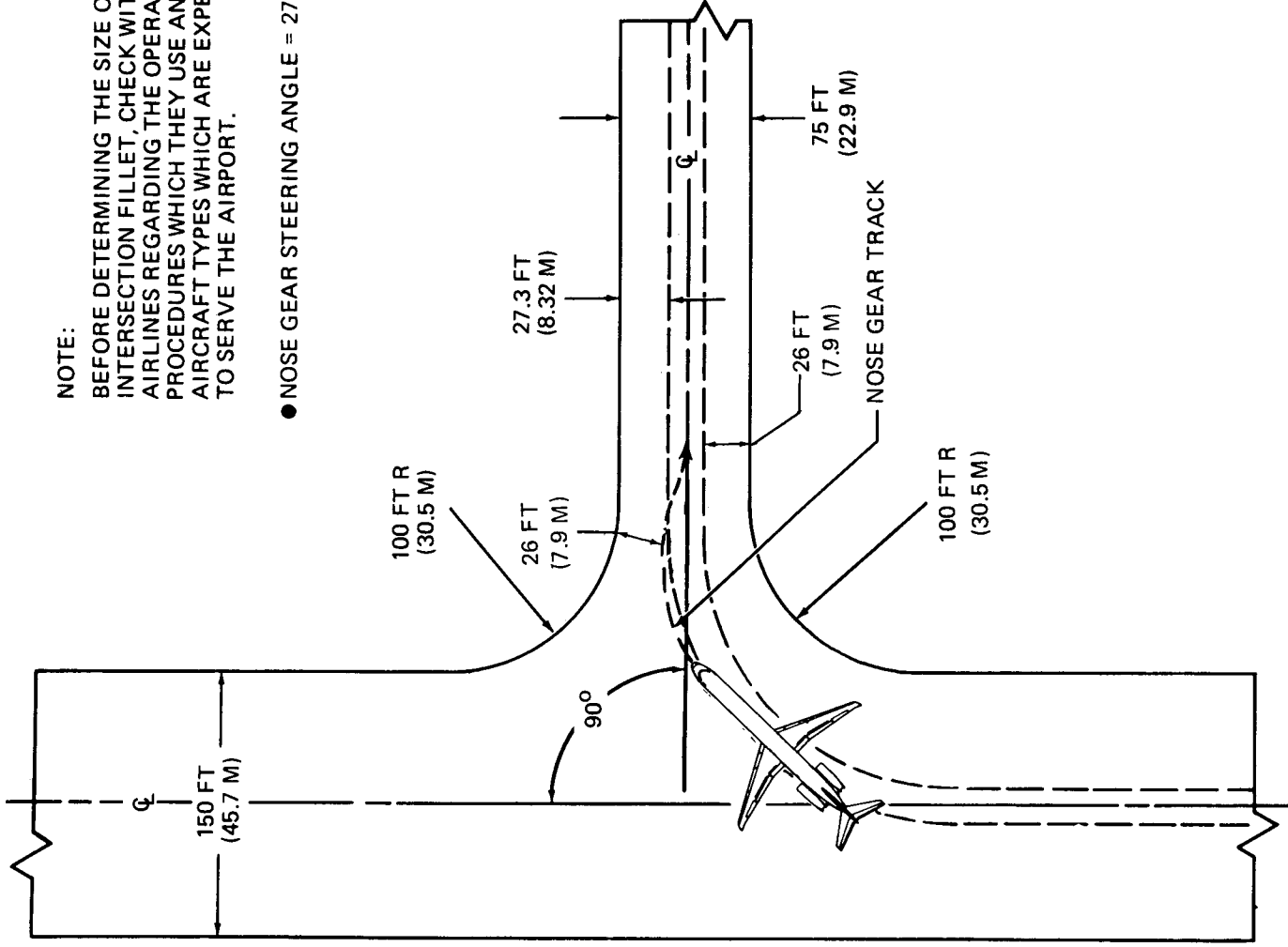


4.5 RUNWAY AND TAXIWAY TURN PATHS

4.5.1 MORE THAN 90-DEG TURN — RUNWAY TO TAXIWAY TURN

MODEL MD-87

NOSE GEAR TRACKING BEYOND
 TAXIWAY CENTERLINE

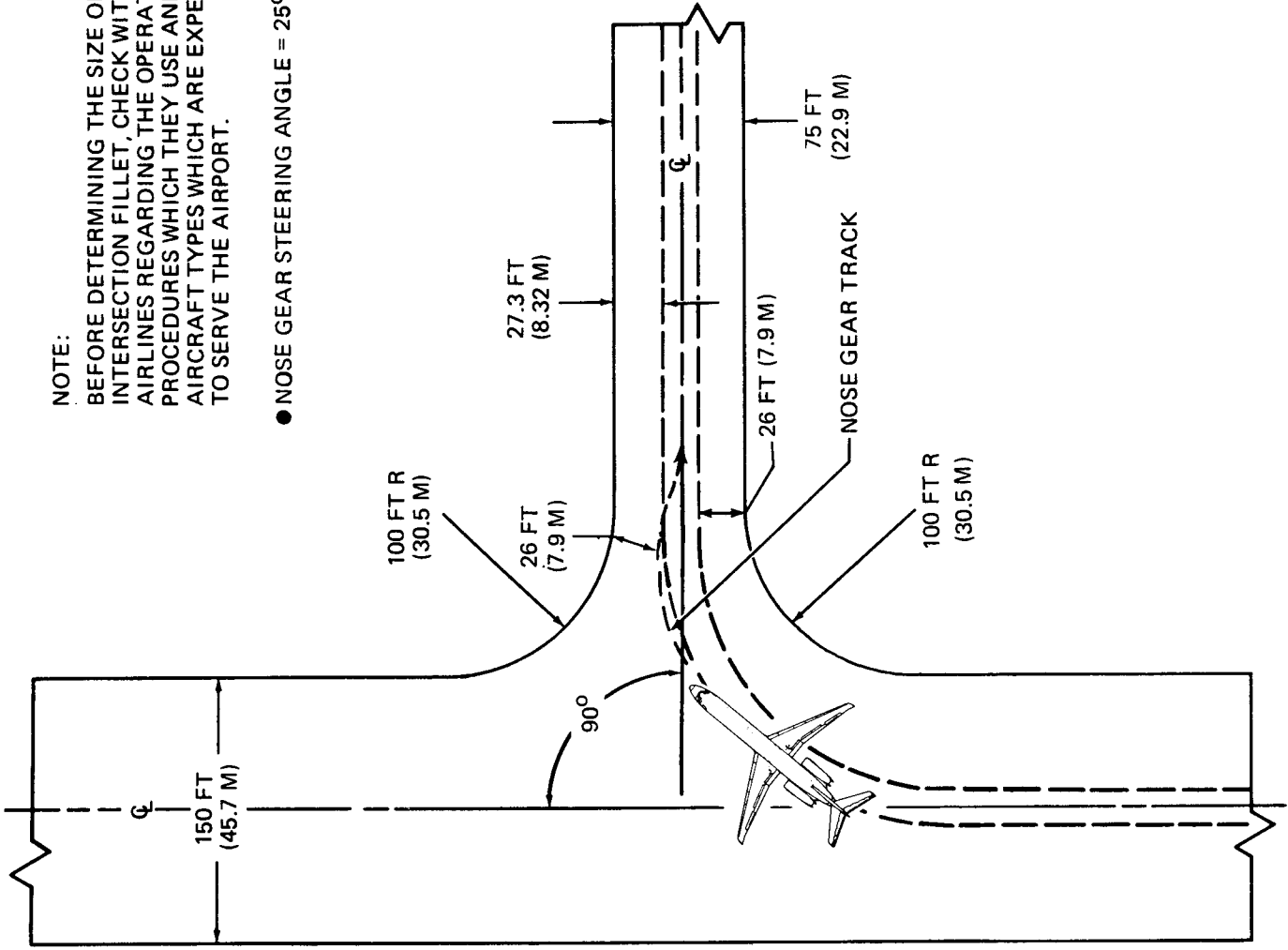


NOTE:
 BEFORE DETERMINING THE SIZE OF THE INTERSECTION FILLET, CHECK WITH THE AIRLINES REGARDING THE OPERATING PROCEDURES WHICH THEY USE AND THE AIRCRAFT TYPES WHICH ARE EXPECTED TO SERVE THE AIRPORT.

● NOSE GEAR STEERING ANGLE = 27°

4.5 RUNWAY AND TAXIWAY TURN PATHS
4.5.2 90-DEG TURN – RUNWAY TO TAXIWAY
MODEL MD-81, -82, -83, AND -88

NOSE GEAR TRACKING BEYOND
 TAXIWAY CENTERLINE



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

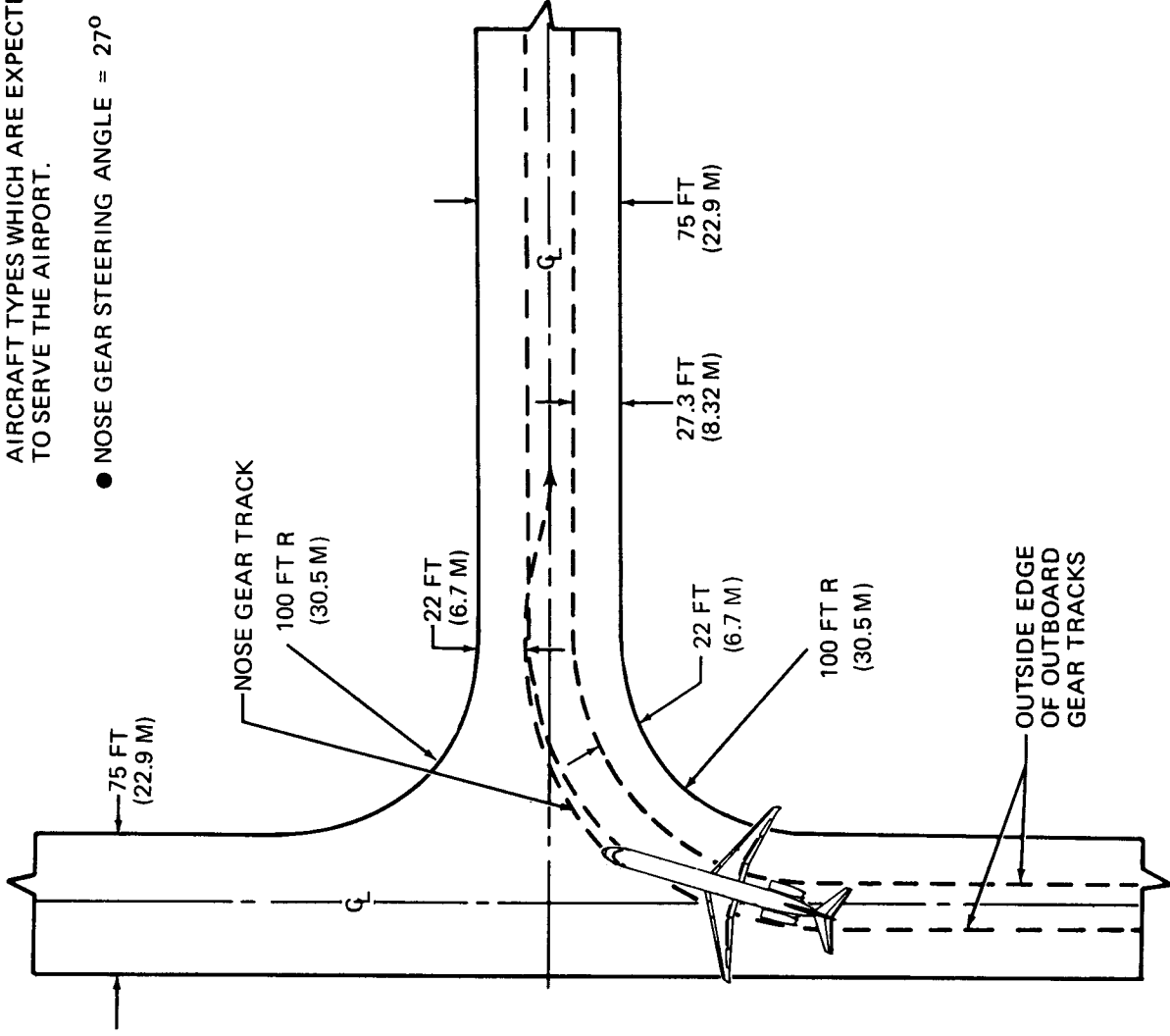
● NOSE GEAR STEERING ANGLE = 25°

4.5 RUNWAY AND TAXIWAY TURN PATHS
4.5.2 90-DEG TURN – RUNWAY TO TAXIWAY
MODEL MD-87
 NOSE GEAR TRACKING BEYOND TAXIWAY CENTERLINE

NOTE:

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

● NOSE GEAR STEERING ANGLE = 27°



4.5 RUNWAY AND TAXIWAY TURN PATHS

4.5.3 90-DEG TURN – TAXIWAY TO TAXIWAY

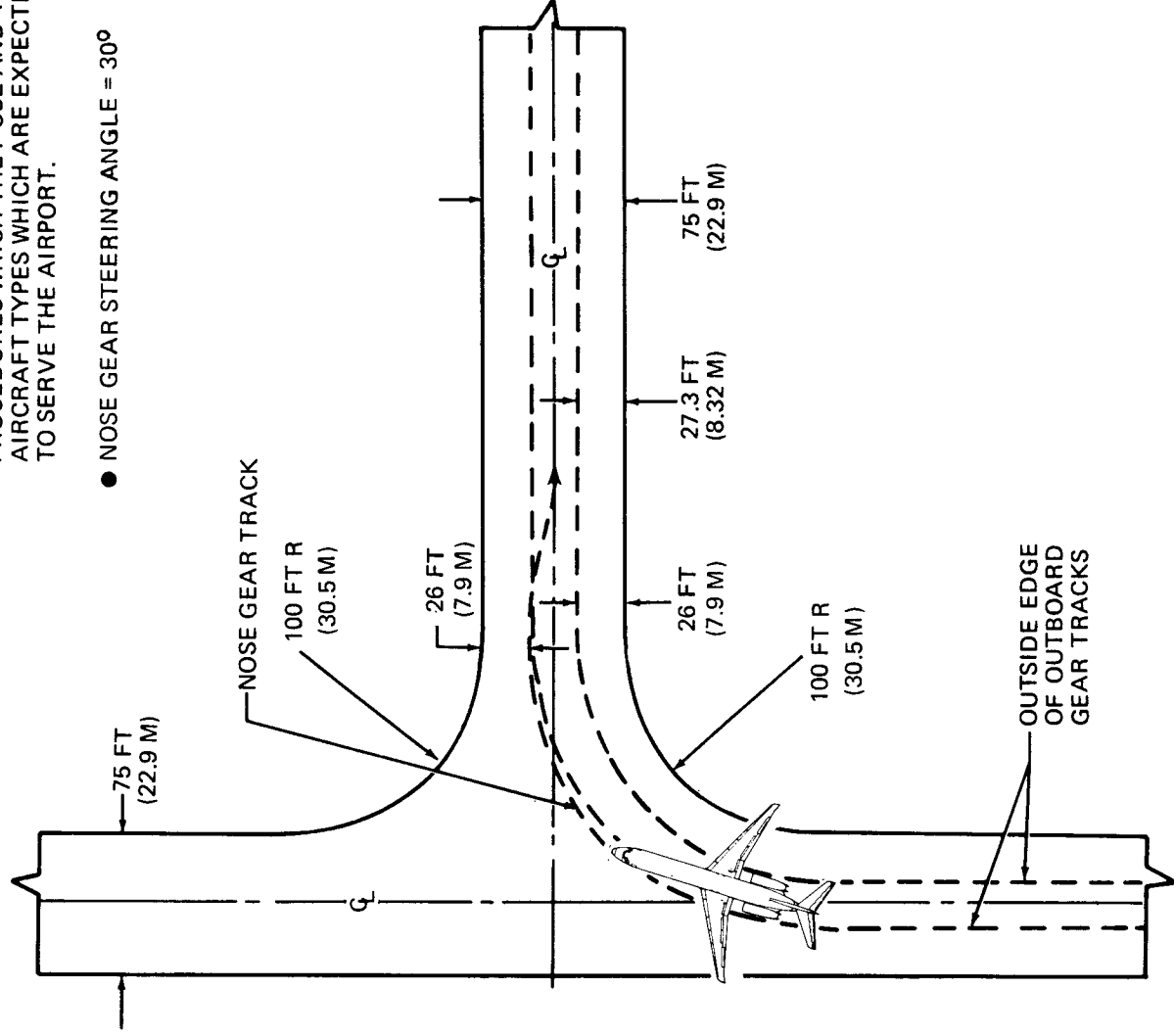
MODEL MD-81, -82, -83, AND -88

NOSE GEAR TRACKING BEYOND
TAXIWAY CENTERLINE

NOTE:

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

- NOSE GEAR STEERING ANGLE = 30°



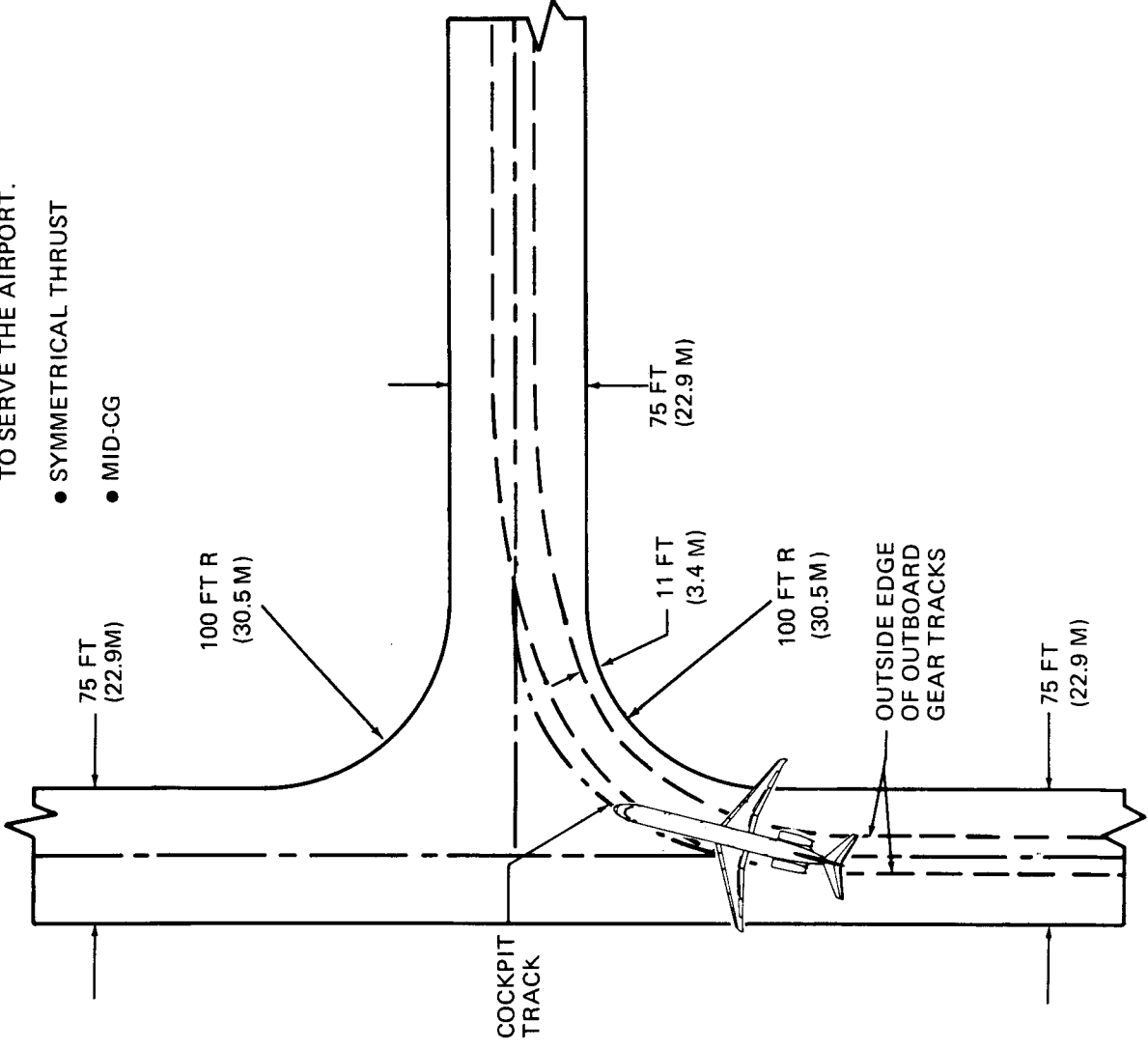
4.5 RUNWAY AND TAXIWAY TURN PATHS

4.5.3 90-DEG TURN — TAXIWAY TO TAXIWAY

MODEL MD-87

NOSE GEAR TRACKING BEYOND
TAXIWAY CENTERLINE

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



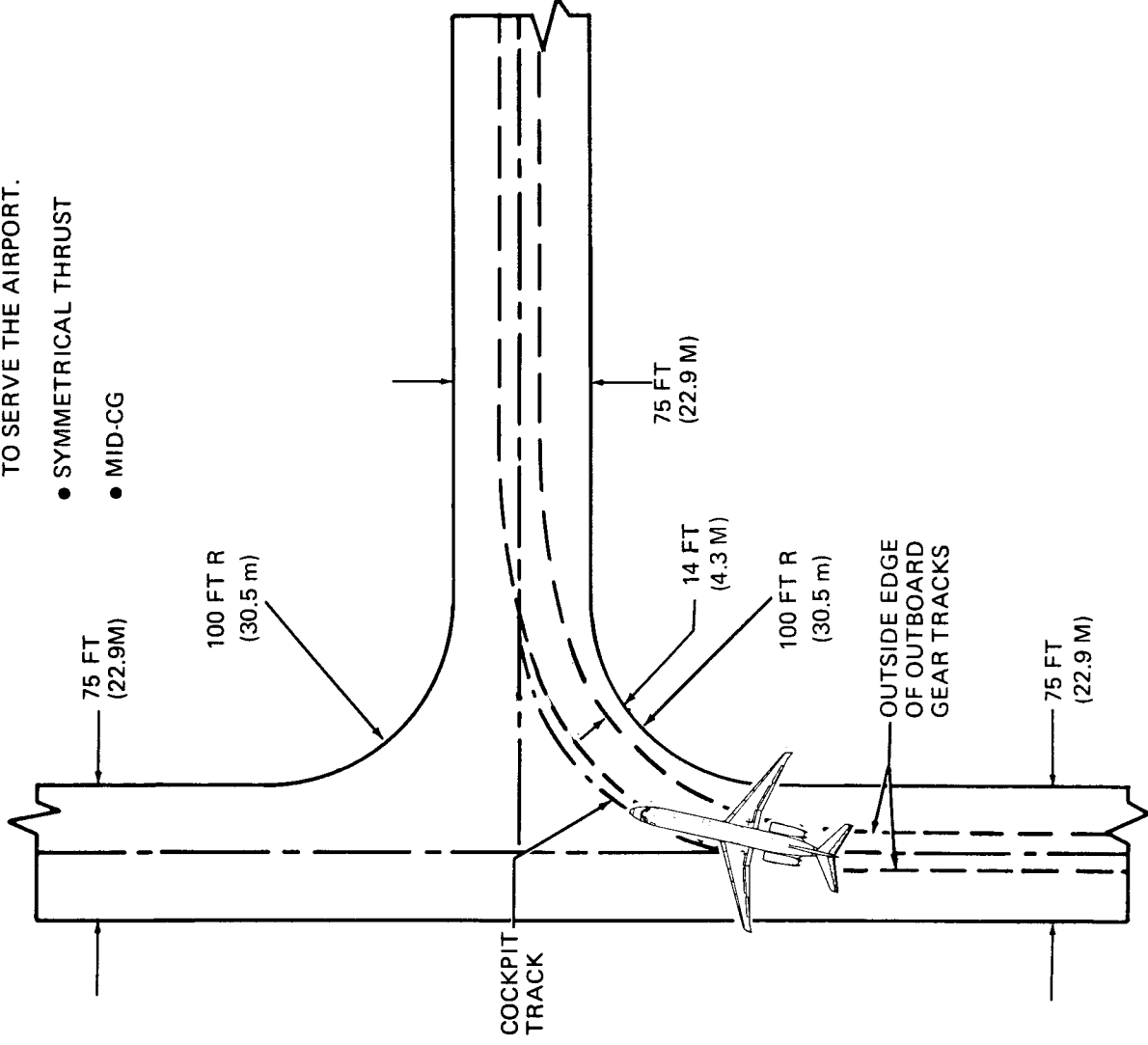
- SYMMETRICAL THRUST
- MID-CG

4.5 RUNWAY AND TAXIWAY TURN PATHS
4.5.4 90-DEG TURN – TAXIWAY TO TAXIWAY
MODEL MD-81, -82, -83, AND -88

COCKPIT TRACKS
 CENTERLINE-TO-CENTERLINE

NOTE:

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

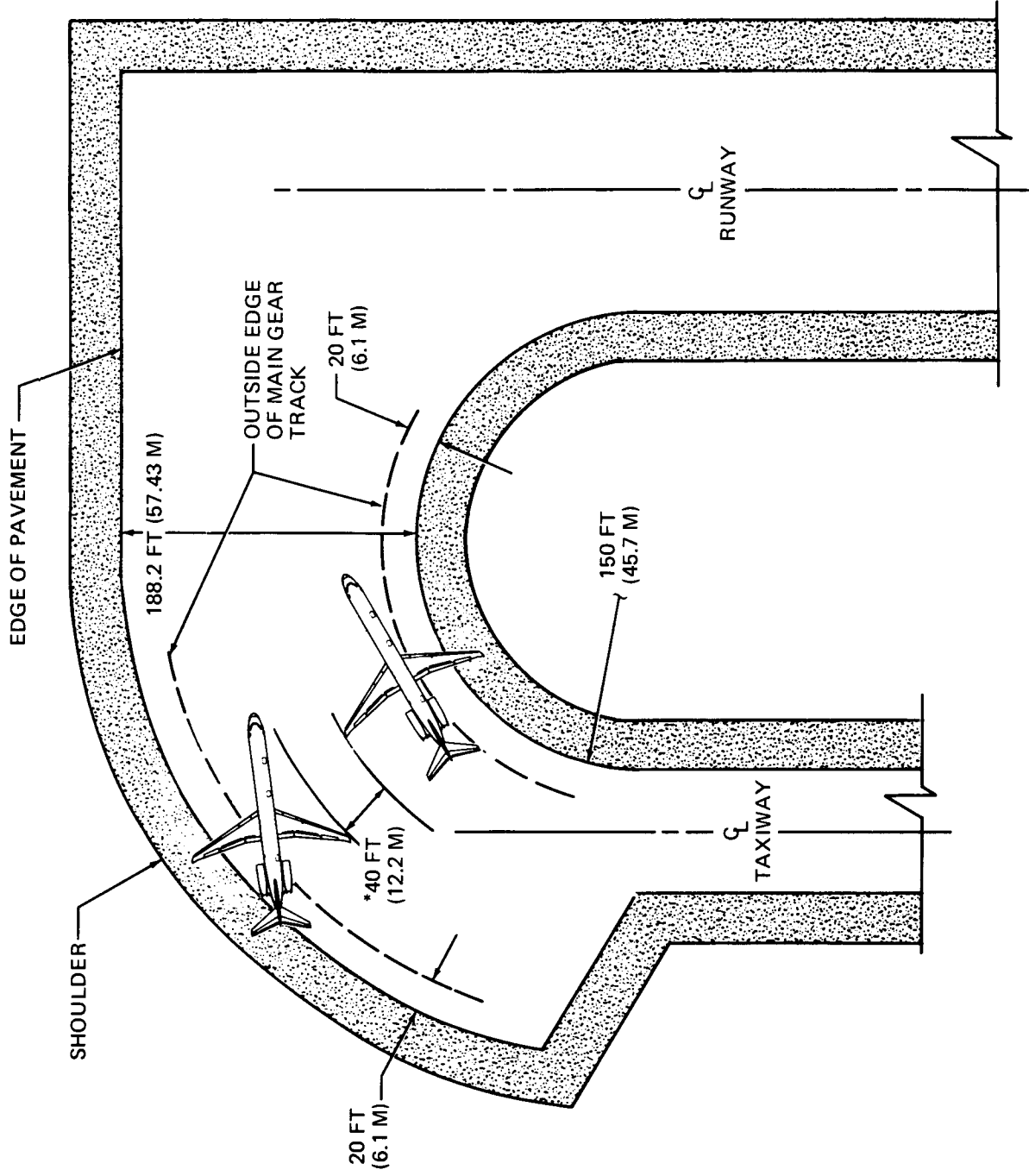


4.5 RUNWAY AND TAXIWAY TURN PATHS

4.5.4 90-DEG TURN — TAXIWAY TO TAXIWAY

MODEL MD-87

COCKPIT TRACKS
CENTERLINE-CENTERLINE

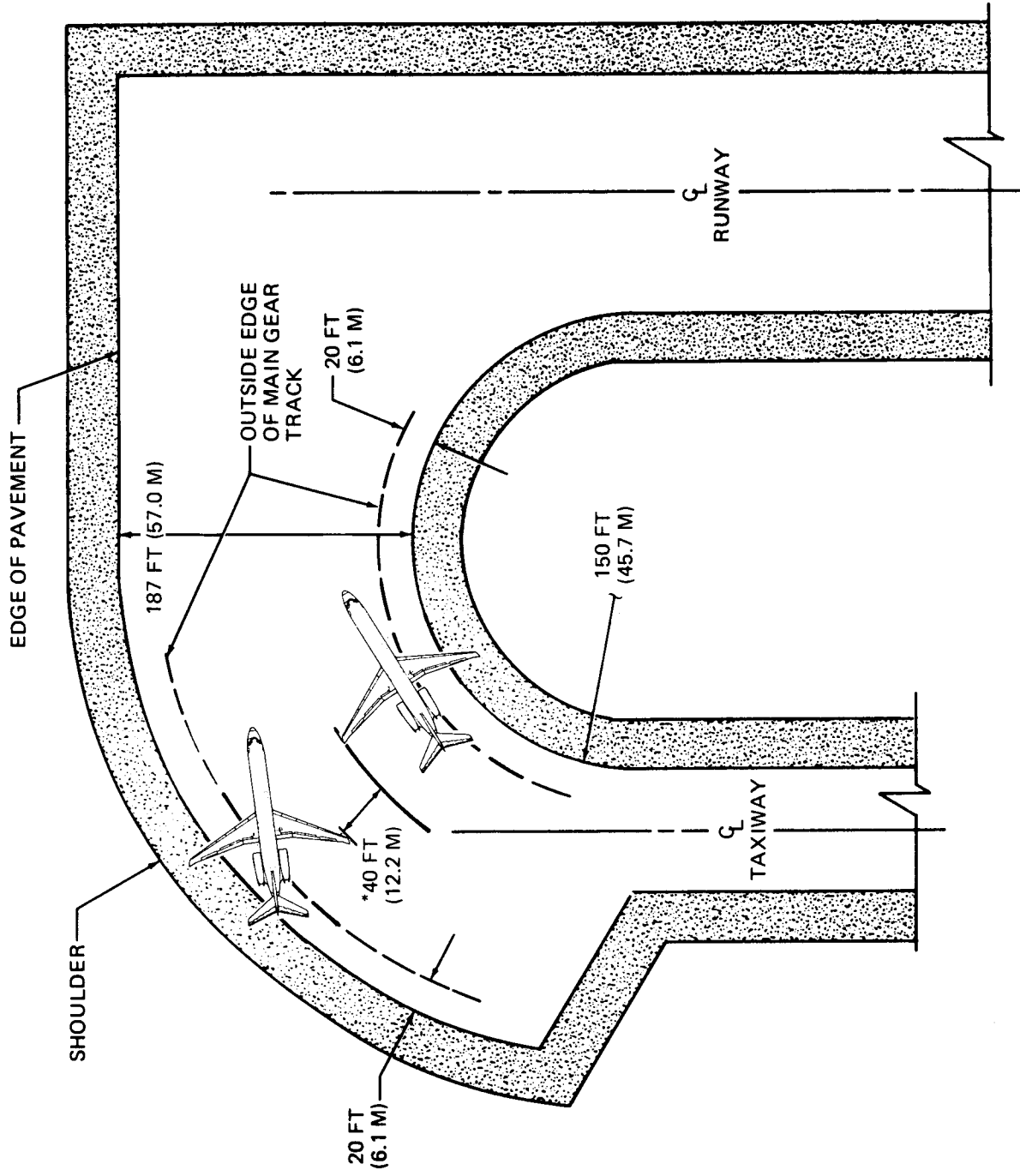


*MINIMUM CLEARANCE FOR MOVING AIRCRAFT = 40 FT (12.2 M)

NOTE:

COORDINATE WITH USING AIRLINES FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN

4.6 RUNWAY HOLDING BAY (APRON) MODEL MD-81, -82, -83, AND -88



*MINIMUM CLEARANCE FOR MOVING AIRCRAFT = 40 FT (12.2 M)

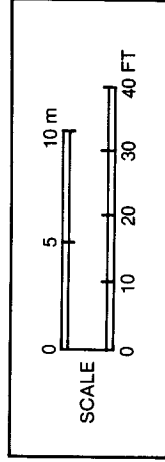
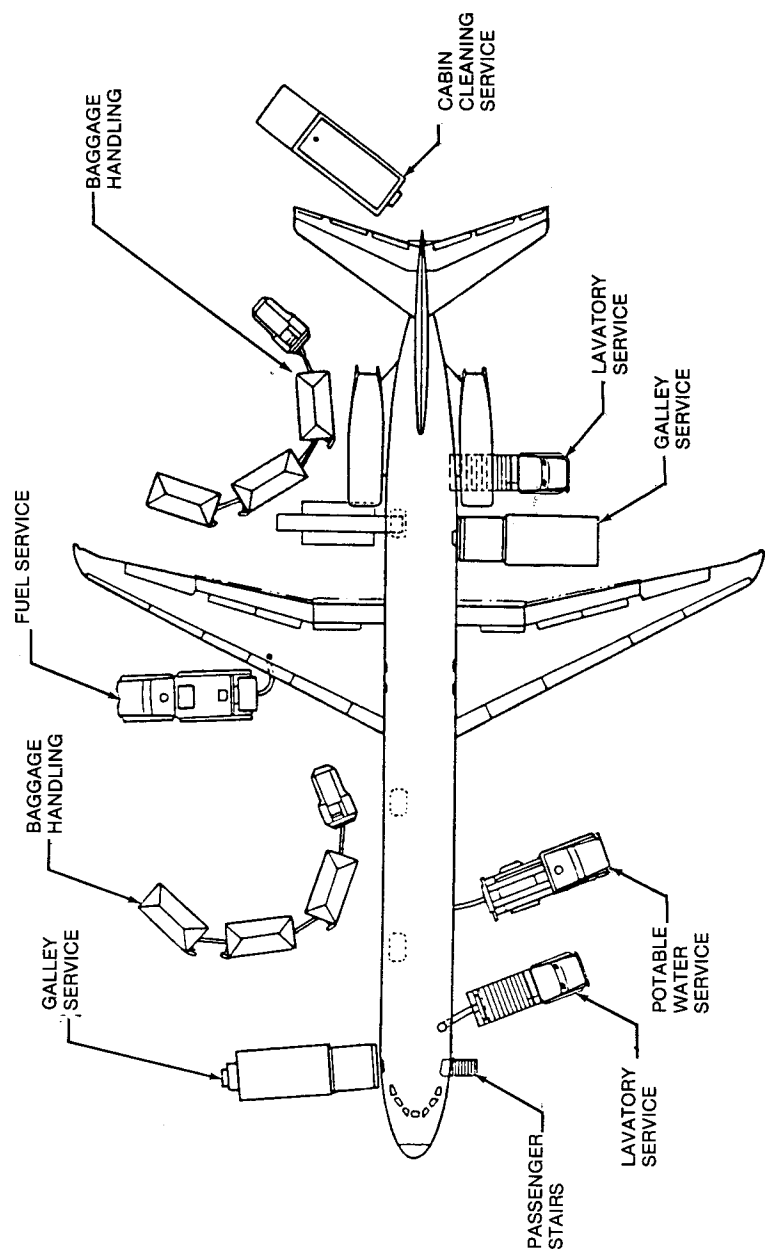
NOTE:

COORDINATE WITH USING AIRLINES FOR SPECIFIC REQUIREMENTS PRIOR TO FACILITY DESIGN

4.6 RUNWAY HOLDING BAY (APRON) MODEL MD-87

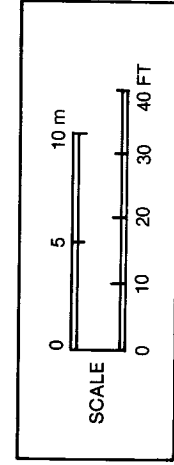
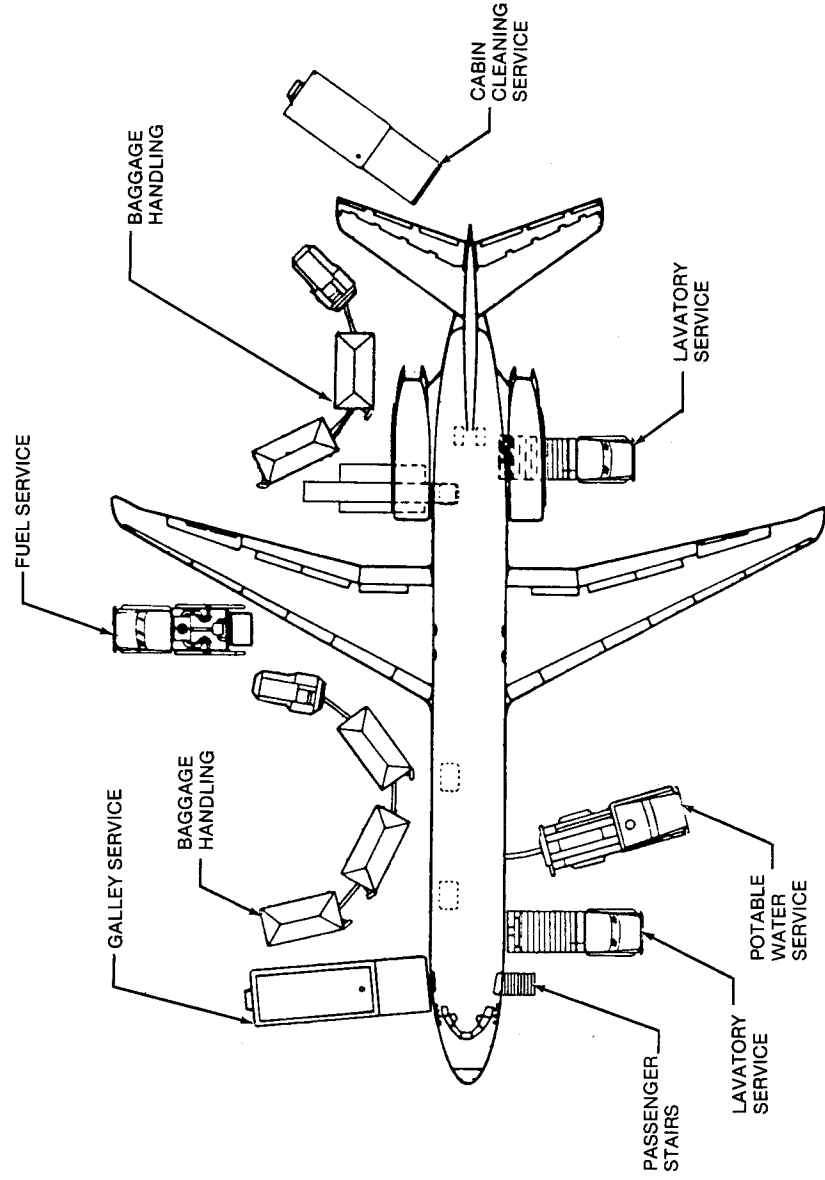
5.0 TERMINAL SERVICING

- 5.1 Airplane Servicing Arrangement (Typical)**
- 5.2 Terminal Operations, Turnaround Station**
- 5.3 Terminal Operations, En Route Station**
- 5.4 Ground Service Connections**
- 5.5 Engine Starting Pneumatic Requirements**
- 5.6 Ground Pneumatic Power Requirements**
- 5.7 Preconditioned Airflow Requirements**
- 5.8 Ground Towing Requirements**



AUXILIARY POWER UNIT PROVIDES
 1. ELECTRICAL POWER
 2. ENGINE START
 3. AIR CONDITIONING

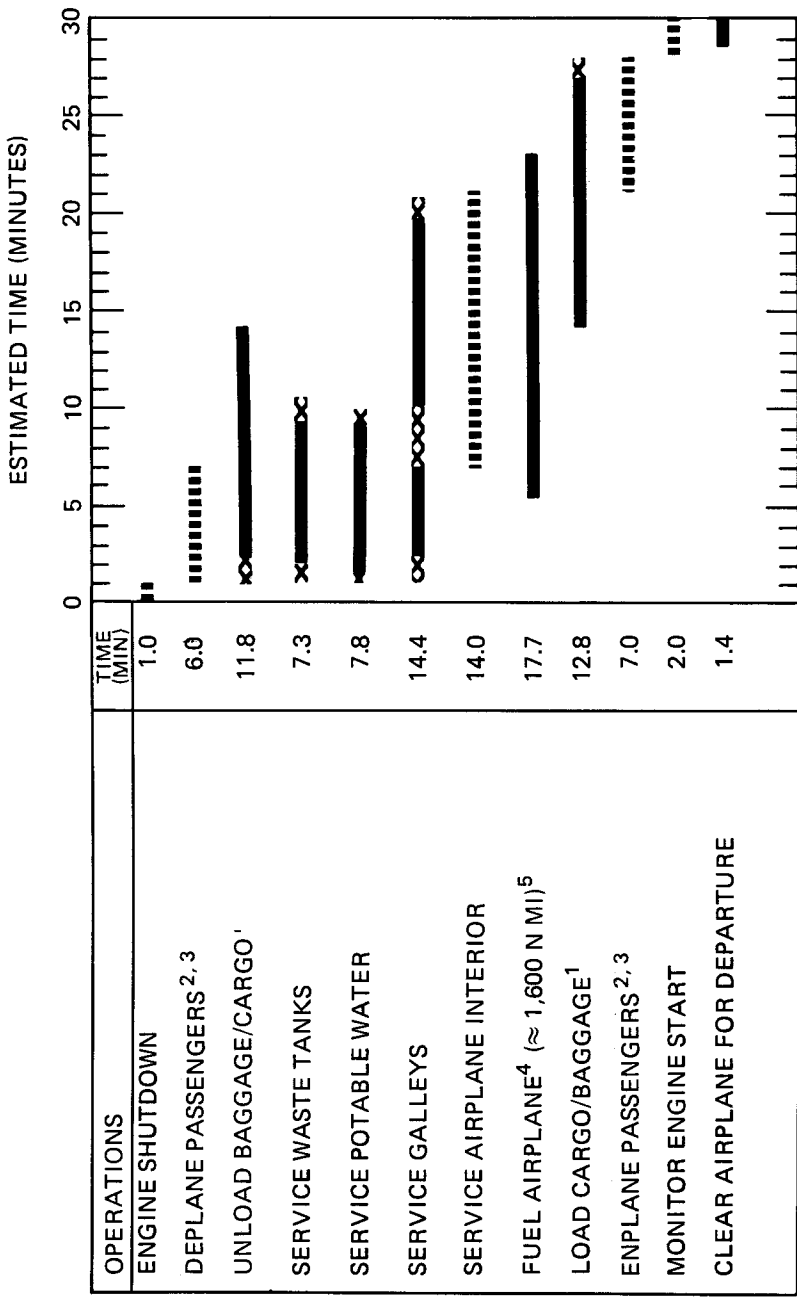
5.0 TERMINAL SERVICING
5.1 AIRPLANE SERVICING ARRANGEMENT (TYPICAL)
MODEL MD-81, -82, -83, AND -88



AUXILIARY POWER UNIT PROVIDES

1. ELECTRICAL POWER
2. ENGINE START
3. AIR CONDITIONING

5.1 AIRPLANE SERVICING ARRANGEMENT (TYPICAL) MODEL MD-87



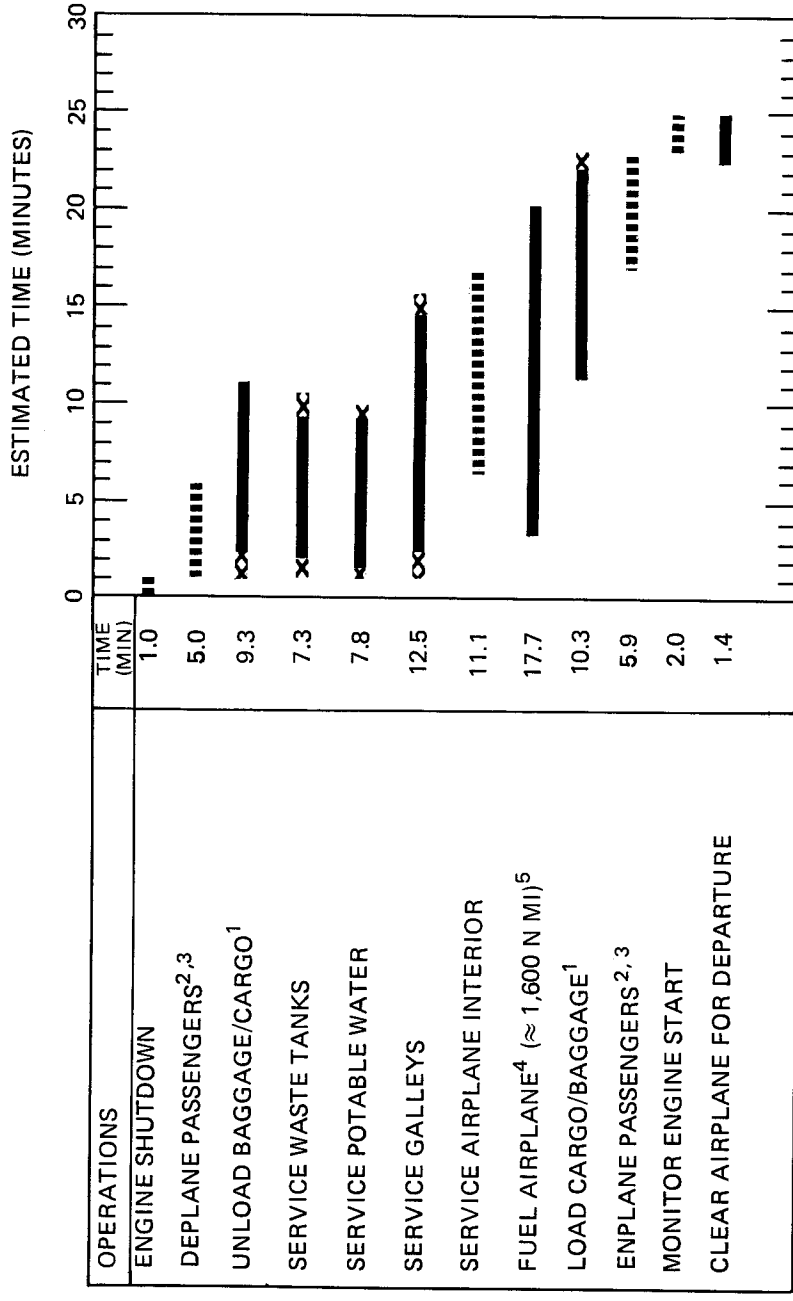
CRITICAL TIMEPATH
 VEHICLE MOVEMENT

- TOURIST CLASS CONFIGURATION WITH 155 PASSENGERS
- 100 PERCENT LOAD FACTOR
- TWO BAGGAGE/CARGO CREWS

1. TIME AVAILABLE FOR 1,500 POUNDS OF BULK CARGO
2. PASSENGER ENPLANE AND DEPLANE VIA FRONT AIRSTAIR AND VENTRAL STAIRS
3. AN ADDITIONAL 3.5 MINUTES REQUIRED FOR BRIDGE OPERATIONS
4. ADDITIONAL TIME REQUIRED FOR FUELING IF AUXILIARY TANKS OR 35 PSIG SYSTEM PRESSURE ARE USED.
5. RANGE IS FOR THE JT8D-209 ENGINE. OTHER SERIES ENGINES WILL HAVE DIFFERENT RANGES.

NOTE: ONBOARD APU OPERATIONAL FOR AIR CONDITIONING, ENGINE START, AND ELECTRICAL POWER. THIS DATA IS PROVIDED TO ILLUSTRATE THE GENERAL SCOPE AND TYPES OF TASKS INVOLVED IN TERMINAL OPERATIONS. VARYING AIRLINE PRACTICES AND OPERATING CIRCUMSTANCES THROUGHOUT THE WORLD WILL RESULT IN DIFFERENT SEQUENCES AND TIME INTERVALS TO ACCOMPLISH THE TASKS SHOWN. BECAUSE OF THIS, GROUND OPERATIONS REQUIREMENTS SHOULD BE COORDINATED WITH THE USING AIRLINES PRIOR TO RAMP PLANNING.

5.2 TERMINAL OPERATIONS TURNAROUND STATION MODEL MD-81, -82, -83, AND -88



●●●●● CRITICAL TIMEPATH
 ○○○○○ VEHICLE MOVEMENT

- TOURIST CLASS CONFIGURATION WITH 130 PASSENGERS
- 100 PERCENT LOAD FACTOR
- TWO BAGGAGE/CARGO CREWS

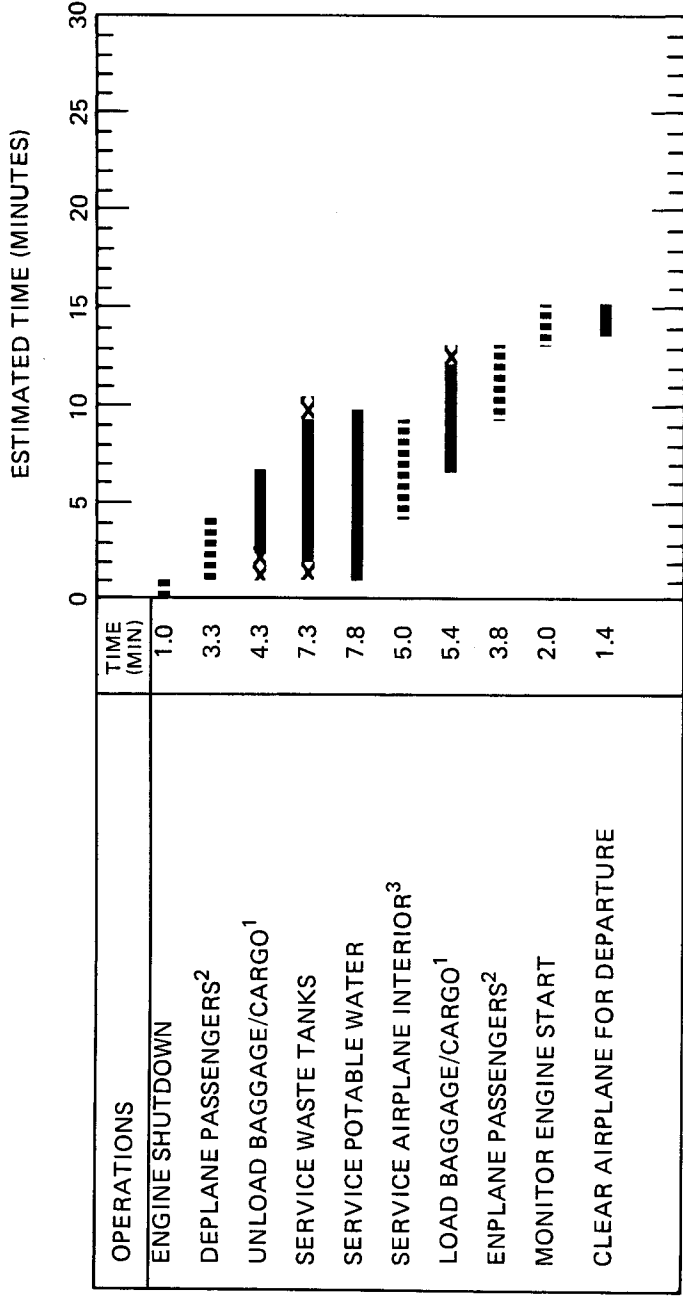
1. TIME AVAILABLE FOR 1,500 POUNDS OF BULK CARGO
2. PASSENGER ENPLANE AND DEPLANE VIA FRONT AIRSTAIR AND VENTRAL STAIRS
3. AN ADDITIONAL 2.9 MINUTES REQUIRED FOR BRIDGE OPERATIONS
4. ADDITIONAL TIME REQUIRED FOR FUELING IF AUXILIARY TANKS OR 35 PSIG SYSTEM PRESSURE ARE USED.
5. RANGE IS FOR THE JT8D-217B ENGINE. OTHER SERIES ENGINES WILL HAVE DIFFERENT RANGES.

NOTE: ONBOARD APU OPERATIONAL FOR AIR CONDITIONING, ENGINE START, AND ELECTRICAL POWER.

THIS DATA IS PROVIDED TO ILLUSTRATE THE GENERAL SCOPE AND TYPES OF TASKS INVOLVED IN TERMINAL OPERATIONS. VARYING AIRLINE PRACTICES AND OPERATING CIRCUMSTANCES THROUGHOUT THE WORLD WILL RESULT IN DIFFERENT SEQUENCES AND TIME INTERVALS TO ACCOMPLISH THE TASKS SHOWN.

BECAUSE OF THIS, GROUND OPERATIONS REQUIREMENTS SHOULD BE COORDINATED WITH THE USING AIRLINES PRIOR TO RAMP PLANNING.

5.2 TERMINAL OPERATIONS TURNAROUND STATION MODEL MD-87



■■■■■ CRITICAL TIMEPATH
 ∞∞∞∞ VEHICLE MOVEMENT

- 55 PERCENT EXCHANGE OF PASSENGERS
- TOURIST CLASS CONFIGURATION WITH 155 PASSENGERS
- TWO BAGGAGE/CARGO CREWS

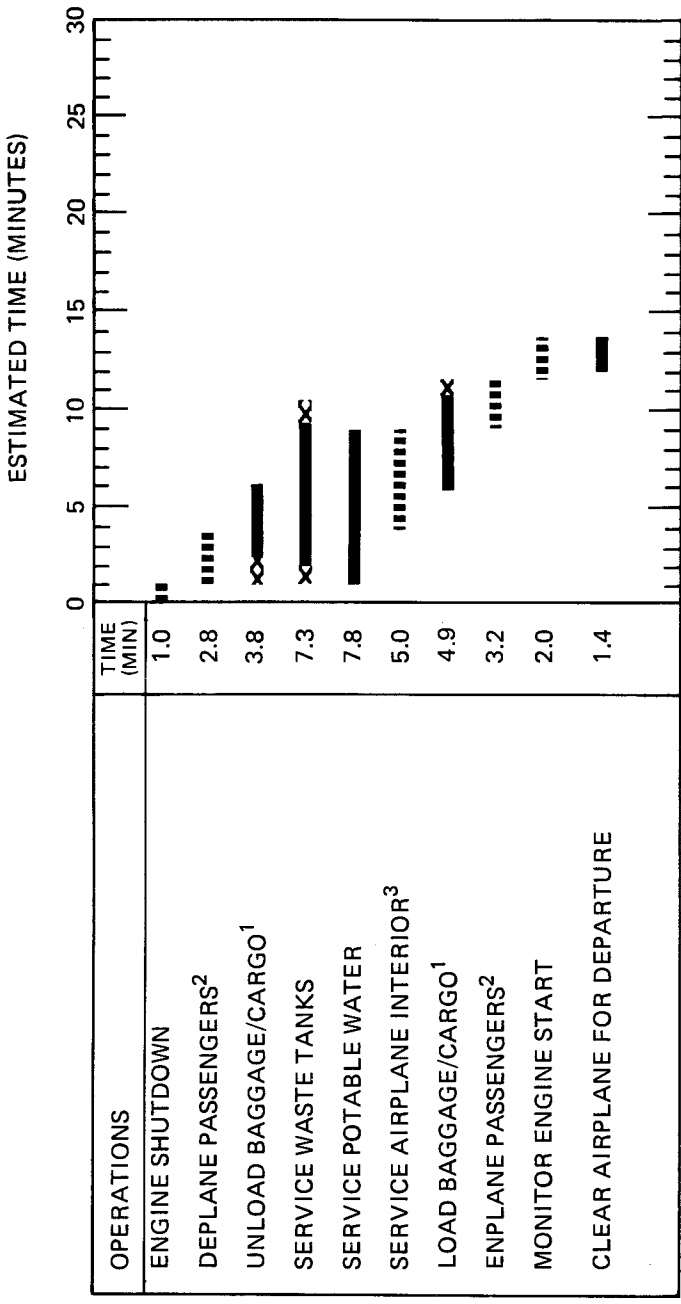
1. TIME AVAILABLE FOR 570 POUNDS OF BULK CARGO
2. PASSENGER ENPLANE AND DEPLANE VIA FRONT AIRSTAIR AND VENTRAL STAIRS
3. CABIN TIDIED BY CABIN ATTENDANT
4. AN ADDITIONAL 2.0 MINUTES REQUIRED FOR BRIDGE OPERATIONS

NOTE: ONBOARD APU OPERATIONAL FOR AIR CONDITIONING, ENGINE START, AND ELECTRICAL POWER.

THIS DATA IS PROVIDED TO ILLUSTRATE THE GENERAL SCOPE AND TYPES OF TASKS INVOLVED IN TERMINAL OPERATIONS. VARYING AIRLINE PRACTICES AND OPERATING CIRCUMSTANCES THROUGHOUT THE WORLD WILL RESULT IN DIFFERENT SEQUENCES AND TIME INTERVALS TO ACCOMPLISH THE TASKS SHOWN.

BECAUSE OF THIS, GROUND OPERATIONS REQUIREMENTS SHOULD BE COORDINATED WITH THE USING AIRLINES PRIOR TO RAMP PLANNING.

5.3 TERMINAL OPERATIONS, EN ROUTE STATION MODEL MD-81, -82, -83, AND -88



■■■■■ CRITICAL TIMEPATH
 ∞∞∞∞ VEHICLE MOVEMENT

- 55 PERCENT EXCHANGE OF PASSENGERS
- TOURIST CLASS CONFIGURATION WITH 130 PASSENGERS
- TWO BAGGAGE/CARGO CREWS

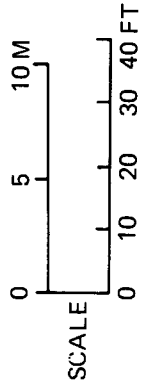
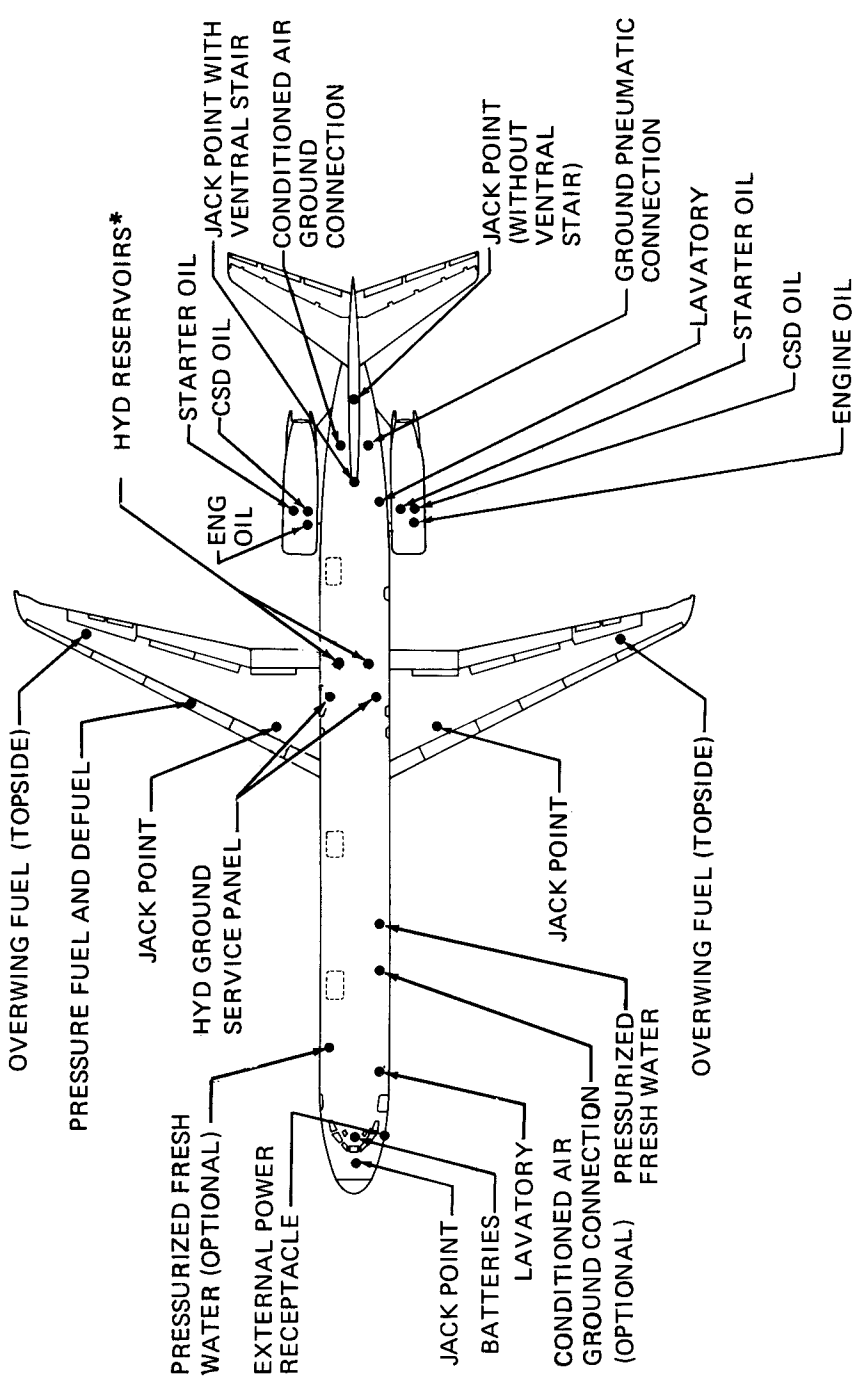
1. TIME AVAILABLE FOR 570 POUNDS OF BULK CARGO
2. PASSENGER ENPLANE AND DEPLANE VIA FRONT AIRSTAIR AND VENTRAL STAIRS
3. CABIN TIDIED BY CABIN ATTENDANT
4. AN ADDITIONAL 1.7 MINUTES REQUIRED FOR BRIDGE OPERATIONS

NOTE: ONBOARD APU OPERATIONAL FOR AIR CONDITIONING, ENGINE START, AND ELECTRICAL POWER.

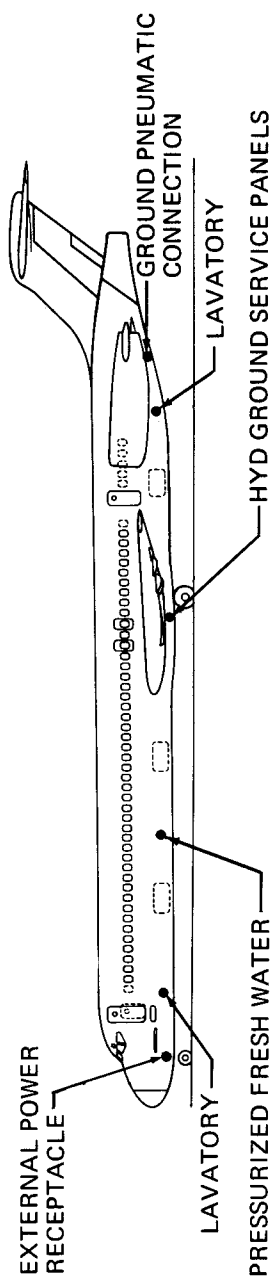
THIS DATA IS PROVIDED TO ILLUSTRATE THE GENERAL SCOPE AND TYPES OF TASKS INVOLVED IN TERMINAL OPERATIONS. VARYING AIRLINE PRACTICES AND OPERATING CIRCUMSTANCES THROUGHOUT THE WORLD WILL RESULT IN DIFFERENT SEQUENCES AND TIME INTERVALS TO ACCOMPLISH THE TASKS SHOWN.

BECAUSE OF THIS, GROUND OPERATIONS REQUIREMENTS SHOULD BE COORDINATED WITH THE USING AIRLINES PRIOR TO RAMP PLANNING.

5.3 TERMINAL OPERATIONS, EN ROUTE STATION MODEL MD-87



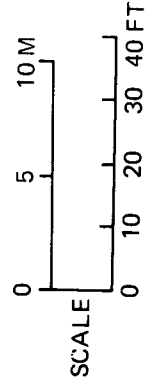
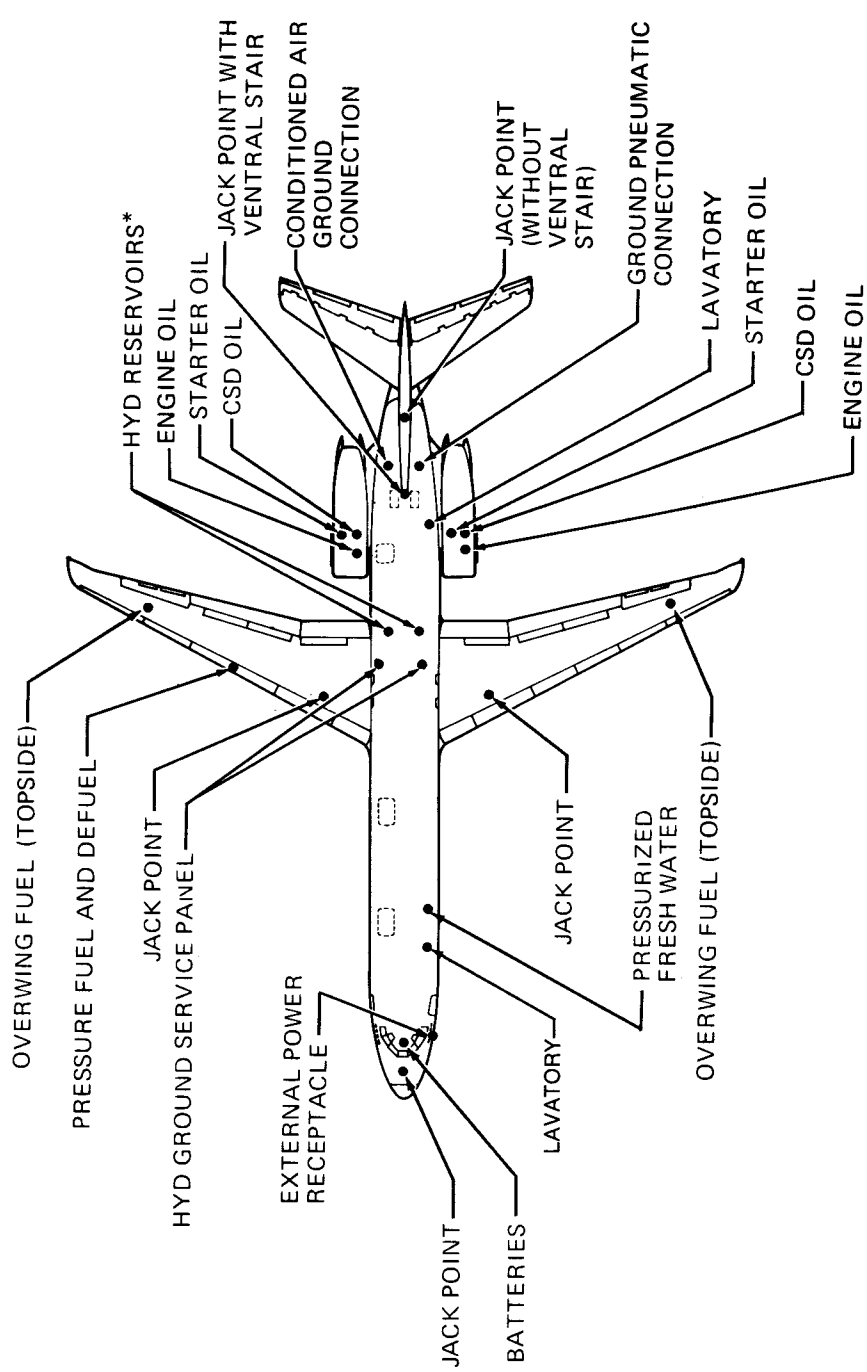
TOP VIEW



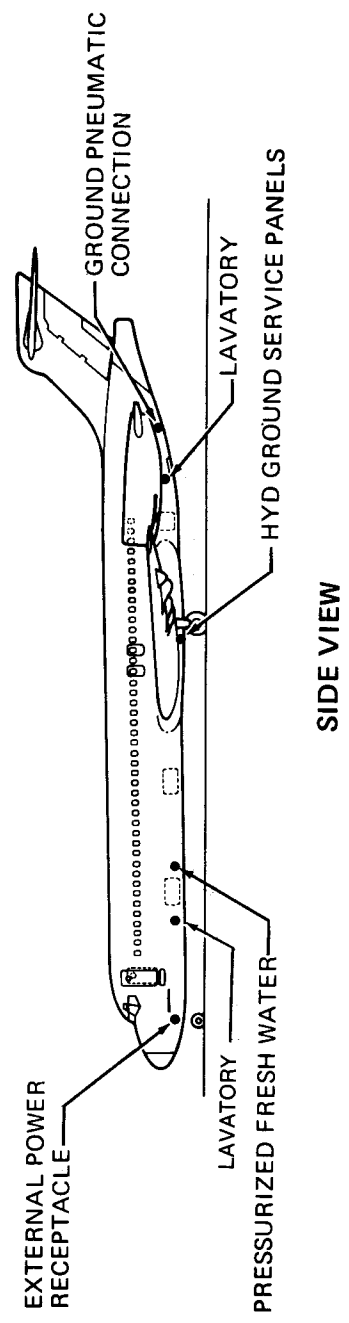
SIDE VIEW

*(ACCESS THROUGH WHEEL WELLS)

5.4 GROUND SERVICE CONNECTIONS MODEL MD-81, -82, -83, AND -88



TOP VIEW



SIDE VIEW

*(ACCESS THROUGH WHEEL WELLS)

5.4 GROUND SERVICE CONNECTIONS MODEL MD-87

| | DISTANCE AFT OF NOSE | | DISTANCE FROM AIRPLANE CENTERLINE | | | | HEIGHT FROM GROUND | |
|---|---|--------|-----------------------------------|--------|-----------|--------|--------------------|--------|
| | FT-IN. | METERS | RIGHT SIDE | | LEFT SIDE | | FT-IN. | METERS |
| | | | FT-IN. | METERS | FT-IN. | METERS | | |
| 5.4.1 HYDRAULIC SYSTEM <ul style="list-style-type: none"> ● 2 SERVICE CONNECTIONS, LH AND RH <ul style="list-style-type: none"> A. HYDRAULIC GROUND CONNECTIONS ● 6 ACCUMULATORS <ul style="list-style-type: none"> A. 2 BRAKE ACCUMULATORS, LH AND RH B. 2 THRUST REVERSER ACCUMULATORS, LH AND RH C. 1 ELEVATOR ACCUMULATORS RH ONLY D. 1 RUDDER ACCUMULATOR RH ONLY (SYSTEM PRESSURE 3000 PSI SKYDROL 500B) | 75-1 | 22.9 | 3-2 | 1.0 | 3-2 | 1.0 | 4-9 | 1.4 |
| | 78-3 | 23.9 | 4-7 | 1.4 | 4-7 | 1.4 | 6-3 | 1.9 |
| | 112-7 | 34.3 | 4-0 | 1.2 | 4-0 | 1.2 | 7-4 | 2.2 |
| | 121-4 | 37.0 | 2-0 | 0.6 | — | — | 8-5 | 2.6 |
| | 116-0 | 35.4 | 2-0 | 0.6 | — | — | 8-5 | 2.6 |
| 5.4.2 ELECTRICAL SYSTEM 1 GROUND SERVICE CONNECTION <ul style="list-style-type: none"> ● 120/208 VOLTS, 400-HZ, 3-PHASE, 4-WIRE 60-KVA CONT. AT 0.80 P.F. | 7-8 | 2.3 | — | — | 4-4 | 1.3 | 5-6 | 1.7 |
| 5.4.3 OXYGEN SYSTEM NO GROUND SERVICE CONNECTIONS A. AIR CREW SYSTEM, ONE 48 FT ³ CYLINDER B. PASSENGER SYSTEM, ONE 114 FT ³ CYLINDER | O ₂ CYLINDERS EXCHANGED. LOCATED IN AIR CREW COMPARTMENT | | | | | | | |
| 5.4.4 FUEL SYSTEM 1 GROUND SERVICE POINT <ul style="list-style-type: none"> ● 420 GPM (1590 LPM) AT 50 PSIG (RH WING) 3 FUEL TANKS <ul style="list-style-type: none"> ● TOTAL CAPACITY 5840 U.S. GALLONS (22,106 LITERS) 2 OUTBOARD MAIN TANKS – 1383 GAL EACH (5235 LITERS) | 77-10 | 23.7 | 26-5 | 8.1 | — | — | 7-2 | 2.2 |

**GROUND SERVICE CONNECTION DATA
MODEL MD-81, -82, -83, AND -88**

| | DISTANCE AFT OF NOSE | | DISTANCE FROM AIRPLANE CENTERLINE | | | | HEIGHT FROM GROUND | |
|---|----------------------|--------|-----------------------------------|--------|-----------|--------|--------------------|--------|
| | FT-IN. | METERS | RIGHT SIDE | | LEFT SIDE | | FT-IN. | METERS |
| | | | FT-IN. | METERS | FT-IN. | METERS | | |
| 5.4.4 FUEL SYSTEM (CONT) 1 CENTER WING TANK – 3074 GAL (11,636 LITERS) 2 OPTIONAL AUXILIARY FUEL TANKS, 580 U.S. GALLONS (2195 LITERS) EACH | | | | | | | | |
| ● TOTAL CAPACITY WITH AUXILIARY TANKS 7000 U.S. GALLONS (26,497 LITERS) | | | | | | | | |
| ● 2 GRAVITY FEED FILLER INLETS | 86-5 | 26.3 | 39-4 | 12.0 | 39-4 | 12.0 | 8.5 | 2.6 |
| ● 6 SUMP DRAIN VALVES | | | | | | | | |
| A. CENTER WING TANK (2 SUMPS) | 73-8 | 22.5 | 2-4 | 0.7 | 2-4 | 0.7 | 4-2 | 1.3 |
| B. WING TANKS (1 SUMP EACH) | 76-2 | 23.2 | 11-4 | 3.5 | 11-4 | 3.5 | 5-11 | 1.8 |
| C. AUXILIARY TANKS (1 SUMP EACH) | | | | | | | | |
| FWD | 48-0 | 14.6 | – | – | 0-9 | 0.2 | 4-1 | 1.2 |
| AFT | 88-4 | 26.9 | – | – | 0-9 | 0.2 | 4-9 | 1.4 |
| 5.4.5 PNEUMATIC SYSTEM | | | | | | | | |
| ● 1 SERVICE CONNECTION FOR AIR CONDITIONING (SEE SECTION 5.6) AND ENGINE STARTING (SEE SECTION 5.5) | 115-9 | 35.3 | – | – | 2-1 | 0.6 | 7-3 | 2.2 |
| ● 1 SERVICE CONNECTION FOR PRECONDITIONED AIR (SEE SECTION 5.7) | 116-1 | 35.4 | 2-1 | 0.6 | – | – | 7-5 | 2.3 |
| OPTIONAL LOCATION | 34-3 | 10.4 | – | – | 4-6 | 1.4 | 6-8 | 2.0 |
| 5.4.6 POTABLE WATER SERVICE | | | | | | | | |
| ● 1 SERVICE CONNECTION AT 10 PSIG PRESSURE | | | | | | | | |
| A. PASSENGER FORWARD POTABLE WATER SERVICE 47 U.S. GALLONS (179 LITERS) AT 6 GALLONS (23 LITERS) PER MINUTE | 43-7 | 13.3 | – | – | 4-5 | 1.3 | 6-6 | 2.0 |
| OPTIONAL LOCATION | 23-3 | 7.1 | 4-5 | 1.3 | – | – | 6-5 | 2.0 |

**GROUND SERVICE CONNECTION DATA
MODEL MD-81, -82, -83, AND -88**

| | DISTANCE AFT OF NOSE | | DISTANCE FROM AIRPLANE CENTERLINE | | | | HEIGHT FROM GROUND | |
|--|----------------------|--------|-----------------------------------|--------|-----------|--------|--------------------|--------|
| | FT-IN. | METERS | RIGHT SIDE | | LEFT SIDE | | FT-IN. | METERS |
| | | | FT-IN. | METERS | FT-IN. | METERS | | |
| 5.4.7 LAVATORY SYSTEMS <ul style="list-style-type: none"> • 2 SERVICE CONNECTIONS 1 FORWARD 12 U.S. GALLONS (45 LITERS) PLUS 8 U.S. GALLONS (30 LITERS) FLUSH REQUIRED AT 25-50 PSIG AND 30 GALLONS (114 LITERS)/MINUTE 1 AFT 34 U.S. GALLONS (128 LITERS) PLUS 16 U.S. GALLONS (60 LITERS) FLUSH REQUIRED AT 25-50 PSIG AND 30 GALLONS (114 LITERS)/MINUTE | 20.0 | 6.1 | — | — | 4-8 | 1.4 | 6-9 | 2.1 |
| | 109-0 | 33.2 | — | — | 4-5 | 1.3 | 8-0 | 2.4 |
| 5.4.8 ENGINE SERVICE SYSTEM <ul style="list-style-type: none"> • 2 SERVICE POINTS A. OIL GRAVITY FILL-CAN SYSTEM OF 5.5 U.S. GAL (21 LITERS), OIL TYPE SPECIFIED BY P&W SERVICE BULLETIN NO. 238 B. CONSTANT SPEED DRIVE. GRAVITY FEED-CAN, REFER TO MD-80 STANDARD PRACTICE MAINTENANCE MANUAL | 106-7 | 32.5 | 7-8 | 2.3 | 10-3 | 3.1 | 9-5 | 2.9 |
| | 107-7 | 32.8 | 8-3 | 2.5 | 9-5 | 2.9 | 8-7 | 2.6 |

**GROUND SERVICE CONNECTION DATA
MODEL MD-81, -82, -83, AND -88**

| | DISTANCE AFT OF NOSE | | DISTANCE FROM AIRPLANE CENTERLINE | | | | HEIGHT FROM GROUND | |
|---|---|--------|-----------------------------------|--------|-----------|--------|--------------------|--------|
| | FT-IN. | METERS | RIGHT SIDE | | LEFT SIDE | | FT-IN. | METERS |
| | | | FT-IN. | METERS | FT-IN. | METERS | | |
| 5.4.1 HYDRAULIC SYSTEM <ul style="list-style-type: none"> ● 2 SERVICE CONNECTIONS, LH AND RH <ul style="list-style-type: none"> A. HYDRAULIC GROUND CONNECTIONS ● 6 ACCUMULATORS <ul style="list-style-type: none"> A. 2 BRAKE ACCUMULATORS, LH AND RH B. 2 THRUST REVERSER ACCUMULATORS, LH AND RH C. 1 ELEVATOR ACCUMULATORS RH ONLY D. 1 RUDDER ACCUMULATOR RH ONLY (SYSTEM PRESSURE 3000 PSI SKYDROL 500B) | 65-7 | 20.0 | 3-2 | 1.0 | 3-2 | 1.0 | 4-10 | 1.5 |
| | 68-9 | 21.0 | 4-7 | 1.4 | 4-7 | 1.4 | 6-3 | 1.9 |
| | 95-2 | 29.0 | 4-0 | 1.2 | 4-0 | 1.2 | 7-4 | 2.2 |
| | 103-11 | 31.7 | 2-0 | 0.6 | — | — | 8-5 | 2.6 |
| | 98-7 | 30.0 | 2-0 | 0.6 | — | — | 8-5 | 2.6 |
| 5.4.2 ELECTRICAL SYSTEM 1 GROUND SERVICE CONNECTION ○ 120/208 VOLTS, 400-HZ, 3-PHASE, 4-WIRE 60-KVA CONT. AT 0.80 P.F. | 7-8 | 2.3 | — | — | 4-4 | 1.3 | 5-5 | 1.7 |
| 5.4.3 OXYGEN SYSTEM NO GROUND SERVICE CONNECTIONS A. AIR CREW SYSTEM, ONE 48 FT ³ CYLINDER B. PASSENGER SYSTEM, ONE 114 FT ³ CYLINDER | O ₂ CYLINDERS EXCHANGED. LOCATED IN AIR CREW COMPARTMENT | | | | | | | |
| 5.4.4 FUEL SYSTEM 1 GROUND SERVICE POINT ● 420 GPM (1590 LPM) AT 50 PSIG (RH WING) 3 FUEL TANKS ● TOTAL CAPACITY 5840 U.S. GALLONS (22,106 LITERS) 2 OUTBOARD MAIN TANKS – 1383 GAL EACH (5235 LITERS) | 68-4 | 20.8 | 26-5 | 8.1 | — | — | 7-3 | 2.2 |

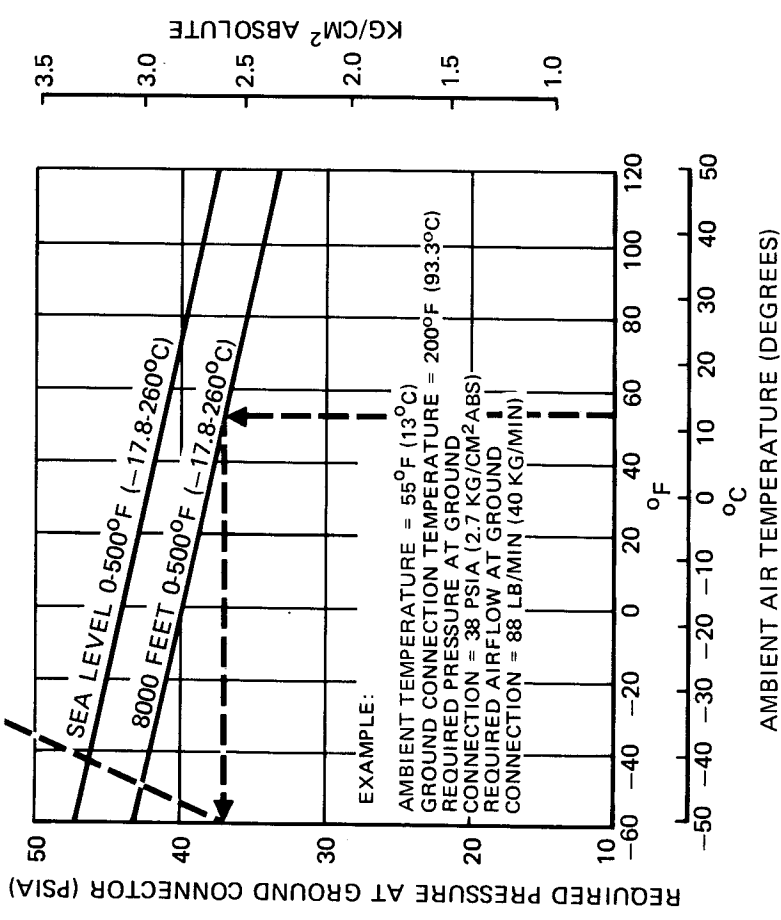
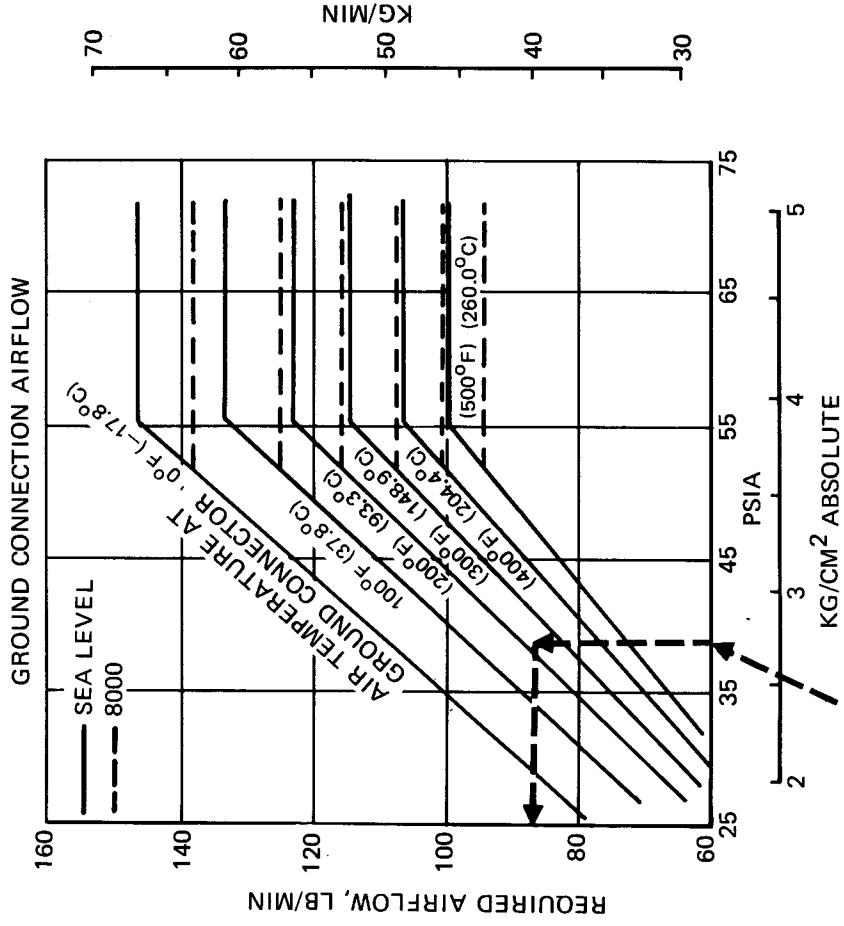
**GROUND SERVICE CONNECTION DATA
MODEL MD-87**

| | DISTANCE AFT OF NOSE | | DISTANCE FROM AIRPLANE CENTERLINE | | | | HEIGHT FROM GROUND | |
|--|----------------------|--------|-----------------------------------|--------|-----------|--------|--------------------|--------|
| | FT-IN. | METERS | RIGHT SIDE | | LEFT SIDE | | FT-IN. | METERS |
| | | | FT-IN. | METERS | FT-IN. | METERS | | |
| 5.4.4 FUEL SYSTEM (CONT) 1 CENTER WING TANK – 3074 GAL (11,636 LITERS) 2 OPTIONAL AUXILIARY FUEL TANKS, 580 U.S. GALLONS (2195 LITERS) EACH ● TOTAL CAPACITY WITH AUXILIARY TANKS 7000 U.S. GALLONS (26,497 LITERS) ● 2 GRAVITY FEED FILLER INLETS ● 6 SUMP DRAIN VALVES A. CENTER WING TANK (2 SUMPS) B. WING TANKS (1 SUMP EACH) C. AUXILIARY TANKS (1 SUMP EACH) FWD AFT | 76-11 | 23.4 | 39-4 | 12.0 | 39-4 | 12.0 | 8-6 | 2.6 |
| | 64-2 | 19.6 | 2-4 | 0.7 | 2-4 | 0.7 | 4-3 | 1.3 |
| | 66-8 | 20.3 | 11-4 | 3.5 | 11-4 | 3.5 | 6-0 | 1.8 |
| | 38-6 | 11.7 | – | – | 0-9 | 0.2 | 4-1 | 1.2 |
| | 78-10 | 24.0 | – | – | 0-9 | 0.2 | 4-11 | 1.5 |
| 5.4.5 PNEUMATIC SYSTEM ● 1 SERVICE CONNECTION FOR AIR CONDITIONING (SEE SECTION 5.6) AND ENGINE STARTING (SEE SECTION 5.5) ● 1 SERVICE CONNECTION FOR PRECONDITIONED AIR (SEE SECTION 5.7) | 98-4 | 30.0 | – | – | 2-1 | 0.6 | 7-3 | 2.2 |
| | 98-8 | 30.1 | 2-1 | 0.6 | – | – | 7-5 | 2.3 |
| 5.4.6 POTABLE WATER SERVICE ● 1 SERVICE CONNECTION AT 10 PSIG PRESSURE A. PASSENGER FORWARD POTABLE WATER SERVICE 47 U.S. GALLONS (179 LITERS) AT 6 GALLONS (23 LITERS) PER MINUTE | 32-5 | 9.9 | – | – | 4-5 | 1.3 | 6-5 | 2.0 |

**GROUND SERVICE CONNECTION DATA
MODEL MD-87**

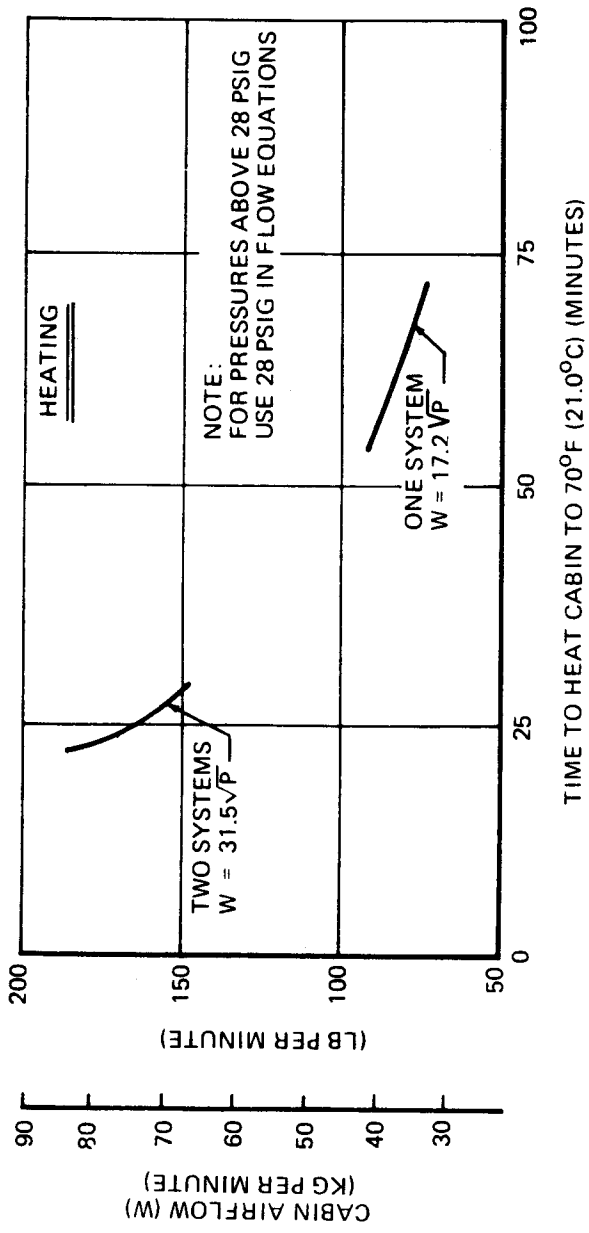
| | DISTANCE AFT OF NOSE | | DISTANCE FROM AIRPLANE CENTERLINE | | | | HEIGHT FROM GROUND | |
|---|----------------------|--------|-----------------------------------|--------|-----------|--------|--------------------|--------|
| | FT-IN. | METERS | RIGHT SIDE | | LEFT SIDE | | FT-IN. | METERS |
| | | | FT-IN. | METERS | FT-IN. | METERS | | |
| 5.4.7 LAVATORY SYSTEMS | | | | | | | | |
| <ul style="list-style-type: none"> • 2 SERVICE CONNECTIONS 1 FORWARD 12 U.S. GALLONS (45 LITERS) PLUS 8 U.S. GALLONS (30 LITERS) FLUSH REQUIRED AT 25-50 PSIG AND 30 GALLONS (114 LITERS)/MINUTE 1 AFT 34 U.S. GALLONS (128 LITERS) PLUS 16 U.S. GALLONS (60 LITERS) FLUSH REQUIRED AT 25-50 PSIG AND 30 GALLONS (114 LITERS)/MINUTE | 23-7 | 7.2 | — | — | 4-10 | 1.5 | 6-3 | 1.9 |
| | 91-7 | 27.9 | — | — | 4-5 | 1.3 | 8-0 | 2.4 |
| 5.4.8 ENGINE SERVICE SYSTEM | | | | | | | | |
| <ul style="list-style-type: none"> • 2 SERVICE POINTS A. OIL GRAVITY FILL-CAN SYSTEM OF 5.5 U.S. GAL (21 LITERS), OIL TYPE SPECIFIED BY P&W SERVICE BULLETIN NO. 238 B. CONSTANT SPEED DRIVE. GRAVITY FEED-CAN, REFER TO MD-80 STANDARD PRACTICE MAINTENANCE MANUAL | 89-2 | 27.2 | 7-8 | 2.3 | 10-3 | 3.1 | 9-4 | 2.8 |
| | 90-2 | 27.5 | 8-3 | 2.5 | 9-5 | 2.9 | 8-7 | 2.6 |

**GROUND SERVICE CONNECTION DATA
MODEL MD-87**

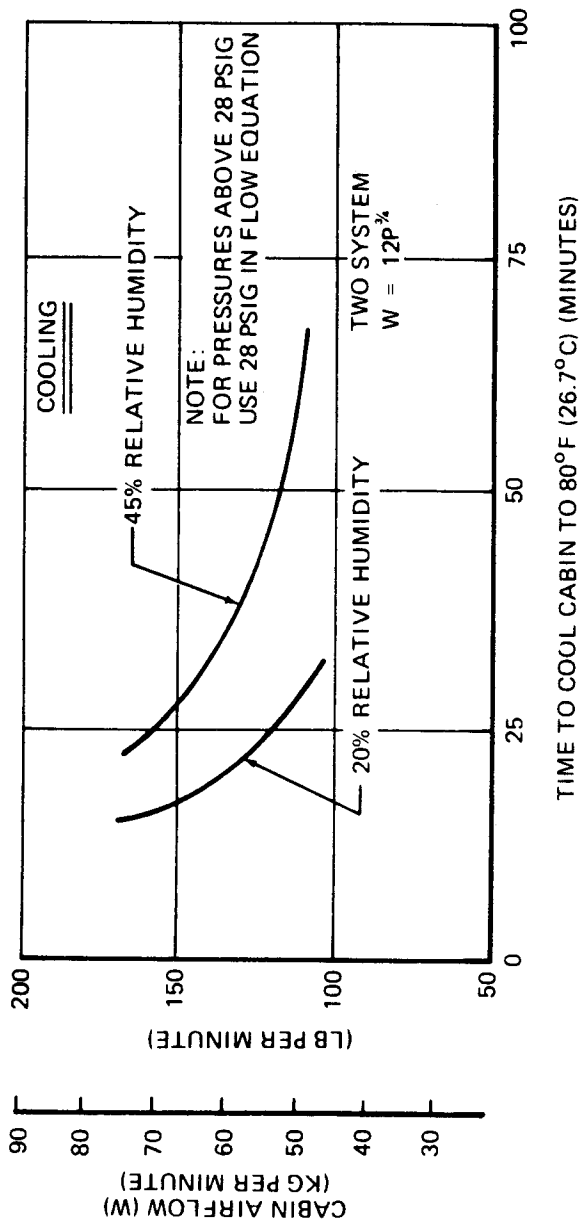


5.5 ENGINE STARTING PNEUMATIC REQUIREMENTS MODEL MD-80 SERIES

INITIAL CABIN TEMP AT 0°F (-17.8°C). OUTSIDE AIR TEMP AT 0°F (-17.8°C). NO GALLEY LOAD, CLOUDY DAY, NO LIGHTS. P = 12 TO 70 PSIG AT THE GROUND CONNECTION. TEMP AT GROUND CONNECTION = 300°F (148.9°C)



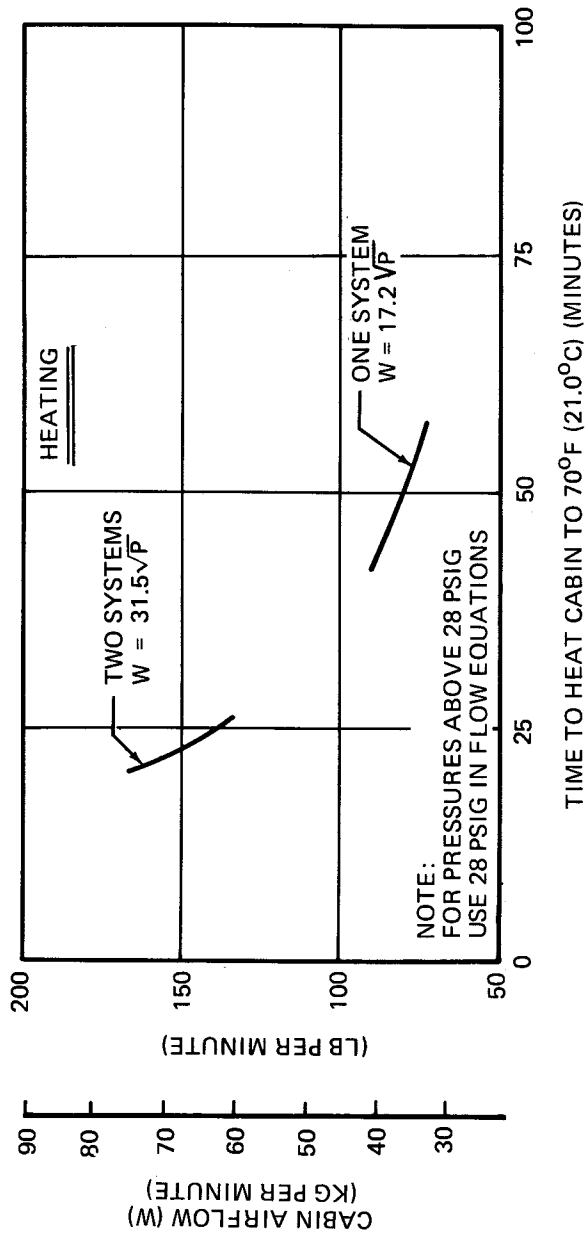
INITIAL CABIN TEMP AT 103°F (39.4°C). OUTSIDE AIR TEMP AT 103°F (39.4°C). SOLAR LOAD x 2430 BTU/HR. BRIGHT DAY; SOLAR IRRADIATION; NO GALLEY LOAD; DAY LIGHTING ON; NO PASSENGERS. P = 12-70 PSIG AT THE GROUND CONNECTION. TEMP AT THE GROUND CONNECTION IS 410°F (210°C).



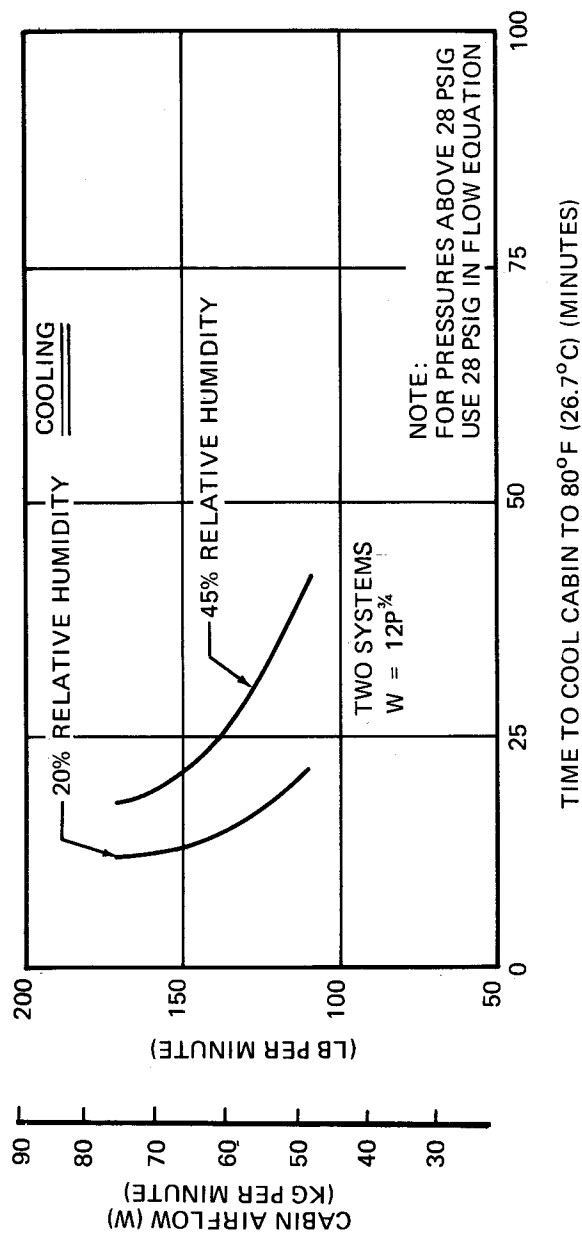
CAUTION: ELECTRICAL POWER IS REQUIRED WHENEVER THE AIR-CONDITIONING SYSTEM IS OPERATED.

5.6 GROUND PNEUMATIC POWER REQUIREMENTS MODEL MD-81, -82, -83, AND -88

INITIAL CABIN TEMP AT 0°F (-17.8°C). OUTSIDE AIR TEMP AT 0°F (-17.8°C). NO GALLEY LOAD, CLOUDY DAY, NO LIGHTS. P = 12 TO 70 PSIG AT THE GROUND CONNECTION. TEMP AT GROUND CONNECTION = 300°F (148.9°C)



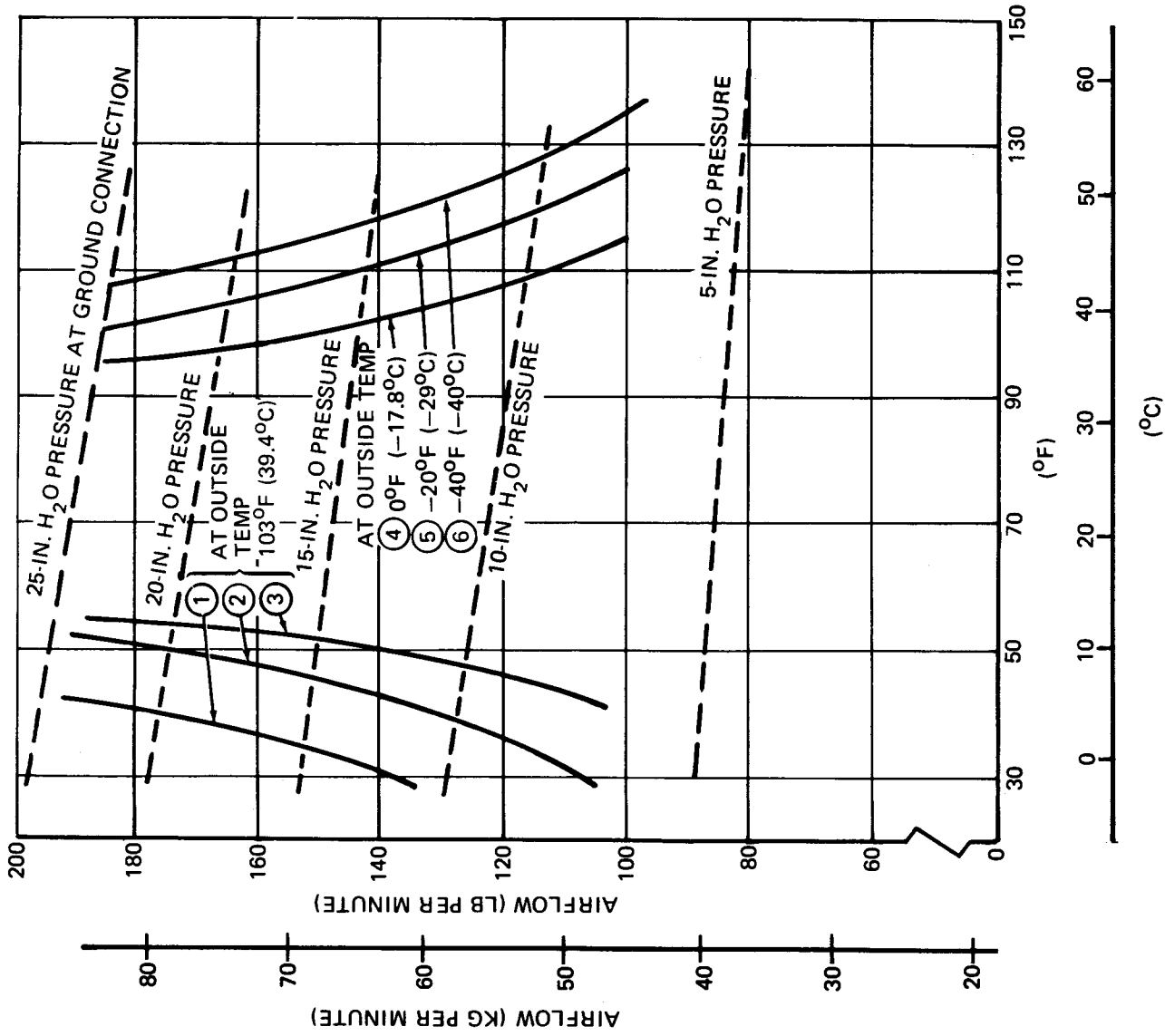
INITIAL CABIN TEMP AT 103°F (39.4°C). OUTSIDE AIR TEMP AT 103°F (39.4°C). SOLAR LOAD x 1970 BTU/HR. BRIGHT DAY; SOLAR IRRADIATION; NO GALLEY LOAD; DAY LIGHTING ON; NO PASSENGERS. P = 12-70 PSIG AT THE GROUND CONNECTION. TEMP AT THE GROUND CONNECTION IS 410°F (210°C).



CAUTION: ELECTRICAL POWER IS REQUIRED WHENEVER THE AIR-CONDITIONING SYSTEM IS OPERATED.

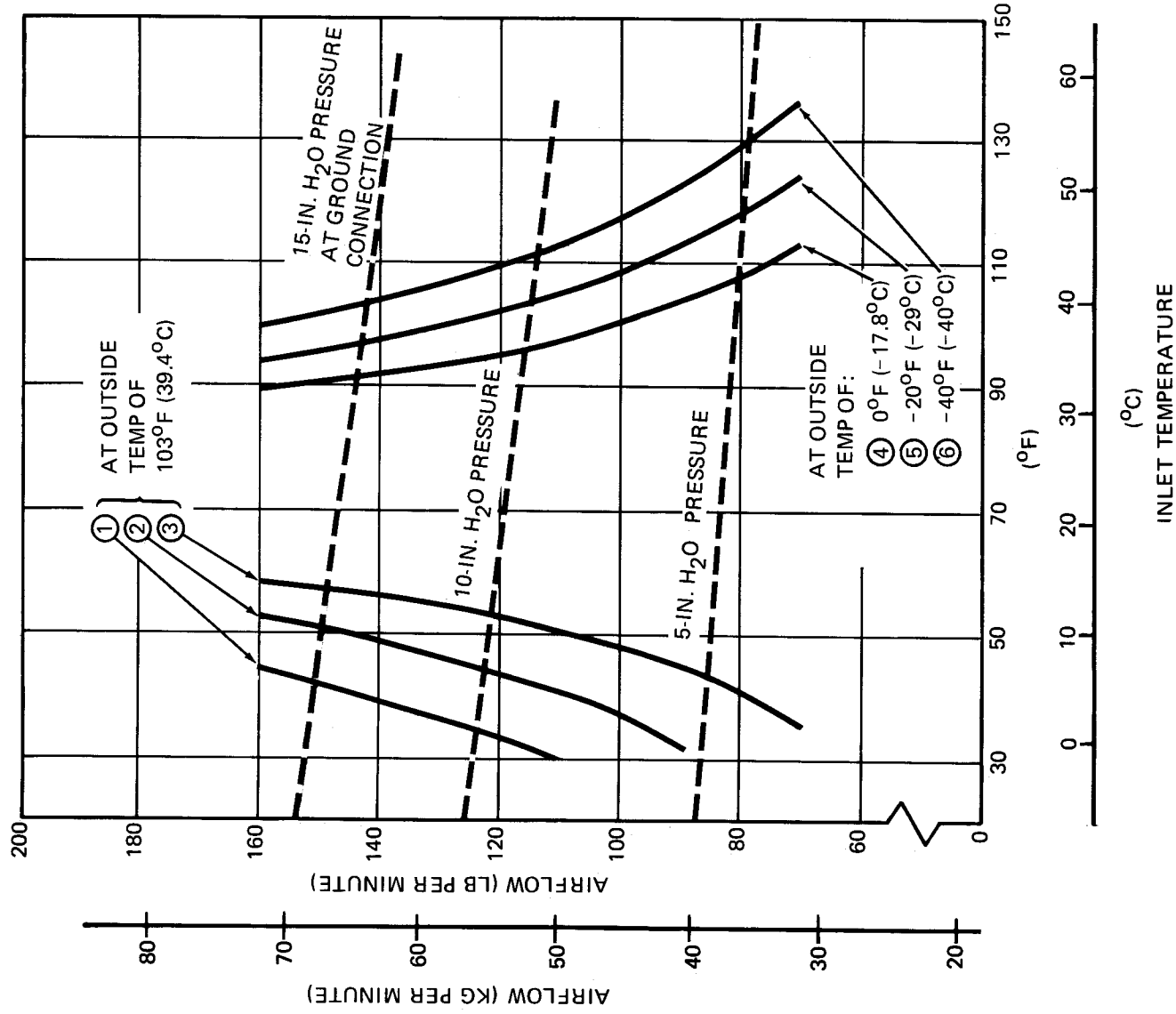
5.7 GROUND PNEUMATIC POWER REQUIREMENTS MODEL MD-87

- ① CABIN TEMP AT 75°F (24°C). 5 CREW, 166 PASSENGERS, NO GALLEY LOAD. BRIGHT DAY; SOLAR IRRADIATION, SOLAR LOAD x 2435 BTU/HR. DAY ELECTRICAL LOAD x 4825 BTU/HR
- ② CABIN TEMP AT 80°F (26.7°C). 5 CREW, 166 PASSENGERS, NO GALLEY LOAD. BRIGHT DAY; SOLAR IRRADIATION, SOLAR LOAD x 2435 BTU/HR. DAY ELECTRICAL LOAD x 4825 BTU/HR.
- ③ CABIN TEMP AT 75°F (24°C). 3 CREW MEMBERS ONLY. BRIGHT DAY; SOLAR IRRADIATION, SOLAR LOAD x 2435 BTU/HR. ELECTRICAL LOAD x 4825 BTU/HR. GALLEY LOAD x 3000 BTU/HR.
- ④ ⑤ AND ⑥ CABIN TEMP AT 70°F (21.1°C). NO CREW, NO PASSENGERS. CLOUDY DAY OR NIGHT, NO SOLAR IRRADIATION, NO ELECTRICAL LOAD. NO GALLEY LOAD.



**5.7 PRECONDITIONED AIRFLOW REQUIREMENTS
MODEL MD-81, -82, -83, AND -88**

- ① CABIN TEMP AT 75°F (24°C). 5 CREW, 130 PASSENGERS, NO GALLEY LOAD. BRIGHT DAY; SOLAR IRRADIATION, SOLAR LOAD x 1970 BTU/HR. DAY ELECTRICAL LOAD x 3860 BTU/HR
- ② CABIN TEMP AT 80°F (26.7°C). 5 CREW, 130 PASSENGERS, NO GALLEY LOAD. BRIGHT DAY; SOLAR IRRADIATION, SOLAR LOAD x 1970 BTU/HR. DAY ELECTRICAL LOAD x 3860 BTU/HR.
- ③ CABIN TEMP AT 75°F (24°C). 3 CREW MEMBERS ONLY. BRIGHT DAY; SOLAR IRRADIATION. SOLAR LOAD x 1970 BTU/HR. ELECTRICAL LOAD x 3860 BTU/HR. GALLEY LOAD x 3000 BTU/HR.
- ④ ⑤ AND ⑥ CABIN TEMP AT 70°F (21.1°C). NO CREW, NO PASSENGERS. CLOUDY DAY OR NIGHT, NO SOLAR IRRADIATION, NO ELECTRICAL LOAD. NO GALLEY LOAD.



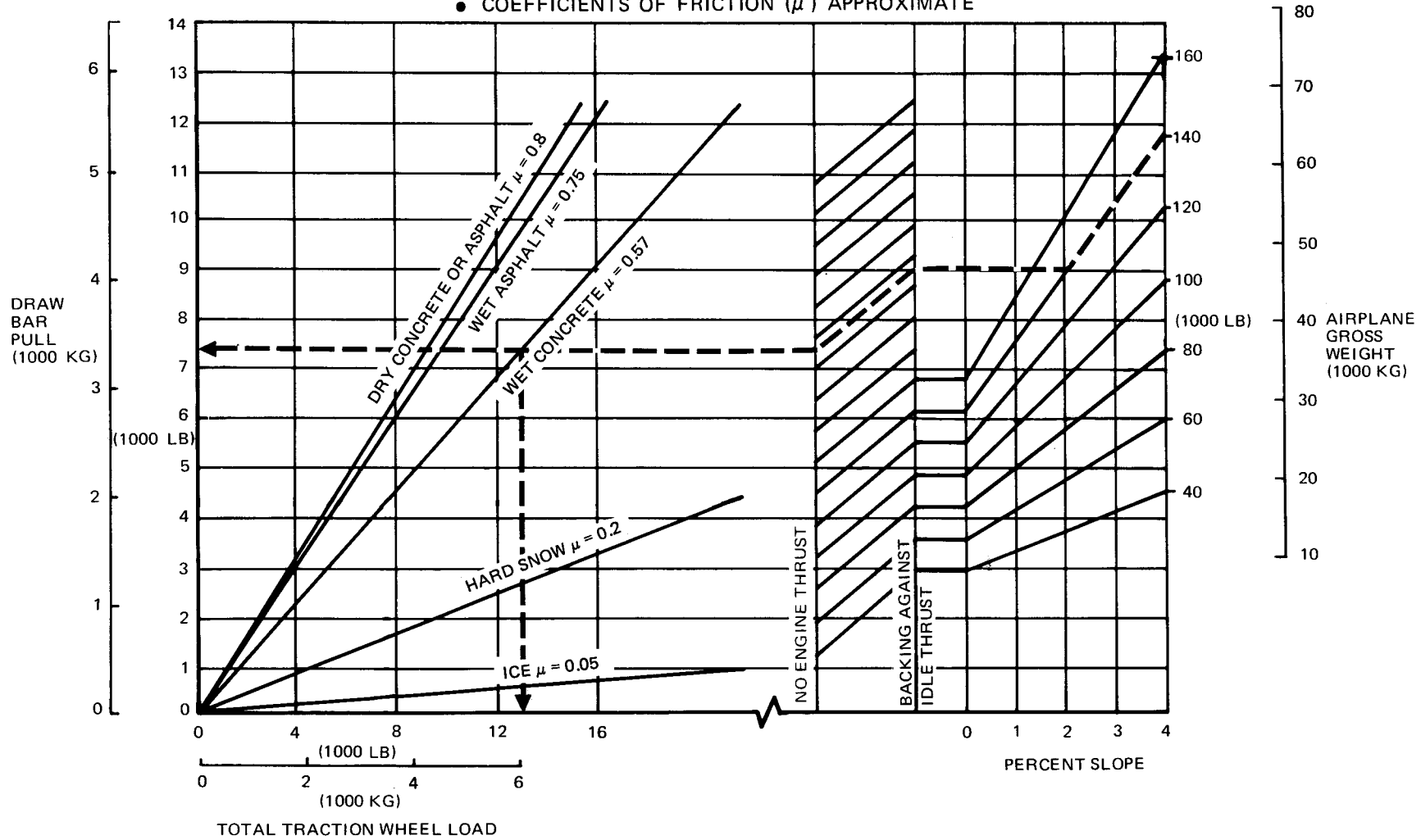
5.7 PRECONDITIONED AIRFLOW REQUIREMENTS MODEL MD-87 SERIES

5.8 Ground Towing Requirements

In order to determine the drawbar pull and total traction wheel load experienced by a tow vehicle, the airplane weight, pavement slope, coefficient of friction, and engine thrust must be known.

In the example for the Model MD-80, the airplane gross weight is 140,000 pounds, the pavement slope is 2 percent, the coefficient of friction is 0.57, and there is no engine thrust. From these conditions, the drawbar pull is 7,300 pounds and the total traction wheel load is 13,000 pounds.

- UNUSUAL BREAKAWAY CONDITIONS NOT REFLECTED
- ESTIMATED FOR RUBBER TIRED TOW VEHICLES
- COEFFICIENTS OF FRICTION (μ) APPROXIMATE

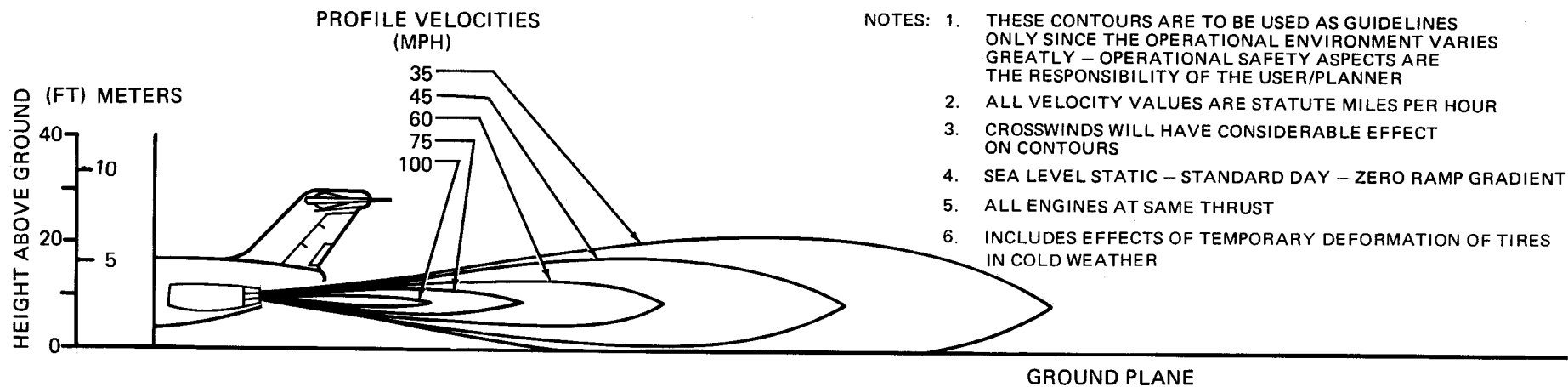


5.8 GROUND TOWING REQUIREMENTS MODEL MD-80

6.0 OPERATING CONDITIONS

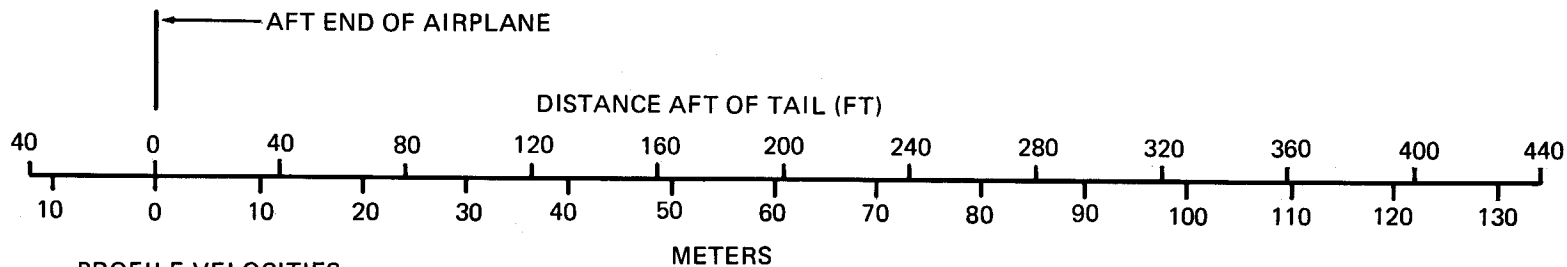
6.1 Jet Engine Exhaust Velocities and Temperatures

6.2 Airport and Community Noise



- NOTES:
1. THESE CONTOURS ARE TO BE USED AS GUIDELINES ONLY SINCE THE OPERATIONAL ENVIRONMENT VARIES GREATLY – OPERATIONAL SAFETY ASPECTS ARE THE RESPONSIBILITY OF THE USER/PLANNER
 2. ALL VELOCITY VALUES ARE STATUTE MILES PER HOUR
 3. CROSSWINDS WILL HAVE CONSIDERABLE EFFECT ON CONTOURS
 4. SEA LEVEL STATIC – STANDARD DAY – ZERO RAMP GRADIENT
 5. ALL ENGINES AT SAME THRUST
 6. INCLUDES EFFECTS OF TEMPORARY DEFORMATION OF TIRES IN COLD WEATHER

ELEVATION

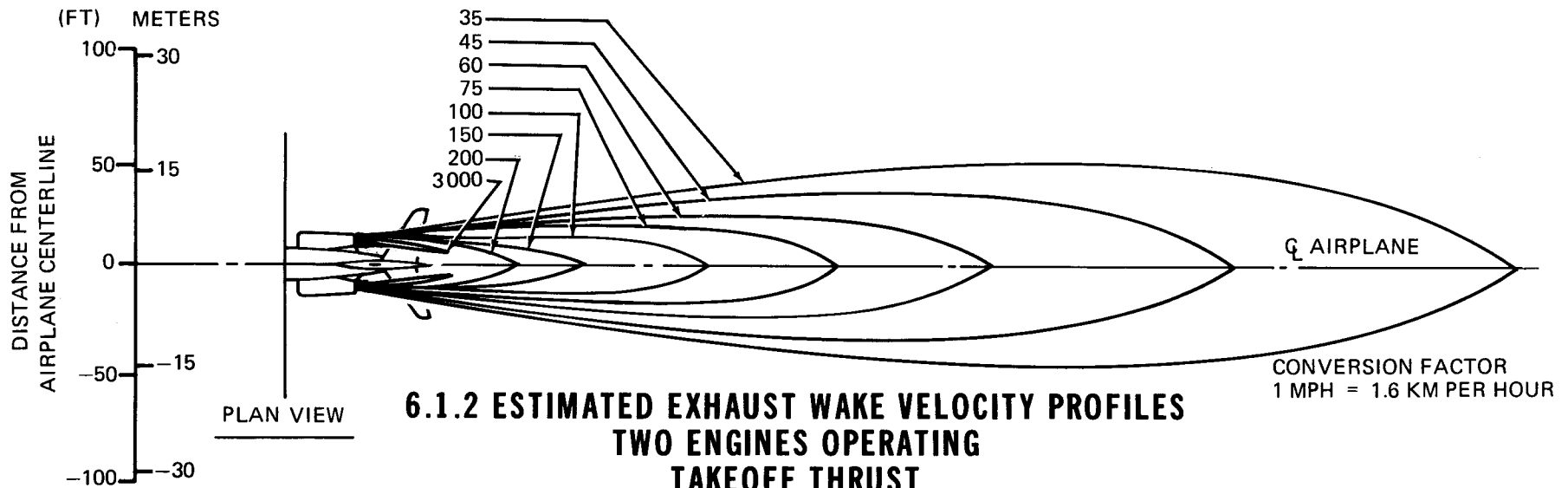
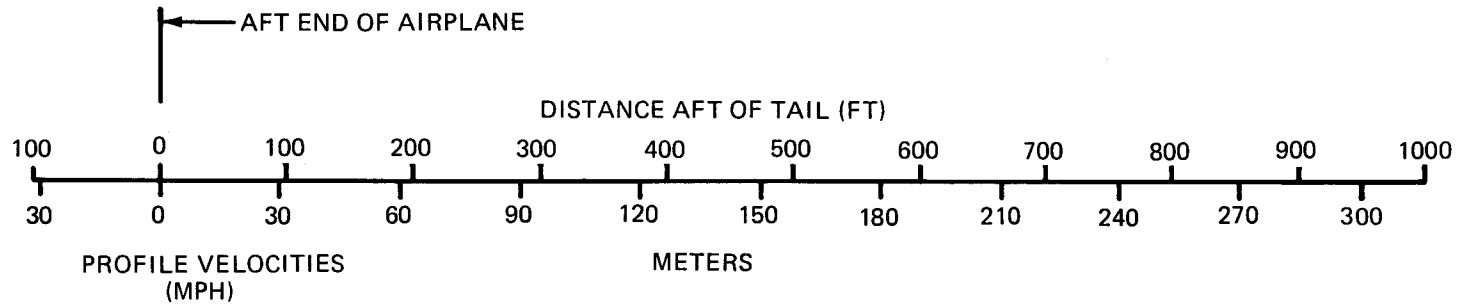
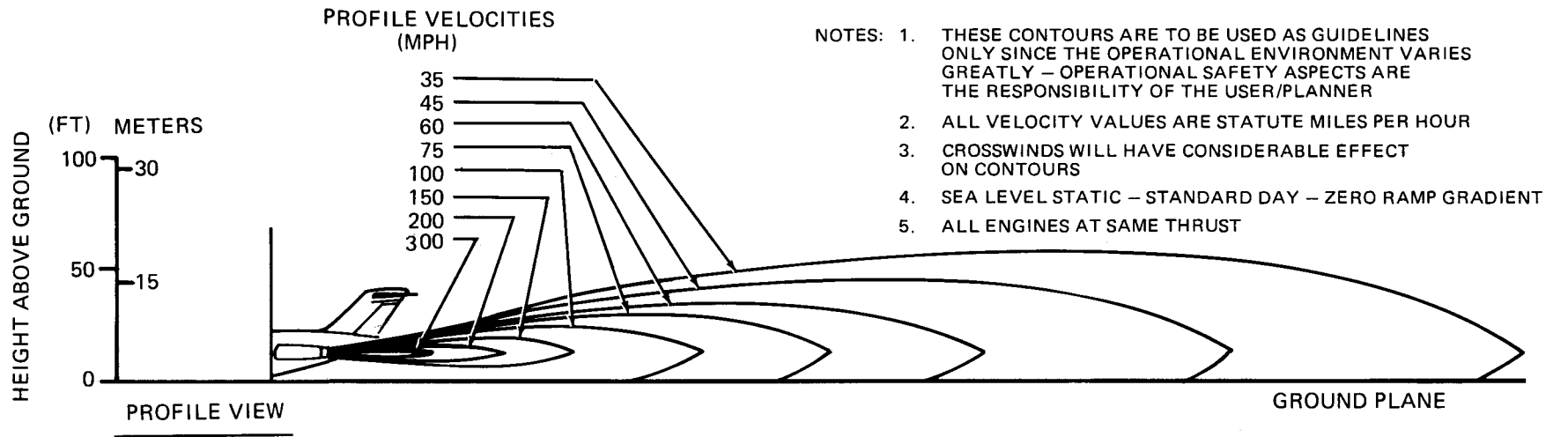


6.0 OPERATING CONDITIONS
6.1 JET ENGINE EXHAUST VELOCITIES AND CONTOURS
6.1.1 ESTIMATED EXHAUST WAKE VELOCITY PROFILES
TWO ENGINES OPERATING
BREAKAWAY THRUST
MD-80 SERIES

PLAN VIEW

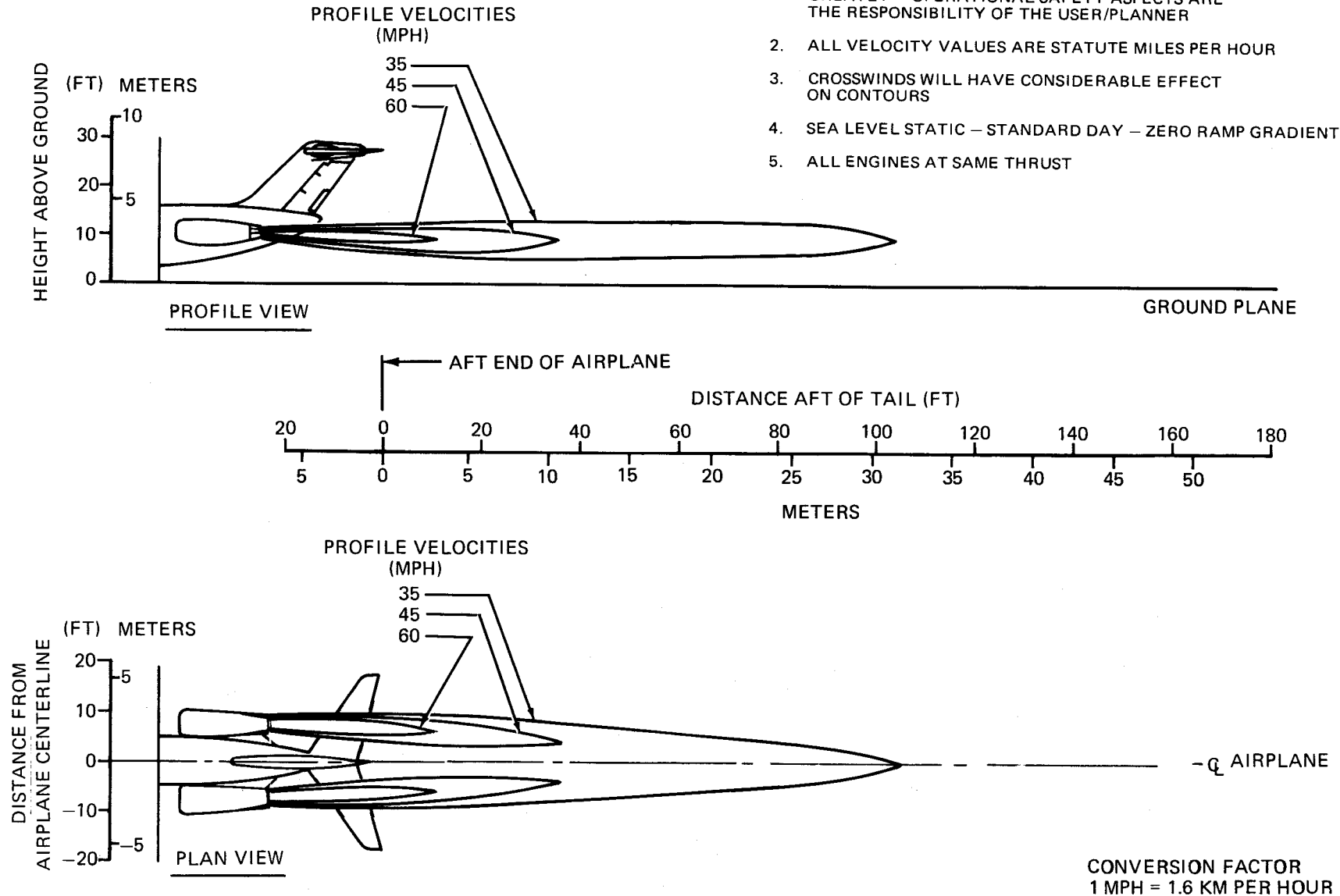
---Q AIRPLANE---

CONVERSION FACTOR
 1 MPH = 1.6 KM PER HOURS



**6.1.2 ESTIMATED EXHAUST WAKE VELOCITY PROFILES
TWO ENGINES OPERATING
TAKEOFF THRUST
MD-80**

- NOTES: 1. THESE CONTOURS ARE TO BE USED AS GUIDELINES ONLY SINCE THE OPERATIONAL ENVIRONMENT VARIES GREATLY – OPERATIONAL SAFETY ASPECTS ARE THE RESPONSIBILITY OF THE USER/PLANNER
2. ALL VELOCITY VALUES ARE STATUTE MILES PER HOUR
3. CROSSWINDS WILL HAVE CONSIDERABLE EFFECT ON CONTOURS
4. SEA LEVEL STATIC – STANDARD DAY – ZERO RAMP GRADIENT
5. ALL ENGINES AT SAME THRUST



**6.1.3 ESTIMATED EXHAUST WAKE VELOCITY PROFILES
TWO ENGINES OPERATING
IDLE THRUST
MD-80**

**6.1.4 JET ENGINE VELOCITIES AND TEMPERATURES
JET ENGINE EXHAUST TEMPERATURE CONTOURS, BREAKAWAY,
TAKEOFF AND IDLE POWER
MD-80**

Temperature contours for the MD-80 with any JT8D engines for idle, breakaway, and takeoff power settings were not prepared because the effects of the exhaust temperatures are considerably less adverse than exhaust velocity at any given position behind the aircraft.

6.2 Airport and Community Noise

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

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

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

1. Operational Factors

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

2. Atmospheric Conditions – Sound Propagation

- (a) Wind – With stronger headwinds, the aircraft can take off and climb more rapidly relative to the ground. Also, winds can influence the distribution of noise in surrounding communities.
- (b) Temperature and Relative Humidity – The absorption of noise in the atmosphere along the transmission path between the aircraft and the ground observer varies with both temperature and relative humidity.

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

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

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

7.0 PAVEMENT DATA

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

7.0 PAVEMENT DATA

7.1 General Information

A brief description of the pavement charts which follow will be helpful in their use for airport planning. Each airplane configuration is depicted with a minimum range of four loads imposed on the main landing gear to aid in interpolation between the discrete values shown. All curves are plotted at constant specified tire pressure at the highest certified weight for each model.

Subsection 7.2 presents basic data on the landing gear footprint configuration, tire sizes, and tire pressures. The pressure for less than at maximum weight may be determined from the chart in Subsection 7.2.1.

Subsection 7.3 lists maximum vertical and horizontal pavement loads at the tire ground interfaces for certain critical conditions.

Subsection 7.4 provides a chart which shows static loads imposed on the main landing gear struts for the operational limits of the airplane. These main landing gear loads are used for the interpretation of the pavement design charts which follow.

Subsection 7.5 presents a pavement requirement chart for flexible pavements. Flexible pavement design curves are based upon the format and procedures set forth in Instruction Report No. S-77-1, "Procedures for Development of CBR Design Curves," published in June 1977 by the U.S. Army Engineer Waterways Experiment Station, Soils and Pavements Laboratory, Vicksburg, Mississippi.

The following procedure is used to develop the flexible pavements curves.

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

Subsection 7.6 consists of LCN conversion curves for flexible pavements. These LCN curves have been plotted using procedures and curves in the International Civil Aviation Organization (ICAO) Aerodrome Design Manual, Part 3 Pavements, Document 9157-AN/901, 1977. On the same charts are plots of equivalent single wheel load versus pavement thickness.

Subsection 7.7 provides rigid pavement design curves prepared with the use of the Westergaard Equations in general accordance with the relationships outlined in the 1955 edition of "Design of Concrete Airport Pavement" published by the Portland Cement Association, 33 W. Grand Ave., Chicago, Illinois, but modified to the new format described in the 1968 Portland Cement Association publication, "Computer Program for Airport Pavement Design" by Robert G. Packard. The following procedure is used to develop the rigid pavement design curves.

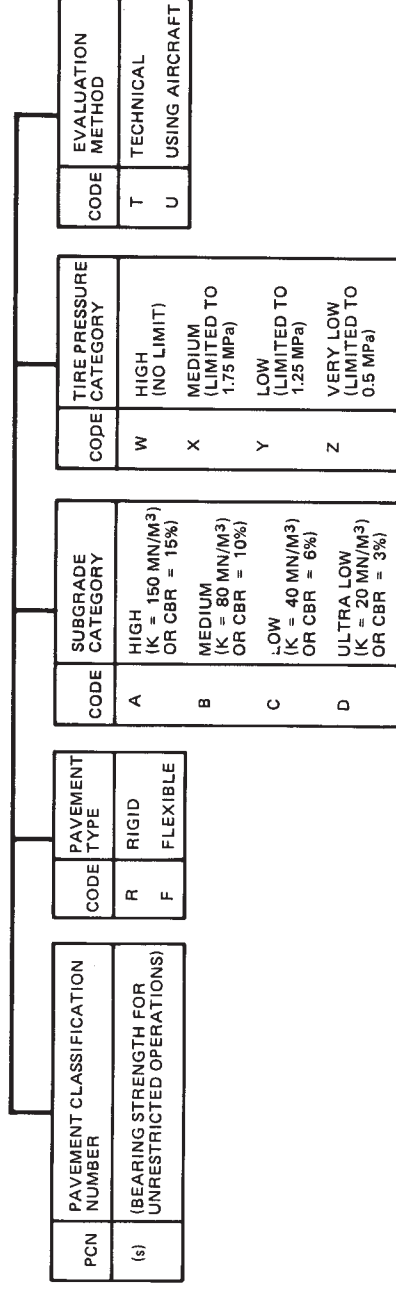
1. Having established the scale for pavement thickness to the left and the scale for allowable working stress to the right, an arbitrary load line is drawn representing the main landing gear maximum weight to be shown.
2. All values of the subgrade modulus (K-values) are then plotted using the maximum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

Subsection 7.8 presents LCN conversion curves for rigid pavements. These curves have been plotted using procedures and curves in the International Civil Aviation Organization (ICAO) Aerodrome Design Manual, Part 3 Pavements, Document 9157-AN/901, 1977. On the same charts are plots of equivalent single wheel load versus radius of relative stiffness. The LCN requirements are based on the condition of center of slab loading. Radius of relative stiffness values are obtained from Subsection 7.8.1.

Subsection 7.9 provides ACN data prepared according to the ACN-PCN system described in Aerodromes, Annex 14 to the Convention on International Civil Aviation.

ACN-PCN 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, where 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 method of pavement evaluation is the responsibility of the airport with the results of their evaluation presented as follows:

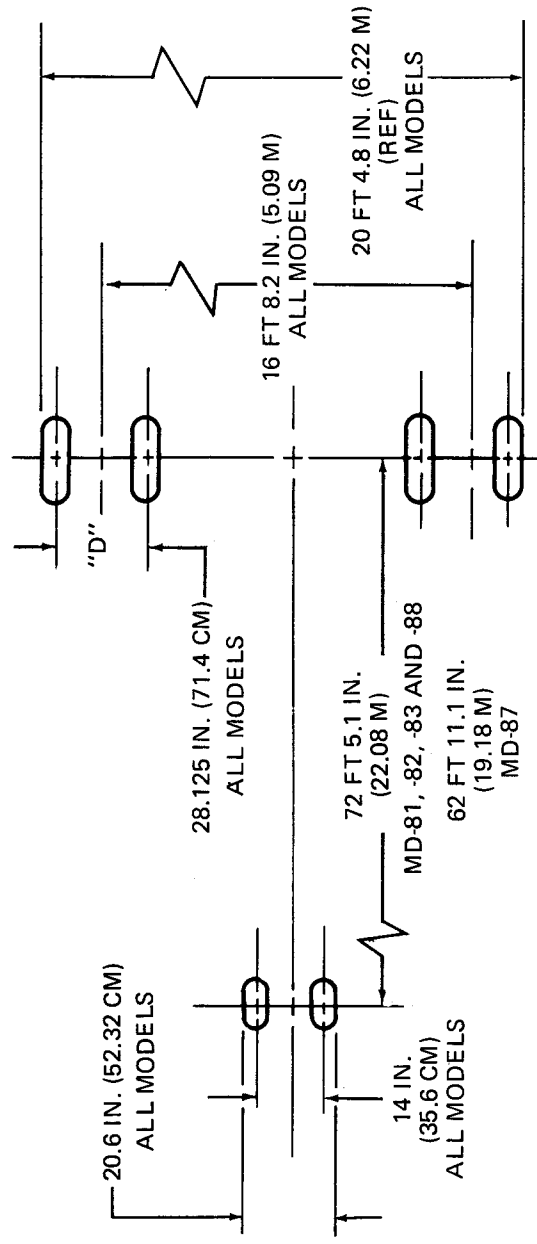
REPORT EXAMPLE: PCN 80/R/B/W/T



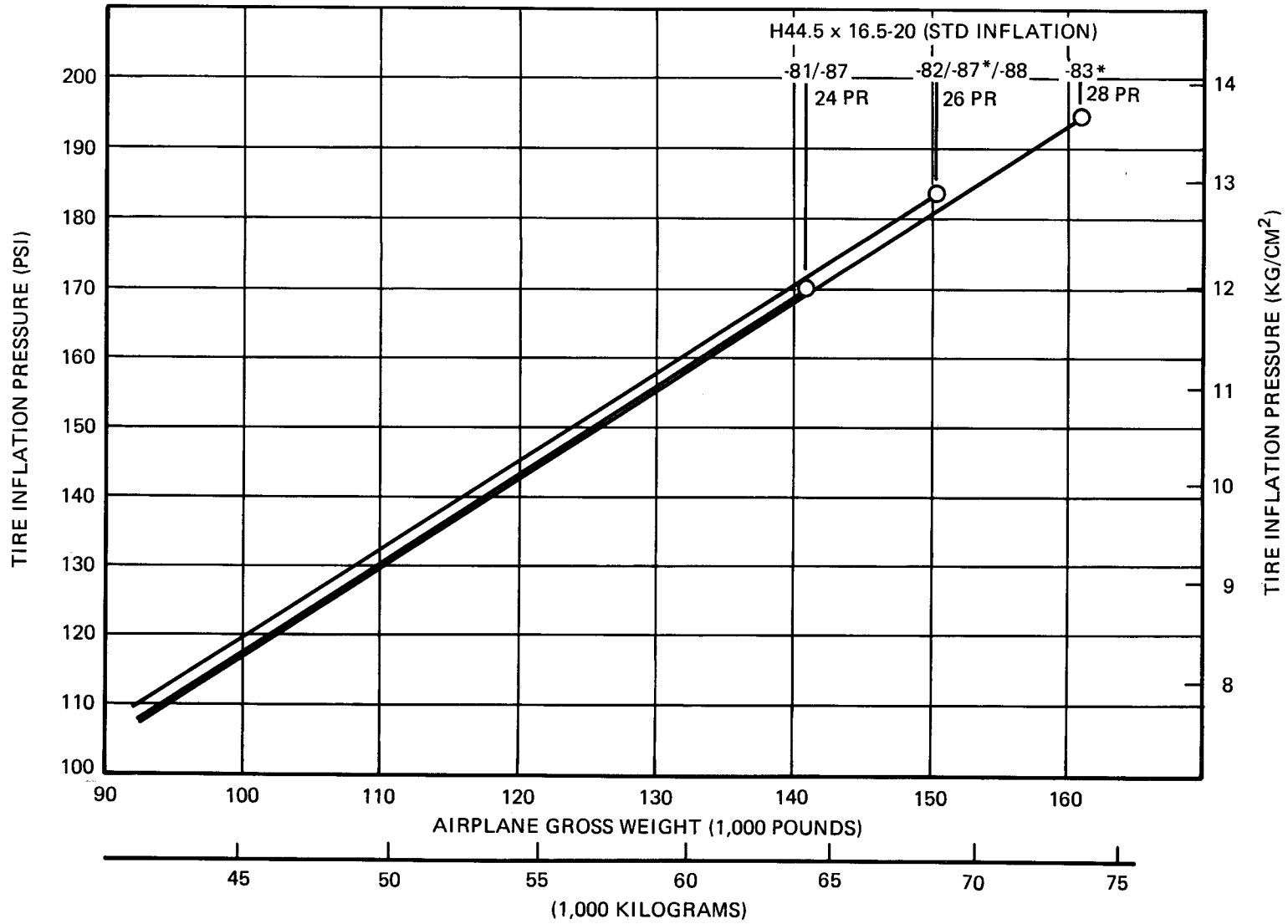
| MODEL MD-80 SERIES | | | |
|--------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| | -81 | -82, -88 | -83* |
| MAXIMUM RAMP WEIGHT | 141,000 LB (63,946 KG) | 150,500 LB (68,254 KG) | 161,000 LB (73,016 KG) |
| PERCENT OF WEIGHT ON MAIN GEAR | | | |
| | | | -87 |
| | | | -87* |
| | | | 150,500 LB (68,254 KG) |
| SEE SUBSECTION 7.4 | | | |
| NOSE TIRE SIZE | 26 x 6.6 TYPE VII | 26 x 6.6 TYPE VII | 26 x 6.6 TYPE VII |
| NOSE TIRE PRESSURE | 155 PSI (10.9 KG/CM ²) | 155 PSI (10.9 KG/CM ²) | 170 PSI (12.0 KG/CM ²) |
| MAIN GEAR TIRE SIZE | H 44.5 x 16.5 - 20 24 PR | H 44.5 x 16.5 - 20 26 PR | H 44.5 x 16.5 - 20 24 PR |
| MAIN GEAR TIRE PRESSURE | 170 PSI (12.0 KG/CM ²) | 184 PSI (12.9 KG/CM ²) | 170 PSI (12.0 KG/CM ²) |
| | | | H 44.5 x 16.5 - 20 26 PR |
| | | | 192 PSI (13.5 KG/CM ²) |
| | | | 184 PSI (12.9 KG/CM ²) |

MAIN GEAR TIRE INFLATIONS INCLUDE A 7 PERCENT MARGIN FOR IMPROVED SAFETY (DOUGLAS POLICY).

*WITH FUSELAGE AUXILIARY FUEL TANKS



7.2 FOOTPRINT MODEL MD-80 SERIES

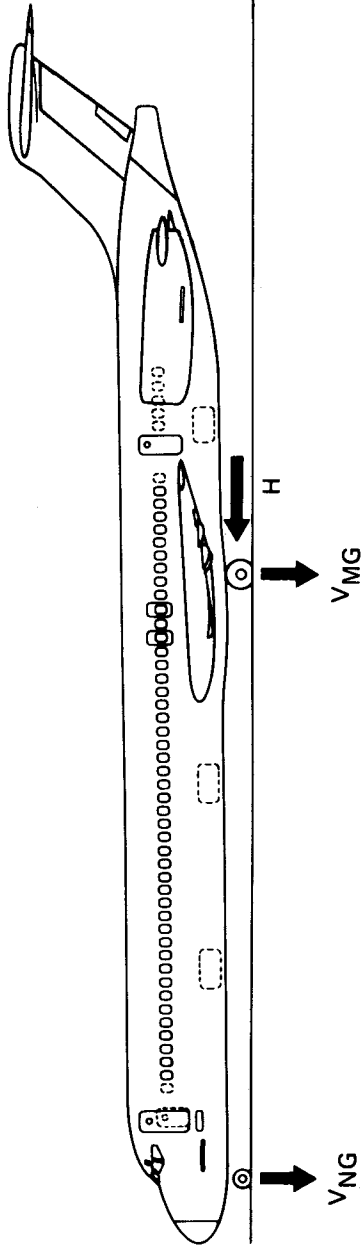


*WITH FUSELAGE AUXILIARY FUEL TANKS

7.2.1 MAIN GEAR TIRE INFLATION CHART – STANDARD-PRESSURE MODEL MD-80 SERIES

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

NOTE: ALL LOADS CALCULATED USING
 AIRPLANE MAXIMUM GROSS WEIGHT



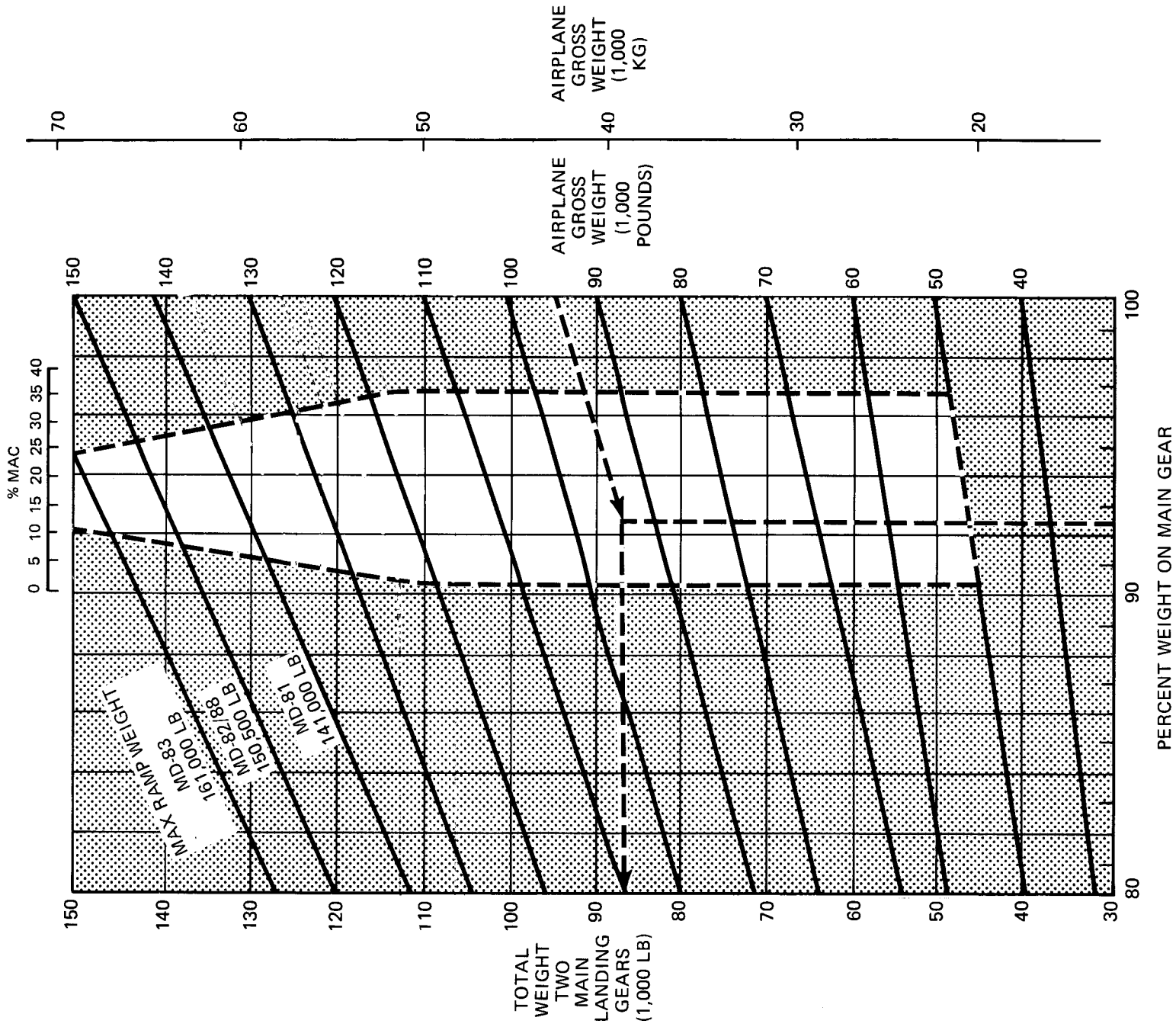
| MODEL MD-80 | MAXIMUM GROSS WEIGHT LB | V _{NG} FORWARD CG | | | V _{MG} PER STRUT (2) AFT CG | | | H PER STRUT (2) | | |
|-------------|----------------------------|----------------------------|--------------|-----------------------|--------------------------------------|--------------|--------|---|---|-----------------------|
| | | STATIC LB | STATIC KG | STEADY BRAKING* LB | STATIC LB | STATIC KG | LB | INSTANTANEOUS BRAKING (COEFF OF FRICTION 0.8) LB | INSTANTANEOUS BRAKING (COEFF OF FRICTION 0.8) KG | STEADY BRAKING* LB |
| -81 | 141,000 | 12,634 | 5,731 | 17,736 | 67,405 | 30,574 | 49,370 | 22,394 | 21,894 | 9,932 |
| -82, -88 | 150,500 | 13,400 | 6,079 | 18,365 | 71,538 | 32,453 | 52,367 | 23,756 | 23,370 | 10,601 |
| -83** | 161,000 | 15,100 | 6,850 | 20,300 | 76,280 | 34,600 | 55,950 | 25,380 | 25,000 | 11,340 |
| -87 | 141,000 | 14,896 | 6,757 | 19,875 | 66,813 | 30,306 | 48,537 | 22,016 | 21,648 | 9,819 |
| -87** | 150,500 | 16,026 | 7,269 | 20,178 | 71,310 | 32,346 | 51,444 | 23,335 | 23,107 | 10,481 |

*10 FT/SEC² DECELERATION DUE ONLY TO BRAKING

**WITH FUSELAGE AUXILIARY FUEL TANKS

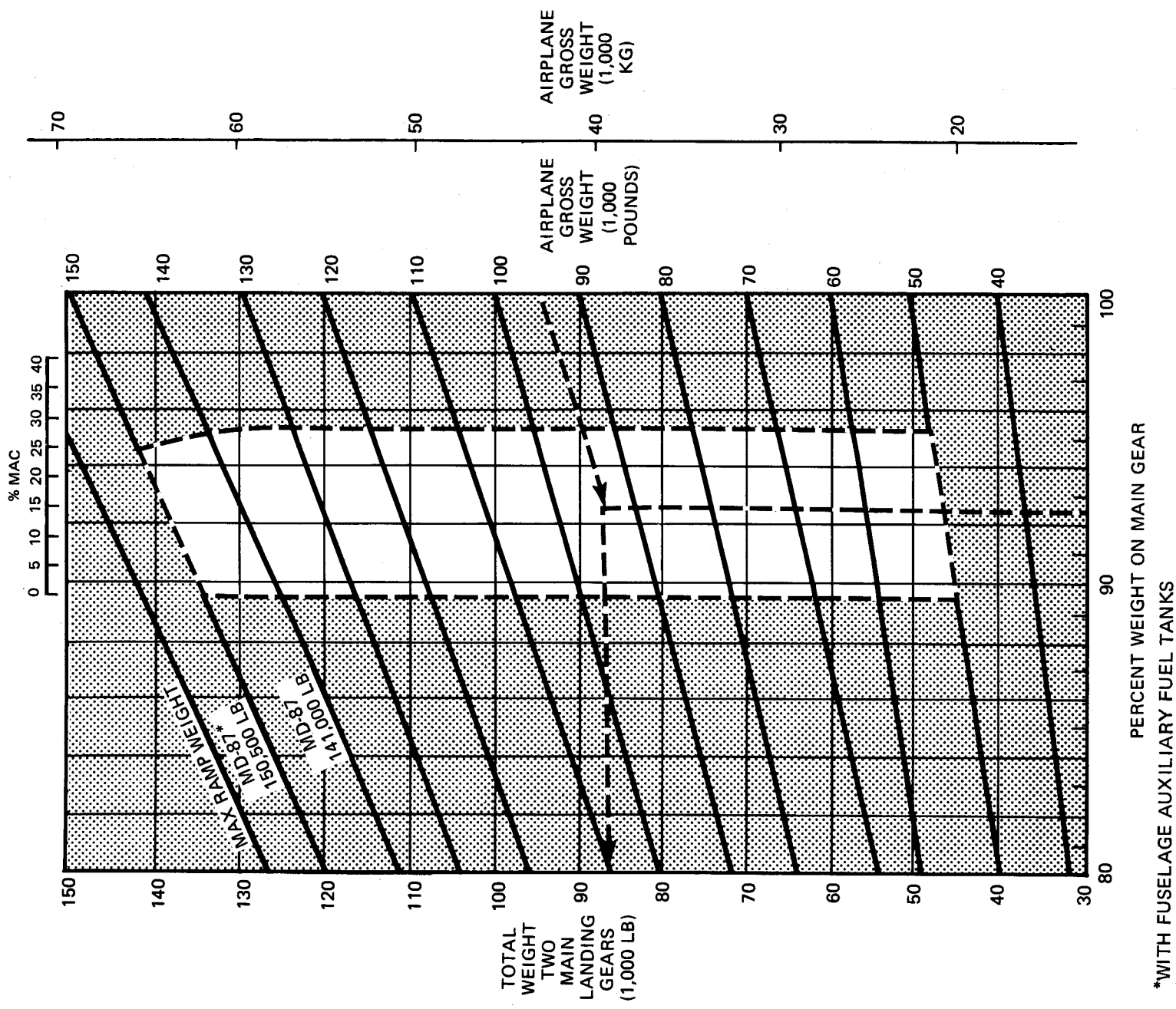
7.3 MAXIMUM PAVEMENT LOADS MODEL MD-80 SERIES

NOTE: UNSHADED AREAS REPRESENT OPERATIONAL LIMITS



7.4 LANDING GEAR LOADING ON PAVEMENT MODEL MD-81, -82, -83, AND -88

NOTE: UNSHADED AREAS REPRESENT OPERATIONAL LIMITS



*WITH FUSELAGE AUXILIARY FUEL TANKS

7.4 LANDING GEAR LOADING ON PAVEMENT MODEL MD-87

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

The flexible-pavement design chart is prepared for standard-pressure tires. This chart presents data for incremental main-gear weights as well as the maximum ramp weight of each model.

In the example shown for the MD-80 series, for a CBR of 7.0 and an annual departure level of 6,000, the required flexible-pavement thickness for an airplane with a main gear loading of 100,000 pounds is 24.0 inches.

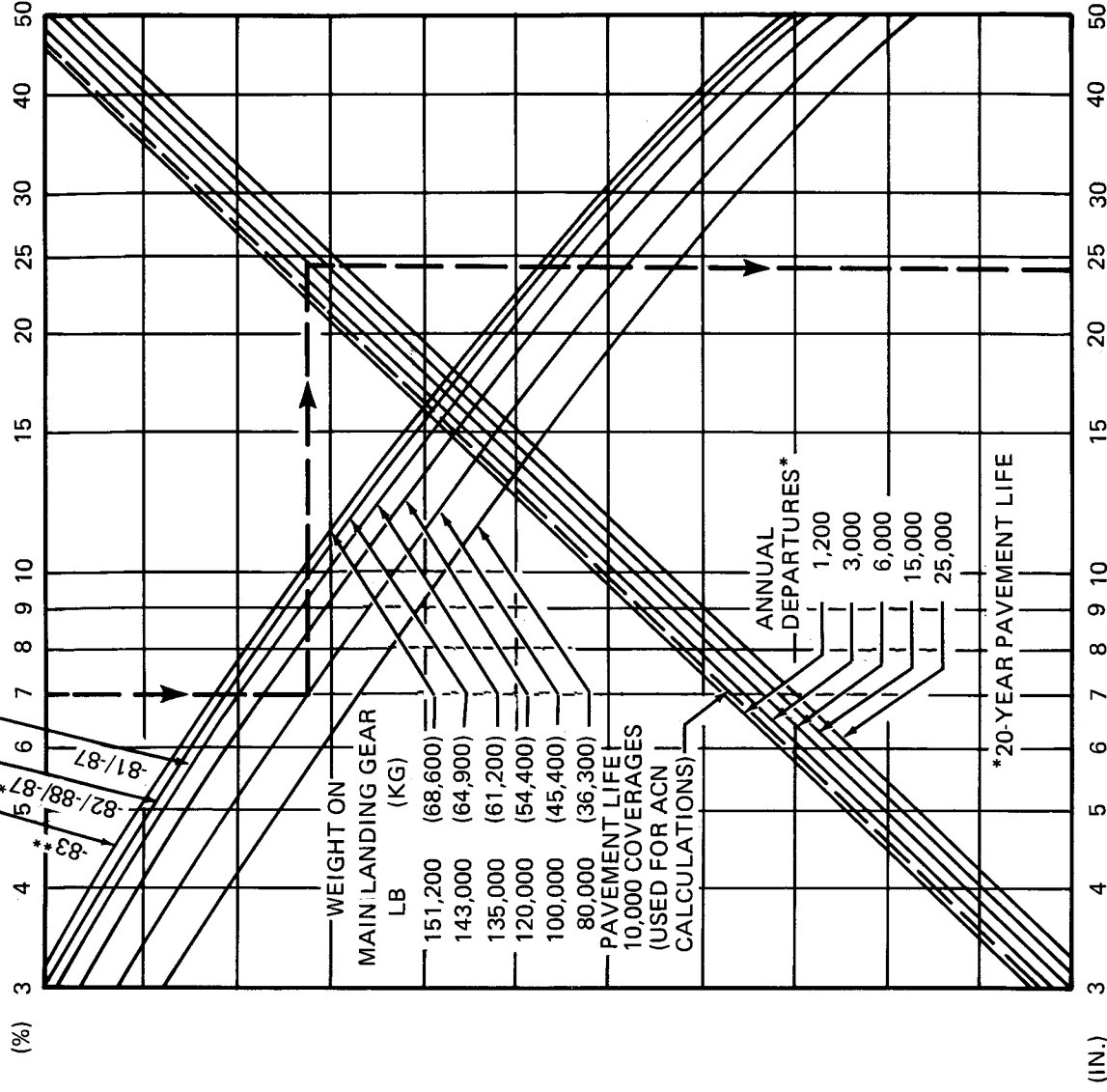
The line showing 10,000 coverages is used for ACN calculations.

H44.5 x 16.5-20 TIRES

TIRE PRESSURE RANGE: 170 TO 195 PSI

MAXIMUM POSSIBLE MAIN GEAR LOAD AT
MAXIMUM RAMP WEIGHT AND AFT C.G.

CALIFORNIA BEARING RATIO (CBR)



(IN.) 3 4 5 6 7 8 9 10 15 20 25 30 40 50

(CM) 10 15 20 25 30 40 50 60 80 100 120

FLEXIBLE PAVEMENT THICKNESS

**WITH FUSELAGE AUXILIARY FUEL TANKS

7.5 FLEXIBLE PAVEMENT REQUIREMENTS – U.S. ARMY CORPS OF ENGINEERS DESIGN METHOD (S-77-1) – MODEL MD-80 SERIES

7.6 Flexible Pavement Requirements, LCN Conversion

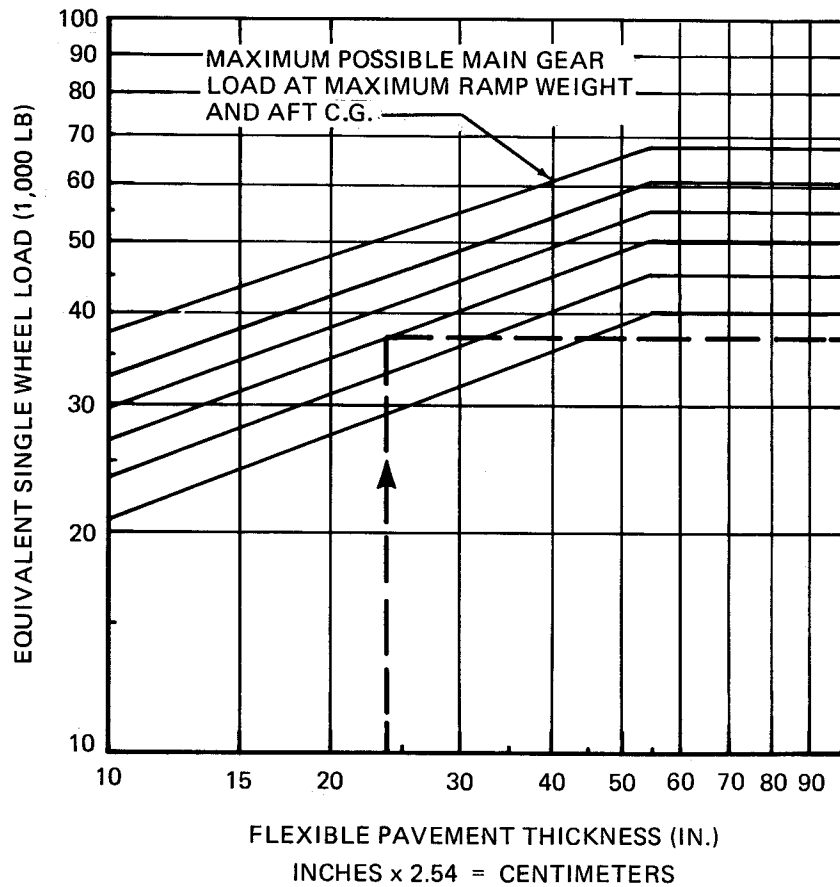
In order to determine the airplane weight that can be accommodated on a particular flexible airport pavement, both the LCN of the pavement and the thickness (h) of the pavement must be known.

In the example for the Model MD-82, the flexible pavement thickness is 30 inches and the LCN is 74. For these conditions, the weight on the main landing gear is 120,000 pounds.

Note: If the resultant aircraft LCN is not more than 10 percent above the published pavement LCN, it is the United Kingdom's view that the bearing strength of the pavement can be considered sufficient for unlimited use by the airplane. The figure of 10 percent has been chosen as representing the lowest degree of variation in LCN which is significant. (Reference: ICAO Aerodrome Design Manual, Part 3 Pavements, Document 9157-AN/901, 1977 Edition.)

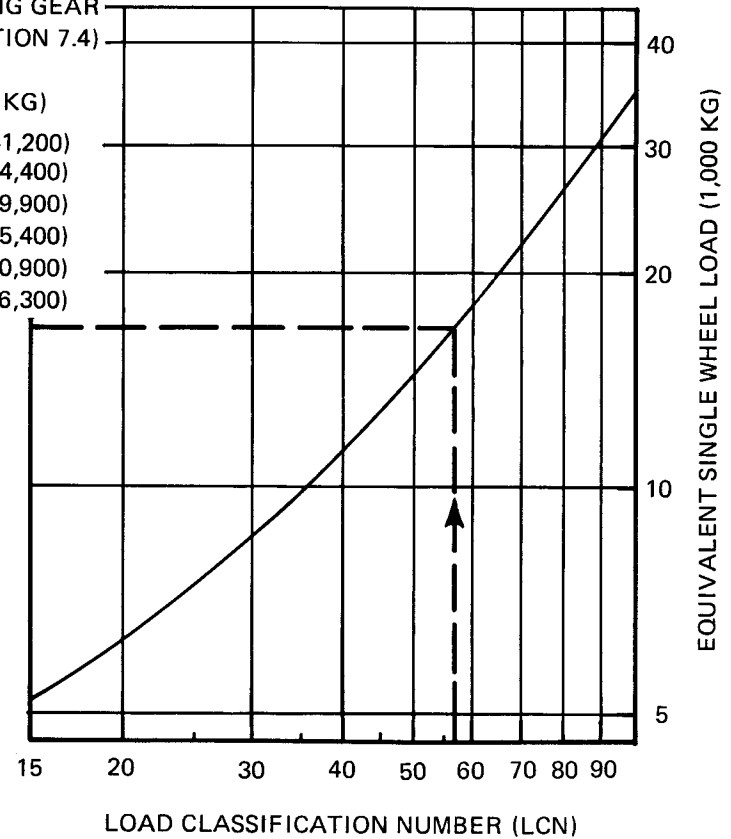
NOTE: EQUIVALENT SINGLE WHEEL LOADS ARE DERIVED BY METHODS SHOWN IN ICAO AERODROME MANUAL

- H44.5 x 16.5-20 TIRES
- TIRE PRESSURE CONSTANT AT 170 PSI



WEIGHT ON MAIN LANDING GEAR (SEE SUBSECTION 7.4)

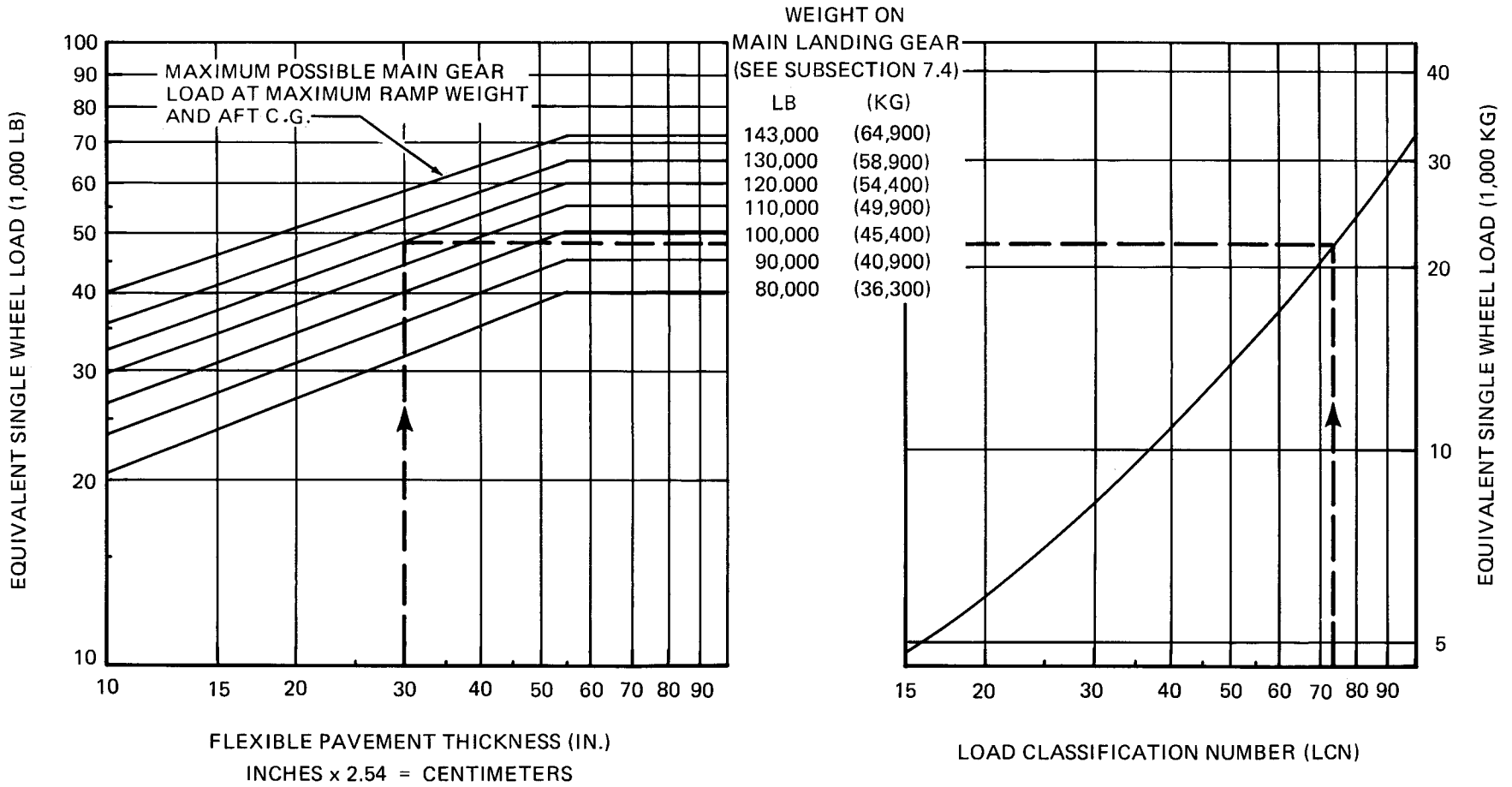
| LB | (KG) |
|---------|----------|
| 135,000 | (61,200) |
| 120,000 | (54,400) |
| 110,000 | (49,900) |
| 100,000 | (45,400) |
| 90,000 | (40,900) |
| 80,000 | (36,300) |



7.6 FLEXIBLE PAVEMENT REQUIREMENTS, LCN CONVERSION MODEL MD-81, AND -87

NOTE: EQUIVALENT SINGLE WHEEL LOADS ARE DERIVED BY METHODS SHOWN IN ICAO AERODROME MANUAL

- H44.5 x 16.5-20 TIRES
- TIRE PRESSURE CONSTANT AT 184 PSI

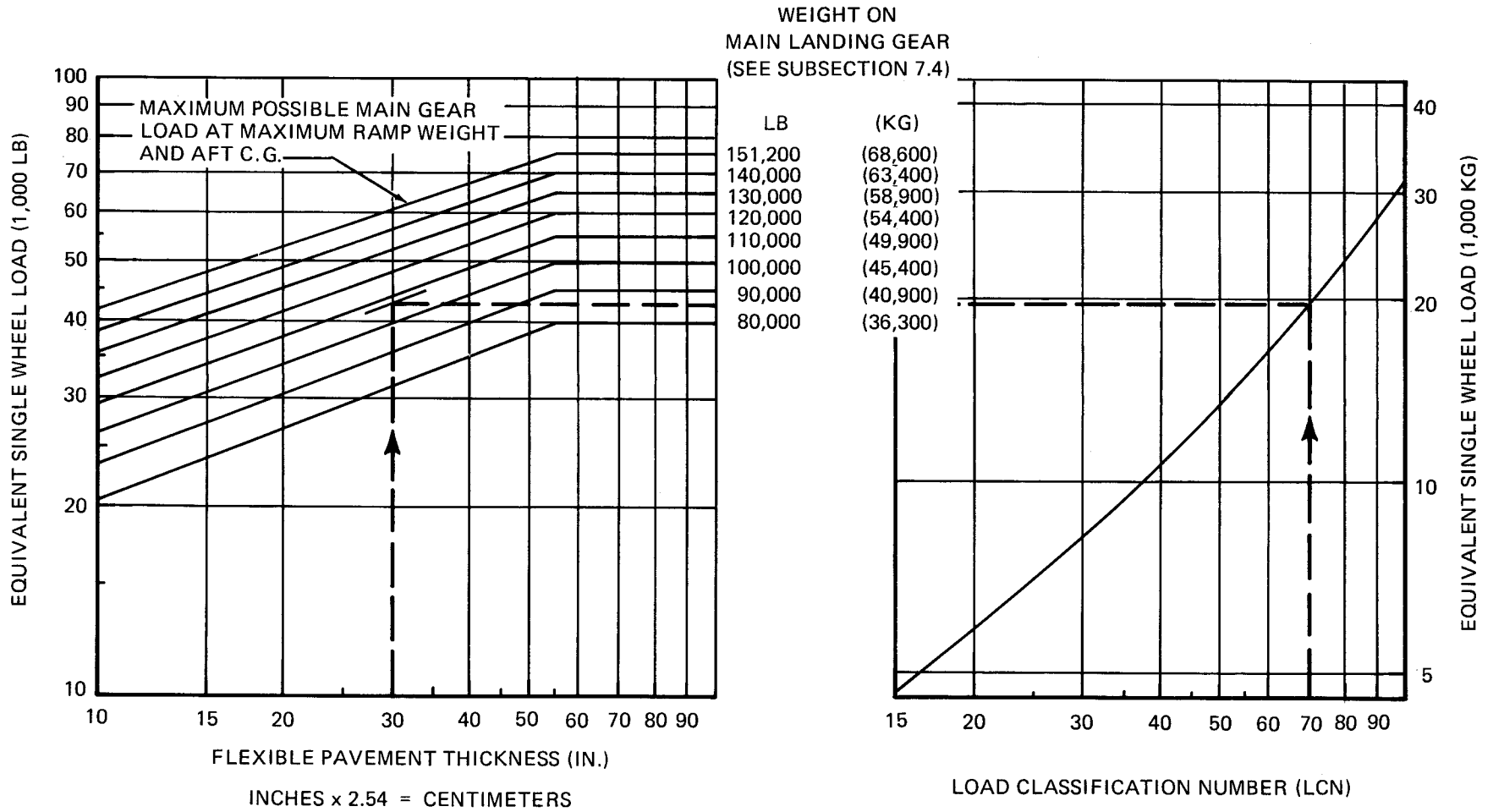


*WITH FUSELAGE AUXILIARY FUEL TANKS

7.6 FLEXIBLE PAVEMENT REQUIREMENTS, LCN CONVERSION MODEL MD-82, -87*, AND -88

NOTE EQUIVALENT SINGLE WHEEL LOADS ARE DERIVED BY METHODS SHOWN IN ICAO AERODROME MANUAL

- H44.5 x 16.5-20 TIRES
- TIRE PRESSURE CONSTANT AT 195 PSI



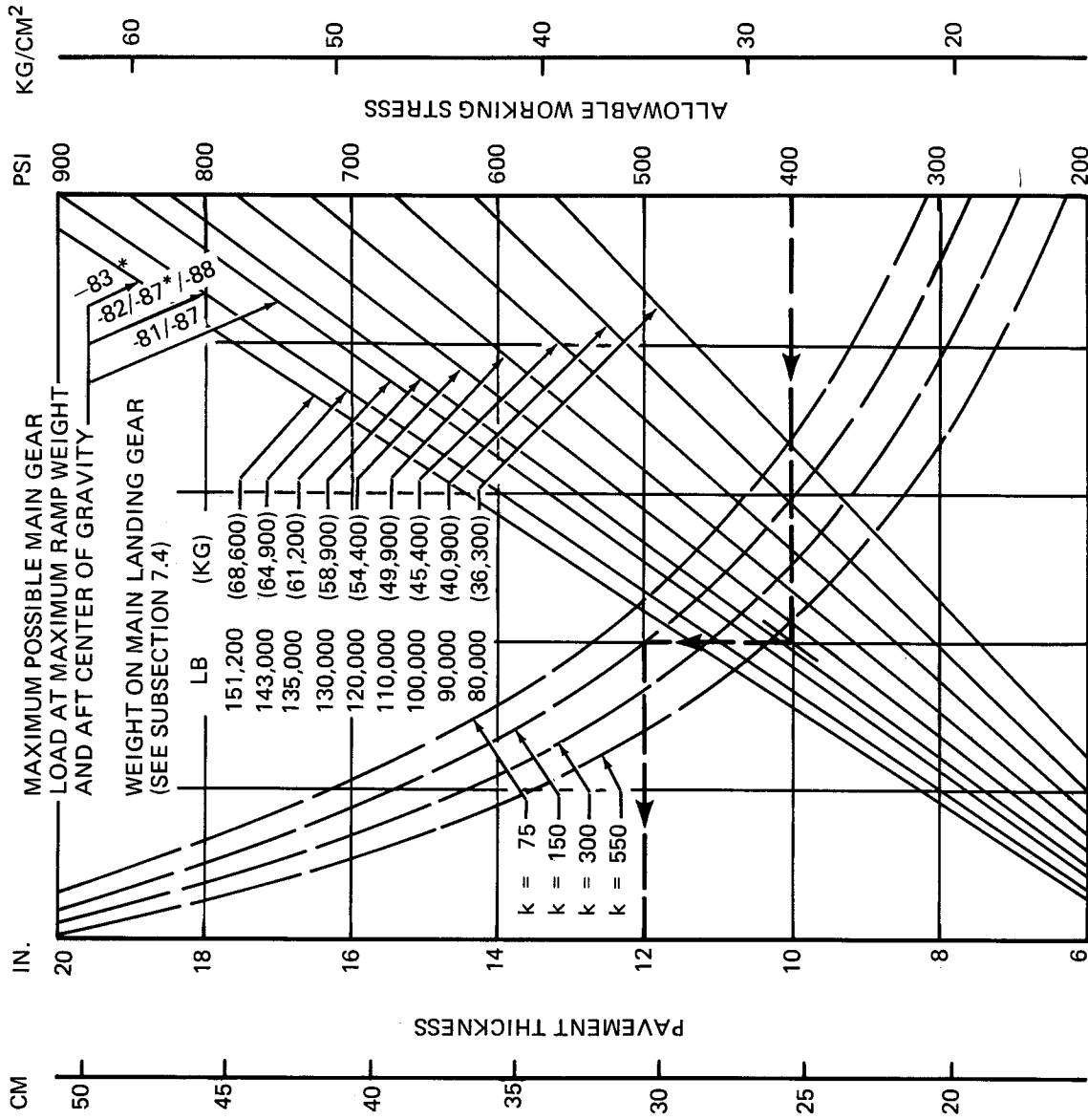
7.6 FLEXIBLE PAVEMENT REQUIREMENTS, LCN CONVERSION MODEL MD-83

7.7 Rigid Pavement Requirements, Portland Cement Association Design Method

In order to determine the airplane weight that can be accommodated on a particular rigid pavement, the thickness of the pavement, the subgrade modulus (k) and the allowable working stress must be known.

In the example for the MD-80 Series, the rigid pavement thickness is 12 inches, the subgrade modulus is 150, and the allowable working stress is 400 psi. For these conditions, the weight on the landing gear is 127,000 pounds.

H44.5 x 16.5-20 TIRES
TIRE PRESSURE RANGE 170 TO 195 PSI



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

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

*WITH FUSELAGE AUXILIARY FUEL TANKS

7.7 RIGID PAVEMENT REQUIREMENTS, PORTLAND CEMENT ASSOCIATION DESIGN METHOD - MODEL MD-80 SERIES

7.8 Rigid Pavement Requirements, LCN Conversion

In order to determine the airplane weight that can be accommodated on a particular rigid airport pavement, both the LCN of the pavement and the radius of relative stiffness must be known.

In the example for the MD-82, the rigid pavement radius of relative stiffness is 26 inches and the LCN is 64. For these conditions, the weight on the main landing gear is 115,500 pounds.

The LCN charts use k -values based on Young's Modulus (E) of 4,000,000 psi and Poisson's Ratio (μ) of 0.15. For convenience in finding k -values based on other values of E and μ , the curves in 7.8.2 are included. For example, to find an k -value based on an E of 3,000,000 psi the "E" factor of 0.931 is multiplied by the k -value found in Table 7.8.1. The effect of variations of " μ " on the k -value is treated in a similar manner.

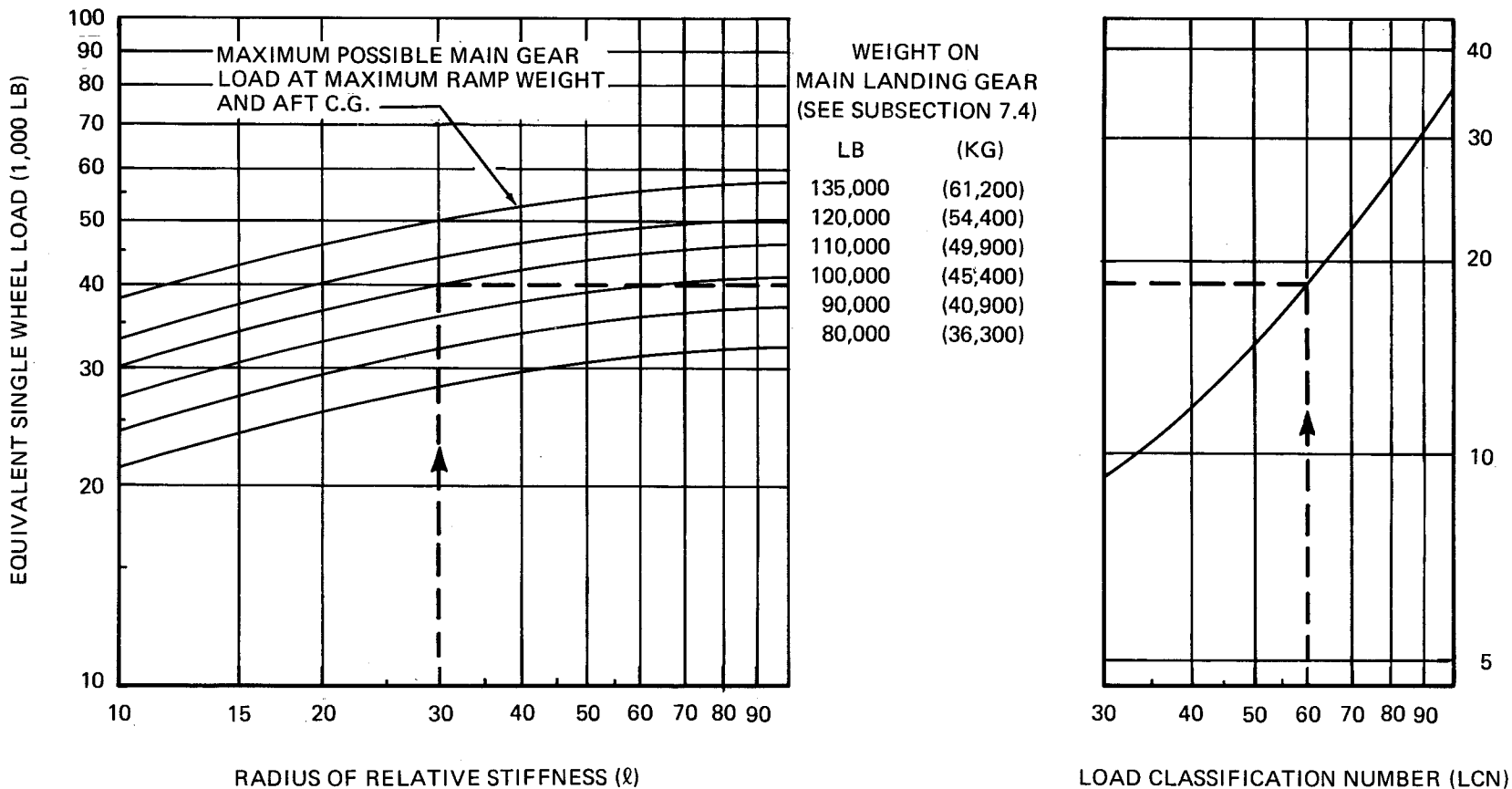
Note: If the resultant aircraft LCN is not more than 10 percent above the published pavement LCN, it is the United Kingdom's view that the bearing strength of the pavement can be considered sufficient for unlimited use by the airplane. The figure of 10 percent has been chosen as representing the lowest degree of variation in LCN which is significant. (Reference: ICAO Aerodrome Design Manual, Part 3 Pavements, Document 9157-AN/901, 1977 Edition.)

NOTE: EQUIVALENT SINGLE WHEEL LOADS ARE DERIVED BY METHODS SHOWN IN ICAO AERODROME MANUAL

- H44.5 x 16.5-20 TIRES
- TIRE PRESSURE CONSTANT AT 170 PSI

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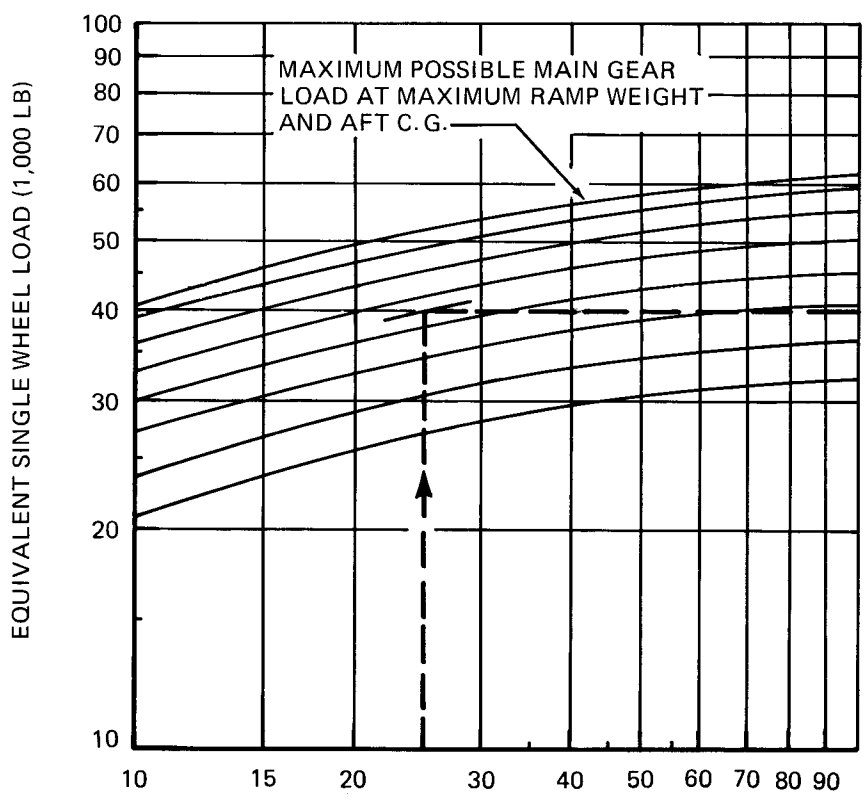
7-17



7.8 RIGID PAVEMENT REQUIREMENTS, LCN CONVERSION MODEL MD-81, AND -87

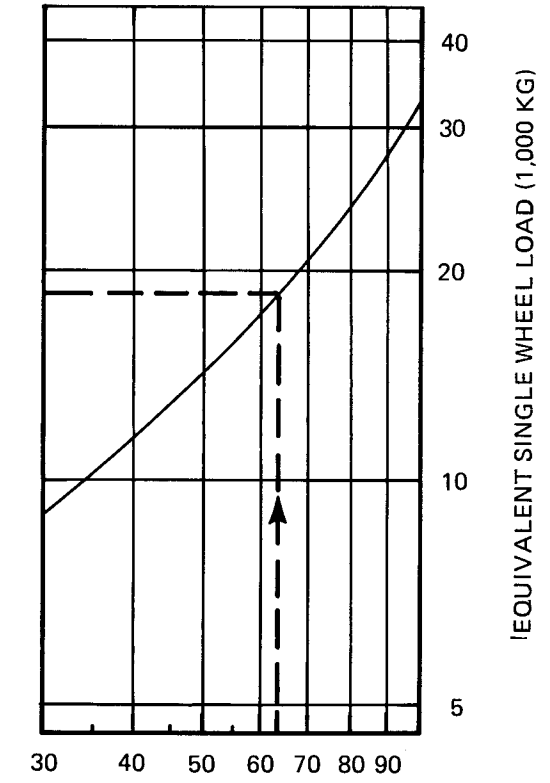
NOTE: EQUIVALENT SINGLE WHEEL LOADS ARE DERIVED BY METHODS SHOWN IN ICAO AERODROME MANUAL

- H44.5 x 16.5-20 TIRES
- TIRE PRESSURE CONSTANT AT 184 PSI



WEIGHT ON MAIN LANDING GEAR (SEE SUBSECTION 7.4)

| LB | (KG) |
|---------|----------|
| 143,000 | (64,000) |
| 140,000 | (63,400) |
| 130,000 | (58,900) |
| 120,000 | (54,400) |
| 110,000 | (49,900) |
| 100,000 | (45,400) |
| 90,000 | (40,900) |
| 80,000 | (36,300) |



RADIUS OF RELATIVE STIFFNESS (ℓ)

LOAD CLASSIFICATION NUMBER (LCN)

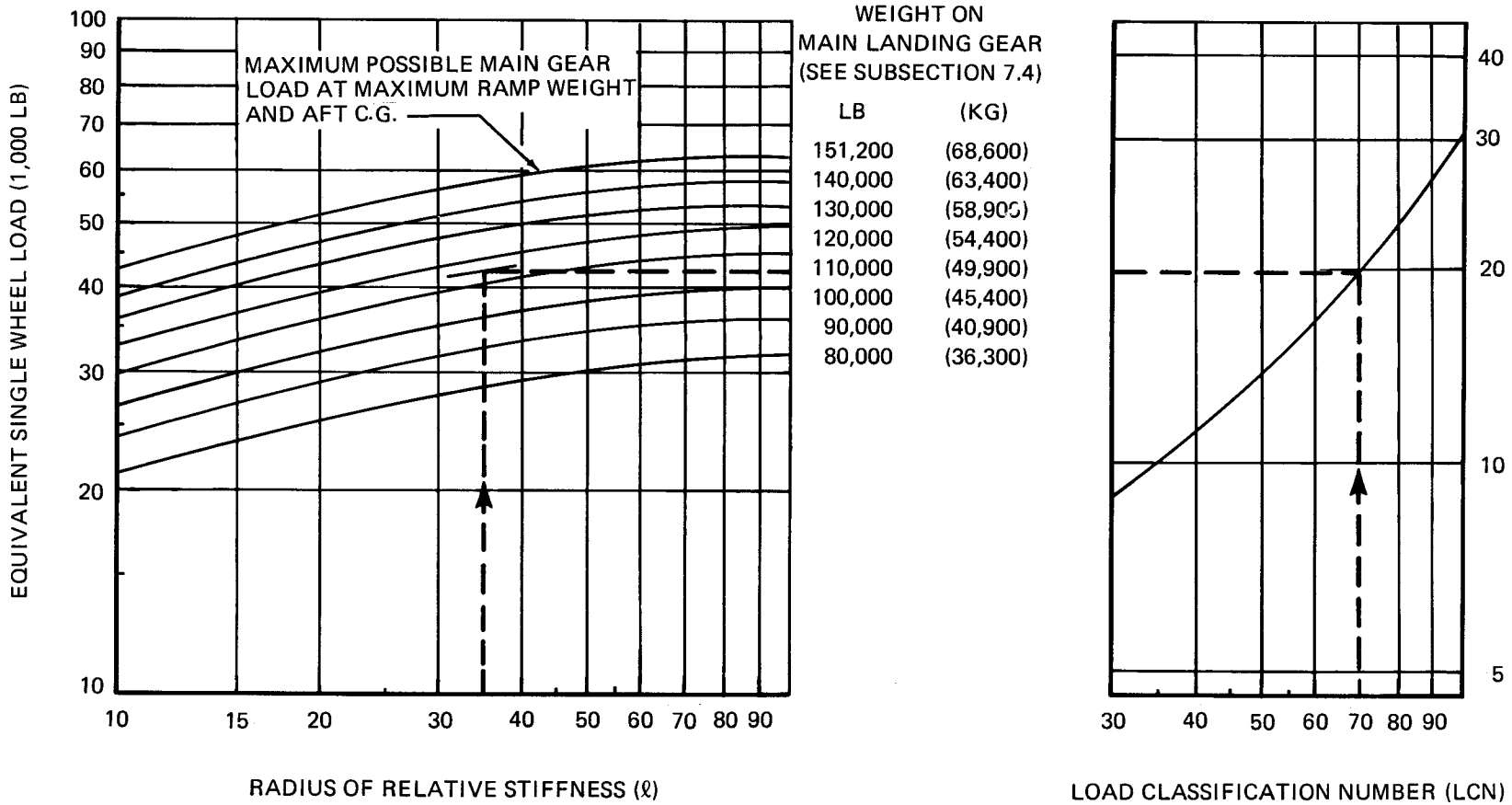
*WITH FUSELAGE AUXILIARY FUEL TANKS

7.8 RIGID PAVEMENT REQUIREMENTS, LCN CONVERSION MODEL MD-82, -87,* AND -88

NOTE: EQUIVALENT SINGLE WHEEL LOADS ARE DERIVED BY METHODS SHOWN IN ICAO AERODROME MANUAL

- H44.5 x 16.5-20 TIRES
- TIRE PRESSURE CONSTANT AT 195 PSI

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7.8 RIGID PAVEMENT REQUIREMENTS, LCN CONVERSION MODEL MD-83

7.8.1 Radius of Relative Stiffness (Other values of E and ℓ)

The table of 7.8.1 presents ℓ -values based on Young's Modulus (E) of 4,000,000 psi and Poisson's Ratio (μ) of 0.15. For convenience in finding ℓ -values based on other values of E and μ , the curves of Section 7.8.2 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 7.8.1. The effect of variations of " μ " on the ℓ -value is treated in a similar manner.

**RADIUS OF RELATIVE STIFFNESS (ℓ)
VALUES OF ℓ IN INCHES**

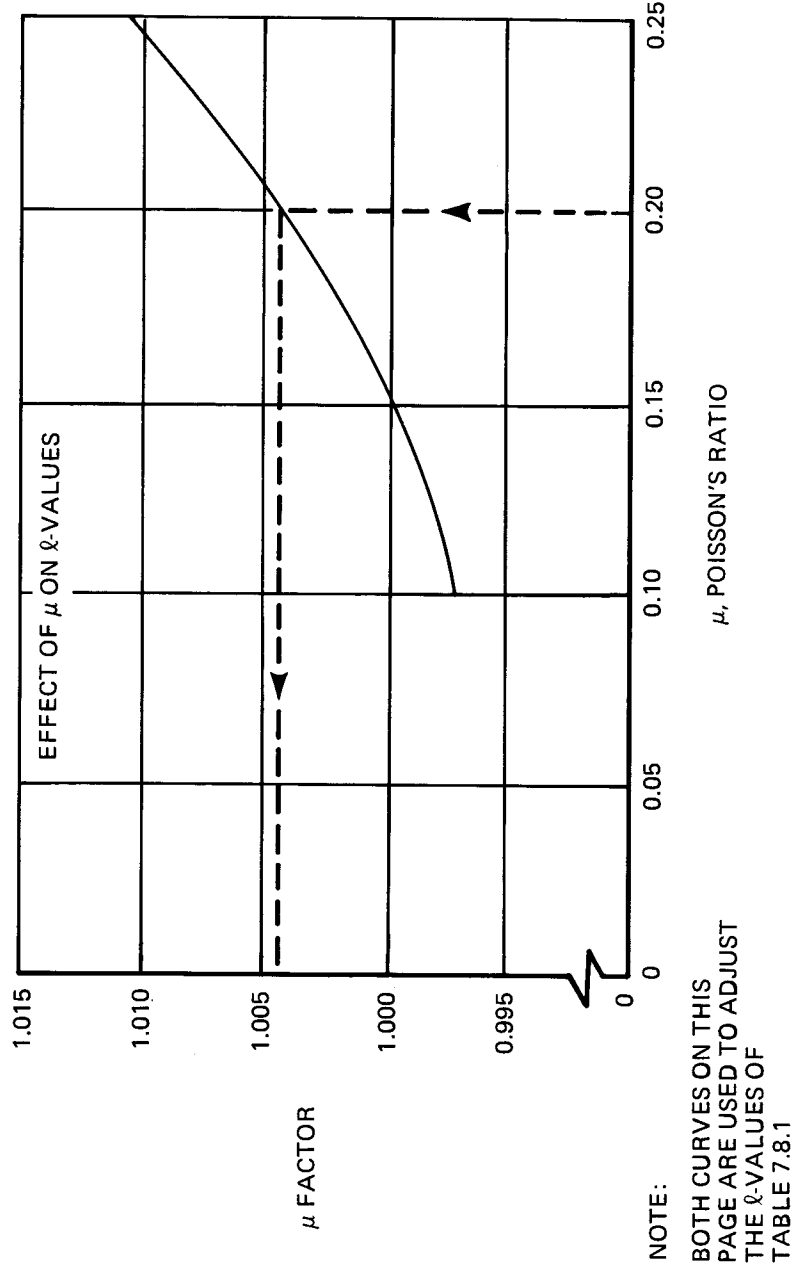
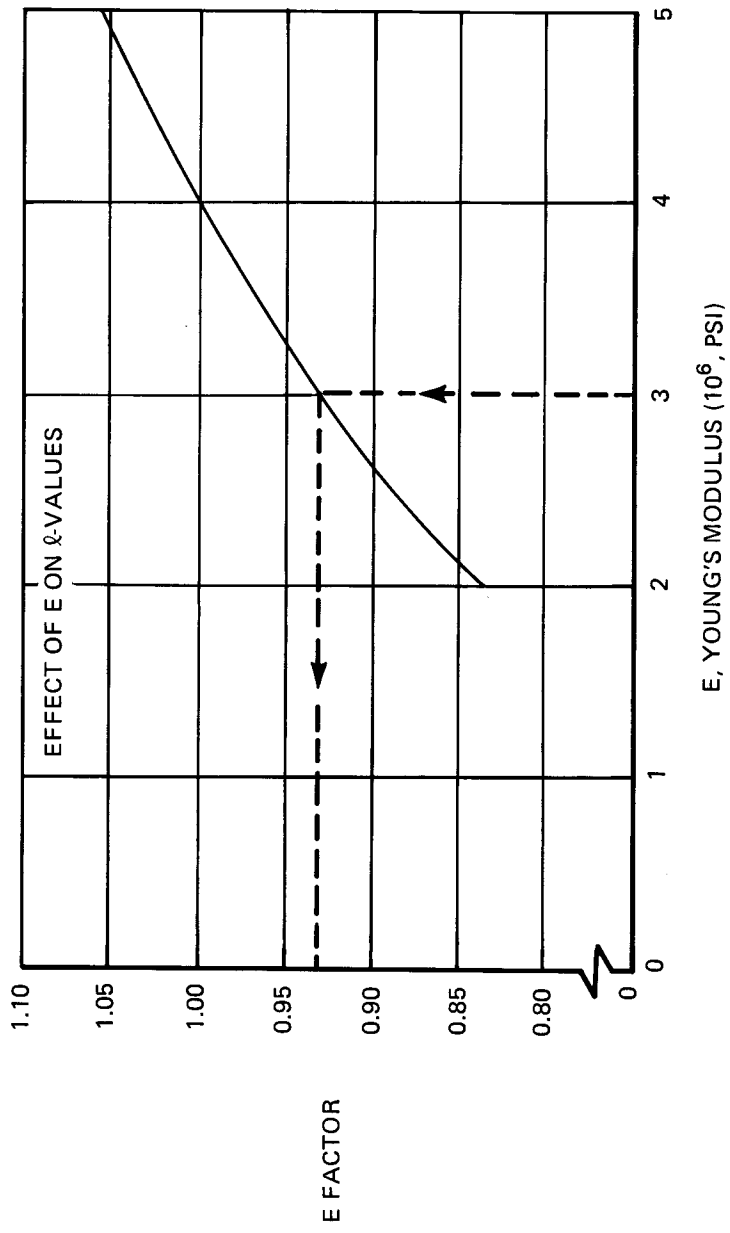
FOR E = 4,000,000 P.S.I. AND μ = 0.15

$$\text{RADIUS OF RELATIVE STIFFNESS} = \ell = \sqrt[4]{\frac{E d^3}{12(1-\mu^2)k}} = 24.1652 \sqrt[4]{\frac{d^3}{k}}$$

| d in in. | k=50 | k=100 | k=150 | k=200 | k=250 | k=300 | k=350 | k=400 | k=500 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 6 | 34.84 | 29.30 | 26.47 | 24.63 | 23.30 | 22.26 | 21.42 | 20.72 | 19.59 |
| 6.5 | 36.99 | 31.11 | 28.11 | 26.16 | 24.74 | 23.64 | 22.74 | 22.00 | 20.80 |
| 7 | 39.11 | 32.89 | 29.72 | 27.65 | 26.15 | 24.99 | 24.04 | 23.25 | 21.99 |
| 7.5 | 41.19 | 34.63 | 31.29 | 29.12 | 27.54 | 26.32 | 25.32 | 24.49 | 23.16 |
| 8 | 43.23 | 36.35 | 32.85 | 30.57 | 28.91 | 27.62 | 26.58 | 25.70 | 24.31 |
| 8.5 | 45.24 | 38.04 | 34.37 | 31.99 | 30.25 | 28.91 | 27.81 | 26.90 | 25.44 |
| 9 | 47.22 | 39.71 | 35.88 | 33.39 | 31.58 | 30.17 | 29.03 | 28.08 | 26.55 |
| 9.5 | 49.17 | 41.35 | 37.36 | 34.77 | 32.89 | 31.42 | 30.23 | 29.24 | 27.65 |
| 10 | 51.10 | 42.97 | 38.83 | 36.14 | 34.17 | 32.65 | 31.42 | 30.39 | 28.74 |
| 10.5 | 53.01 | 44.57 | 40.28 | 37.48 | 35.45 | 33.87 | 32.59 | 31.52 | 29.81 |
| 11 | 54.89 | 46.16 | 41.71 | 38.81 | 36.71 | 35.07 | 33.75 | 32.64 | 30.87 |
| 11.5 | 56.75 | 47.72 | 43.12 | 40.13 | 37.95 | 36.26 | 34.89 | 33.74 | 31.91 |
| 12 | 58.59 | 49.27 | 44.52 | 41.43 | 39.18 | 37.44 | 36.02 | 34.84 | 32.95 |
| 12.5 | 60.41 | 50.80 | 45.90 | 42.72 | 40.40 | 38.60 | 37.14 | 35.92 | 33.97 |
| 13 | 62.22 | 52.32 | 47.27 | 43.99 | 41.61 | 39.75 | 38.25 | 36.99 | 34.99 |
| 13.5 | 64.00 | 53.82 | 48.63 | 45.26 | 42.80 | 40.89 | 39.35 | 38.06 | 35.99 |
| 14 | 65.77 | 55.31 | 49.98 | 46.51 | 43.98 | 42.02 | 40.44 | 39.11 | 36.99 |
| 14.5 | 67.53 | 56.78 | 51.31 | 47.75 | 45.16 | 43.15 | 41.51 | 40.15 | 37.97 |
| 15 | 69.27 | 58.25 | 52.63 | 48.98 | 46.32 | 44.26 | 42.58 | 41.19 | 38.95 |
| 15.5 | 70.99 | 59.70 | 53.94 | 50.20 | 47.47 | 45.36 | 43.64 | 42.21 | 39.92 |
| 16 | 72.70 | 61.13 | 55.24 | 51.41 | 48.62 | 46.45 | 44.70 | 43.23 | 40.88 |
| 16.5 | 74.40 | 62.56 | 56.53 | 52.61 | 49.75 | 47.54 | 45.74 | 44.24 | 41.84 |
| 17 | 76.08 | 63.98 | 57.81 | 53.80 | 50.88 | 48.61 | 46.77 | 45.24 | 42.78 |
| 17.5 | 77.75 | 65.38 | 59.08 | 54.98 | 52.00 | 49.68 | 47.80 | 46.23 | 43.72 |
| 18 | 79.41 | 66.78 | 60.34 | 56.16 | 53.11 | 50.74 | 48.82 | 47.22 | 44.66 |
| 19 | 82.70 | 68.14 | 62.84 | 58.48 | 55.31 | 52.84 | 50.84 | 49.17 | 46.51 |
| 20 | 85.95 | 69.54 | 65.30 | 60.77 | 57.47 | 54.91 | 52.84 | 51.10 | 48.33 |
| 21 | 89.15 | 72.27 | 67.74 | 63.04 | 59.62 | 56.96 | 54.81 | 53.01 | 50.13 |
| 22 | 92.31 | 74.96 | 70.14 | 65.28 | 61.73 | 58.98 | 56.75 | 54.89 | 51.91 |
| 23 | 95.44 | 77.63 | 72.52 | 67.49 | 63.83 | 60.98 | 58.68 | 56.75 | 53.67 |
| 24 | 98.54 | 80.26 | 74.87 | 69.68 | 65.90 | 62.96 | 60.58 | 58.59 | 55.41 |

7.8.1 RADIUS OF RELATIVE STIFFNESS

(REFERENCE: PORTLAND CEMENT ASSOCIATION)



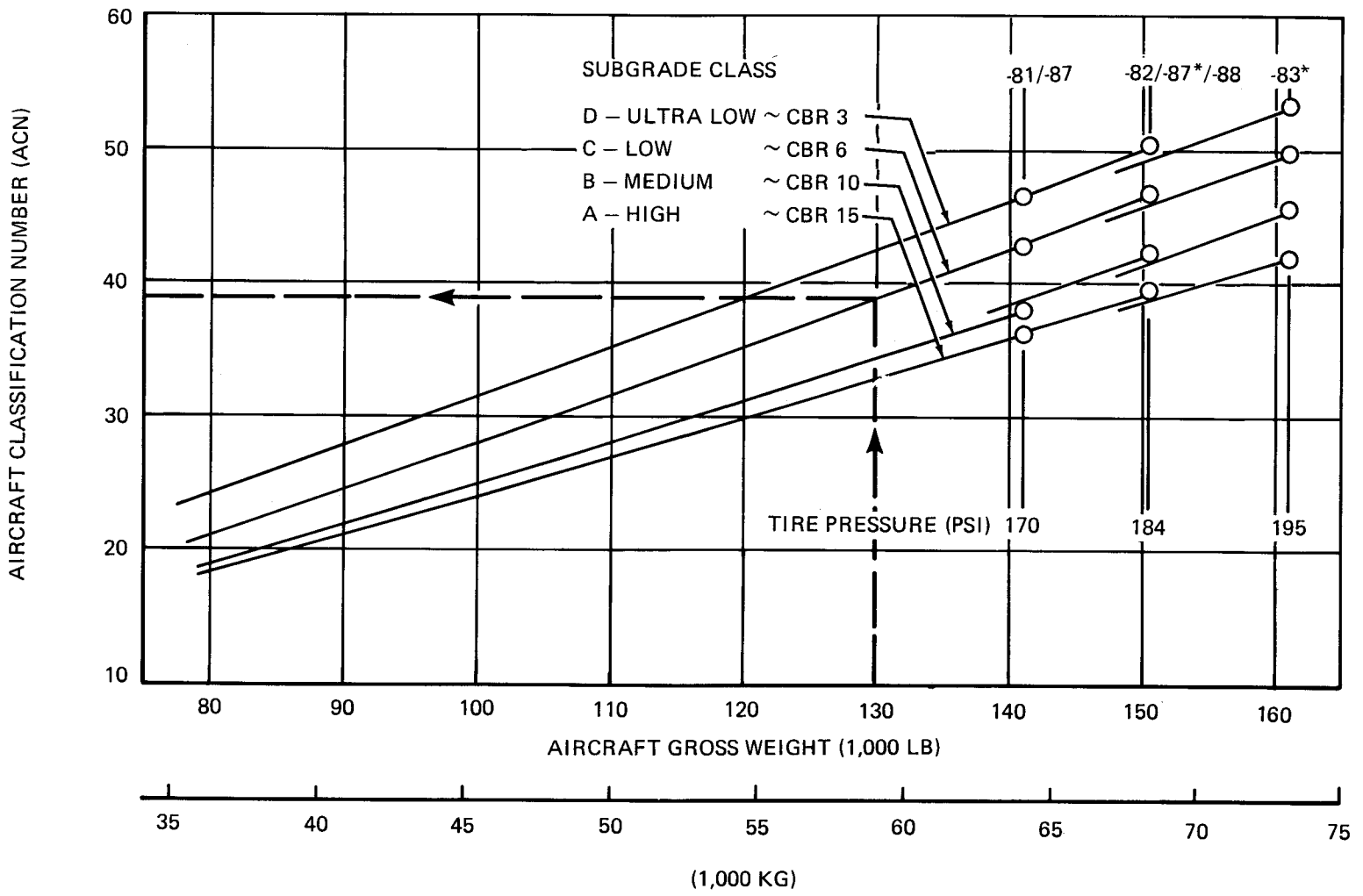
NOTE:
 BOTH CURVES ON THIS PAGE ARE USED TO ADJUST THE l -VALUES OF TABLE 7.8.1

7.8.2 EFFECT OF E AND μ ON l VALUES

7.9 ACN-PCN Reporting System: Flexible and Rigid Pavements

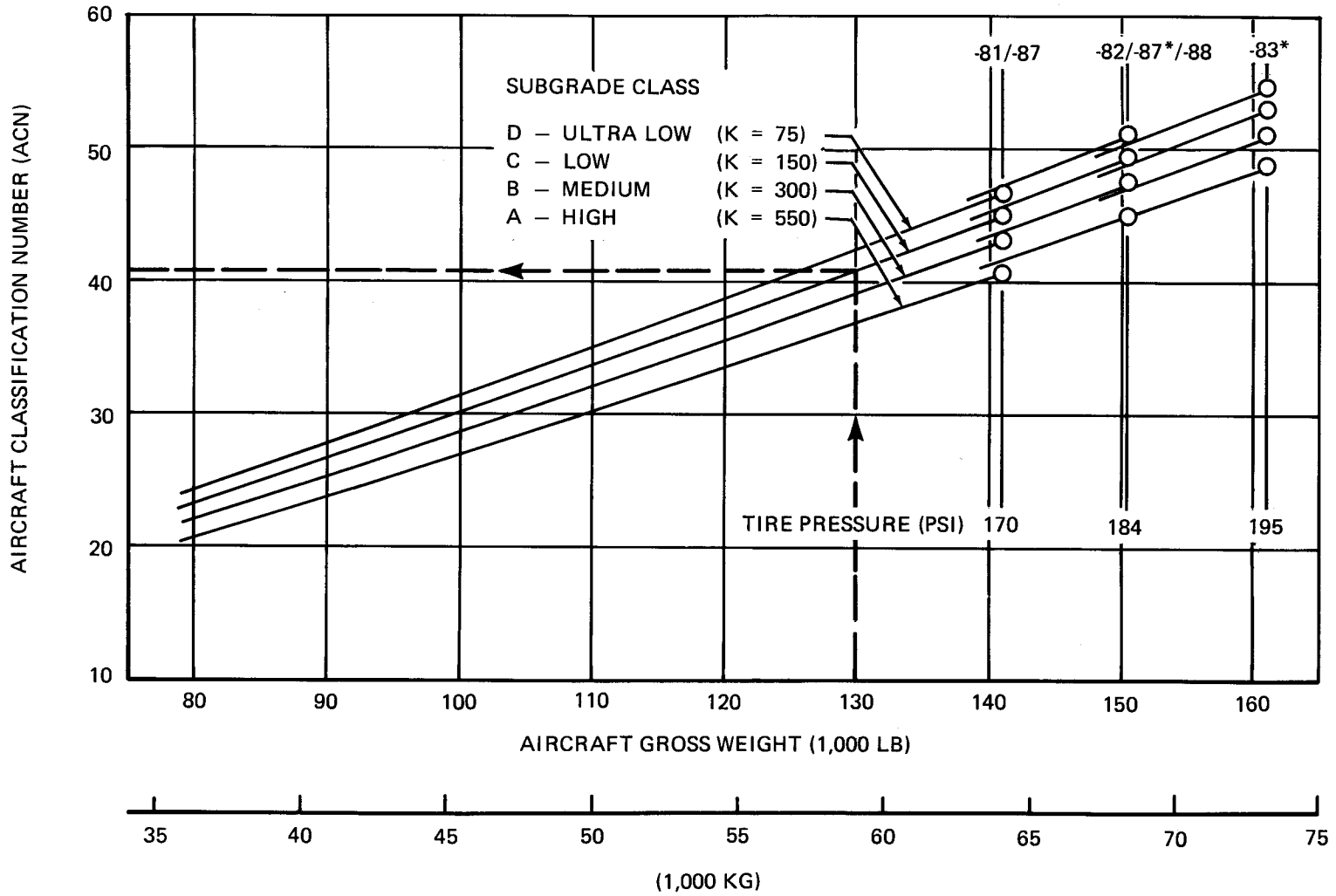
To determine the ACN of an aircraft on flexible or rigid pavement, both the aircraft gross weight and the subgrade strength category must be known. The examples show that for an aircraft gross weight of 130,000 pounds and low subgrade strength, the ACN for flexible pavement is 39 and the ACN for rigid pavement for the same gross weight is 41.

Note: An aircraft with an ACN equal to or less than the reported PCN can operate on the pavement subject to any limitations on the tire pressure.



*WITH FUSELAGE AUXILIARY FUEL TANKS

7.9 AIRCRAFT CLASSIFICATION NUMBER – FLEXIBLE PAVEMENT MODEL MD-80 SERIES



*WITH FUSELAGE AUXILIARY FUEL TANKS

7.9 AIRCRAFT CLASSIFICATION NUMBER — RIGID PAVEMENT MODEL MD-80 SERIES

7.9.1 Development of ACN Charts

The ACN charts for flexible and rigid pavements were developed by methods referenced in the ICAO Aerodrome Manual, Part 3 – Pavements, Document 9157-AN/901, 1983 Edition. The procedures used in developing these charts are also described below.

The following procedure was used to develop the flexible-pavement ACN charts already shown in this subsection.

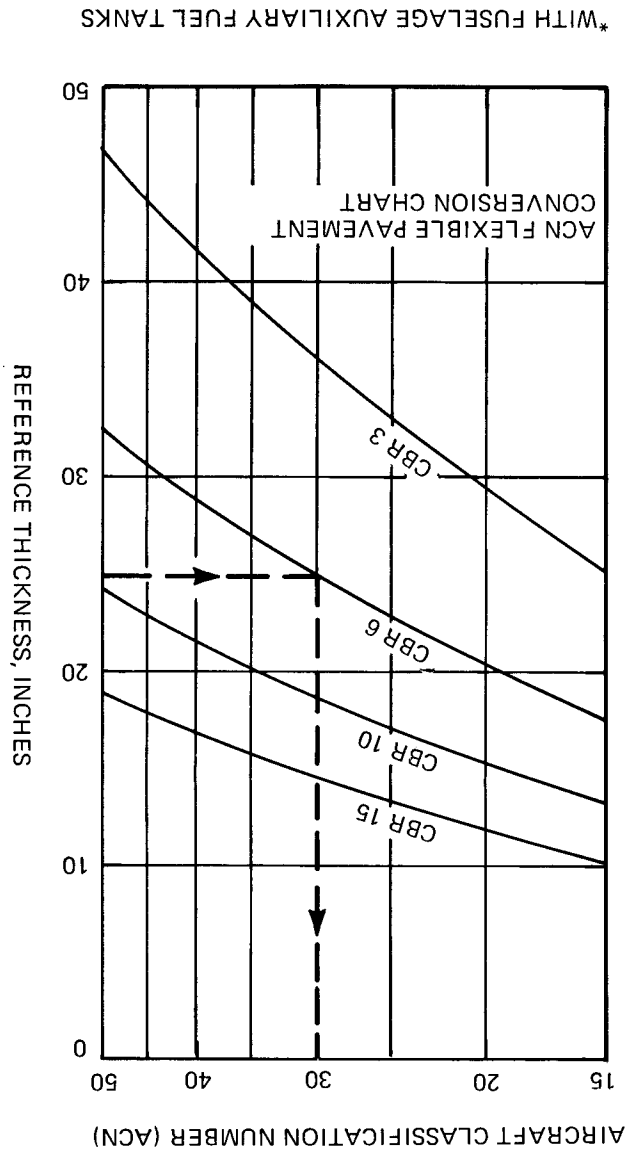
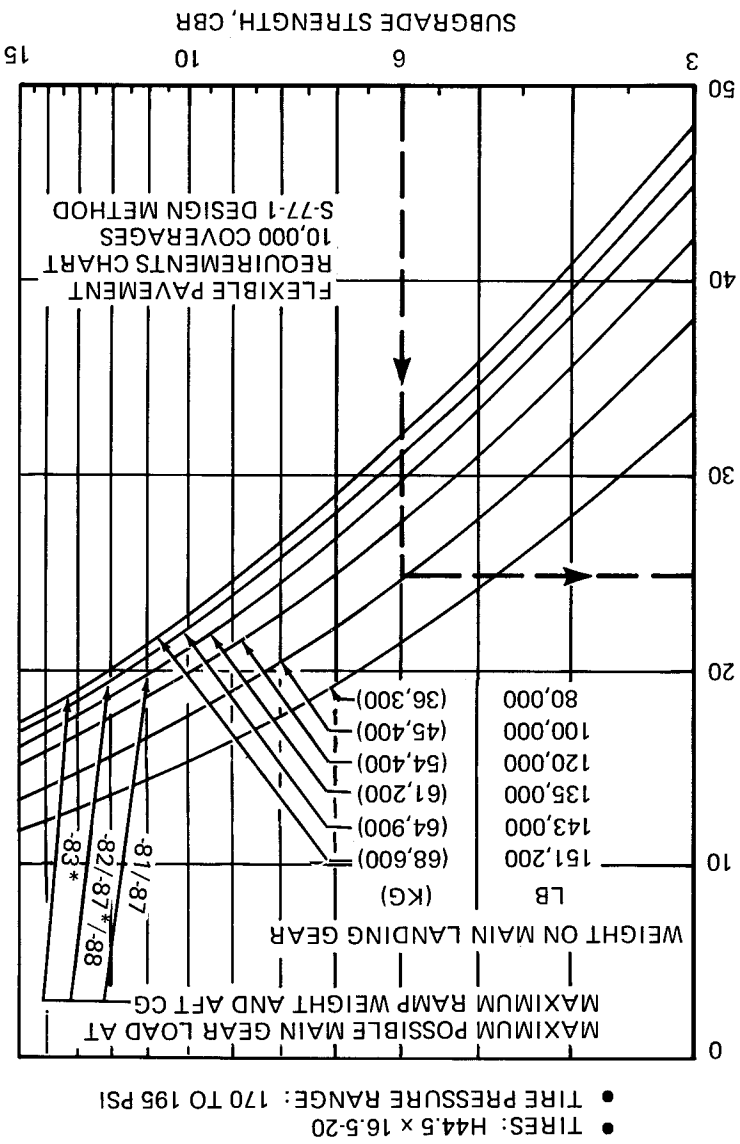
1. Determine the percentage of weight on the main gear to be used below in steps 2, 3, and 4, below. The maximum aft center of gravity position yields the critical loading on the critical gear (see Subsection 7.4). This center of gravity position is used to determine main-gear loads at all gross weights of the model being considered.
2. Establish a flexible-pavement requirements chart using the S-77-1 design method, such as shown on the right side of 7.9.2. Use standard subgrade strengths of CBR 3, 6, 10, and 15 percent and 10,000 coverages. This chart provides the same thickness values as those of Subsection 7.5, but is presented here in a different format.
3. Determine reference thickness values from the pavement requirements chart of step 2 for each standard subgrade strength and gear loading.
4. Enter the reference thickness values into the ACN flexible-pavement conversion chart shown on the left side of Figure 7.9.2 to determine ACN. This chart was developed using the S-77-1 design method with a single tire inflated to 1.25 MPa (181 psi) pressure and 10,000 coverages. The ACN is two times the derived single-wheel load expressed in thousands of kilograms. These values of ACN were plotted as functions of aircraft gross weight, as already shown.

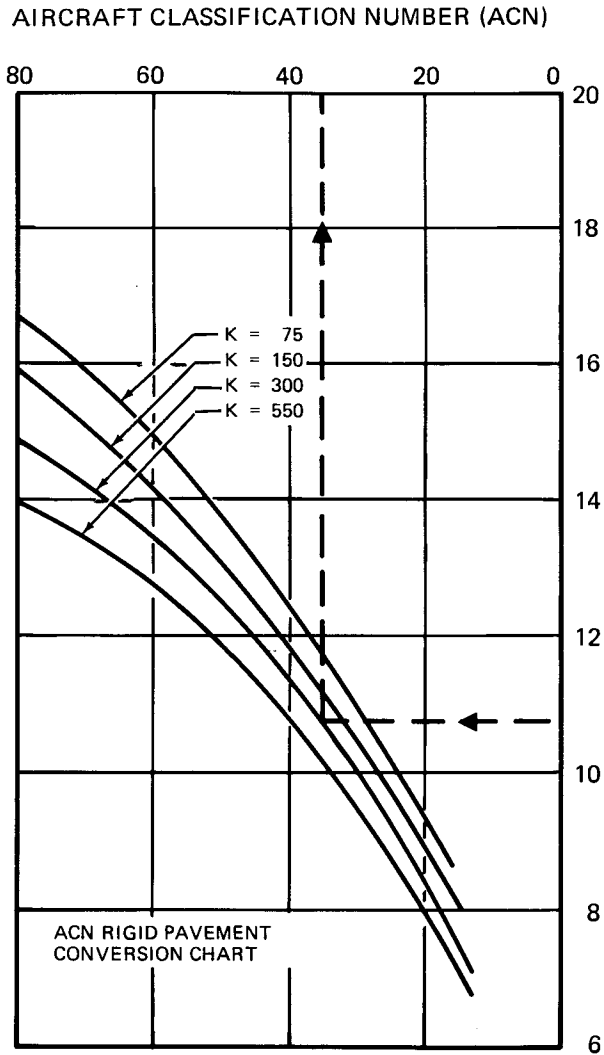
The following procedure was used to develop the rigid-pavement ACN charts already shown in this Subsection.

1. Determine the percentage of weight on the main gear to be used in steps 2, 3, and 4, below. The maximum aft center of gravity position yields the critical loading on the critical gear (see Subsection 7.4). This center of gravity position is used to determine main-gear loads at all gross weights of the model being considered.
2. Establish a rigid-pavement-requirements chart using the PCA computer program PDILB, such as shown on the right side of Figure 7.9.3. Use standard subgrade strengths of $k = 75, 150, 300,$ and 550 pci (nominal values for $k = 20, 40, 80,$ and 150 MN/m³). This chart provides the same thickness values as those of Subsection 7.7.
3. Determine reference thickness values from the pavement requirements chart of step 2 for each standard subgrade strength and gear loading at 400 psi working stress (nominal value for 2.75 MPa working stress).

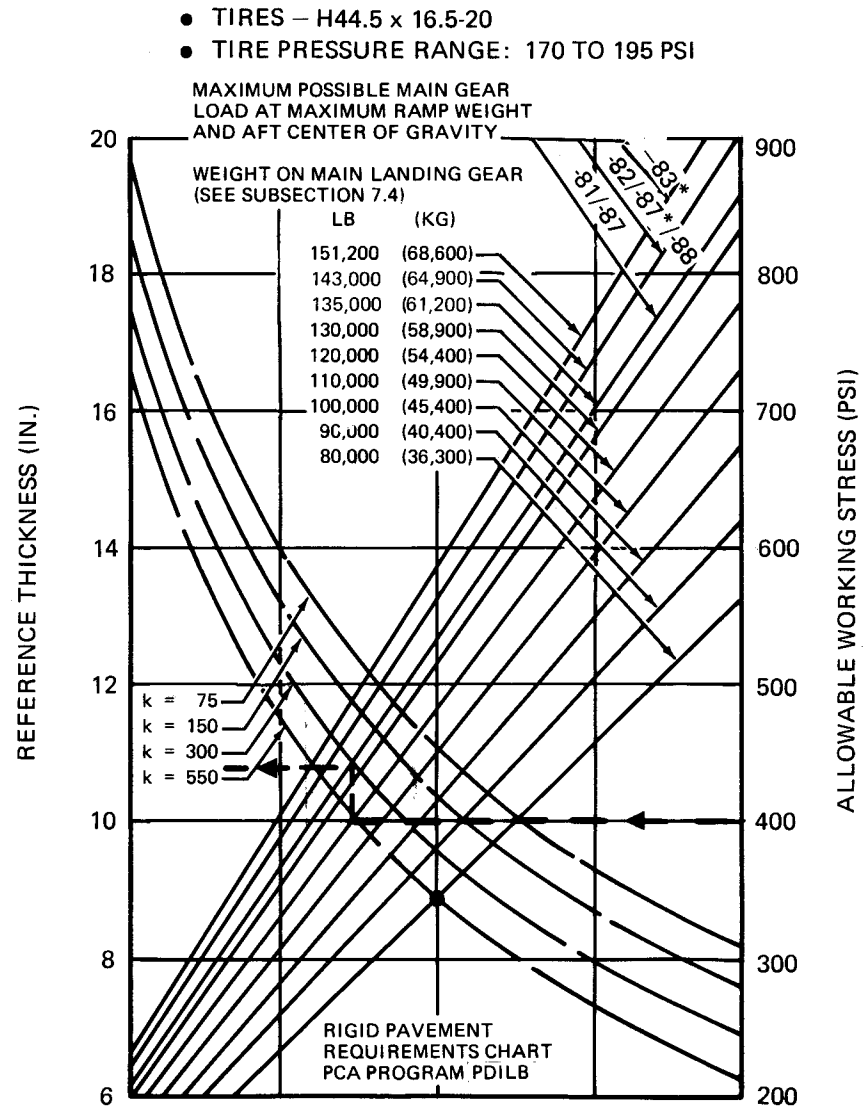
4. Enter the reference thickness values into the ACN rigid-pavement conversion chart shown on the left side of Figure 7.9.3 to determine ACN. This chart was developed using the PCA computer program PDILB with a single tire inflated to 1.25 MPa (181 psi) pressure and a working stress of 400 psi. The ACN is two times the derived single-wheel load expressed in thousands of kilograms. These values of ACN were plotted as functions of aircraft gross weight, as already shown in this Subsection.

7.9.2 DEVELOPMENT OF AIRCRAFT CLASSIFICATION NUMBER (ACN) – FLEXIBLE PAVEMENT





*WITH FUSELAGE AUXILIARY FUEL TANKS



7.9.3 DEVELOPMENT OF AIRCRAFT CLASSIFICATION NUMBER (ACN) – RIGID PAVEMENT

8.0 POSSIBLE MD-80 DERIVATIVE AIRPLANES

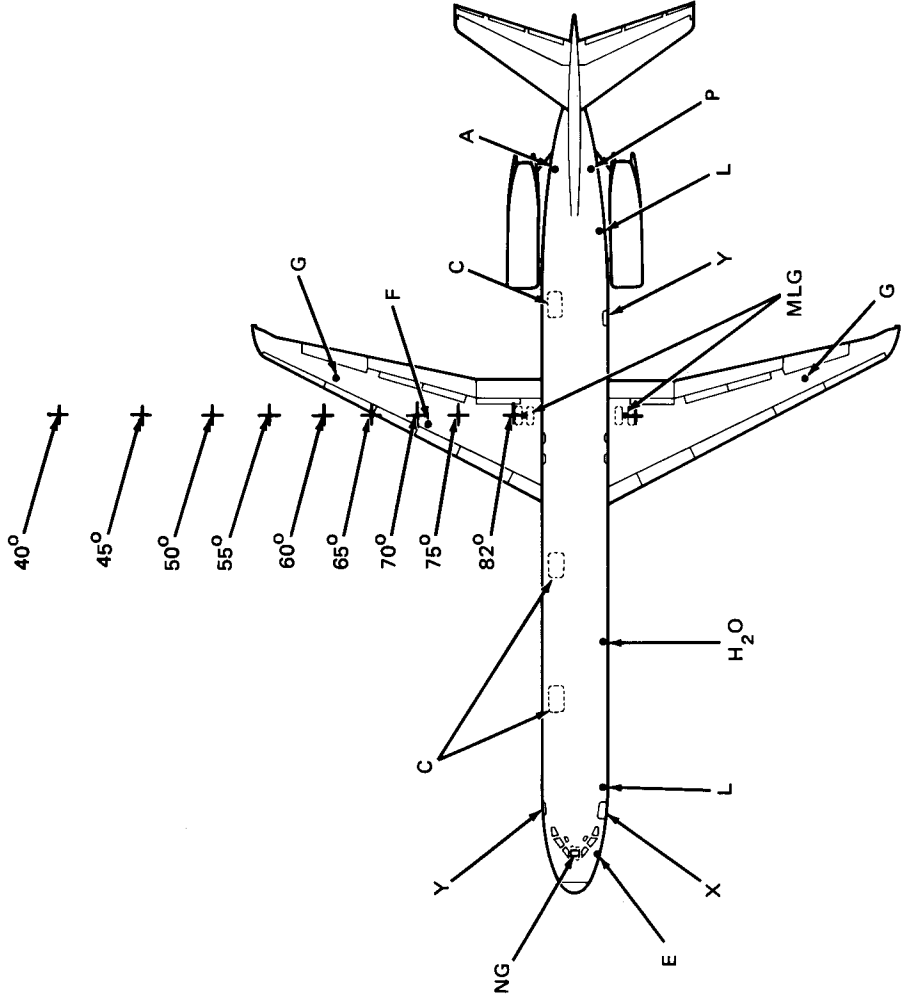
8.0 POSSIBLE MD-80 DERIVATIVE AIRPLANES

Several derivatives and versions of the MD-80 series of aircraft are currently being considered. The potential variants include:

- MD-87 and stretched MD-88 derivatives with ultra-high-bypass ratio engines.
- MD-88 with ultra-high-bypass-ratio engine retrofit.
- Combi/convertible/freighter versions.

9.0 SCALE DRAWINGS

SCALE: 1 IN. = 32 FT



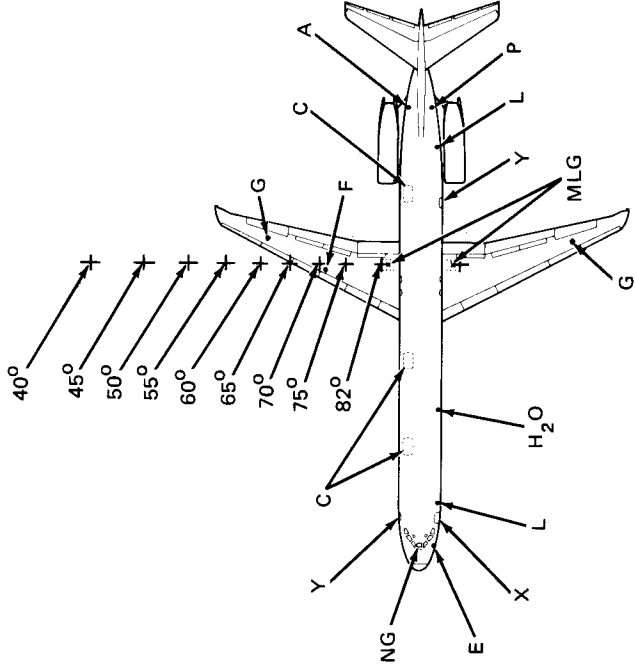
LEGEND

- | | | | |
|----|------------------------------|------------------|-------------------|
| A. | PRECONDITIONED AIR | H ₂ O | POTABLE WATER (1) |
| B. | MAIN CARGO DOOR (NONE) | L. | LAVATORY (2) |
| C. | FWD, MID AND AFT CARGO DOORS | MLG | MAIN LANDING GEAR |
| E. | ELECTRICAL - GROUND POWER | NG | NOSE LANDING GEAR |
| F. | PRESSURE REFUELING POINT (1) | P. | PNEUMATIC POWER |
| G. | GRAVITY REFUELING POINT (2) | X. | PASSENGER DOOR |
| | | Y. | SERVICE DOOR |

TURNING RADIUS POINTS +
82°, 75°, 70°, 65°, 60°, 55°, 50°, 45°, 40°

**9.0 SCALE DRAWINGS
MODEL MD-81, -82, -83, AND -88**

SCALE: 1 IN. = 50 FT



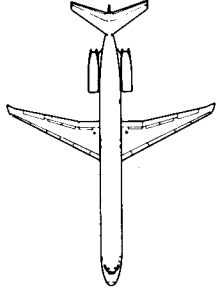
LEGEND

- | | | | |
|----|------------------------------|------------------|-------------------|
| A. | PRECONDITIONED AIR | H ₂ O | POTABLE WATER (1) |
| B. | MAIN CARGO DOOR (NONE) | L. | LAVATORY (2) |
| C. | FWD, MID AND AFT CARGO DOORS | MLG | MAIN LANDING GEAR |
| E. | ELECTRICAL - GROUND POWER | NG | NOSE LANDING GEAR |
| F. | PRESSURE REFUELING POINT (1) | P. | PNEUMATIC POWER |
| G. | GRAVITY REFUELING POINT (2) | X. | PASSENGER DOOR |
| | | Y. | SERVICE DOOR |

TURNING RADIUS POINTS +
82°, 75°, 70°, 65°, 60°, 55°, 50°, 45°, 40°

**9.0 SCALE DRAWINGS
MODEL MD-81, -82, -83, AND -88**

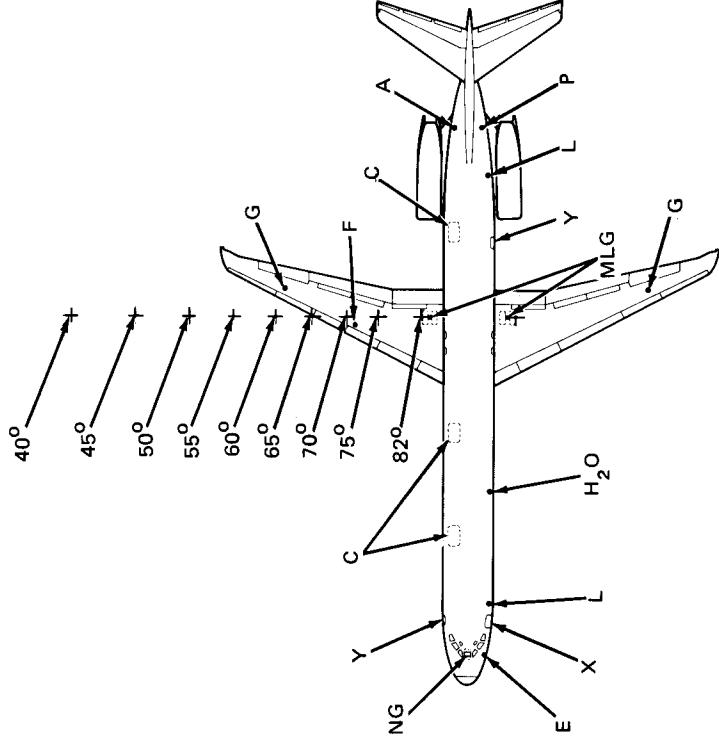
SCALE: 1 IN. = 100 FT



*SEE OTHER PAGES IN THIS SECTION FOR SERVICE POINT LOCATIONS.

**9.0 SCALE DRAWINGS
MODEL MD-81, -82, -83 AND -88**

SCALE: 1 TO 500



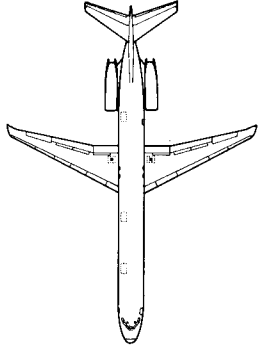
LEGEND

- | | | | |
|----|------------------------------|------------------|-------------------|
| A. | PRECONDITIONED AIR | H ₂ O | POTABLE WATER (1) |
| B. | MAIN CARGO DOOR (NONE) | L. | LAVATORY (2) |
| C. | FWD, MID AND AFT CARGO DOORS | MLG | MAIN LANDING GEAR |
| E. | ELECTRICAL - GROUND POWER | NG | NOSE LANDING GEAR |
| F. | PRESSURE REFUELING POINT (1) | P. | PNEUMATIC POWER |
| G. | GRAVITY REFUELING POINT (2) | X. | PASSENGER DOOR |
| | | Y. | SERVICE DOOR |

TURNING RADIUS POINTS +
82°, 75°, 70°, 65°, 60°, 55°, 50°, 45°, 40°

**9.0 SCALE DRAWINGS
MODEL MD-81, -82, -83, AND -88**

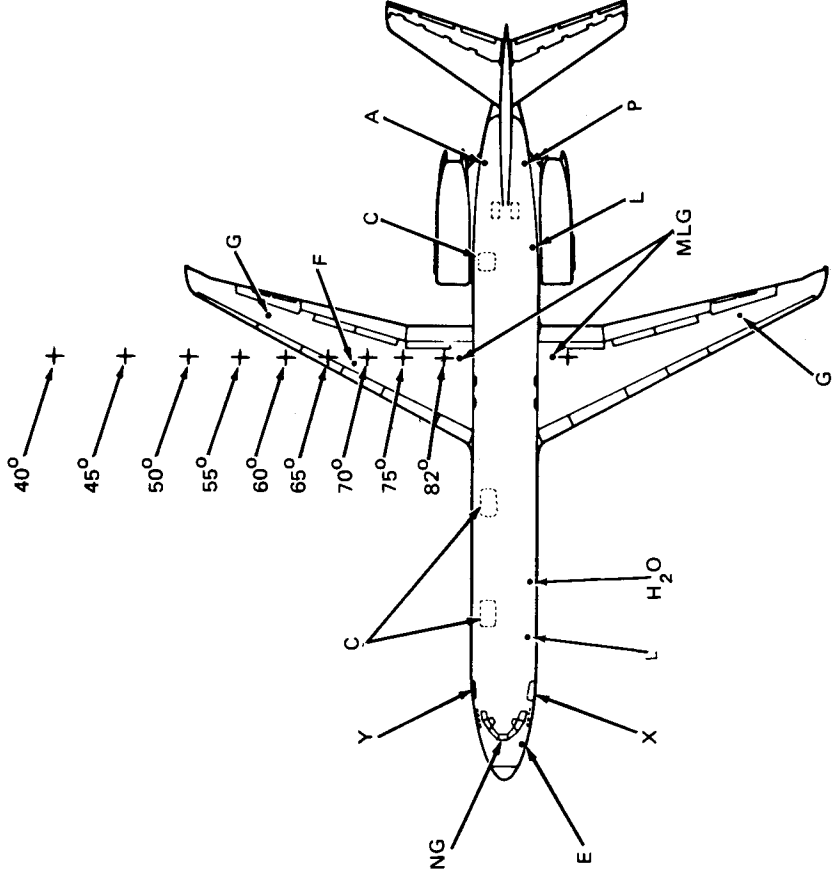
SCALE: 1 TO 1000



*SEE OTHER PAGES IN THIS SECTION FOR SERVICE POINT LOCATIONS.

**9.0 SCALE DRAWINGS
MODEL MD-81, -82, -83, AND -88**

SCALE: 1 IN. = 32 FT



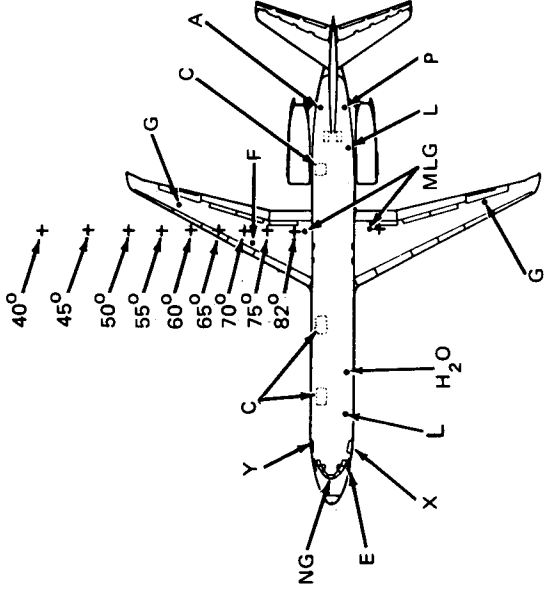
LEGEND

- | | | | |
|----|------------------------------|------------------|-------------------|
| A. | PRECONDITIONED AIR | H ₂ O | POTABLE WATER (1) |
| B. | MAIN CARGO DOOR (NONE) | L. | LAVATORY (2) |
| C. | FWD, MID AND AFT CARGO DOORS | MLG | MAIN LANDING GEAR |
| E. | ELECTRICAL - GROUND POWER | NG | NOSE LANDING GEAR |
| F. | PRESSURE REFUELING POINT (1) | P. | PNEUMATIC POWER |
| G. | GRAVITY REFUELING POINT (2) | X. | PASSENGER DOOR |
| | | Y. | SERVICE DOOR |

TURNING RADIUS POINTS +
82°, 75°, 70°, 65°, 60°, 55°, 50°, 45°, 40°

**9.0 SCALE DRAWINGS
MODEL MD-87**

SCALE: 1 IN. = 50 FT



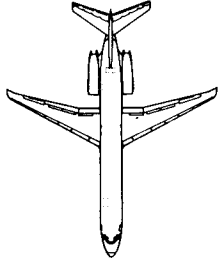
LEGEND

- | | | | |
|----|------------------------------|------------------|-------------------|
| A. | PRECONDITIONED AIR | H ₂ O | POTABLE WATER (1) |
| B. | MAIN CARGO DOOR (NONE) | L. | LAVATORY (2) |
| C. | FWD, MID AND AFT CARGO DOORS | MLG | MAIN LANDING GEAR |
| E. | ELECTRICAL - GROUND POWER | NG | NOSE LANDING GEAR |
| F. | PRESSURE REFUELING POINT (1) | P. | PNEUMATIC POWER |
| G. | GRAVITY REFUELING POINT (2) | X. | PASSENGER DOOR |
| | | Y. | SERVICE DOOR |

TURNING RADIUS POINTS +
82°, 75°, 70°, 65°, 60°, 55°, 50°, 45°, 40°

**9.0 SCALE DRAWINGS
MODEL MD-87**

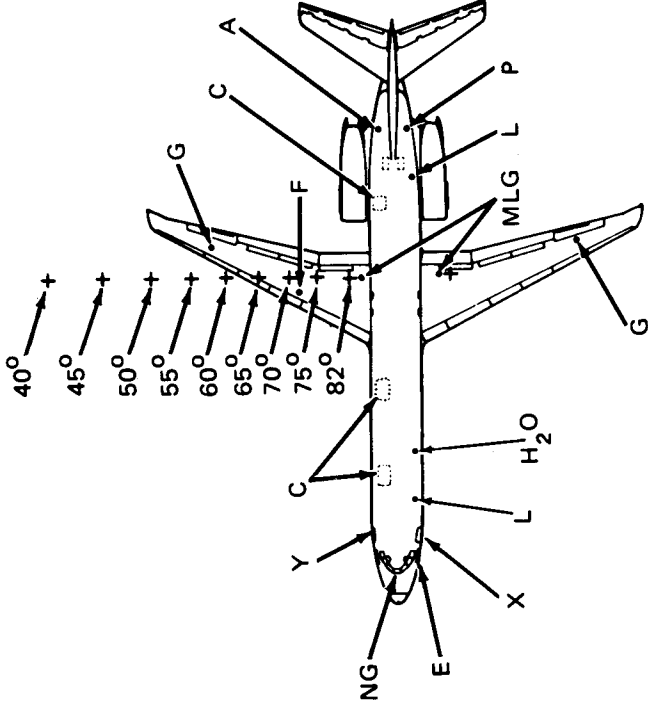
SCALE: 1 IN. = 100 FT



*SEE OTHER PAGES IN THIS SECTION FOR SERVICE POINT LOCATIONS.

9.0 SCALE DRAWINGS MODEL MD-87

SCALE: 1 TO 500



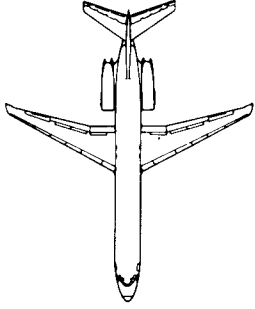
LEGEND

- | | | | |
|----|------------------------------|------------------|-------------------|
| A. | PRECONDITIONED AIR | H ₂ O | POTABLE WATER (1) |
| B. | MAIN CARGO DOOR (NONE) | L. | LAVATORY (2) |
| C. | FWD, MID AND AFT CARGO DOORS | MLG | MAIN LANDING GEAR |
| E. | ELECTRICAL - GROUND POWER | NG | NOSE LANDING GEAR |
| F. | PRESSURE REFUELING POINT (1) | P. | PNEUMATIC POWER |
| G. | GRAVITY REFUELING POINT (2) | X. | PASSENGER DOOR |
| | | Y. | SERVICE DOOR |

TURNING RADIUS POINTS +
82°, 75°, 70°, 65°, 60°, 55°, 50°, 45°, 40°

**9.0 SCALE DRAWINGS
MODEL MD-87**

SCALE: 1 TO 1000



*SEE OTHER PAGES IN THIS SECTION FOR SERVICE POINT LOCATIONS.

9.0 SCALE DRAWINGS MODEL MD-87