MD-90 (28K Thrust) Operational Data Manual (ODM)

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MD-90 (28K Thrust) Operational Data Manual

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FUNCTION

The Aircraft Operational Data Manual (ODM) serves to provide trained Delta Flight Operations and Operations Control personnel with some of the information and instructions necessary for safe and economical operation of the aircraft.

AUTHORITY

This manual is published by the General Manager – Perfomance Engineering, Dept. 088, ATL under the authority of the Vice President – Operations Reliability and Control.

The procedures and data contained in this manual include those in the FAA Approved Airplane Flight Manual and aircraft manufacturer's data.

RESPONSIBILITY

The General Manager – Performance Engineering has been designated the responsibility for the quality of this manual.

Distribution of this manual is the responsibility of the Dept. 188, ATG, LibSvc.ATL188@delta.com.

Maintenance, safeguard, and revision of this manual are the responsibilities of the individual to whom it is issued.

All manual holders and users are encouraged to contribute their suggestions and criticisms regarding the manual so that its function is well served. Inputs concerning data and technical content should be addressed to Performance Engineering, Dept. 088, ATL.

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Revision Notification

Publication: **MD-90 (28K THRUST) OPERATIONAL DATA MANUAL** ***Date:*** **23 Sep 16**

Revision Number: **27** ***Page:*** **1 of 1**

REMOVE	*INSERT*	*REMARKS*
TABLE OF CONTENTS	**TABLE OF CONTENTS**	Date updated to reflect revision.
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QUICK REFERENCE Pages: All	**QUICK REFERENCE** Pages: All	Changed the table title and eliminated fair nomenclature to make it consistent with new FAA policy

**Pages not displaying a revision date of 23 Sep 16 were unchanged and included only for filing purposes.*

This list is effective with ODM Revision #27

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END

OPERATIONAL LANDING DISTANCES

RUNWAY CONDITION ASSESSMENT MATRIX

For additional guidance regarding the classification of the braking action based on existing contaminant types and the ICAO/Runway Condition Code values, please refer to Airway Manual, Supplemental, 4 – Weather, Braking Action.

Reported Braking Action		Reported Runway Surface Conditions			
PIREP	**Definition**	**Runway Contaminant**	**ICAO/ Runway Condition Code**	**Mu [2]**	**RCR**
--	--	• Dry	6		--
Good	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal	• Frost • Wet or Damp 1/8" or less depth of: • Water • Slush • Dry Snow • Wet Snow	5	40 or higher	19 & above
Good to Medium	Braking deceleration OR directional control is between Good and Medium.	-15°C and colder OAT: • Compacted Snow	4	39 to 30	
Medium	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	• Wet ("slippery when wet" runway) • Dry Snow or Wet Snow (any depth) over Compacted Snow Greater than 1/8" depth of: • Dry Snow • Wet Snow Warmer than -15°C OAT: • Compacted Snow	3	29 to 21	13 – 18
Medium to Poor	Braking deceleration OR directional control is between Medium and Poor.	Greater than 1/8" depth of: • Water • Slush	2		
Poor	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	• Ice	1	20 or lower	6 – 12
Nil [1]	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	• Wet Ice • Water on top of Compacted Snow • Dry Snow or Wet Snow over Ice	0		5 & below
--	--	• Unreliable	9 (ICAO only)	N/A	N/A

[1] Operations on any runway with a PIREP or runway contaminant of nil are prohibited.

[2] The overlapping Mu scales reflect the inherent inaccuracies of ground based Mu devices. Do not base the calculation of a landing distance solely on runway friction meter readings.

Braking actions "GOOD TO MEDIUM (4)" and "MEDIUM TO POOR (2)" are not displayed on the following pages. It is acceptable to interpolate between the provided data to calculate the desired landing performance when these conditions are present.

CROSSWIND

On slippery runways, crosswind guidelines are a function of runway surface condition, airplane loading and assume proper pilot technique. The following crosswind guidelines are applicable to all Delta aircraft for takeoff and landing.

	DRY	GOOD	MEDIUM	POOR
Crosswind Limit	Aircraft Limits	Aircraft Limits	20KTS	10KTS
Tailwind Limit	10KTS*	10KTS*	5KTS	0KTS

*Or as permitted by Delta 10-0 special pages.

OPERATIONAL LANDING DISTANCES

FEET

FLAPS 28

NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).

Landing Weight (lb)	DRY (6)				GOOD (5)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	12,400	9,000	5,300	5,000	12,400	9,000	7,000	6,600
165,000	12,200	8,800	5,200	4,900	12,200	8,800	6,900	6,500
160,000	11,900	8,600	5,100	4,800	11,900	8,600	6,700	6,400
155,000	11,600	8,400	5,000	4,700	11,600	8,400	6,600	6,300
150,000	11,300	8,200	4,900	4,600	11,300	8,200	6,400	6,100
145,000	11,100	8,000	4,800	4,500	11,100	8,000	6,300	6,000
142,000	10,900	7,900	4,800	4,500	11,100	8,000	6,300	6,000
140,000	10,800	7,800	4,700	4,400	10,800	7,800	6,100	5,800
135,000	10,500	7,600	4,600	4,300	10,500	7,600	6,000	5,700
130,000	10,200	7,400	4,500	4,200	10,200	7,400	5,800	5,500
125,000	10,000	7,200	4,400	4,100	10,000	7,200	5,700	5,400
120,000	9,700	7,000	4,300	4,000	9,700	7,000	5,500	5,300
115,000	9,500	6,900	4,200	3,900	9,500	6,900	5,400	5,200
110,000	9,200	6,700	4,000	3,800	9,200	6,700	5,300	5,000

BASIS: Zero wind and slope ● Touchdown Speed = VREF28 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Data is advisory and includes 15% safety margin and 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	DRY (6)				GOOD (5)			
0	-200	-200	-200	-200	-300	-300	-300	-300
2,000	0	0	0	0	0	0	0	0
4,000	300	300	300	300	300	300	300	300
6,000	500	500	500	500	700	700	700	700
8,000	800	800	800	800	1,000	1,000	1,000	1,000

CORRECTIONS	DRY (6)				GOOD (5)			
PER 1 KT HEADWIND	-50	-50	0	0	-50	-50	-50	-50
PER 1 KT TAILWIND	100	100	100	100	100	100	100	100
PER 5 KTS ADD'L SPD	150	150	150	150	250	250	250	250
PER 10°C ABOVE ISA	250	250	250	250	300	300	300	300
PER 10°C BELOW ISA	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% UP SLOPE	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% DOWN SLOPE	300	300	300	300	400	400	400	400
1 REVERSER INOP	50	50	50	50	400	400	400	400
2 REVERSERS INOP	100	100	100	100	600	600	600	600

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES

FEET

FLAPS 28

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR (1)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	12,700	10,500	9,800	9,500	13,400	13,400	12,700	12,300
165,000	12,400	10,300	9,600	9,300	13,100	13,100	12,400	12,000
160,000	12,100	10,100	9,400	9,000	12,700	12,700	12,100	11,700
155,000	11,800	9,900	9,200	8,800	12,400	12,400	11,800	11,500
150,000	11,500	9,600	8,900	8,600	12,100	12,100	11,500	11,200
145,000	11,200	9,400	8,700	8,400	11,800	11,800	11,200	10,900
142,000	11,000	9,200	8,600	8,300	11,700	11,700	11,100	10,800
140,000	10,900	9,100	8,500	8,200	11,500	11,500	10,900	10,600
135,000	10,600	8,900	8,300	8,000	11,200	11,200	10,600	10,300
130,000	10,300	8,600	8,000	7,800	10,800	10,800	10,300	10,000
125,000	10,100	8,400	7,800	7,600	10,500	10,500	10,000	9,700
120,000	9,800	8,200	7,600	7,300	10,200	10,200	9,700	9,400
115,000	9,600	8,000	7,400	7,200	10,000	10,000	9,500	9,200
110,000	9,300	7,700	7,200	7,000	9,700	9,700	9,200	9,000

BASIS: Zero wind and slope ● Touchdown Speed = VREF28 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Data is advisory and includes 15% safety margin and 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	MEDIUM (3)				POOR (1)			
0	-400	-400	-400	-400	-500	-500	-500	-500
2,000	0	0	0	0	0	0	0	0
4,000	500	500	500	500	700	700	700	700
6,000	1,000	1,000	1,000	1,000	1,300	1,300	1,300	1,300
8,000	1,500	1,500	1,500	1,500	2,000	2,000	2,000	2,000

CORRECTIONS	MEDIUM (3)				POOR (1)			
PER 1 KT HEADWIND	-50	-50	-50	-50	-50	-50	-50	-50
PER 1 KT TAILWIND	150	150	150	150	200	200	200	200
PER 5 KTS ADD'L SPD	350	350	350	350	450	450	450	450
PER 10°C ABOVE ISA	450	450	450	450	650	650	650	650
PER 10°C BELOW ISA	-100	-100	-100	-100	-150	-150	-150	-150
PER 1% UP SLOPE	-150	-150	-150	-150	-200	-200	-200	-200
PER 1% DOWN SLOPE	600	600	600	600	800	800	800	800
1 REVERSER INOP	1,400	1,400	1,400	1,400	2,350	2,350	2,350	2,350
2 REVERSERS INOP	2,100	2,100	2,100	2,100	3,600	3,600	3,600	3,600

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES

FEET

FLAPS 40

NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).

Landing Weight (lb)	DRY (6)				GOOD (5)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	11,800	8,600	5,000	4,700	11,800	8,600	6,700	6,300
165,000	11,600	8,400	4,900	4,600	11,600	8,400	6,600	6,200
160,000	11,300	8,200	4,800	4,500	11,300	8,200	6,400	6,100
155,000	11,100	8,100	4,700	4,400	11,100	8,100	6,300	6,000
150,000	10,800	7,900	4,600	4,300	10,800	7,900	6,100	5,800
145,000	10,600	7,700	4,600	4,300	10,600	7,700	6,000	5,700
142,000	10,400	7,600	4,500	4,200	10,300	7,500	5,900	5,600
140,000	10,300	7,500	4,500	4,200	10,300	7,500	5,900	5,600
135,000	10,100	7,400	4,400	4,100	10,100	7,400	5,800	5,500
130,000	9,800	7,200	4,300	4,000	9,800	7,200	5,600	5,300
125,000	9,600	7,000	4,200	3,900	9,600	7,000	5,500	5,200
120,000	9,300	6,800	4,100	3,800	9,300	6,800	5,300	5,100
115,000	9,000	6,600	4,000	3,700	9,100	6,600	5,200	5,000
110,000	8,700	6,400	3,800	3,600	8,800	6,400	5,000	4,800

BASIS: Zero wind and slope ● Touchdown Speed = VREF40 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Data is advisory and includes 15% safety margin and 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	DRY (6)				GOOD (5)			
0	-200	-200	-200	-200	-200	-200	-200	-200
2,000	0	0	0	0	0	0	0	0
4,000	200	200	200	200	300	300	300	300
6,000	500	500	500	500	600	600	600	600
8,000	700	700	700	700	1,000	1,000	1,000	1,000

CORRECTIONS	DRY (6)				GOOD (5)			
PER 1 KT HEADWIND	-50	-50	0	0	-50	-50	-50	-50
PER 1 KT TAILWIND	100	100	100	100	100	100	100	100
PER 5 KTS ADD'L SPD	150	150	150	150	250	250	250	250
PER 10°C ABOVE ISA	250	250	250	250	300	300	300	300
PER 10°C BELOW ISA	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% UP SLOPE	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% DOWN SLOPE	300	300	300	300	400	400	400	400
1 REVERSER INOP	100	100	100	100	350	350	350	350
2 REVERSERS INOP	150	150	150	150	550	550	550	550

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES

FEET

FLAPS 40

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR (1)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	12,100	10,000	9,400	9,000	12,800	12,800	12,000	11,700
165,000	11,800	9,800	9,200	8,800	12,500	12,500	11,800	11,500
160,000	11,500	9,600	8,900	8,600	12,200	12,200	11,500	11,200
155,000	11,300	9,400	8,700	8,400	11,900	11,900	11,200	10,900
150,000	11,000	9,100	8,500	8,200	11,600	11,600	10,900	10,600
145,000	10,800	8,900	8,300	8,000	11,400	11,400	10,700	10,400
142,000	10,600	8,800	8,200	7,900	11,200	11,200	10,500	10,200
140,000	10,500	8,700	8,100	7,800	11,100	11,100	10,400	10,100
135,000	10,200	8,500	7,900	7,700	10,800	10,800	10,200	9,900
130,000	9,900	8,300	7,700	7,500	10,500	10,500	9,900	9,600
125,000	9,700	8,100	7,500	7,300	10,200	10,200	9,600	9,400
120,000	9,400	7,800	7,300	7,100	9,900	9,900	9,300	9,100
115,000	9,100	7,600	7,100	6,900	9,600	9,600	9,100	8,800
110,000	8,800	7,400	6,900	6,700	9,300	9,300	8,800	8,500

BASIS: Zero wind and slope ● Touchdown Speed = VREF40 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Data is advisory and includes 15% safety margin and 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

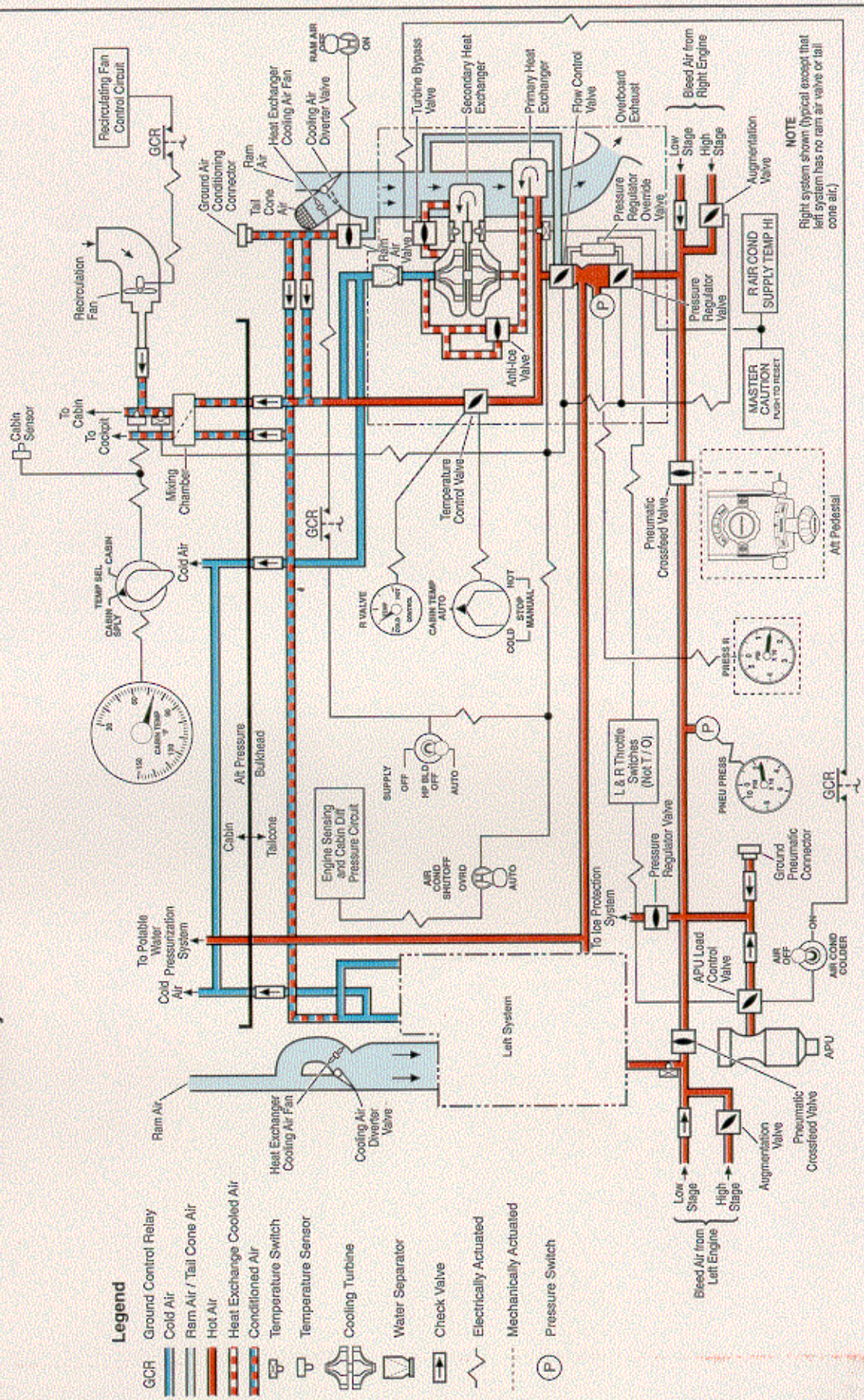
ALTITUDE ADJUSTMENT

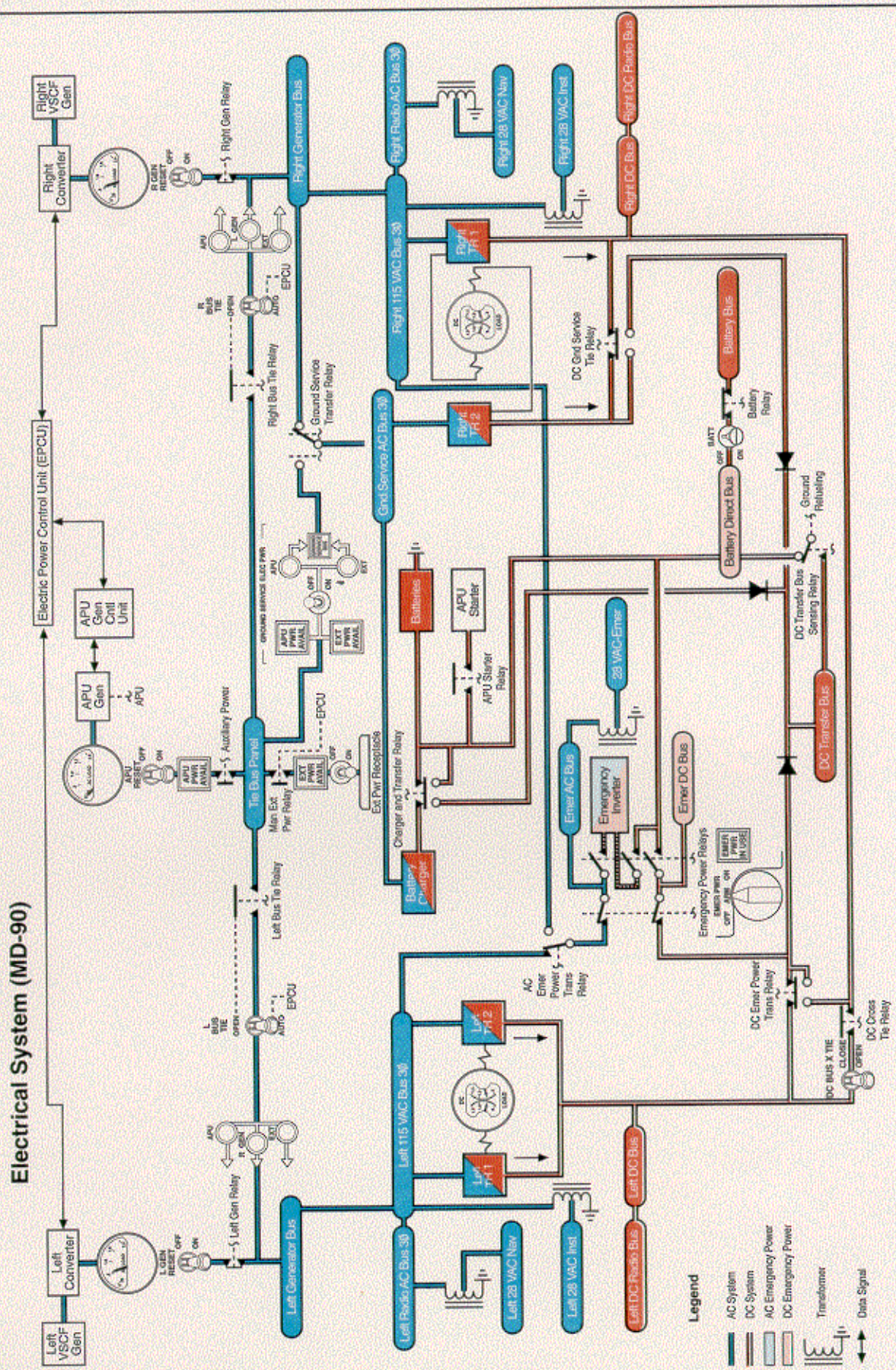
ALTITUDE (FEET)	MEDIUM (3)				POOR (1)			
0	-300	-300	-300	-300	-400	-400	-400	-400
2,000	0	0	0	0	0	0	0	0
4,000	500	500	500	500	600	600	600	600
6,000	1,000	1,000	1,000	1,000	1,300	1,300	1,300	1,300
8,000	1,400	1,400	1,400	1,400	1,900	1,900	1,900	1,900

CORRECTIONS	MEDIUM (3)				POOR (1)			
PER 1 KT HEADWIND	-50	-50	-50	-50	-50	-50	-50	-50
PER 1 KT TAILWIND	150	150	150	150	200	200	200	200
PER 5 KTS ADD'L SPD	300	300	300	300	450	450	450	450
PER 10°C ABOVE ISA	450	450	450	450	600	600	600	600
PER 10°C BELOW ISA	-150	-150	-150	-150	-150	-150	-150	-150
PER 1% UP SLOPE	-150	-150	-150	-150	-150	-150	-150	-150
PER 1% DOWN SLOPE	600	600	600	600	750	750	750	750
1 REVERSER INOP	1,050	1,050	1,050	1,050	1,700	1,700	1,700	1,700
2 REVERSERS INOP	1,600	1,600	1,600	1,600	2,600	2,600	2,600	2,600

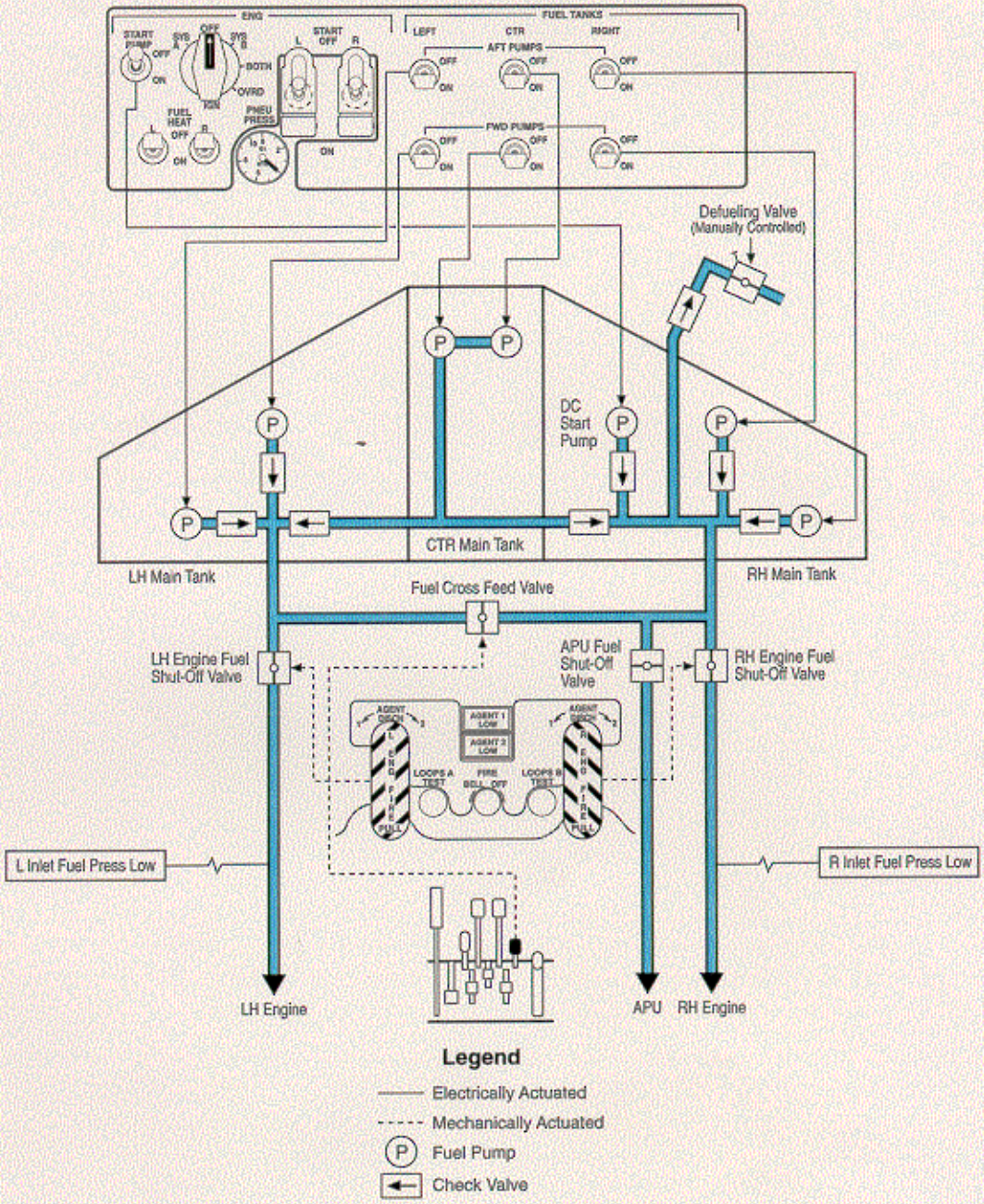
Note: Do not operate when Braking Action is Nil.

Air Conditioning/ Pressurization System



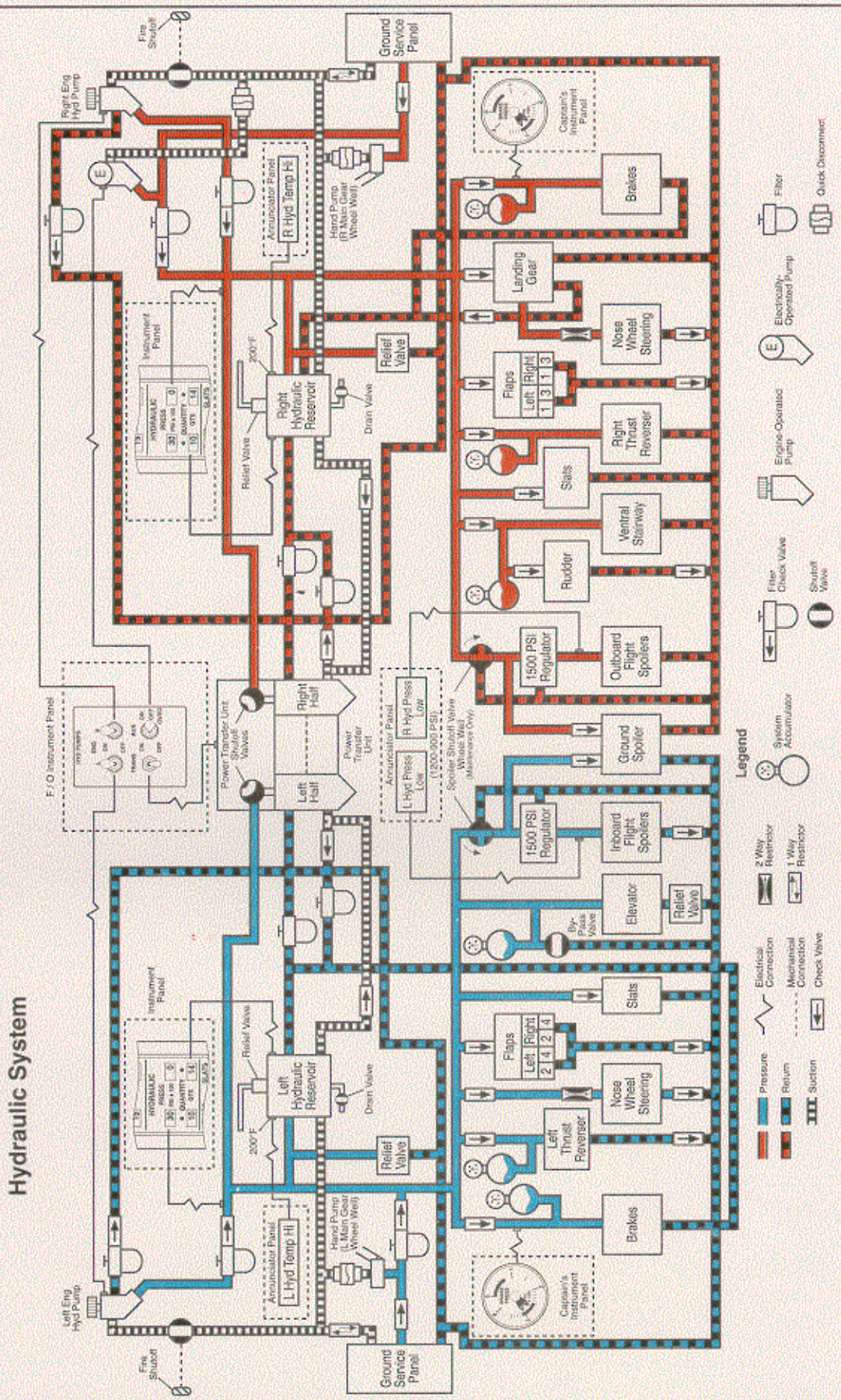

Electrical System (MD-90)
Right VSCF Gen
Right Converter
Right Gen Relay
Right Generator Bus
Right Radio AC Bus 3B
Right 28 VAC Nav
Right 28 VAC Inst
Right DC Radio Bus
Right DC Bus
Right 115 VAC Bus 3B
Right TR 1
Right TR 2
DC Grd Service Tie Relay
Battery Bus
Battery Relay
Battery Direct Bus
Ground Refueling
DC Transfer Bus Sensing Relay
DC Transfer Bus
Electric Power Control Unit (EPCU)
APU Gen Cntl Unit
APU Gen
APU
Auxiliary Power
Tie Bus Panel
Right Bus Tie Relay
Ground Service Transfer Relay
Grd Service AC Bus 3B
Batteries
APU Starter
APU Starter Relay
28 VAC-Emer
Emer AC Bus
Emergency Inverter
Emer DC Bus
Emergency Power Relays
Ext Pwr Receptacle
Man Ext Pwr Relay
Charger and Transfer Relay
Battery Charger
Left Bus Tie Relay
AC Emer Power Trans Relay
DC Emer Power Trans Relay
DC Cross Tie Relay
Left 115 VAC Bus 3B
Left TR 1
Left TR 2
Left Gen Relay
Left Generator Bus
Left Radio AC Bus 3B
Left 28 VAC Nav
Left 28 VAC Inst
Left DC Radio Bus
Left DC Bus
Left Converter
Left VSCF Gen
Legend
AC System
DC System
AC Emergency Power
DC Emergency Power
Transformer
Data Signal

Fuel System

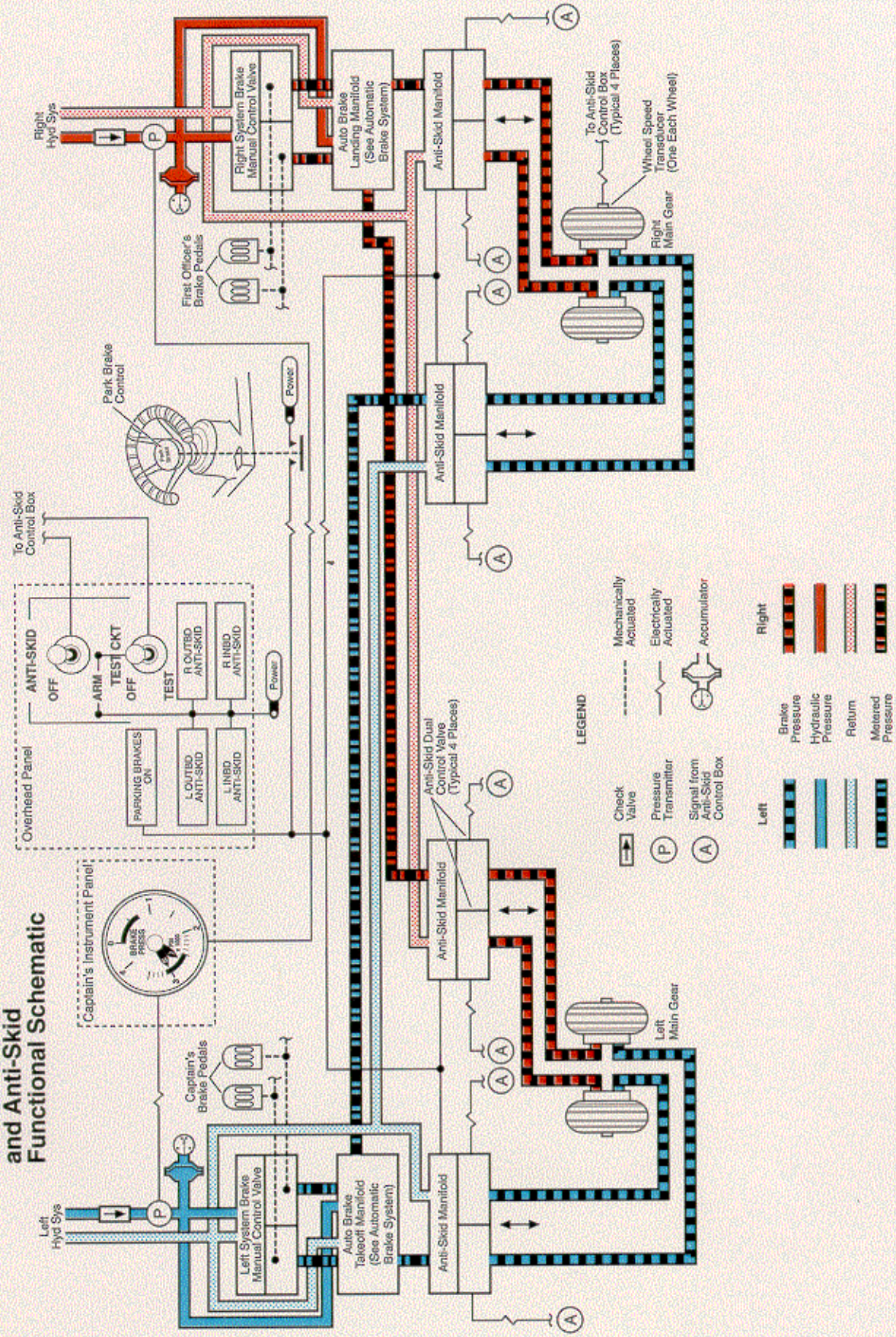


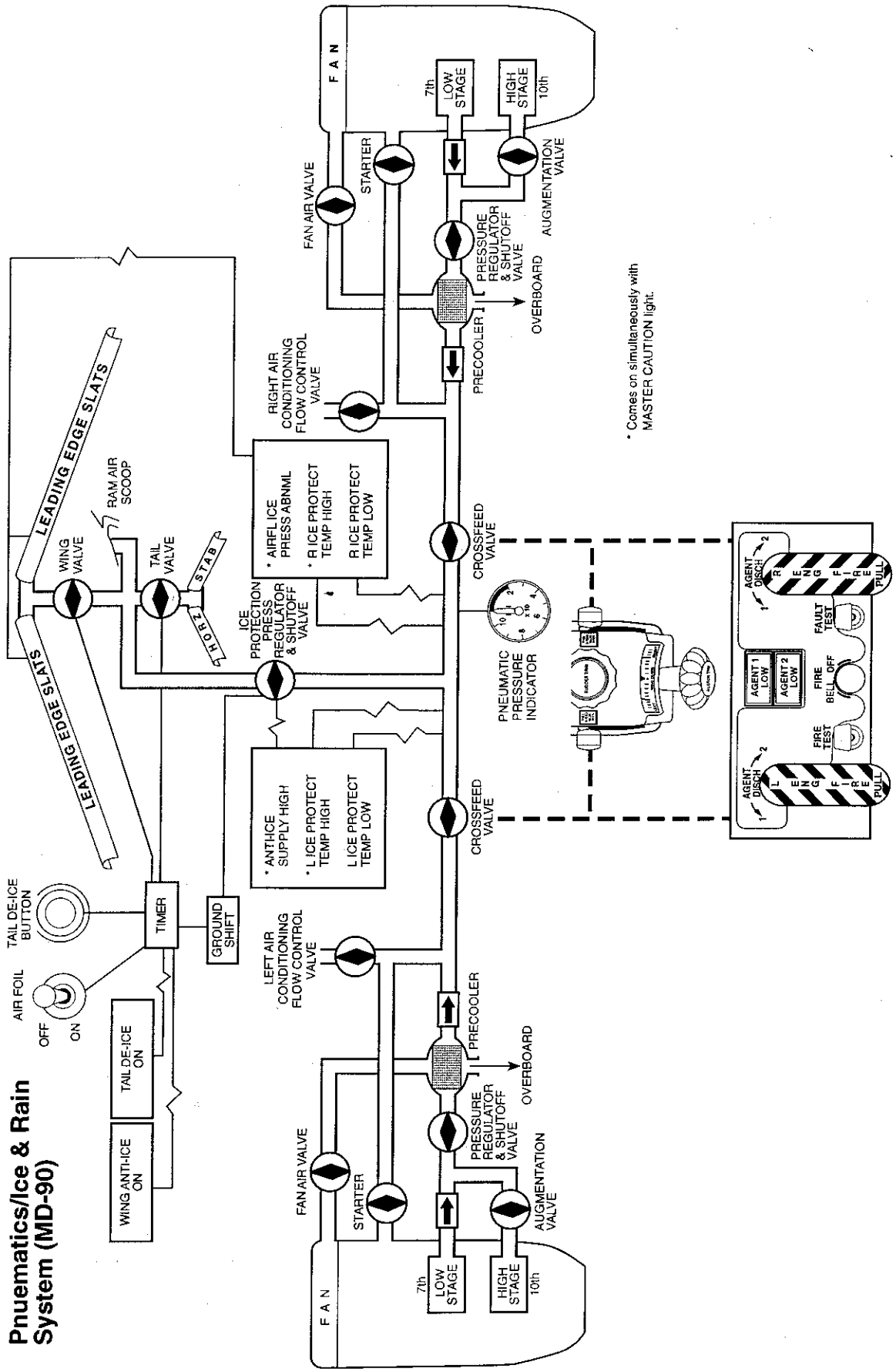
Legend

- Electrically Actuated
- Mechanically Actuated
- (P) Fuel Pump
- Check Valve


Hydraulic System
Fire Shutoff
Right Eng Hyd Pump
Ground Service Panel
Annunciator Panel
R Hyd Temp Hi
Hand Pump (R Main Gear Wheel Well)
Captain's Instrument Panel
Brakes
Landing Gear
Nose Wheel Steering
Flaps
Left
Right
1 3 1 3
Right Thrust Reverser
Slats
Ventral Stairway
Rudder
Outboard Flight Spoilers
1500 PSI Regulator
Ground Spoiler
Inboard Flight Spoilers
Elevator
Relief Valve
By-Pass Valve
Instrument Panel
HYDRAULIC
PRESS
QUANTITY
TEMP
Right Hydraulic Reservoir
Drain Valve
200°F
Relief Valve
Power Transfer Unit Shutoff Valves
Right Half
Left Half
Power Transfer Unit
F / O Instrument Panel
Annunciator Panel
R Hyd Press Low
L Hyd Press Low
(1200-900 PSI)
Spoiler Shutoff Valve (Wheel Well Maintenance Only)
Left Hydraulic Reservoir
Left Thrust Reverser
L Hyd Temp Hi
Left Eng Hyd Pump
Legend
Filter
Quick Disconnect
Electrically-Operated Pump
Engine-Operated Pump
Filter Check Valve
Shutoff Valve
System Accumulator
2 Way Restrictor
1 Way Restrictor
Electrical Connection
Mechanical Connection
Check Valve
Pressure
Return
Suction

Main Wheel Brakes and Anti-Skid Functional Schematic




Pnuematics/Ice & Rain System (MD-90)
LEADING EDGE SLATS
LEADING EDGE SLATS
RAM AIR SCOOP
WING VALVE
TAIL VALVE
STAB
HORZ
TAIL DE-ICE BUTTON
AIR FOIL
OFF
ON
TIMER
GROUND SHIFT
TAIL DE-ICE ON
WING ANTI-ICE ON
ICE PROTECTION PRESS REGULATOR & SHUTOFF VALVE
* AIRFL ICE PRESS ABNML
* R ICE PROTECT TEMP HIGH
R ICE PROTECT TEMP LOW
* ANTI ICE SUPPLY HIGH
* L ICE PROTECT TEMP HIGH
L ICE PROTECT TEMP LOW
RIGHT AIR CONDITIONING FLOW CONTROL VALVE
LEFT AIR CONDITIONING FLOW CONTROL VALVE
CROSSFEED VALVE
CROSSFEED VALVE
PNEUMATIC PRESSURE INDICATOR
* Comes on simultaneously with MASTER CAUTION light.
FAN AIR VALVE
STARTER
FAN
7th LOW STAGE
HIGH STAGE 10th
AUGMENTATION VALVE
PRESSURE REGULATOR & SHUTOFF VALVE
PRECOOLER
OVERBOARD
AGENT DISCH
ENGINE FIRE PULL
FAULT TEST
AGENT 1 LOW
AGENT 2 LOW
FIRE BELL OFF
FIRE TEST

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DEFINITIONS AND ASSUMPTIONS

ISA - International Standard Atmosphere temperature, in °C, for a given pressure altitude. ISA temperature for Sea Level is 15°C (59°F).

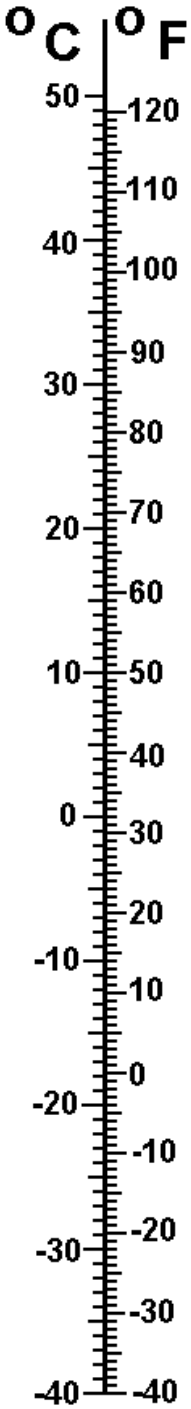
ISA DEVIATION - The difference between the standard ISA temperature and the ambient temperature in °C.

STATIC AIR TEMPERATURE (SAT) - The ambient still air temperature outside of the aircraft. Sometimes known as the Outside Air Temperature (OAT).

TOTAL AIR TEMPERATURE (TAT) - The total of the ambient air temperature (SAT) plus the increase in temperature due to compression heating.

Vmo/Mmo - Maximum allowable operating indicated airspeed or Mach number.

TEMPERATURE CONVERSION AND STATIC AIR TEMPERATURE



°C

ALTITUDE - FEET	ISA DEVIATION					
	ISA-20°C	ISA-10°C	ISA	ISA+10°C	ISA+20°C	ISA+30°C
36,000 & Higher	-76.5	-66.5	-56.5	-46.5	-36.5	-26.5
35,000	-74.2	-64.2	-54.2	-44.2	-34.2	-24.2
34,000	-72.3	-62.3	-52.3	-42.3	-32.3	-22.3
33,000	-70.3	-60.3	-50.3	-40.3	-30.3	-20.3
32,000	-68.3	-58.3	-48.3	-38.3	-28.3	-18.3
31,000	-66.3	-56.3	-46.3	-36.3	-26.3	-16.3
30,000	-64.3	-54.3	-44.3	-34.3	-24.3	-14.3
29,000	-62.4	-52.4	-42.4	-32.4	-22.4	-12.4
28,000	-60.4	-50.4	-40.4	-30.4	-20.4	-10.4
27,000	-58.4	-48.4	-38.4	-28.4	-18.4	-8.4
26,000	-56.5	-46.5	-36.5	-26.5	-16.5	-6.5
25,000	-54.5	-44.5	-34.5	-24.5	-14.5	-4.5
24,000	-52.5	-42.5	-32.5	-22.5	-12.5	-2.5
23,000	-50.5	-40.5	-30.5	-20.5	-10.5	-0.5
22,000	-48.5	-38.5	-28.5	-18.5	-8.5	+1.5
21,000	-46.6	-36.6	-26.6	-16.6	-6.6	+3.4
20,000	-44.6	-34.6	-24.6	-14.6	-4.6	+5.4
19,000	-42.6	-32.6	-22.6	-12.6	-2.6	+7.4
18,000	-40.6	-30.6	-20.6	-10.6	-0.6	+9.4
17,000	-38.7	-28.7	-18.7	-8.7	+1.3	+11.3
16,000	-36.7	-26.7	-16.7	-6.7	+3.3	+13.3
15,000	-34.7	-24.7	-14.7	-4.7	+5.3	+15.3
14,000	-32.7	-22.7	-12.7	-2.7	+7.3	+17.3
13,000	-30.7	-20.7	-10.7	-0.7	+9.3	+19.3
12,000	-28.8	-18.8	-8.8	+1.2	+11.2	+21.2
11,000	-26.8	-16.8	-6.8	+3.2	+13.2	+23.2
10,000	-24.8	-14.8	-4.8	+5.2	+15.2	+25.2
5000	-14.9	-4.9	+5.1	+15.1	+25.1	+35.1
0	-5.0	+5.0	+15.0	+25.0	+35.0	+45.0

RULE OF THUMB: For standard temperature (ISA) at or below 36,000 feet:

Double altitude (in thousands of feet), subtract 15, change sign.

EXAMPLES:	ALT	DOUBLE ALT	SUBTRACT 15	CHANGE SIGN
	0	0	-15	+15
	33	66	51	-51

RAM AIR TEMPERATURE vs STATIC AIR TEMPERATURE

°C

RAT	INDICATED MACH NUMBER													
°C	.40	.50	.60	.70	.74	.75	.76	.77	.78	.80	.82	.84	.86	.88
75	64	58	52	44	41	40	39	38	37	35	34	32	30	28
70	59	54	47	39	36	35	34	33	33	31	29	28	26	24
65	55	49	42	35	32	31	30	29	28	27	25	23	21	20
60	50	44	38	30	27	26	25	24	24	22	21	19	17	15
55	45	39	33	26	23	22	21	20	19	18	16	14	13	11
50	40	35	28	21	18	17	16	15	14	13	12	10	8	7
45	35	30	24	17	14	13	12	11	10	9	7	6	4	2
40	30	25	19	12	9	8	7	6	6	4	3	1	0	-2
35	25	20	14	7	5	4	3	2	1	0	-1	-3	-5	-6
30	21	16	10	3	0	-1	-2	-3	-3	-4	-6	-7	-9	-11
25	16	11	5	-2	-4	-5	-6	-7	-7	-9	-10	-12	-13	-15
20	11	6	0	-6	-9	-10	-11	-12	-12	-13	-15	-16	-18	-19
15	6	1	-4	-11	-13	-14	-15	-16	-16	-18	-19	-21	-22	-24
10	1	-3	-9	-15	-18	-19	-20	-21	-21	-22	-23	-25	-27	-28
5	-4	-8	-14	-20	-22	-23	-24	-25	-25	-27	-28	-29	-31	-32
0	-8	-13	-18	-24	-27	-28	-29	-30	-30	-31	-32	-34	-35	-37
-5	-13	-18	-23	-29	-31	-32	-33	-34	-34	-35	-37	-38	-40	-41
-10	-18	-23	-28	-33	-36	-37	-38	-39	-39	-40	-41	-43	-44	-45
-15	-23	-27	-32	-38	-40	-41	-42	-43	-43	-44	-46	-47	-48	-50
-20	-28	-32	-37	-43	-45	-46	-47	-48	-48	-49	-50	-51	-53	-54
-25	-33	-37	-42	-47	-49	-50	-51	-52	-52	-53	-54	-56	-57	-58
-30	-38	-42	-46	-52	-54	-54	-55	-55	-56	-58	-59	-60	-61	-63
-35	-42	-46	-51	-56	-58	-59	-60	-61	-61	-62	-63	-64	-66	-67
-40	-47	-51	-56	-61	-63	-63	-64	-64	-65	-66	-68	-69	-70	-71
-45	-52	-56	-60	-65	-67	-68	-69	-70	-70	-71	-72	-73	-74	-76
-50	-57	-61	-65	-70	-72	-72	-73	-73	-74	-75	-76	-78	-79	-80
-55	-62	-65	-70	-74	-76	-77	-78	-79	-79	-80	-81	-82	-83	-84

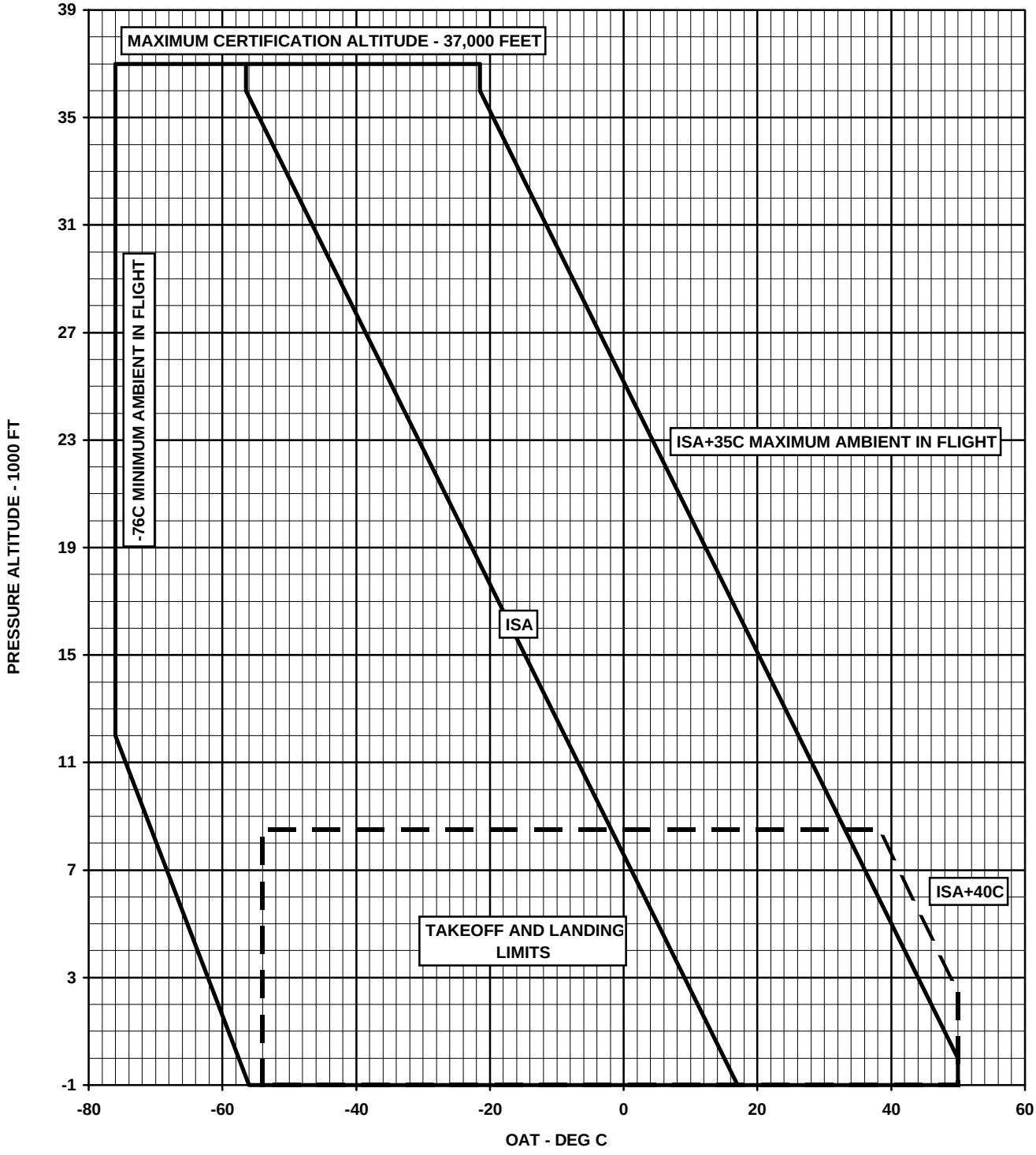
NORMAL OPERATING SPEED LIMIT

Vmo / Mmo

PRESSURE ALTITUDE	INDICATED Vmo (KIAS)	MACH Mmo
0	340	.550
5000	340	.580
10000	340	.620
15000	340	.670
17000	340	.690
19000	340	.730
21000	340	.750
23000	340	.770
25000	340	.810
27000	340	.835
29000	326	.840
31000	312	.840
33000	299	.840
35000	285	.840
37000	273	.840

NOTE: If the Mach Trim Compensator malfunctions or becomes inoperative during flight, DO NOT EXCEED 0.78 Mach.

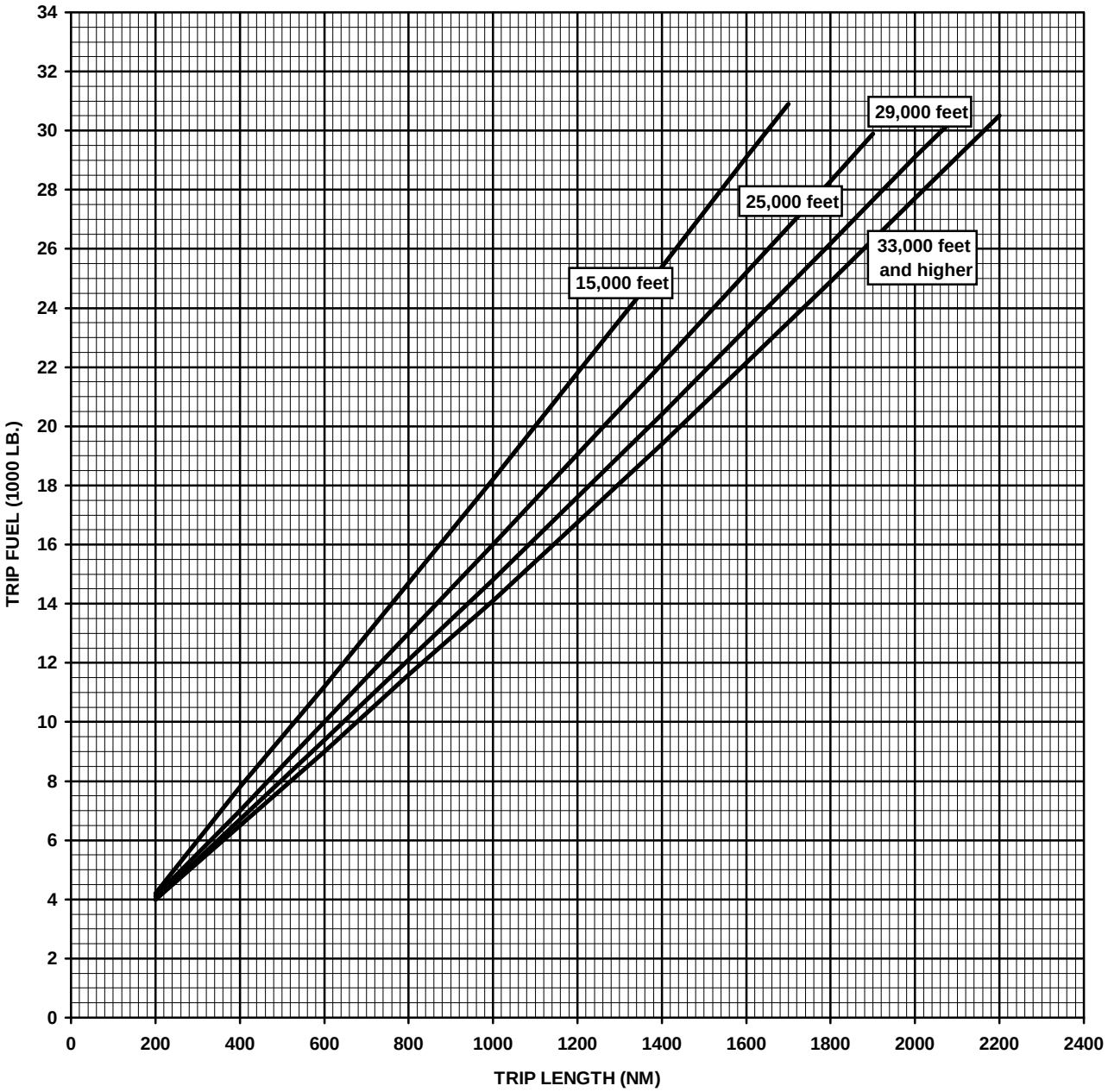
ENVIRONMENT ENVELOPE



TRIP FUEL ESTIMATE

STANDARD DAY, ZERO WIND

- Climb @ 250/300/.76Mn
- Cruise @ .76Mn
- Descent @ .76Mn/300/250
- 65% Space Limit Payload



NOTES: 1.) To obtain block fuel add 600 pounds to trip fuel.
2.) To determine start of takeoff weight, add trip fuel to landing weight.

SHORT RANGE FLIGHTS FUEL CONSUMPTION TABLE

Standard Day

Block Time (minutes)	Block Fuel (pounds)
20	1640
25	2150
30	2650
35	3160
40	3660
45	4170
50	4670
55	5180
60	5680
65	6190
70	6690
75	7200
80	7710

The above fuel consumptions are based on the following conditions:

1. 65% Limit Payload

2. Non - VFR reserves

3. Climb @ 250 KIAS / 310 KIAS / Cruise Mach
   Cruise at Minimum Cost
   Descent @ Cruise Mach / 300 KIAS / 250 KIAS

4. Block (time/fuel) = Trip (time/fuel) + Ground Maneuver (time/fuel)

5. Ground Maneuver = Taxi Time, 15 minutes; Taxi fuel, 600 lbs.

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DRIFTDOWN PERFORMANCE

(ONE ENGINE INOPERATIVE)

Net driftdown performance is provided for one engine inoperative. The data on Page 1-11 defines net level-off altitudes following driftdown. The data on Pages 1-12 – 1-13 defines the driftdown net flight path from normal operational altitudes.

This net driftdown performance data may be used to assess terrain clearance for operation over mountainous areas. In addition, the driftdown profiles on Pages 1-12 – 1-13 may be used to determine altitude capability during driftdown. For overwater operation without life rafts, the driftdown profiles may be used to assure that the aircraft has sufficient driftdown performance to the coastline so that the 162 nm limitation is not exceeded.

Instructions for determining ground distance during driftdown for a given weight and intercept altitude (charts on Pages 1-12 – 1-13):

A) Determine equivalent gross weight from chart at top of Page 1-12 or 1-13 by entering chart at actual gross weight and exiting with equivalent gross weight.

B) Select chart on Page 1-12 or 1-13 applicable to cruise altitude at engine failure.

C) As shown by example trace lines on FL 330 chart, for a given intercept altitude, proceed over to equivalent gross weight, then down to wind reference line. Correct for wind, then proceed down to distance traveled.

APPLICABILITY:

The driftdown level-off altitude data presented in this manual are used for obstacle clearance analysis for ice protection ON and OFF, with various temperatures and airplane weights at a set initial cruise altitude. The net driftdown performance represents the gross (actual) driftdown gradient minus 1.1%. This is in accordance with FAR 25.123 for two-engine aircraft.

The net data (also stored in FPS 2.0) provide an additional margin to account for a number of possible navigational and procedural errors that could take place. It is used for pre-flight analysis of enroute obstacles to ensure clearance. Per FAR 121.191(a), the *net* level-off altitude must clear all enroute terrain by at least 1,000 feet.

The gross data represents the actual aircraft performance in the event of an in-flight engine failure and are directly available in the FMS, as well as the Abnormal section of this manual. These numbers cannot be used for dispatch/pre-flight analysis purposes.

DRIFTDOWN NET LEVEL OFF ALTITUDE

(FOR FLIGHT PLANNING PURPOSES)

MAXIMUM CONTINUOUS THRUST

BASED ON 28K THRUST, FL350 INITIAL ALTITUDE

ENGINE ANTI-ICE OFF

GROSS WEIGHT – POUNDS		APPROXIMATE NET LEVEL OFF ALTITUDE – FEET			
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA - 10°C	ISA + 0°C	ISA + 10°C	ISA + 20°C
170,000	163,600	7,600	7,600	7,500	2,400
160,000	154,400	10,400	10,400	10,300	5,600
150,000	145,000	13,200	13,200	13,100	8,900
140,000	135,700	15,900	15,900	15,900	12,200
130,000	126,300	18,600	18,600	18,600	15,500
120,000	116,900	20,700	20,700	20,700	18,800
110,000	107,100	23,000	23,000	23,000	21,000
100,000	97,500	25,600	25,600	25,600	23,600

ENGINE ANTI-ICE ON

GROSS WEIGHT – POUNDS		APPROXIMATE NET LEVEL OFF ALTITUDE – FEET			
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA - 10°C	ISA + 0°C	ISA + 10°C	ISA + 20°C
170,000	163,500	6,800	6,800	6,800	1,700
160,000	154,200	9,600	9,600	9,600	4,800
150,000	145,000	12,400	12,400	12,400	8,100
140,000	135,600	15,200	15,200	15,200	11,300
130,000	126,200	18,000	18,000	17,900	14,600
120,000	117,000	20,300	20,300	20,200	17,900
110,000	107,100	22,400	22,400	22,400	20,400
100,000	97,500	25,000	25,000	25,000	22,800

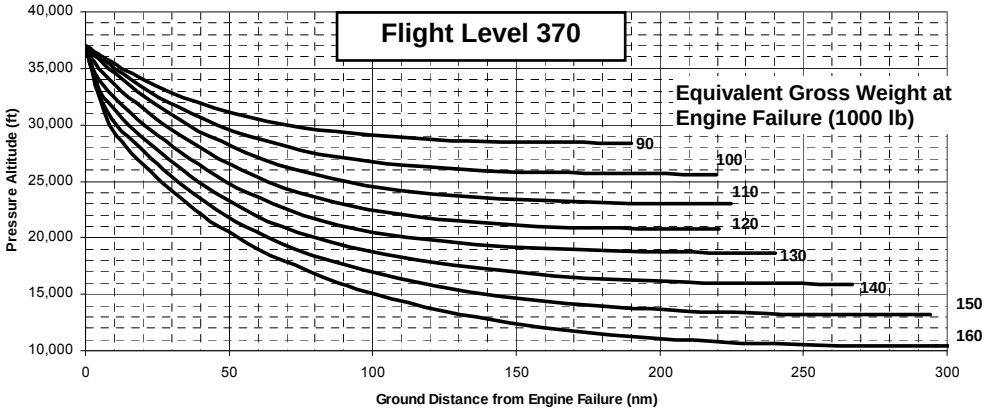
ENGINE & WING ANTI-ICE ON

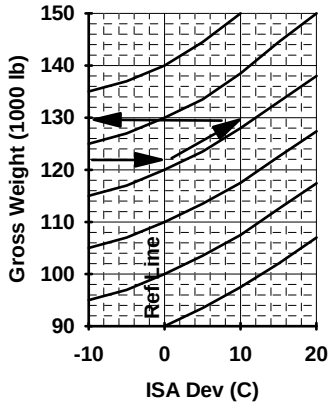
GROSS WEIGHT – POUNDS		APPROXIMATE NET LEVEL OFF ALTITUDE – FEET			
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA - 10°C	ISA + 0°C	ISA + 10°C	ISA + 20°C
170,000	163,200	4,900	4,900	4,800	
160,000	153,900	7,700	7,600	7,500	2,800
150,000	144,500	10,500	10,500	10,400	5,900
140,000	135,200	13,400	13,300	13,300	9,100
130,000	125,800	16,200	16,200	16,100	12,300
120,000	116,800	19,100	19,000	19,000	15,600
110,000	107,100	21,100	21,100	21,100	19,000
100,000	97,400	23,600	23,500	23,500	21,200

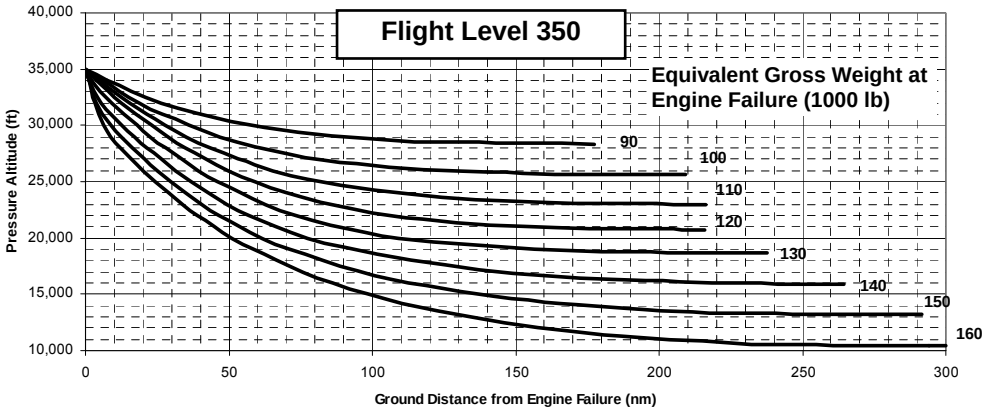
BASIS: Max continuous thrust, APU operating, 35,000 ft. initial altitude, 100 ft/min. residual rate of climb.

DRIFTDOWN NET FLIGHT PATH

(ONE ENGINE OPERATING)

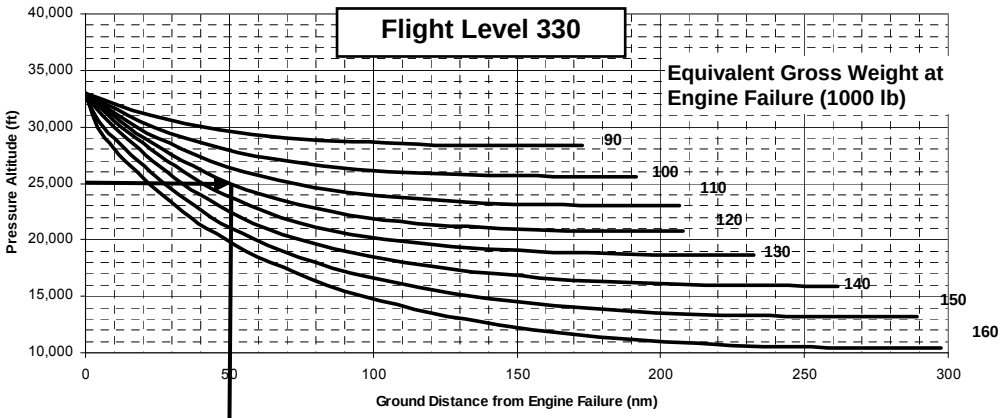


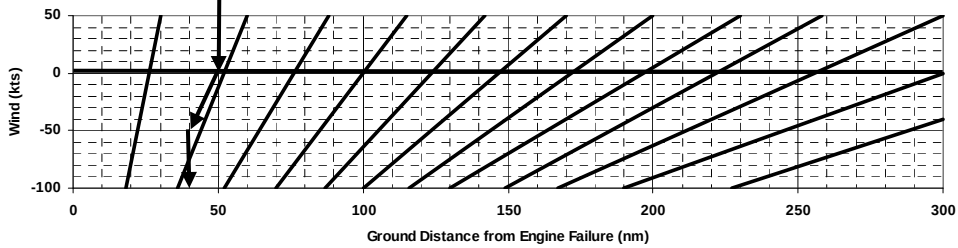




Note: Each line represents 10,000 lb. weight interval.

Instructions on Page 1-10.

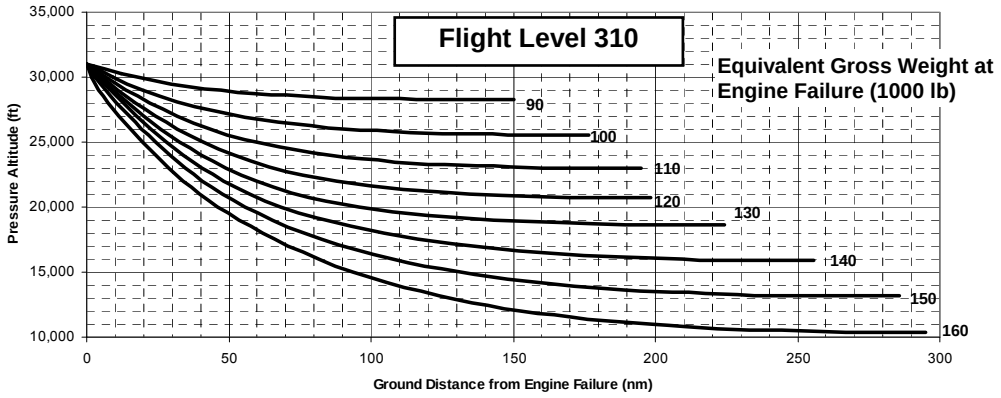


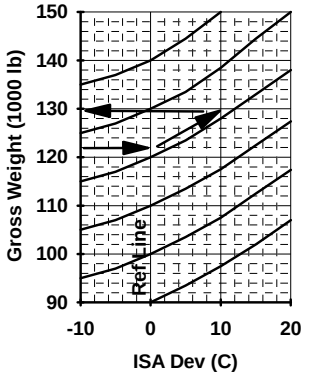


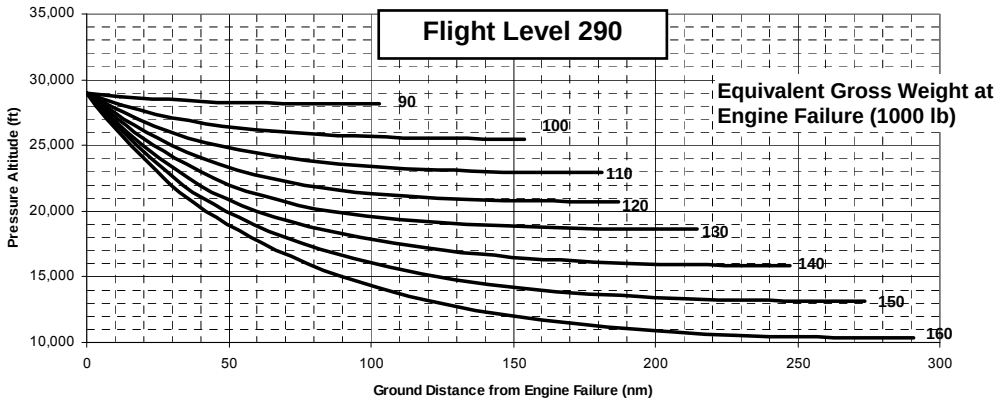
Ref Line

DRIFTDOWN NET FLIGHT PATH

(ONE ENGINE OPERATING)

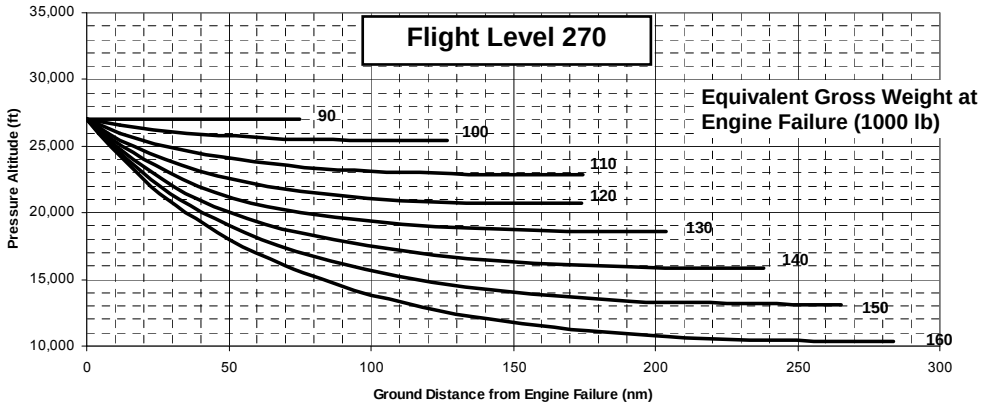


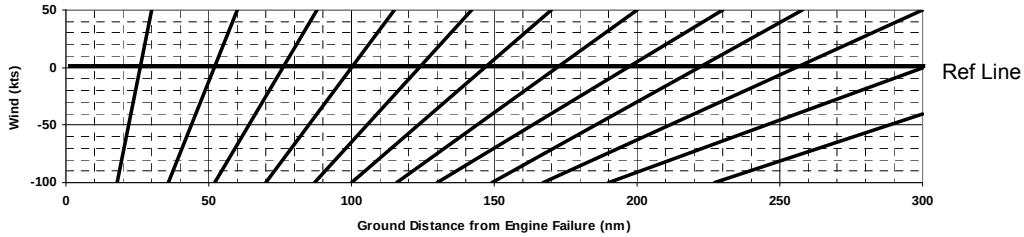




Note: Each line represents 10,000 lb. weight interval.

Instructions on Page 1-10.





End of Section

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TAKEOFF STABILIZER SETTINGS **2-14**

CROSS REFERENCES

SELECTION OF TAKEOFF THRUST ..... TAKEOFF

BUFFET ONSET BOUNDARY SPEEDS ..... CRUISE

MAXIMUM INITIAL CRUISE ALTITUDE ..... CRUISE

PATTERN AND APPROACH SPEED ..... APPROACH/LANDING

STALL SPEED ..... APPROACH/LANDING

DIVERSION PLANNING CHART ..... QUICK REFERENCE

DEFINITIONS AND ASSUMPTIONS

AWABS Automated Weight and Balance System. The computerized system for determining the weight & balance and airport performance.

AIRPORT PRESSURE ALTITUDE The altitude read from the altimeter while sitting on the airport and adjusting the altimeter setting to 29.92 inches of mercury.

EPR Engine pressure ratio. Used as the primary thrust setting parameter for the V2528-D5 engines.

FMS Flight Management System.

FMC Flight Management Computer.

GWT Gross Weight for Takeoff. The aircraft weight at the start of the takeoff roll.

N_1 Fan rotor speed in percent. Used as the backup thrust setting parameter for the V2528-D5 engine.

V_1 Takeoff Decision Speed. V_1 is the speed that determines a **go** or **no-go** decision in the event of an engine failure. No time is allowed after V_1 for reaction or decision; **action** must be initiated at or before V_1. FAR, Part 25 defines V_1 as "the speed at which an engine failure has been recognized and action initiated to either continue or stop the takeoff".

V_R Rotation Speed. V_R is the speed at which the pilot begins to rotate the aircraft to the takeoff pitch attitude. V_R is selected so that, with a normal rate of rotation, the aircraft will lift off and attain a height of 35 feet at a speed of V_2.

V_2 Takeoff Safety Speed. V_2 is the speed used to achieve the required gradient during second climb segment.

TAKEOFF THRUST

THRUST SETTINGS

Takeoff thrust setting data is provided in this manual for the following ratings:

28TO Power is based on the 28K engine rating with Packs ON or OFF as required. This power rating is always used on these aircraft. (25K thrust is only available on Ships 9201-9216.)

Assumed temperature thrust setting tables are not provided in this manual. However, the TO NORMAL Takeoff Thrust table for **EPR only** may also be used to set AT Thrust. When using Assumed Temperature reduced thrust for takeoff, refer to Vol 1 of the AOM, section NP.20. Along with the full takeoff thrust settings, the WDR will display a range of assumed temperatures with the associated flap settings which meet the performance requirements of the flight for each runway, e.g.

THRUST/FLAP
D50 / 11 … 28K
D49 / 11 … 28K
D48 / 11 … 28K
DTO / 11 … 28K
DTO / 18 … 28K

AT's provided on the WDR will vary depending on aircraft weight and airport conditions.

Setting Takeoff Thrust using an assumed temperature results in the thrust that would be obtained from full rated thrust if the outside temperature was actually the temperature selected.

It is permissible to use an assumed temperature outside the environmental envelope; however, the aircraft may not be operated with an OAT greater than the environmental envelope.

Target N_1 settings corresponding to the selected assumed temperature are calculated and displayed on the PERF INIT page of the MCDU. (Refer to AOM Vol 1, Normal Procedures.)

TRP OPERATION:

AT THRUST Select TO/GA Mode button. Set AT to be used on the ASSUMED TEMP selector.

28TO Select TO/GA Mode button.

Pressure Altitude
When using Takeoff Thrust charts, Pressure Altitude is obtained from the altimeter. However, an alternative method of obtaining pressure altitude is to:

Subtract 100 feet from elevation for every 0.11 inch barometric setting above 29.92 inches of Mercury **or**
Add 100 feet to elevation for every 0.11 inch barometric setting below 29.92 inches of Mercury.

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TAKEOFF THRUST

EPR

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

28TO

V2528-D5

BASED ON 28K RATING
STATIC SETTING
NORMAL BLEED – PACKS ON, ANTI-ICE OFF

OAT		AIRPORT PRESSURE ALTITUDE – FT									
ºC	ºF	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
50	122.0	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39
48	118.4	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
46	114.8	1.41	1.41	1.41	1.41	1.41	1.41	1.42	1.41	1.41	1.41
44	111.2	1.42	1.42	1.42	1.42	1.42	1.43	1.43	1.42	1.42	1.42
42	107.6	1.43	1.43	1.43	1.43	1.44	1.44	1.44	1.43	1.43	1.43
40	104.0	1.44	1.44	1.44	1.45	1.45	1.45	1.45	1.45	1.44	1.44
38	100.4	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.45
36	96.8	1.47	1.47	1.47	1.47	1.47	1.48	1.48	1.47	1.47	1.47
34	93.2	1.48	1.48	1.48	1.48	1.48	1.49	1.49	1.48	1.48	1.48
32	89.6	1.48	1.49	1.49	1.49	1.49	1.50	1.50	1.49	1.49	1.49
30	86.0	1.48	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
28	82.4	1.48	1.51	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
26	78.8	1.48	1.51	1.52	1.53	1.54	1.54	1.54	1.53	1.53	1.53
24	75.2	1.48	1.51	1.52	1.53	1.55	1.55	1.55	1.55	1.55	1.54
22	71.6	1.48	1.51	1.52	1.53	1.55	1.56	1.56	1.56	1.56	1.56
20	68.0	1.48	1.51	1.52	1.53	1.55	1.56	1.58	1.57	1.57	1.57
18	64.4	1.48	1.51	1.52	1.53	1.55	1.56	1.58	1.58	1.58	1.58
16 & below	53.6	1.48	1.51	1.52	1.53	1.55	1.56	1.58	1.58	1.58	1.58

CORRECTIONS:

Packs OFF	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.02	+ 0.02	+ 0.02	+ 0.02
Engine Anti-Ice ON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Airplane Anti-Ice ON	- 0.01	- 0.01	- 0.01	- 0.01	- 0.01	- 0.01	- 0.02	- 0.02	- 0.02	- 0.02

TAKEOFF THRUST

% N_1

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

EPR CHECK ONLY
BASED ON 28K RATING
STATIC SETTING
NORMAL BLEED – PACKS ON, ANTI-ICE OFF

28TO

V2528-D5

OAT		AIRPORT PRESSURE ALTITUDE – FT									
ºC	ºF	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
50	122.0	89.0	88.9	89.0	89.0	89.0	89.0	89.0	88.9	88.7	88.6
48	118.4	89.4	89.4	89.4	89.4	89.4	89.4	89.4	89.3	89.1	89.1
46	114.8	89.7	89.7	89.7	89.7	89.7	89.7	89.7	89.6	89.4	89.4
44	111.2	90.1	90.0	90.0	90.0	90.0	90.0	90.0	89.9	89.7	89.6
42	107.6	90.4	90.3	90.4	90.3	90.4	90.3	90.3	90.1	90.0	89.9
40	104.0	90.7	90.6	90.6	90.6	90.6	90.6	90.5	90.4	90.3	90.1
38	100.4	91.1	91.1	91.0	91.0	91.0	91.0	91.0	90.8	90.6	90.5
36	96.8	91.7	91.5	91.6	91.6	91.6	91.6	91.5	91.4	91.2	91.0
34	93.2	91.9	91.8	91.9	91.9	91.8	91.8	91.8	91.6	91.5	91.3
32	89.6	91.6	92.1	92.1	92.1	92.1	92.1	92.0	91.9	91.7	91.6
30	86.0	91.3	92.6	92.7	92.7	92.6	92.6	92.6	92.4	92.3	92.2
28	82.4	91.0	92.3	93.1	93.1	93.1	93.1	93.0	92.8	92.7	92.6
26	78.8	90.7	92.0	92.8	93.5	93.5	93.5	93.4	93.2	93.1	93.0
24	75.2	90.4	91.7	92.5	93.2	93.9	93.9	93.8	93.6	93.5	93.3
22	71.6	90.1	91.4	92.2	92.9	93.6	94.3	94.2	94.0	93.9	93.7
20	68.0	89.8	91.1	91.9	92.6	93.3	94.0	94.6	94.4	94.2	94.1
18	64.4	89.5	90.8	91.6	92.3	93.0	93.6	94.3	94.6	94.4	94.3
16	60.8	89.2	90.5	91.2	91.9	92.6	93.3	93.9	94.2	94.1	94.0
14	57.2	88.9	90.2	90.9	91.6	92.3	93.0	93.6	93.9	93.8	93.7
12	53.6	88.6	89.8	90.6	91.3	92.0	92.7	93.3	93.6	93.5	93.3
10	50.0	88.3	89.5	90.3	91.0	91.7	92.3	92.9	93.2	93.1	93.0
8	46.8	88.0	89.2	90.0	90.7	91.3	92.0	92.6	92.9	92.8	92.7
6	42.8	87.6	88.9	89.6	90.3	91.0	91.7	92.3	92.6	92.5	92.4
4	39.2	87.3	88.6	89.3	90.0	90.7	91.4	92.0	92.3	92.1	92.0
2	35.6	87.0	88.2	89.0	89.7	90.4	91.0	91.6	91.9	91.8	91.7
0	32.0	86.7	87.9	88.7	89.4	90.0	90.7	91.3	91.6	91.5	91.4
-2	28.4	86.4	87.6	88.4	89.0	89.7	90.4	91.0	91.3	91.1	91.0
-4	24.8	86.1	87.3	88.0	88.7	89.4	90.0	90.6	90.9	90.8	90.7
-6	21.2	85.7	87.0	87.7	88.4	89.0	89.7	90.3	90.6	90.5	90.4
-8	17.6	85.4	86.6	87.4	88.0	88.7	89.0	89.9	90.2	90.1	90.0
-10	14.0	85.1	86.3	87.0	87.7	88.4	89.4	89.6	89.9	89.8	89.7
-12	10.4	84.8	86.0	86.7	87.4	88.0	88.7	89.3	89.6	89.4	89.3
-14	6.8	84.4	85.6	86.4	87.0	87.7	88.3	88.9	89.2	89.1	89.0
-16	3.2	84.1	85.3	86.0	86.7	87.4	88.0	88.6	88.9	88.8	88.6
-18	-0.4	83.8	85.0	85.7	86.4	87.0	87.7	88.2	88.5	88.4	88.3
-20	-4.0	83.5	84.6	85.4	86.0	86.7	87.3	87.9	88.2	88.1	88.0
-22	-7.6	83.1	84.3	85.0	85.7	86.3	87.0	87.5	87.8	87.7	87.6
-24	-11.2	82.8	84.0	84.7	85.3	86.0	86.6	87.2	87.5	87.4	87.3

CORRECTIONS:

Packs OFF	+ 1.0	+ 1.0	+ 1.0	+ 1.0	+ 1.0	+ 1.0	+ 1.0	+ 1.0	+1.0	+1.0
Engine Anti-Ice ON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Airplane Anti-Ice ON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DRY RUNWAY TAKEOFF SPEEDS – V_1 / V_R / V_2

KIAS

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

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TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & below	20	30	40	50
170,000	8,000	154 \ 158 \ 167	154 \ 159 \ 167	156 \ 159 \ 167	159 \ 160 \ 167	159 \ 160 \ 167
	6,000	152 \ 158 \ 167	152 \ 158 \ 167	154 \ 159 \ 167	157 \ 160 \ 167	158 \ 160 \ 167
	4,000	151 \ 157 \ 167	151 \ 157 \ 167	152 \ 158 \ 167	155 \ 159 \ 167	157 \ 160 \ 167
	2,000	150 \ 157 \ 167	150 \ 157 \ 167	150 \ 157 \ 167	153 \ 158 \ 167	156 \ 159 \ 167
	0	149 \ 156 \ 167	149 \ 156 \ 167	149 \ 156 \ 167	151 \ 157 \ 167	154 \ 158 \ 167
160,000	8,000	147 \ 153 \ 162	148 \ 154 \ 162	150 \ 154 \ 162	152 \ 155 \ 162	152 \ 155 \ 162
	6,000	146 \ 153 \ 162	146 \ 153 \ 162	148 \ 153 \ 162	151 \ 154 \ 162	152 \ 155 \ 162
	4,000	144 \ 152 \ 162	144 \ 152 \ 162	146 \ 153 \ 162	149 \ 154 \ 162	151 \ 154 \ 162
	2,000	143 \ 151 \ 162	143 \ 151 \ 162	144 \ 152 \ 162	147 \ 153 \ 162	150 \ 154 \ 162
	0	142 \ 151 \ 162	142 \ 151 \ 162	142 \ 151 \ 162	145 \ 152 \ 162	148 \ 153 \ 162
150,000	8,000	141 \ 148 \ 157	142 \ 148 \ 157	144 \ 149 \ 157	146 \ 150 \ 157	146 \ 150 \ 157
	6,000	140 \ 147 \ 157	140 \ 147 \ 157	142 \ 148 \ 157	144 \ 149 \ 157	145 \ 149 \ 157
	4,000	138 \ 146 \ 157	138 \ 146 \ 157	140 \ 147 \ 157	142 \ 148 \ 157	145 \ 149 \ 157
	2,000	137 \ 146 \ 157	137 \ 146 \ 157	138 \ 146 \ 157	140 \ 147 \ 157	143 \ 148 \ 157
	0	136 \ 145 \ 157	136 \ 145 \ 157	136 \ 145 \ 157	138 \ 146 \ 157	141 \ 148 \ 157
140,000	8,000	134 \ 142 \ 152	135 \ 142 \ 152	137 \ 143 \ 152	139 \ 144 \ 152	139 \ 144 \ 152
	6,000	133 \ 141 \ 152	133 \ 141 \ 152	135 \ 142 \ 152	138 \ 143 \ 152	139 \ 144 \ 152
	4,000	131 \ 141 \ 152	131 \ 141 \ 152	133 \ 141 \ 152	136 \ 142 \ 152	138 \ 143 \ 152
	2,000	130 \ 140 \ 152	130 \ 140 \ 152	131 \ 140 \ 152	134 \ 142 \ 152	137 \ 143 \ 152
	0	129 \ 139 \ 152	129 \ 139 \ 152	129 \ 139 \ 152	131 \ 141 \ 152	135 \ 142 \ 152
135,000	8,000	131 \ 139 \ 149	132 \ 139 \ 149	134 \ 140 \ 149	136 \ 141 \ 149	136 \ 141 \ 149
	6,000	129 \ 138 \ 149	130 \ 138 \ 149	132 \ 139 \ 149	134 \ 140 \ 149	135 \ 141 \ 149
	4,000	128 \ 138 \ 149	128 \ 138 \ 149	129 \ 138 \ 149	132 \ 139 \ 149	135 \ 140 \ 149
	2,000	126 \ 137 \ 149	126 \ 137 \ 149	127 \ 137 \ 149	130 \ 139 \ 149	133 \ 140 \ 149
	0	125 \ 136 \ 149	125 \ 136 \ 149	125 \ 136 \ 149	128 \ 138 \ 149	131 \ 139 \ 149
130,000	8,000	128 \ 136 \ 146	128 \ 136 \ 146	130 \ 137 \ 146	133 \ 138 \ 146	133 \ 138 \ 146
	6,000	126 \ 135 \ 146	126 \ 135 \ 146	128 \ 136 \ 146	131 \ 137 \ 146	132 \ 138 \ 146
	4,000	124 \ 134 \ 146	124 \ 135 \ 146	126 \ 135 \ 146	129 \ 136 \ 146	131 \ 137 \ 146
	2,000	123 \ 134 \ 146	123 \ 134 \ 146	124 \ 134 \ 146	127 \ 135 \ 146	130 \ 137 \ 146
	0	121 \ 133 \ 146	121 \ 133 \ 146	121 \ 133 \ 146	124 \ 134 \ 146	128 \ 136 \ 146
125,000	8,000	124 \ 133 \ 144	125 \ 133 \ 144	127 \ 134 \ 144	130 \ 135 \ 144	130 \ 135 \ 144
	6,000	122 \ 132 \ 144	123 \ 132 \ 144	125 \ 133 \ 144	128 \ 134 \ 144	129 \ 135 \ 144
	4,000	121 \ 131 \ 144	121 \ 132 \ 144	123 \ 132 \ 144	126 \ 133 \ 144	128 \ 134 \ 144
	2,000	119 \ 131 \ 144	119 \ 131 \ 144	120 \ 131 \ 144	123 \ 132 \ 144	127 \ 134 \ 144
	0	119* \ 130 \ 144	119* \ 130 \ 144	119* \ 130 \ 144	121 \ 131 \ 144	125 \ 133 \ 144

CONDITION		V_1 CORRECTION - KNOTS
Runway slope	Per ½% uphill slope	+ 1
	Per ½% downhill slope	- 1
Wind	Per 10 knots headwind	none
	Per 10 knots tailwind	- 1

NOTES: Speeds denoted by an asterisk (*) are V_{MCG} limited. DO NOT APPLY NEGATIVE CORRECTIONS

DRY RUNWAY TAKEOFF SPEEDS – V_1 / V_R / V_2

KIAS

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

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TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & below	20	30	40	50
120,000	8,000	120 \ 130 \ 141	121 \ 130 \ 141	123 \ 131 \ 141	126 \ 132 \ 141	126 \ 132 \ 141
	6,000	118 \ 129 \ 141	119 \ 129 \ 141	121 \ 130 \ 141	124 \ 131 \ 141	125 \ 132 \ 141
	4,000	117 \ 128 \ 141	117 \ 128 \ 141	119 \ 129 \ 141	122 \ 130 \ 141	124 \ 131 \ 141
	2,000	115 \ 127 \ 141	115 \ 127 \ 141	116 \ 128 \ 141	119 \ 129 \ 141	123 \ 131 \ 141
	0	116* \ 127 \ 141	116* \ 127 \ 141	116* \ 127 \ 141	117 \ 128 \ 141	121 \ 130 \ 141
115,000	8,000	116 \ 127 \ 138	118 \ 127 \ 138	120 \ 128 \ 138	122 \ 129 \ 138	122 \ 129 \ 138
	6,000	115 \ 126 \ 138	115 \ 126 \ 138	117 \ 127 \ 138	120 \ 128 \ 138	121 \ 129 \ 138
	4,000	114* \ 125 \ 138	114* \ 125 \ 138	115 \ 126 \ 138	118 \ 127 \ 138	121 \ 128 \ 138
	2,000	115* \ 124 \ 138	115* \ 124 \ 138	114* \ 125 \ 138	115 \ 126 \ 138	119 \ 128 \ 138
	0	116* \ 124 \ 138	116* \ 124 \ 138	116* \ 124 \ 138	116* \ 125 \ 138	117 \ 127 \ 138
110,000	8,000	112 \ 123 \ 135	114 \ 123 \ 135	116 \ 124 \ 135	118 \ 125 \ 135	118 \ 125 \ 135
	6,000	111 \ 122 \ 135	111 \ 122 \ 135	113 \ 123 \ 135	116 \ 125 \ 135	117 \ 125 \ 135
	4,000	111* \ 121 \ 135	111* \ 121 \ 135	111 \ 122 \ 135	114 \ 124 \ 135	117 \ 125 \ 135
	2,000	114* \ 120 \ 135	114* \ 120 \ 135	112* \ 121 \ 135	111 \ 122 \ 135	115 \ 124 \ 135
	0	116* \ 120 \ 135	116* \ 120 \ 135	116* \ 120 \ 135	111* \ 121 \ 135	113 \ 123 \ 135
105,000	8,000	108 \ 120 \ 132	110 \ 120 \ 132	112 \ 121 \ 132	114 \ 122 \ 132	114 \ 122 \ 132
	6,000	109* \ 119 \ 132	109* \ 119 \ 132	109 \ 120 \ 132	112 \ 122 \ 132	113 \ 122 \ 132
	4,000	111* \ 118 \ 132	111* \ 118 \ 132	109* \ 119 \ 132	110 \ 120 \ 132	113 \ 122 \ 132
	2,000	114* \ 118 \ 133	114* \ 118 \ 133	112* \ 118 \ 132	109* \ 119 \ 132	111 \ 121 \ 132
	0	116* \ 119 \ 134	116* \ 119 \ 134	116* \ 119 \ 134	111* \ 118 \ 132	109 \ 120 \ 132
100,000	8,000	104 \ 116 \ 129	105 \ 116 \ 129	108 \ 117 \ 129	110 \ 118 \ 129	110 \ 118 \ 129
	6,000	107* \ 115 \ 129	106* \ 115 \ 129	105 \ 116 \ 129	108 \ 118 \ 129	109 \ 118 \ 129
	4,000	111* \ 114 \ 129	111* \ 114 \ 129	107* \ 115 \ 129	106 \ 116 \ 129	109 \ 118 \ 129
	2,000	114* \ 115 \ 131	114* \ 115 \ 130	112* \ 114 \ 129	106* \ 115 \ 129	107 \ 117 \ 129
	0	116* \ 117 \ 133	116* \ 117 \ 133	116* \ 117 \ 133	111* \ 114 \ 129	105 \ 116 \ 129
95,000	8,000	104* \ 112 \ 126	104* \ 113 \ 126	104 \ 114 \ 126	106 \ 115 \ 126	106 \ 115 \ 126
	6,000	107* \ 112 \ 127	106* \ 112 \ 127	104* \ 113 \ 126	104 \ 114 \ 126	105 \ 114 \ 126
	4,000	111* \ 113 \ 129	111* \ 113 \ 129	107* \ 112 \ 127	104* \ 113 \ 126	105 \ 114 \ 126
	2,000	114* \ 115 \ 132	114* \ 115 \ 131	112* \ 114 \ 130	106* \ 112 \ 127	104* \ 113 \ 126
	0	116* \ 117 \ 134	116* \ 117 \ 134	116* \ 117 \ 134	111* \ 113 \ 129	105* \ 112 \ 126
90,000	8,000	104* \ 108 \ 123	102* \ 109 \ 123	99 \ 110 \ 123	102 \ 111 \ 123	102 \ 111 \ 123
	6,000	107* \ 109 \ 124	106* \ 109 \ 124	103* \ 109 \ 123	100 \ 110 \ 123	101 \ 110 \ 123
	4,000	111* \ 112 \ 129	111* \ 112 \ 128	107* \ 109 \ 125	102* \ 109 \ 123	100 \ 110 \ 123
	2,000	114* \ 115 \ 132	114* \ 115 \ 132	112* \ 113 \ 130	106* \ 109 \ 124	101* \ 109 \ 123
	0	116* \ 117 \ 135	116* \ 117 \ 135	116* \ 117 \ 135	111* \ 112 \ 129	104* \ 108 \ 123

CONDITION		V_1 CORRECTION - KNOTS
Runway slope	Per ½% uphill slope	+ 1
	Per ½% downhill slope	- 1
Wind	Per 10 knots headwind	none
	Per 10 knots tailwind	- 1

NOTE: Speeds denoted by an asterisk (*) are V_{MCG} limited. DO NOT APPLY NEGATIVE CORRECTIONS

DRY RUNWAY TAKEOFF SPEEDS – V_1 / V_R / V_2

KIAS

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

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TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & below	20	30	40	50
170,000	8,000	149 / 151 / 158	150 / 152 / 158	152 / 152 / 158	154 / 154 / 158	158 / 168 / 158
	6,000	147 / 151 / 158	147 / 151 / 158	149 / 151 / 158	152 / 153 / 158	154 / 154 / 158
	4,000	145 / 150 / 158	145 / 150 / 158	147 / 150 / 158	150 / 152 / 158	153 / 153 / 158
	2,000	144 / 149 / 158	144 / 149 / 158	145 / 150 / 158	147 / 151 / 158	151 / 152 / 158
	0	143 / 149 / 158	143 / 149 / 158	143 / 149 / 158	145 / 150 / 158	148 / 151 / 158
160,000	8,000	142 / 146 / 153	143 / 146 / 153	145 / 147 / 153	148 / 148 / 153	151 / 162 / 153
	6,000	140 / 145 / 153	140 / 145 / 153	142 / 146 / 153	145 / 147 / 153	148 / 148 / 153
	4,000	138 / 145 / 153	138 / 145 / 153	140 / 145 / 153	143 / 146 / 153	146 / 148 / 153
	2,000	137 / 144 / 153	137 / 144 / 153	138 / 144 / 153	140 / 145 / 153	144 / 147 / 153
	0	136 / 143 / 153	136 / 143 / 153	136 / 143 / 153	138 / 144 / 153	142 / 146 / 153
150,000	8,000	135 / 141 / 149	136 / 141 / 149	138 / 142 / 149	141 / 143 / 149	144 / 156 / 149
	6,000	133 / 140 / 149	134 / 140 / 149	136 / 141 / 149	139 / 142 / 149	142 / 143 / 149
	4,000	132 / 139 / 149	132 / 139 / 149	133 / 140 / 149	136 / 141 / 149	139 / 142 / 149
	2,000	130 / 138 / 149	130 / 139 / 149	131 / 139 / 149	134 / 140 / 149	137 / 141 / 149
	0	129 / 138 / 149	129 / 138 / 149	129 / 138 / 149	131 / 139 / 149	135 / 140 / 149
140,000	8,000	128 / 135 / 144	129 / 136 / 144	131 / 136 / 144	134 / 137 / 144	137 / 150 / 144
	6,000	126 / 134 / 144	127 / 135 / 144	129 / 135 / 144	132 / 136 / 144	135 / 137 / 144
	4,000	125 / 134 / 144	125 / 134 / 144	126 / 134 / 144	129 / 136 / 144	133 / 137 / 144
	2,000	123 / 133 / 144	123 / 133 / 144	124 / 133 / 144	127 / 135 / 144	130 / 136 / 144
	0	122 / 132 / 144	122 / 132 / 144	122 / 132 / 144	125 / 133 / 144	128 / 135 / 144
135,000	8,000	125 / 132 / 141	126 / 133 / 141	128 / 134 / 141	131 / 135 / 141	133 / 147 / 141
	6,000	123 / 132 / 141	123 / 132 / 141	125 / 133 / 141	128 / 134 / 141	131 / 135 / 141
	4,000	121 / 131 / 141	121 / 131 / 141	123 / 131 / 141	126 / 133 / 141	129 / 134 / 141
	2,000	120 / 130 / 141	120 / 130 / 141	121 / 130 / 141	124 / 132 / 141	127 / 133 / 141
	0	119 / 129 / 141	119 / 129 / 141	119 / 129 / 141	121 / 131 / 141	125 / 132 / 141
130,000	8,000	122 / 129 / 139	122 / 130 / 139	124 / 131 / 139	127 / 132 / 139	130 / 145 / 139
	6,000	120 / 129 / 139	120 / 129 / 139	122 / 130 / 139	125 / 131 / 139	128 / 132 / 139
	4,000	118 / 128 / 139	118 / 128 / 139	120 / 129 / 139	123 / 130 / 139	126 / 131 / 139
	2,000	117 / 127 / 139	117 / 127 / 139	117 / 128 / 139	120 / 129 / 139	124 / 130 / 139
	0	116* / 126 / 139	116* / 126 / 139	116* / 126 / 139	118 / 128 / 139	121 / 129 / 139
125,000	8,000	118 / 126 / 136	119 / 127 / 136	121 / 128 / 136	124 / 129 / 136	126 / 142 / 136
	6,000	116 / 126 / 136	117 / 126 / 136	119 / 127 / 136	121 / 128 / 136	124 / 129 / 136
	4,000	114 / 125 / 136	114 / 125 / 136	116 / 126 / 136	119 / 127 / 136	122 / 128 / 136
	2,000	113* / 124 / 136	113* / 124 / 136	114 / 124 / 136	117 / 126 / 136	120 / 127 / 136
	0	116* / 123 / 136	116* / 123 / 136	116* / 123 / 136	114 / 125 / 136	118 / 126 / 136

CONDITION		V_1 CORRECTION - KNOTS
Runway slope	Per ½% uphill slope	+ 2
	Per ½% downhill slope	- 1
Wind	Per 10 knots headwind	none
	Per 10 knots tailwind	- 1

NOTE: Speeds denoted by an asterisk (*) are V_{MCG} limited. DO NOT APPLY NEGATIVE CORRECTIONS

DRY RUNWAY TAKEOFF SPEEDS – V_1 / V_R / V_2

KIAS

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

28TO / 18

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & below	20	30	40	50
120,000	8,000	115 / 123 / 133	116 / 124 / 133	117 / 125 / 133	120 / 126 / 133	122 / 140 / 133
	6,000	113 / 123 / 133	113 / 123 / 133	115 / 124 / 133	118 / 125 / 133	121 / 126 / 133
	4,000	111 / 122 / 133	111 / 122 / 133	113 / 123 / 133	116 / 124 / 133	119 / 125 / 133
	2,000	113* / 121 / 133	113* / 121 / 133	111* / 121 / 133	113 / 123 / 133	117 / 124 / 133
	0	116* / 120 / 133	116* / 120 / 133	116* / 120 / 133	111 / 122 / 133	114 / 123 / 133
115,000	8,000	111 / 120 / 131	112 / 121 / 131	114 / 122 / 131	116 / 123 / 131	119 / 137 / 131
	6,000	109 / 119 / 131	109 / 120 / 131	111 / 121 / 131	114 / 122 / 131	117 / 123 / 131
	4,000	110* / 118 / 131	110* / 119 / 131	109 / 119 / 131	112 / 121 / 131	115 / 122 / 131
	2,000	113* / 118 / 131	113* / 118 / 131	111* / 118 / 131	109 / 120 / 131	113 / 121 / 131
	0	116* / 117 / 131	116* / 117 / 131	116* / 117 / 131	110* / 118 / 131	111 / 120 / 131
110,000	8,000	107 / 117 / 128	108 / 118 / 128	110 / 119 / 128	113 / 120 / 128	115 / 134 / 128
	6,000	106* / 116 / 128	106* / 116 / 128	108 / 117 / 128	111 / 119 / 128	113 / 120 / 128
	4,000	110* / 115 / 128	110* / 115 / 128	107* / 116 / 128	108 / 118 / 128	111 / 119 / 128
	2,000	113* / 114 / 128	113* / 114 / 128	111* / 115 / 128	106* / 116 / 128	109 / 118 / 128
	0	116* / 116 / 131	116* / 116 / 131	116* / 116 / 130	110* / 115 / 128	107 / 117 / 128
105,000	8,000	103 / 114 / 125	104 / 114 / 125	106 / 115 / 125	109 / 117 / 125	111 / 132 / 125
	6,000	106* / 113 / 125	106* / 113 / 125	104 / 114 / 125	107 / 115 / 125	109 / 117 / 125
	4,000	110* / 112 / 125	110* / 112 / 125	107* / 113 / 125	104 / 114 / 125	108 / 116 / 125
	2,000	113* / 114 / 128	113* / 114 / 128	111* / 112 / 126	106* / 113 / 125	105 / 115 / 125
	0	116* / 116 / 131	116* / 116 / 131	116* / 116 / 131	110* / 112 / 125	104* / 114 / 125
100,000	8,000	103* / 110 / 122	101* / 111 / 122	102 / 112 / 122	105 / 113 / 122	107 / 129 / 122
	6,000	106* / 109 / 122	106* / 110 / 122	102* / 111 / 122	103 / 112 / 122	106 / 113 / 122
	4,000	110* / 111 / 125	110* / 111 / 125	107* / 109 / 122	101* / 111 / 122	104 / 113 / 122
	2,000	113* / 114 / 129	113* / 114 / 128	111* / 112 / 126	106* / 110 / 122	101 / 111 / 122
	0	116* / 116 / 132	116* / 116 / 132	116* / 116 / 132	110* / 111 / 125	104* / 110 / 122
95,000	8,000	103* / 107 / 119	101* / 107 / 119	98 / 109 / 119	101 / 110 / 119	103 / 126 / 119
	6,000	106* / 108 / 121	106* / 107 / 120	102* / 107 / 119	99 / 109 / 119	102 / 110 / 119
	4,000	110* / 111 / 126	110* / 111 / 125	107* / 108 / 121	101* / 107 / 119	99 / 109 / 119
	2,000	113* / 114 / 129	113* / 114 / 129	111* / 112 / 127	106* / 107 / 121	100* / 108 / 119
	0	116* / 116 / 133	116* / 116 / 132	116* / 116 / 132	110* / 111 / 126	104* / 107 / 119
90,000	8,000	103* / 105 / 117	101* / 104 / 116	97* / 105 / 116	97 / 106 / 116	99 / 122 / 116
	6,000	106* / 108 / 122	106* / 107 / 121	102* / 104 / 117	97* / 105 / 116	97 / 106 / 116
	4,000	110* / 111 / 126	110* / 111 / 126	107* / 108 / 122	101* / 104 / 116	95* / 105 / 116
	2,000	113* / 114 / 130	113* / 114 / 130	111* / 112 / 127	106* / 107 / 121	100* / 104 / 116
	0	116* / 116 / 133	116* / 116 / 133	116* / 116 / 133	110* / 111 / 126	104* / 106 / 119

CONDITION		V_1 CORRECTION - KNOTS
Runway slope	Per ½% uphill slope	+ 2
	Per ½% downhill slope	- 1
Wind	Per 10 knots headwind	none
	Per 10 knots tailwind	- 1

NOTE: Speeds denoted by an asterisk (*) are V_{MCG} limited. DO NOT APPLY NEGATIVE CORRECTIONS

DRY RUNWAY TAKEOFF SPEEDS – V_1 / V_R / V_2

KIAS

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

28TO / 24

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & below	20	30	40	50
170,000	8,000	145 \ 146 \ 153	146 \ 147 \ 153	147 \ 147 \ 153	148 \ 148 \ 153	148 \ 148 \ 153
	6,000	143 \ 145 \ 153	143 \ 146 \ 153	146 \ 146 \ 153	147 \ 147 \ 153	148 \ 148 \ 153
	4,000	141 \ 145 \ 153	141 \ 145 \ 153	143 \ 145 \ 153	146 \ 146 \ 153	147 \ 147 \ 153
	2,000	139 \ 144 \ 153	139 \ 144 \ 153	140 \ 145 \ 153	143 \ 146 \ 153	147 \ 147 \ 153
	0	138 \ 144 \ 153	138 \ 144 \ 153	138 \ 144 \ 153	140 \ 145 \ 153	145 \ 146 \ 153
160,000	8,000	139 \ 141 \ 149	140 \ 141 \ 149	142 \ 142 \ 149	143 \ 143 \ 149	143 \ 143 \ 149
	6,000	136 \ 140 \ 149	137 \ 141 \ 149	139 \ 141 \ 149	142 \ 142 \ 149	143 \ 143 \ 149
	4,000	134 \ 140 \ 149	134 \ 140 \ 149	136 \ 140 \ 149	140 \ 141 \ 149	142 \ 142 \ 149
	2,000	133 \ 139 \ 149	133 \ 139 \ 149	134 \ 139 \ 149	137 \ 140 \ 149	142 \ 142 \ 149
	0	132 \ 138 \ 149	132 \ 139 \ 149	132 \ 139 \ 149	134 \ 140 \ 149	139 \ 141 \ 149
150,000	8,000	132 \ 136 \ 144	133 \ 136 \ 144	135 \ 137 \ 144	138 \ 138 \ 144	138 \ 138 \ 144
	6,000	130 \ 135 \ 144	130 \ 135 \ 144	133 \ 136 \ 144	136 \ 137 \ 144	137 \ 138 \ 144
	4,000	128 \ 134 \ 144	128 \ 135 \ 144	130 \ 135 \ 144	133 \ 136 \ 144	136 \ 137 \ 144
	2,000	127 \ 134 \ 144	127 \ 134 \ 144	128 \ 134 \ 144	130 \ 135 \ 144	135 \ 137 \ 144
	0	126 \ 133 \ 144	126 \ 133 \ 144	126 \ 133 \ 144	128 \ 134 \ 144	132 \ 136 \ 144
140,000	8,000	125 \ 131 \ 139	126 \ 131 \ 139	128 \ 132 \ 139	131 \ 133 \ 139	131 \ 133 \ 139
	6,000	124 \ 130 \ 139	124 \ 130 \ 139	126 \ 131 \ 139	129 \ 132 \ 139	130 \ 132 \ 139
	4,000	122 \ 129 \ 139	122 \ 129 \ 139	123 \ 130 \ 139	126 \ 131 \ 139	129 \ 132 \ 139
	2,000	120 \ 128 \ 139	120 \ 128 \ 139	121 \ 129 \ 139	124 \ 130 \ 139	128 \ 131 \ 139
	0	119 \ 128 \ 139	119 \ 128 \ 139	119 \ 128 \ 139	122 \ 129 \ 139	125 \ 130 \ 139
135,000	8,000	122 \ 128 \ 137	123 \ 128 \ 137	125 \ 129 \ 137	128 \ 130 \ 137	128 \ 130 \ 137
	6,000	120 \ 127 \ 137	121 \ 127 \ 137	123 \ 128 \ 137	126 \ 129 \ 137	127 \ 130 \ 137
	4,000	118 \ 126 \ 137	118 \ 126 \ 137	120 \ 127 \ 137	123 \ 128 \ 137	125 \ 129 \ 137
	2,000	117 \ 125 \ 137	117 \ 126 \ 137	118 \ 126 \ 137	121 \ 127 \ 137	124 \ 129 \ 137
	0	116 \ 125 \ 137	116 \ 125 \ 137	116 \ 125 \ 137	118 \ 126 \ 137	122 \ 128 \ 137
130,000	8,000	119 \ 125 \ 134	120 \ 125 \ 134	122 \ 126 \ 134	124 \ 127 \ 134	124 \ 127 \ 134
	6,000	117 \ 124 \ 134	117 \ 124 \ 134	119 \ 125 \ 134	122 \ 126 \ 134	123 \ 127 \ 134
	4,000	115 \ 123 \ 134	115 \ 123 \ 134	117 \ 124 \ 134	120 \ 125 \ 134	122 \ 126 \ 134
	2,000	114 \ 123 \ 134	114 \ 123 \ 134	115 \ 123 \ 134	117 \ 124 \ 134	121 \ 126 \ 134
	0	115* \ 122 \ 134	115* \ 122 \ 134	115* \ 122 \ 134	115 \ 123 \ 134	118 \ 125 \ 134
125,000	8,000	116 \ 122 \ 132	117 \ 123 \ 132	119 \ 124 \ 132	121 \ 125 \ 132	121 \ 125 \ 132
	6,000	114 \ 121 \ 132	114 \ 122 \ 132	116 \ 122 \ 132	119 \ 124 \ 132	120 \ 124 \ 132
	4,000	113* \ 120 \ 132	113* \ 121 \ 132	114 \ 121 \ 132	117 \ 123 \ 132	119 \ 124 \ 132
	2,000	114* \ 120 \ 132	114* \ 120 \ 132	113* \ 120 \ 132	114 \ 122 \ 132	118 \ 123 \ 132
	0	115* \ 119 \ 132	115* \ 119 \ 132	115* \ 119 \ 132	113* \ 120 \ 132	115 \ 122 \ 132

CONDITION		V_1 CORRECTION - KNOTS
Runway slope	Per ½% uphill slope	+ 2
	Per ½% downhill slope	- 1
Wind	Per 10 knots headwind	none
	Per 10 knots tailwind	- 1

NOTE: Speeds denoted by an asterisk (*) are V_{MCG} limited. DO NOT APPLY NEGATIVE CORRECTIONS

DRY RUNWAY TAKEOFF SPEEDS – V_1 / V_R / V_2

KIAS

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

28TO / 24

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & below	20	30	40	50
120,000	8,000	112 \ 119 \ 129	113 \ 120 \ 129	115 \ 121 \ 129	117 \ 122 \ 129	117 \ 122 \ 129
	6,000	110 \ 118 \ 129	110 \ 119 \ 129	112 \ 119 \ 129	115 \ 121 \ 129	116 \ 121 \ 129
	4,000	110* \ 117 \ 129	110* \ 118 \ 129	110 \ 118 \ 129	113 \ 120 \ 129	115 \ 121 \ 129
	2,000	113* \ 117 \ 129	113* \ 117 \ 129	111* \ 117 \ 129	110 \ 119 \ 129	114 \ 120 \ 129
	0	115* \ 116 \ 129	115* \ 116 \ 129	115* \ 116 \ 129	110* \ 117 \ 129	112 \ 119 \ 129
115,000	8,000	108 \ 116 \ 127	109 \ 117 \ 127	111 \ 118 \ 127	114 \ 119 \ 127	114 \ 119 \ 127
	6,000	108* \ 115 \ 127	108* \ 116 \ 127	109 \ 116 \ 127	112 \ 118 \ 127	113 \ 118 \ 127
	4,000	110* \ 114 \ 127	110* \ 115 \ 127	108* \ 115 \ 127	109 \ 117 \ 127	112 \ 118 \ 127
	2,000	113* \ 114 \ 127	113* \ 114 \ 127	111* \ 114 \ 127	108* \ 116 \ 127	111 \ 117 \ 127
	0	115* \ 115 \ 129	115* \ 115 \ 129	115* \ 115 \ 129	110* \ 114 \ 127	108 \ 116 \ 127
110,000	8,000	104 \ 113 \ 124	105 \ 114 \ 124	107 \ 114 \ 124	110 \ 116 \ 124	110 \ 116 \ 124
	6,000	106* \ 112 \ 124	106* \ 112 \ 124	105 \ 113 \ 124	108 \ 115 \ 124	109 \ 115 \ 124
	4,000	110* \ 111 \ 124	110* \ 111 \ 124	106* \ 112 \ 124	105 \ 113 \ 124	108 \ 115 \ 124
	2,000	113* \ 111 \ 125	113* \ 111 \ 125	111* \ 111 \ 124	106* \ 112 \ 124	107 \ 114 \ 124
	0	115* \ 114 \ 129	115* \ 114 \ 129	115* \ 114 \ 128	110* \ 111 \ 124	104 \ 113 \ 124
105,000	8,000	104* \ 110 \ 121	103* \ 111 \ 121	104 \ 111 \ 121	106 \ 113 \ 121	106 \ 113 \ 121
	6,000	106* \ 109 \ 121	106* \ 109 \ 121	104* \ 110 \ 121	104 \ 112 \ 121	105 \ 112 \ 121
	4,000	110* \ 110 \ 123	110* \ 110 \ 123	106* \ 109 \ 121	103* \ 110 \ 121	104 \ 112 \ 121
	2,000	113* \ 111 \ 126	113* \ 111 \ 126	111* \ 110 \ 124	106* \ 109 \ 121	104* \ 111 \ 121
	0	115* \ 114 \ 130	115* \ 114 \ 130	115* \ 114 \ 129	110* \ 110 \ 124	104* \ 110 \ 121
100,000	8,000	103* \ 106 \ 118	101* \ 107 \ 118	100 \ 108 \ 118	102 \ 109 \ 118	102 \ 109 \ 118
	6,000	106* \ 105 \ 118	106* \ 106 \ 118	106* \ 107 \ 118	100 \ 108 \ 118	101 \ 109 \ 118
	4,000	110* \ 108 \ 122	110* \ 108 \ 122	106* \ 105 \ 118	101* \ 107 \ 118	100 \ 108 \ 118
	2,000	113* \ 111 \ 126	113* \ 111 \ 126	111* \ 109 \ 124	106* \ 106 \ 118	100* \ 107 \ 118
	0	115* \ 114 \ 130	115* \ 114 \ 130	115* \ 114 \ 130	110* \ 109 \ 123	104* \ 106 \ 118
95,000	8,000	103* \ 104 \ 117	101* \ 104 \ 116	99* \ 105 \ 116	98 \ 106 \ 116	98 \ 106 \ 116
	6,000	106* \ 105 \ 119	106* \ 105 \ 118	102* \ 104 \ 116	99* \ 105 \ 116	99* \ 106 \ 116
	4,000	110* \ 108 \ 123	110* \ 108 \ 123	106* \ 105 \ 119	101* \ 104 \ 116	99* \ 105 \ 116
	2,000	113* \ 111 \ 127	113* \ 111 \ 127	111* \ 109 \ 125	106* \ 106 \ 118	100* \ 104 \ 116
	0	115* \ 114 \ 131	115* \ 114 \ 131	115* \ 114 \ 131	110* \ 109 \ 124	104* \ 105 \ 117
90,000	8,000	103* \ 102 \ 115	101* \ 100 \ 113	98* \ 101 \ 113	94 \ 102 \ 113	94 \ 102 \ 113
	6,000	106* \ 105 \ 119	106* \ 104 \ 118	102* \ 101 \ 114	97* \ 101 \ 113	96* \ 102 \ 113
	4,000	110* \ 108 \ 124	110* \ 108 \ 123	106* \ 105 \ 119	101* \ 100 \ 113	98* \ 101 \ 113
	2,000	113* \ 111 \ 128	113* \ 111 \ 128	111* \ 109 \ 125	106* \ 105 \ 118	100* \ 100 \ 113
	0	115* \ 114 \ 131	115* \ 114 \ 131	115* \ 114 \ 131	110* \ 109 \ 124	104* \ 103 \ 116

CONDITION		V_1 CORRECTION - KNOTS
Runway slope	Per ½% uphill slope	+ 2
	Per ½% downhill slope	- 1
Wind	Per 10 knots headwind	none
	Per 10 knots tailwind	- 1

NOTE: Speeds denoted by an asterisk (*) are V_{MCG} limited. DO NOT APPLY NEGATIVE CORRECTIONS

TAKEOFF STABILIZER SETTINGS

CAUTION: Crews are not authorized to perform manual weight and balance computations without coordination and approval from Flight Control and the LCC. Refer to FOM Ch 5, Manual WDR.

CENTER OF GRAVITY - %MAC	STABILIZER SETTINGS – DEGREES ANU		
	FLAPS 5°	FLAPS 11°	FLAPS 18°
-7	7.7	9.2	10.9
-6	7.5	8.9	10.7
-5	7.4	8.7	10.4
-4	7.2	8.5	10.2
-3	7.0	8.3	9.9
-2	6.8	8.1	9.7
-1	6.7	7.9	9.4
0	6.5	7.7	9.2
1	6.3	7.5	9.0
2	6.1	7.3	8.7
3	5.9	7.1	8.5
4	5.7	6.8	8.2
5	5.5	6.6	8.0
6	5.4	6.4	7.8
7	5.2	6.2	7.5
8	5.0	6.0	7.3
9	4.8	5.8	7.0
10	4.6	5.6	6.8
11	4.4	5.4	6.6
12	4.3	5.2	6.3
13	4.1	5.0	6.1
14	3.9	4.8	5.9
15	3.7	4.6	5.6
16	3.6	4.3	5.4
17	3.4	4.1	5.1
18	3.2	3.9	4.9
19	3.0	3.7	4.6
20	2.8	3.5	4.4
21	2.7	3.3	4.2
22	2.5	3.1	3.9
23	2.3	2.9	3.7
24	2.1	2.7	3.5
25	2.0	2.5	3.2
26	1.8	2.3	3.0
27	1.6	2.1	2.8
28	1.4	1.9	2.5
29	1.2	1.7	2.3
30	1.1	1.4	2.0
31	0.9	1.2	1.8
32	0.7	1.1	1.6
33	0.5	0.8	1.3

End of Section

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CLIMB EPR SETTINGS

BASED ON 28K CL RATING

CL

V2528-D5

BASED ON 250 / 320 KIAS / 0.76M
NORMAL BLEED - PACKS ON / ANTI-ICE OFF

TAT	PRESSURE ALTITUDE - 1000 FT								
°C	SL	5	10	15	20	25	30	35	37
50	1.27	1.26	1.24	1.24	1.27	1.30			
45	1.29	1.29	1.27	1.26	1.27	1.30	1.36		
40	1.32	1.32	1.30	1.29	1.29	1.30	1.36		
35	1.36	1.35	1.33	1.33	1.32	1.31	1.36	1.42	
30	1.36	1.38	1.36	1.36	1.35	1.35	1.36	1.42	1.43
25	1.36	1.40	1.39	1.39	1.39	1.38	1.37	1.42	1.43
20	1.36	1.40	1.40	1.42	1.42	1.41	1.40	1.42	1.43
15	1.36	1.40	1.40	1.44	1.45	1.44	1.43	1.42	1.43
10	1.36	1.40	1.40	1.44	1.48	1.48	1.46	1.45	1.43
5	1.36	1.40	1.40	1.44	1.48	1.51	1.50	1.48	1.46
0	1.36	1.40	1.40	1.44	1.48	1.52	1.53	1.51	1.50
-5	1.36	1.40	1.40	1.44	1.48	1.52	1.55	1.54	1.52
-10	1.36	1.40	1.40	1.44	1.48	1.52	1.57	1.56	1.55
-15	1.36	1.40	1.40	1.44	1.48	1.52	1.57	1.59	1.58
-20	1.36	1.40	1.40	1.44	1.48	1.52	1.57	1.61	1.61
-25	1.36	1.40	1.40	1.44	1.48	1.52	1.57	1.61	1.62
-30	1.36	1.40	1.40	1.44	1.48	1.52	1.57	1.61	1.62

NOTE: For the following engine bleed conditions adjust EPR by the indicated amount

Packs Off	.01	.01	.02	.02	.02	.03	.03	.03	.04
Engine Anti-Ice On	-.01	-.01	-.02	-.02	-.02	-.03	-.03	-.03	-.03
Airplane Anti-Ice On (2 Eng)	-.01	-.01	-.02	-.02	-.02	-.03	-.03	-.03	-.03
Airplane Anti-Ice On (1 Eng)	-.02	-.02	-.03	-.03	-.04	-.05	-.05	-.06	-.06

CLIMB TIME, DISTANCE, AND FUEL

SPEED SCHEDULE 250 KIAS / 320 KIAS / CRUISE MACH

BASED ON **28K** CL THRUST RATING

TOGW 170,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370									
350	30	195	5390	31	203	5620			
330	23	143	4510	24	150	4700	34	233	6110
310	20	120	4080	20	126	4250	28	185	5300
290	18	104	3770	18	109	3930	25	157	4810
270	16	91	3510	16	96	3650	22	136	4410
250	15	80	3270	15	84	3400	20	118	4050
230	13	68	2970	13	71	3090	17	97	3610
210	12	57	2700	12	59	2800	15	80	3230
190	10	48	2450	10	50	2540	13	66	2900
150	8	32	2000	8	34	2070	10	44	2300
100	6	18	1490	6	18	1530	7	23	1650

TOGW 165,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370									
350	26	165	4790	27	173	4990	44	308	7150
330	21	131	4200	22	137	4380	31	205	5520
310	19	112	3850	19	117	4010	26	169	4930
290	17	98	3580	17	102	3720	23	146	4510
270	15	86	3330	16	90	3470	21	127	4150
250	14	76	3110	14	80	3240	19	111	3830
230	12	64	2840	13	67	2950	16	91	3430
210	11	54	2580	11	57	2680	14	76	3080
190	10	45	2350	10	47	2430	12	63	2760
150	8	31	1920	8	32	1980	9	42	2200
100	5	17	1430	6	18	1470	6	22	1580

TOGW 160,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	37	244	5910	37	251	6110			
350	23	147	4380	24	153	4560	35	239	5940
330	20	121	3940	20	127	4110	28	184	5070
310	18	105	3640	18	110	3790	24	156	4600
290	16	92	3390	16	96	3530	22	136	4230
270	15	82	3170	15	85	3300	19	119	3920
250	13	72	2970	14	76	3080	18	104	3620
230	12	61	2710	12	64	2810	15	86	3250
210	11	52	2470	11	54	2560	13	72	2930
190	9	43	2250	10	45	2330	12	60	2630
150	7	30	1840	7	31	1900	9	40	2100
100	5	16	1380	5	17	1410	6	21	1520

CLIMB TIME, DISTANCE, AND FUEL

SPEED SCHEDULE 250 KIAS / 320 KIAS / CRUISE MACH

BASED ON **28K** CL THRUST RATING

TOGW 155,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	28	179	4780	28	186	4980	60	433	8590
350	21	133	4060	22	139	4230	30	205	5290
330	19	113	3710	19	118	3860	26	168	4700
310	17	98	3440	17	103	3590	23	144	4300
290	15	87	3220	15	91	3350	20	127	3990
270	14	77	3020	14	81	3140	18	111	3700
250	13	68	2830	13	72	2940	17	98	3430
230	11	58	2580	12	61	2680	14	81	3090
210	10	49	2360	10	51	2450	13	68	2780
190	9	41	2150	9	43	2230	11	56	2510
150	7	28	1760	7	29	1820	9	38	2010
100	5	15	1320	5	16	1350	6	20	1450

TOGW 150,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	24	153	4270	24	159	4450	37	258	5930
350	20	122	3780	20	128	3950	27	183	4830
330	17	105	3490	18	110	3640	24	154	4370
310	16	93	3260	16	97	3400	21	134	4040
290	14	82	3060	15	86	3180	19	118	3760
270	13	73	2870	13	76	2990	17	105	3500
250	12	65	2690	12	68	2800	16	92	3250
230	11	55	2460	11	58	2560	14	77	2930
210	10	47	2250	10	49	2340	12	64	2650
190	9	39	2050	9	41	2130	11	54	2390
150	7	27	1690	7	28	1740	8	36	1920
100	5	15	1260	5	15	1300	6	19	1390

TOGW 145,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	22	136	3910	22	142	4080	31	210	5100
350	18	113	3540	19	118	3700	25	165	4450
330	16	98	3300	17	103	3440	22	142	4080
310	15	87	3090	15	91	3220	20	125	3800
290	14	78	2900	14	81	3020	18	111	3540
270	12	69	2730	13	72	2840	16	98	3310
250	11	62	2560	12	64	2660	15	87	3080
230	10	52	2350	10	55	2440	13	73	2780
210	9	44	2150	9	46	2230	11	61	2520
190	8	37	1960	8	39	2030	10	51	2270
150	6	26	1610	7	27	1670	8	34	1830
100	5	14	1210	5	15	1240	5	18	1330

CLIMB TIME, DISTANCE, AND FUEL

SPEED SCHEDULE 250 KIAS / 320 KIAS / CRUISE MACH

BASED ON **28K** CL THRUST RATING

TOGW 140,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	20	123	3620	20	129	3780	27	183	4600
350	17	105	3330	18	110	3470	23	151	4130
330	15	92	3110	16	96	3240	20	132	3820
310	14	82	2930	14	86	3050	18	117	3570
290	13	73	2760	13	77	2870	17	104	3340
270	12	66	2590	12	69	2700	15	93	3120
250	11	58	2440	11	61	2530	14	82	2910
230	10	50	2240	10	52	2320	12	69	2640
210	9	42	2050	9	44	2120	11	58	2390
190	8	36	1870	8	37	1940	10	48	2160
150	6	25	1540	6	26	1590	7	33	1740
100	4	13	1150	4	14	1180	5	17	1260

TOGW 135,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	18	113	3380	19	118	3520	25	164	4210
350	16	98	3130	16	102	3260	21	139	3850
330	15	87	2940	15	91	3060	19	123	3590
310	13	77	2770	14	81	2880	17	109	3360
290	12	69	2610	12	73	2720	16	98	3150
270	11	62	2460	11	65	2560	15	87	2950
250	10	55	2320	11	58	2410	13	77	2760
230	9	47	2130	9	49	2210	12	65	2500
210	8	40	1950	8	42	2020	10	55	2270
190	7	34	1780	8	35	1840	9	46	2050
150	6	23	1470	6	24	1510	7	31	1660
100	4	13	1100	4	13	1130	5	17	1200

TOGW 130,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	17	105	3160	17	109	3290	22	149	3890
350	15	91	2950	15	96	3070	20	129	3600
330	14	81	2780	14	85	2890	18	114	3370
310	13	73	2620	13	76	2730	16	102	3170
290	12	66	2480	12	69	2580	15	92	2980
270	11	59	2340	11	62	2430	14	82	2790
250	10	53	2200	10	55	2290	13	73	2610
230	9	45	2020	9	47	2100	11	61	2370
210	8	38	1850	8	40	1920	10	52	2150
190	7	32	1690	7	34	1750	9	43	1950
150	6	22	1400	6	23	1440	7	29	1570
100	4	12	1050	4	13	1080	5	16	1140

CLIMB TIME, DISTANCE, AND FUEL

SPEED SCHEDULE 250 KIAS / 320 KIAS / CRUISE MACH

BASED ON **28K** CL THRUST RATING

TOGW 125,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	16	97	2970	16	101	3090	21	137	3620
350	14	86	2780	14	89	2900	18	120	3370
330	13	77	2630	13	80	2740	17	107	3170
310	12	69	2490	12	72	2590	15	96	2990
290	11	62	2350	11	65	2450	14	86	2810
270	10	56	2220	10	58	2310	13	77	2640
250	9	50	2090	10	52	2170	12	69	2470
230	8	43	1920	9	44	2000	10	58	2250
210	7	36	1760	8	38	1830	9	49	2040
190	7	31	1610	7	32	1670	8	41	1850
150	5	21	1330	5	22	1380	6	28	1500
100	4	12	1000	4	12	1030	4	15	1090

TOGW 120,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	15	90	2790	15	94	2910	19	126	3380
350	13	80	2630	14	84	2740	17	111	3160
330	12	72	2490	12	75	2590	16	100	2980
310	11	65	2360	11	68	2450	14	90	2820
290	10	59	2230	11	61	2320	13	81	2660
270	10	53	2110	10	55	2190	12	73	2500
250	9	47	1990	9	49	2070	11	65	2340
230	8	40	1830	8	42	1900	10	55	2130
210	7	34	1680	7	36	1740	9	46	1940
190	6	29	1540	7	30	1590	8	39	1760
150	5	20	1270	5	21	1310	6	26	1430
100	4	11	950	4	11	980	4	14	1040

TOGW 115,000 LB

FL	ISA and lower			ISA+10			ISA+20		
	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)	Time (min)	Distance (nm)	Fuel (lb)
370	14	84	2620	14	88	2730	18	116	3160
350	12	75	2480	13	79	2580	16	104	2970
330	11	68	2350	12	71	2450	15	94	2810
310	11	61	2230	11	64	2320	14	84	2660
290	10	55	2110	10	58	2200	13	76	2510
270	9	50	2000	9	52	2080	12	69	2360
250	8	45	1890	9	47	1960	11	61	2210
230	8	38	1740	8	40	1800	9	52	2020
210	7	33	1600	7	34	1650	8	44	1840
190	6	28	1460	6	29	1510	7	37	1670
150	5	19	1210	5	20	1250	6	25	1360
100	3	10	910	3	11	930	4	13	990

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DEFINITIONS AND ASSUMPTIONS

Minimum Cost Cruise: Minimum cost speed schedule based on current fuel price and cruise-relevant hourly time costs.

Long Range Cruise: Speed which gives 99% maximum fuel mileage.

EPR: Powersetting required to maintain level flight speed.

FF: Fuel flow for all engines combined in lb/hr.

IAS: Indicated airspeed in knots.

ISA: Standard day temperature at given altitude in °C.

MN: Indicated mach number.

SAR: Specific range with no wind (nm / 1000 lbs of fuel).

TAS: True Airspeed in knots.

TAT: Total air temperature in °C. (RAT + 1°C)

VB: Severe turbulence target speed.

MCR Thrust Limit lines (Max Rec. Initial Cruise Alt. chart): Altitude vs. weight limit based on 25K maximum cruise thrust.

Buffet Onset Ceiling lines (Max Rec. Initial Cruise Alt. chart): Altitude vs. weight limit for light turbulence (1.25g) and moderate turbulence (1.5g) due to Mach buffet.

MCL Thrust Limit lines (Max Rec. Initial Cruise Alt. chart): Altitude vs. weight limit based on 300 fpm rate-of-climb at 25K maximum climb thrust.

MAXIMUM CRUISE EPR SETTINGS

28K MCR RATING

V2528-D5

BASED ON 250 / 320 KIAS / 0.76M
NORMAL BLEED - PACKS ON / ANTI-ICE OFF

TAT	PRESSURE ALTITUDE - 1000 FT								
°C	SL	5	10	15	20	25	30	35	37
50	1.23	1.22	1.20	1.20	1.23	1.26			
45	1.25	1.25	1.23	1.22	1.23	1.26	1.32		
40	1.28	1.28	1.26	1.25	1.25	1.26	1.32		
35	1.32	1.31	1.29	1.29	1.28	1.27	1.32	1.38	
30	1.32	1.34	1.32	1.32	1.31	1.31	1.32	1.38	1.39
25	1.32	1.36	1.35	1.35	1.35	1.34	1.33	1.38	1.39
20	1.32	1.36	1.36	1.38	1.38	1.37	1.36	1.38	1.39
15	1.32	1.36	1.36	1.40	1.41	1.40	1.39	1.38	1.39
10	1.32	1.36	1.36	1.40	1.44	1.44	1.42	1.41	1.39
5	1.32	1.36	1.36	1.40	1.44	1.47	1.46	1.44	1.42
0	1.32	1.36	1.36	1.40	1.44	1.48	1.49	1.47	1.46
-5	1.32	1.36	1.36	1.40	1.44	1.48	1.51	1.50	1.48
-10	1.32	1.36	1.36	1.40	1.44	1.48	1.53	1.52	1.51
-15	1.32	1.36	1.36	1.40	1.44	1.48	1.53	1.55	1.54
-20	1.32	1.36	1.36	1.40	1.44	1.48	1.53	1.57	1.57
-25	1.32	1.36	1.36	1.40	1.44	1.48	1.53	1.57	1.58
-30	1.32	1.36	1.36	1.40	1.44	1.48	1.53	1.57	1.58

NOTE: For the following engine bleed conditions adjust EPR by the indicated amount

Packs Off	.01	.01	.02	.02	.02	.03	.03	.03	.04
Engine Anti-Ice On	-.01	-.01	-.02	-.02	-.02	-.03	-.03	-.03	-.03
Airplane Anti-Ice On (2 Eng)	-.01	-.01	-.02	-.02	-.02	-.03	-.03	-.03	-.03
Airplane Anti-Ice On (1 Eng)	-.02	-.02	-.03	-.03	-.04	-.05	-.05	-.06	-.06

BUFFET ONSET BOUNDARY SPEEDS (KIAS)

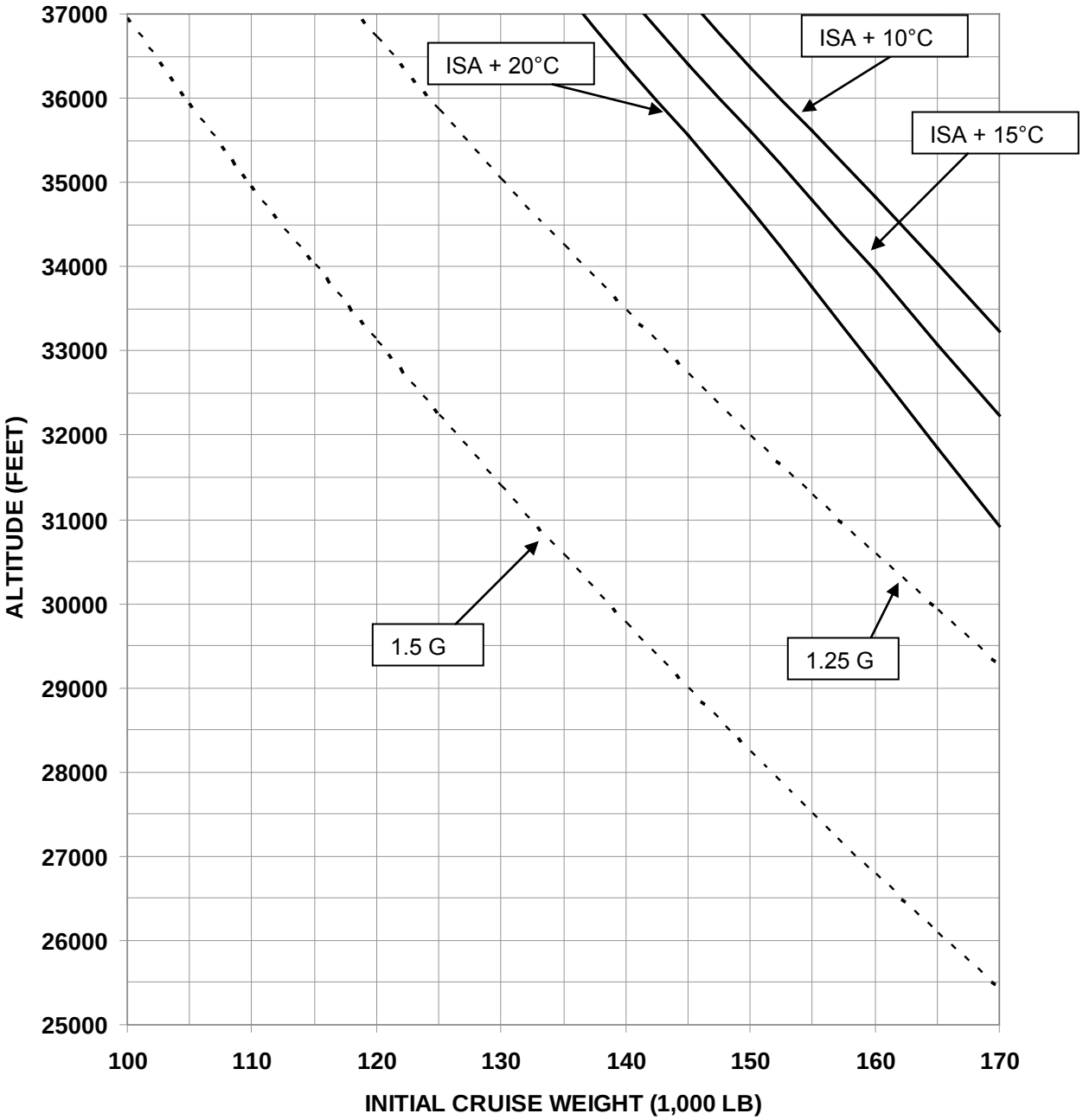
Flight Level	Cruise Weight (1000 lbs)	Vb (KIAS)	G / °Bank					
			1.0 / 0°		1.15 / 30°		1.5 / 48°	
			Low	High	Low	High	Low	High
370	130	0.79M	214	260	N/A	N/A	N/A	N/A
	120		204	265	221	257	N/A	N/A
	110		192	267	210	263	N/A	N/A
	100		179	269	199	266	238	242
350	140	0.79M	222	275	242	261	N/A	N/A
	130		213	279	231	271	N/A	N/A
	120		200	280	220	276	N/A	N/A
	110		185	281	208	279	250	255
	100		173	283	194	281	231	270
330	150	0.79M	228	286	249	271	N/A	N/A
	140		217	290	239	281	N/A	N/A
	130		204	293	229	286	N/A	N/A
	120		192	294	214	289	255	262
	110		179	296	199	293	242	276
	100		168	297	186	294	229	288
310	160	285 KIAS	236	302	257	289	N/A	N/A
	150		226	305	249	295	N/A	N/A
	140		214	306	237	301	N/A	N/A
	130		202	308	226	305	265	281
	120		188	309	210	307	253	292
	110		175	310	197	308	241	301
	100		165	310	184	309	226	304
290	160	285 KIAS	228	320	253	315	N/A	N/A
	150		219	321	244	316	N/A	N/A
	140		208	322	231	320	275	294
	130		195	324	218	322	263	310
	120		182	324	204	323	249	315
	110		170	324	189	324	236	319
	100		161	324	177	324	220	321
270	170	285 KIAS	235	336	260	330	N/A	N/A
	160		223	336	250	332	N/A	N/A
	150		214	336	239	333	286	309
	140		203	337	226	336	276	322
	130		192	338	213	336	259	329
	120		180	338	200	337	246	333
	110		167	338	186	338	230	336
	100		158	339	174	338	215	337
250	170	285 KIAS	229	351	258	341	300	328
	160		218	351	245	349	290	335
	150		207	351	233	350	279	341
	140		195	352	220	351	270	345
	130		185	352	205	351	256	347
	120		173	352	172	352	236	349
	110		162	353	180	352	225	351
	100		153	353	169	353	207	352

Vb - Severe turbulence target speed.
N/A - Denotes "Not Applicable"; Aircraft is above buffet onset ceiling at this weight and altitude.

MAXIMUM RECOMMENDED INITIAL CRUISE ALTITUDE

BASED ON LONG RANGE CRUISE

Limited by **28K** Maximum Cruise Thrust
and
Buffet Onset



BLEED ADJUSTMENTS (for ISA thrust limits (solid lines))

Weight (1,000 LB)	100	110	120	130	140	150	160	170
ENG ANTI-ICE ON	-900	-900	-900	-900	-900	-1,100	-1,300	-1,400
ENG & WING ANTI-ICE ON	-2,000	-2,100	-2,100	-2,200	-2,200	-2,700	-2,900	-3,600

LONG RANGE CRUISE DATA

ALL ENGINES OPERATING

FL ISA		GROSS WEIGHT (1000 LB)												
		170	165	160	155	150	145	140	135	130	125	120	115	110
370 -56	SAR											90.2	93.4	96.8
	EPR											1.41	1.38	1.36
	FF											4880	4710	4540
	MN											.768	.768	.767
	IAS											248	248	248
	TAS											441	441	440
350 -54	SAR									83.1	85.9	88.7	91.5	94.3
	EPR									1.40	1.38	1.36	1.34	1.32
	FF									5310	5140	4970	4800	4640
	MN									.767	.766	.765	.763	.760
	IAS									260	259	259	258	257
	TAS									442	442	441	440	438
330 -50	SAR							77.0	79.2	81.6	83.8	86.2	88.7	91.2
	EPR							1.39	1.37	1.35	1.33	1.32	1.30	1.28
	FF							5790	5630	5450	5290	5120	4940	4760
	MN							.767	.767	.765	.763	.759	.754	.747
	IAS							272	272	271	270	268	267	264
	TAS							446	446	445	444	441	439	434
310 -46	SAR				69.7	71.6	73.5	75.5	77.3	79.3	81.4	83.4	85.6	88.0
	EPR				1.39	1.38	1.36	1.34	1.33	1.31	1.30	1.28	1.27	1.25
	FF				6450	6280	6110	5930	5780	5600	5430	5250	5050	4840
	MN				.767	.767	.766	.763	.762	.758	.753	.747	.738	.726
	IAS				284	284	283	282	282	280	278	276	272	267
	TAS				450	450	449	448	447	445	442	438	433	426
290 -42	SAR		65.4	66.9	68.6	70.2	71.9	73.6	75.3	77.0	78.9	80.9	83.0	85.3
	EPR		1.38	1.36	1.35	1.33	1.32	1.31	1.29	1.28	1.26	1.25	1.23	1.22
	FF		6930	6780	6580	6430	6240	6080	5900	5720	5510	5310	5060	4820
	MN		.766	.767	.764	.763	.759	.756	.751	.745	.736	.726	.711	.695
	IAS		296	297	295	295	293	292	290	287	284	279	273	267
	TAS		454	454	452	452	449	447	444	441	436	430	421	411

Definitions:

IAS: Indicated airspeed in knots
ISA: Standard Day temperature in °C
TAS: True airpseed in knots
SAR: Specific Range (nm / 1000 lbs of fuel)
EPR: EPR Required for flight
FF: Fuel Flow (lb / hr)

Temperature Trade Factors:

- SAR decreases 0.7% for +10°C and increases 0.7% for every -10°C difference from ISA.
- TAS increases 1 knot per °C above ISA and decreases 1 knot per °C below ISA.
- FF increases 3% for +10°C and decreases 3% for -10°C difference from ISA.

Notes:

- Blank areas indicate flight regimes in exceedance of 1.25g buffet limit.
- Shaded areas indicate optimum performance for given weight.

LONG RANGE CRUISE DATA

ALL ENGINES OPERATING

FL ISA		GROSS WEIGHT (1000 LB)												
		170	**165**	**160**	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**
280 -40	SAR	63.5	64.9	66.4	67.8	69.4	71.0	72.6	74.2	75.9	77.7	79.6	81.7	83.8
	EPR	1.37	1.36	1.34	1.33	1.32	1.30	1.29	1.28	1.26	1.25	1.23	1.22	1.20
	FF	7174	6999	6830	6670	6490	6310	6130	5950	5750	5540	5300	5050	4830
	MN	.766	.765	.763	.762	.758	.754	.749	.743	.735	.725	.711	.695	.682
	IAS	302	302	301	301	299	297	295	293	289	285	279	272	267
	TAS	455	454	454	453	451	448	445	442	437	431	423	413	405
270 -38	SAR	62.9	64.3	65.6	67.0	68.5	70.0	71.5	73.1	74.8	76.6	78.4	80.4	82.4
	EPR	1.35	1.34	1.32	1.31	1.30	1.29	1.27	1.26	1.25	1.23	1.22	1.20	1.19
	FF	7247	7079	6910	6740	6560	6380	6180	5980	5770	5530	5290	5070	4840
	MN	.764	.762	.760	.757	.753	.748	.741	.733	.723	.710	.696	.683	.669
	IAS	308	307	306	305	303	301	298	295	290	285	279	273	267
	TAS	456	455	454	452	449	447	442	438	432	424	415	408	399
260 -37	SAR	62.3	63.5	64.8	66.2	67.6	69.0	70.4	72.0	73.6	75.4	77.2	79.0	80.9
	EPR	1.33	1.32	1.31	1.29	1.28	1.27	1.26	1.25	1.23	1.22	1.20	1.19	1.17
	FF	7326	7154	6990	6800	6610	6420	6210	6000	5770	5520	5290	5080	4890
	MN	.761	.758	.756	.751	.746	.739	.731	.721	.709	.695	.682	.670	.660
	IAS	313	312	311	309	307	304	300	296	290	284	279	273	269
	TAS	456	455	453	450	447	443	438	432	425	417	409	402	396
250 -35	SAR	61.5	62.8	64.0	65.3	66.6	67.9	69.4	70.9	72.5	74.2	75.9	77.6	79.3
	EPR	1.31	1.30	1.29	1.28	1.27	1.26	1.24	1.23	1.21	1.20	1.19	1.17	1.16
	FF	7406	7218	7040	6860	6660	6460	6230	5990	5760	5530	5310	5110	4950
	MN	.757	.753	.749	.744	.737	.730	.719	.707	.694	.682	.670	.660	.653
	IAS	318	316	314	312	309	306	301	296	290	284	279	275	272
	TAS	456	453	451	448	444	439	433	426	418	411	403	397	393
240 -33	SAR	60.7	61.8	63.0	64.2	65.5	66.8	68.3	69.7	71.2	72.8	74.4	75.9	77.5
	EPR	1.30	1.29	1.27	1.26	1.25	1.24	1.23	1.21	1.20	1.18	1.17	1.16	1.15
	FF	7480	7294	7120	6900	6710	6480	6230	5990	5770	5560	5370	5190	5050
	MN	.751	.746	.742	.734	.727	.717	.704	.692	.681	.670	.661	.653	.648
	IAS	322	320	318	314	311	306	300	295	290	285	281	277	275
	TAS	454	451	448	444	439	433	426	418	412	405	400	395	392
230 -31	SAR	59.8	60.8	61.9	63.2	64.4	65.7	67.1	68.5	70.0	71.4	72.8	74.2	75.7
	EPR	1.28	1.27	1.26	1.25	1.24	1.22	1.21	1.20	1.18	1.17	1.16	1.15	1.14
	FF	7552	7362	7170	6950	6700	6470	6240	6000	5800	5620	5450	5290	5120
	MN	.743	.738	.732	.724	.712	.701	.690	.678	.669	.661	.654	.648	.639
	IAS	325	322	320	316	310	305	300	295	290	287	284	281	277
	TAS	451	448	444	439	432	425	419	411	406	401	397	393	388

Definitions:

IAS: Indicated airspeed in knots
ISA: Standard Day temperature in °C
TAS: True airpseed in knots
SAR: Specific Range (nm / 1000 lbs of fuel)
EPR: EPR Required for flight
FF: Fuel Flow (lb / hr)

Temperature Trade Factors:

- SAR decreases 0.7% for +10°C and increases 0.7% for every -10°C difference from ISA.
- TAS increases 1 knot per °C above ISA and decreases 1 knot per °C below ISA.
- FF increases 3% for +10°C and decreases 3% for -10°C difference from ISA.

Notes:

- Shaded areas indicate optimum performance for given weight.

LONG RANGE CRUISE DATA

ALL ENGINES OPERATING

FL ISA		GROSS WEIGHT (1000 LB)												
		170	**165**	**160**	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**
210 -27	SAR	57.9	59.0	60.0	61.1	62.3	63.5	64.8	66.0	67.2	68.3	69.6	70.8	72.2
	EPR	1.25	1.24	1.23	1.22	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12
	FF	7625	7396	7200	6950	6720	6510	6290	6100	5940	5810	5620	5440	5240
	MN	.722	.713	.706	.695	.685	.676	.666	.658	.653	.649	.640	.630	.619
	IAS	328	323	320	315	310	306	301	297	295	293	289	284	279
	TAS	442	436	432	425	419	414	408	403	400	397	392	385	379
190 -23	SAR	55.9	56.9	57.9	58.9	60.0	61.1	62.1	63.1	64.1	65.2	66.4	67.7	69.1
	EPR	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10
	FF	7643	7395	7210	6980	6800	6610	6450	6300	6130	5940	5760	5510	5200
	MN	.693	.683	.677	.668	.662	.655	.650	.645	.638	.629	.620	.605	.584
	IAS	327	322	319	314	311	308	305	303	299	295	291	283	273
	TAS	427	421	418	412	408	404	401	398	393	388	382	373	360
170 -19	SAR	54.7	55.7	56.7	57.6	58.5	59.4	60.4	61.4	62.4	63.6	64.9	66.2	67.6
	EPR	1.19	1.18	1.17	1.16	1.15	1.14	1.14	1.13	1.12	1.11	1.10	1.09	1.08
	FF	7597	7388	7180	7020	6860	6700	6510	6320	6130	5890	5600	5320	5090
	MN	.669	.662	.655	.651	.646	.641	.633	.625	.616	.603	.585	.568	.554
	IAS	327	324	320	318	315	313	309	305	300	294	285	276	269
	TAS	416	412	407	405	402	398	393	389	383	375	364	353	344
150 -15	SAR	52.1	52.9	53.6	54.4	55.1	55.9	56.8	57.8	58.8	59.9	61.0	62.1	63.3
	EPR	1.17	1.16	1.15	1.14	1.13	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.07
	FF	7866	7699	7540	7370	7190	7000	6810	6560	6270	5990	5750	5520	5310
	MN	.654	.650	.646	.640	.633	.626	.618	.605	.589	.573	.560	.548	.537
	IAS	332	330	328	325	321	317	313	306	298	290	283	277	271
	TAS	410	407	405	401	397	392	387	379	369	359	351	343	336
130 -11	SAR	50.1	50.7	51.3	52.0	52.7	53.6	54.5	55.4	56.4	57.3	58.3	59.4	60.4
	EPR	1.14	1.14	1.13	1.12	1.11	1.11	1.10	1.09	1.08	1.07	1.07	1.06	1.06
	FF	8015	7904	7730	7560	7350	7070	6780	6510	6260	6050	5850	5650	5460
	MN	.636	.634	.629	.623	.615	.601	.586	.572	.560	.550	.541	.532	.523
	IAS	335	334	331	328	324	316	308	300	294	288	284	279	274
	TAS	401	400	397	393	388	379	370	361	353	347	341	336	330
110 -7	SAR	48.1	48.6	49.2	49.9	50.7	51.5	52.3	53.1	54.0	54.8	55.7	56.7	57.8
	EPR	1.12	1.12	1.11	1.10	1.09	1.09	1.08	1.07	1.07	1.06	1.06	1.05	1.05
	FF	8115	8032	7870	7600	7310	7040	6790	6580	6370	6190	5980	5790	5430
	MN	.614	.614	.609	.597	.583	.570	.559	.550	.541	.534	.525	.516	.494
	IAS	335	335	332	326	318	311	304	299	294	291	286	281	268
	TAS	390	390	387	380	371	363	356	350	344	340	334	328	314

Definitions:

IAS: Indicated airspeed in knots
ISA: Standard Day temperature in °C
TAS: True airpseed in knots
SAR: Specific Range (nm / 1000 lbs of fuel)
EPR: EPR Required for flight
FF: Fuel Flow (lb / hr)

Temperature Trade Factors:

- SAR decreases 0.7% for +10°C and increases 0.7% for every -10°C difference from ISA.
- TAS increases 1 knot per °C above ISA and decreases 1 knot per °C below ISA.
- FF increases 3% for +10°C and decreases 3% for -10°C difference from ISA.

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MACH 0.78 / 330 KIAS CRUISE DATA

ALL ENGINES OPERATING

FLT LVL	IAS ISA TAS		GROSS WEIGHT (1000 LB)											
			170	165	160	155	150	145	140	135	130	125	120	115	110
370	252	SAR											87.8	91.1	94.2
	-56	EPR											1.42	1.40	1.38
	447	FF											5090	4910	4740
350	264	SAR									80.9	83.6	86.2	88.7	91.1
	-54	EPR									1.42	1.39	1.38	1.36	1.34
	450	FF									5550	5370	5210	5060	4930
330	277	SAR							75.0	77.2	79.3	81.4	83.3	85.2	87.1
	-50	EPR							1.40	1.39	1.37	1.35	1.34	1.33	1.31
	454	FF							6050	5870	5720	5570	5440	5320	5200
310	289	SAR				67.9	69.7	71.5	73.3	74.9	76.6	78.1	79.7	81.2	82.6
	-46	EPR				1.41	1.39	1.38	1.36	1.35	1.34	1.32	1.31	1.30	1.29
	458	FF				6740	6560	6400	6240	6100	5970	5850	5740	5630	5540
290	302	SAR			65.2	66.6	68.1	69.5	70.8	72.1	73.4	74.7	75.9	77.0	78.1
	-42	EPR			1.38	1.37	1.35	1.34	1.33	1.32	1.31	1.30	1.29	1.28	1.27
	462	FF			7080	6920	6780	6640	6510	6390	6280	6180	6080	5990	5900
280	309	SAR		63.1	64.4	65.7	67.0	68.2	69.4	70.6	71.7	72.8	73.9	74.9	75.9
	-40	EPR		1.38	1.36	1.35	1.34	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.27
	464	FF		7351	7190	7050	6920	6790	6670	6560	6460	6360	6270	6180	6100
270	315	SAR	61.1	62.3	63.5	64.6	65.7	66.8	67.9	68.9	69.9	70.9	71.9	72.8	73.6
	-38	EPR	1.37	1.36	1.35	1.33	1.32	1.31	1.31	1.30	1.29	1.28	1.27	1.27	1.26
	466	FF	7624	7475	7330	7200	7080	6960	6850	6750	6650	6560	6470	6390	6320
260	322	SAR	60.3	61.3	62.4	63.4	64.4	65.4	66.3	67.2	68.1	69.0	69.8	70.6	71.4
	-37	EPR	1.35	1.34	1.33	1.32	1.31	1.30	1.30	1.29	1.28	1.27	1.27	1.26	1.25
	468	FF	7758	7623	7490	7370	7260	7150	7050	6950	6860	6770	6690	6610	6540
250	328	SAR	59.3	60.3	61.2	62.1	63.0	63.8	64.7	65.5	66.3	67.1	67.8	68.5	69.5
	-35	EPR	1.34	1.33	1.32	1.31	1.30	1.29	1.29	1.28	1.27	1.27	1.26	1.25	1.25
	470	FF	7916	7791	7670	7560	7450	7350	7250	7160	7080	7000	6920	6850	6750
240	330	SAR	58.2	59.1	61.2	62.0	62.8	63.6	64.4	65.1	65.9	66.6	67.2	67.9	68.6
	-33	EPR	1.32	1.31	1.29	1.29	1.28	1.27	1.26	1.26	1.25	1.25	1.24	1.24	1.23
	465	FF	8090	7974	7590	7490	7390	7300	7210	7130	7050	6980	6910	6850	6770

Definitions:

IAS: Indicated airspeed in knots
ISA: Standard Day temperature in °C
TAS: True airpseed in knots
SAR: Specific Range (nm / 1000 lbs of fuel)
EPR: EPR Required for flight
FF: Fuel Flow (lb / hr)

Temperature Trade Factors:

- SAR decreases 0.7% for +10°C and increases 0.7% for every -10°C difference from ISA.
- TAS increases 1 knot per °C above ISA and decreases 1 knot per °C below ISA.
- FF increases 3% for +10°C and decreases 3% for -10°C difference from ISA.

Notes:

- Blank areas indicate flight regimes in exceedance of 1.25g buffet limit.
- Shaded areas indicate optimum performance for given weight.

MACH 0.78 / 330 KIAS CRUISE DATA

ALL ENGINES OPERATING

FLT LVL	IAS ISA TAS		GROSS WEIGHT (1000 LB)												
			170	**165**	**160**	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**
230	252	SAR	58.6	59.4	60.9	61.7	62.5	63.2	64.0	64.7	65.3	66.0	66.7	67.3	68.0
	-56	EPR	1.29	1.29	1.27	1.26	1.25	1.25	1.24	1.23	1.23	1.22	1.22	1.21	1.21
	447	FF	7926	7820	7510	7410	7320	7230	7150	7070	7000	6930	6860	6790	6720
220	264	SAR	58.2	58.9	60.2	61.0	61.7	62.4	63.1	63.8	64.5	65.1	65.8	66.4	67.0
	-54	EPR	1.27	1.27	1.25	1.25	1.24	1.23	1.23	1.22	1.22	1.21	1.20	1.20	1.20
	450	FF	7864	7763	7480	7390	7300	7220	7140	7060	6990	6920	6850	6780	6720
210	277	SAR	57.5	58.2	59.3	60.1	60.8	61.5	62.2	62.9	63.6	64.2	64.9	65.5	66.1
	-50	EPR	1.26	1.25	1.24	1.23	1.23	1.22	1.21	1.21	1.20	1.20	1.19	1.19	1.18
	454	FF	7846	7747	7480	7390	7300	7220	7140	7060	6980	6910	6840	6780	6720
200	289	SAR	56.6	57.3	58.4	59.1	59.8	60.5	61.2	61.9	62.5	63.2	63.8	64.4	65.0
	-46	EPR	1.24	1.23	1.22	1.21	1.21	1.20	1.20	1.19	1.18	1.18	1.17	1.17	1.17
	458	FF	7846	7750	7500	7410	7320	7230	7150	7070	7000	6930	6860	6800	6730
190	302	SAR	55.5	56.2	57.2	57.9	58.6	59.3	60.0	60.6	61.3	61.9	62.5	63.1	63.7
	-42	EPR	1.23	1.22	1.21	1.20	1.20	1.19	1.18	1.18	1.17	1.17	1.16	1.16	1.16
	462	FF	7890	7793	7540	7450	7360	7270	7190	7110	7040	6970	6900	6840	6770
180	309	SAR	54.6	55.3	56.3	57.0	57.7	58.3	59.0	59.6	60.3	60.9	61.4	62.0	62.5
	-40	EPR	1.21	1.21	1.20	1.19	1.18	1.18	1.17	1.17	1.16	1.16	1.15	1.15	1.15
	464	FF	7903	7807	7550	7460	7370	7290	7210	7130	7060	6980	6920	6850	6800
170	315	SAR	54.4	55.1	56.1	56.8	57.5	58.2	58.8	59.5	60.1	60.7	61.3	61.8	62.4
	-38	EPR	1.20	1.19	1.18	1.17	1.17	1.16	1.15	1.15	1.15	1.14	1.14	1.13	1.13
	466	FF	7822	7724	7460	7370	7280	7200	7110	7040	6970	6900	6830	6770	6710
150	322	SAR	52.0	52.6	53.5	54.1	54.7	55.3	55.8	56.4	56.9	57.4	57.9	58.4	58.9
	-37	EPR	1.17	1.16	1.15	1.15	1.14	1.14	1.13	1.13	1.13	1.12	1.12	1.11	1.11
	468	FF	7952	7858	7610	7520	7440	7360	7290	7220	7150	7090	7020	6960	6900
130	328	SAR	50.1	50.6	51.4	51.9	52.4	53.0	53.5	54.0	54.5	55.0	55.5	55.9	56.4
	-35	EPR	1.14	1.14	1.13	1.13	1.12	1.12	1.12	1.11	1.11	1.10	1.10	1.10	1.10
	470	FF	8015	7930	7700	7620	7540	7470	7390	7320	7260	7190	7130	7070	7020
110	330	SAR	48.1	48.6	49.2	49.7	50.2	50.7	51.2	51.7	52.1	52.6	53.0	53.4	53.9
	-33	EPR	1.12	1.12	1.11	1.10	1.10	1.10	1.10	1.09	1.09	1.09	1.09	1.08	1.08
	465	FF	8115	8032	7810	7730	7650	7580	7510	7440	7370	7310	7250	7190	7140

Definitions:

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Temperature Trade Factors:

- SAR decreases 0.7% for +10°C and increases 0.7% for every -10°C difference from ISA.
- TAS increases 1 knot per °C above ISA and decreases 1 knot per °C below ISA.
- FF increases 3% for +10°C and decreases 3% for -10°C difference from ISA.

End of Section

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HOLDING SPEED / EPR / FUEL FLOW

STANDARD DAY - FLAPS UP

FL		GROSS WEIGHT - 1000 LB											
		95	**100**	**105**	**110**	**115**	**120**	**125**	**130**	**140**	**150**	**160**	**170**
370	KIAS	209	215	221	227	236							
	EPR	1.288	1.313	1.337	1.359	1.377							
	FF	4060	4340	4610	4870	5150							
350	KIAS	205	213	219	225	231	237	244					
	EPR	1.241	1.267	1.291	1.314	1.335	1.355	1.372					
	FF	3960	4240	4510	4790	5070	5340	5600					
330	KIAS	199	208	216	223	229	235	240	246				
	EPR	1.199	1.221	1.245	1.268	1.290	1.310	1.330	1.349				
	FF	3900	4150	4420	4700	4980	5260	5540	5810				
310	KIAS	199	204	210	218	225	232	238	244	254	266		
	EPR	1.164	1.182	1.202	1.223	1.244	1.265	1.285	1.304	1.341	1.371		
	FF	3890	4110	4350	4610	4880	5170	5450	5730	6290	6830		
290	KIAS	199	204	209	214	219	227	234	241	252	263	272	
	EPR	1.136	1.151	1.167	1.184	1.203	1.221	1.241	1.260	1.297	1.330	1.361	
	FF	3890	4100	4320	4550	4790	5050	5320	5600	6170	6740	7300	
270	KIAS	199	204	209	214	219	223	228	235	249	260	270	280
	EPR	1.113	1.125	1.139	1.153	1.168	1.184	1.200	1.217	1.253	1.287	1.319	1.348
	FF	3890	4103	4320	4530	4750	4980	5210	5480	6030	6600	7180	7740
250	KIAS	199	204	209	214	219	223	228	232	243	256	268	277
	EPR	1.095	1.105	1.116	1.128	1.140	1.153	1.167	1.181	1.211	1.244	1.276	1.306
	FF	3900	4110	4320	4540	4750	4970	5190	5410	5900	6450	7020	7600
230	KIAS	199	204	209	214	219	223	228	232	241	250	262	274
	EPR	1.080	1.089	1.097	1.107	1.117	1.128	1.139	1.151	1.177	1.204	1.233	1.263
	FF	3920	4130	4340	4560	4770	4990	5200	5420	5870	6340	6880	7460
210	KIAS	199	204	209	214	219	223	228	232	241	250	258	271
	EPR	1.068	1.075	1.083	1.091	1.099	1.108	1.117	1.127	1.148	1.171	1.196	1.223
	FF	3950	4150	4360	4580	4790	5000	5220	5440	5880	6330	6800	7350
190	KIAS	199	204	209	214	218	223	228	232	241	250	258	271
	EPR	1.057	1.063	1.070	1.077	1.084	1.091	1.099	1.107	1.125	1.144	1.165	1.188
	FF	3990	4190	4400	4600	4810	5030	5250	5470	5910	6350	6800	7320

NOTES:
1) Based on racetrack pattern - Fuel Flow increased by 5%.
2) Speeds based on 1.5 Vs
3) Shaded areas indicate exceedance of ATC Hold Speeds
4) FF = Total fuel in lb/hr

HOLDING SPEED / EPR / FUEL FLOW

STANDARD DAY - FLAPS UP

PRESSURE ALTITUDE (FT)		GROSS WEIGHT - 1000 LB											
		95	**100**	**105**	**110**	**115**	**120**	**125**	**130**	**140**	**150**	**160**	**170**
17,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	270
	EPR	1.047	1.053	1.059	1.065	1.071	1.078	1.084	1.091	1.105	1.121	1.139	1.158
	FF (pph)	3940	4150	4350	4550	4750	4960	5170	5390	5830	6270	6710	7210
15,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	269
	EPR	1.040	1.044	1.050	1.055	1.060	1.066	1.072	1.078	1.090	1.103	1.118	1.134
	FF (pph)	4070	4270	4480	4690	4900	5100	5300	5520	5950	6400	6840	7320
13,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	268
	EPR	1.033	1.037	1.042	1.046	1.051	1.056	1.061	1.066	1.077	1.088	1.100	1.113
	FF (pph)	4140	4360	4570	4780	4990	5200	5411	5620	6050	6500	6940	7430
11,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	268
	EPR	1.028	1.031	1.035	1.039	1.043	1.047	1.052	1.056	1.066	1.076	1.086	1.097
	FF (pph)	4190	4400	4610	4830	5040	5250	5470	5680	6100	6530	6970	7460
9,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	267
	EPR	1.023	1.026	1.029	1.033	1.036	1.040	1.043	1.047	1.056	1.065	1.074	1.083
	FF (pph)	4230	4440	4650	4870	5080	5300	5510	5730	6160	6580	7000	7480
7,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	267
	EPR	1.019	1.022	1.025	1.027	1.030	1.033	1.037	1.040	1.047	1.055	1.063	1.072
	FF (pph)	4290	4500	4700	4920	5230	5340	5560	5780	6210	6650	7070	7510
5,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	266
	EPR	1.016	1.018	1.021	1.023	1.026	1.028	1.031	1.034	1.040	1.047	1.054	1.061
	FF (pph)	4350	4550	4760	4970	5180	5390	5610	5830	6260	6710	7140	7570
3,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	266
	EPR	1.013	1.015	1.017	1.019	1.022	1.024	1.026	1.029	1.034	1.040	1.046	1.053
	FF (pph)	4430	4630	4830	5030	5240	5450	5660	5880	6320	6760	7200	7640
1,500	KIAS	199	204	209	214	218	223	228	232	241	250	258	265
	EPR	1.012	1.013	1.015	1.017	1.019	1.021	1.023	1.025	1.030	1.035	1.041	1.047
	FF (pph)	4500	4690	4890	5090	5290	5500	5710	5930	6360	6800	7240	7680
1,000	KIAS	199	204	209	214	218	223	228	232	241	250	258	265
	EPR	1.011	1.013	1.015	1.016	1.018	1.020	1.022	1.024	1.029	1.034	1.039	1.045
	FF (pph)	4520	4710	4910	5110	5310	5520	5730	5940	6370	6820	7260	7690

NOTES:
1) Based on racetrack pattern - Fuel Flow increased by 5%.
2) Speeds based on 1.5 Vs
3) Shaded areas indicate exceedance of ATC Hold Speeds
4) FF = Total fuel in lb/hr

DESCENT REFERENCE GUIDE

START DESCENT		FOLLOW 3:1 LINE		
1000 FPM Entry Cruise Mach / 300 KIAS		Cruise Mach / 300 KIAS		
Cruise Altitude (1000 Ft)	**Top of Descent Distance (NM)**	**Intercept Altitude** (1000 Ft)	**Distance (NM)**	**Rate of Descent** Zero wind (FPM)
37	126	**33**	99	2600
35	120	**31**	93	2600
33	114	**29**	87	2600
31	108	**27**	81	2500
29	102	**25**	75	2400
28	99	**24**	72	2400
27	96	**23**	69	2300
26	93	**22**	66	2300
25	90	**21**	63	2300
24	87	**20**	60	2200
23	84	**19**	57	2200
22	81	**18**	54	2200
21	78	**17**	51	2100
20	75	**16**	48	2100
19	72	**15**	45	2100
18	69	**14**	42	2000
17	66	**13**	39	2000
16	63	**12**	36	2000
15	60	**11**	33	1900
14	57	**10**	30	1900
13	52	**10**	30	1900
12	47	**10**	30	1900
11	42	**10**	30	1900
10	36	**10**	30	1900

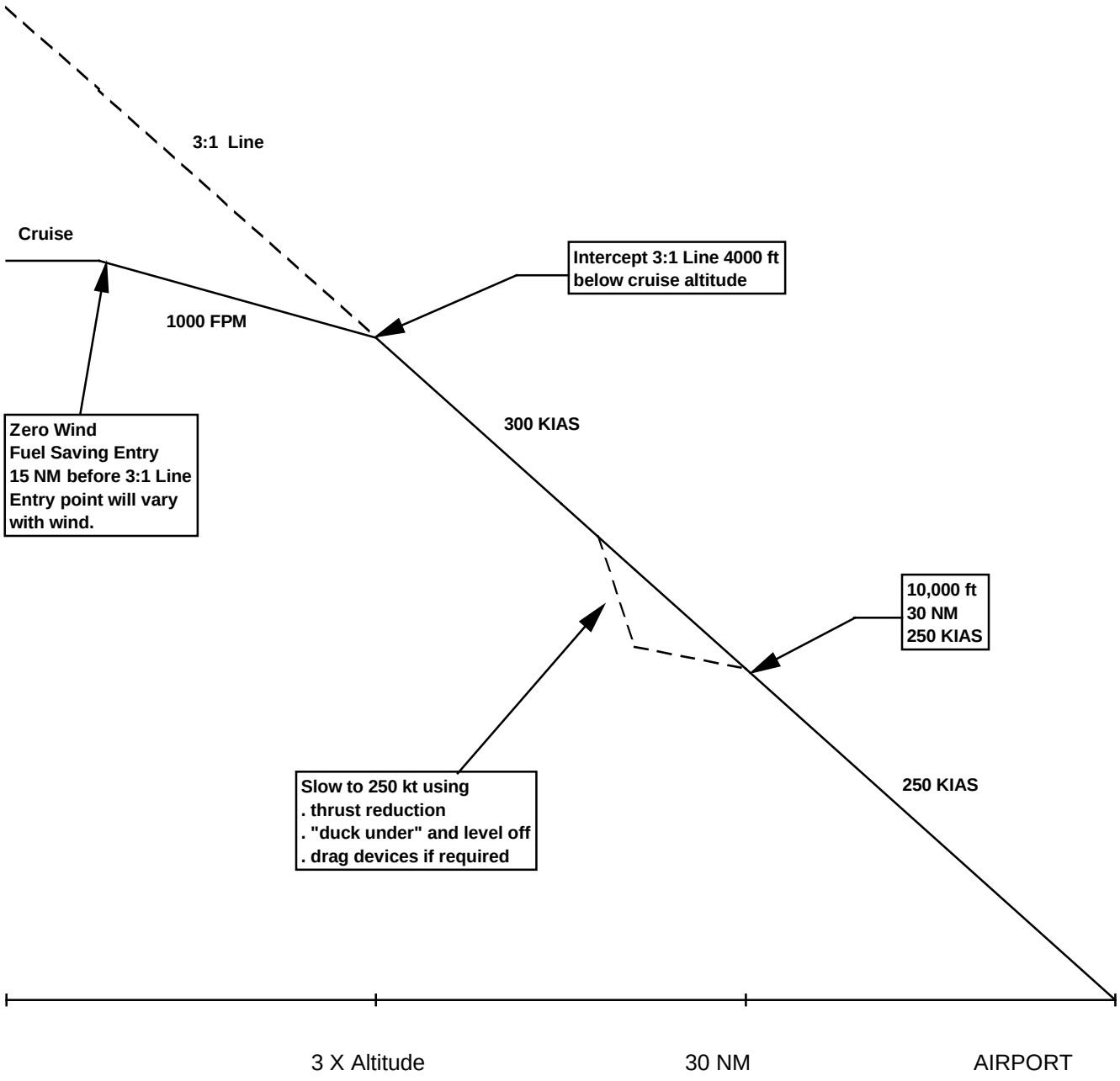
Descent entry point distance will increase/decrease with tailwind/headwind.

<u>Example</u>

1. From FL 350 start descent 120 NM out with a 1000 fpm rate of descent.
2. You will intercept 3:1 line at FL 310, 93 NM out.
3. A target 2600 fpm rate of descent will put you on the 3:1 line initially.
4. Read down to check 3:1 distance and rate of descent at lower altitudes.

DESCENT PROFILE

- SPEED - Cruise Mach/300 KIAS
- THRUST - as required



DESCENT PLANNING

Cruise Mach / 300 KIAS / 250 KIAS

Cruise Altitude (FL / ALT)	Top of Descent Distance (NM)	Fuel (LB)	Zero Wind Time (min)	Average TAS to S.L. (KT)
FL 370	126	1240	23	322
350	120	1210	22	317
330	114	1190	21	312
310	108	1150	20	307
290	102	1120	20	303
280	99	1110	19	300
270	96	1090	19	297
260	93	1070	18	295
250	90	1060	18	292
240	87	1040	18	290
230	84	1020	17	286
220	81	1000	17	284
210	78	990	16	280
200	75	970	16	278
190	72	960	15	275
180	69	940	15	272
ALT 17	66	920	14	269
16	63	900	14	266
15	60	880	13	263
14	57	850	13	259
13	52	810	13	248
12	47	770	12	235
11	42	740	12	230
10	36	690	10	216
10*	30	640	9	200

* 250 KIAS

ALTITUDE FOR ALTERNATE DESTINATION

Based on Missed Approach

Distance (NM)	Cruise Altitude/ Flight Level	Cruise Speed Schedule
25	5000 Ft	Min Cost
50	7 - 9,000 Ft.	|
100	11 - 15,000 Ft.	|
125	14,000 Ft. - FL 180	|
150	17,000 Ft. - FL 210	|
200	FL 230 - 270	|
250	FL 350/370	|
300	FL 350/370	|
400	FL 350/370	V

MD-90 DIVERSION CHARTS

(MIN FUEL = 4000 lb)

DIVERSION FROM MISSED APPROACH
FUEL & TIME REQUIRED

DIST (NM)	CRUISE ALTITUDE - 1000 FT						
	5	**10**	**15**	**20**	**25**	**29**	**35**
400				12.3 1:05	11.6 1:07	11.3 1:08	11.1 1:09
300			11.3 0:51	10.5 0:53	10.1 0:54	9.9 0:55	9.7 0:55
200			9.1 0:39	8.7 0:40	8.5 0:41	8.4 0:42	
180		9.3 0:34	8.7 0:36	8.3 0:37	8.2 0:39	8.2 0:39	
160		8.8 0:32	8.3 0:34	8 0:35	7.9 0:36		
140		8.3 0:29	7.9 0:31	7.6 0:32	7.7 0:34		
120		7.8 0:27	7.4 0:29	7.3 0:30			
100	7.8 0:22	7.3 0:25	7 0:26				
80	7.2 0:19	6.8 0:22	6.6 0:24				
70	6.9 0:18	6.5 0:21	6.4 0:23				
60	6.6 0:17	6.2 0:20					
50	6.3 0:16	6 0:18					
40 OR LESS	6 0:14						

DIVERSION FROM HOLDING
FUEL & TIME REQUIRED

DIST (NM)	CRUISE ALTITUDE - 1000 FT				
	15	**20**	**25**	**29**	**35**
400		11.2 1:02	10.4 1:04	10 1:05	9.8 1:06
300		9.4 0:49	8.9 0:51	8.6 0:52	8.5 0:52
200	8.1 0:35	7.6 0:37	7.2 0:38	7.1 0:39	
180	7.7 0:33	7.2 0:34	7 0:35	6.9 0:36	
160	7.2 0:30	6.8 0:31	6.7 0:33	6.6 0:33	
140	6.8 0:28	6.5 0:29	6.4 0:30		
120	6.4 0:25	6.1 0:26	6.3 0:28		
100	5.9 0:23	5.8 0:24			
80	5.5 0:20				
70 OR LESS	5.3 0:19				

End of Section

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DEFINITIONS AND ASSUMPTIONS

ACTUAL LANDING DISTANCE The actual distance required to land starting at 50 feet above the runway (usually at the threshold) to a complete stop on the runway. This distance is based on a 1.3 V_S speed at 50 feet and assumes maximum braking and NO reverse thrust.

APPROACH CLIMB LIMIT WEIGHT Approach Climb Limit Weight is defined in FAR 25.121 as the maximum weight at which a missed approach climb meets the FAR prescribed climb gradient (2.1% for a two engine aircraft). This gradient is determined with the critical engine inoperative, remaining engine at takeoff thrust, landing gear retracted, and approach flap setting (as defined in the FAA Approved Flight Manual). This weight takes into account an air conditioning pack ON and operated from engine bleed air.

F.A.R. LANDING FIELD LENGTH This is the landing field length as defined in the Federal Air Regulations Part 121, and is the actual landing distance plus an additional safety margin of 67%. Dispatch is based on F.A.R. Landing Field Length at the destination airport.

GO-AROUND THRUST Maximum thrust setting available for use during a missed approach.

LANDING CLIMB LIMIT WEIGHT Landing Climb Limit Weight is defined in FAR 25.119 as the maximum weight at which the aircraft meets the FAR prescribed climb gradient (3.2%). This gradient is determined with all engines operating, landing gear extended, and landing flap setting.

V_{REF} Reference speed for the aircraft weight and configuration. This value typically represents 1.3 V_S for the configuration (unless otherwise noted). These speeds assume minimum maneuvering is required after being established on final approach.

V_S Indicated stall speed for the aircraft weight and configuration. 1.3 V_S is 1.3 times the stall speed, or an increase of 30% above stall speed.

GO-AROUND EPR SETTINGS

BASED ON 28K THRUST

BASED ON FULL INFLIGHT TAKEOFF RATING
NORMAL BLEED - PACKS ON / ANTI-ICE OFF

V2528-D5

OAT – °C	AIRPORT PRESSURE ALTITUDE – FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
50	1.37	1.37	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
48	1.38	1.38	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
46	1.39	1.39	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38
44	1.40	1.40	1.39	1.39	1.40	1.40	1.40	1.40	1.40	1.39
42	1.41	1.41	1.40	1.40	1.41	1.41	1.41	1.41	1.41	1.40
40	1.43	1.42	1.41	1.41	1.42	1.42	1.42	1.42	1.42	1.41
38	1.44	1.44	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
36	1.45	1.45	1.44	1.44	1.44	1.44	1.45	1.44	1.44	1.44
34	1.46	1.46	1.45	1.45	1.45	1.45	1.46	1.45	1.45	1.45
32	1.46	1.48	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47
30	1.46	1.49	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
28	1.46	1.49	1.49	1.49	1.49	1.49	1.50	1.49	1.49	1.49
26	1.46	1.49	1.49	1.50	1.50	1.50	1.51	1.50	1.50	1.50
24	1.46	1.49	1.49	1.50	1.52	1.52	1.52	1.52	1.52	1.51
22	1.46	1.49	1.49	1.50	1.52	1.53	1.53	1.53	1.53	1.52
20	1.46	1.49	1.49	1.50	1.52	1.53	1.55	1.54	1.54	1.54
18	1.46	1.49	1.49	1.50	1.52	1.53	1.55	1.54	1.54	1.54
16	1.46	1.49	1.49	1.50	1.52	1.53	1.55	1.54	1.54	1.54
14	1.46	1.49	1.49	1.50	1.52	1.53	1.55	1.54	1.54	1.54
12 & below	1.46	1.49	1.49	1.50	1.52	1.53	1.55	1.54	1.54	1.54

Bleed Adjustments:

Packs Off	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.02	+ 0.02	+ 0.02	+ 0.02
Engine Anti-Ice On	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Airplane Anti-Ice On FL<40	- 0.03	- 0.03	- 0.03	- 0.03	- 0.03	- 0.03	- 0.03	- 0.03	- 0.03	- 0.04
Airplane Anti-Ice On FL=40	- 0.05	- 0.05	- 0.06	- 0.06	- 0.06	- 0.06	- 0.06	- 0.07	- 0.07	- 0.07

PATTERN AND APPROACH SPEEDS

KIAS

NORMAL CONFIGURATION

GROSS WEIGHT – POUNDS	APPROACH – GEAR UP			LANDING – GEAR DOWN	
	SLATS RET.	SLATS EXTENDED		SLATS EXTENDED	
	FLAPS 0	FLAPS 0	FLAPS 15	FLAPS	FLAPS
	1.5Vs	*1.5Vs*	*1.4Vs*	**28**	**40**
170,000	266	213	181	159	154
165,000	261	210	178	156	151
160,000	258	207	176	152	147
155,000	255	204	173	150	145
150,000	250	200	170	147	142
145,000	245	197	167	144	139
140,000	241	194	164	142	137
135,000	236	190	161	139	134
130,000	233	187	159	137	132
125,000	226	184	154	134	129
120,000	223	179	152	131	127
115,000	218	176	149	129	124
110,000	214	172	146	126	122
105,000	209	167	142	124	119
100,000	205	164	139	120	116
95,000	199	159	136	117	113

NOTE: MD-88/MD-90 Speed Book common maneuver and approach speeds represent the more conservative (i.e. higher) speed of either the MD-88 or the MD-90. For this reason, the chart speeds above may not agree with the Speed Book values. The Speed Book values should always be equal to or greater than the chart KIAS.

STALL SPEEDS - V_s

KIAS

GROSS WEIGHT – POUNDS	GEAR UP						GEAR DOWN	
	FLAPS 0 SLATS RET	FLAPS 0 SLATS EXT	FLAPS 5 SLATS EXT	FLAPS 11 SLATS EXT	FLAPS 15 SLATS EXT	FLAPS 18 SLATS EXT	FLAPS 28 SLATS EXT	FLAPS 40 SLATS EXT
170,000	177	142	137	132	129	127	122	118
165,000	174	140	135	130	127	125	120	116
160,000	172	138	134	129	125	123	117	113
155,000	170	136	132	127	123	121	115	111
150,000	167	134	130	125	121	119	113	109
145,000	164	132	127	123	119	117	111	107
140,000	161	130	125	121	117	115	109	105
135,000	158	127	123	119	115	113	107	103
130,000	156	125	121	116	113	111	105	101
125,000	151	123	118	114	110	109	103	99
120,000	149	120	116	112	108	107	101	97
115,000	146	118	114	110	106	105	99	96
110,000	143	115	111	107	104	102	97	94
105,000	140	112	109	105	101	99	95	92
100,000	137	110	106	102	99	97	92	90
95,000	133	107	103	99	97	95	90	87

F.A.R. DRY LANDING FIELD LENGTH

FEET

V2528-D5

FLAPS 28

AIRCRAFT WEIGHT – POUNDS	AIRPORT PRESSURE ALTITUDE – FEET								
	0	**1,000**	**2,000**	**3,000**	**4,000**	**5,000**	**6,000**	**7,000**	**8,000**
170,000	6,200	6,400	6,500	6,650	6,860	7,000	7,190	7,380	7,550
165,000	6,090	6,260	6,410	6,530	6,750	6,870	7,010	7,200	7,360
160,000	5,950	6,075	6,200	6,350	6,500	6,650	6,800	6,975	7,150
155,000	5,800	5,925	6,050	6,200	6,350	6,500	6,650	6,825	7,000
150,000	5,650	5,775	5,900	6,050	6,200	6,350	6,500	6,650	6,800
145,000	5,500	5,625	5,750	5,875	6,000	6,175	6,350	6,500	6,650
140,000	5,350	5,475	5,600	5,725	5,850	6,000	6,150	6,300	6,450
135,000	5,200	5,325	5,450	5,575	5,700	5,850	6,000	6,125	6,250
130,000	5,050	5,175	5,300	5,425	5,550	5,675	5,800	5,950	6,100
125,000	4,920	5,035	5,150	5,260	5,370	5,510	5,650	5,775	5,900
120,000	4,780	4,890	5,000	5,125	5,250	5,375	5,500	5,625	5,750
115,000	4,640	4,745	4,850	4,950	5,050	5,175	5,300	5,425	5,550
110,000	4,500	4,580	4,660	4,780	4,900	5,010	5,120	5,235	5,350
105,000	4,350	4,435	4,520	4,635	4,750	4,850	4,950	5,075	5,200
100,000	4,200	4,275	4,350	4,450	4,550	4,650	4,750	4,875	5,000
95,000	4,050	4,125	4,200	4,300	4,400	4,500	4,600	4,700	4,800

NOTE:
Actual Landing Distance is:

- 60 percent of the F.A.R. Landing Field Lengths above.
- The distance to a complete stop from 50 feet above the runway threshold at V_{Ref28}.
- Based on Maximum Braking, Speed Brakes Extended and No Thrust Reverse.

CONDITION	CORRECTION
Headwind	- 30 ft. per knot
Tailwind	+ 95 ft. per knot
Auto or Inboard Ground Spoilers Inoperative	+ 550 ft.
Wet runway and/or Low Minima	increase distance by 15%

F.A.R. DRY LANDING FIELD LENGTH

FEET

V2528-D5

FLAPS 40

AIRCRAFT WEIGHT – POUNDS	AIRPORT PRESSURE ALTITUDE – FEET								
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
170,000	6,080	6,120	6,270	6,490	6,630	6,790	6,920	7,100	7,300
165,000	5,850	5,980	6,140	6,330	6,480	6,640	6,780	6,940	7,130
160,000	5,750	5,875	6,000	6,150	6,300	6,460	6,620	6,785	6,950
155,000	5,600	5,735	5,870	6,010	6,150	6,300	6,450	6,600	6,750
150,000	5,500	5,625	5,750	5,875	6,000	6,150	6,300	6,400	6,500
145,000	5,350	5,475	5,600	5,725	5,850	5,985	6,120	6,260	6,400
140,000	5,200	5,325	5,450	5,575	5,700	5,850	6,000	6,125	6,250
135,000	5,050	5,175	5,300	5,400	5,500	5,650	5,800	5,925	6,050
130,000	4,900	5,025	5,150	5,260	5,370	5,495	5,620	5,760	5,900
125,000	4,770	4,885	5,000	5,125	5,250	5,375	5,500	5,625	5,750
120,000	4,630	4,740	4,850	4,950	5,050	5,175	5,300	5,425	5,550
115,000	4,500	4,600	4,700	4,800	4,900	5,010	5,120	5,250	5,380
110,000	4,350	4,450	4,550	4,650	4,750	4,875	5,000	5,100	5,200
105,000	4,200	4,300	4,400	4,500	4,600	4,700	4,800	4,900	5,000
100,000	4,050	4,150	4,250	4,325	4,400	4,510	4,620	4,735	4,850
95,000	3,900	4,000	4,100	4,175	4,250	4,350	4,450	4,550	4,650

NOTE:
Actual Landing Distance is:

- 60 percent of the F.A.R. Landing Field Lengths above.
- The distance to a complete stop from 50 feet above the runway threshold at V_{Ref40}.
- Based on Maximum Braking, Speed Brakes Extended and No Thrust Reverse.

CONDITION	CORRECTION
Headwind	- 30 ft. per knot
Tailwind	+ 95 ft. per knot
Auto or Inboard Ground Spoilers Inoperative	+ 550 ft.
Wet runway and/or Low Minima	increase distance by 15%

APPROACH AND LANDING CLIMB LIMITS

BASED ON 28K THRUST

POUNDS

V2528-D5

APPROACH FLAPS 11
LANDING FLAPS 28

ONE PACK ON, ANTI-ICE OFF

OAT – °C	AIRPORT PRESSURE ALTITUDE – FEET								
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
50	156,500	151,000	144,500						
45	167,000	161,000	155,500	149,500	142,000	136,000			
40	177,000	170,000	164,000	158,000	152,000	145,500	140,000	135,000	
35	185,000	178,500	172,500	166,500	160,500	154,500	148,000	142,500	137,500
32	190,000	183,000	177,500	171,500	165,500	159,000	152,500	147,000	141,500
30	190,000	186,000	180,000	174,000	168,000	162,500	155,500	149,500	143,500
28	190,000	189,500	183,000	177,000	171,000	165,000	158,500	152,000	146,500
26	190,000	189,500	186,000	179,500	173,500	167,000	160,500	154,500	148,500
24	190,000	189,500	186,000	182,500	176,500	170,500	164,000	157,500	151,000
22	190,000	189,500	186,000	182,500	178,500	172,500	166,000	159,500	153,500
20	190,000	189,500	186,000	182,500	179,000	175,500	169,000	162,000	155,500
18	190,000	189,500	186,000	182,500	179,000	175,500	171,000	164,500	158,000
16	190,000	189,500	186,000	182,500	179,000	175,500	171,000	167,000	159,500
10 & below	190,000	189,500	186,000	183,000	179,500	175,500	171,500	167,000	162,000

NOTES:

1. Shaded region represents conditions outside environmental envelope.
2. Reduce Gross Weight by 1,750 lbs. when operating in icing conditions during any part of the flight when the forecast landing temperature is below 20°C.
3. Apply the following Gross Weight Corrections (pounds) for applicable bleed configuration:

CONFIGURATION	CORRECTION – POUNDS
Packs OFF	+ 3,000
Engine Ice Protection	0
Engine and Airplane Ice Protection	- 10,000

BASIS:

In accordance with FAR 25.119 and FAR 25.121(d), the limit weights shown are the more restrictive of the following two scenarios:

Approach Climb

- One engine inoperative.
- Flaps at approach setting. (Flaps 11)
- Landing gear retracted.

Landing Climb

- All engines operating.
- Flaps at landing setting. (Flaps 28)
- Landing gear extended.

APPROACH AND LANDING CLIMB LIMITS

BASED ON 28K THRUST

POUNDS

V2528-D5

ONE PACK ON, ANTI-ICE OFF

APPROACH FLAPS 15
LANDING FLAPS 28 or 40

OAT – °C	AIRPORT PRESSURE ALTITUDE – FEET								
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
50	145,000	140,000	134,400						
45	154,300	149,200	143,900	138,100	132,600	126,700			
40	163,300	157,300	151,900	146,600	141,000	135,600	130,000	125,100	
35	171,400	165,300	160,100	154,200	148,600	143,400	137,600	132,400	127,400
32	175,400	169,700	164,100	158,500	153,000	147,700	141,700	136,200	131,100
30	177,800	172,600	166,800	161,000	155,800	150,500	144,300	138,600	133,300
28	178,400	174,800	169,400	163,700	158,500	153,000	146,800	140,800	135,400
26	178,000	174,900	171,800	166,300	161,100	155,400	149,200	143,100	137,500
24	178,000	174,900	172,500	168,300	163,500	157,800	151,500	145,400	139,600
22	177,900	174,900	172,100	168,700	165,100	160,200	153,700	147,800	141,700
20	178,000	175,000	171,800	168,500	165,600	161,700	156,000	149,900	143,700
18	178,100	175,000	171,900	168,500	165,400	162,000	157,700	152,000	145,600
16	178,100	175,100	172,000	168,500	165,100	161,700	158,300	153,500	147,400
10 & below	178,300	175,300	172,000	168,600	165,200	161,800	157,800	153,500	148,900

NOTES:

1. Shaded region represents conditions outside environmental envelope.
2. Reduce Gross Weight by 1,790 lbs. when operating in icing conditions during any part of the flight when the forecast landing temperature is below 20°C.
3. Apply the following Gross Weight Corrections (pounds) for applicable bleed configuration:

CONFIGURATION	CORRECTION – POUNDS
Packs OFF	+ 2,100
Engine Ice Protection	-300
Engine and Airplane Ice Protection	- 10,500

BASIS:

In accordance with FAR 25.119 and FAR 25.121(d), the limit weights shown are the more restrictive of the following two scenarios:

Approach Climb

- One engine inoperative.
  - Flaps at approach setting. (Flaps 15)
  - Landing gear retracted.

Landing Climb

- All engines operating.
- Flaps at landing setting. (Flaps 28 or 40)
- Landing gear extended.

OPERATIONAL LANDING DISTANCES

FEET

FLAPS 28

NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).

Landing Weight (lb)	DRY (6)				GOOD (5)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	12,400	9,000	5,300	5,000	12,400	9,000	7,000	6,600
165,000	12,200	8,800	5,200	4,900	12,200	8,800	6,900	6,500
160,000	11,900	8,600	5,100	4,800	11,900	8,600	6,700	6,400
155,000	11,600	8,400	5,000	4,700	11,600	8,400	6,600	6,300
150,000	11,300	8,200	4,900	4,600	11,300	8,200	6,400	6,100
145,000	11,100	8,000	4,800	4,500	11,100	8,000	6,300	6,000
142,000	10,900	7,900	4,800	4,500	11,100	8,000	6,300	6,000
140,000	10,800	7,800	4,700	4,400	10,800	7,800	6,100	5,800
135,000	10,500	7,600	4,600	4,300	10,500	7,600	6,000	5,700
130,000	10,200	7,400	4,500	4,200	10,200	7,400	5,800	5,500
125,000	10,000	7,200	4,400	4,100	10,000	7,200	5,700	5,400
120,000	9,700	7,000	4,300	4,000	9,700	7,000	5,500	5,300
115,000	9,500	6,900	4,200	3,900	9,500	6,900	5,400	5,200
110,000	9,200	6,700	4,000	3,800	9,200	6,700	5,300	5,000

BASIS: Zero wind and slope ● Touchdown Speed = VREF28 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Data is advisory and includes 15% safety margin and 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	DRY (6)				GOOD (5)			
0	-200	-200	-200	-200	-300	-300	-300	-300
2,000	0	0	0	0	0	0	0	0
4,000	300	300	300	300	300	300	300	300
6,000	500	500	500	500	700	700	700	700
8,000	800	800	800	800	1,000	1,000	1,000	1,000

CORRECTIONS	DRY (6)				GOOD (5)			
PER 1 KT HEADWIND	-50	-50	0	0	-50	-50	-50	-50
PER 1 KT TAILWIND	100	100	100	100	100	100	100	100
PER 5 KTS ADD'L SPD	150	150	150	150	250	250	250	250
PER 10°C ABOVE ISA	250	250	250	250	300	300	300	300
PER 10°C BELOW ISA	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% UP SLOPE	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% DOWN SLOPE	300	300	300	300	400	400	400	400
1 REVERSER INOP	50	50	50	50	400	400	400	400
2 REVERSERS INOP	100	100	100	100	600	600	600	600

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES

FEET

FLAPS 28

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR (1)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	12,700	10,500	9,800	9,500	13,400	13,400	12,700	12,300
165,000	12,400	10,300	9,600	9,300	13,100	13,100	12,400	12,000
160,000	12,100	10,100	9,400	9,000	12,700	12,700	12,100	11,700
155,000	11,800	9,900	9,200	8,800	12,400	12,400	11,800	11,500
150,000	11,500	9,600	8,900	8,600	12,100	12,100	11,500	11,200
145,000	11,200	9,400	8,700	8,400	11,800	11,800	11,200	10,900
142,000	11,000	9,200	8,600	8,300	11,700	11,700	11,100	10,800
140,000	10,900	9,100	8,500	8,200	11,500	11,500	10,900	10,600
135,000	10,600	8,900	8,300	8,000	11,200	11,200	10,600	10,300
130,000	10,300	8,600	8,000	7,800	10,800	10,800	10,300	10,000
125,000	10,100	8,400	7,800	7,600	10,500	10,500	10,000	9,700
120,000	9,800	8,200	7,600	7,300	10,200	10,200	9,700	9,400
115,000	9,600	8,000	7,400	7,200	10,000	10,000	9,500	9,200
110,000	9,300	7,700	7,200	7,000	9,700	9,700	9,200	9,000

BASIS: Zero wind and slope ● Touchdown Speed = VREF28 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Data is advisory and includes 15% safety margin and 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	MEDIUM (3)				POOR (1)			
0	-400	-400	-400	-400	-500	-500	-500	-500
2,000	0	0	0	0	0	0	0	0
4,000	500	500	500	500	700	700	700	700
6,000	1,000	1,000	1,000	1,000	1,300	1,300	1,300	1,300
8,000	1,500	1,500	1,500	1,500	2,000	2,000	2,000	2,000

CORRECTIONS	MEDIUM (3)				POOR (1)			
PER 1 KT HEADWIND	-50	-50	-50	-50	-50	-50	-50	-50
PER 1 KT TAILWIND	150	150	150	150	200	200	200	200
PER 5 KTS ADD'L SPD	350	350	350	350	450	450	450	450
PER 10°C ABOVE ISA	450	450	450	450	650	650	650	650
PER 10°C BELOW ISA	-100	-100	-100	-100	-150	-150	-150	-150
PER 1% UP SLOPE	-150	-150	-150	-150	-200	-200	-200	-200
PER 1% DOWN SLOPE	600	600	600	600	800	800	800	800
1 REVERSER INOP	1,400	1,400	1,400	1,400	2,350	2,350	2,350	2,350
2 REVERSERS INOP	2,100	2,100	2,100	2,100	3,600	3,600	3,600	3,600

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES

FEET

FLAPS 40

NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).

Landing Weight (lb)	DRY (6)				GOOD (5)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	11,800	8,600	5,000	4,700	11,800	8,600	6,700	6,300
165,000	11,600	8,400	4,900	4,600	11,600	8,400	6,600	6,200
160,000	11,300	8,200	4,800	4,500	11,300	8,200	6,400	6,100
155,000	11,100	8,100	4,700	4,400	11,100	8,100	6,300	6,000
150,000	10,800	7,900	4,600	4,300	10,800	7,900	6,100	5,800
145,000	10,600	7,700	4,600	4,300	10,600	7,700	6,000	5,700
142,000	10,400	7,600	4,500	4,200	10,300	7,500	5,900	5,600
140,000	10,300	7,500	4,500	4,200	10,300	7,500	5,900	5,600
135,000	10,100	7,400	4,400	4,100	10,100	7,400	5,800	5,500
130,000	9,800	7,200	4,300	4,000	9,800	7,200	5,600	5,300
125,000	9,600	7,000	4,200	3,900	9,600	7,000	5,500	5,200
120,000	9,300	6,800	4,100	3,800	9,300	6,800	5,300	5,100
115,000	9,000	6,600	4,000	3,700	9,100	6,600	5,200	5,000
110,000	8,700	6,400	3,800	3,600	8,800	6,400	5,000	4,800

BASIS: Zero wind and slope ● Touchdown Speed = VREF40 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Data is advisory and includes 15% safety margin and 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	DRY (6)				GOOD (5)			
0	-200	-200	-200	-200	-200	-200	-200	-200
2,000	0	0	0	0	0	0	0	0
4,000	200	200	200	200	300	300	300	300
6,000	500	500	500	500	600	600	600	600
8,000	700	700	700	700	1,000	1,000	1,000	1,000

CORRECTIONS	DRY (6)				GOOD (5)			
PER 1 KT HEADWIND	-50	-50	0	0	-50	-50	-50	-50
PER 1 KT TAILWIND	100	100	100	100	100	100	100	100
PER 5 KTS ADD'L SPD	150	150	150	150	250	250	250	250
PER 10°C ABOVE ISA	250	250	250	250	300	300	300	300
PER 10°C BELOW ISA	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% UP SLOPE	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% DOWN SLOPE	300	300	300	300	400	400	400	400
1 REVERSER INOP	100	100	100	100	350	350	350	350
2 REVERSERS INOP	150	150	150	150	550	550	550	550

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES

FEET

FLAPS 40

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR (1)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	12,100	10,000	9,400	9,000	12,800	12,800	12,000	11,700
165,000	11,800	9,800	9,200	8,800	12,500	12,500	11,800	11,500
160,000	11,500	9,600	8,900	8,600	12,200	12,200	11,500	11,200
155,000	11,300	9,400	8,700	8,400	11,900	11,900	11,200	10,900
150,000	11,000	9,100	8,500	8,200	11,600	11,600	10,900	10,600
145,000	10,800	8,900	8,300	8,000	11,400	11,400	10,700	10,400
142,000	10,600	8,800	8,200	7,900	11,200	11,200	10,500	10,200
140,000	10,500	8,700	8,100	7,800	11,100	11,100	10,400	10,100
135,000	10,200	8,500	7,900	7,700	10,800	10,800	10,200	9,900
130,000	9,900	8,300	7,700	7,500	10,500	10,500	9,900	9,600
125,000	9,700	8,100	7,500	7,300	10,200	10,200	9,600	9,400
120,000	9,400	7,800	7,300	7,100	9,900	9,900	9,300	9,100
115,000	9,100	7,600	7,100	6,900	9,600	9,600	9,100	8,800
110,000	8,800	7,400	6,900	6,700	9,300	9,300	8,800	8,500

BASIS: Zero wind and slope ● Touchdown Speed = VREF40 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Data is advisory and includes 15% safety margin and 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	MEDIUM (3)				POOR (1)			
0	-300	-300	-300	-300	-400	-400	-400	-400
2,000	0	0	0	0	0	0	0	0
4,000	500	500	500	500	600	600	600	600
6,000	1,000	1,000	1,000	1,000	1,300	1,300	1,300	1,300
8,000	1,400	1,400	1,400	1,400	1,900	1,900	1,900	1,900

CORRECTIONS	MEDIUM (3)				POOR (1)			
PER 1 KT HEADWIND	-50	-50	-50	-50	-50	-50	-50	-50
PER 1 KT TAILWIND	150	150	150	150	200	200	200	200
PER 5 KTS ADD'L SPD	300	300	300	300	450	450	450	450
PER 10°C ABOVE ISA	450	450	450	450	600	600	600	600
PER 10°C BELOW ISA	-150	-150	-150	-150	-150	-150	-150	-150
PER 1% UP SLOPE	-150	-150	-150	-150	-150	-150	-150	-150
PER 1% DOWN SLOPE	600	600	600	600	750	750	750	750
1 REVERSER INOP	1,050	1,050	1,050	1,050	1,700	1,700	1,700	1,700
2 REVERSERS INOP	1,600	1,600	1,600	1,600	2,600	2,600	2,600	2,600

Note: Do not operate when Braking Action is Nil.

End of Section

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DEFINITIONS AND ASSUMPTIONS

GROSS LEVEL OFF ALTITUDE Altitude at which the aircraft is expected to level off after the loss of one engine. No conservatism is built into this value. For use during flight, not for flight planning.

LONG RANGE CRUISE The speed of the aircraft that will result in 99% of the maximum range of the aircraft in no wind conditions for a given weight and altitude.

MAXIMUM CONTINUOUS THRUST (MCT) The maximum thrust level for which the engine is rated with no time constraint.

SPECIFIC AIR RANGE (SAR) The gas mileage range an aircraft can fly per 1,000 lbs of fuel for a given weight, altitude, Mach number, and temperature. The SAR changes as the weight of the aircraft changes, all other parameters remaining constant. Fuel burn required for a given flight segment is the segment length divided by the average SAR for the leg.

STATIC AIR TEMPERATURE (SAT) The static air temperature outside of the aircraft. Also referred to as the Outside Air Temperature or OAT.

TOTAL AIR TEMPERATURE (TAT) The sum of both the ambient air temperature plus the total increase in temperature due to compression heating.

V_{REF} Reference speed for the aircraft weight and configuration. This value typically represents 1.3 V_S for the configuration (unless otherwise noted). These speeds assume minimum maneuvering is required after being established on final approach.

ONE ENGINE INOPERATIVE

MAXIMUM CONTINUOUS THRUST EPR

BASED ON 28K MCT RATING

V2528-D5

BASED ON 250 KIAS / 320 KIAS / 0.76 MACH SPEED SCHEDULE
NORMAL BLEED - PACKS ON, ANTI-ICE OFF

MCT

TAT – ºC	PRESSURE ALTITUDE – FEET								
	- 1,000	0	1,000	2,000	3,000	10,000	20,000	30,000	40,000
50	1.30	1.30	1.30	1.30	1.30	1.29			
45	1.33	1.33	1.33	1.33	1.33	1.32			
40	1.36	1.35	1.35	1.35	1.36	1.35			
35	1.39	1.39	1.39	1.39	1.40	1.39	1.37		
30	1.39	1.40	1.40	1.42	1.42	1.41	1.41		
25	1.39	1.40	1.41	1.42	1.43	1.44	1.44		
20	1.39	1.40	1.41	1.42	1.43	1.45	1.47	1.40	
15	1.39	1.40	1.41	1.42	1.43	1.45	1.50	1.43	
10	1.39	1.40	1.41	1.42	1.43	1.45	1.54	1.46	
5	1.39	1.40	1.41	1.42	1.43	1.45	1.54	1.49	
0	1.39	1.40	1.41	1.42	1.43	1.45	1.54	1.53	
-5	1.39	1.40	1.41	1.42	1.43	1.45	1.54	1.56	1.62
-10 & below	1.39	1.40	1.41	1.42	1.43	1.45	1.54	1.57	1.62

CORRECTIONS:

Packs OFF	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.02	+ 0.02	+ 0.03	+ 0.04
Engine Anti-Ice ON	- 0.01	- 0.01	- 0.01	- 0.01	- 0.01	- 0.02	- 0.02	- 0.03	- 0.03
Airplane Anti-Ice ON (1 Engine)	- 0.02	- 0.02	- 0.02	- 0.02	- 0.02	- 0.03	- 0.04	- 0.05	- 0.06

ONE ENGINE INOPERATIVE

DRIFTDOWN PROCEDURES

IN THE EVENT OF AN ENGINE FAILURE OR SHUTDOWN DURING CRUISE:

1. Immediately set Maximum Continuous Thrust (MCT) from previous page.
2. Allow aircraft to decelerate in level flight to driftdown speed prior to initiating descent.
   - Aircraft will level off at or above altitudes shown in DRIFTDOWN GROSS LEVEL-OFF ALTITUDE chart.
   - Cross-check FMS engine-out level-off altitude.
3. If driftdown terrain clearance is critical, consult Flight Plan Remarks to determine:
   - Recommended en route alternate airports, if required.
   - ISA temperature deviation at 18,000 feet.
4. If terrain clearance is a factor, select a suitable alternate airport as follows:
   - Terrain clearance is assured for flight to any flight plan alternate airport listed.
   - Comply with Unrestricted/Restricted Critical Terrain Procedures as described in Airway Manual – Section 6.
   - Use flight plan recommended en route alternate airport, or:
   - Determine aircraft position on appropriate Jeppesen Low Level or High/Low Level enroute chart and locations of other suitable alternates.
   - Check terrain clearance for flight via MEA / MOCA on airway or Grid MORA for a non-flight-plan suitable enroute alternate.
   - Maintain MCT / driftdown speed after level-off and allow aircraft to climb until at/above MEA / MOCA on airway or Grid MORA.
   - Maintain airway MEA / MOCA until established on the arrival to selected alternate airport.
5. Proceed to selected nearest suitable alternate.
6. Except as specified in Step 4, maintain Maximum Continuous Thrust (MCT) and allow aircraft to accelerate to engine-out Long Range Cruise speed at level-off altitude.

DRIFTDOWN SPEED SCHEDULE
KIAS

GROSS WEIGHT – POUNDS	PRESSURE ALTITUDE – FEET						
	15,000 & below	18,000	20,000	25,000	29,000	31,000	33,000 & above
170,000	248	258	265	277			
165,000	242	252	259	273			
160,000	236	245	252	268	272		
155,000	232	239	246	262	267		
150,000	228	233	239	256	262	266	
145,000	224	227	233	249	257	260	
140,000	220	221	226	243	252	254	262
135,000	216	217	220	236	247	249	254
130,000	212	213	213	229	241	244	246
125,000	208	208	209	221	234	238	240
120,000	204	204	204	214	227	232	235
115,000	199	200	200	207	219	225	229
110,000	195	195	196	200	212	218	223
105,000	191	191	191	193	204	210	215
100,000	186	186	186	187	195	202	208
95,000	181	181	182	182	187	193	199
90,000	176	177	177	177	180	185	191

ONE ENGINE INOPERATIVE

DRIFTDOWN GROSS LEVEL OFF ALTITUDE

FEET

ENGINE ANTI-ICE OFF

GROSS WEIGHT – POUNDS		APPROX GROSS LEVEL OFF ALTITUDE – FEET			
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA - 10°C	ISA + 0°C	ISA + 10°C	ISA + 20°C
170,000	164,700	12,900	12,900	12,800	8,500
160,000	155,400	15,400	15,400	15,300	11,400
150,000	146,100	17,800	17,800	17,800	14,300
140,000	137,000	19,900	19,900	19,900	17,300
130,000	127,100	21,700	21,700	21,700	19,900
120,000	117,300	23,800	23,800	23,800	21,800
110,000	107,500	26,100	26,100	26,100	24,300
100,000	97,800	28,600	28,600	28,600	27,000

ENGINE ANTI-ICE ON

GROSS WEIGHT – POUNDS		APPROX GROSS LEVEL OFF ALTITUDE – FEET			
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA - 10°C	ISA + 0°C	ISA + 10°C	ISA + 20°C
170,000	164,500	12,100	12,100	12,100	7,700
160,000	155,200	14,700	14,700	14,600	10,600
150,000	145,900	17,100	17,100	17,100	13,400
140,000	136,800	19,500	19,500	19,500	16,400
130,000	127,100	21,200	21,200	21,200	19,300
120,000	117,200	23,300	23,300	23,200	21,200
110,000	107,600	25,600	25,600	25,600	23,600
100,000	97,900	28,000	28,000	28,000	26,300

ENGINE & WING ANTI-ICE ON

GROSS WEIGHT – POUNDS		APPROX GROSS LEVEL OFF ALTITUDE – FEET			
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA - 10°C	ISA + 0°C	ISA + 10°C	ISA + 20°C
170,000	164,000	10,200	10,100	10,100	5,300
160,000	154,800	12,700	12,700	12,600	8,300
150,000	145,300	15,300	15,300	15,200	11,200
140,000	136,100	18,000	18,000	17,900	14,200
130,000	127,000	20,100	20,100	20,100	17,200
120,000	117,000	22,000	21,900	21,900	19,900
110,000	107,400	24,300	24,200	24,200	21,800
100,000	97,700	26,700	26,700	26,700	24,400

BASIS: Max continuous thrust, APU operating, 35,000 ft. initial altitude, 100 ft/min. residual rate of climb.

ONE ENGINE INOPERATIVE

LONG RANGE CRUISE

FL ISA		GROSS WEIGHT – 1,000 POUNDS												
		170	165	160	155	150	145	140	135	130	125	120	115	110
250 - 35	SAR													79.2
	EPR													1.53
	FF													4,460
	MN													.587
	IAS													243
	TAS													353
240 - 33	SAR												75.8	78.5
	EPR												1.53	1.50
	FF												4,680	4,460
	MN												.587	.580
	IAS												248	245
	TAS												355	351
230 - 31	SAR											72.6	75.2	77.5
	EPR											1.53	1.50	1.48
	FF		*THRUST REQUIRED EXCEEDS MAXIMUM CONTINUOUS THRUST*									4,900	4,680	4,470
	MN											.587	.580	.572
	IAS											253	250	246
	TAS											356	352	347
220 - 29	SAR										69.7	72.0	74.2	76.5
	EPR										1.53	1.50	1.48	1.45
	FF										5,130	4,900	4,700	4,480
	MN										.587	.580	.573	.563
	IAS										258	255	252	247
	TAS										358	353	349	343
210 - 27	SAR									67.0	69.1	71.1	73.2	75.5
	EPR									1.53	1.50	1.48	1.46	1.43
	FF									5,350	5,130	4,920	4,710	4,470
	MN									.586	.580	.573	.564	.552
	IAS									263	260	257	253	247
	TAS									359	355	351	345	338
200 - 25	SAR								64.5	66.5	68.3	70.2	72.3	74.6
	EPR								1.53	1.50	1.48	1.46	1.43	1.40
	FF								5,580	5,350	5,150	4,930	4,690	4,430
	MN								.586	.579	.573	.564	.553	.538
	IAS								269	265	262	258	253	246
	TAS								360	356	352	346	340	331

DEFINITIONS:

FL: Flight level / altitude (feet).
ISA: Standard Day temperature in °C.
SAR: Specific Air Range (nm per 1000 lbs of fuel).
EPR: Target EPR.
FF: Fuel Flow (lb per hr).
MN: Mach number.
IAS: Indicated airspeed in knots.
TAS: True airspeed in knots.

TEMPERATURE TRADE FACTORS:

- SAR decreases 0.7% for every +10°C and increases 0.7% for every -10°C difference from ISA.
- FF increases 3% for every +10°C and decreases 3% for every -10°C difference from ISA.
- TAS increases 1 knot per 1°C above ISA and decreases 1 knot per 1°C below ISA.

ONE ENGINE INOPERATIVE

LONG RANGE CRUISE

FL ISA		GROSS WEIGHT – 1,000 POUNDS												
		170	165	160	155	150	145	140	135	130	125	120	115	110
190 - 23	SAR							62.0	63.8	65.5	67.3	69.1	71.3	73.6
	EPR							1.52	1.50	1.48	1.46	1.43	1.40	1.37
	FF							5,820	5,590	5,380	5,170	4,930	4,660	4,390
	MN							.585	.579	.572	.564	.553	.539	.524
	IAS							274	271	267	263	258	251	244
	TAS							361	357	353	348	341	332	323
180 - 21	SAR						59.8	61.4	63.0	64.6	66.4	68.4	70.5	72.6
	EPR						1.52	1.50	1.48	1.46	1.43	1.40	1.37	1.35
	FF						6,040	5,820	5,610	5,390	5,150	4,880	4,610	4,360
	MN						.584	.578	.571	.563	.553	.539	.525	.512
	IAS						279	276	272	268	263	256	249	243
	TAS						362	358	354	349	342	334	325	317
170 - 19	SAR					58.1	59.7	61.3	62.9	64.6	66.5	68.4	70.4	72.5
	EPR					1.51	1.49	1.47	1.45	1.43	1.40	1.38	1.35	1.32
	FF					6,220	6,000	5,780	5,550	5,320	5,040	4,780	4,520	4,280
	MN					.582	.577	.570	.562	.553	.539	.526	.513	.500
	IAS					283	281	277	273	268	261	255	248	242
	TAS					362	359	354	349	344	335	327	319	311
150 - 15	SAR				55.2	56.4	57.8	59.2	60.8	62.4	64.1	65.9	67.7	69.7
	EPR				1.49	1.47	1.45	1.43	1.40	1.37	1.35	1.33	1.30	1.28
	FF				6,520	6,290	6,070	5,810	5,540	5,260	5,020	4,770	4,540	4,310
	MN				.575	.567	.560	.550	.538	.525	.514	.502	.491	.480
	IAS				291	286	283	278	271	265	259	253	247	241
	TAS				360	355	351	345	337	329	322	314	308	301
130 - 11	SAR		51.9	52.7	53.9	55.2	56.5	57.9	59.4	60.9	62.4	64.1	65.8	67.5
	EPR		1.475	1.46	1.44	1.42	1.39	1.37	1.35	1.33	1.31	1.29	1.27	1.25
	FF		6,981	6,750	6,540	6,240	5,970	5,700	5,450	5,200	4,970	4,740	4,530	4,340
	MN		.574	.564	.558	.546	.535	.524	.513	.502	.492	.482	.473	.465
	IAS		301	296	293	286	280	274	269	263	257	252	247	243
	TAS		362	356	352	345	338	331	324	317	311	304	299	294
110 - 7	SAR	49.7	50.8	51.6	52.7	54.0	55.2	56.5	57.9	59.3	60.7	62.2	63.7	65.3
	EPR	1.44	1.42	1.41	1.39	1.37	1.34	1.32	1.31	1.29	1.27	1.25	1.24	1.22
	FF	7,128	6,856	6,670	6,400	6,130	5,880	5,630	5,390	5,170	4,960	4,770	4,590	4,410
	MN	.557	.548	.541	.531	.521	.511	.501	.491	.482	.474	.467	.460	.453
	IAS	304	298	294	289	283	278	272	267	262	257	253	250	246
	TAS	355	349	344	338	331	325	319	312	307	301	297	293	288

DEFINITIONS:

FL: Flight level / altitude (feet).
ISA: Standard Day temperature in °C.
SAR: Specific Air Range (nm per 1000 lbs of fuel).
EPR: Target EPR.
FF: Fuel Flow (lb per hr).
MN: Mach number.
IAS: Indicated airspeed in knots.
TAS: True airspeed in knots.

TEMPERATURE TRADE FACTORS:

- SAR decreases 0.7% for every +10°C and increases 0.7% for every -10°C difference from ISA.
- FF increases 3% for every +10°C and decreases 3% for every -10°C difference from ISA.
- TAS increases 1 knot per 1°C above ISA and decreases 1 knot per 1°C below ISA.

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

FEET
KIAS

BASIS:
- Sea level, standard day, no wind, no slope.
- All brakes operating.
- Manual Braking Technique*
- Forward idle thrust
- Hydraulics operating
- 1,500 foot Air Distance

NOTE: Use the charts on this page when referred by QRH, Anti-skid Inoperative Non-normal procedure ONLY. These values are NOT to be used for dispatch purposes.

ANTISKID INOPERATIVE FLAPS 28

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**	**105**	**100**
DRY	5,960	5,810	5,660	5,510	5,390	5,240	5,090	4,940	4,790	4,640	4,490	4,340	4,190
WET	6,780	6,610	6,430	6,260	6,120	5,950	5,780	5,610	5,430	5,260	5,090	4,920	4,740
VREF28	153	150	147	145	143	140	137	135	132	129	126	124	121

CONDITION		DRY CORRECTION – FEET	WET CORRECTION – FEET
Altitude	Per 1,000 feet	+ 160	+ 180

ANTISKID INOPERATIVE FLAPS 40

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**	**105**	**100**
DRY	5,630	5,480	5,360	5,210	5,090	4,940	4,790	4,670	4,535	4,400	4,250	4,130	3,980
WET	6,400	6,230	6,090	5,920	5,780	5,610	5,430	5,300	5,140	4,990	4,810	4,670	4,500
VREF40	147	145	142	140	138	135	132	130	127	125	122	119	116

CONDITION		DRY CORRECTION – FEET	WET CORRECTION – FEET
Altitude	Per 1,000 feet	+ 150	+ 170

***NOTE:** The manual braking technique is to gradually increase brake pedal force until a moderate deceleration is felt. Reverse thrust effects are not included in the stopping performance but use of reverse thrust is recommended.

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

FEET
KIAS

BASIS:

- Sea level, standard day, no wind, no slope
- All brakes operating
- Forward idle thrust
- 1,500 foot Air Distance

NOTE: No Altitude adjustments available for the following configurations.

FLAPS 0, SLATS RET

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**	**105**	**100**
DRY	7,550	7,400	7,250	7,050	6,850	6,675	6,500	6,325	6,150	5,950	5,750	5,575	5,400
WET	8,610	8,440	8,270	8,040	7,810	7,605	7,400	7,200	7,000	6,770	6,540	6,340	6,140
1.25V_S	215	212	209	205	201	198	194	190	186	183	179	174	170

FLAPS 0, SLATS TO

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**	**105**	**100**
DRY	6,250	6,125	6,000	5,850	5,700	5,550	5,400	5,250	5,100	4,975	4,850	4,675	4,500
WET	7,120	6,975	6,830	6,655	6,480	6,310	6,140	5,965	5,790	5,650	5,510	5,305	5,100
1.35V_S	187	185	181	178	175	172	169	166	162	159	155	152	148

FLAPS 11, SLATS TO

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**	**105**	**100**
DRY	5,750	5,620	5,485	5,350	5,220	5,085	4,950	4,820	4,685	4,550	4,420	4,285	4,150
WET	6,540	6,390	6,230	6,080	5,930	5,770	5,620	5,470	5,310	5,160	5,010	4,850	4,700
1.3V_S	167	165	162	160	156	154	151	148	145	142	139	136	132

FLAPS 15, SLATS TO

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	**155**	**150**	**145**	**140**	**135**	**130**	**125**	**120**	**115**	**110**	**105**	**100**
DRY	5,300	5,200	5,100	4,975	4,850	4,725	4,600	4,475	4,350	4,250	4,150	4,025	3,900
WET	6,020	5,905	5,790	5,650	5,510	5,365	5,220	5,075	4,930	4,815	4,700	4,555	4,410
1.3V_S	163	161	158	156	153	150	147	145	141	139	135	133	129

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

FEET
KIAS

BASIS:

- Sea level, standard day, no wind, no slope
- All brakes operating
- Forward idle thrust
- 1,500 foot Air Distance

FLAPS 28, SLATS RET

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	155	150	145	140	135	130	125	120	115	110	105	100
DRY	6,350	6,200	6,050	5,900	5,750	5,600	5,450	5,275	5,100	4,950	4,800	4,650	4,500
WET	7,230	7,060	6,890	6,715	6,540	6,370	6,200	5,995	5,790	5,620	5,450	5,275	5,100
$1.3V_S$	190	187	184	181	177	174	171	168	164	161	158	154	150

FLAPS 40, SLATS RET

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	155	150	145	140	135	130	125	120	115	110	105	100
DRY	6,250	6,100	5,950	5,775	5,600	5,425	5,250	5,125	5,000	4,825	4,650	4,500	4,350
WET	7,120	6,925	6,730	6,550	6,370	6,170	5,970	5,825	5,680	5,480	5,280	5,105	4,930
$1.3V_S$	184	181	178	175	172	169	166	163	159	156	153	149	145

COMPLETE HYDRAULIC FAILURE - FLAPS 0, SLATS RET

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	155	150	145	140	135	130	125	120	115	110	105	100
DRY	8,420	8,220	8,020	7,825	7,630	7,430	7,230	7,015	6,800	7,085	7,370	6,665	5,960
WET	9,610	9,380	9,150	8,925	8,700	8,470	8,240	7,995	7,750	8,075	8,400	7,590	6,780
$1.3V_S$	215	212	209	205	201	198	194	190	186	183	179	174	170

STABILIZER INOPERATIVE IN FLIGHT – FLAPS 15, SLATS TO

RWY COND VREF	LANDING WEIGHT (1,000 POUNDS)												
	160	155	150	145	140	135	130	125	120	115	110	105	100
DRY	6,000	5,890	5,740	5,600	5,480	5,350	5,190	5,030	4,920	4,790	4,640	4,500	4,380
WET	6,830	6,700	6,530	6,370	6,230	6,080	5,900	5,710	5,590	5,440	5,270	5,100	4,970
$1.4V_S$	175	173	170	167	164	162	158	155	152	149	146	142	139

Condition		Dry Correction - Feet	Wet Correction - Feet
V_{REF}	Per knot above $1.4V_S$	+ 50	+ 60

EMERGENCY LANDING DISTANCES

FEET

NOTE: TO BE USED ONLY UNDER CAPTAIN'S EMERGENCY AUTHORITY. PROVIDES ACTUAL LANDING DISTANCES ON CONTAMINATED RUNWAYS.

FLAPS 28

DATA IS ADVISORY AND DOES *NOT* INCLUDE 15% SAFETY MARGIN.

NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).

Landing Weight (lb)	DRY (6)				GOOD (5)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	10,800	7,800	4,600	4,300	10,800	7,800	6,100	5,800
165,000	10,600	7,700	4,600	4,300	10,600	7,600	6,000	5,700
160,000	10,300	7,500	4,500	4,200	10,300	7,400	5,800	5,500
155,000	10,100	7,300	4,400	4,100	10,100	7,300	5,700	5,400
150,000	9,900	7,100	4,300	4,000	9,800	7,100	5,600	5,300
145,000	9,700	7,000	4,200	3,900	9,600	7,000	5,500	5,200
142,000	9,500	6,900	4,200	3,900	9,600	7,000	5,500	5,200
140,000	9,400	6,800	4,100	3,800	9,400	6,800	5,300	5,100
135,000	9,200	6,600	4,000	3,700	9,200	6,600	5,200	5,000
130,000	8,900	6,400	3,900	3,600	8,900	6,400	5,100	4,800
125,000	8,700	6,300	3,800	3,600	8,700	6,300	5,000	4,700
120,000	8,400	6,100	3,700	3,500	8,500	6,100	4,800	4,600
115,000	8,200	6,000	3,600	3,400	8,300	6,000	4,700	4,500
110,000	8,000	5,800	3,500	3,300	8,000	5,800	4,600	4,300

BASIS: Zero wind and slope ● Touchdown Speed = VREF28 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Distances include 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	DRY (6)				GOOD (5)			
0	-200	-200	-200	-200	-200	-200	-200	-200
2,000	0	0	0	0	0	0	0	0
4,000	200	200	200	200	300	300	300	300
6,000	400	400	400	400	600	600	600	600
8,000	700	700	700	700	900	900	900	900

CORRECTIONS	DRY (6)				GOOD (5)			
PER 1 KT HEADWIND	-50	-50	0	0	-50	-50	-50	-50
PER 1 KT TAILWIND	50	50	50	50	100	100	100	100
PER 5 KTS ADD'L SPD	150	150	150	150	200	200	200	200
PER 10°C ABOVE ISA	200	200	200	200	300	300	300	300
PER 10°C BELOW ISA	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% UP SLOPE	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% DOWN SLOPE	250	250	250	250	350	350	350	350
1 REVERSER INOP	50	50	50	50	350	350	350	350
2 REVERSERS INOP	50	50	50	50	550	550	550	550

EMERGENCY LANDING DISTANCES

FEET

NOTE: TO BE USED ONLY UNDER CAPTAIN'S EMERGENCY AUTHORITY. PROVIDES ACTUAL LANDING DISTANCES ON CONTAMINATED RUNWAYS.

DATA IS ADVISORY AND DOES *NOT* INCLUDE 15% SAFETY MARGIN.

FLAPS 28

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR (1)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	11,000	9,200	8,500	8,200	11,600	11,600	11,000	10,700
165,000	10,800	9,000	8,400	8,100	11,400	11,400	10,800	10,500
160,000	10,500	8,700	8,200	7,900	11,100	11,100	10,500	10,200
155,000	10,300	8,500	8,000	7,700	10,800	10,800	10,300	10,000
150,000	10,000	8,300	7,800	7,500	10,500	10,500	10,000	9,700
145,000	9,800	8,100	7,600	7,300	10,300	10,300	9,800	9,500
142,000	9,600	8,000	7,500	7,200	10,100	10,100	9,600	9,300
140,000	9,500	7,900	7,400	7,100	10,000	10,000	9,500	9,200
135,000	9,300	7,700	7,200	6,900	9,700	9,700	9,200	9,000
130,000	9,000	7,500	7,000	6,700	9,400	9,400	8,900	8,700
125,000	8,800	7,300	6,800	6,600	9,200	9,200	8,700	8,500
120,000	8,500	7,100	6,600	6,400	8,900	8,900	8,400	8,200
115,000	8,300	6,900	6,500	6,300	8,700	8,700	8,200	8,000
110,000	8,100	6,700	6,300	6,100	8,400	8,400	8,000	7,800

BASIS: Zero wind and slope ● Touchdown Speed = VREF28 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Distances include 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	MEDIUM (3)				POOR (1)			
0	-300	-300	-300	-300	-400	-400	-400	-400
2,000	0	0	0	0	0	0	0	0
4,000	400	400	400	400	600	600	600	600
6,000	900	900	900	900	1,200	1,200	1,200	1,200
8,000	1,300	1,300	1,300	1,300	1,700	1,700	1,700	1,700

CORRECTIONS	MEDIUM (3)				POOR (1)			
PER 1 KT HEADWIND	-50	-50	-50	-50	-50	-50	-50	-50
PER 1 KT TAILWIND	150	150	150	150	200	200	200	200
PER 5 KTS ADD'L SPD	300	300	300	300	400	400	400	400
PER 10°C ABOVE ISA	400	400	400	400	550	550	550	550
PER 10°C BELOW ISA	-100	-100	-100	-100	-150	-150	-150	-150
PER 1% UP SLOPE	-100	-100	-100	-100	-150	-150	-150	-150
PER 1% DOWN SLOPE	550	550	550	550	700	700	700	700
1 REVERSER INOP	1,200	1,200	1,200	1,200	2,050	2,050	2,050	2,050
2 REVERSERS INOP	1,850	1,850	1,850	1,850	3,150	3,150	3,150	3,150

EMERGENCY LANDING DISTANCES

FEET

NOTE: TO BE USED ONLY UNDER CAPTAIN'S EMERGENCY AUTHORITY. PROVIDES ACTUAL LANDING DISTANCES ON CONTAMINATED RUNWAYS.

FLAPS 40

DATA IS ADVISORY AND DOES *NOT* INCLUDE 15% SAFETY MARGIN.

NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).

Landing Weight (lb)	DRY (6)				GOOD (5)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	10,200	7,400	4,400	4,100	10,300	7,500	5,800	5,500
165,000	10,000	7,300	4,300	4,000	10,100	7,400	5,700	5,400
160,000	9,800	7,100	4,200	3,900	9,800	7,200	5,600	5,300
155,000	9,600	7,000	4,100	3,900	9,600	7,000	5,500	5,200
150,000	9,400	6,800	4,000	3,800	9,400	6,800	5,300	5,100
145,000	9,200	6,700	4,000	3,700	9,200	6,700	5,200	5,000
142,000	9,100	6,600	3,900	3,600	9,000	6,500	5,100	4,900
140,000	9,000	6,500	3,900	3,600	9,000	6,500	5,100	4,900
135,000	8,800	6,400	3,800	3,600	8,800	6,400	5,000	4,800
130,000	8,500	6,300	3,700	3,500	8,600	6,200	4,900	4,600
125,000	8,300	6,100	3,600	3,400	8,400	6,100	4,800	4,500
120,000	8,100	5,900	3,500	3,300	8,100	5,900	4,600	4,400
115,000	7,900	5,800	3,400	3,200	7,900	5,800	4,500	4,300
110,000	7,600	5,600	3,300	3,100	7,600	5,600	4,400	4,200

BASIS: Zero wind and slope ● Touchdown Speed = VREF40 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Distances include 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	DRY (6)				GOOD (5)			
0	-200	-200	-200	-200	-200	-200	-200	-200
2,000	0	0	0	0	0	0	0	0
4,000	200	200	200	200	300	300	300	300
6,000	400	400	400	400	600	600	600	600
8,000	600	600	600	600	900	900	900	900

CORRECTIONS	DRY (6)				GOOD (5)			
PER 1 KT HEADWIND	-50	-50	0	0	-50	-50	-50	-50
PER 1 KT TAILWIND	50	50	50	50	100	100	100	100
PER 5 KTS ADD'L SPD	150	150	150	150	200	200	200	200
PER 10°C ABOVE ISA	200	200	200	200	250	250	250	250
PER 10°C BELOW ISA	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% UP SLOPE	-100	-100	-50	-50	-100	-100	-100	-100
PER 1% DOWN SLOPE	250	250	250	250	350	350	350	350
1 REVERSER INOP	100	100	100	100	300	300	300	300
2 REVERSERS INOP	150	150	150	150	500	500	500	500

EMERGENCY LANDING DISTANCES

FEET

NOTE: TO BE USED ONLY UNDER CAPTAIN'S EMERGENCY AUTHORITY. PROVIDES ACTUAL LANDING DISTANCES ON CONTAMINATED RUNWAYS.

DATA IS ADVISORY AND DOES *NOT* INCLUDE 15% SAFETY MARGIN.

FLAPS 40

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR (1)			
	Min AB	Med AB	Max AB	Max Manual	Min AB	Med AB	Max AB	Max Manual
170,000	10,500	8,700	8,100	7,800	11,100	11,100	10,500	10,200
165,000	10,300	8,500	8,000	7,700	10,900	10,900	10,300	10,000
160,000	10,000	8,300	7,800	7,500	10,600	10,600	10,000	9,700
155,000	9,800	8,100	7,600	7,400	10,400	10,400	9,800	9,500
150,000	9,500	7,900	7,400	7,200	10,100	10,100	9,500	9,200
145,000	9,300	7,800	7,300	7,000	9,900	9,900	9,300	9,000
142,000	9,200	7,700	7,200	6,900	9,700	9,700	9,100	8,900
140,000	9,100	7,600	7,100	6,800	9,600	9,600	9,000	8,800
135,000	8,900	7,400	6,900	6,700	9,400	9,400	8,800	8,600
130,000	8,600	7,200	6,700	6,500	9,100	9,100	8,600	8,300
125,000	8,400	7,000	6,600	6,300	8,900	8,900	8,400	8,100
120,000	8,200	6,800	6,400	6,100	8,600	8,600	8,100	7,900
115,000	8,000	6,600	6,200	6,000	8,400	8,400	7,900	7,700
110,000	7,700	6,400	6,000	5,800	8,100	8,100	7,600	7,400

BASIS: Zero wind and slope ● Touchdown Speed = VREF40 - 5 ●
Full Reverse Thrust (two engines at maximum reverse thrust to 80 KIAS, then reverse idle to stop)

Distances include 1,500 ft. air distance from threshold to touchdown.

REFERENCE DISTANCES BASED UPON PRESSURE ALTITUDE OF 2,000 FEET AND ARE CONSERVATIVE FOR ALL LOWER ALTITUDES.

Shaded region corresponds to Max Landing Weight (MLW)

ALTITUDE ADJUSTMENT

ALTITUDE (FEET)	MEDIUM (3)				POOR (1)			
0	-300	-300	-300	-300	-400	-400	-400	-400
2,000	0	0	0	0	0	0	0	0
4,000	400	400	400	400	600	600	600	600
6,000	800	800	800	800	1,100	1,100	1,100	1,100
8,000	1,300	1,300	1,300	1,300	1,600	1,600	1,600	1,600

CORRECTIONS	MEDIUM (3)				POOR (1)			
PER 1 KT HEADWIND	-50	-50	-50	-50	-50	-50	-50	-50
PER 1 KT TAILWIND	150	150	150	150	200	200	200	200
PER 5 KTS ADD'L SPD	300	300	300	300	350	350	350	350
PER 10°C ABOVE ISA	400	400	400	400	500	500	500	500
PER 10°C BELOW ISA	-100	-100	-100	-100	-150	-150	-150	-150
PER 1% UP SLOPE	-100	-100	-100	-100	-150	-150	-150	-150
PER 1% DOWN SLOPE	500	500	500	500	650	650	650	650
1 REVERSER INOP	900	900	900	900	1,500	1,500	1,500	1,500
2 REVERSERS INOP	1,400	1,400	1,400	1,400	2,250	2,250	2,250	2,250

OPERATION WITHOUT AIRSPEED INDICATION

Use the following body attitude and EPR Setting data to estimate airspeed and rate of climb/descent, if the airspeed system becomes unreliable or unusable enroute. ***If the damage to the airspeed indication system is detected during early stages of the flight (takeoff or initial climb), return to departure airport.***

CLIMB

SPEED: 1.5*V_S + 10 (see below)

THRUST: see below
FLAPS: UP

PRESSURE ALTITUDE – FEET		GROSS WEIGHT – POUNDS		
		160,000	**130,000**	**100,000**
15,000	AIRSPEED - KIAS BODY ATT % N1 V/S (FPM)	271 7.5 87.0 +2,240	244 9.5 87.7 +3,170	215 13.0 88.4 +4,450
10,000	AIRSPEED - KIAS BODY ATT % N1 V/S (FPM)	269 8.5 86.7 +2,730	243 11.0 87.3 +3,700	214 15.0 87.7 +5,060
5,000	AIRSPEED - KIAS BODY ATT % N1 V/S (FPM)	268 10.0 86.1 +3,160	242 12.5 86.7 +4,190	214 17.0 87.0 +5,580
0	AIRSPEED - KIAS BODY ATT % N1 V/S (FPM)	267 11.0 85.2 +3,500	242 14.0 85.6 +4,540	213 19.5 86.0 +5,970

CRUISE

SPEED: see below

THRUST: %N_1 FOR LEVEL FLIGHT
FLAPS: UP

PRESSURE ALTITUDE – FEET		GROSS WEIGHT – POUNDS		
		160,000	**130,000**	**100,000**
37,000 (245 KIAS)	BODY ATT % N_1			1.5 76.8
35,000 (257 KIAS)	BODY ATT % N_1			1.5 76.1
30,000 (285 KIAS)	BODY ATT % N_1	2.0 81.2	1.5 77.9	0.5 75.5
25,000 (285 KIAS)	BODY ATT % N_1	2.5 77.6	2.0 74.6	1.0 72.2
20,000 (285 KIAS)	BODY ATT % N_1	3.0 74.1	2.0 71.4	1.0 69.2

BASIS:

- One air conditioning pack per operating engine
- Ice protection off
- Both engines operating
- Standard day temperature

OPERATION WITHOUT AIRSPEED INDICATION

Use the following body attitude and N_1 Setting data to estimate airspeed and rate of climb/descent, if the airspeed system becomes unreliable or unusable enroute. ***If the damage to the airspeed indication system is detected during early stages of the flight (takeoff or initial climb), return to departure airport***.

DESCENT

SPEED: see below

THRUST: IDLE
FLAPS: UP

PRESSURE ALTITUDE – FEET		GROSS WEIGHT – POUNDS		
		160,000	130,000	100,000
37,000	AIRSPEED - KIAS BODY ATT V/S (FPM)			245 -2.0 -2,760
35,000	AIRSPEED - KIAS BODY ATT V/S (FPM)			257 -3.0 -3,230
30,000	AIRSPEED - KIAS BODY ATT V/S (FPM)	285 - 0.5 - 2,390	285 - 1.5 - 2,520	285 - 3.0 - 2,890
20,000	AIRSPEED - KIAS BODY ATT V/S (FPM)	285 - 0.5 - 2,210	285 - 1.5 - 2,370	285 - 3.0 - 2,750
10,000	AIRSPEED - KIAS BODY ATT V/S (FPM)	259 1.0 - 1,710	250 0.0 - 1,690	250 - 2.0 - 1,890
5,000	AIRSPEED - KIAS BODY ATT V/S (FPM)	258 1.0 -1,610	250 0.0 -1,610	250 -1.5 -1,820

HOLDING

SPEED: AS REQ'D

THRUST: %N_1 FOR LEVEL FLIGHT
FLAPS: UP
GEAR: UP

PRESSURE ALTITUDE – FEET		GROSS WEIGHT – POUNDS		
		160,000	130,000	100,000
10,000	AIRSPEED - KIAS BODY ATT N_1	258 4.0 64.9	232 4.0 59.8	204 4.0 52.9
5,000	AIRSPEED - KIAS BODY ATT N_1	258 4.0 61.4	232 4.0 55.9	204 4.0 49.3
1,500	AIRSPEED - KIAS BODY ATT N_1	258 4.0 58.9	232 4.0 53.3	204 4.0 47.1

BASIS:

- One air conditioning pack per operating engine
- Ice protection off
- Both engines operating
- Standard day temperature

OPERATION WITHOUT AIRSPEED INDICATION

Use the following body attitude and N_1 Setting data to estimate airspeed and rate of climb/descent, if the airspeed system becomes unreliable or unusable enroute. ***If the damage to the airspeed indication system is detected during early stages of the flight (takeoff or initial climb), return to departure airport***.

TERMINAL AREA

SPEED: APPROX 1.5*V_S (see below)

THRUST: %N_1 FOR LEVEL FLIGHT
FLAPS: AS REQ'D
GEAR: UP

PRESSURE ALTITUDE – FEET	FLAPS/ SLATS		GROSS WEIGHT – POUNDS		
			160,000	130,000	100,000
10,000	0/RET	KIAS	260	234	205
		BODY ATT	4.0	4.0	4.0
		N_1	65.0	59.9	53.0
	15/EXT	KIAS	176	158	139
		BODY ATT	7.5	7.5	7.5
		N_1	69.2	63.6	56.9
5,000	0/RET	KIAS	259	233	204
		BODY ATT	4.0	4.0	4.0
		N_1	61.5	55.9	49.3
	15/EXT	KIAS	176	158	139
		BODY ATT	7.5	7.5	7.5
		N_1	65.3	60.0	53.3
0	0/RET	KIAS	258	232	204
		BODY ATT	4.0	4.0	4.0
		N_1	57.7	52.2	46.2
	15/EXT	KIAS	175	158	139
		BODY ATT	7.5	7.5	7.5
		N_1	61.9	56.2	50.6

BASIS:

- One air conditioning pack per operating engine
- Ice protection off
- Both engines operating
- Standard day temperature

OPERATION WITHOUT AIRSPEED INDICATION

Use the following body attitude and N_1 Setting data to estimate airspeed and rate of climb/descent, if the airspeed system becomes unreliable or unusable enroute. ***If the damage to the airspeed indication system is detected during early stages of the flight (takeoff or initial climb), return to departure airport***.

FINAL APPROACH

APPR SPEED: APPROX 1.4*V_S (see below)

THRUST: %N1 FOR 3° GLIDESLOPE
FLAPS: AS REQ'D
GEAR: DOWN

PRESSURE ALTITUDE – FEET	FLAPS/ SLATS		GROSS WEIGHT – POUNDS		
			160,000	130,000	100,000
10,000	28/EXT	KIAS	164	148	130
		BODY ATT	2.5	2.5	2.5
		N_1	61.9	56.7	51.1
		V/S (FPM)	-1,020	-920	-810
	40/EXT	KIAS	158	143	125
		BODY ATT	1.5	1.5	1.5
		N_1	68.7	63.2	56.6
		V/S (FPM)	-990	-890	-780
5,000	28/EXT	KIAS	164	148	129
		BODY ATT	2.5	2.5	2.5
		N_1	58.2	53.4	47.5
		V/S (FPM)	-940	-850	-750
	40/EXT	KIAS	158	143	125
		BODY ATT	1.5	1.5	1.5
		N_1	64.9	59.7	53.0
		V/S (FPM)	-920	-830	-720
0	28/EXT	KIAS	164	147	129
		BODY ATT	2.5	2.5	2.5
		N_1	55.0	50.5	43.9
		V/S (FPM)	-880	-790	-690
	40/EXT	KIAS	158	142	125
		BODY ATT	1.5	1.5	1.5
		N_1	61.5	55.9	50.3
		V/S (FPM)	-850	-800	-670

BASIS:

- One air conditioning pack per operating engine
- Ice protection off
- Both engines operating
- Standard day temperature

OPERATION WITHOUT AIRSPEED INDICATION

Use the following body attitude and N_1 Setting data to estimate airspeed and rate of climb/descent, if the airspeed system becomes unreliable or unusable enroute. ***If the damage to the airspeed indication system is detected during early stages of the flight (takeoff or initial climb), return to departure airport***.

GO AROUND

SPEED: Go Around Speed at Flaps 40 ($1.3*V_S + 5$) (see below)

THRUST: TOGA SELECTED
FLAPS: AS REQ'D
GEAR: UP ON POSITIVE CLIMB

PRESSURE ALTITUDE – FEET	FLAPS/ SLATS		GROSS WEIGHT – POUNDS		
			160,000	130,000	100,000
10,000	11/EXT	KIAS BODY ATT N_1 V/S (FPM)	158 17.3 92.7 +2,180	143 19.9 92.8 +2,860	ACCEL 20.0+ 93.0
	15/EXT	KIAS BODY ATT N_1 V/S (FPM)	152 16.8 92.7 +2,040	138 19.5 92.8 +2,710	ACCEL 20.0+ 93.0
5,000	11/EXT	KIAS BODY ATT N_1 V/S (FPM)	157 19.1 92.3 +2,630	ACCEL 20.0+ 92.4	ACCEL 20.0+ 92.5
	15/EXT	KIAS BODY ATT N_1 V/S (FPM)	152 18.7 92.4 +2,480	ACCEL 20.0+ 92.5	ACCEL 20.0+ 92.5
0	11/EXT	KIAS BODY ATT N_1 V/S (FPM)	ACCEL 20.0+ 90.6	ACCEL 20.0+ 90.7	ACCEL 20.0+ 90.8
	15/EXT	KIAS BODY ATT N_1 V/S (FPM)	ACCEL 20.0+ 90.6	ACCEL 20.0+ 90.7	ACCEL 20.0+ 90.8

+20° maximum pitch attitude limited.

BASIS:

- One air conditioning pack per operating engine
- Ice protection off
- Both engines operating
- Standard day temperature

BRAKE COOLING

PROCEDURES

LANDING

Maximum Permissible Quick Turn-Around Landing Weight (QTLW)

BTMS Operative

If ten (10) minutes after parking, the temperature of the warmest brake displayed by the BTMS is less than 540°C and decreasing and the brake "OVHT" light is OFF, no waiting period or inspection is required. The full 40 minute waiting period (ramp time) and a check of tire pressures are required if the warmest brake temperature exceeds 540°C or if the brake "OVHT" light is ON.

BTMS Inoperative

Compare the Maximum Permissible Quick Turn-Around Landing Weight (page 7-22), corrected for runway slope and wind, with the actual landing weight.

If the actual landing weight exceeds the Maximum Permissible Quick Turn-Around Landing Weight, wait at least 40 minutes on the ramp and check that wheel thermal plugs have not melted before executing a takeoff.

REJECTED TAKEOFF

BTMS Operative

If ten (10) minutes after parking, the temperature of the warmest brake displayed by the BTMS is less than 540°C and decreasing and the brake "OVHT" light is OFF, no waiting period or inspection is required. The full 40 minute waiting period (ramp time) and a check of tire pressures are required if the warmest brake temperature exceeds 540°C or if the brake "OVHT" light is ON.

BTMS Inoperative

Refer to MEL 32-47-01.

BRAKE COOLING

MAXIMUM QUICK TURN-AROUND LANDING WEIGHT

POUNDS

FLAPS 28

AIRPORT PRESSURE ALTITUDE – FT.	AMBIENT TEMPERATURE – °C						
	-40	-20	-10	0	10	20	40
0	165,000	158,500	155,500	152,500	150,000	147,500	142,500
2,000	160,000	153,000	150,000	147,500	145,000	142,500	137,500
4,000	154,000	147,500	145,000	142,500	140,000	137,500	132,500
6,000	148,000	142,500	139,500	137,000	134,500	132,500	127,500
8,000	142,500	137,000	134,500	132,000	129,500	127,500	123,000
10,000	137,500	132,000	129,000	127,000	124,500	122,500	119,000

FLAPS 40

AIRPORT PRESSURE ALTITUDE – FT.	AMBIENT TEMPERATURE – °C						
	-40	-20	-10	0	10	20	40
0	172,500	166,000	162,500	160,000	157,000	154,500	149,500
2,000	167,000	160,000	157,500	154,000	151,500	148,000	144,000
4,000	161,000	154,500	151,500	148,500	146,000	143,000	139,000
6,000	155,000	148,500	146,000	143,000	140,500	138,000	133,500
8,000	149,000	143,000	140,000	137,500	135,000	132,500	129,000
10,000	143,500	137,500	135,000	132,500	130,000	127,500	124,000

CORRECTIONS: ***valid for both tables***

CONDITION		CORRECTION – POUNDS
Wind	per 1 kt. of headwind per 1 kt. of tailwind	+ 350 - 1,100
Runway slope	per 0.1% uphill slope per 0.1% downhill slope	+ 200 - 200

BRAKE COOLING

BRAKE COOLING TIME CHART

MAX① TAKEOFF BRAKE TEMP - °C	BRAKE COOLING TIME – HOURS:MINUTES											
	TEMPERATURE OF HOTTEST BRAKE - °C②											
	50	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**440**	**450**	**500**	**540**
50	0:00	1:10	1:30	2:00								
100		0:00	0:35	1:05	1:20	1:40	2:00					
150			0:00	0:30	0:50	1:05	1:20	1:30	1:38	1:40	1:50	2:00
200				0:00	0:30	0:35	0:50	1:05	1:08	1:10	1:20	1:30
250					0:00	0:15	0:30	0:45	0:52	0:55	1:05	1:10
300						0:00	0:15	0:25	0:32	0:35	0:45	0:55
350							0:00	0:10	0:18	0:20	0:30	0:50
400								0:00	0:07	0:10	0:20	0:35
440									0:00	0:02	0:12	0:20
450										0:00	0:10	0:15
500											0:00	0:05
540												0:00

NOTES:

1. Refer to Page 7-24 for maximum allowable takeoff brake temperature.
2. Allow an additional 15 minutes for brake temperatures to peak following brake use.
3. For inoperative Brake Temperature Monitoring System (MEL 32-47-01), assume temperature of hottest brake to be 540°C.

BRAKE COOLING

MAXIMUM TAKEOFF BRAKE TEMPERATURE - ^{o}C

UP TO 2,200 FT MSL

TAKEOFF WEIGHT LBS	TAKEOFF DECISION SPEED, V_1 – KIAS						
	130	**135**	**140**	**145**	**150**	**155**	**160**
170,000	540	510	440	390	330	270	220
165,000	540	530	480	420	360	310	250
160,000	540	540	490	440	390	330	265
155,000	540	540	515	465	415	365	305
150,000	540	540	540	495	445	395	340
145,000	540	540	540	520	475	425	380
140,000	540	540	540	540	505	460	410
135,000	540	540	540	540	535	490	445
130,000	540	540	540	540	540	525	480

2,201 - 3,000 FT MSL

TAKEOFF WEIGHT LBS	TAKEOFF DECISION SPEED, V_1 – KIAS						
	130	**135**	**140**	**145**	**150**	**155**	**160**
170,000	540	490	410	360	295	240	180
165,000	540	510	440	390	330	270	210
160,000	540	515	465	415	360	300	235
155,000	540	540	490	440	390	335	275
150,000	540	540	520	470	420	365	315
145,000	540	540	540	500	450	400	350
140,000	540	540	540	525	480	430	385
135,000	540	540	540	540	510	465	420
130,000	540	540	540	540	540	500	455

3,001 - 4,500 FT MSL

TAKEOFF WEIGHT LBS	TAKEOFF DECISION SPEED, V_1 – KIAS						
	130	**135**	**140**	**145**	**150**	**155**	**160**
170,000	500	410	360	325	250	200	125
165,000	520	440	400	350	290	230	160
160,000	530	470	415	360	305	250	175
155,000	540	500	445	390	335	280	215
150,000	540	525	475	420	365	310	255
145,000	540	540	500	450	400	345	295
140,000	540	540	530	480	430	380	330
135,000	540	540	540	515	465	415	365
130,000	540	540	540	540	500	455	405

CORRECTIONS: ***valid for all above tables***

CONDITION		CORRECTION – ^{o}C
Temperature	per 2° above 90 ^{o}F per 2° below 90 ^{o}F	-5 +3
Wind	per 1 kt. of headwind per 1 kt. of tailwind	+2 -15

BRAKE COOLING

MAXIMUM TAKEOFF BRAKE TEMPERATURE - ^{o}C

4,501 - 5,500 FT MSL

TAKEOFF WEIGHT LBS	TAKEOFF DECISION SPEED, V_1 – KIAS						
	130	**135**	**140**	**145**	**150**	**155**	**160**
170,000	470	410	325	290	200	135	60
165,000	485	440	370	320	240	190	105
160,000	500	450	380	340	265	200	130
155,000	525	470	410	355	300	235	170
150,000	540	495	440	385	330	275	215
145,000	540	525	470	420	365	310	255
140,000	540	540	500	450	395	345	295
135,000	540	540	530	480	430	380	330
130,000	540	540	540	515	465	420	370

5,501 - 6,500 FT MSL

TAKEOFF WEIGHT LBS	TAKEOFF DECISION SPEED, V_1 – KIAS						
	130	**135**	**140**	**145**	**150**	**155**	**160**
170,000	410	370	290	240	140	100	-----
165,000	450	400	310	270	190	135	40
160,000	470	410	340	290	225	155	90
155,000	495	440	370	320	260	195	129
150,000	520	470	410	350	295	235	172
145,000	540	495	440	385	330	270	214
140,000	540	530	470	420	365	310	255
135,000	540	540	500	450	400	350	295
130,000	540	540	530	485	430	390	336

CORRECTIONS: ***valid for both tables***

CONDITION		CORRECTION – ^{o}C
Temperature	per 2° above 90 ^{o}F per 2° below 90 ^{o}F	-5 +3
Wind	per 1 kt. of headwind per 1 kt. of tailwind	+2 -15

MEL SUPPORT

30-14-02B: L/R ENG VALVE ANNUNCIATION SYSTEM
30-14-03B: INLET COWL ANTI-ICE REGULATOR/SHUTOFF VALVES

PROCEDURES

RESTRICTIONS

The following restrictions apply to all MEL items presented on this page:

1. Do not use Autothrottles for Takeoff or for Max Continuous Thrust below 24,000 feet pressure altitude.
2. For temperatures below 7.7°C, select Engine or Engine and Airfoil Ice Protection ON. For temperatures above 7.7°C, Engine Ice Protection should remain OFF.
3. Use of reduced or alternate takeoff thrust is not authorized.

30-14-02B
30-14-03B
ANTI-ICE VALVE OPEN

MEL 30-14-02B and 30-14-03B allow dispatch with the inlet cowl anti-ice valve locked OPEN. The following EPR power settings must be used in lieu of the NORMAL thrust setting charts.

Set EPR on the engine with the inoperative valve by using the following tables.

TAKEOFF THRUST (28TO)
Use table on the next page to set takeoff thrust.

GO-AROUND THRUST (G/A)
Use table on Page 7-28 to set Go-Around thrust.

MAX CONTINUOUS THRUST (MCT) CORRECTION
Use the table below to find the EPR correction for MCT. Interpolation may be used to determine the EPR correction at intermediate altitudes, if required.

NOTE: No EPR correction is necessary above 24,000 feet pressure altitude.

EXAMPLE: The end of the takeoff thrust segment occurs at a pressure altitude of 14,000 feet, the Max Continuous Thrust EPR Limit displayed might read 1.53 (depending on airspeed and temperature). Assuming SAT is less than 7.7°C, the EPR on the engine with the inoperative valve should then be set to 1.505, with the change in EPR determined by interpolating from the table above to be -0.026. The EPR on the other engine could be set to either 1.53 or 1.505.

MCT EPR CORRECTION		
PRESSURE ALTITUDE – FEET	**SAT ≤ 7.7°C (46°F)**	**SAT > 7.7°C (46°F)**
0	- 0.015	- 0.022
4,000	- 0.016	- 0.024
8,000	- 0.019	- 0.029
12,000	- 0.024	- 0.036
16,000	- 0.029	- 0.044
20,000	- 0.035	- 0.052
24,000	- 0.040	- 0.036

MEL SUPPORT

MEL 30-14-02B: L/R ENG VALVE ANNUNCIATION SYSTEM
MEL 30-14-03B: INLET COWL ANTI-ICE REGULATOR/SHUTOFF VALVES

28TO EPR SETTINGS

BASED ON 28K RATING, STATIC SETTING
FOR USE WITH MEL 30-14-02B or 30-14-03B (VALVE OPEN)

V2528-D5

OAT – °C	AIRPORT PRESSURE ALTITUDE – FEET									
	-1,000	**0**	**1,000**	**2,000**	**3,000**	**4,000**	**5,000**	**6,000**	**7,000**	**8,000**
50	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
48	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
46	1.37	1.37	1.37	1.37	1.37	1.37	1.38	1.37	1.37	1.37
44	1.38	1.38	1.38	1.38	1.38	1.39	1.39	1.38	1.38	1.38
42	1.39	1.39	1.39	1.39	1.40	1.40	1.40	1.39	1.39	1.39
40	1.40	1.40	1.40	1.41	1.41	1.41	1.41	1.41	1.40	1.40
38	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.41
36	1.43	1.43	1.43	1.43	1.43	1.44	1.44	1.43	1.43	1.43
34	1.44	1.44	1.44	1.44	1.44	1.45	1.45	1.44	1.44	1.44
32	1.44	1.45	1.45	1.45	1.45	1.46	1.46	1.45	1.45	1.45
30	1.44	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47
28	1.44	1.47	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
26	1.44	1.47	1.48	1.49	1.50	1.50	1.50	1.49	1.49	1.49
24	1.44	1.47	1.48	1.49	1.51	1.51	1.51	1.51	1.51	1.50
22	1.44	1.47	1.48	1.49	1.51	1.52	1.52	1.52	1.52	1.52
20	1.44	1.47	1.48	1.49	1.51	1.52	1.54	1.53	1.53	1.53
18	1.44	1.47	1.48	1.49	1.51	1.52	1.54	1.54	1.54	1.54
16 & below	1.44	1.47	1.48	1.49	1.51	1.52	1.54	1.54	1.54	1.54

Engine Bleed Adjustments

PACKS OFF	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.02	+ 0.02	+ 0.02	+ 0.02

MEL SUPPORT

MEL 30-14-02B: L/R ENG VALVE ANNUNCIATION SYSTEM
MEL 30-14-03B: INLET COWL ANTI-ICE REGULATOR/SHUTOFF VALVES

GO-AROUND EPR SETTINGS

BASED ON 28K TOGA RATING
FOR USE WITH MEL 30-14-02B or 30-14-03B (VALVE OPEN)

V2528-D5

OAT – °C	AIRPORT PRESSURE ALTITUDE – FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
50	1.33	1.33	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32
48	1.34	1.34	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
46	1.35	1.35	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34
44	1.36	1.36	1.35	1.35	1.36	1.36	1.36	1.36	1.36	1.35
42	1.37	1.37	1.36	1.36	1.37	1.37	1.37	1.37	1.37	1.36
40	1.39	1.38	1.37	1.37	1.38	1.38	1.38	1.38	1.38	1.37
38	1.40	1.40	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39
36	1.41	1.41	1.40	1.40	1.40	1.40	1.41	1.40	1.40	1.40
34	1.42	1.42	1.41	1.41	1.41	1.41	1.42	1.41	1.41	1.41
32	1.42	1.44	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
30	1.42	1.45	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44
28	1.42	1.45	1.45	1.45	1.45	1.45	1.46	1.45	1.45	1.45
26	1.42	1.45	1.45	1.46	1.46	1.46	1.47	1.46	1.46	1.46
24	1.42	1.45	1.45	1.46	1.48	1.48	1.48	1.48	1.48	1.47
22	1.42	1.45	1.45	1.46	1.48	1.49	1.49	1.49	1.49	1.48
20	1.42	1.45	1.45	1.46	1.48	1.49	1.51	1.50	1.50	1.50
18	1.42	1.45	1.45	1.46	1.48	1.49	1.51	1.50	1.50	1.50
16	1.42	1.45	1.45	1.46	1.48	1.49	1.51	1.50	1.50	1.50
14	1.42	1.45	1.45	1.46	1.48	1.49	1.51	1.50	1.50	1.50
12	1.42	1.45	1.45	1.46	1.48	1.49	1.51	1.50	1.50	1.50
10	1.42	1.45	1.45	1.46	1.48	1.49	1.51	1.50	1.50	1.50
8	1.42	1.45	1.45	1.46	1.48	1.49	1.51	1.50	1.50	1.50
7.7 & below	1.43	1.46	1.46	4.47	4.49	1.50	1.52	1.51	1.51	1.51

Engine Bleed Adjustments

PACKS OFF	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.01	+ 0.02	+ 0.02	+ 0.02	+ 0.02

End of Section

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AUTHORIZATION AND FLIGHT PLANNING

Authorization, procedures, and applicability of data for ferry operations is described in the Flight Operations Manual (Chapters 9 and 35) and the Technical Operations Policies and Procedures Manual (TOPP 40-60-05). Procedures outlined in these manuals must be strictly adhered to.

Ferry operational data is available for the following configurations:

- Landing Gear Extended, Doors Closed
- Landing Gear Extended, Two Main Doors Removed
- Main Landing Gear Strut Doors Removed, Gear Retracted
- Nose Gear Extended, All Nose Gear Doors Removed
- Leading Edge Slats Extended (Fully)
- Leading Edge Slats Retracted
- Flaps Retracted, Slats Operational
- Tailcone Removed
- Anti-Skid Inoperative

The following method should be used for ferry flight planning and operations:

1. Obtain a normal, unfiled flight plan using minimum fuel cruise (MNF) at the cruise altitude for the ferry configuration listed below.
2. Calculate the trip time and fuel load based on the values in the flight plan by multiplying the time and fuel values obtained in Step 1 by the factors listed under the appropriate ferry configuration. Enter this data either in the Dispatcher Remarks section of the Computerized Flight Plan or on the Standby Flight Plan form (NS80172).
3. Add remarks containing the ferry speed, speed limit, altitude limit, total time, leg times if appropriate, and engine-out altitude capability.
   Note: Suggested cruise altitudes are for reference, and reasonable adjustments may be made to accommodate ATC and direction of flight.
4. Assure adequate terrain clearance by referring to the Engine Out Altitude Limit table. Interpolate between weights and temperatures for driftdown altitudes and speeds.
5. Adjust the Runway Allowable and Climb Limit Takeoff Weights, and the Landing Climb Limit Weight. Subtract the weight decrements indicated under the ferry configuration from the 28TO Thrust takeoff weights and the Landing Climb weight obtained from the ARM (SP 3910 or 3911).
6. Data presented in this section assumes no cargo is carried.

The following limitations should be applied to all ferry flights:

1. Do not combine two or more ferry configurations.
2. All ferry flight takeoffs will be done at 28TO thrust and climb out will be made at CL thrust unless otherwise specified on ferry configuration data page.
3. Observe additional limitations and restrictions as listed for each ferry configuration on the following data pages.

ALL LANDING GEAR EXTENDED, DOORS CLOSED

Use the following conditions and factors for gear down ferry, doors closed operations:

LIMITATIONS

Maximum Cruise Altitude:	31,000 feet.
Maximum Speed:	250 IAS/M.70.
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	Dispatch into known icing prohibited.

FLIGHT PLANNING

Time and fuel factors (multiply by basic flight plan values - interpolate linearly):

Range-NM	Recommended Altitude	Time	Fuel
400	25,000	1.36	1.60
800	25,000	1.30	1.54
1200	25,000	1.27	1.53

Estimated No Wind Maximum Ferry Range (No cargo): 1700 NM.
Target Gate Arrival Fuel: 7,000 lb. plus fuel to Alternate.

TAKEOFF

Dispatcher – ADD S Item S32-10-01 Ferry Flight – All Landing Gear Extended – Doors Closed – This allows AWABS calculations for gear down takeoff and landing – **Remove item after operation is completed.**

Adjustment to Runway Allowable and Climb Limit Takeoff Weights:
Packs On or Off, Flaps 11 deg., Subtract 26,000 pounds.
NOTE: This weight adjustment is automatically applied once the S Item above is added.

Adjustment to Takeoff V Speeds: use speeds for 28TO THRUST, Flaps 11 as applicable.
Thrust Setting Restrictions: 28TO. Flex Thrust NOT approved.
Flap Setting Restrictions: 11 degrees only.
Operation from Contaminated Runway: permitted, use standard procedures at adjusted runway allowable takeoff weight.

ENROUTE

Climb or Cruise Weight	Climb IAS/M	25,000 feet Cruise IAS/M	25,000 feet Target EPR	Engine-Out Altitude Limit ISA+10	Engine-Out Altitude Limit ISA+30	Engine-Out @ Speed IAS
100,000	220/.53	212/.515	1.240	19,500	13,200	187
110,000	220/.53	228/.554	1.295	16,400	8,200	199
120,000	220/.53	240/.581	1.343	13,800	-600	214

Climb - Use 28CL Climb Thrust.
Cruise - Maximum Cruise Thrust Limits Based On 28K MCR.
Engine-Out Altitude Limit based on Maximum Continuous Thrust, 28K MCT.

LANDING

Landing Speed Restrictions: no additional restrictions.
Flap Setting Restrictions: no additional restrictions.
Adjustment to Landing Climb Limit Weights: subtract 21,000 pounds.

HOLDING SPEED/THRUST - IAS/EPR

Weight	10,000 Feet	15,000 Feet
100,000 lb.	204/1.082	205/1.115
110,000 lb.	214/1.097	215/1.097

ALL LANDING GEAR EXTENDED, TWO MAIN DOORS REMOVED

Use the following conditions and factors for gear down ferry, two main gear doors removed operations:

LIMITATIONS

Maximum Cruise Altitude:	31,000 feet.
Maximum Speed:	250 IAS/M.70.
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	Dispatch into known icing prohibited.

FLIGHT PLANNING

Time and fuel factors (multiply by basic flight plan values - interpolate linearly):

Range-NM	Recommended Altitude	Time	Fuel
400	25,000	1.36	1.73
800	25,000	1.29	1.68
1200	25,000	1.26	1.68

Estimated Maximum Ferry Range (No cargo): 1500 NM.
Target Gate Arrival Fuel: 7000 lb. plus fuel to Alternate.

TAKEOFF

Dispatcher – ADD S Item S32-10-02 Ferry Flight – All Landing Gear Extended – Two Main Doors Rmvd – This allows AWABS calculations for gear down takeoff and landing – **Remove item after operation is completed.**

Adjustment to Runway Allowable and Climb Limit Takeoff Weights:
Packs On or Off, Flaps 11 deg., Subtract 30,000 pounds.
NOTE: This weight adjustment is automatically applied once the S Item above is added.

Adjustment to Takeoff V Speeds: use speeds for 28TO THRUST, Flaps 11 as applicable.
Thrust Setting Restrictions: 28TO. Flex Thrust NOT approved.
Flap Setting Restrictions: 11 degrees only.
Operation from Contaminated Runway: permitted, use standard procedures at adjusted runway allowable takeoff weight.

ENROUTE

Climb or Cruise Weight	Climb IAS/M	25,000 feet Cruise IAS/M	25,000 feet Target EPR	Engine-Out Altitude Limit ISA+10	Engine-Out Altitude Limit ISA+30	Engine-Out @ Speed IAS
100,000	220/.53	205/.500	1.259	17,100	11,500	187
110,000	220/.53	220/.535	1.314	14,100	2,900	199
120,000	220/.53	233/.564	1.368	11,700	-2,000	214

Climb - Use 28CL Climb Thrust.
Cruise - Maximum Cruise Thrust Limits Based On 28K MCR.
Engine-Out Altitude Limit based on Maximum Continuous Thrust, 28K MCT.

LANDING

Landing Speed Restrictions: no additional restrictions.
Flap Setting Restrictions: no additional restrictions.
Adjustment to Landing Climb Limit Weights: subtract 25,000 pounds.

HOLDING SPEED/THRUST - IAS/EPR

Weight	10,000 Feet	15,000 Feet
100,000 lb.	204/1.095	205/1.131
110,000 lb.	214/1.111	215/1.153

TWO LANDING GEAR STRUT DOORS REMOVED, GEAR RETRACTED

Use the following conditions and factors for landing gear strut doors removed, gear retracted ferry operations:

LIMITATIONS

Maximum Cruise Altitude:	37,000 feet.
Maximum Speed:	300 IAS.
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	Dispatch into known icing prohibited.

FLIGHT PLANNING

Time and fuel factors (multiply by basic flight plan values - interpolate linearly):

Range-NM	Recommended Altitude	Time	Fuel
400	25,000	1.00	1.36
800	25,000	1.00	1.23
1200	25,000	1.00	1.18

Estimated Maximum Ferry Range (No cargo): 2200 NM.
Target Gate Arrival Fuel: 5,000 lb. plus fuel to Alternate.

TAKEOFF

Dispatcher – ADD S Item S32-10-03 Ferry Flight – Two Landing Gear Strut Doors Rmvd/Gear Retracted – This allows AWABS calculations for gear down takeoff and landing – **Remove item after operation is completed.**

Adjustment to Runway Allowable and Climb Limit Takeoff Weights:
Packs On or Off, Flaps 11 deg., Subtract 2,000 pounds.
NOTE: This weight adjustment is automatically applied once the S Item above is added.

Adjustment to Takeoff V Speeds: use speeds for 28TO THRUST, Flaps 11 as applicable.
Thrust Setting Restrictions: 28TO. Flex Thrust NOT approved.
Flap Setting Restrictions: 11 degrees only.
Operation from Contaminated Runway: permitted, use standard procedures at adjusted runway allowable takeoff weight.

ENROUTE

Climb or Cruise Weight	Climb IAS/M	25,000 feet Cruise IAS/M	25,000 feet Target EPR	Engine-Out Altitude Limit ISA+10	Engine-Out Altitude Limit ISA+30	Engine-Out @ Speed IAS
100,000	280/.626	260/.626	1.147	26,300	22,100	187
110,000	280/.643	267/.643	1.172	24,800	20,300	199
120,000	280/.664	276/.664	1.201	22,100	17,400	214

Climb - Use 28CL Climb Thrust.
Cruise - Maximum Cruise Thrust Limits Based On 28K MCR.
If excessive buffet occurs, reduce speed.
Engine-Out Altitude Limit based on Maximum Continuous Thrust, 28K MCT.

LANDING

Landing Speed Restrictions: no additional restrictions.
Flap Setting Restrictions: no additional restrictions.
Adjustment to Landing Climb Limit Weights: subtract 2,000 pounds.

HOLDING SPEED/THRUST - IAS/EPR

Weight	10,000 Feet	15,000 Feet
100,000 lb.	204/1.032	205/1.049
110,000 lb.	214/1.040	215/1.061

NOSE GEAR EXTENDED, ALL NOSE GEAR DOORS REMOVED

Use the following conditions and factors for nose gear extended, all nose gear doors removed ferry operations:

LIMITATIONS

Maximum Cruise Altitude:	31,000 feet.
Maximum Speed:	250 IAS/M.70.
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	Dispatch into known icing prohibited.

FLIGHT PLANNING

Time and fuel factors (multiply by basic flight plan values - interpolate linearly):

Range-NM	Recommended Altitude	Time	Fuel
400	25,000	1.07	1.45
800	25,000	1.08	1.33
1200	25,000	1.09	1.28

Estimated Maximum Ferry Range (No cargo): 2000 NM.
Target Gate Arrival Fuel: 7,000 lb. plus fuel to Alternate.

TAKEOFF

Dispatcher – ADD S Item S32-10-04 Ferry Flight – Nose Gear Extended – All Nose Gear Doors Rmvd – This allows AWABS calculations for gear down takeoff and landing – **Remove item after operation is completed.**

Adjustment to Runway Allowable and Climb Limit Takeoff Weights:
Packs On or Off, Flaps 11 deg., Subtract 4,000 pounds.
NOTE: This weight adjustment is automatically applied once the S Item above is added.

Adjustment to Takeoff V Speeds: use speeds for 28TO THRUST, Flaps 11 as applicable.
Thrust Setting Restrictions: 28TO. Flex Thrust NOT approved.
Flap Setting Restrictions: 11 degrees only.
Operation from Contaminated Runway: permitted, use standard procedures at adjusted runway allowable takeoff weight.

ENROUTE

Climb or Cruise Weight	Climb IAS/M	25,000 feet Cruise IAS/M	25,000 feet Target EPR	Engine-Out Altitude Limit ISA+10	Engine-Out Altitude Limit ISA+30	Engine-Out @ Speed IAS
100,000	240/.581	240/.581	1.153	26,000	21,100	187
110,000	240/.581	240/.581	1.173	24,300	19,700	199
120,000	240/.581	240/.581	1.196	22,300	15,200	214

Climb - Use 28CL Climb Thrust.
Cruise - Maximum Cruise Thrust Limits Based On 28K MCR.
If excessive buffet occurs, reduce speed.
Engine-Out Altitude Limit based on Maximum Continuous Thrust, 28K MCT.

LANDING

Landing Speed Restrictions: no additional restrictions.
Flap Setting Restrictions: no additional restrictions.
Adjustment to Landing Climb Limit Weights: subtract 4,500 pounds.

HOLDING SPEED/THRUST - IAS/EPR

Weight	10,000 Feet	15,000 Feet
100,000 lb.	204/1.040	205/1.059
110,000 lb.	214/1.048	215/1.071

LEADING EDGE SLATS EXTENDED

Use the following conditions and factors for leading edge slats fixed extended (flaps operational) ferry operations:

LIMITATIONS

Maximum Cruise Altitude:	30,000 feet.
Maximum Speed:	240 IAS/M.57
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	Dispatch into known icing prohibited.

FLIGHT PLANNING

Time and fuel factors (multiply by basic flight plan values - interpolate linearly):

Range-NM	Recommended Altitude	Time	Fuel
400	25,000	1.22	1.74
800	25,000	1.17	1.68
1200	25,000	1.16	1.67

Estimated Maximum Ferry Range (No cargo): 1500 NM.
Target Gate Arrival Fuel: 6000 lb. plus fuel to Alternate.

TAKEOFF

Adjustment to Climb Limit Takeoff Weights (ONLY):
Packs On or Off, Flaps 11 deg. Subtract 37,000 pounds.
Adjustment to Takeoff V Speeds: use speeds for 28TO THRUST, Flaps 11 as applicable.
Thrust Setting Restrictions: 28TO. Flex Thrust NOT approved.
Flap Setting Restrictions: 11 degrees only.
Operation from Contaminated Runway: permitted, use standard procedures at adjusted runway allowable takeoff weight.

ENROUTE

Climb or Cruise Weight	Climb IAS/M	25,000 feet Cruise IAS/M	25,000 feet Target EPR	Engine-Out Altitude Limit ISA+10	Engine-Out Altitude Limit ISA+30	Engine-Out @ Speed IAS
100,000	220/.490	203/.490	1.267	20,200	16,500	148
110,000	220/.529	218/.529	1.321	18,800	11,500	155
120,000	220/.550	230/.559	1.376	15,500	6,700	162

Climb - Use 28CL Climb Thrust.
Cruise - Maximum Cruise Thrust Limits Based On 28K MCR.
If excessive buffet occurs, reduce speed.
Engine-Out Altitude Limit based on Maximum Continuous Thrust, 28K MCT.

LANDING

Landing Speed Restrictions: no additional restrictions.
Flap Setting Restrictions: no additional restrictions.
Adjustment to Landing Climb Limit Weights: none.

HOLDING SPEED/THRUST - IAS/EPR

Weight	10,000 Feet	15,000 Feet
100,000 lb.	204/1.100	205/1.137
110,000 lb.	214/1.116	215/1.159

LEADING EDGE SLATS RETRACTED

Use the following conditions and factors for leading edge slats fixed retracted (flaps operational) ferry operations:

LIMITATIONS

Maximum Cruise Altitude:	Normal.
Maximum Speed:	Normal.
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	no additional restrictions.

Note stabilizer setting differences below.

FLIGHT PLANNING

Flight Plan as Normal.
Target Gate Arrival Fuel: 5,000 lb. plus fuel to Alternate.

TAKEOFF

Adjustment to Runway Allowable (ONLY) Takeoff Weights:
Packs On or Off, Flaps 24 deg. Slats Retracted, Subtract 34,000 lb.
Takeoff V Speeds:

WEIGHT	Field Elev.	V1		VR		V2	
		Ambient Temperature - degrees C					
		ISA + 10	ISA + 30	ISA + 10	ISA + 30	ISA + 10	ISA + 30
90,000	SL	133	124	135	133	152	146
	6000	125	125	132	134	146	146
110,000	SL	134	141	148	151	161	161
	6000	138	143	150	151	161	161
130,000	SL	154	159	165	166	174	174
	6000	156	161	166	167	174	174

Thrust Setting Restrictions: 28TO. Flex Thrust NOT approved.
Flap Setting Restrictions: 24 degrees ONLY.
Stabilizer Setting: Nominal Center of Gravity (15% MAC): 1.9 DEG ANU. Subtract 0.18 DEG (Less ANU) per 1% MAC Increase from Nominal CG, Add 0.18 DEG (More ANU) for each 1% Decrease from Nominal CG.
Operation from Contaminated Runway: NOT permitted.

ENROUTE

Use Normal climb, cruise, and descent speeds and thrusts (FMS/ODM).
Climb - Use 28CL Climb Thrust.

LANDING

Landing Speed Restrictions: Flaps 28/Slats Retracted or Flaps 40 degrees/Slats Retracted Speed per ODM, ABNORMAL Section.
Flap Setting Restrictions: Flaps 28 or 40 degrees only for Landing.
Minimum Runway Length: See ABNORMAL Section for ACTUAL landing distances.
Adjustment to Landing Climb Limit Weights: none.

HOLDING

Standard FMS/ODM speeds and thrusts.

FLAPS RETRACTED

(SLATS EXTENDED FOR TAKEOFF AND LANDING)

Use the following conditions and factors for flaps fixed retracted (slats operational) ferry operations:

LIMITATIONS

Maximum Cruise Altitude:	Normal.
Maximum Speed:	Normal.
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	no additional restrictions.

Note stabilizer setting differences below.

FLIGHT PLANNING

Flight Plan as Normal.
Target Gate Arrival Fuel: 5,000 lb. plus fuel to Alternate.

TAKEOFF

Adjustment to Runway Allowable and Climb Limit Takeoff Weights:

Packs On or Off, Flaps 0 deg. Slats Extended, Subtract 35,000 lb. from Flaps 11 Data to obtain Flaps 0/Extended Runway Allowable and Climb Limit Takeoff Weights.

Takeoff V Speeds:

WEIGHT	Field Elev.	V1		VR		V2	
		Ambient Temperature - degrees C					
		ISA + 10	ISA + 30	ISA + 10	ISA + 30	ISA + 10	ISA + 30
90,000	SL	114	121	140	143	147	147
	6000	117	123	142	145	147	147
110,000	SL	136	142	158	161	162	162
	6000	139	143	160	162	162	162
130,000	SL	155	161	175	177	176	177
	6000	158	162	176	178	176	178

Thrust Setting Restrictions: 28TO. Flex Thrust NOT approved.
Flap Setting Restrictions: 0 degrees/Slats Extended.
Stabilizer Setting: Nominal Center of Gravity (15% MAC): 2.9 DEG ANU. Subtract 0.16 DEG (Less ANU) per 1% MAC Increase from Nominal CG, Add 0.16 DEG (More ANU) for each 1% Decrease from Nominal CG.
Operation from Contaminated Runway: NOT permitted.

ENROUTE

Use Normal climb, cruise, and descent speeds and thrusts (FMS/ODM).
Climb - Use 28CL Climb Thrust.

LANDING

Landing Speed Restrictions: Flaps 0 degrees/Slats Extended Speed per ODM, ABNORMAL Section.
Flap Setting Restrictions: 0 degrees/Slats Extended.
Minimum Runway Length: See ABNORMAL Section for ACTUAL landing distances.
Adjustment to Landing Climb Limit Weights: none.

HOLDING

Standard FMS/ODM speeds and thrusts.

TAILCONE REMOVED

Use the following conditions and factors for tailcone removed operations:

LIMITATIONS

Maximum Cruise Altitude:	37,000 feet.
Maximum Speed:	300 IAS.
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	Dispatch into known icing prohibited.

FLIGHT PLANNING

Time and fuel factors (multiply by basic flight plan values - interpolate linearly):

Range-NM	Recommended Altitude	Time	Fuel
300	25,000	1.00	1.47
600	25,000	1.00	1.34
900	25,000	1.00	1.30

Estimated Maximum Ferry Range (No cargo): 2000 NM.
Target Gate Arrival Fuel: 5000 lb. plus fuel to Alternate.

TAKEOFF

Adjustment to Runway Allowable and Climb Limit Takeoff Weights:
Packs On or Off, Flaps 24 deg. Subtract 4,000 pounds from Flaps 24 weight limits.
Adjustment to Takeoff V Speeds: use speeds for 28TO THRUST and Flaps 11 should be used for 28TO THRUST at Flaps 24.
Thrust Setting Restrictions: 28TO. Flex Thrust NOT approved.
Flap Setting Restrictions: 24 degrees only.
Operation from Contaminated Runway: permitted, use standard procedures at adjusted runway allowable takeoff weight.

ENROUTE

Climb or Cruise Weight	Climb IAS/M	25,000 feet Cruise IAS/M	25,000 feet Target EPR	Engine-Out Altitude Limit ISA+10	Engine-Out Altitude Limit ISA+30	Engine-Out @ Speed IAS
100,000	280/.602	249/.602	1.175	24,200	21,700	187
110,000	280/.622	258/.622	1.206	22,600	18,500	199
120,000	280/.643	267/.643	1.238	20,600	14,500	214

Climb - Use 28CL Climb Thrust.
Cruise - Maximum Cruise Thrust Limits Based On 28K MCR.
If excessive buffet occurs, reduce speed.
Engine-Out Altitude Limit based on Maximum Continuous Thrust, 28K MCT.

LANDING

Landing Speed Restrictions: no additional restrictions.
Flap Setting Restrictions: no additional restrictions.
Adjustment to Landing Climb Limit Weights: none.

HOLDING SPEED/THRUST - IAS/EPR

Weight	10,000 Feet	15,000 Feet
100,000 lb.	204/1.043	205/1.063
110,000 lb.	214/1.052	215/1.076

ANTI-SKID INOPERATIVE

Use the following conditions and factors for anti-skid inoperative ferry operations:

LIMITATIONS

Maximum Cruise Altitude:	Normal.
Maximum Speed:	Normal.
C. G. Limitations:	no additional restrictions.
En Route Weather Restrictions:	no additional restrictions.

FLIGHT PLANNING
Flight Plan as Normal.
Target Gate Arrival Fuel: 5,000 lb. plus fuel to Alternate.

TAKEOFF
Dispatcher – ADD S Item S32-10-05 Ferry Flight – Anti-Skid Inoperative – This allows AWABS calculations for anti-skid inoperative takeoff – **Remove item after operation is completed.**

Adjustment to Runway Allowable and Climb Limit Takeoff Weights:
Packs On or Off, Flaps 24 deg., Subtract 36,000 pounds.
NOTE: This weight adjustment is automatically applied once the S Item above is added.

Adjustment to Takeoff V Speeds: use speeds for 28TO THRUST, Flaps 24 as applicable.
Thrust Setting Restrictions: 28TO, Flex Thrust NOT approved.
Flap Setting Restrictions: 24 degrees only.
Operation from Contaminated Runway: NOT permitted. Operation allowed only on DRY runways.
Abort procedures: Reduce engine thrust to idle. Simultaneously extend the spoilers and apply brakes. Use manual braking techniques, constantly increasing the pedal force until moderate braking is felt. Apply reverse thrust as quickly as possible after initiation of the abort procedure.

ENROUTE
Standard Flight Planning Data and Procedures.

LANDING
Landing Speed Restrictions: no additional restrictions.
Flap Setting Restrictions: 28 or 40 degrees ONLY.
For ACTUAL Landing Distances, see ODM, ABNORMAL Section.
Landing procedure: Verify that spoilers are deployed at main gear wheel spin up or use manual spoiler extension. Once the main gear is on the ground, apply brakes using manual braking techniques, constantly increasing the pedal force until a moderate deceleration is felt. Apply reverse thrust as quickly as possible after brake initiation.

Thrust reverse procedure: Do NOT exceed 1.27 EPR reverse thrust above 60 knots, idle reverse below 60 knots unless higher thrust is dictated by existing conditions. Should difficulty be experienced in maintaining directional control, reduce reverse thrust as required. Do NOT attempt to maintain directional control by using asymmetric reverse thrust.
Adjustment to Landing Climb Limit Weights: None.

HOLDING
Standard FMS/ODM speeds and thrusts.

End of Section