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B-777-200LR 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 – Performance 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

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REMOVE	INSERT	REMARKS
TABLE OF CONTENTS	TABLE OF CONTENTS	Date updated to reflect revision.
COVER PAGE	COVER PAGE	Cover page updated to reflect revision.
LIST OF EFFECTIVE PAGES Page <i>i</i>	LIST OF EFFECTIVE PAGES Page <i>i</i>	List of Effective Pages updated to reflect revision.
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 33

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END

777-200LR QUICK REFERENCE CHART

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	
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	30 to 29	13 – 18
Medium to Poor	Braking deceleration OR directional control is between Medium and Poor.	Greater than 1/8" depth of: - Water - Slush	2	21 to 20 or lower	
Poor	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	• Ice	1		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	15KTS	15KTS	5KTS	0KTS

777-200LR QUICK REFERENCE CHART

OPERATIONAL LANDING DISTANCES FEET

FLAPS 30

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).									
	DRY (6)						GOOD (5)			
	AB 1	AB 2	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	14,500	13,100	12,000	9,900	7,600	6,400	12,000	10,000	8,300	8,100
740,000	14,100	12,800	11,700	9,700	7,400	6,200	11,700	9,800	8,200	8,000
720,000	13,800	12,500	11,400	9,500	7,300	6,100	11,400	9,500	8,000	7,800
700,000	13,400	12,200	11,100	9,200	7,100	5,900	11,100	9,300	7,800	7,600
680,000	13,000	11,900	10,800	9,000	6,900	5,700	10,800	9,100	7,600	7,400
660,000	12,700	11,500	10,500	8,800	6,800	5,600	10,500	8,800	7,400	7,200
640,000	12,300	11,200	10,200	8,600	6,600	5,400	10,200	8,600	7,200	7,000
620,000	11,900	10,900	9,900	8,300	6,500	5,200	9,900	8,400	7,100	6,900
600,000	11,500	10,600	9,600	8,100	6,300	5,100	9,600	8,200	6,900	6,700
580,000	11,200	10,300	9,300	7,900	6,100	4,900	9,300	7,900	6,700	6,500
560,000	10,800	9,900	9,000	7,600	6,000	4,800	9,000	7,700	6,500	6,300
540,000	10,400	9,600	8,700	7,400	5,800	4,600	8,700	7,500	6,300	6,100
520,000	10,100	9,300	8,400	7,200	5,700	4,400	8,400	7,200	6,100	5,900
500,000	9,700	9,000	8,100	6,900	5,500	4,300	8,100	7,000	5,900	5,800
492,000	9,600	8,800	8,000	6,900	5,400	4,200	8,000	6,900	5,900	5,700
480,000	9,400	8,700	7,900	6,800	5,400	4,200	7,900	6,900	5,800	5,600
460,000	9,300	8,600	7,900	6,800	5,400	4,200	7,900	6,900	5,800	5,600
440,000	9,100	8,500	7,800	6,800	5,400	4,100	7,800	6,900	5,800	5,500
420,000	9,000	8,300	7,700	6,800	5,400	4,100	7,700	6,900	5,800	5,500
400,000	8,800	8,200	7,700	6,800	5,400	4,100	7,700	6,900	5,800	5,500
380,000	8,600	8,000	7,600	6,800	5,400	4,100	7,600	6,900	5,700	5,400
360,000	8,500	7,900	7,500	6,800	5,400	4,100	7,500	6,900	5,700	5,400

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF30 - 5 •

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	-600	-400	-300	-300	-200	-100	-300	-300	-300	-200
2,000	0	0	0	0	0	0	0	0	0	0
4,000	600	400	300	300	200	100	300	300	300	200
6,000	1,100	900	700	600	400	300	700	600	500	500
8,000	2,300	1,800	1,400	1,200	900	600	1,400	1,200	1,100	1,000

CORRECTIONS

	DRY (6)						GOOD (5)			
PER 1 KT HEADWIND	-50	-50	-50	-50	0	0	-50	-50	0	0
PER 1 KT TAILWIND	150	150	100	100	50	50	100	100	100	100
PER 5 KTS ADD'L SPD	300	300	400	350	250	150	400	350	200	200
PER 10°C ABOVE ISA	250	200	200	150	100	50	200	150	100	100
PER 10°C BELOW ISA	-250	-200	-200	-150	-100	-50	-200	-150	-150	-100
PER 1% UP SLOPE	-250	-150	-50	0	0	-50	-50	0	-100	-100
PER 1% DOWN SLOPE	250	100	0	0	0	50	0	50	100	100
1 REVERSER INOP	1,000	300	0	0	0	100	0	100	400	300
2 REVERSERS INOP	1,200	300	0	0	0	200	0	200	800	800
MANUAL SPOILERS	200	200	200	200	200	300	200	200	200	300

Note: Do not operate when Braking Action is Nil.

777-200LR QUICK REFERENCE CHART

OPERATIONAL LANDING DISTANCES FEET

FLAPS 30

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR(1)			
	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	12,400	11,300	11,100	10,800	14,500	14,300	14,300	14,300
740,000	12,100	11,100	10,900	10,600	14,200	13,900	13,900	13,900
720,000	11,800	10,800	10,600	10,300	13,800	13,600	13,600	13,500
700,000	11,500	10,500	10,300	10,100	13,400	13,200	13,200	13,100
680,000	11,200	10,200	10,000	9,800	13,100	12,800	12,800	12,800
660,000	10,900	10,000	9,800	9,500	12,700	12,400	12,400	12,400
640,000	10,600	9,700	9,500	9,300	12,300	12,100	12,100	12,000
620,000	10,300	9,400	9,200	9,000	12,000	11,700	11,700	11,700
600,000	10,000	9,100	8,900	8,800	11,600	11,300	11,300	11,300
580,000	9,700	8,900	8,700	8,500	11,200	11,000	11,000	10,900
560,000	9,400	8,600	8,400	8,300	10,800	10,600	10,600	10,600
540,000	9,100	8,300	8,100	8,000	10,500	10,200	10,200	10,200
520,000	8,800	8,000	7,800	7,800	10,100	9,900	9,900	9,800
500,000	8,500	7,800	7,500	7,500	9,700	9,500	9,500	9,500
492,000	8,400	7,600	7,400	7,400	9,600	9,400	9,400	9,300
480,000	8,400	7,600	7,400	7,400	9,500	9,200	9,200	9,200
460,000	8,300	7,600	7,300	7,300	9,400	9,100	9,100	9,000
440,000	8,200	7,600	7,200	7,200	9,200	9,000	8,900	8,900
420,000	8,100	7,500	7,100	7,100	9,100	8,800	8,800	8,700
400,000	8,100	7,500	7,000	7,000	8,900	8,700	8,600	8,600
380,000	8,000	7,500	6,900	6,900	8,800	8,600	8,400	8,400
360,000	7,900	7,500	6,800	6,800	8,700	8,400	8,300	8,200

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF30 - 5 •

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	-600	-600	-500
2,000	0	0	0	0	0	0	0	0
4,000	400	400	400	400	500	600	600	500
6,000	800	700	700	700	1,100	1,100	1,100	1,100
8,000	1,200	1,100	1,100	1,100	1,600	1,700	1,700	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	400	350	250	250	350	300	250	250
PER 10°C ABOVE ISA	200	200	150	150	250	250	250	250
PER 10°C BELOW ISA	-200	-200	-150	-150	-250	-250	-250	-250
PER 1% UP SLOPE	-150	-150	-200	-200	-350	-400	-450	-450
PER 1% DOWN SLOPE	150	200	300	300	550	650	650	600
1 REVERSER INOP	400	800	800	900	1,500	1,700	1,700	1,700
2 REVERSERS INOP	1,500	2,200	2,200	2,200	5,100	5,300	5,300	5,300
MANUAL SPOILERS	200	200	200	300	200	200	200	300

Note: Do not operate when Braking Action is Nil.

777-200LR QUICK REFERENCE CHART

OPERATIONAL LANDING DISTANCES FEET

FLAPS 25

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).									
	DRY (6)						GOOD (5)			
	AB 1	AB 2	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	14,800	13,100	11,700	9,800	7,600	6,200	11,700	9,800	8,300	7,800
740,000	14,400	12,900	11,400	9,600	7,500	6,100	11,400	9,700	8,200	7,700
720,000	14,100	12,600	11,200	9,400	7,300	5,900	11,200	9,500	8,000	7,500
700,000	13,700	12,300	11,000	9,200	7,200	5,800	11,000	9,300	7,800	7,400
680,000	13,400	12,000	10,800	9,100	7,000	5,700	10,800	9,100	7,700	7,200
660,000	13,100	11,800	10,500	8,900	6,900	5,500	10,500	8,900	7,500	7,100
640,000	12,700	11,500	10,300	8,700	6,800	5,400	10,300	8,700	7,400	7,000
620,000	12,400	11,200	10,100	8,500	6,600	5,300	10,100	8,500	7,200	6,800
600,000	12,000	10,900	9,800	8,300	6,500	5,100	9,800	8,400	7,000	6,700
580,000	11,700	10,700	9,600	8,100	6,400	5,000	9,600	8,200	6,900	6,600
560,000	11,300	10,400	9,400	8,000	6,200	4,800	9,400	8,000	6,700	6,400
540,000	11,000	10,100	9,100	7,800	6,100	4,700	9,100	7,800	6,500	6,300
520,000	10,600	9,800	8,900	7,600	5,900	4,600	8,900	7,600	6,400	6,100
500,000	10,300	9,500	8,700	7,400	5,800	4,400	8,700	7,400	6,200	6,000
492,000	10,200	9,400	8,600	7,300	5,700	4,400	8,600	7,400	6,200	6,000
480,000	10,000	9,300	8,500	7,300	5,700	4,300	8,500	7,300	6,100	5,900
460,000	9,800	9,100	8,400	7,200	5,700	4,300	8,400	7,300	6,100	5,800
440,000	9,600	9,000	8,300	7,200	5,600	4,200	8,300	7,200	6,000	5,800
420,000	9,400	8,800	8,200	7,200	5,600	4,200	8,200	7,200	6,000	5,700
400,000	9,200	8,600	8,100	7,100	5,500	4,200	8,100	7,100	5,900	5,600
380,000	9,000	8,400	7,900	7,100	5,500	4,100	7,900	7,100	5,900	5,600
360,000	8,800	8,200	7,800	7,000	5,400	4,100	7,800	7,100	5,800	5,500

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF25 - 5 •

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	-600	-500	-400	-300	-200	-200	-400	-300	-300	-300
2,000	0	0	0	0	0	0	0	0	0	0
4,000	600	500	400	300	200	200	400	300	300	300
6,000	1,200	1,100	900	700	500	300	900	700	600	600
8,000	1,900	1,600	1,300	1,000	700	500	1,300	1,000	800	800

CORRECTIONS

	DRY (6)						GOOD (5)			
PER 1 KT HEADWIND	-50	-50	-50	-50	0	0	-50	-50	0	0
PER 1 KT TAILWIND	150	150	100	100	50	50	100	100	100	100
PER 5 KTS ADD'L SPD	300	300	400	350	250	150	400	350	250	200
PER 10°C ABOVE ISA	250	250	200	150	100	100	200	150	150	150
PER 10°C BELOW ISA	-250	-250	-200	-150	-150	-100	-200	-150	-150	-150
PER 1% UP SLOPE	-300	-200	-50	0	0	-50	-50	0	-50	-100
PER 1% DOWN SLOPE	300	100	0	0	0	50	0	50	100	150
1 REVERSER INOP	1,200	400	100	0	0	100	100	100	400	400
2 REVERSERS INOP	1,400	400	100	0	0	200	100	200	900	900
MANUAL SPOILERS	300	300	300	300	300	300	300	300	300	300

Note: Do not operate when Braking Action is Nil.

777-200LR QUICK REFERENCE CHART

OPERATIONAL LANDING DISTANCES FEET

FLAPS 25

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR(1)			
	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	12,400	11,200	10,900	10,900	14,500	14,200	14,200	14,100
740,000	12,100	11,000	10,700	10,700	14,200	13,800	13,800	13,800
720,000	11,900	10,800	10,500	10,400	13,900	13,500	13,500	13,500
700,000	11,600	10,500	10,200	10,200	13,500	13,200	13,200	13,200
680,000	11,400	10,300	10,000	10,000	13,200	12,900	12,900	12,800
660,000	11,100	10,100	9,800	9,700	12,900	12,600	12,600	12,500
640,000	10,900	9,800	9,500	9,500	12,600	12,200	12,200	12,200
620,000	10,600	9,600	9,300	9,300	12,300	11,900	11,900	11,900
600,000	10,400	9,400	9,100	9,100	11,900	11,600	11,600	11,600
580,000	10,100	9,200	8,900	8,800	11,600	11,300	11,300	11,200
560,000	9,900	8,900	8,600	8,600	11,300	11,000	10,900	10,900
540,000	9,600	8,700	8,400	8,400	11,000	10,600	10,600	10,600
520,000	9,400	8,500	8,200	8,100	10,600	10,300	10,300	10,300
500,000	9,100	8,200	7,900	7,900	10,300	10,000	10,000	10,000
492,000	9,000	8,100	7,800	7,800	10,200	9,900	9,800	9,800
480,000	8,900	8,100	7,800	7,700	10,100	9,700	9,700	9,700
460,000	8,800	8,000	7,600	7,600	9,900	9,500	9,500	9,500
440,000	8,600	7,900	7,500	7,400	9,700	9,400	9,300	9,300
420,000	8,500	7,800	7,300	7,300	9,500	9,200	9,100	9,100
400,000	8,400	7,700	7,200	7,200	9,300	9,000	8,900	8,900
380,000	8,200	7,600	7,100	7,000	9,100	8,800	8,700	8,700
360,000	8,100	7,500	6,900	6,900	9,000	8,600	8,500	8,400

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF25 - 5 •

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	-500	-400	-400	-400	-600	-600	-600	-600
2,000	0	0	0	0	0	0	0	0
4,000	500	400	400	400	600	600	600	600
6,000	900	900	900	800	1,200	1,200	1,200	1,200
8,000	1,400	1,300	1,300	1,200	1,800	1,800	1,800	1,800

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	400	350	250	250	400	300	300	300
PER 10°C ABOVE ISA	200	200	200	200	250	250	250	250
PER 10°C BELOW ISA	-200	-200	-200	-200	-250	-250	-250	-250
PER 1% UP SLOPE	-150	-150	-250	-250	-350	-450	-450	-450
PER 1% DOWN SLOPE	150	200	300	300	550	650	650	650
1 REVERSER INOP	400	800	900	900	1,600	1,900	1,900	1,900
2 REVERSERS INOP	1,600	2,300	2,400	2,400	5,600	5,800	5,800	5,800
MANUAL SPOILERS	300	300	300	300	300	300	300	300

Note: Do not operate when Braking Action is Nil.

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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.

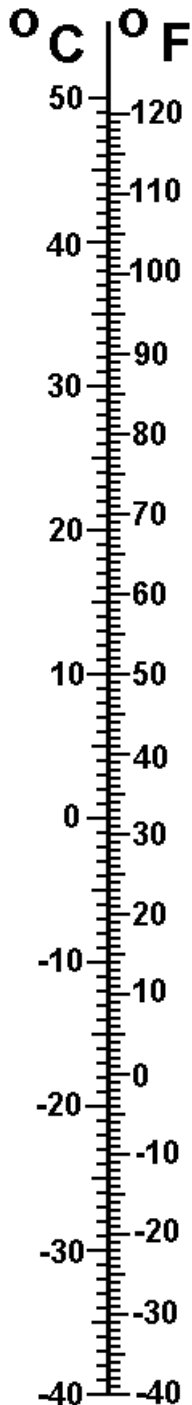
STATIC AIR TEMPERATURE (SAT) - The ambient still air temperature outside of the aircraft. Sometimes known as the Outside Air Temperature (OAT).

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

V_{mo}/M_{mo} - Maximum allowable operating indicated airspeed or Mach number.

TEMPERATURE CONVERSION AND STATIC AIR TEMPERATURE

°C



ALTITUDE - FEET	ISA DEVIATION - °C					
	ISA-20	ISA-10	ISA	ISA+10	ISA+20	ISA+30
36,000 ≥	-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

TOTAL AIR TEMPERATURE vs STATIC AIR TEMPERATURE

°C

TAT °C	INDICATED MACH NUMBER													
	.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	329	0.497
5,000	331	0.544
10,000	333	0.599
15,000	336	0.661
17,000	338	0.690
19,000	340	0.720
21,000	341	0.749
23,000	343	0.781
25,000	345	0.816
27,000	348	0.854
29,000	350	0.890
31,000	335	0.890
33,000	321	0.890
35,000	307	0.890
37,000	293	0.890
39,000	280	0.890
41,000	267	0.890
43,000	255	0.890

ENROUTE FUEL TEMPERATURE

ADJUSTED FUEL FREEZE TEMP. °C		JET A		JP-5		JET-A1		TS-1	
FLT CONDITION -		DEVIATION FROM STANDARD DAY TEMPERATURE*							
@ MACH 0.82									
FL 280		-25	-30	-31	-42				
FL 310		-19	-24	-25	-36				
FL 330		-15	-20	-21	-32				
FL 350		-11	-16	-17	-28				
FL 370 & HIGHER		-8	-14	-15	-26				
@ MACH 0.83									
FL 280		-25	-30	-31	-43				
FL 310		-19	-24	-25	-37				
FL 330		-15	-20	-21	-33				
FL 350		-11	-17	-17	-29				
FL 370 & HIGHER		-9	-14	-15	-27				
@ MACH 0.84									
FL 280		-26	-31	-32	-43				
FL 310		-20	-25	-26	-37				
FL 330		-16	-21	-22	-33				
FL 350		-12	-17	-18	-29				
FL 370 & HIGHER		-10	-15	-16	-27				
@ MACH 0.85									
FL 280		-26	-32	-32	-44				
FL 310		-20	-26	-27	-38				
FL 330		-16	-22	-23	-34				
FL 350		-12	-18	-19	-30				
FL 370 & HIGHER		-10	-16	-16	-28				

*Includes 3°C margin above actual fuel freeze temperature for type of fuel.

INSTRUCTIONS:

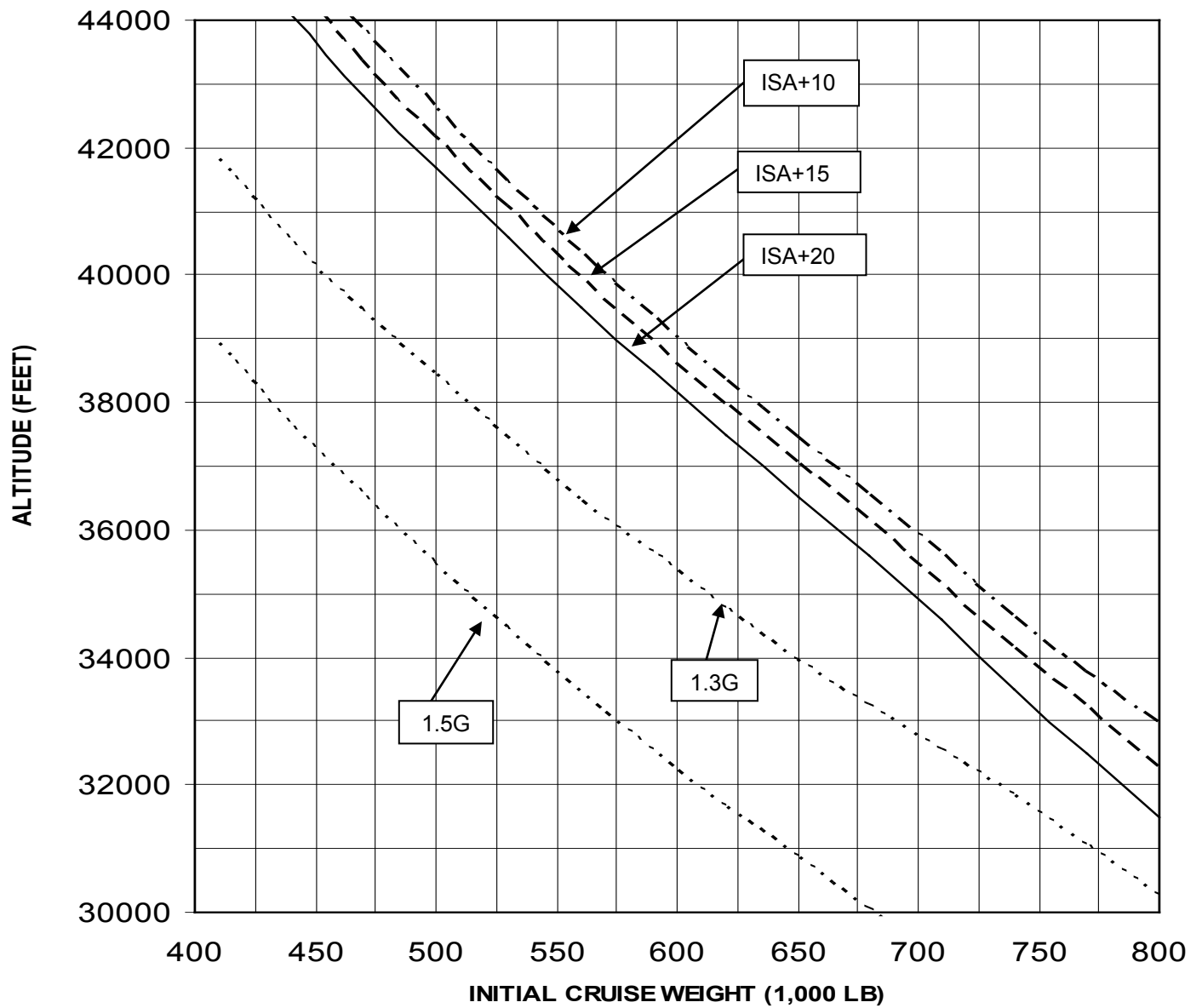
1. Enter the top of the chart with the Fuel Type (e.g. Jet A, JP-5, etc.).
2. Move vertically down to the Flight Condition (Mach and Altitude) expected en-route and read the Limit Standard Day Deviation.
3. Do not dispatch Aircraft into en-route temperatures colder than the Limit Standard Day Deviation obtained in Step 2 above.

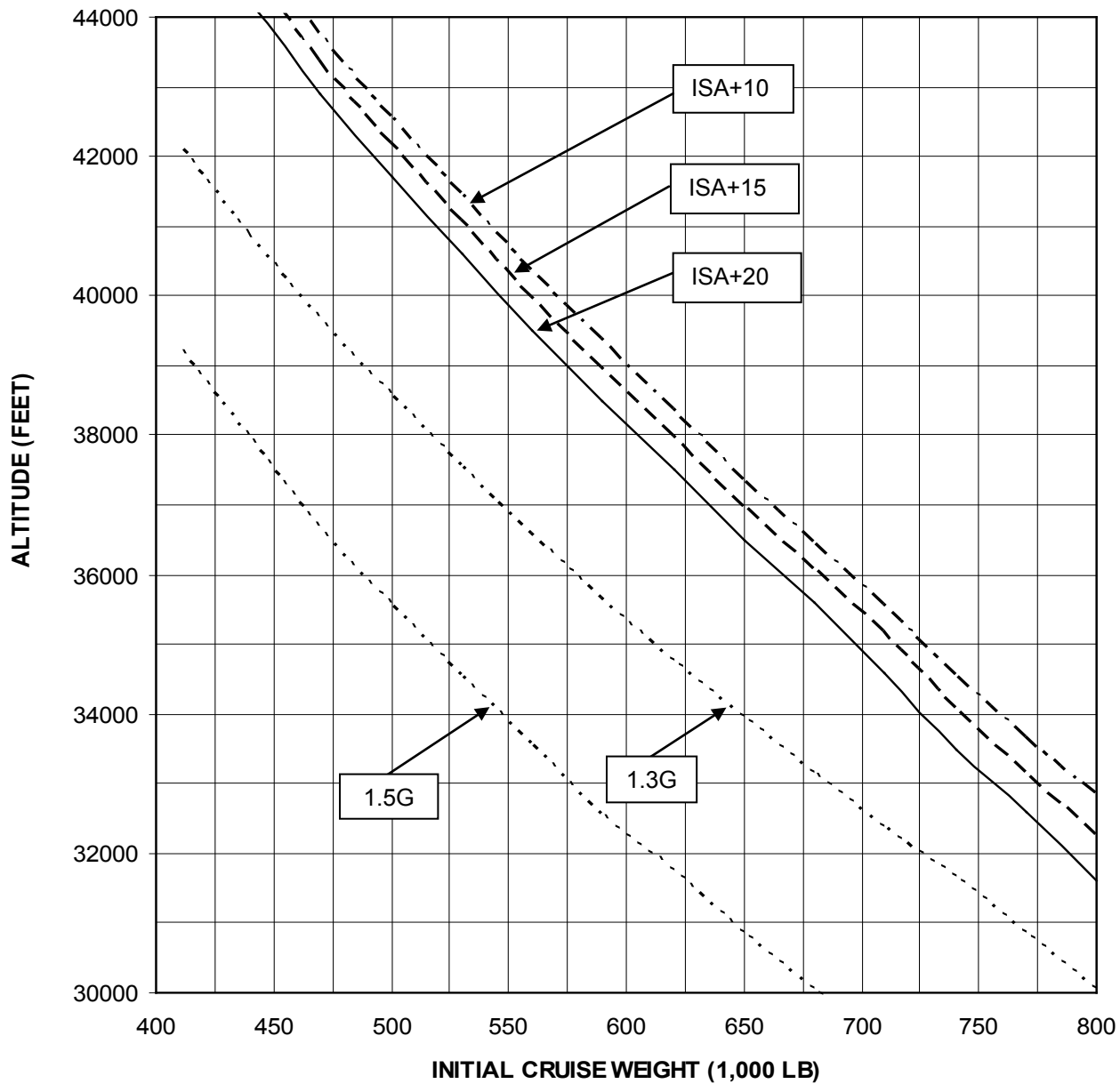
EXAMPLE: Fuel Type of Jet A dispatched at Mach 0.82 and FL 350/370.

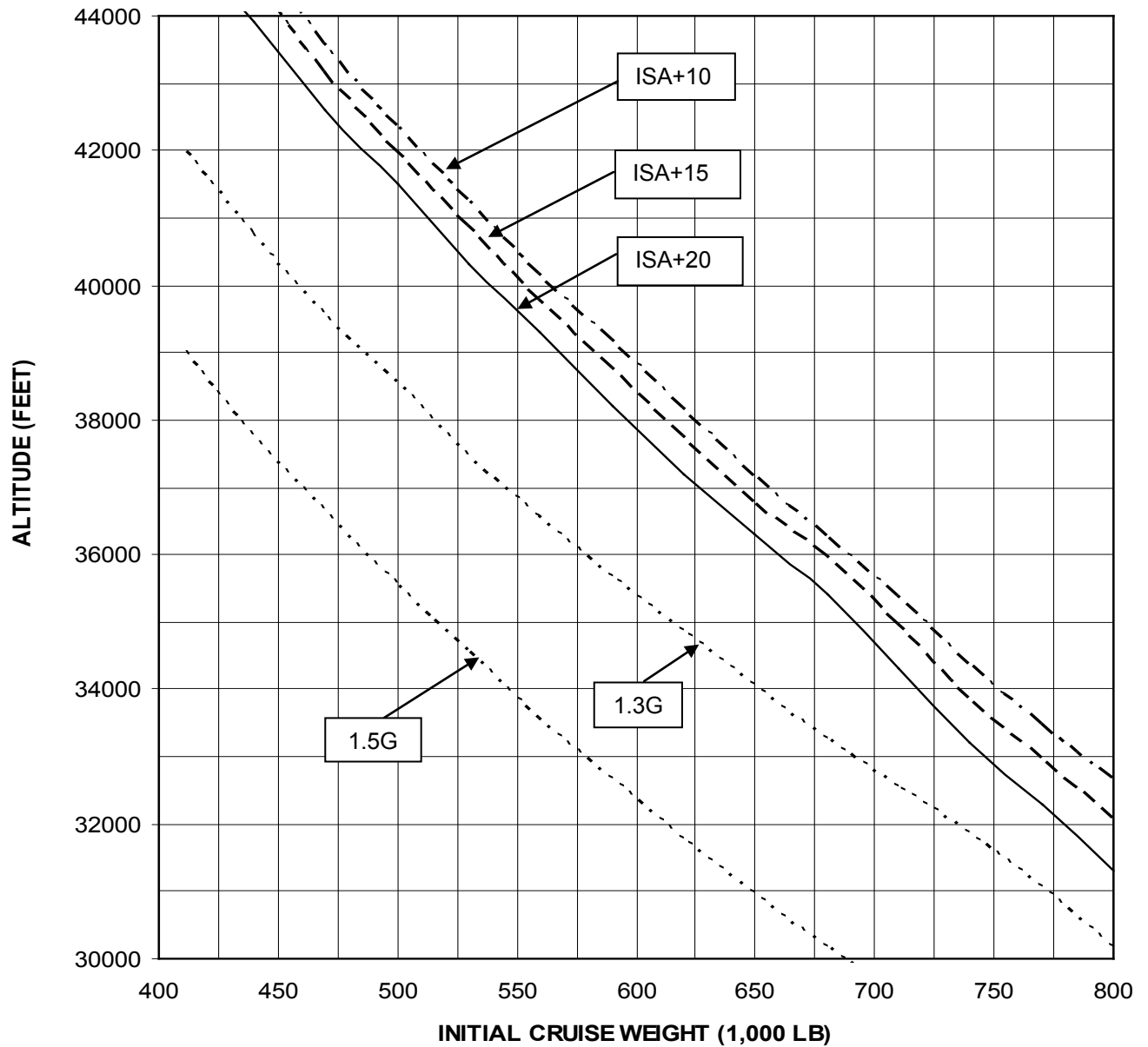
1. Enter the top of the Chart at: Jet A
2. Move vertically down the Chart to the Flight Conditions of Mach 0.82 and FL 350 and FL 370 & HIGHER and read the Limit Standard Day Deviations:

FL 350 - -11°C
 FL 370 & HIGHER - -8°C
3. Do not dispatch aircraft into temperatures colder than Standard -11°C at FL 350 and Standard -8°C at FL 370 and above.

FUEL TYPE	Jet A	JP-5	Jet-A1	TS-1
FREEZE POINT	-40°C	-46°C	-47°C	-60°C

MAXIMUM RECOMMENDED INITIAL CRUISE ALTITUDE**LRC**

MAXIMUM RECOMMENDED INITIAL CRUISE ALTITUDE**.82 MACH**

MAXIMUM RECOMMENDED INITIAL CRUISE ALTITUDE**.83 MACH**

BUFFET ONSET BOUNDARY SPEEDS

KIAS

FLIGHT LEVEL	CRUISE WEIGHT - POUNDS	V _b - M KIAS	G / BANK ANGLE - DEGREES					
			1.0 / 0°		1.30 / 30°		1.5 / 48°	
			LOW	HIGH	LOW	HIGH	LOW	HIGH
430	750	280 -0.84						
	650							
	550		226	256+				
	450		194	256+				
	350		170	256+	198	256+	214	256+
410	750	280 -0.84						
	650							
	550		218	268+				
	450		198	268+	230	268+		
	350		167	268+	197	268+	211	268+
390	750	280 -0.84						
	650		239	279+				
	550		216	279+				
	450		196	279+	223	279+		
	350		163	279+	196	279+	209	279+
370	750	280 -0.84	257	293+				
	650		234	293+				
	550		215	293+	254	293+		
	450		194	293+	222	293+	240	293+
	350		159	293+	193	293+	207	293+
350	750	280 -0.84	253	308+				
	650		233	308+				
	550		213	308+	247	308+		
	450		191	308+	220	308+	238	308+
	350		156	308+	189	308+	205	308+
330	750	280 -0.84	250	320+				
	650		232	320+	270	320+		
	550		210	320+	245	320+	267	320+
	450		187	320+	218	320+	236	320+
	350		157	320+	186	320+	202	320+
310	750	280 -0.84	249	335+	290	335+		
	650		230	335+	267	335+	296	335+
	550		207	335+	243	335+	263	335+
	450		183	335+	215	335+	235	335+
	350		155	335+	183	335+	198	335+

+ NOTE: Buffet Speeds shown with a **following + sign** are higher than the aircraft V_{mo}/M_{mo}.
The displayed speed is V_{mo}/M_{mo}.

 Aircraft is above buffet onset ceiling at this weight and altitude.

End of Section

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DEFINITIONS AND ASSUMPTIONS

V₁ Takeoff Decision Speed	V₁ is the speed that determines the go or no-go decision in the event of an engine failure. No time is allowed after V₁ for reaction or decision. Action must be initiated at or before V₁ . The Federal Aviation Regulations define V₁ 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 rotation of the aircraft to the takeoff pitch attitude. V_R is selected so that, with normal rate of rotation, the aircraft will lift off and attain a height of 35 feet at a speed of V₂ .
V₂ - Takeoff Safety Speed	V₂ is the speed used to achieve the required gradient during the second climb segment (landing gear retracted and flaps in the takeoff position).

NOTE: The following takeoff speeds may only be used with a manual weight data record based on ARM takeoff performance weight limits. They may not be used with takeoff performance weight limits from AWABS. Optimum **V₁** speeds are calculated in AWABS versus Balanced or fixed **V₁** speeds which are to be used for a manual WDR.

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TAKEOFF SPEEDS

DRY RUNWAY 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.

V₁ / V_R / V₂
TO2 / 15
DRY

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & BELOW	20	30	40	50
675,000	8,000	169 / 169 / 169	170 / 170 / 170	172 / 172 / 172	174 / 174 / 174	174 / 174 / 174
	6,000	167 / 167 / 167	168 / 168 / 168	169 / 169 / 169	170 / 170 / 170	172 / 172 / 172
	4,000	166 / 166 / 167	166 / 166 / 167	167 / 167 / 167	169 / 169 / 169	170 / 170 / 170
	2,000	164 / 165 / 166	165 / 165 / 167	166 / 166 / 167	166 / 166 / 166	169 / 169 / 169
	0	162 / 164 / 166	162 / 164 / 166	162 / 164 / 166	165 / 165 / 167	167 / 167 / 167
650,000	8,000	165 / 165 / 165	166 / 166 / 166	168 / 168 / 168	170 / 170 / 170	170 / 170 / 170
	6,000	163 / 163 / 163	164 / 164 / 164	165 / 165 / 165	166 / 166 / 166	167 / 167 / 167
	4,000	162 / 162 / 164	162 / 162 / 164	163 / 163 / 163	165 / 165 / 165	166 / 166 / 166
	2,000	160 / 161 / 163	162 / 162 / 164	162 / 162 / 164	163 / 163 / 163	165 / 165 / 165
	0	159 / 160 / 164	159 / 160 / 164	159 / 160 / 164	162 / 162 / 164	163 / 163 / 163
625,000	8,000	161 / 161 / 161	162 / 162 / 162	163 / 163 / 163	165 / 165 / 165	165 / 165 / 165
	6,000	159 / 159 / 160	160 / 160 / 160	161 / 161 / 161	162 / 162 / 162	163 / 163 / 163
	4,000	158 / 158 / 160	158 / 158 / 160	159 / 159 / 160	161 / 161 / 161	162 / 162 / 162
	2,000	157 / 157 / 160	157 / 157 / 160	157 / 158 / 160	159 / 159 / 160	161 / 161 / 161
	0	156 / 157 / 161	156 / 157 / 161	155 / 157 / 161	157 / 157 / 160	159 / 159 / 160
600,000	8,000	157 / 157 / 157	158 / 158 / 158	159 / 159 / 159	161 / 161 / 161	161 / 161 / 161
	6,000	155 / 155 / 157	156 / 156 / 157	157 / 157 / 157	158 / 158 / 158	159 / 159 / 159
	4,000	154 / 155 / 157	154 / 155 / 157	155 / 155 / 157	157 / 157 / 157	158 / 158 / 158
	2,000	153 / 154 / 157	153 / 154 / 157	153 / 154 / 157	155 / 155 / 157	157 / 157 / 157
	0	152 / 153 / 158	152 / 153 / 158	152 / 153 / 158	153 / 154 / 157	155 / 155 / 157
575,000	8,000	153 / 153 / 154	154 / 154 / 154	155 / 155 / 155	156 / 156 / 156	156 / 156 / 156
	6,000	151 / 152 / 154	152 / 152 / 154	153 / 153 / 154	154 / 154 / 154	155 / 155 / 155
	4,000	150 / 151 / 154	150 / 151 / 154	151 / 151 / 154	153 / 153 / 154	154 / 154 / 154
	2,000	149 / 150 / 154	149 / 150 / 154	149 / 150 / 154	151 / 151 / 154	153 / 153 / 154
	0	148 / 149 / 155	147 / 149 / 155	147 / 149 / 155	149 / 150 / 154	151 / 151 / 154
550,000	8,000	149 / 149 / 151	149 / 149 / 151	151 / 151 / 151	152 / 152 / 152	152 / 152 / 152
	6,000	147 / 148 / 151	147 / 148 / 151	149 / 149 / 151	150 / 150 / 150	150 / 150 / 151
	4,000	146 / 147 / 151	146 / 147 / 151	147 / 147 / 151	149 / 149 / 151	149 / 149 / 150
	2,000	144 / 146 / 151	144 / 146 / 151	145 / 146 / 151	147 / 147 / 151	149 / 149 / 150
	0	143 / 145 / 152	143 / 145 / 152	143 / 145 / 152	145 / 146 / 151	148 / 148 / 151
525,000	8,000	145 / 145 / 147	145 / 145 / 147	146 / 146 / 147	148 / 148 / 148	148 / 148 / 148
	6,000	143 / 144 / 148	143 / 144 / 148	144 / 145 / 147	146 / 146 / 147	146 / 146 / 147
	4,000	141 / 143 / 148	141 / 143 / 148	142 / 144 / 148	144 / 145 / 147	145 / 145 / 147
	2,000	140 / 142 / 148	140 / 142 / 148	140 / 142 / 148	142 / 143 / 148	145 / 145 / 147
	0	139 / 141 / 148	139 / 141 / 148	139 / 141 / 148	140 / 142 / 148	143 / 144 / 147

Limited by either Maximum Brake Energy, Tire Limit Speed, and/or Environmental Envelope.

TAKEOFF SPEEDS

DRY RUNWAY 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.

V₁ / V_R / V₂
TO2 / 15
DRY

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & BELOW	20	30	40	50
500,000	8,000	140 / 141 / 144	141 / 141 / 144	142 / 142 / 144	143 / 143 / 144	143 / 143 / 144
	6,000	138 / 140 / 144	138 / 140 / 144	140 / 141 / 144	141 / 141 / 144	142 / 142 / 144
	4,000	137 / 139 / 145	137 / 139 / 145	138 / 139 / 144	140 / 141 / 144	141 / 141 / 144
	2,000	135 / 138 / 145	135 / 138 / 145	136 / 138 / 145	138 / 139 / 144	141 / 141 / 144
	0	134 / 137 / 145	134 / 137 / 145	134 / 137 / 145	136 / 138 / 145	139 / 140 / 144
475,000	8,000	136 / 137 / 141	136 / 137 / 140	138 / 138 / 140	139 / 139 / 140	139 / 139 / 140
	6,000	134 / 136 / 141	134 / 136 / 141	135 / 136 / 141	137 / 137 / 140	137 / 138 / 140
	4,000	132 / 135 / 141	132 / 135 / 141	133 / 135 / 141	135 / 136 / 141	137 / 137 / 140
	2,000	131 / 134 / 142	131 / 134 / 142	131 / 134 / 141	133 / 135 / 141	136 / 137 / 140
	0	129 / 133 / 142	129 / 133 / 142	129 / 133 / 142	131 / 134 / 141	134 / 136 / 141
450,000	8,000	131 / 133 / 137	131 / 133 / 137	133 / 134 / 137	134 / 134 / 136	134 / 134 / 136
	6,000	129 / 131 / 138	129 / 131 / 137	130 / 132 / 137	132 / 133 / 137	133 / 133 / 137
	4,000	127 / 130 / 138	127 / 130 / 138	128 / 131 / 138	130 / 132 / 137	132 / 133 / 137
	2,000	126 / 130 / 138	126 / 130 / 138	126 / 130 / 138	128 / 131 / 137	131 / 132 / 137
	0	124 / 129 / 138	124 / 129 / 138	124 / 129 / 138	126 / 130 / 138	129 / 131 / 137
425,000	8,000	126 / 128 / 133	126 / 128 / 133	128 / 129 / 133	129 / 130 / 133	129 / 130 / 133
	6,000	124 / 127 / 134	124 / 127 / 134	125 / 128 / 133	127 / 129 / 133	128 / 129 / 133
	4,000	122 / 126 / 134	122 / 126 / 134	123 / 126 / 134	125 / 128 / 133	127 / 128 / 133
	2,000	120 / 125 / 135	120 / 125 / 135	121 / 125 / 134	123 / 126 / 134	126 / 128 / 133
	0	*121 / 124 / 135	*120 / 124 / 135	*120 / 124 / 135	121 / 125 / 134	124 / 127 / 134
400,000	8,000	121 / 123 / 130	121 / 124 / 130	123 / 124 / 129	124 / 125 / 129	124 / 125 / 129
	6,000	118 / 122 / 130	118 / 122 / 130	120 / 123 / 130	122 / 124 / 129	122 / 124 / 129
	4,000	117 / 121 / 130	117 / 121 / 130	118 / 122 / 130	120 / 123 / 130	122 / 124 / 129
	2,000	*118 / 120 / 131	*118 / 120 / 131	*117 / 120 / 131	118 / 122 / 131	122 / 125 / 131
	0	*121 / 122 / 133	*121 / 122 / 133	*120 / 122 / 133	117 / 123 / 133	121 / 126 / 133
375,000	8,000	115 / 118 / 126	115 / 119 / 126	117 / 120 / 125	119 / 120 / 125	119 / 120 / 125
	6,000	113 / 117 / 126	113 / 117 / 126	114 / 118 / 126	117 / 120 / 126	117 / 120 / 126
	4,000	*115 / 118 / 128	*114 / 118 / 128	114 / 119 / 128	117 / 121 / 128	119 / 122 / 128
	2,000	*118 / 120 / 131	*118 / 120 / 131	*117 / 120 / 131	116 / 122 / 131	120 / 125 / 131
	0	*121 / 122 / 133	*121 / 122 / 133	*121 / 122 / 133	*117 / 123 / 133	119 / 126 / 133
350,000	8,000	111 / 115 / 123	111 / 116 / 123	113 / 117 / 123	115 / 118 / 123	115 / 118 / 123
	6,000	*111 / 117 / 126	*111 / 117 / 126	112 / 118 / 126	114 / 120 / 126	115 / 120 / 126
	4,000	*115 / 118 / 128	*115 / 118 / 128	*112 / 119 / 128	114 / 121 / 128	116 / 122 / 128
	2,000	*118 / 120 / 131	*118 / 120 / 131	*117 / 120 / 131	113 / 122 / 131	118 / 125 / 131
	0	*122 / 122 / 133	*121 / 122 / 133	*121 / 122 / 133	*117 / 123 / 133	117 / 126 / 133

* V₁ set by Vmcg



Limited by either Maximum Brake Energy, Tire Limit Speed, and/or Environmental Envelope.

TAKEOFF SPEEDS

DRY RUNWAY 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.

V₁ / V_R / V₂
TO2 / 5
DRY

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & BELOW	20	30	40	50
675,000	8,000	175 / 176 / 176	171 / 177 / 177	168 / 177 / 177	165 / 178 / 178	165 / 178 / 178
	6,000	174 / 175 / 175	174 / 175 / 175	175 / 176 / 176	173 / 177 / 177	172 / 177 / 177
	4,000	173 / 174 / 174	172 / 174 / 174	173 / 175 / 175	176 / 176 / 176	176 / 176 / 176
	2,000	172 / 173 / 174	171 / 173 / 174	171 / 174 / 174	173 / 174 / 174	176 / 176 / 176
	0	170 / 173 / 174	170 / 173 / 174	170 / 173 / 174	171 / 173 / 174	174 / 175 / 175
650,000	8,000	172 / 172 / 172	172 / 173 / 173	172 / 173 / 173	170 / 174 / 174	169 / 174 / 174
	6,000	170 / 171 / 171	170 / 172 / 172	171 / 172 / 172	173 / 173 / 173	173 / 173 / 173
	4,000	169 / 171 / 171	169 / 171 / 171	170 / 171 / 171	172 / 172 / 172	173 / 173 / 173
	2,000	168 / 170 / 171	168 / 170 / 171	168 / 170 / 171	170 / 171 / 171	172 / 172 / 172
	0	167 / 169 / 171	167 / 169 / 171	167 / 169 / 171	168 / 170 / 171	171 / 171 / 171
625,000	8,000	168 / 169 / 169	169 / 169 / 169	170 / 170 / 170	170 / 170 / 170	170 / 170 / 170
	6,000	167 / 168 / 168	167 / 168 / 168	168 / 168 / 168	169 / 169 / 169	169 / 169 / 169
	4,000	166 / 167 / 168	165 / 167 / 168	166 / 167 / 168	168 / 168 / 168	169 / 169 / 169
	2,000	165 / 166 / 168	164 / 166 / 168	164 / 166 / 167	166 / 167 / 167	168 / 168 / 168
	0	164 / 165 / 168	163 / 165 / 168	163 / 165 / 168	165 / 166 / 167	167 / 167 / 167
600,000	8,000	165 / 165 / 165	165 / 165 / 165	166 / 166 / 166	166 / 166 / 166	166 / 166 / 166
	6,000	163 / 164 / 164	163 / 164 / 164	164 / 165 / 165	165 / 165 / 165	166 / 166 / 166
	4,000	162 / 163 / 164	162 / 163 / 164	163 / 163 / 164	164 / 164 / 164	165 / 165 / 165
	2,000	161 / 162 / 164	161 / 162 / 164	161 / 162 / 164	163 / 163 / 164	165 / 165 / 165
	0	160 / 161 / 165	160 / 161 / 165	160 / 161 / 165	161 / 162 / 164	164 / 164 / 164
575,000	8,000	161 / 161 / 161	161 / 161 / 161	162 / 162 / 162	162 / 162 / 162	162 / 162 / 162
	6,000	160 / 160 / 161	160 / 160 / 161	161 / 161 / 161	161 / 161 / 161	162 / 162 / 162
	4,000	158 / 159 / 161	158 / 159 / 161	159 / 160 / 161	161 / 161 / 161	161 / 161 / 161
	2,000	157 / 158 / 161	157 / 158 / 161	157 / 158 / 161	159 / 159 / 161	161 / 161 / 161
	0	155 / 157 / 161	155 / 157 / 161	155 / 157 / 161	157 / 158 / 161	160 / 160 / 161
550,000	8,000	157 / 157 / 157	157 / 157 / 157	158 / 158 / 158	158 / 158 / 158	159 / 159 / 159
	6,000	155 / 156 / 158	155 / 156 / 157	156 / 157 / 157	157 / 157 / 157	158 / 158 / 158
	4,000	154 / 155 / 158	153 / 155 / 158	155 / 155 / 158	156 / 156 / 157	157 / 157 / 157
	2,000	152 / 154 / 158	152 / 154 / 158	152 / 154 / 158	155 / 155 / 157	157 / 157 / 157
	0	151 / 153 / 158	151 / 153 / 158	151 / 153 / 158	152 / 154 / 158	155 / 156 / 157
525,000	8,000	152 / 153 / 154	153 / 153 / 154	154 / 154 / 154	154 / 154 / 154	154 / 154 / 154
	6,000	150 / 152 / 154	151 / 152 / 154	152 / 152 / 154	153 / 153 / 154	154 / 154 / 154
	4,000	149 / 151 / 154	149 / 151 / 154	150 / 151 / 154	152 / 152 / 154	153 / 153 / 154
	2,000	147 / 150 / 155	147 / 150 / 155	148 / 150 / 155	150 / 151 / 154	153 / 153 / 154
	0	146 / 149 / 155	146 / 149 / 155	146 / 149 / 155	148 / 150 / 155	151 / 152 / 154

Limited by either Maximum Brake Energy, Tire Limit Speed, and/or Environmental Envelope.

TAKEOFF SPEEDS

DRY RUNWAY 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.

V₁ / V_R / V₂
TO2 / 5
DRY

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & BELOW	20	30	40	50
500,000	8,000	148 / 149 / 150	148 / 149 / 150	150 / 150 / 150	150 / 150 / 150	150 / 150 / 150
	6,000	146 / 147 / 151	146 / 148 / 151	147 / 148 / 150	149 / 149 / 150	149 / 149 / 150
	4,000	144 / 146 / 151	144 / 147 / 151	145 / 147 / 151	147 / 148 / 150	149 / 149 / 150
	2,000	143 / 146 / 151	143 / 146 / 151	143 / 146 / 151	145 / 147 / 151	148 / 149 / 150
	0	141 / 145 / 152	141 / 145 / 152	141 / 145 / 152	143 / 146 / 151	146 / 147 / 151
475,000	8,000	143 / 144 / 147	143 / 145 / 147	145 / 145 / 146	146 / 146 / 146	146 / 146 / 146
	6,000	141 / 143 / 147	141 / 143 / 147	142 / 144 / 147	144 / 145 / 146	145 / 145 / 146
	4,000	139 / 142 / 148	139 / 142 / 148	140 / 143 / 147	142 / 144 / 147	144 / 145 / 147
	2,000	138 / 141 / 148	138 / 141 / 148	138 / 141 / 148	140 / 143 / 147	144 / 144 / 147
	0	136 / 140 / 148	136 / 140 / 148	136 / 140 / 148	138 / 141 / 148	141 / 143 / 147
450,000	8,000	138 / 140 / 143	138 / 140 / 143	140 / 141 / 143	141 / 141 / 142	141 / 142 / 142
	6,000	136 / 138 / 144	136 / 139 / 144	137 / 139 / 143	139 / 140 / 143	140 / 141 / 143
	4,000	134 / 137 / 144	134 / 138 / 144	135 / 138 / 144	137 / 139 / 143	139 / 140 / 143
	2,000	132 / 137 / 144	132 / 137 / 144	133 / 137 / 144	135 / 138 / 144	139 / 140 / 143
	0	131 / 136 / 145	131 / 136 / 145	131 / 136 / 145	133 / 137 / 144	136 / 138 / 143
425,000	8,000	133 / 135 / 139	133 / 135 / 139	135 / 136 / 139	136 / 137 / 139	136 / 137 / 139
	6,000	130 / 134 / 140	130 / 134 / 140	132 / 135 / 139	134 / 136 / 139	134 / 136 / 139
	4,000	129 / 133 / 140	129 / 133 / 140	130 / 133 / 140	132 / 134 / 139	134 / 135 / 139
	2,000	127 / 132 / 141	127 / 132 / 141	127 / 132 / 140	130 / 133 / 140	133 / 135 / 139
	0	126 / 131 / 141	125 / 131 / 141	125 / 131 / 141	127 / 132 / 140	131 / 134 / 140
400,000	8,000	127 / 130 / 136	128 / 130 / 135	129 / 131 / 135	131 / 132 / 135	131 / 132 / 135
	6,000	125 / 129 / 136	125 / 129 / 136	126 / 130 / 136	129 / 131 / 135	129 / 131 / 135
	4,000	123 / 128 / 136	123 / 128 / 136	124 / 128 / 136	127 / 130 / 136	128 / 130 / 135
	2,000	121 / 127 / 137	121 / 127 / 137	122 / 127 / 137	124 / 128 / 136	128 / 130 / 135
	0	*122 / 126 / 137	*122 / 126 / 137	*121 / 126 / 137	122 / 127 / 137	125 / 129 / 136
375,000	8,000	121 / 125 / 131	122 / 125 / 131	124 / 126 / 131	125 / 127 / 131	125 / 127 / 131
	6,000	119 / 124 / 132	119 / 124 / 132	121 / 125 / 132	123 / 126 / 131	123 / 126 / 131
	4,000	118 / 123 / 132	118 / 123 / 132	118 / 123 / 132	121 / 124 / 131	123 / 125 / 131
	2,000	*119 / 122 / 133	*119 / 122 / 133	*118 / 122 / 133	118 / 123 / 132	122 / 125 / 131
	0	*122 / 122 / 134	*122 / 122 / 134	*122 / 122 / 134	*118 / 122 / 133	120 / 124 / 132
350,000	8,000	115 / 120 / 127	116 / 120 / 127	118 / 121 / 127	119 / 122 / 126	119 / 122 / 126
	6,000	114 / 118 / 128	113 / 118 / 128	115 / 119 / 127	117 / 120 / 127	117 / 121 / 127
	4,000	*116 / 118 / 129	*116 / 118 / 129	114 / 118 / 128	115 / 119 / 127	117 / 120 / 127
	2,000	*119 / 119 / 131	*119 / 119 / 131	*118 / 119 / 130	114 / 118 / 128	116 / 120 / 127
	0	*123 / 123 / 135	*122 / 122 / 135	*122 / 122 / 134	*119 / 119 / 130	114 / 118 / 128

* V₁ set by Vmcg

TAKEOFF SPEEDS

DRY RUNWAY 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.

**V₁ / V_R / V₂
TO / 15
DRY**

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & BELOW	20	30	40	50
775,000	8,000	174 / 179 / 179	174 / 179 / 179	179 / 181 / 181	183 / 183 / 183	183 / 183 / 183
	6,000	171 / 177 / 178	171 / 177 / 178	173 / 178 / 178	180 / 181 / 181	180 / 181 / 181
	4,000	167 / 173 / 176	167 / 173 / 176	170 / 176 / 178	173 / 178 / 178	176 / 180 / 180
	2,000	166 / 173 / 176	165 / 173 / 176	166 / 173 / 176	171 / 176 / 178	175 / 179 / 179
	0	165 / 172 / 176	165 / 172 / 176	164 / 172 / 176	166 / 173 / 176	172 / 177 / 178
750,000	8,000	170 / 175 / 176	171 / 176 / 176	175 / 177 / 177	179 / 179 / 179	179 / 179 / 179
	6,000	168 / 174 / 176	168 / 174 / 176	169 / 175 / 175	176 / 177 / 177	176 / 177 / 177
	4,000	166 / 172 / 175	166 / 172 / 175	167 / 173 / 175	170 / 175 / 175	173 / 176 / 176
	2,000	165 / 171 / 176	164 / 171 / 176	164 / 171 / 175	168 / 173 / 175	172 / 175 / 175
	0	164 / 171 / 176	164 / 171 / 176	163 / 171 / 176	165 / 172 / 175	169 / 174 / 175
725,000	8,000	167 / 172 / 173	167 / 172 / 173	171 / 174 / 174	176 / 176 / 176	176 / 176 / 176
	6,000	165 / 170 / 173	165 / 170 / 173	166 / 171 / 173	172 / 173 / 173	172 / 174 / 174
	4,000	163 / 169 / 173	163 / 169 / 173	164 / 170 / 173	167 / 171 / 172	169 / 173 / 173
	2,000	162 / 168 / 173	162 / 168 / 173	162 / 168 / 173	165 / 170 / 172	169 / 172 / 172
	0	161 / 167 / 173	161 / 167 / 173	161 / 168 / 173	163 / 168 / 173	166 / 170 / 172
700,000	8,000	164 / 168 / 170	164 / 168 / 170	168 / 170 / 170	172 / 172 / 172	172 / 172 / 172
	6,000	162 / 167 / 170	162 / 167 / 170	163 / 168 / 170	168 / 169 / 170	168 / 170 / 170
	4,000	160 / 166 / 170	160 / 166 / 170	161 / 166 / 170	164 / 168 / 170	166 / 169 / 169
	2,000	159 / 165 / 170	159 / 165 / 170	159 / 165 / 170	162 / 166 / 170	165 / 168 / 169
	0	158 / 164 / 171	158 / 164 / 171	158 / 164 / 171	160 / 165 / 170	163 / 167 / 169
675,000	8,000	161 / 164 / 167	161 / 165 / 167	164 / 166 / 167	168 / 168 / 168	168 / 168 / 168
	6,000	159 / 163 / 167	158 / 163 / 167	160 / 164 / 167	164 / 166 / 167	165 / 166 / 166
	4,000	157 / 162 / 167	157 / 162 / 167	158 / 163 / 167	161 / 164 / 167	163 / 165 / 166
	2,000	156 / 161 / 168	156 / 161 / 168	156 / 162 / 168	159 / 163 / 167	162 / 165 / 166
	0	155 / 161 / 168	155 / 161 / 168	155 / 161 / 168	157 / 162 / 167	160 / 163 / 167
650,000	8,000	157 / 161 / 164	158 / 161 / 164	160 / 162 / 164	164 / 164 / 164	164 / 164 / 164
	6,000	155 / 160 / 164	155 / 160 / 164	157 / 161 / 164	160 / 162 / 164	161 / 162 / 163
	4,000	154 / 159 / 165	154 / 159 / 165	155 / 159 / 164	157 / 161 / 164	159 / 162 / 163
	2,000	153 / 158 / 165	153 / 158 / 165	153 / 158 / 165	156 / 159 / 164	159 / 161 / 163
	0	152 / 157 / 165	152 / 157 / 165	152 / 157 / 165	153 / 158 / 165	157 / 160 / 164
625,000	8,000	154 / 157 / 161	155 / 158 / 161	157 / 159 / 160	160 / 160 / 160	160 / 160 / 160
	6,000	152 / 156 / 161	152 / 156 / 161	154 / 157 / 161	157 / 158 / 160	157 / 158 / 160
	4,000	151 / 155 / 162	151 / 155 / 162	152 / 156 / 161	154 / 157 / 161	156 / 158 / 160
	2,000	150 / 154 / 162	149 / 154 / 162	150 / 154 / 162	152 / 156 / 161	156 / 157 / 160
	0	148 / 153 / 162	148 / 153 / 162	148 / 153 / 162	150 / 154 / 162	154 / 156 / 161

TAKEOFF SPEEDS

DRY RUNWAY 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.

V₁ / V_R / V₂
TO / 15
DRY

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & BELOW	20	30	40	50
600,000	8,000	151 / 154 / 158	151 / 154 / 158	153 / 155 / 157	156 / 156 / 157	156 / 156 / 157
	6,000	149 / 152 / 158	149 / 152 / 158	150 / 153 / 158	153 / 154 / 157	153 / 155 / 157
	4,000	147 / 151 / 159	147 / 151 / 159	148 / 152 / 158	151 / 153 / 158	153 / 154 / 157
	2,000	146 / 150 / 159	145 / 150 / 159	146 / 151 / 159	149 / 152 / 158	152 / 154 / 157
	0	144 / 150 / 159	144 / 150 / 159	144 / 150 / 159	146 / 151 / 159	150 / 152 / 158
575,000	8,000	147 / 150 / 155	147 / 150 / 155	149 / 151 / 154	151 / 152 / 154	151 / 152 / 154
	6,000	144 / 148 / 155	145 / 149 / 155	146 / 149 / 155	149 / 151 / 154	149 / 151 / 154
	4,000	143 / 147 / 156	143 / 147 / 156	144 / 148 / 155	147 / 149 / 155	149 / 150 / 154
	2,000	141 / 146 / 156	141 / 147 / 156	141 / 147 / 156	144 / 148 / 155	148 / 150 / 154
	0	140 / 146 / 156	140 / 146 / 156	140 / 146 / 156	142 / 147 / 156	146 / 149 / 155
550,000	8,000	143 / 146 / 152	143 / 146 / 152	145 / 147 / 151	147 / 148 / 151	147 / 148 / 151
	6,000	140 / 145 / 152	140 / 145 / 152	142 / 146 / 152	144 / 147 / 151	145 / 147 / 151
	4,000	138 / 144 / 153	138 / 144 / 153	139 / 144 / 152	142 / 146 / 152	144 / 147 / 151
	2,000	137 / 143 / 153	137 / 143 / 153	137 / 143 / 153	140 / 144 / 152	144 / 146 / 151
	0	135 / 142 / 153	135 / 142 / 153	135 / 142 / 153	137 / 143 / 153	141 / 145 / 152
525,000	8,000	138 / 142 / 149	139 / 142 / 148	141 / 143 / 148	142 / 144 / 148	143 / 144 / 148
	6,000	136 / 141 / 149	136 / 141 / 149	138 / 142 / 149	140 / 143 / 148	141 / 143 / 148
	4,000	134 / 140 / 149	134 / 140 / 149	135 / 140 / 149	138 / 142 / 149	140 / 143 / 148
	2,000	132 / 139 / 150	132 / 139 / 150	132 / 139 / 150	136 / 140 / 149	139 / 142 / 148
	0	*134 / 138 / 150	*134 / 138 / 150	*134 / 138 / 150	133 / 139 / 150	137 / 141 / 149
500,000	8,000	133 / 138 / 145	134 / 138 / 145	136 / 139 / 145	138 / 140 / 144	138 / 140 / 144
	6,000	131 / 136 / 146	131 / 137 / 146	133 / 137 / 145	135 / 139 / 145	136 / 139 / 145
	4,000	129 / 135 / 146	129 / 135 / 146	130 / 136 / 146	133 / 138 / 145	135 / 139 / 145
	2,000	*131 / 134 / 147	*131 / 134 / 147	*130 / 135 / 146	131 / 136 / 146	135 / 138 / 145
	0	*134 / 134 / 147	*134 / 134 / 147	*134 / 134 / 147	*130 / 135 / 146	132 / 137 / 145
475,000	8,000	129 / 134 / 142	129 / 134 / 142	131 / 135 / 141	133 / 136 / 143	134 / 136 / 143
	6,000	126 / 132 / 143	126 / 132 / 143	128 / 133 / 142	131 / 135 / 142	132 / 135 / 141
	4,000	*128 / 131 / 143	*127 / 131 / 143	126 / 132 / 143	129 / 133 / 142	131 / 135 / 142
	2,000	*131 / 131 / 143	*131 / 131 / 143	*130 / 130 / 143	126 / 132 / 143	130 / 134 / 142
	0	*134 / 134 / 145	*134 / 134 / 144	*134 / 134 / 144	*130 / 131 / 143	128 / 133 / 142
450,000	8,000	124 / 130 / 139	125 / 130 / 139	127 / 131 / 138	129 / 132 / 141	129 / 132 / 141
	6,000	*124 / 128 / 139	*123 / 128 / 139	124 / 129 / 139	126 / 131 / 138	127 / 131 / 138
	4,000	*127 / 127 / 140	*127 / 127 / 140	*125 / 128 / 139	124 / 129 / 139	126 / 130 / 138
	2,000	*131 / 131 / 140	*131 / 131 / 140	*130 / 130 / 140	*124 / 128 / 139	126 / 130 / 138
	0	*135 / 135 / 142	*135 / 135 / 142	*134 / 134 / 141	*130 / 130 / 140	123 / 129 / 139

* V₁ set by Vmcg

TAKEOFF SPEEDS

DRY RUNWAY 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.

V₁ / V_R / V₂
TO / 5
DRY

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & BELOW	20	30	40	50
775,000	8,000	157 / 189 / 189	152 / 189 / 189	148 / 191 / 191	145 / 192 / 192	144 / 192 / 192
	6,000	165 / 187 / 187	162 / 187 / 187	158 / 188 / 188	155 / 189 / 189	154 / 190 / 190
	4,000	173 / 183 / 184	169 / 185 / 186	165 / 186 / 186	163 / 187 / 187	161 / 188 / 188
	2,000	174 / 182 / 184	174 / 182 / 184	172 / 182 / 184	170 / 186 / 186	168 / 188 / 188
	0	173 / 181 / 184	173 / 181 / 184	173 / 181 / 184	175 / 182 / 184	175 / 184 / 184
750,000	8,000	161 / 185 / 185	156 / 185 / 185	153 / 187 / 187	149 / 188 / 188	149 / 188 / 188
	6,000	169 / 183 / 183	165 / 183 / 183	162 / 184 / 184	159 / 185 / 185	158 / 186 / 186
	4,000	174 / 181 / 183	172 / 182 / 183	169 / 182 / 183	167 / 184 / 184	165 / 185 / 185
	2,000	172 / 180 / 183	172 / 180 / 183	172 / 180 / 183	174 / 182 / 183	172 / 184 / 184
	0	172 / 179 / 183	171 / 179 / 183	171 / 179 / 183	173 / 180 / 183	177 / 182 / 182
725,000	8,000	164 / 181 / 181	160 / 182 / 182	157 / 183 / 183	153 / 184 / 184	153 / 184 / 184
	6,000	172 / 179 / 180	169 / 180 / 180	166 / 181 / 181	163 / 182 / 182	162 / 182 / 182
	4,000	171 / 178 / 181	171 / 178 / 181	172 / 179 / 180	171 / 180 / 180	169 / 181 / 181
	2,000	170 / 177 / 181	170 / 177 / 181	170 / 177 / 181	173 / 179 / 180	175 / 181 / 181
	0	169 / 176 / 181	169 / 177 / 181	168 / 177 / 181	171 / 178 / 180	175 / 179 / 180
700,000	8,000	168 / 178 / 178	164 / 178 / 178	161 / 179 / 179	158 / 180 / 180	158 / 180 / 180
	6,000	170 / 176 / 177	169 / 176 / 177	170 / 177 / 177	167 / 178 / 178	166 / 178 / 178
	4,000	168 / 175 / 178	168 / 175 / 178	169 / 175 / 177	172 / 177 / 177	173 / 177 / 177
	2,000	167 / 174 / 178	167 / 174 / 178	167 / 174 / 178	170 / 175 / 177	173 / 177 / 177
	0	166 / 173 / 178	166 / 173 / 178	165 / 173 / 178	168 / 174 / 178	171 / 176 / 177
675,000	8,000	169 / 174 / 174	168 / 174 / 174	165 / 175 / 175	163 / 176 / 176	162 / 176 / 176
	6,000	166 / 172 / 175	166 / 172 / 174	168 / 173 / 174	171 / 174 / 174	170 / 174 / 174
	4,000	165 / 171 / 175	165 / 171 / 175	166 / 172 / 175	169 / 173 / 174	171 / 174 / 174
	2,000	164 / 170 / 175	163 / 170 / 175	163 / 170 / 175	167 / 172 / 174	170 / 173 / 174
	0	163 / 169 / 175	163 / 169 / 175	162 / 169 / 175	164 / 170 / 175	168 / 172 / 174
650,000	8,000	165 / 170 / 171	166 / 170 / 171	168 / 171 / 171	167 / 172 / 172	167 / 172 / 172
	6,000	163 / 168 / 172	163 / 168 / 171	165 / 169 / 171	167 / 170 / 171	168 / 171 / 171
	4,000	162 / 167 / 172	161 / 167 / 172	162 / 168 / 172	165 / 169 / 171	167 / 170 / 171
	2,000	160 / 166 / 172	160 / 166 / 172	160 / 167 / 172	163 / 168 / 171	167 / 170 / 171
	0	160 / 165 / 172	159 / 165 / 172	159 / 166 / 172	161 / 167 / 172	165 / 168 / 171
625,000	8,000	162 / 166 / 168	162 / 166 / 168	164 / 167 / 168	166 / 168 / 168	166 / 168 / 168
	6,000	160 / 164 / 168	160 / 165 / 168	161 / 165 / 168	164 / 167 / 168	164 / 167 / 168
	4,000	158 / 163 / 169	158 / 163 / 169	159 / 164 / 169	162 / 165 / 168	164 / 166 / 168
	2,000	157 / 162 / 169	157 / 162 / 169	157 / 163 / 169	160 / 164 / 168	163 / 166 / 168
	0	156 / 162 / 169	156 / 162 / 169	156 / 162 / 169	158 / 163 / 169	161 / 165 / 168

Limited by either Maximum Brake Energy, Tire Limit Speed, and/or Environmental Envelope.

TAKEOFF SPEEDS

DRY RUNWAY 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.

V₁ / V_R / V₂
TO / 5
DRY

TAKEOFF WEIGHT LBS	AIRPORT PRESSURE ALTITUDE FT	AMBIENT TEMPERATURE - °C				
		10 & BELOW	20	30	40	50
600,000	8,000	159 / 162 / 165	159 / 162 / 165	161 / 163 / 164	163 / 164 / 164	163 / 164 / 164
	6,000	156 / 161 / 165	156 / 161 / 165	158 / 162 / 165	160 / 163 / 164	161 / 163 / 164
	4,000	155 / 160 / 166	155 / 160 / 166	156 / 160 / 165	158 / 162 / 165	160 / 163 / 164
	2,000	153 / 158 / 166	153 / 159 / 166	154 / 159 / 166	157 / 160 / 165	160 / 162 / 164
	0	152 / 158 / 166	152 / 158 / 166	152 / 158 / 166	154 / 159 / 166	158 / 161 / 165
575,000	8,000	155 / 158 / 162	155 / 158 / 162	157 / 159 / 161	159 / 160 / 161	159 / 160 / 161
	6,000	152 / 157 / 162	152 / 157 / 162	154 / 158 / 162	157 / 159 / 161	157 / 159 / 161
	4,000	150 / 155 / 163	150 / 155 / 163	152 / 156 / 162	155 / 158 / 162	157 / 159 / 161
	2,000	149 / 154 / 163	149 / 154 / 163	149 / 155 / 163	152 / 156 / 162	156 / 158 / 161
	0	148 / 154 / 163	147 / 154 / 163	147 / 154 / 163	150 / 155 / 163	154 / 157 / 162
550,000	8,000	150 / 154 / 158	151 / 154 / 158	153 / 155 / 158	155 / 156 / 158	155 / 156 / 158
	6,000	148 / 152 / 159	148 / 153 / 159	150 / 153 / 159	152 / 155 / 158	153 / 155 / 158
	4,000	146 / 151 / 159	146 / 151 / 159	147 / 152 / 159	150 / 153 / 158	152 / 154 / 158
	2,000	144 / 150 / 160	144 / 150 / 160	144 / 151 / 160	148 / 152 / 159	151 / 154 / 158
	0	143 / 149 / 160	143 / 149 / 160	143 / 150 / 160	145 / 151 / 159	149 / 153 / 159
525,000	8,000	146 / 150 / 155	146 / 150 / 155	148 / 151 / 155	150 / 152 / 154	150 / 152 / 154
	6,000	143 / 148 / 156	143 / 148 / 156	145 / 149 / 155	148 / 151 / 155	148 / 151 / 155
	4,000	141 / 147 / 156	141 / 147 / 156	142 / 148 / 156	145 / 149 / 155	147 / 150 / 155
	2,000	139 / 146 / 156	139 / 146 / 156	140 / 146 / 156	143 / 148 / 156	147 / 150 / 155
	0	138 / 145 / 157	138 / 145 / 157	138 / 145 / 157	140 / 146 / 156	144 / 148 / 155
500,000	8,000	141 / 145 / 152	141 / 146 / 152	144 / 147 / 151	146 / 148 / 151	146 / 148 / 151
	6,000	138 / 144 / 152	138 / 144 / 152	140 / 145 / 152	143 / 146 / 151	143 / 147 / 151
	4,000	136 / 143 / 153	136 / 143 / 153	137 / 143 / 152	140 / 145 / 152	143 / 146 / 151
	2,000	134 / 142 / 153	134 / 142 / 153	135 / 142 / 153	138 / 144 / 152	142 / 146 / 151
	0	*135 / 141 / 153	*135 / 141 / 153	*135 / 141 / 153	135 / 142 / 153	139 / 144 / 152
475,000	8,000	136 / 141 / 148	136 / 141 / 148	139 / 142 / 148	141 / 143 / 147	141 / 143 / 147
	6,000	133 / 139 / 149	133 / 139 / 149	135 / 141 / 148	138 / 142 / 148	138 / 142 / 148
	4,000	131 / 138 / 149	131 / 138 / 149	132 / 139 / 149	135 / 141 / 148	138 / 142 / 148
	2,000	*132 / 137 / 150	*132 / 137 / 150	*131 / 137 / 150	133 / 139 / 149	137 / 141 / 148
	0	*136 / 137 / 150	*135 / 137 / 150	*135 / 137 / 150	*131 / 137 / 149	134 / 140 / 148
450,000	8,000	131 / 136 / 145	131 / 137 / 145	133 / 138 / 144	136 / 139 / 144	136 / 139 / 144
	6,000	128 / 135 / 145	128 / 135 / 145	130 / 136 / 145	133 / 137 / 144	133 / 138 / 144
	4,000	*129 / 134 / 146	*129 / 134 / 146	128 / 134 / 145	130 / 136 / 145	132 / 137 / 144
	2,000	*133 / 134 / 147	*133 / 133 / 147	*132 / 133 / 146	128 / 134 / 145	132 / 137 / 144
	0	*136 / 136 / 150	*136 / 136 / 150	*136 / 136 / 150	*131 / 133 / 146	129 / 135 / 145

* V₁ set by V_{mcg}

TAKEOFF STABILIZER SETTINGS

(UNITS AIRPLANE NOSE UP)

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.

FLAPS 5 TO2 THRUST

GROSS WEIGHT LBS	CENTER OF GRAVITY PERCENT M.A.C.								
	14.0	16.0	24.0	29.0	34.0	39.0	41.0	43.0	44.0
780,000	10.75	10.25	7.75	6.25	4.75	3.25	3.25	3.00	2.75
750,000	10.25	9.75	7.25	6.00	4.50	3.25	3.00	2.75	2.75
700,000	9.75	9.25	7.00	5.50	4.25	3.00	2.75	2.75	2.50
650,000	9.50	9.00	6.50	5.00	3.75	2.75	2.75	2.50	2.50
600,000	9.25	8.50	6.25	4.75	3.25	2.50	2.50	2.25	2.25
550,000	8.50	8.00	5.75	4.25	2.75	2.50	2.25	2.25	2.00
500,000	7.75	7.25	5.00	3.50	2.75	2.25	2.25	2.00	2.00
450,000	6.75	6.25	4.25	3.00	2.50	2.25	2.25	2.00	2.00
400,000	5.00	4.75	3.25	2.75	2.50	2.00	2.00	1.75	1.75
340,000	3.75	3.50	2.50	2.25	2.00	1.75	1.50	1.50	1.50

FLAPS 15 TO2 THRUST

GROSS WEIGHT LBS	CENTER OF GRAVITY – PERCENT M.A.C.								
	14.0	16.0	24.0	29.0	34.0	39.0	41.0	43.0	44.0
780,000	11.25	10.75	8.25	6.75	5.25	3.50	3.25	3.00	3.00
750,000	11.00	10.25	7.75	6.50	5.00	3.25	3.25	3.00	2.75
700,000	10.25	9.75	7.50	6.25	4.50	3.25	3.00	2.75	2.75
650,000	9.75	9.25	7.00	5.75	4.25	3.00	2.75	2.75	2.50
600,000	9.00	8.50	6.50	5.25	3.75	2.75	2.75	2.50	2.50
550,000	8.25	7.75	5.50	4.25	3.00	2.50	2.25	2.25	2.00
500,000	7.50	7.00	4.75	3.50	2.75	2.25	2.25	2.00	2.00
450,000	6.50	6.00	4.25	2.75	2.50	2.25	2.00	2.00	1.75
400,000	5.50	5.00	3.50	2.50	2.25	2.00	1.75	1.75	1.75
340,000	3.75	3.50	2.75	2.25	2.00	1.75	1.75	1.50	1.50

TAKEOFF STABILIZER SETTINGS

(UNITS AIRPLANE NOSE UP)

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.

FLAPS 20
TO2 THRUST

GROSS WEIGHT LBS	CENTER OF GRAVITY – PERCENT M.A.C.								
	14.0	16.0	24.0	29.0	34.0	39.0	41.0	43.0	44.0
780,000	11.50	11.75	8.75	7.25	5.75	3.75	3.25	2.75	2.50
750,000	11.50	11.50	8.75	7.00	5.50	3.50	3.25	2.75	2.50
700,000	11.50	11.25	8.50	6.75	5.25	3.25	3.00	2.50	2.50
650,000	11.50	10.75	8.00	6.50	5.00	2.75	2.50	2.25	2.25
600,000	10.75	10.25	7.50	6.00	4.25	2.75	2.50	2.25	2.00
550,000	10.00	9.25	6.50	5.00	3.50	2.50	2.25	2.00	1.75
500,000	9.00	8.50	5.75	4.00	2.75	2.25	2.00	1.75	1.75
450,000	7.75	7.00	4.50	3.00	2.50	2.25	2.00	1.75	1.75
400,000	6.25	5.75	3.50	2.50	2.25	2.00	1.75	1.75	1.75
340,000	4.25	4.00	2.50	2.25	2.00	1.75	1.75	1.50	1.50

TAKEOFF STABILIZER SETTINGS

(UNITS AIRPLANE NOSE UP)

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.

FLAPS 5 TO THRUST

GROSS WEIGHT LBS	CENTER OF GRAVITY PERCENT M.A.C.								
	14.0	16.0	24.0	29.0	34.0	39.0	41.0	43.0	44.0
780,000	9.00	8.75	6.50	5.00	3.75	2.75	2.50	2.25	2.00
750,000	9.00	8.50	6.25	4.75	3.50	2.50	2.50	2.00	2.00
700,000	8.75	8.25	5.75	4.50	3.25	2.50	2.25	2.00	2.00
650,000	8.50	8.00	5.50	4.00	3.00	2.50	2.25	2.00	1.75
600,000	8.00	7.50	5.25	3.75	3.00	2.25	2.00	1.75	1.75
550,000	7.50	6.75	4.75	3.50	2.75	2.25	2.00	1.75	1.50
500,000	6.75	6.25	4.25	3.00	2.50	2.00	1.75	1.50	1.50
450,000	5.50	5.00	3.50	2.50	2.25	1.75	1.50	1.50	1.25
400,000	4.25	4.00	2.75	2.00	1.75	1.25	1.25	1.00	1.00
340,000	2.75	2.75	2.00	1.50	1.25	0.75	0.75	0.50	0.50

FLAPS 15 TO THRUST

GROSS WEIGHT LBS	CENTER OF GRAVITY – PERCENT M.A.C.								
	14.0	16.0	24.0	29.0	34.0	39.0	41.0	43.0	44.0
780,000	10.25	9.75	6.75	5.25	3.50	2.75	2.50	2.25	2.25
750,000	9.75	9.25	6.50	5.00	3.50	2.75	2.50	2.25	2.00
700,000	9.25	8.50	6.25	4.75	3.25	2.50	2.25	2.00	2.00
650,000	8.75	8.25	5.75	4.25	3.25	2.50	2.25	2.00	2.00
600,000	8.50	7.75	5.25	4.00	3.00	2.50	2.25	2.00	1.75
550,000	7.50	6.75	4.50	3.50	2.75	2.25	2.00	1.75	1.50
500,000	6.25	5.75	3.75	3.00	2.25	2.00	1.75	1.50	1.25
450,000	5.00	4.25	3.25	2.50	2.00	1.75	1.50	1.50	1.25
400,000	4.00	3.50	2.50	2.00	1.75	1.25	1.25	1.25	1.00
340,000	2.75	2.50	1.75	1.50	1.25	1.00	1.00	1.00	0.75

TAKEOFF STABILIZER SETTINGS

(UNITS AIRPLANE NOSE UP)

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.

FLAPS 20 TO THRUST

GROSS WEIGHT LBS	CENTER OF GRAVITY – PERCENT M.A.C.								
	14.0	16.0	24.0	29.0	34.0	39.0	41.0	43.0	44.0
780,000	11.25	10.50	7.50	6.00	4.25	3.00	2.75	2.25	2.25
750,000	11.25	10.25	7.50	5.75	4.25	2.75	2.50	2.25	2.25
700,000	10.75	10.00	7.25	5.50	4.00	2.75	2.50	2.25	2.25
650,000	10.00	9.50	6.75	5.25	3.25	2.75	2.25	2.00	2.00
600,000	9.50	8.75	6.25	4.75	3.25	2.50	2.25	2.00	1.75
550,000	8.25	7.50	5.25	4.00	3.00	2.25	2.00	1.75	1.50
500,000	6.75	6.25	4.00	3.25	2.50	2.00	1.75	1.50	1.50
450,000	5.50	5.00	3.25	2.75	2.25	2.00	1.75	1.50	1.50
400,000	4.00	3.75	3.00	2.50	2.00	1.75	1.50	1.25	1.25
340,000	2.75	2.75	2.25	2.00	1.50	1.50	1.25	1.25	1.25

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 V_{REF} speed at 50 feet and assumes maximum braking and NO reverse thrust.
AUTOMATIC WHEEL BRAKES	Aircraft system that automatically applies wheel brakes to maintain a constant deceleration rate after touchdown.
F.A.R - FEDERAL AVIATION REGULATIONS	When used in conjunction with landing, the distance is measured from an altitude of 50 feet at V_{ref} speed to touchdown followed by braking levels that do not cause excessive tire wear. The F.A.R. distance includes a safety margin of 67%.
F.A.R. LANDING DISTANCE	The actual landing distance increased by 67%. This is the minimum runway length at the destination permitted for dispatch.
LANDING CLIMB LIMIT	The Federal Aviation Regulations require that the aircraft must be weight limited such that the aircraft in landing configuration can achieve a 3.2% climb gradient with all engines operating at go-around power at $1.3 V_S$.
N1	Fan Rotor Speed in %N1 is used for setting thrust with the GE90-110 series engines.
PRESSURE ALTITUDE	The altitude read directly from the altimeter when the altimeter setting window is set to 29.92 inches mercury.
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.

PATTERN AND APPROACH SPEEDS (KIAS)

NORMAL CONFIGURATION

GROSS WEIGHT - POUNDS	APPROACH GEAR UP					LANDING GEAR DOWN	
	Flaps 0° Slats Retracted $V_{REF30} + 80$	Flaps 1° Slats Mid-Range $V_{REF30} + 60$	Flaps 5° Slats Mid-Range $V_{REF30} + 40$	Flaps 15° Slats Mid-Range $V_{REF30} + 20$	Flaps 20° Slats Mid-Range $V_{REF30} + 20$	Flaps 25° Slats Fully Extended V_{REF25}	Flaps 30° Slats Fully Extended V_{REF30}
760,000	262	242	222	202	202	181	182
740,000	259	239	219	199	199	180	179
720,000	256	236	216	196	196	178	176
700,000	253	233	213	193	193	175	173
680,000	249	229	209	189	189	173	169
660,000	244	224	204	184	184	170	164
640,000	242	222	202	182	182	168	162
620,000	239	219	199	179	179	165	159
600,000	235	215	195	175	175	162	155
580,000	231	211	191	171	171	159	151
560,000	228	208	188	168	168	157	148
540,000	225	205	185	165	165	154	145
520,000	223	203	183	163	163	151	143
500,000	220	200	180	160	160	148	140
480,000	217	197	177	157	157	145	137
460,000	217	197	177	157	157	142	137
440,000	217	197	177	157	157	140	137
420,000	217	197	177	157	157	137	137
400,000	217	197	177	157	157	137	137
380,000	217	197	177	157	157	137	137

STALL SPEEDS-Vs (KIAS)

GROSS WEIGHT LBS	APPROACH GEAR UP					LANDING GEAR DOWN	
	FLAPS - 0° SLATS- Retracted	1° Mid-range	5° Mid-range	15° Mid-range	20° Mid-range	25° Fully Extended	30° Fully Extended
740,000	202	167	156	152	148	141	138
720,000	199	164	153	150	145	139	136
700,000	196	162	151	147	143	137	134
680,000	192	159	148	145	141	135	132
660,000	190	156	146	142	138	133	130
640,000	186	154	143	140	136	130	128
620,000	183	151	141	137	134	128	125
600,000	179	148	138	135	132	127	124
580,000	176	145	136	133	129	124	121
560,000	173	142	133	130	127	122	119
540,000	170	140	131	128	124	119	117
520,000	167	137	128	125	122	117	115
500,000	164	134	126	124	121	115	113
480,000	160	131	123	121	117	113	111
460,000	157	128	121	118	115	111	108
440,000	154	126	118	116	113	108	106
420,000	150	123	116	113	110	106	104
400,000	147	120	113	111	108	104	102

APPROACH AND LANDING CLIMB LIMIT WEIGHTS

POUNDS

APPROACH FLAPS 20

LANDING FLAPS 25

OAT °C	PRESSURE ALTITUDE - FEET								
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
50	662,000	633,700	607,700						
45	703,600	675,100	647,400						
40	745,000	714,600	686,000	658,900	632,200	608,100	583,100	553,500	
35	790,700	757,500	724,000	694,300	666,200	640,600	612,000	580,600	
32	803,300	781,600	745,600	713,400	684,500	657,200	627,100	594,900	562,600
30	803,700	789,700	763,000	726,500	697,200	667,900	636,400	603,800	571,200
28	804,000	790,000	774,700	736,000	707,700	679,600	646,700	612,200	579,600
26	804,300	790,300	774,900	744,600	715,600	690,600	657,500	621,700	587,700
24	804,600	790,500	775,000	745,700	722,300	697,600	667,300	631,700	596,500
22	804,900	790,700	775,200	745,800	725,400	701,600	673,700	640,300	605,900
20	805,200	790,900	775,300	745,900	725,600	704,400	677,400	646,300	613,900
18	805,400	791,100	775,500	746,100	725,700	704,500	681,400	650,000	619,600
16 & BELOW	805,700	791,300	775,700	746,300	725,900	704,700	681,500	653,900	623,500

NOTES:

- AFM Maximum Structural Landing Weight should not be exceeded unless an overweight landing is necessary.
- Reduce Limit Weight by 54,100 pounds when operating in icing conditions during any part of the flight when the forecast landing temperature is below 10 degrees C.

CORRECTIONS:

PACKS OFF	+ 3,000
WING ANTI-ICE ON	- 5,100

BASIS:

The limit weights shown are the more restrictive of:

APPROACH

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

LANDING

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

APPROACH AND LANDING CLIMB LIMIT WEIGHTS

POUNDS

APPROACH FLAPS 20
LANDING FLAPS 30

OAT °C	PRESSURE ALTITUDE - FEET								
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
50	649,400	622,000	594,600						
45	698,400	665,200	634,600						
40	743,700	710,900	677,400	608,400	581,300				
35	793,500	758,200	720,600	645,900	620,400				
				687,300	654,000	596,000	566,600	536,900	
						628,100	599,500	563,200	530,800
32	806,400	784,300	744,200	709,200	675,400	644,000	614,500	577,300	545,100
30	806,700	792,700	767,200	723,000	690,500	655,600	623,800	588,700	553,300
28	807,000	793,000	777,500	733,600	703,100	669,700	633,800	600,000	561,400
26	807,300	793,300	777,700	743,100	711,700	682,800	644,400	609,200	569,400
24	807,600	793,500	777,900	744,300	718,900	691,300	654,600	619,100	579,300
22	807,900	793,700	778,000	744,500	722,000	696,100	662,300	627,300	591,600
20	808,200	793,900	778,200	744,600	722,200	699,600	666,900	633,000	601,400
18	808,500	794,100	778,400	744,800	722,300	699,800	671,800	636,800	606,900
16 & BELOW	808,800	794,300	778,600	745,000	722,500	699,900	672,000	640,700	610,700

NOTES:

- AFM Maximum Structural Landing Weight should not be exceeded unless an overweight landing is necessary.
- Reduce Limit Weight by 59,400 pounds when operating in icing conditions during any part of the flight when the forecast landing temperature is below 10 degrees C.

CORRECTIONS:

PACKS OFF	+ 2,700
WING ANTI-ICE ON	- 5,200

BASIS:

The limit weights shown are the more restrictive of:

APPROACH

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

LANDING

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

F.A.R. DRY LANDING FIELD LENGTH**FEET****FLAPS 25**

AIRCRAFT WEIGHT POUNDS	AIRPORT PRESSURE ALTITUDE								
	FEET								
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	9,170	9,480	9,810	10,160	10,520	10,910	11,330	11,770	12,240
740,000	8,810	9,110	9,420	9,740	10,090	10,450	10,840	11,260	11,690
720,000	8,390	8,660	8,950	9,250	9,570	9,910	10,270	10,650	11,060
700,000	7,970	8,220	8,490	8,770	9,070	9,380	9,710	10,060	10,430
680,000	7,570	7,800	8,050	8,310	8,580	8,870	9,180	9,500	9,840
660,000	7,210	7,400	7,630	7,870	8,130	8,390	8,670	8,970	9,290
640,000	6,920	7,090	7,260	7,460	7,690	7,940	8,200	8,470	8,760
620,000	6,640	6,800	6,970	7,140	7,320	7,510	7,750	8,000	8,260
600,000	6,480	6,640	6,800	6,960	7,140	7,310	7,500	7,690	7,890
580,000	6,310	6,470	6,620	6,790	6,950	7,130	7,310	7,490	7,680
560,000	6,150	6,300	6,450	6,610	6,770	6,940	7,110	7,290	7,480
540,000	5,980	6,130	6,270	6,430	6,580	6,750	6,920	7,090	7,270
520,000	5,820	5,950	6,100	6,250	6,400	6,560	6,720	6,890	7,070
500,000	5,650	5,780	5,920	6,060	6,210	6,370	6,530	6,690	6,860
480,000	5,480	5,610	5,740	5,880	6,030	6,170	6,330	6,490	6,650
460,000	5,310	5,440	5,570	5,700	5,840	5,980	6,130	6,280	6,440
440,000	5,140	5,260	5,380	5,510	5,650	5,780	5,930	6,070	6,230
420,000	5,030	5,080	5,200	5,320	5,450	5,580	5,720	5,860	6,010
400,000	5,020	5,060	5,100	5,130	5,260	5,380	5,520	5,650	5,800
380,000	5,010	5,050	5,090	5,120	5,140	5,180	5,310	5,440	5,580
360,000	5,000	5,040	5,080	5,110	5,130	5,150	5,160	5,230	5,360
340,000	4,980	5,030	5,070	5,090	5,120	5,140	5,150	5,130	5,140

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 VREF.
- Based on Maximum Braking, Speed Brakes Extended and No Thrust Reverse.

CORRECTIONS:

CONDITION	CORRECTION
Headwind	- 25 ft. per knot
Tailwind	+ 240 ft. per knot
Manual Spoilers	Refer to ODM Abnormal section
Wet runway and/or Low Minima	increase distance by 15%

F.A.R. DRY LANDING FIELD LENGTH**FEET****FLAPS 30**

AIRCRAFT WEIGHT POUNDS	AIRPORT PRESSURE ALTITUDE								
	FEET								
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	9,050	9,350	9,670	10,010	10,370	10,750	11,150	11,570	12,030
740,000	8,580	8,860	9,160	9,470	9,800	10,150	10,520	10,910	11,330
720,000	8,110	8,370	8,640	8,930	9,230	9,550	9,890	10,250	10,630
700,000	7,660	7,890	8,150	8,410	8,690	8,980	9,290	9,620	9,960
680,000	7,180	7,370	7,600	7,840	8,090	8,350	8,630	8,930	9,240
660,000	6,800	6,970	7,140	7,320	7,540	7,780	8,030	8,300	8,580
640,000	6,480	6,640	6,800	6,970	7,140	7,320	7,540	7,780	8,040
620,000	6,320	6,480	6,630	6,800	6,960	7,140	7,320	7,500	7,700
600,000	6,170	6,320	6,470	6,630	6,790	6,960	7,140	7,320	7,500
580,000	5,890	6,030	6,170	6,330	6,480	6,640	6,810	6,990	7,170
560,000	5,710	5,840	5,980	6,130	6,280	6,430	6,600	6,760	6,940
540,000	5,550	5,680	5,820	5,960	6,110	6,260	6,410	6,580	6,740
520,000	5,400	5,530	5,660	5,800	5,940	6,080	6,230	6,390	6,550
500,000	5,240	5,370	5,500	5,630	5,770	5,910	6,050	6,210	6,360
480,000	5,090	5,210	5,330	5,460	5,590	5,730	5,870	6,020	6,170
460,000	5,080	5,110	5,170	5,290	5,420	5,550	5,690	5,830	5,980
440,000	5,070	5,110	5,150	5,170	5,240	5,370	5,500	5,640	5,780
420,000	5,060	5,100	5,140	5,160	5,190	5,200	5,310	5,450	5,580
400,000	5,050	5,090	5,130	5,150	5,180	5,190	5,210	5,250	5,380
380,000	5,040	5,080	5,120	5,150	5,170	5,180	5,200	5,170	5,180
360,000	5,030	5,070	5,110	5,140	5,160	5,180	5,190	5,160	5,130
340,000	5,020	5,060	5,100	5,130	5,150	5,170	5,180	5,150	5,120

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 VREF.
- Based on Maximum Braking, Speed Brakes Extended and No Thrust Reverse.

CORRECTIONS:

CONDITION	CORRECTION
Headwind	- 25 ft. per knot
Tailwind	+ 240 ft. per knot
Manual Spoilers	Refer to ODM Abnormal section
Wet runway and/or Low Minima	increase distance by 15%

OPERATIONAL LANDING DISTANCES FEET

FLAPS 30

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).									
	DRY (6)						GOOD (5)			
	AB 1	AB 2	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	14,500	13,100	12,000	9,900	7,600	6,400	12,000	10,000	8,300	8,100
740,000	14,100	12,800	11,700	9,700	7,400	6,200	11,700	9,800	8,200	8,000
720,000	13,800	12,500	11,400	9,500	7,300	6,100	11,400	9,500	8,000	7,800
700,000	13,400	12,200	11,100	9,200	7,100	5,900	11,100	9,300	7,800	7,600
680,000	13,000	11,900	10,800	9,000	6,900	5,700	10,800	9,100	7,600	7,400
660,000	12,700	11,500	10,500	8,800	6,800	5,600	10,500	8,800	7,400	7,200
640,000	12,300	11,200	10,200	8,600	6,600	5,400	10,200	8,600	7,200	7,000
620,000	11,900	10,900	9,900	8,300	6,500	5,200	9,900	8,400	7,100	6,900
600,000	11,500	10,600	9,600	8,100	6,300	5,100	9,600	8,200	6,900	6,700
580,000	11,200	10,300	9,300	7,900	6,100	4,900	9,300	7,900	6,700	6,500
560,000	10,800	9,900	9,000	7,600	6,000	4,800	9,000	7,700	6,500	6,300
540,000	10,400	9,600	8,700	7,400	5,800	4,600	8,700	7,500	6,300	6,100
520,000	10,100	9,300	8,400	7,200	5,700	4,400	8,400	7,200	6,100	5,900
500,000	9,700	9,000	8,100	6,900	5,500	4,300	8,100	7,000	5,900	5,800
492,000	9,600	8,800	8,000	6,900	5,400	4,200	8,000	6,900	5,900	5,700
480,000	9,400	8,700	7,900	6,800	5,400	4,200	7,900	6,900	5,800	5,600
460,000	9,300	8,600	7,900	6,800	5,400	4,200	7,900	6,900	5,800	5,600
440,000	9,100	8,500	7,800	6,800	5,400	4,100	7,800	6,900	5,800	5,500
420,000	9,000	8,300	7,700	6,800	5,400	4,100	7,700	6,900	5,800	5,500
400,000	8,800	8,200	7,700	6,800	5,400	4,100	7,700	6,900	5,800	5,500
380,000	8,600	8,000	7,600	6,800	5,400	4,100	7,600	6,900	5,700	5,400
360,000	8,500	7,900	7,500	6,800	5,400	4,100	7,500	6,900	5,700	5,400

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF30 - 5 •

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	-600	-400	-300	-300	-200	-100	-300	-300	-300	-200
2,000	0	0	0	0	0	0	0	0	0	0
4,000	600	400	300	300	200	100	300	300	300	200
6,000	1,100	900	700	600	400	300	700	600	500	500
8,000	2,300	1,800	1,400	1,200	900	600	1,400	1,200	1,100	1,000

CORRECTIONS

	DRY (6)						GOOD (5)			
PER 1 KT HEADWIND	-50	-50	-50	-50	0	0	-50	-50	0	0
PER 1 KT TAILWIND	150	150	100	100	50	50	100	100	100	100
PER 5 KTS ADD'L SPD	300	300	400	350	250	150	400	350	200	200
PER 10°C ABOVE ISA	250	200	200	150	100	50	200	150	100	100
PER 10°C BELOW ISA	-250	-200	-200	-150	-100	-50	-200	-150	-150	-100
PER 1% UP SLOPE	-250	-150	-50	0	0	-50	-50	0	-100	-100
PER 1% DOWN SLOPE	250	100	0	0	0	50	0	50	100	100
1 REVERSER INOP	1,000	300	0	0	0	100	0	100	400	300
2 REVERSERS INOP	1,200	300	0	0	0	200	0	200	800	800
MANUAL SPOILERS	200	200	200	200	200	300	200	200	200	300

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES FEET

FLAPS 30

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR(1)			
	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	12,400	11,300	11,100	10,800	14,500	14,300	14,300	14,300
740,000	12,100	11,100	10,900	10,600	14,200	13,900	13,900	13,900
720,000	11,800	10,800	10,600	10,300	13,800	13,600	13,600	13,500
700,000	11,500	10,500	10,300	10,100	13,400	13,200	13,200	13,100
680,000	11,200	10,200	10,000	9,800	13,100	12,800	12,800	12,800
660,000	10,900	10,000	9,800	9,500	12,700	12,400	12,400	12,400
640,000	10,600	9,700	9,500	9,300	12,300	12,100	12,100	12,000
620,000	10,300	9,400	9,200	9,000	12,000	11,700	11,700	11,700
600,000	10,000	9,100	8,900	8,800	11,600	11,300	11,300	11,300
580,000	9,700	8,900	8,700	8,500	11,200	11,000	11,000	10,900
560,000	9,400	8,600	8,400	8,300	10,800	10,600	10,600	10,600
540,000	9,100	8,300	8,100	8,000	10,500	10,200	10,200	10,200
520,000	8,800	8,000	7,800	7,800	10,100	9,900	9,900	9,800
500,000	8,500	7,800	7,500	7,500	9,700	9,500	9,500	9,500
492,000	8,400	7,600	7,400	7,400	9,600	9,400	9,400	9,300
480,000	8,400	7,600	7,400	7,400	9,500	9,200	9,200	9,200
460,000	8,300	7,600	7,300	7,300	9,400	9,100	9,100	9,000
440,000	8,200	7,600	7,200	7,200	9,200	9,000	8,900	8,900
420,000	8,100	7,500	7,100	7,100	9,100	8,800	8,800	8,700
400,000	8,100	7,500	7,000	7,000	8,900	8,700	8,600	8,600
380,000	8,000	7,500	6,900	6,900	8,800	8,600	8,400	8,400
360,000	7,900	7,500	6,800	6,800	8,700	8,400	8,300	8,200

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF30 - 5 •

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	-600	-600	-500
2,000	0	0	0	0	0	0	0	0
4,000	400	400	400	400	500	600	600	500
6,000	800	700	700	700	1,100	1,100	1,100	1,100
8,000	1,200	1,100	1,100	1,100	1,600	1,700	1,700	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	400	350	250	250	350	300	250	250
PER 10°C ABOVE ISA	200	200	150	150	250	250	250	250
PER 10°C BELOW ISA	-200	-200	-150	-150	-250	-250	-250	-250
PER 1% UP SLOPE	-150	-150	-200	-200	-350	-400	-450	-450
PER 1% DOWN SLOPE	150	200	300	300	550	650	650	600
1 REVERSER INOP	400	800	800	900	1,500	1,700	1,700	1,700
2 REVERSERS INOP	1,500	2,200	2,200	2,200	5,100	5,300	5,300	5,300
MANUAL SPOILERS	200	200	200	300	200	200	200	300

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES FEET

FLAPS 25

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).									
	DRY (6)						GOOD (5)			
	AB 1	AB 2	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	14,800	13,100	11,700	9,800	7,600	6,200	11,700	9,800	8,300	7,800
740,000	14,400	12,900	11,400	9,600	7,500	6,100	11,400	9,700	8,200	7,700
720,000	14,100	12,600	11,200	9,400	7,300	5,900	11,200	9,500	8,000	7,500
700,000	13,700	12,300	11,000	9,200	7,200	5,800	11,000	9,300	7,800	7,400
680,000	13,400	12,000	10,800	9,100	7,000	5,700	10,800	9,100	7,700	7,200
660,000	13,100	11,800	10,500	8,900	6,900	5,500	10,500	8,900	7,500	7,100
640,000	12,700	11,500	10,300	8,700	6,800	5,400	10,300	8,700	7,400	7,000
620,000	12,400	11,200	10,100	8,500	6,600	5,300	10,100	8,500	7,200	6,800
600,000	12,000	10,900	9,800	8,300	6,500	5,100	9,800	8,400	7,000	6,700
580,000	11,700	10,700	9,600	8,100	6,400	5,000	9,600	8,200	6,900	6,600
560,000	11,300	10,400	9,400	8,000	6,200	4,800	9,400	8,000	6,700	6,400
540,000	11,000	10,100	9,100	7,800	6,100	4,700	9,100	7,800	6,500	6,300
520,000	10,600	9,800	8,900	7,600	5,900	4,600	8,900	7,600	6,400	6,100
500,000	10,300	9,500	8,700	7,400	5,800	4,400	8,700	7,400	6,200	6,000
492,000	10,200	9,400	8,600	7,300	5,700	4,400	8,600	7,400	6,200	6,000
480,000	10,000	9,300	8,500	7,300	5,700	4,300	8,500	7,300	6,100	5,900
460,000	9,800	9,100	8,400	7,200	5,700	4,300	8,400	7,300	6,100	5,800
440,000	9,600	9,000	8,300	7,200	5,600	4,200	8,300	7,200	6,000	5,800
420,000	9,400	8,800	8,200	7,200	5,600	4,200	8,200	7,200	6,000	5,700
400,000	9,200	8,600	8,100	7,100	5,500	4,200	8,100	7,100	5,900	5,600
380,000	9,000	8,400	7,900	7,100	5,500	4,100	7,900	7,100	5,900	5,600
360,000	8,800	8,200	7,800	7,000	5,400	4,100	7,800	7,100	5,800	5,500

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF25 - 5 •

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	-600	-500	-400	-300	-200	-200	-400	-300	-300	-300
2,000	0	0	0	0	0	0	0	0	0	0
4,000	600	500	400	300	200	200	400	300	300	300
6,000	1,200	1,100	900	700	500	300	900	700	600	600
8,000	1,900	1,600	1,300	1,000	700	500	1,300	1,000	800	800

CORRECTIONS

	DRY (6)						GOOD (5)			
PER 1 KT HEADWIND	-50	-50	-50	-50	0	0	-50	-50	0	0
PER 1 KT TAILWIND	150	150	100	100	50	50	100	100	100	100
PER 5 KTS ADD'L SPD	300	300	400	350	250	150	400	350	250	200
PER 10°C ABOVE ISA	250	250	200	150	100	100	200	150	150	150
PER 10°C BELOW ISA	-250	-250	-200	-150	-150	-100	-200	-150	-150	-150
PER 1% UP SLOPE	-300	-200	-50	0	0	-50	-50	0	-50	-100
PER 1% DOWN SLOPE	300	100	0	0	0	50	0	50	100	150
1 REVERSER INOP	1,200	400	100	0	0	100	100	100	400	400
2 REVERSERS INOP	1,400	400	100	0	0	200	100	200	900	900
MANUAL SPOILERS	300	300	300	300	300	300	300	300	300	300

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES FEET

FLAPS 25

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR(1)			
	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	12,400	11,200	10,900	10,900	14,500	14,200	14,200	14,100
740,000	12,100	11,000	10,700	10,700	14,200	13,800	13,800	13,800
720,000	11,900	10,800	10,500	10,400	13,900	13,500	13,500	13,500
700,000	11,600	10,500	10,200	10,200	13,500	13,200	13,200	13,200
680,000	11,400	10,300	10,000	10,000	13,200	12,900	12,900	12,800
660,000	11,100	10,100	9,800	9,700	12,900	12,600	12,600	12,500
640,000	10,900	9,800	9,500	9,500	12,600	12,200	12,200	12,200
620,000	10,600	9,600	9,300	9,300	12,300	11,900	11,900	11,900
600,000	10,400	9,400	9,100	9,100	11,900	11,600	11,600	11,600
580,000	10,100	9,200	8,900	8,800	11,600	11,300	11,300	11,200
560,000	9,900	8,900	8,600	8,600	11,300	11,000	10,900	10,900
540,000	9,600	8,700	8,400	8,400	11,000	10,600	10,600	10,600
520,000	9,400	8,500	8,200	8,100	10,600	10,300	10,300	10,300
500,000	9,100	8,200	7,900	7,900	10,300	10,000	10,000	10,000
492,000	9,000	8,100	7,800	7,800	10,200	9,900	9,800	9,800
480,000	8,900	8,100	7,800	7,700	10,100	9,700	9,700	9,700
460,000	8,800	8,000	7,600	7,600	9,900	9,500	9,500	9,500
440,000	8,600	7,900	7,500	7,400	9,700	9,400	9,300	9,300
420,000	8,500	7,800	7,300	7,300	9,500	9,200	9,100	9,100
400,000	8,400	7,700	7,200	7,200	9,300	9,000	8,900	8,900
380,000	8,200	7,600	7,100	7,000	9,100	8,800	8,700	8,700
360,000	8,100	7,500	6,900	6,900	9,000	8,600	8,500	8,400

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF25 - 5 •

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	-500	-400	-400	-400	-600	-600	-600	-600
2,000	0	0	0	0	0	0	0	0
4,000	500	400	400	400	600	600	600	600
6,000	900	900	900	800	1,200	1,200	1,200	1,200
8,000	1,400	1,300	1,300	1,200	1,800	1,800	1,800	1,800

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	400	350	250	250	400	300	300	300
PER 10°C ABOVE ISA	200	200	200	200	250	250	250	250
PER 10°C BELOW ISA	-200	-200	-200	-200	-250	-250	-250	-250
PER 1% UP SLOPE	-150	-150	-250	-250	-350	-450	-450	-450
PER 1% DOWN SLOPE	150	200	300	300	550	650	650	650
1 REVERSER INOP	400	800	900	900	1,600	1,900	1,900	1,900
2 REVERSERS INOP	1,600	2,300	2,400	2,400	5,600	5,800	5,800	5,800
MANUAL SPOILERS	300	300	300	300	300	300	300	300

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.
GO AROUND THRUST	Maximum thrust setting available for use during a missed approach. Minimum climb gradient limit weights are based on an engine inoperative and the remaining engine set to this thrust level.
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.
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.

MEL RELATED PERFORMANCE ABBREVIATIONS DISPLAYED ON WDR

BK1	AWABS has automatically corrected the allowable weights and V1 speeds due to one inoperative brake.
BK2	AWABS has automatically corrected the allowable weights and V1 speeds due to two inoperative brakes.
GRD	AWABS has automatically corrected the allowable weights and V1 speeds due to gear down dispatch. Used when an MEL item requires delayed gear retraction or gear down flight.

THRUST SETTINGS – ALL ENGINE

TAKEOFF %N1

TO

GE90-110B1L

0 TO 60 KNOTS
BASED ON NORMAL* BLEED

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	8,400
70	91.7	92.0	91.8	91.7	91.8	91.9	91.9	91.8	91.2	90.3	89.9
60	94.6	94.8	94.7	94.6	94.7	94.7	94.7	94.7	94.1	93.2	92.8
55	96.0	96.2	96.1	96.0	96.1	96.1	96.1	96.1	95.5	94.6	94.2
50	97.5	98.0	97.6	97.3	97.4	97.5	97.5	97.4	96.8	95.9	95.6
45	98.9	99.4	99.1	98.8	98.7	98.8	98.8	98.7	98.2	97.3	96.9
40	100.2	100.9	100.4	100.2	100.0	99.9	100.0	99.9	99.4	98.6	98.2
35	100.8	102.8	102.3	101.8	101.4	101.2	101.3	101.0	100.4	99.6	99.3
30	99.9	102.7	104.0	104.0	103.8	103.4	103.4	102.6	101.5	100.7	100.3
25	99.1	101.8	103.1	104.4	105.5	105.8	106.3	105.3	103.8	102.4	101.8
20	98.3	101.0	102.3	103.5	104.6	105.8	106.8	106.8	105.9	104.8	104.3
15	97.4	100.1	101.4	102.6	103.7	104.9	105.9	106.4	106.1	105.6	105.3
10	96.6	99.2	100.5	101.7	102.8	103.9	105.0	105.5	105.2	104.9	104.7
5	95.7	98.4	99.6	100.8	101.9	103.0	104.1	104.5	104.2	104.0	103.8
0	94.9	97.5	98.7	99.9	101.0	102.1	103.1	103.6	103.3	103.0	102.9
-10	93.1	95.7	96.9	98.1	99.1	100.2	101.2	101.7	101.4	101.1	101.0
-20	91.3	93.8	95.0	96.2	97.2	98.3	99.3	99.7	99.4	99.2	99.0
-30	89.5	92.0	93.1	94.3	95.3	96.3	97.3	97.7	97.5	97.2	97.1
-40	87.6	90.1	91.2	92.3	93.3	94.3	95.3	95.7	95.4	95.2	95.1
-50	85.7	88.1	89.2	90.3	91.3	92.3	93.2	93.6	93.4	93.1	93.0

Engine Bleed Adjustments

Packs OFF	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
1 Pack ON	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
Wing A/I	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

*NORMAL Power is based on the FULL GE90-110B1L engine rating with:

- Packs ON
- Engine Anti-ice on or off
- Wing anti-ice off

Pressure Altitude / Field Elevation Correction:

Subtract/Add 100ft to elevation for every 0.11 inch barometric setting above/below 29.92 inches.

THRUST SETTINGS – ALL ENGINE**CLIMB %N1****CLB****GE90-110B1L**310 KIAS/MACH 0.84 SPEED SCHEDULE
PACKS ON OR OFF / ANTI-ICE OFF

TAT - °C	PRESSURE ALTITUDE - FEET									
	0	5,000	10,000	15,000	20,000	25,000	30,000	35,000	40,000	43,000
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
35	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
30	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
25	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
20	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
15	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
10	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
0	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-5	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-10	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-15	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-20	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-25	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-30	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5
-35	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
-40	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6

Bleed Adjustments

Eng. A/I ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
Eng. & Wing A/I ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
Eng. & Wing A/I ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

*Packs on or off with 2 bleed sources.

** Packs off with 1 bleed source.

THRUST SETTINGS – ALL ENGINE**CRUISE %N1****CRZ****GE90-110B1L****CRUISE SPEED: 0.84M**

TAT - °C	PRESSURE ALTITUDE - FEET										
	30,000	31,000	32,000	33,000	34,000	35,000	36,000	37,000	39,000	41,000	43,000
15	95.5	95.3	95.1	94.9	94.7	94.6	94.0	94.0			
10	96.2	95.9	95.6	95.4	95.2	95.0	94.5	94.5	94.5	94.3	94.0
5	96.9	96.6	96.3	96.0	95.7	95.5	94.9	94.9	95.0	94.7	94.4
0	97.7	97.3	97.0	96.8	96.5	96.2	95.5	95.5	95.5	95.2	94.9
-5	97.1	97.5	97.8	97.4	97.1	96.8	96.2	96.2	96.3	95.9	95.6
-10	96.1	96.6	97.0	97.4	97.9	97.7	96.9	96.9	97.0	96.7	96.3
-15	95.2	95.6	96.0	96.5	97.0	97.4	97.3	97.4	97.4	97.1	96.9
-20	94.2	94.7	95.1	95.5	96.0	96.4	96.4	96.4	96.4	96.1	95.9
-25	93.3	93.7	94.1	94.5	95.0	95.4	95.4	95.4	95.4	95.1	94.9
-30	92.3	92.7	93.1	93.5	94.0	94.4	94.4	94.4	94.4	94.2	94.0
-35	91.3	91.7	92.1	92.5	93.0	93.4	93.4	93.4	93.5	93.2	93.0
-40	90.4	90.7	91.1	91.5	92.0	92.4	92.4	92.4	92.4	92.2	92.0
-45	89.4	89.7	90.1	90.5	91.0	91.4	91.4	91.4	91.4	91.2	91.0
-50	88.4	88.7	89.1	89.5	89.9	90.4	90.3	90.4	90.4	90.1	90.0

Bleed Adjustments

Eng. A/I ON	-0.2
Eng. & Wing A/I ON	-0.6

THRUST SETTINGS – ALL ENGINE**GO AROUND %N1****GE90-110B1L**

NORMAL BLEED - PACKS ON / ENGINE ANTI-ICE OFF OR ON

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	8,400
50	97.8	98.1	97.9	97.6							
45	99.1	99.5	99.4	99.1							
40	100.4	101.0	100.7	100.5	100.4	100.3	100.4	100.2	99.6		
35	101.5	102.8	102.6	102.2	102.1	102.0	101.9	101.6	100.7		
30	100.8	102.9	104.3	104.3	104.2	104.0	103.9	103.1	101.9	100.9	100.5
25	100.0	102.1	103.4	104.7	105.8	106.2	106.5	105.6	104.0	102.4	101.8
20	99.1	101.2	102.5	103.8	104.9	106.0	107.1	106.9	105.9	104.5	103.9
15	98.3	100.3	101.7	102.9	104.0	105.1	106.2	106.6	106.2	105.3	104.9
10	97.4	99.4	100.8	102.0	103.1	104.2	105.3	105.6	105.2	104.6	104.4
5	96.7	98.4	100.1	101.0	102.1	103.5	104.6	104.6	104.2	103.6	103.5
0 ≤	95.9	97.4	99.3	100.0	101.1	102.7	103.8	103.6	103.2	102.6	102.5

Packs OFF	+0.3	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.3
Pack(1) ON	-0.4	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Wing A/I ON	-0.7	-0.8	-1.0	-1.0	-1.0	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9

NOTE: Shaded area outside environmental envelope.

Pressure Alt./Field Elevation Correction: Subtract/Add 100 ft. to elevation for every 0.11 inch barometric setting above/below 29.92 inches.

THRUST SETTINGS - ONE ENGINE INOPERATIVE

MAXIMUM CONTINUOUS THRUST % N1

GE90-110B1L

NORMAL BLEED - PACKS ON / ANTI-ICE OFF

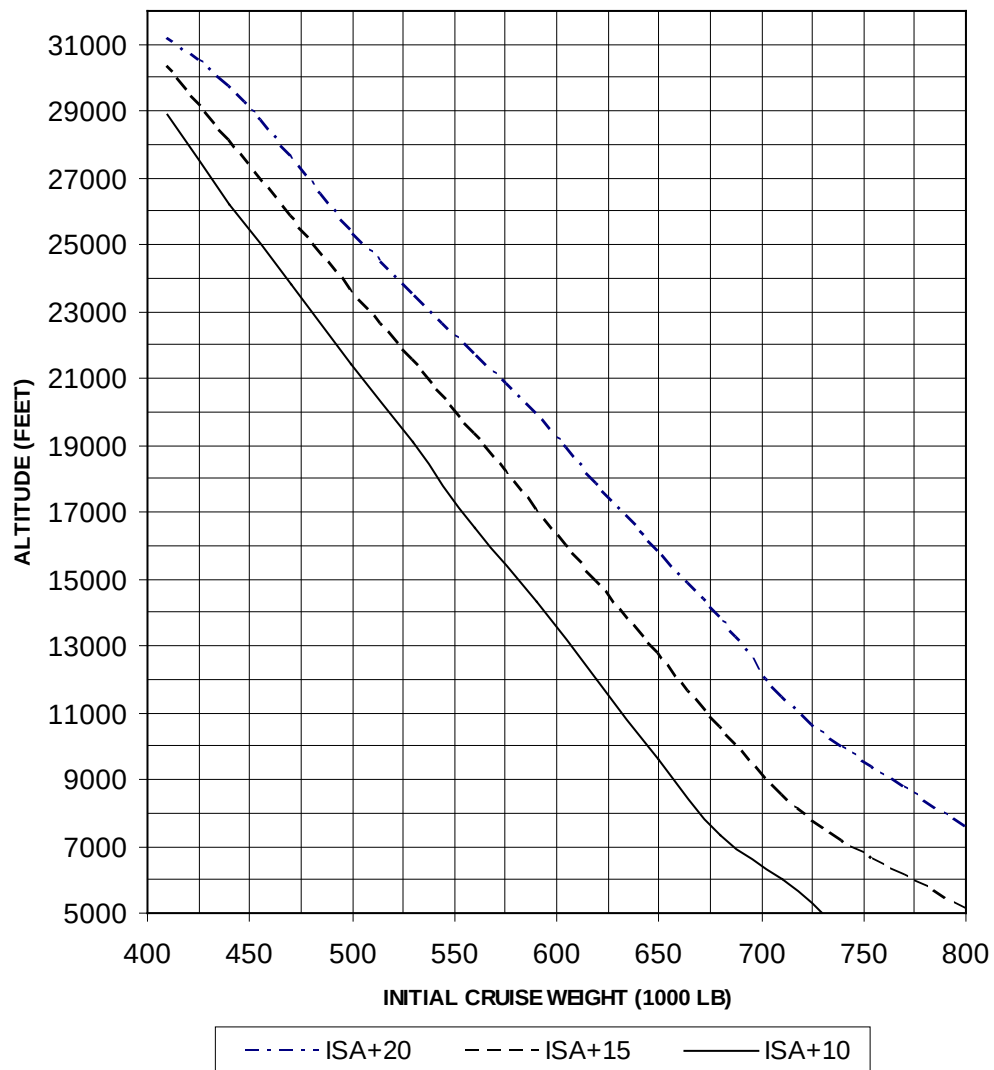
TAT -	PRESSURE ALTITUDE - FEET																			
°C	5,000	10,000	15,000	20,000	25,000	30,000	35,000	37,000	39,000	41,000	43,000									
40	98.3	97.3	ABOVE ENVIRONMENTAL ENVELOPE																	
35	99.4	98.2																		
30	100.5	99.5										98.2								
25	101.6	100.8										99.5	97.5							
20	101.0	102.0										101.2	98.9	96.1	96.9	95.9	95.9	95.6	95.3	95.0
15	100.2	101.8	103.2	100.8	96.9	97.6	96.3	96.3	96.0	95.7	95.4									
10	99.3	100.9	104.0	102.5	98.1	98.6	97.0	97.0	96.6	96.3	96.0									
5	98.4	100.0	103.6	104.2	99.6	99.9	97.8	97.8	97.4	97.1	96.8									
0	97.5	99.1	102.7	104.1	101.1	101.0	98.8	98.8	98.3	97.9	97.6									
-5	96.6	98.2	101.8	103.2	102.1	100.6	100.2	100.2	99.7	99.3	98.8									
-10	95.7	97.3	100.8	102.2	101.9	99.7	101.3	101.3	100.7	100.3	100.0									
-15	94.8	96.3	99.8	101.3	101.0	98.7	102.0	102.0	101.1	100.8	100.5									
-20	93.9	95.4	98.9	100.3	100.0	97.7	101.0	101.0	100.1	99.8	99.5									
-25	93.0	94.4	97.9	99.3	99.0	96.8	100.0	100.0	99.1	98.8	98.5									
-30	92.1	93.4	97.0	98.3	98.0	95.8	99.0	99.0	98.1	97.8	97.5									
-35	91.2	92.4	96.0	97.3	96.9	94.8	97.9	97.9	97.1	96.8	96.5									
-40	90.3	91.5	95.1	96.3	95.9	93.8	96.9	96.9	96.1	95.8	95.5									

NOTE: For the following engine bleed conditions adjust %N1 by the amount indicated.

Engine A/I ON	-0.5	-0.5	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3
Wing A/I ON- Packs ON	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5	-0.5	-0.5
Wing A/I ON Packs OFF	-1.1	-0.9	-0.7	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6	-0.7	-0.7

ONE ENGINE INOPERATIVE

LONG RANGE CRUISE ALTITUDE CAPABILITY



BLEED ADJUSTMENTS

ENGINE ANTI-ICE ON

-800FT

ENGINE & WING ANTI-ICE ON

-1000FT

ONE ENGINE INOPERATIVE

GEAR DOWN LANDING RATE OF CLIMB AVAILABLE

(FT/MIN)

FLAPS 20°**SEA LEVEL**

TAT (C)	Weight (LBS)								
	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000
52	1,040	740	490	290	90	-110	-310	-510	-710
50	1,100	800	550	350	150	-50	-250	-450	-650
48	1,150	850	600	400	200	0	-200	-400	-600
46	1,200	900	650	450	250	50	-150	-350	-550
44	1,260	960	710	510	310	110	-90	-290	-490
42	1,310	1,010	760	560	360	160	-40	-240	-440
40	1,360	1,060	810	610	410	210	10	-190	-390
38	1,410	1,110	860	660	460	260	60	-140	-340
36	1,450	1,150	900	700	500	300	100	-100	-300
34	1,450	1,150	900	700	500	300	100	-100	-300
32	1,460	1,160	910	710	510	310	110	-90	-290
30	1,460	1,160	910	710	510	310	110	-90	-290
20	1,480	1,180	930	730	530	330	130	-70	-270
10	1,500	1,200	950	750	550	350	150	-50	-250
0	1,520	1,220	970	770	570	370	170	-30	-230
-20	1,570	1,270	1,020	820	620	420	220	20	-180
-40	1,620	1,320	1,070	870	670	470	270	70	-130

Decrease rate of climb 105 ft/min per 1000 ft. above sea level.

Above 40°C TAT - Increase rate of climb 35 ft/min per 1000 ft. below sea level.

FLAPS 30°**SEA LEVEL**

TAT (C)	Weight (LBS)								
	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000
52	290	90	-85	-235	-385	-535	-685	-835	-985
50	340	140	-35	-185	-335	-485	-635	-785	-935
48	390	190	15	-135	-285	-435	-585	-735	-885
46	430	230	55	-95	-245	-395	-545	-695	-845
44	480	280	105	-45	-195	-345	-495	-645	-795
42	530	330	155	5	-145	-295	-445	-595	-745
40	580	380	205	55	-95	-245	-395	-545	-695
38	630	430	255	105	-45	-195	-345	-495	-645
36	660	460	285	135	-15	-165	-315	-465	-615
34	670	470	295	145	-5	-155	-305	-455	-605
32	670	470	295	145	-5	-155	-305	-455	-605
30	670	470	295	145	-5	-155	-305	-455	-605
20	680	480	305	155	5	-145	-295	-445	-595
10	690	490	315	165	15	-135	-285	-435	-585
0	700	500	325	175	25	-125	-275	-425	-575
-20	720	520	345	195	45	-105	-255	-405	-555
-40	730	530	355	205	55	-95	-245	-395	-545

Decrease rate of climb 85 ft/min per 1000 ft. above sea level.

Above 40°C TAT - Increase rate of climb 40 ft/min per 1000 ft. below sea level.

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ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

APPLICABILITY

The tables on the following pages provide landing distances and approach speeds to be used in the event of in-flight system failures. **The values in this section are not to be used for dispatch purposes.**

Refer to the “MEL Support” pages at the end of this section of the ODM for dispatch landing distances with the following MELs applied:

- Manual Spoilers
- One Brake Inoperative
- Two Brakes Inoperative

The landing distances provided in this section are classified by runway braking action. These classifications include “DRY,” “GOOD,” “MEDIUM,” or “POOR.” Refer to the Airway Manual – Section 4 (Weather) to find the relationship between these terms, the current environmental conditions, and runway friction values.

ASSUMPTIONS

The data within this section was generated based on a set of assumed conditions:

- Maximum manual braking (more aggressive than Max Autobrakes)
- Includes distance from 50 feet above threshold to stop (1,500 feet of air distance)
- Based on demonstrated landing performance produced by the manufacturer during certification process
- Does not include any other safety factors or margins

In addition, the data within this section were also calculated with certain baseline conditions. There are corrections provided for each abnormal configuration accounting for any variances from the following:

- Sea level altitude
- Standard Day Outside Air Temperature (OAT = ISA)
- No wind
- No slope
- Operating engines at maximum reverse thrust, except for hydraulic system failures
- Each abnormal configuration landing distance table is based on the approach speed stated within each table.

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

ANTISKID (FLAPS 25)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	8,900	8,500	8,100	7,700	7,300	6,900	6,500	6,100	5,730	5,570
GOOD	8,900	8,500	8,100	7,700	7,300	6,900	6,500	6,100	5,730	5,570
MEDIUM	11,500	10,940	10,380	9,820	9,260	8,700	8,140	7,580	7,055	6,775
POOR	15,795	14,955	14,115	13,275	12,435	11,595	10,755	9,915	9,115	8,595
VREF25	179	174	169	164	159	153	148	142	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+160	+160	+230	+330
Wind	Per 10 kt. headwind	-300	-300	-430	-690
	Per 10 kt. tailwind	+1110	+1110	+1680	+3050
Slope	Per 1% downhill	+210	+210	+470	+2180
	Per 1% uphill	-170	-170	-320	-710
Temperature	Per 10°C above ISA	+140	+140	+180	+250
	Per 10°C below ISA	-140	-140	-180	-250
Approach Speed	Per 10 kt. Above VREF	+370	+370	+420	+470
Reverse Thrust	One Reverser Operative	+710	+710	+1460	+4150
	No Reversers Operative	+1970	+1970	+4840	+15000

ANTISKID (FLAPS 30)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	8,860	8,460	8,060	7,660	7,260	6,860	6,460	6,060	5,690	5,530
GOOD	8,860	8,460	8,060	7,660	7,260	6,860	6,460	6,060	5,690	5,530
MEDIUM	11,410	10,850	10,290	9,730	9,170	8,610	8,050	7,490	6,965	6,685
POOR	15,635	14,795	13,955	13,115	12,275	11,435	10,595	9,755	8,955	8,435
VREF30	178	172	164	158	151	145	140	137	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+110	+110	+170	+270
Wind	Per 10 kt. headwind	-300	-300	-420	-680
	Per 10 kt. tailwind	+1100	+1100	+1670	+3020
Slope	Per 1% downhill	+210	+210	+460	+2110
	Per 1% uphill	-170	-170	-320	-690
Temperature	Per 10°C above ISA	+130	+130	+180	+250
	Per 10°C below ISA	-140	-140	-180	-250
Approach Speed	Per 10 kt. Above VREF	+370	+370	+410	+450
Reverse Thrust	One Reverser Operative	+680	+680	+1400	+3940
	No Reversers Operative	+1890	+1890	+4540	+15000

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

ENG SHUTDOWN L, R (FLAPS 20)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,090	5,770	5,450	5,130	4,810	4,490	4,170	3,850	3,555	3,435
GOOD	7,145	6,865	6,585	6,305	6,025	5,745	5,465	5,185	4,915	4,715
MEDIUM	10,470	9,990	9,510	9,030	8,550	8,070	7,590	7,110	6,645	6,285
POOR	14,380	13,660	12,940	12,220	11,500	10,780	10,060	9,340	8,640	8,080
VREF20	189	184	179	173	168	162	156	150	143	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+70	+120	+190	+290
Wind	Per 10 kt. headwind	-120	-210	-350	-530
	Per 10 kt. tailwind	+420	+760	+1270	+2010
Slope	Per 1% downhill	+40	+120	+310	+750
	Per 1% uphill	-30	-100	-240	-490
Temperature	Per 10°C above ISA	+70	+110	+170	+240
	Per 10°C below ISA	-70	-110	-170	-240
Approach Speed	Per 10 kt. Above VREF	+230	+350	+460	+550
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	+150	+590	+1780	+4600

ENG SHUTDOWN L, R (FLAPS 30)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,290	5,050	4,810	4,570	4,330	4,090	3,850	3,610	3,395	3,355
GOOD	6,825	6,545	6,265	5,985	5,705	5,425	5,145	4,865	4,610	4,530
MEDIUM	9,605	9,165	8,725	8,285	7,845	7,405	6,965	6,525	6,120	5,960
POOR	12,910	12,270	11,630	10,990	10,350	9,710	9,070	8,430	7,830	7,510
VREF30	178	172	164	158	151	145	140	137	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+40	+70	+120	+190
Wind	Per 10 kt. headwind	-120	-200	-330	-490
	Per 10 kt. tailwind	+410	+730	+1200	+1900
Slope	Per 1% downhill	+40	+110	+280	+660
	Per 1% uphill	-30	-90	-220	-430
Temperature	Per 10°C above ISA	+60	+100	+150	+210
	Per 10°C below ISA	-60	-100	-150	-210
Approach Speed	Per 10 kt. Above VREF	+230	+330	+430	+490
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	+130	+510	+1460	+3670

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

FLAPS DRIVE (FLAPS ≤ 5)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	7,920	7,440	6,960	6,480	6,000	5,520	5,040	4,560	4,135	4,095
GOOD	8,230	7,910	7,590	7,270	6,950	6,630	6,310	5,990	5,690	5,530
MEDIUM	11,585	11,065	10,545	10,025	9,505	8,985	8,465	7,945	7,455	7,175
POOR	15,295	14,535	13,775	13,015	12,255	11,495	10,735	9,975	9,255	8,815
VREF30+40	218	212	204	198	191	185	180	177	177	177

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+60	+110	+190	+280
Wind	Per 10 kt. headwind	-130	-220	-340	-490
	Per 10 kt. tailwind	+450	+780	+1240	+1880
Slope	Per 1% downhill	+40	+110	+260	+560
	Per 1% uphill	-40	-100	-210	-390
Temperature	Per 10°C above ISA	+80	+130	+190	+250
	Per 10°C below ISA	-80	-130	-190	-250
Approach Speed	Per 10 kt. Above VREF	+210	+310	+400	+470
Reverse Thrust	One Reverser Operative	+110	+470	+1220	+2460
	No Reversers Operative	+260	+1200	+3660	+9120

FLAPS DRIVE (5 < FLAPS < 20)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,655	6,295	5,935	5,575	5,215	4,855	4,495	4,135	3,815	3,775
GOOD	7,710	7,390	7,070	6,750	6,430	6,110	5,790	5,470	5,175	5,055
MEDIUM	10,520	10,040	9,560	9,080	8,600	8,120	7,640	7,160	6,715	6,515
POOR	13,695	13,015	12,335	11,655	10,975	10,295	9,615	8,935	8,295	7,935
VREF30+20	198	192	184	178	171	165	160	157	157	157

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+50	+90	+160	+230
Wind	Per 10 kt. headwind	-130	-210	-330	-470
	Per 10 kt. tailwind	+430	+750	+1200	+1810
Slope	Per 1% downhill	+40	+110	+250	+540
	Per 1% uphill	-40	-90	-200	-370
Temperature	Per 10°C above ISA	+70	+120	+170	+220
	Per 10°C below ISA	-70	-120	-170	-220
Approach Speed	Per 10 kt. Above VREF	+230	+320	+410	+470
Reverse Thrust	One Reverser Operative	+90	+390	+1000	+2020
	No Reversers Operative	+210	+980	+2930	+7180

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

FLAPS DRIVE (FLAPS ≥ 20)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,755	5,475	5,195	4,915	4,635	4,355	4,075	3,795	3,535	3,415
GOOD	6,965	6,685	6,405	6,125	5,845	5,565	5,285	5,005	4,735	4,535
MEDIUM	9,615	9,175	8,735	8,295	7,855	7,415	6,975	6,535	6,110	5,790
POOR	12,650	12,010	11,370	10,730	10,090	9,450	8,810	8,170	7,550	7,070
VREF20	189	184	179	173	168	162	156	150	143	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+70	+120	+180	+250
Wind	Per 10 kt. headwind	-120	-200	-310	-450
	Per 10 kt. tailwind	+410	+720	+1150	+1740
Slope	Per 1% downhill	+40	+100	+230	+510
	Per 1% uphill	-30	-90	-190	-350
Temperature	Per 10°C above ISA	+60	+100	+150	+200
	Per 10°C below ISA	-60	-100	-150	-200
Approach Speed	Per 10 kt. Above VREF	+220	+320	+390	+450
Reverse Thrust	One Reverser Operative	+70	+310	+820	+1690
	No Reversers Operative	+170	+770	+2310	+5690

FLAPS PRIMARY FAIL

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,165	5,885	5,605	5,325	5,045	4,765	4,485	4,205	3,945	3,825
GOOD	7,770	7,450	7,130	6,810	6,490	6,170	5,850	5,530	5,225	5,025
MEDIUM	10,470	9,990	9,510	9,030	8,550	8,070	7,590	7,110	6,645	6,285
POOR	13,535	12,855	12,175	11,495	10,815	10,135	9,455	8,775	8,115	7,595
VREF20	189	184	179	173	168	162	156	150	143	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+80	+130	+200	+280
Wind	Per 10 kt. headwind	-130	-220	-330	-470
	Per 10 kt. tailwind	+460	+770	+1210	+1820
Slope	Per 1% downhill	+40	+120	+260	+550
	Per 1% uphill	-40	-100	-210	-380
Temperature	Per 10°C above ISA	+70	+110	+160	+210
	Per 10°C below ISA	-70	-120	-160	-210
Approach Speed	Per 10 kt. Above VREF	+290	+390	+470	+520
Reverse Thrust	One Reverser Operative	+90	+380	+970	+1930
	No Reversers Operative	+210	+960	+2830	+6840

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

FLAP/SLAT CONTROL

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,755	5,475	5,195	4,915	4,635	4,355	4,075	3,795	3,535	3,415
GOOD	6,965	6,685	6,405	6,125	5,845	5,565	5,285	5,005	4,735	4,535
MEDIUM	9,615	9,175	8,735	8,295	7,855	7,415	6,975	6,535	6,110	5,790
POOR	12,650	12,010	11,370	10,730	10,090	9,450	8,810	8,170	7,550	7,070
VREF20	189	184	179	173	168	162	156	150	143	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+70	+120	+180	+250
Wind	Per 10 kt. headwind	-120	-200	-310	-450
	Per 10 kt. tailwind	+410	+720	+1150	+1740
Slope	Per 1% downhill	+40	+100	+230	+510
	Per 1% uphill	-30	-90	-190	-350
Temperature	Per 10°C above ISA	+60	+100	+150	+200
	Per 10°C below ISA	-60	-100	-510	-200
Approach Speed	Per 10 kt. Above VREF	+220	+320	+390	+450
Reverse Thrust	One Reverser Operative	+70	+310	+820	+1690
	No Reversers Operative	+170	+770	+2310	+5690

FLIGHT CONTROL MODE

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,205	5,925	5,645	5,365	5,085	4,805	4,525	4,245	3,985	3,865
GOOD	7,840	7,520	7,200	6,880	6,560	6,240	5,920	5,600	5,295	5,095
MEDIUM	10,895	10,375	9,855	9,335	8,815	8,295	7,775	7,255	6,755	6,395
POOR	14,010	13,290	12,570	11,850	11,130	10,410	9,690	8,970	8,275	7,755
VREF20	189	184	179	173	168	162	156	150	143	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+80	+130	+210	+290
Wind	Per 10 kt. headwind	-140	-220	-340	-480
	Per 10 kt. tailwind	+460	+780	+1230	+1840
Slope	Per 1% downhill	+40	+120	+270	+570
	Per 1% uphill	-40	-100	-220	-390
Temperature	Per 10°C above ISA	+70	+120	+170	+220
	Per 10°C below ISA	-80	-120	-170	-220
Approach Speed	Per 10 kt. Above VREF	+300	+410	+490	+550
Reverse Thrust	One Reverser Operative	+100	+400	+1030	+2050
	No Reversers Operative	+230	+1030	+3040	+7430

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

HYD PRESS SYS C

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,165	5,885	5,605	5,325	5,045	4,765	4,485	4,205	3,945	3,825
GOOD	7,770	7,450	7,130	6,810	6,490	6,170	5,850	5,530	5,225	5,025
MEDIUM	10,470	9,990	9,510	9,030	8,550	8,070	7,590	7,110	6,645	6,285
POOR	13,535	12,855	12,175	11,495	10,815	10,135	9,455	8,775	8,115	7,595
VREF20	189	184	179	173	168	162	156	150	143	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+80	+130	+200	+280
Wind	Per 10 kt. headwind	-130	-220	-330	-470
	Per 10 kt. tailwind	+460	+770	+1210	+1820
Slope	Per 1% downhill	+40	+120	+260	+550
	Per 1% uphill	-40	-100	-210	-380
Temperature	Per 10°C above ISA	+70	+110	+160	+210
	Per 10°C below ISA	-70	-120	-160	-210
Approach Speed	Per 10 kt. Above VREF	+290	+390	+470	+520
Reverse Thrust	One Reverser Operative	+90	+380	+970	+1930
	No Reversers Operative	+210	+960	+2830	+6840

HYD PRESS SYS L+C

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	7,220	6,900	6,580	6,260	5,940	5,620	5,300	4,980	4,705	4,745
GOOD	9,730	9,330	8,930	8,530	8,130	7,730	7,330	6,930	6,575	6,535
MEDIUM	13,940	13,300	12,660	12,020	11,380	10,740	10,100	9,460	8,875	8,675
POOR	18,855	17,935	17,015	16,095	15,175	14,255	13,335	12,415	11,555	11,115
VREF30+20	198	192	184	178	171	165	160	157	157	157

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+60	+120	+200	+330
Wind	Per 10 kt. headwind	-160	-280	-440	-680
	Per 10 kt. tailwind	+540	+950	+1570	+2580
Slope	Per 1% downhill	+70	+200	+500	+1260
	Per 1% uphill	-60	-170	-380	-760
Temperature	Per 10°C above ISA	+100	+160	+240	+330
	Per 10°C below ISA	-100	-160	-240	-330
Approach Speed	Per 10 kt. Above VREF	+410	+550	+670	+740
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	+200	+880	+2580	+6370

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

FEET
KIAS

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

HYD PRESS SYS L+R

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	7,560	7,240	6,920	6,600	6,280	5,960	5,640	5,320	5,045	5,085
GOOD	10,210	9,810	9,410	9,010	8,610	8,210	7,810	7,410	7,060	7,060
MEDIUM	16,335	15,655	14,975	14,295	13,615	12,935	12,255	11,575	10,970	10,890
POOR	25,165	24,165	23,165	22,165	21,165	20,165	19,165	18,165	17,265	17,065
VREF30+20	198	192	184	178	171	165	160	157	157	157

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+70	+120	+220	+430
Wind	Per 10 kt. headwind	-190	-310	-570	-1090
	Per 10 kt. tailwind	+640	+1060	+2020	+4110
Slope	Per 1% downhill	+110	+290	+990	+4580
	Per 1% uphill	-90	-240	-680	-1880
Temperature	Per 10°C above ISA	+120	+180	+320	+530
	Per 10°C below ISA	-120	-190	-320	-530
Approach Speed	Per 10 kt. Above VREF	+450	+630	+860	+1050
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	N/A	N/A	N/A	N/A

HYD PRESS SYS R+C

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	8,150	7,830	7,510	7,190	6,870	6,550	6,230	5,910	5,630	5,630
GOOD	9,830	9,430	9,030	8,630	8,230	7,830	7,430	7,030	6,675	6,635
MEDIUM	14,050	13,410	12,770	12,130	11,490	10,850	10,210	9,570	8,985	8,785
POOR	18,955	18,035	17,115	16,195	15,275	14,355	13,435	12,515	11,655	11,215
VREF30+20	198	192	184	178	171	165	160	157	157	157

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+80	+120	+210	+330
Wind	Per 10 kt. headwind	-210	-280	-440	-680
	Per 10 kt. tailwind	+720	+960	+1580	+2590
Slope	Per 1% downhill	+120	+210	+510	+1280
	Per 1% uphill	-110	-180	-390	-770
Temperature	Per 10°C above ISA	+130	+160	+240	+340
	Per 10°C below ISA	-130	-160	-240	-340
Approach Speed	Per 10 kt. Above VREF	+500	+580	+690	+760
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	+470	+930	+2690	+6570

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

HYD PRESS SYS L (FLAPS 25)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,470	5,230	4,990	4,750	4,510	4,270	4,030	3,790	3,580	3,580
GOOD	7,205	6,925	6,645	6,365	6,085	5,805	5,525	5,245	4,995	4,955
MEDIUM	10,620	10,140	9,660	9,180	8,700	8,220	7,740	7,260	6,820	6,660
POOR	14,445	13,765	13,085	12,405	11,725	11,045	10,365	9,685	9,050	8,730
VREF25	179	174	169	164	159	153	148	142	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+70	+120	+200	+310
Wind	Per 10 kt. headwind	-130	-220	-370	-590
	Per 10 kt. tailwind	+430	+790	+1360	+2300
Slope	Per 1% downhill	+40	+130	+360	+990
	Per 1% uphill	-40	-110	-280	-590
Temperature	Per 10°C above ISA	+70	+110	+170	+250
	Per 10°C below ISA	-70	-110	-180	-250
Approach Speed	Per 10 kt. Above VREF	+270	+400	+510	+600
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	+100	+480	+1550	+4100

HYD PRESS SYS L (FLAPS 30)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,510	5,270	5,030	4,790	4,550	4,310	4,070	3,830	3,620	3,620
GOOD	7,550	7,230	6,910	6,590	6,270	5,950	5,630	5,310	5,025	4,985
MEDIUM	10,935	10,415	9,895	9,375	8,855	8,335	7,815	7,295	6,820	6,660
POOR	14,710	13,990	13,270	12,550	11,830	11,110	10,390	9,670	9,000	8,680
VREF30	178	172	164	158	151	145	140	137	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+40	+80	+140	+230
Wind	Per 10 kt. headwind	-130	-220	-370	-580
	Per 10 kt. tailwind	+440	+800	+1360	+2290
Slope	Per 1% downhill	+40	+140	+360	+990
	Per 1% uphill	-40	-120	-280	-590
Temperature	Per 10°C above ISA	+70	+110	+170	+250
	Per 10°C below ISA	-70	-110	-180	-250
Approach Speed	Per 10 kt. Above VREF	+280	+400	+510	+590
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	+100	+490	+1520	+3950

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

HYD PRESS SYS R (FLAPS 25)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,455	5,255	5,055	4,855	4,655	4,455	4,255	4,055	3,880	3,880
GOOD	7,205	6,925	6,645	6,365	6,085	5,805	5,525	5,245	4,995	4,955
MEDIUM	10,580	10,100	9,620	9,140	8,660	8,180	7,700	7,220	6,780	6,620
POOR	14,345	13,665	12,985	12,305	11,625	10,945	10,265	9,585	8,950	8,630
VREF25	179	174	169	164	159	153	148	142	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+80	+120	+200	+300
Wind	Per 10 kt. headwind	-140	-220	-370	-580
	Per 10 kt. tailwind	+500	+790	+1350	+2280
Slope	Per 1% downhill	+60	+130	+360	+970
	Per 1% uphill	-50	-110	-270	-580
Temperature	Per 10°C above ISA	+80	+110	+170	+250
	Per 10°C below ISA	-80	-110	-170	-250
Approach Speed	Per 10 kt. Above VREF	+300	+400	+500	+580
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	+150	+480	+1520	+3960

HYD PRESS SYS R (FLAPS 30)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,465	5,265	5,065	4,865	4,665	4,465	4,265	4,065	3,890	3,890
GOOD	7,500	7,180	6,860	6,540	6,220	5,900	5,580	5,260	4,975	4,935
MEDIUM	10,480	10,000	9,520	9,040	8,560	8,080	7,600	7,120	6,680	6,520
POOR	14,105	13,425	12,745	12,065	11,385	10,705	10,025	9,345	8,710	8,390
VREF30	178	172	164	158	151	145	140	137	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+50	+80	+140	+220
Wind	Per 10 kt. headwind	-150	-220	-360	-570
	Per 10 kt. tailwind	+510	+790	+1340	+2240
Slope	Per 1% downhill	+60	+130	+340	+920
	Per 1% uphill	-50	-110	-260	-550
Temperature	Per 10°C above ISA	+80	+110	+170	+240
	Per 10°C below ISA	-80	-110	-170	-240
Approach Speed	Per 10 kt. Above VREF	+310	+390	+480	+550
Reverse Thrust	One Reverser Operative	N/A	N/A	N/A	N/A
	No Reversers Operative	+150	+470	+1410	+3550

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

PITCH DOWN AUTHORITY (FLAPS 25)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,870	5,590	5,310	5,030	4,750	4,470	4,190	4,090	4,050	4,010
GOOD	7,170	6,890	6,610	6,330	6,050	5,770	5,490	5,330	5,210	5,090
MEDIUM	9,420	9,020	8,620	8,220	7,820	7,420	7,020	6,740	6,500	6,260
POOR	12,020	11,460	10,900	10,340	9,780	9,220	8,660	8,250	7,890	7,530
VREF25	179	174	169	164	159	153	148	142	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+80	+120	+190	+270
Wind	Per 10 kt. headwind	-140	-230	-340	-490
	Per 10 kt. tailwind	+470	+790	+1230	+1860
Slope	Per 1% downhill	+40	+110	+260	+580
	Per 1% uphill	-40	-100	-210	-390
Temperature	Per 10°C above ISA	+80	+120	+170	+220
	Per 10°C below ISA	-80	-120	-170	-220
Approach Speed	Per 10 kt. Above VREF	+140	+190	+230	+250
Reverse Thrust	One Reverser Operative	+50	+260	+720	+1540
	No Reversers Operative	+120	+620	+1960	+4870

PITCH DOWN AUTHORITY (FLAPS 30)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	5,720	5,440	5,160	4,880	4,600	4,320	4,040	3,970	3,970	3,970
GOOD	7,180	6,860	6,540	6,220	5,900	5,580	5,260	5,150	5,110	5,070
MEDIUM	9,340	8,900	8,460	8,020	7,580	7,140	6,700	6,470	6,310	6,150
POOR	11,840	11,240	10,640	10,040	9,440	8,840	8,240	7,880	7,600	7,320
VREF3	178	172	164	158	151	145	140	137	137	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+70	+110	+170	+240
Wind	Per 10 kt. headwind	-140	-220	-330	-480
	Per 10 kt. tailwind	+460	+770	+1210	+1820
Slope	Per 1% downhill	+40	+110	+250	+550
	Per 1% uphill	-40	-100	-200	-380
Temperature	Per 10°C above ISA	+70	+110	+160	+210
	Per 10°C below ISA	-70	-110	-160	-210
Approach Speed	Per 10 kt. Above VREF	+140	+190	+220	+250
Reverse Thrust	One Reverser Operative	+50	+230	+650	+1400
	No Reversers Operative	+100	+560	+1760	+4380

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

PITCH UP AUTHORITY (FLAPS 5)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	7,725	7,285	6,845	6,405	5,965	5,525	5,085	4,645	4,255	4,215
GOOD	8,320	8,000	7,680	7,360	7,040	6,720	6,400	6,080	5,780	5,620
MEDIUM	11,585	11,065	10,545	10,025	9,505	8,985	8,465	7,945	7,455	7,175
POOR	14,840	14,120	13,400	12,680	11,960	11,240	10,520	9,800	9,115	8,675
VREF30+40	218	212	204	198	191	185	180	177	177	177

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+60	+120	+190	+270
Wind	Per 10 kt. headwind	-140	-230	-340	-490
	Per 10 kt. tailwind	+460	+790	+1250	+1860
Slope	Per 1% downhill	+40	+120	+260	+550
	Per 1% uphill	-40	-100	-210	-390
Temperature	Per 10°C above ISA	+90	+140	+190	+250
	Per 10°C below ISA	-90	-140	-190	-250
Approach Speed	Per 10 kt. Above VREF	+230	+320	+390	+450
Reverse Thrust	One Reverser Operative	+120	+460	+1140	+2210
	No Reversers Operative	+280	+1180	+3300	+7640

PITCH UP AUTHORITY (FLAPS 20)

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,370	6,050	5,730	5,410	5,090	4,770	4,450	4,130	3,845	3,805
GOOD	7,700	7,380	7,060	6,740	6,420	6,100	5,780	5,460	5,165	5,045
MEDIUM	10,440	9,960	9,480	9,000	8,520	8,040	7,560	7,080	6,635	6,435
POOR	13,535	12,855	12,175	11,495	10,815	10,135	9,455	8,775	8,135	7,775
VREF30+20	198	192	184	178	171	165	160	157	157	157

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+50	+90	+150	+220
Wind	Per 10 kt. headwind	-130	-210	-320	-460
	Per 10 kt. tailwind	+440	+750	+1190	+1790
Slope	Per 1% downhill	+40	+110	+240	+520
	Per 1% uphill	-40	-90	-200	-360
Temperature	Per 10°C above ISA	+70	+120	+170	+220
	Per 10°C below ISA	-70	-120	-170	-220
Approach Speed	Per 10 kt. Above VREF	+230	+320	+390	+440
Reverse Thrust	One Reverser Operative	+90	+370	+920	+1820
	No Reversers Operative	+210	+910	+2580	+6060

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

PRI FLIGHT COMPUTERS

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,205	5,925	5,645	5,365	5,085	4,805	4,525	4,245	3,985	3,865
GOOD	7,840	7,520	7,200	6,880	6,560	6,240	5,920	5,600	5,295	5,095
MEDIUM	10,895	10,375	9,855	9,335	8,815	8,295	7,775	7,255	6,755	6,395
POOR	14,010	13,290	12,570	11,850	11,130	10,410	9,690	8,970	8,275	7,755
VREF20	189	184	179	173	168	162	156	150	143	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+80	+130	+210	+290
Wind	Per 10 kt. headwind	-140	-220	-340	-480
	Per 10 kt. tailwind	+460	+780	+1230	+1840
Slope	Per 1% downhill	+40	+120	+270	+570
	Per 1% uphill	-40	-100	-220	-390
Temperature	Per 10°C above ISA	+70	+120	+170	+220
	Per 10°C below ISA	-80	-120	-170	-220
Approach Speed	Per 10 kt. Above VREF	+300	+410	+490	+550
Reverse Thrust	One Reverser Operative	+100	+400	+1030	+2050
	No Reversers Operative	+230	+1030	+3040	+7430

SLATS DRIVE

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,935	6,575	6,215	5,855	5,495	5,135	4,775	4,415	4,095	4,055
GOOD	8,060	7,740	7,420	7,100	6,780	6,460	6,140	5,820	5,525	5,405
MEDIUM	11,215	10,695	10,175	9,655	9,135	8,615	8,095	7,575	7,090	6,850
POOR	14,380	13,660	12,940	12,220	11,500	10,780	10,060	9,340	8,660	8,260
VREF30+30	208	202	194	188	181	175	170	167	167	167

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+60	+110	+170	+250
Wind	Per 10 kt. headwind	-130	-220	-340	-480
	Per 10 kt. tailwind	+460	+780	+1230	+1830
Slope	Per 1% downhill	+40	+120	+260	+540
	Per 1% uphill	-40	-100	-210	-380
Temperature	Per 10°C above ISA	+80	+130	+180	+230
	Per 10°C below ISA	-80	-130	-180	-240
Approach Speed	Per 10 kt. Above VREF	+240	+330	+400	+450
Reverse Thrust	One Reverser Operative	+110	+420	+1020	+1980
	No Reversers Operative	+250	+1040	+2870	+6600

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES AND APPROACH SPEEDS

**FEET
KIAS**

NOTE: Data below assumes Max Manual Braking and does NOT include 15% safety margin. Refer to Page 4-13 for all assumed conditions.

STABILIZER

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,370	6,050	5,730	5,410	5,090	4,770	4,450	4,130	3,845	3,805
GOOD	7,700	7,380	7,060	6,740	6,420	6,100	5,780	5,460	5,165	5,045
MEDIUM	10,440	9,960	9,480	9,000	8,520	8,040	7,560	7,080	6,635	6,435
POOR	13,535	12,855	12,175	11,495	10,815	10,135	9,455	8,775	8,135	7,775
VREF30+20	198	192	184	178	171	165	160	157	157	157

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+50	+90	+150	+220
Wind	Per 10 kt. headwind	-130	-210	-320	-460
	Per 10 kt. tailwind	+440	+750	+1190	+1790
Slope	Per 1% downhill	+40	+110	+240	+520
	Per 1% uphill	-40	-90	-200	-360
Temperature	Per 10°C above ISA	+70	+120	+170	+220
	Per 10°C below ISA	-70	-120	-170	-220
Approach Speed	Per 10 kt. Above VREF	+230	+320	+390	+440
Reverse Thrust	One Reverser Operative	+90	+370	+920	+1820
	No Reversers Operative	+210	+910	+2580	+6060

ALL OTHER FLAPS 20 ABNORMAL CONFIGURATIONS

RWY COND. & APPCH SPEED	LANDING WEIGHT – 1,000 POUNDS									
	740	700	660	620	580	540	500	460	420	380
DRY	6,205	5,925	5,645	5,365	5,085	4,805	4,525	4,245	3,985	3,865
GOOD	7,840	7,520	7,200	6,880	6,560	6,240	5,920	5,600	5,295	5,095
MEDIUM	10,895	10,375	9,855	9,335	8,815	8,295	7,775	7,255	6,755	6,395
POOR	14,010	13,290	12,570	11,850	11,130	10,410	9,690	8,970	8,275	7,755
VREF20	189	184	179	173	168	162	156	150	143	137

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+80	+130	+210	+290
Wind	Per 10 kt. headwind	-140	-220	-340	-480
	Per 10 kt. tailwind	+460	+780	+1230	+1840
Slope	Per 1% downhill	+40	+120	+270	+570
	Per 1% uphill	-40	-100	-220	-390
Temperature	Per 10°C above ISA	+70	+120	+170	+220
	Per 10°C below ISA	-80	-120	-170	-220
Approach Speed	Per 10 kt. Above VREF	+300	+410	+490	+550
Reverse Thrust	One Reverser Operative	+100	+400	+1030	+2050
	No Reversers Operative	+230	+1030	+3040	+7430

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EMERGENCY LANDING DISTANCES FEET

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

FLAPS 20

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

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).									
	DRY (6)						GOOD (5)			
	AB 1	AB 2	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	13,900	12,700	11,100	9,300	7,000	6,200	11,100	9,400	7,600	7,400
740,000	13,600	12,400	10,900	9,200	6,900	6,000	10,900	9,200	7,500	7,300
720,000	13,300	12,100	10,600	9,000	6,800	5,900	10,600	9,000	7,300	7,100
700,000	13,000	11,800	10,400	8,800	6,600	5,700	10,400	8,800	7,200	7,000
680,000	12,700	11,600	10,200	8,600	6,500	5,500	10,200	8,600	7,100	6,900
660,000	12,300	11,300	10,000	8,400	6,400	5,400	10,000	8,500	6,900	6,700
640,000	12,000	11,000	9,800	8,300	6,300	5,200	9,800	8,300	6,800	6,600
620,000	11,700	10,700	9,500	8,100	6,200	5,100	9,500	8,100	6,600	6,400
600,000	11,400	10,400	9,300	7,900	6,000	4,900	9,300	7,900	6,500	6,300
580,000	11,100	10,200	9,100	7,700	5,900	4,700	9,100	7,700	6,400	6,200
560,000	10,700	9,900	8,900	7,500	5,800	4,600	8,900	7,600	6,200	6,000
540,000	10,400	9,600	8,700	7,400	5,700	4,400	8,700	7,400	6,100	5,900
520,000	10,100	9,300	8,400	7,200	5,600	4,300	8,400	7,200	5,900	5,700
500,000	9,800	9,000	8,200	7,000	5,400	4,100	8,200	7,000	5,800	5,600
492,000	9,700	8,900	8,100	6,900	5,400	4,000	8,100	6,900	5,800	5,600
480,000	9,500	8,800	8,000	6,800	5,300	4,000	8,000	6,900	5,700	5,500
460,000	9,200	8,500	7,800	6,700	5,200	3,900	7,800	6,700	5,600	5,400
440,000	8,900	8,300	7,700	6,600	5,100	3,900	7,700	6,600	5,500	5,200
420,000	8,600	8,100	7,500	6,400	5,000	3,800	7,500	6,400	5,400	5,100
400,000	8,400	7,800	7,300	6,300	4,900	3,800	7,300	6,300	5,300	5,000
380,000	8,100	7,600	7,100	6,100	4,800	3,700	7,100	6,200	5,200	4,900
360,000	7,800	7,300	6,900	6,000	4,700	3,600	6,900	6,000	5,100	4,800

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF20 - 5 •

Data is advisory and includes a 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	-600	-500	-400	-300	-200	-200	-400	-300	-300	-300
2,000	0	0	0	0	0	0	0	0	0	0
4,000	600	500	400	300	200	200	400	300	300	300
6,000	1,200	1,000	800	700	500	300	800	700	600	500
8,000	1,800	1,500	1,300	1,000	700	500	1,300	1,000	800	800

CORRECTIONS

	DRY (6)						GOOD (5)			
PER 1 KT HEADWIND	-50	-50	-50	-50	0	0	-50	-50	0	0
PER 1 KT TAILWIND	150	150	100	100	50	50	100	100	100	100
PER 5 KTS ADD'L SPD	300	300	350	300	200	100	350	300	200	150
PER 10°C ABOVE ISA	250	200	200	150	100	50	200	150	150	100
PER 10°C BELOW ISA	-250	-200	-200	-150	-100	-50	-200	-150	-150	-100
PER 1% UP SLOPE	-300	-200	-50	0	0	-50	-50	0	-50	-100
PER 1% DOWN SLOPE	250	100	0	0	0	50	0	50	100	100
1 REVERSER INOP	1,200	400	100	0	0	100	100	100	400	400
2 REVERSERS INOP	1,400	400	100	0	0	200	100	200	900	900
MANUAL SPOILERS	200	200	200	200	200	300	200	200	200	300

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 20

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR(1)			
	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	11,700	10,600	10,300	10,300	13,900	13,600	13,600	13,600
740,000	11,500	10,400	10,100	10,100	13,600	13,300	13,300	13,200
720,000	11,200	10,200	9,900	9,900	13,300	12,900	12,900	12,900
700,000	11,000	9,900	9,600	9,600	12,900	12,600	12,600	12,600
680,000	10,700	9,700	9,400	9,400	12,600	12,300	12,300	12,300
660,000	10,500	9,500	9,200	9,200	12,300	12,000	12,000	12,000
640,000	10,300	9,300	9,000	9,000	12,000	11,700	11,700	11,600
620,000	10,000	9,100	8,800	8,800	11,700	11,300	11,300	11,300
600,000	9,800	8,800	8,500	8,500	11,300	11,000	11,000	11,000
580,000	9,500	8,600	8,300	8,300	11,000	10,700	10,700	10,700
560,000	9,300	8,400	8,100	8,100	10,700	10,400	10,400	10,400
540,000	9,100	8,200	7,900	7,900	10,400	10,100	10,100	10,000
520,000	8,800	8,000	7,700	7,700	10,100	9,700	9,700	9,700
500,000	8,600	7,700	7,400	7,400	9,700	9,400	9,400	9,400
492,000	8,500	7,700	7,400	7,400	9,600	9,300	9,300	9,300
480,000	8,400	7,500	7,200	7,200	9,500	9,100	9,100	9,100
460,000	8,200	7,400	7,100	7,100	9,200	8,900	8,900	8,800
440,000	8,000	7,200	6,900	6,900	9,000	8,700	8,600	8,600
420,000	7,800	7,100	6,700	6,700	8,700	8,400	8,400	8,300
400,000	7,600	6,900	6,500	6,500	8,500	8,200	8,100	8,100
380,000	7,400	6,700	6,300	6,300	8,300	7,900	7,800	7,800
360,000	7,200	6,600	6,200	6,200	8,000	7,700	7,600	7,500

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF20 - 5 •

Data is advisory and includes a 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	-600	-600	-600	-600
2,000	0	0	0	0	0	0	0	0
4,000	400	400	400	400	600	600	600	600
6,000	900	800	800	800	1,200	1,200	1,200	1,200
8,000	1,300	1,300	1,300	1,300	1,700	1,800	1,800	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	100	100	200	200	200	200
PER 5 KTS ADD'L SPD	350	300	200	200	350	250	250	250
PER 10°C ABOVE ISA	200	200	150	150	250	250	250	250
PER 10°C BELOW ISA	-200	-200	-150	-150	-250	-250	-250	-250
PER 1% UP SLOPE	-150	-100	-200	-200	-350	-400	-400	-400
PER 1% DOWN SLOPE	150	200	300	250	500	600	600	600
1 REVERSER INOP	400	800	900	900	1,600	1,900	1,900	1,900
2 REVERSERS INOP	1,600	2,400	2,500	2,500	5,700	6,000	6,000	6,000
MANUAL SPOILERS	200	200	200	300	200	200	200	300

EMERGENCY LANDING DISTANCES FEET

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

FLAPS 25

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

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).									
	DRY (6)						GOOD (5)			
	AB 1	AB 2	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	12,900	11,400	10,200	8,500	6,600	5,400	10,200	8,600	7,200	6,800
740,000	12,600	11,200	10,000	8,400	6,500	5,300	10,000	8,400	7,100	6,700
720,000	12,300	10,900	9,800	8,200	6,400	5,200	9,800	8,200	7,000	6,500
700,000	12,000	10,700	9,600	8,000	6,200	5,100	9,600	8,100	6,800	6,400
680,000	11,700	10,500	9,400	7,900	6,100	4,900	9,400	7,900	6,700	6,300
660,000	11,400	10,200	9,200	7,700	6,000	4,800	9,200	7,800	6,500	6,200
640,000	11,100	10,000	9,000	7,600	5,900	4,700	9,000	7,600	6,400	6,100
620,000	10,800	9,700	8,800	7,400	5,800	4,600	8,800	7,400	6,300	5,900
600,000	10,500	9,500	8,600	7,200	5,600	4,500	8,600	7,300	6,100	5,800
580,000	10,200	9,300	8,400	7,100	5,500	4,300	8,400	7,100	6,000	5,700
560,000	9,900	9,000	8,200	6,900	5,400	4,200	8,200	7,000	5,800	5,600
540,000	9,600	8,800	8,000	6,800	5,300	4,100	8,000	6,800	5,700	5,500
520,000	9,300	8,500	7,800	6,600	5,200	4,000	7,800	6,600	5,600	5,300
500,000	9,000	8,300	7,600	6,400	5,000	3,900	7,600	6,500	5,400	5,200
492,000	8,800	8,200	7,500	6,400	5,000	3,800	7,500	6,400	5,400	5,200
480,000	8,700	8,100	7,400	6,300	5,000	3,800	7,400	6,400	5,300	5,100
460,000	8,500	7,900	7,300	6,300	4,900	3,700	7,300	6,300	5,300	5,100
440,000	8,400	7,800	7,200	6,300	4,900	3,700	7,200	6,300	5,200	5,000
420,000	8,200	7,600	7,100	6,200	4,800	3,700	7,100	6,300	5,200	5,000
400,000	8,000	7,500	7,000	6,200	4,800	3,600	7,000	6,200	5,200	4,900
380,000	7,800	7,300	6,900	6,100	4,800	3,600	6,900	6,200	5,100	4,800
360,000	7,600	7,100	6,800	6,100	4,700	3,500	6,800	6,100	5,100	4,800

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF25 - 5 •

Data is advisory and includes a 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	-500	-500	-400	-300	-200	-100	-400	-300	-200	-200
2,000	0	0	0	0	0	0	0	0	0	0
4,000	500	500	400	300	200	100	400	300	200	200
6,000	1,100	900	800	600	400	300	800	600	500	500
8,000	1,600	1,400	1,100	900	600	400	1,100	900	700	700

CORRECTIONS

	DRY (6)						GOOD (5)			
PER 1 KT HEADWIND	-50	-50	-50	-50	0	0	-50	-50	0	0
PER 1 KT TAILWIND	150	100	100	100	50	50	100	100	100	50
PER 5 KTS ADD'L SPD	250	250	350	300	200	100	350	300	200	150
PER 10°C ABOVE ISA	200	200	200	150	100	50	200	150	100	100
PER 10°C BELOW ISA	-200	-200	-200	-150	-100	-50	-200	-150	-100	-100
PER 1% UP SLOPE	-250	-150	-50	0	0	-50	-50	0	-50	-100
PER 1% DOWN SLOPE	250	100	0	0	0	50	0	50	100	100
1 REVERSER INOP	1,000	300	100	0	0	100	100	100	300	300
2 REVERSERS INOP	1,200	300	100	0	0	200	100	200	800	700
MANUAL SPOILERS	200	200	200	200	200	300	200	200	200	300

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 25

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR(1)			
	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	10,800	9,800	9,500	9,500	12,600	12,300	12,300	12,300
740,000	10,600	9,600	9,300	9,300	12,300	12,000	12,000	12,000
720,000	10,300	9,400	9,100	9,100	12,100	11,800	11,800	11,700
700,000	10,100	9,200	8,900	8,900	11,800	11,500	11,500	11,500
680,000	9,900	9,000	8,700	8,700	11,500	11,200	11,200	11,200
660,000	9,700	8,800	8,500	8,500	11,200	10,900	10,900	10,900
640,000	9,500	8,600	8,300	8,300	10,900	10,600	10,600	10,600
620,000	9,200	8,400	8,100	8,100	10,700	10,400	10,400	10,300
600,000	9,000	8,200	7,900	7,900	10,400	10,100	10,100	10,100
580,000	8,800	8,000	7,700	7,700	10,100	9,800	9,800	9,800
560,000	8,600	7,800	7,500	7,500	9,800	9,500	9,500	9,500
540,000	8,400	7,600	7,300	7,300	9,500	9,200	9,200	9,200
520,000	8,100	7,400	7,100	7,100	9,300	9,000	9,000	8,900
500,000	7,900	7,200	6,900	6,900	9,000	8,700	8,700	8,700
492,000	7,800	7,100	6,800	6,800	8,900	8,600	8,600	8,500
480,000	7,700	7,000	6,700	6,700	8,800	8,500	8,400	8,400
460,000	7,600	6,900	6,600	6,600	8,600	8,300	8,300	8,200
440,000	7,500	6,900	6,500	6,500	8,400	8,100	8,100	8,100
420,000	7,400	6,800	6,400	6,400	8,300	8,000	7,900	7,900
400,000	7,300	6,700	6,300	6,200	8,100	7,800	7,700	7,700
380,000	7,100	6,600	6,100	6,100	8,000	7,700	7,500	7,500
360,000	7,000	6,500	6,000	6,000	7,800	7,500	7,400	7,300

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF25 - 5 •

Data is advisory and includes a 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	400	400	400	400	500	500	500	500
6,000	800	800	800	700	1,000	1,000	1,000	1,000
8,000	1,200	1,100	1,100	1,100	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	100	100	100	200	200	200	200
PER 5 KTS ADD'L SPD	350	300	200	200	350	250	250	250
PER 10°C ABOVE ISA	200	150	150	150	250	200	200	200
PER 10°C BELOW ISA	-200	-150	-150	-150	-250	-200	-200	-200
PER 1% UP SLOPE	-150	-100	-200	-200	-300	-350	-400	-400
PER 1% DOWN SLOPE	150	200	250	250	450	550	550	550
1 REVERSER INOP	300	700	800	800	1,400	1,600	1,600	1,600
2 REVERSERS INOP	1,400	2,000	2,100	2,100	4,900	5,100	5,100	5,100
MANUAL SPOILERS	200	200	200	300	200	200	200	300

EMERGENCY LANDING DISTANCES FEET

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

FLAPS 30

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

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).									
	DRY (6)						GOOD (5)			
	AB 1	AB 2	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	12,600	11,400	10,400	8,600	6,600	5,500	10,400	8,700	7,300	7,100
740,000	12,300	11,200	10,200	8,400	6,500	5,400	10,200	8,500	7,100	6,900
720,000	12,000	10,900	9,900	8,200	6,300	5,300	9,900	8,300	6,900	6,800
700,000	11,600	10,600	9,700	8,000	6,200	5,100	9,700	8,100	6,800	6,600
680,000	11,300	10,300	9,400	7,800	6,000	5,000	9,400	7,900	6,600	6,400
660,000	11,000	10,000	9,100	7,600	5,900	4,800	9,100	7,700	6,500	6,300
640,000	10,700	9,800	8,900	7,400	5,800	4,700	8,900	7,500	6,300	6,100
620,000	10,400	9,500	8,600	7,200	5,600	4,600	8,600	7,300	6,100	6,000
600,000	10,000	9,200	8,400	7,000	5,500	4,400	8,400	7,100	6,000	5,800
580,000	9,700	8,900	8,100	6,800	5,300	4,300	8,100	6,900	5,800	5,600
560,000	9,400	8,600	7,800	6,600	5,200	4,100	7,800	6,700	5,700	5,500
540,000	9,100	8,400	7,600	6,400	5,100	4,000	7,600	6,500	5,500	5,300
520,000	8,800	8,100	7,300	6,200	4,900	3,900	7,300	6,300	5,300	5,200
500,000	8,400	7,800	7,100	6,000	4,800	3,700	7,100	6,100	5,200	5,000
492,000	8,300	7,700	7,000	6,000	4,700	3,700	7,000	6,000	5,100	4,900
480,000	8,200	7,600	6,900	5,900	4,700	3,600	6,900	6,000	5,100	4,900
460,000	8,100	7,500	6,800	5,900	4,700	3,600	6,800	6,000	5,100	4,900
440,000	7,900	7,400	6,800	5,900	4,700	3,600	6,800	6,000	5,000	4,800
420,000	7,800	7,200	6,700	5,900	4,700	3,600	6,700	6,000	5,000	4,800
400,000	7,700	7,100	6,700	5,900	4,700	3,600	6,700	6,000	5,000	4,700
380,000	7,500	7,000	6,600	5,900	4,700	3,500	6,600	6,000	5,000	4,700
360,000	7,400	6,900	6,500	5,900	4,700	3,500	6,500	6,000	5,000	4,700

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF30 - 5 •

Data is advisory and includes a 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	-500	-400	-300	-200	-200	-100	-300	-300	-200	-200
2,000	0	0	0	0	0	0	0	0	0	0
4,000	500	400	300	200	200	100	300	300	200	200
6,000	1,000	800	600	500	400	200	600	500	400	400
8,000	2,000	1,600	1,200	1,000	800	500	1,200	1,100	900	800

CORRECTIONS

	DRY (6)						GOOD (5)			
PER 1 KT HEADWIND	-50	-50	-50	0	0	0	-50	-50	0	0
PER 1 KT TAILWIND	150	100	100	100	50	50	100	100	50	50
PER 5 KTS ADD'L SPD	250	250	350	300	200	100	350	300	200	150
PER 10°C ABOVE ISA	200	200	150	150	100	50	150	150	100	100
PER 10°C BELOW ISA	-200	-200	-150	-150	-100	-50	-150	-150	-100	-100
PER 1% UP SLOPE	-200	-150	-50	0	0	-50	-50	0	-50	-100
PER 1% DOWN SLOPE	200	100	0	0	0	50	0	50	100	100
1 REVERSER INOP	900	300	0	0	0	100	0	100	300	300
2 REVERSERS INOP	1,000	300	0	0	0	200	0	200	700	700
MANUAL SPOILERS	200	200	200	200	200	300	200	200	200	300

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 30

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).							
	MEDIUM (3)				POOR(1)			
	AB 3	AB 4	Max AB	Max Manual	AB 3	AB 4	Max AB	Max Manual
760,000	10,800	9,900	9,700	9,400	12,600	12,400	12,400	12,400
740,000	10,500	9,600	9,400	9,200	12,300	12,100	12,100	12,100
720,000	10,300	9,400	9,200	9,000	12,000	11,800	11,800	11,800
700,000	10,000	9,100	9,000	8,700	11,700	11,500	11,500	11,400
680,000	9,800	8,900	8,700	8,500	11,400	11,100	11,100	11,100
660,000	9,500	8,700	8,500	8,300	11,000	10,800	10,800	10,800
640,000	9,200	8,400	8,200	8,100	10,700	10,500	10,500	10,500
620,000	9,000	8,200	8,000	7,900	10,400	10,200	10,200	10,200
600,000	8,700	7,900	7,800	7,600	10,100	9,900	9,900	9,800
580,000	8,500	7,700	7,500	7,400	9,800	9,500	9,500	9,500
560,000	8,200	7,500	7,300	7,200	9,400	9,200	9,200	9,200
540,000	7,900	7,200	7,000	7,000	9,100	8,900	8,900	8,900
520,000	7,700	7,000	6,800	6,800	8,800	8,600	8,600	8,600
500,000	7,400	6,700	6,600	6,500	8,500	8,300	8,300	8,200
492,000	7,300	6,700	6,500	6,500	8,400	8,100	8,100	8,100
480,000	7,300	6,600	6,400	6,400	8,300	8,000	8,000	8,000
460,000	7,200	6,600	6,300	6,300	8,100	7,900	7,900	7,900
440,000	7,100	6,600	6,200	6,200	8,000	7,800	7,800	7,700
420,000	7,100	6,600	6,200	6,200	7,900	7,700	7,600	7,600
400,000	7,000	6,500	6,100	6,100	7,800	7,600	7,500	7,400
380,000	7,000	6,500	6,000	6,000	7,700	7,400	7,300	7,300
360,000	6,900	6,500	5,900	5,900	7,500	7,300	7,200	7,200

BASIS: Zero wind • Two Engine Reverse Thrust • Touchdown Speed = VREF30 - 5 •

Data is advisory and includes a 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	-500	-500	-500	-500
2,000	0	0	0	0	0	0	0	0
4,000	300	300	300	300	500	500	500	500
6,000	700	600	600	600	900	1,000	1,000	900
8,000	1,000	1,000	1,000	1,000	1,400	1,400	1,400	1,400

CORRECTIONS	MEDIUM (3)				POOR (1)			
PER 1 KT HEADWIND	-50	-50	-50	-50	-50	-50	-50	-50
PER 1 KT TAILWIND	150	100	100	100	200	200	200	200
PER 5 KTS ADD'L SPD	350	300	200	200	300	250	250	250
PER 10°C ABOVE ISA	200	150	150	150	200	200	200	200
PER 10°C BELOW ISA	-200	-150	-150	-150	-200	-200	-200	-200
PER 1% UP SLOPE	-100	-100	-200	-200	-300	-350	-350	-350
PER 1% DOWN SLOPE	150	200	250	250	450	550	550	550
1 REVERSER INOP	300	700	700	700	1,300	1,500	1,500	1,500
2 REVERSERS INOP	1,300	1,900	1,900	1,900	4,400	4,600	4,600	4,600
MANUAL SPOILERS	200	200	200	300	200	200	200	300

BRAKE COOLING FOLLOWING LANDING

GOVERNING CONDITIONS

NOTE: Maximum Quick Turnaround Landing Weight (QTLW) is not limiting for most normal operations.

If any of the following conditions apply, accomplish the procedures below to determine QTLW and Brake Cooling requirements.

- “QTLW Warning Remark” appears on the WDR **or**
- Landing above MLW **or**
- Landing within 5,000 lbs of MLW using Flaps 30 at an altitude of 7,000 feet or above **or**
- Landing within 10,000 lbs of MLW using Flaps 25 at an altitude of 6,000 feet or above.
- Landing with non-standard aircraft configurations (flaps inoperative, brake deactivated, etc.)

PROCEDURES

- A) Determine if the Maximum Quick Turnaround Landing Weight has been exceeded.
- B) Obtain a Landing Brake Cooling time.
- C) **Wait the longer of the two times** once the aircraft is parked at the gate with the parking brake off.

QUICK TURNAROUND LANDING WEIGHT

1. BTMS OPERATIVE

No sooner than 10 and no later than 15 minutes after parking, check for the “BRAKE TEMP” advisory message on EICAS.

If the EICAS message is not displayed:

No waiting period is required.

If the EICAS message is displayed:

Do not dispatch until at least 65 minutes after Landing or until the Brake Temperature Monitoring System (BTMS) readings on the Landing Gear Synoptic Display are all 3.0 or lower. Check that wheel thermal plugs have not melted before making a subsequent takeoff.

NOTE: If any brake temperature display is blank or the “BRAKE TEMP SYS” status message is displayed, the BTMS INOPERATIVE Method must be used.

2. BTMS INOPERATIVE

Determine the Maximum Quick Turnaround Landing Weight from Page 4-33.

If the Actual Landing Weight is greater than the Maximum Quick Turnaround Landing Weight then:

A **65 minute** ground cooling period is required.

NOTE: Check that wheel thermal plugs have not melted before executing a takeoff.

LANDING BRAKE COOLING

1. BTMS OPERATIVE

- a) Check the BTMS display on EICAS no sooner than 10 minutes and no later than 15 minutes after parking.
- b) Use the highest value to enter the BTMS Operative Brake Cooling table for ground from Page 4-34.
- c) Wait the specified time associated with the value from the BTMS indicator.

NOTE: If any brake temperature display is blank or indicates 0, the BTMS INOPERATIVE Method must be used.

2. BTMS INOPERATIVE

Determine the Cooling Time and associated action if applicable from the Brake Cooling Time and AutoBrake Adjustment tables on Page 4-35. Comply with the specified procedures for the Caution Zone and Fuse Plug Melt Zone.

BRAKE COOLING FOLLOWING LANDING

MAXIMUM QUICK TURNAROUND LANDING WEIGHT

1,000 POUNDS

FLAPS 30

AIRPORT PRESSURE ALTITUDE FEET	AMBIENT TEMPERATURE - °C							
	-20	-10	0	10	20	30	40	50
-1,000	595.8	587.2	578.9	569.6	559.4	549.7	540.6	532.0
0	588.2	579.6	570.2	559.6	549.6	540.1	531.2	522.6
1,000	580.1	570.4	559.4	549.1	539.3	530.1	521.3	512.8
2,000	571.0	559.6	548.8	538.8	529.3	520.1	511.4	503.1
3,000	560.1	548.9	538.5	528.6	519.2	510.2	501.7	-----
4,000	549.4	538.5	528.3	518.5	509.2	500.5	492.2	-----
5,000	538.9	528.3	518.1	508.5	499.5	491.0	482.9	-----
6,000	528.5	518.0	508.0	498.7	489.9	481.6	473.6	-----
7,000	518.2	507.8	498.1	489.0	480.5	472.2	464.2	-----
8,000	508.0	497.9	488.5	479.7	471.0	462.8	-----	-----
8,400	503.9	494.0	484.7	475.8	467.3	459.1	-----	-----

FLAPS 25

AIRPORT PRESSURE ALTITUDE FEET	AMBIENT TEMPERATURE - °C							
	-20	-10	0	10	20	30	40	50
-1,000	569.3	557.9	547.2	537.0	527.4	518.4	509.8	501.5
0	559.3	548.1	537.5	527.6	518.3	509.4	500.9	492.8
1,000	548.8	537.8	527.5	517.8	508.6	499.8	491.5	483.6
2,000	538.3	527.6	517.6	508.1	499.0	490.4	482.2	474.5
3,000	528.1	517.7	507.8	498.4	489.5	481.1	473.2	-----
4,000	518.1	507.8	498.1	488.9	480.2	472.0	464.3	-----
5,000	508.2	498.1	488.5	479.5	471.1	463.1	455.4	-----
6,000	498.3	488.4	479.1	470.4	462.1	454.1	446.5	-----
7,000	488.5	478.9	469.9	461.3	453.0	445.2	437.8	-----
8,000	479.0	469.6	460.7	452.2	444.1	436.5	-----	-----
8,400	475.2	466.0	457.1	448.6	440.6	433.1	-----	-----

NOTE: Weights in shaded area are above the maximum landing weight.

CORRECTIONS:

Wind	per 1 kt. of headwind	1,350
	per 1 kt. of tailwind	6,490
Runway slope	per 1% uphill slope	+4,600
	per 1% downhill slope	-7,600
Brake(s) Inop	One brake deactivated	27,800
	Two brakes deactivated	55,000

BRAKE COOLING FOLLOWING LANDING BTMS OPERATIVE BRAKE COOLING

LANDING AND REJECTED TAKEOFF

(minutes)

BTMS INDICATION																
	Up to 2.4	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0 – 6.3	6.3 +
GROUND	0	10	17	24	30	36	41	46	50	55	60	64	68	71	CAUTION ZONE	FUSE PLUG MELT ZONE
IN FLIGHT GEAR DOWN*	0	1	2	2	3	4	4	5	5	6	6	6	7	7		

NOTE: A BTMS indication of 5 or higher will cause an EICAS message “BRAKE TEMP” to appear. The message will extinguish when the temperature decreases to 4.

- The In-Flight Gear Down cooling times are for use **ONLY** after waiting the duration of the ground cooling time and BTMS indicates overheating on the subsequent takeoff.
- Brake cooling time may be shorter if maintenance uses brake cooling fans.

BRAKE COOLING FOLLOWING LANDING LANDING BRAKE COOLING

(BTMS INOPERATIVE)

LANDING USING MAX MANUAL BRAKING:

Obtain a brake cooling time from the following table. A quick assessment can be made by using the next highest weight and speed. If the resulting wait time has the potential of causing a delay or is in the Caution or Fuse Plug Melt Zones, interpolation may be used to determine a more precise wait time with the associated zone action. Zones are indicated in the table for quicker identification. Refer to the time ranges for Caution and Fuse Plug Melt Zones below.

BRAKE COOLING TIME (h:mm)

WEIGHT (1,000 lbs)	Brakes on Speed (Ground Speed KTS)					
	80	100	120	140	160	180
Reversers	0 Eng / 2 Eng	0 Eng / 2 Eng	0 Eng / 2 Eng	0 Eng / 2 Eng	0 Eng / 2 Eng	0 Eng / 2 Eng
700	0:00 / 0:00	0:46 / 0:39	1:16C / 1:10	1:37F / 1:33F	1:57F / 1:51F	2:18F / 2:10F
675	0:00 / 0:00	0:43 / 0:35	1:13 / 1:07	1:35F / 1:30C	1:54F / 1:48F	2:14F / 2:06F
650	0:00 / 0:00	0:40 / 0:32	1:10 / 1:04	1:32F / 1:28C	1:51F / 1:45F	2:10F / 2:02F
625	0:00 / 0:00	0:36 / 0:28	1:07 / 1:01	1:29C / 1:25C	1:47F / 1:43F	2:06F / 1:59F
600	0:00 / 0:00	0:33 / 0:25	1:07 / 0:57	1:26C / 1:22C	1:44F / 1:40F	2:02F / 1:55F
575	0:00 / 0:00	0:29 / 0:21	1:00 / 0:53	1:23C / 1:18C	1:41F / 1:36F	1:58F / 1:52F
550	0:00 / 0:00	0:25 / 0:17	0:56 / 0:50	1:20C / 1:15C	1:37F / 1:33F	1:54F / 1:48F
525	0:00 / 0:00	0:21 / 0:12	0:52 / 0:46	1:16C / 1:11	1:34F / 1:30C	1:50F / 1:45F
500	0:00 / 0:00	0:17 / 0:00	0:48 / 0:41	1:13 / 1:07	1:31F / 1:26C	1:46F / 1:41F
475	0:00 / 0:00	0:13 / 0:00	0:44 / 0:37	1:09 / 1:03	1:27C / 1:22C	1:42F / 1:38F
450	0:00 / 0:00	0:00 / 0:00	0:40 / 0:32	1:04 / 0:58	1:23C / 1:19C	1:38F / 1:34F
425	0:00 / 0:00	0:00 / 0:00	0:35 / 0:27	1:00 / 0:53	1:19C / 1:14	1:34F / 1:30C

NOTE: When using one thrust reverser during landing, the brake cooling time for zero reversers should be used to allow adequate cooling.

C - CAUTION ZONE (1:15 - 1:30) – Fuse plugs may melt. Wait the specified time. After the landing gear assembly has cooled, visually inspect for tire damage and seal leakage.

F - FUSE PLUG MELT ZONE (Shaded Region, 1:31 +) – Under these conditions, consider that the fuse plugs will likely melt and deflate the tires. Unless required, do not set parking brake. The possibility of tire, grease or hydraulic fluid fires should also be considered. Maintenance inspection of tires, wheels, and brakes is recommended.

LANDING USING AUTOBRAKES:

- 1) Determine the time from the table above. This is the reference time.
- 2) Subtract the times in the adjustment table below from the reference time in the table above to get proper cooling time for the respective brake setting. **Any resulting wait time of 1:31 or above is in the Fuse Plug Melt Zone.**

AUTOBRAKE ADJUSTMENT

NW INDICATES NO WAITING REQUIRED

	Brakes on Speed (Ground Speed KTS)					
	80	100	120	140	160	180
Reversers	0 Eng / 2 Eng	0 Eng / 2 Eng	0 Eng / 2 Eng	0 Eng / 2 Eng	0 Eng / 2 Eng	0 Eng / 2 Eng
MaxAuto	NW / NW	0:09 / 0:25	0:08 / 0:24	0:07 / 0:22	0:07 / 0:20	0:07 / 0:18
Auto 4	NW / NW	0:14 / NW	0:14 / 0:50	0:13 / 0:46	0:13 / 0:43	0:15 / 0:40
Auto 3	NW / NW	0:19 / NW	0:19 / NW	0:18 / 1:15	0:18 / 1:10	0:19 / 1:03
Auto 2	NW / NW	0:25 / NW	0:26 / NW	0:25 / NW	0:24 / 1:38	0:23 / 1:35
Auto 1	NW / NW	0:30 / NW	0:35 / NW	0:34 / NW	0:33 / NW	0:33 / NW

BRAKE COOLING FOLLOWING REJECTED TAKEOFF

REJECTED TAKEOFF BRAKE COOLING

PROCEDURES

BTMS OPERATIVE:

- 1) Check the brake temperature indication on EICAS no sooner than 10 minutes and no later than 15 minutes after aircraft has come to a complete stop.
- 2) Use the highest value to enter the following BTMS Operative Brake Cooling table from Page 4-34.
- 3) Wait the specified time associated with the value from the BTMS indicator prior to subsequent takeoff.

BTMS INOPERATIVE:

Use the table below. A quick assessment can be made by using the next highest weight and speed. If the resulting wait time has the potential of causing a delay or is in the Caution or Fuse Plug Melt Zones, interpolation may be used to determine a more precise wait time with the associated zone action. Zones are indicated in the table for quicker identification. Refer to the time ranges for Caution and Fuse Plug Melt Zones below.

NOTE: All wait times begin once the aircraft is parked at the gate or other designated area.

BRAKE COOLING TIME (h:mm)

WEIGHT (1,000 lbs)	Brakes on Speed (Ground Speed KTS)					
	80	100	120	140	160	180
775	0:41	1:12	1:35F	1:57F	2:20F	2:44F
750	0:39	1:10	1:33F	1:54F	2:17F	2:40F
725	0:37	1:08	1:31C	1:51F	2:13F	2:36F
700	0:34	1:05	1:29C	1:49F	2:10F	2:32F
675	0:32	1:03	1:27C	1:46F	2:06F	2:27F
650	0:30	1:01	1:24C	1:43F	2:03F	2:23F
625	0:27	0:58	1:22C	1:41F	1:59F	2:19F
600	0:25	0:55	1:19C	1:38F	1:56F	2:15F
575	0:22	0:52	1:17C	1:35F	1:52F	2:11F
550	0:20	0:49	1:14	1:32F	1:49F	2:06F
525	0:17	0:46	1:11	1:30C	1:46F	2:02F
500	0:14	0:43	1:07	1:26C	1:42F	1:58F

C - CAUTION ZONE (1:15 – 1:30) – Fuse plugs may melt. Wait the specified time. After the landing gear assembly has cooled, visually inspect for tire damage and seal leakage.

F - FUSE PLUG MELT ZONE (Shaded Region, 1:31 +) – Under these conditions, consider that the fuse plugs will likely melt and deflate the tires. Unless required, do not set parking brake. The possibility of tire, grease or hydraulic fluid fires should also be considered. Maintenance inspection of tires, wheels, and brakes is recommended.

OPERATION WITH UNRELIABLE AIRSPEED INDICATION

Use the following pitch attitude and thrust data to estimate airspeed and rate of climb/descent, if the airspeed system becomes unreliable or unusable. ***If the malfunction occurs during early stages of the flight (takeoff or climb), return to departure airport if possible.***

CLIMB

FLAPS UP, MAX CLIMB THRUST

PRESSURE ALTITUDE FT		GROSS WEIGHT- (1,000) POUNDS				
		400	500	600	700	800
40,000	AIRSPEED-MACH	0.82	0.82			
	PITCH ATTITUDE - DEGREES	5.0	4.5			
	RATE OF CLIMB - FEET/MINUTE	1,800	1,000			
30,000	AIRSPEED-KIAS	280	280	280	280	280
	PITCH ATTITUDE - DEGREES	6.0	5.5	5.5	5.0	4.5
	RATE OF CLIMB - FEET/MINUTE	2,900	2,100	1,500	1,100	800
20,000	AIRSPEED-KIAS	270	270	270	270	270
	PITCH ATTITUDE - DEGREES	8.5	8.0	8.0	8.0	7.0
	RATE OF CLIMB - FEET/MINUTE	4,000	3,100	2,300	1,800	1,300
10,000	AIRSPEED-KIAS	270	270	270	270	270
	PITCH ATTITUDE - DEGREES	12.0	10.5	10.0	9.5	9.5
	RATE OF CLIMB - FEET/MINUTE	5,500	4,200	3,300	2,700	2,100
0	AIRSPEED-KIAS	270	270	270	270	270
	PITCH ATTITUDE - DEGREES	15.5	13.0	12.0	11.5	11.0
	RATE OF CLIMB - FEET/MINUTE	6,400	4,900	4,000	3,200	2,600

Shaded AREA reflects the minimum speed limitation of 15 kts above minimum maneuvering speed.

OPERATION WITH UNRELIABLE AIRSPEED INDICATION

CRUISE

FLAPS UP, %N1 FOR LEVEL FLIGHT

PRESSURE ALTITUDE FT		GROSS WEIGHT- (1,000) POUNDS				
		400	500	600	700	800
40,000	AIRSPEED-MACH	0.82	0.82			
	PITCH ATTITUDE	2.5	3.5			
	%N1	81.2	86.6			
35,000	AIRSPEED-MACH	0.82	0.82	0.82	0.82	
	PITCH ATTITUDE	2.0	2.5	3.5	4.0	
	%N1	77.9	80.7	84.8	90.8	
30,000	AIRSPEED-KIAS	280	280	280	280	280
	PITCH ATTITUDE	2.0	2.5	3.5	4.0	3.5
	%N1	73.8	76.3	80.0	84.2	88.6
25,000	AIRSPEED-KIAS	280	280	280	280	280
	PITCH ATTITUDE	2.0	3.0	3.5	4.5	4.0
	%N1	69.8	72.3	75.4	79.2	83.2
20,000	AIRSPEED-KIAS	270	270	270	270	270
	PITCH ATTITUDE	2.5	3.0	4.0	5.0	5.5
	%N1	64.8	67.5	70.6	74.3	78.5
15,000	AIRSPEED-KIAS	270	270	270	270	270
	PITCH ATTITUDE	2.5	3.0	4.0	5.0	5.5
	%N1	60.8	63.4	66.4	69.6	73.6

NOTE: Adjust Power to Maintain Pitch Attitude, Level Flight.

Shaded AREA reflects the minimum speed limitation of 15 kts above minimum maneuvering speed.

AIRSPEED = KIAS (Except where indicated)

PITCH ATTITUDE = DEGREES

OPERATION WITH UNRELIABLE AIRSPEED INDICATION

DESCENT

FLAPS UP, IDLE THRUST

PRESSURE ALTITUDE FT		GROSS WEIGHT- (1,000) POUNDS				
		400	500	600	700	800
40,000	AIRSPEED-MACH	0.82	0.82			
	PITCH ATTITUDE	-0.5	0.5			
	DESCENT RATE	2,700	2,700			
30,000	AIRSPEED	280	280	280	280	280
	PITCH ATTITUDE	-0.5	0.5	1.0	1.5	0.5
	DESCENT RATE	2,100	1,900	1,800	1,900	2,500
20,000	AIRSPEED	270	270	270	270	270
	PITCH ATTITUDE	0.0	1.0	2.0	3.0	3.0
	DESCENT RATE	1,600	1,500	1,400	1,400	1,500
10,000	AIRSPEED	270	270	270	270	270
	PITCH ATTITUDE	-0.5	0.5	1.5	2.5	3.0
	DESCENT RATE	1,500	1,400	1,300	1,300	1,300
0	AIRSPEED	270	270	270	270	270
	PITCH ATTITUDE	-1.0	0.5	1.5	2.0	3.0
	DESCENT RATE	1,400	1,200	1,200	1,200	1,200

NOTE: Fly to Pitch Attitude

Shaded AREA reflects the minimum speed limitation of 15 kts above minimum maneuvering speed.

AIRSPEED = KIAS (Except where indicated)
 PITCH ATTITUDE = DEGREES
 DESCENT RATE = FEET/MINUTE

OPERATION WITH UNRELIABLE AIRSPEED INDICATION

HOLDING

FLAPS UP, SET THRUST FOR LEVEL FLIGHT

CONFIGURATION		GROSS WEIGHT - (1,000) POUNDS				
		400	500	600	700	800
ALTITUDE 10,000 FEET FLAPS - UP GEAR UP	PITCH ATTITUDE	4.0	5.5	5.5	6.0	6.0
	%N1	52.8	56.9	61.3	65.5	69.3
	AIRSPEED	216	220	236	252	266
ALTITUDE 5,000 FEET FLAPS - UP GEAR UP	PITCH ATTITUDE	4.0	5.5	5.5	6.0	6.0
	%N1	49.3	53.3	57.4	61.3	65.1
	AIRSPEED	216	220	236	252	265

TERMINAL AREA (5,000 FEET)

%N1 FOR LEVEL FLIGHT

CONFIGURATION		GROSS WEIGHT - (1,000) POUNDS				
		400	500	600	700	800
FLAPS UP GEAR UP (VREF30 + 80)	PITCH ATTITUDE	4.5	6.0	6.0	6.5	6.5
	%N1	50.6	54.9	59.3	63.6	67.5
	AIRSPEED	217	218	234	250	266
FLAPS 1 GEAR UP (VREF30 + 60)	PITCH ATTITUDE	6.0	7.5	8.0	8.0	8.0
	%N1	51.5	56.3	61.1	65.5	69.3
	AIRSPEED	197	198	214	230	246
FLAPS 5 GEAR UP (VREF30 + 40)	PITCH ATTITUDE	5.0	7.0	7.0	7.0	6.5
	%N1	52.0	57.0	62.0	66.2	70.2
	AIRSPEED	177	178	194	211	226
FLAPS 15 GEAR UP (VREF30 + 20)	PITCH ATTITUDE	5.5	7.5	7.5	7.0	7.0
	%N1	52.8	59.1	64.0	68.3	72.4
	AIRSPEED	157	158	174	190	206
FLAPS 20 GEAR DOWN (VREF30 + 20)	PITCH ATTITUDE	3.5	6.0	6.0	5.5	5.5
	%N1	59.4	64.4	70.1	74.9	79.3
	AIRSPEED	157	158	174	190	206

AIRSPEED = KIAS

PITCH ATTITUDE = DEGREES

OPERATION WITH UNRELIABLE AIRSPEED INDICATION

FINAL APPROACH (1,500 FEET)

GEAR DOWN, %N1 FOR 3° GLIDESLOPE

CONFIGURATION		GROSS WEIGHT - POUNDS				
		400	500	600	700	800
FLAPS 20 (VREF20 + 10)	PITCH ATTITUDE	2.0	2.0	2.5	2.5	2.5
	%N1	38.9	43.1	47.1	50.5	53.3
	AIRSPEED	148	164	179	192	205
FLAPS 25 (VREF25 + 10)	PITCH ATTITUDE	1.0	2.0	2.0	2.5	2.5
	%N1	49.6	52.5	56.7	60.7	64.2
	AIRSPEED	147	156	170	183	195
FLAPS 30 (VREF30 + 10)	PITCH ATTITUDE	0.5	2.0	1.5		
	%N1	55.9	57.7	62.6		
	AIRSPEED	147	148	164		

NOTE:

Based on 3° glide slope. Fly to glide slope or, if not available, to rate of descent Vref + 10.

AIRSPEED = KIAS

PITCH ATTITUDE = DEGREES

MEL SUPPORT

ALTERNATE MODE EEC

TAKEOFF % N1

0 TO 60 KNOTS

NORMAL BLEED - PACKS ON / ENG. ANTI-ICE ON OR OFF/WING ANTI-ICE OFF

GE90-110B1L

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	8,400
55	96.0	96.2	96.1	96.0	96.1	96.1	96.1	96.1	95.5	94.6	94.2
50	97.5	98.0	97.6	97.3	97.4	97.5	97.5	97.4	96.8	95.9	95.6
45	98.9	99.4	99.1	98.8	98.7	98.8	98.8	98.7	98.2	97.3	96.9
40	100.2	100.9	100.4	100.2	100.0	99.9	100.0	99.9	99.4	98.6	98.2
35	100.8	102.8	102.3	101.8	101.4	101.2	101.3	101.0	100.4	99.6	99.3
30	99.9	102.7	104.0	104.0	103.8	103.4	103.4	102.6	101.5	100.7	100.3
25	99.1	101.8	103.1	104.4	105.5	105.8	106.3	105.3	103.8	102.4	101.8
20	98.3	101.0	102.3	103.5	104.6	105.8	106.8	106.8	105.9	104.8	104.3
15	97.4	100.1	101.4	102.6	103.7	104.9	105.9	106.4	106.1	105.6	105.3
10	96.6	99.2	100.5	101.7	102.8	103.9	105.0	105.5	105.2	104.9	104.8
5	95.7	98.4	99.6	100.8	101.9	103.0	104.1	104.5	104.2	104.0	103.8
0	94.9	97.5	98.7	99.9	101.0	102.1	103.1	103.6	103.3	103.0	102.9
-10	93.1	95.7	96.9	98.1	99.1	100.2	101.2	101.7	101.4	101.1	101.0
-20	91.3	93.8	95.0	96.2	97.2	98.3	99.3	99.7	99.4	99.2	99.0
-30	89.5	92.0	93.1	94.3	95.3	96.3	97.3	97.7	97.5	97.2	97.1
-40	87.6	90.1	91.2	92.3	93.3	94.3	95.3	95.7	95.4	95.2	95.1
-50	85.7	88.1	89.2	90.3	91.3	92.3	93.2	93.6	93.4	93.1	93.0

NOTE: For the following engine bleed conditions adjust N1 by the amount indicated.

Packs OFF	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
Wing A-I On	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

MEL SUPPORT

V_{MCG} - MINIMUM CONTROL SPEED, GROUND

KIAS

TO2

AIRPORT PRESSURE ALTITUDE - FEET	AMBIENT TEMPERATURE - °C						
	-10	0	10	20	30	40	50
0	123	123	122	122	122	119	112
1,000	122	122	121	121	120	116	109
2,000	120	120	119	119	118	113	106
4,000	116	116	116	116	113	108	104
6,000	112	112	112	112	108	104	103
8,000	106	106	106	106	102	99	99

TO

AIRPORT PRESSURE ALTITUDE - FEET	AMBIENT TEMPERATURE - °C						
	-10	0	10	20	30	40	50
0	138	138	138	138	137	133	125
1,000	136	136	136	136	135	130	122
2,000	134	134	134	134	133	127	119
4,000	130	130	130	130	127	122	117
6,000	126	126	126	126	122	116	115
8,000	120	120	119	119	115	110	110

RESTRICTIONS

Some MEL items require a V₁ reduction. If the resulting V₁ is less than minimum V_{mCG}, takeoff is permitted with V₁ set equal to V_{mCG}. V₁ must never be less than V_{mCG}.

NOTES:

V_{MCG} is defined as the minimum control speed on the *ground*. It is the speed where the airplane can maintain directional control after a critical engine failure using the primary aerodynamic controls only. Credit for nose wheel steering is NOT taken.

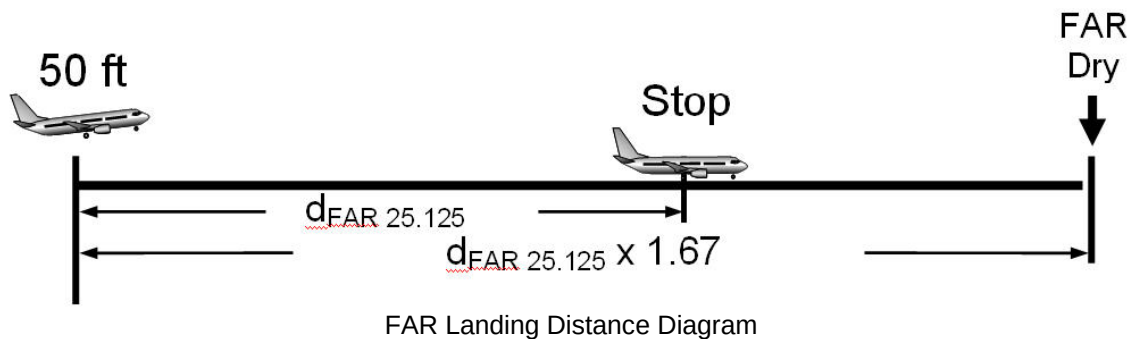
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MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

Definition

All given distances in this section are FAR (Factored) Landing Distances. These distances represent the actual (or demonstrated) landing distances – designated as d_{FAR} in the diagram below – multiplied by a factor of 1.67.



This is in accordance with FAR 121.195, requiring the aircraft to be able to come to a complete stop within 60% of the effective length of the runway.

Applicability

The tables on the following pages provide landing distances and approach speeds to be used for dispatch with the given conditions and the associated MEL applied. For landing distances in the event of an in-flight system failure or abnormality not detected at or prior to dispatch, please refer to the “Abnormal Configuration Actual Landing Distances and Approach Speeds” pages in this section of the ODM.

Assumptions

The data within this section was generated based on a set of assumed conditions:

- Standard day conditions
- No wind
- No slope
- No reverse thrust credit factored in FAR Landing Distances
- Maximum manual braking
- Includes distance from 50 feet above threshold to stop (1,000 feet of air distance)

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

FLAPS 25

Actual (unfactored) landing distances are 60% of the distances indicated.

MANUAL SPOILERS – DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	9,270	9,550	9,870	10,200	10,550	10,910	11,300	11,720	12,160	12,630
720,000	8,530	8,780	9,050	9,340	9,650	9,970	10,310	10,670	11,060	11,460
680,000	7,750	7,960	8,190	8,440	8,710	8,980	9,280	9,580	9,910	10,250
640,000	7,160	7,320	7,490	7,670	7,860	8,090	8,340	8,600	8,880	9,170
600,000	6,720	6,870	7,030	7,200	7,370	7,550	7,730	7,920	8,120	8,320
560,000	6,390	6,530	6,680	6,840	7,000	7,170	7,340	7,520	7,710	7,900
520,000	6,050	6,180	6,320	6,470	6,630	6,780	6,950	7,120	7,290	7,470
480,000	5,710	5,830	5,960	6,100	6,250	6,400	6,550	6,710	6,870	7,040
440,000	5,360	5,470	5,600	5,730	5,860	6,000	6,140	6,290	6,440	6,600
400,000	5,260	5,350	5,390	5,430	5,470	5,590	5,730	5,860	6,000	6,150
360,000	5,240	5,330	5,370	5,410	5,440	5,460	5,480	5,490	5,560	5,690
340,000	5,220	5,310	5,350	5,400	5,420	5,450	5,460	5,480	5,450	5,460

MANUAL SPOILERS - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	10,660	10,980	11,350	11,730	12,130	12,550	13,000	13,480	13,980	14,520
720,000	9,800	10,090	10,410	10,750	11,100	11,470	11,860	12,270	12,710	13,180
680,000	8,910	9,150	9,420	9,710	10,010	10,330	10,670	11,020	11,390	11,790
640,000	8,230	8,420	8,620	8,820	9,030	9,300	9,590	9,890	10,210	10,550
600,000	7,730	7,900	8,090	8,280	8,470	8,680	8,890	9,110	9,340	9,570
560,000	7,340	7,500	7,680	7,860	8,050	8,240	8,440	8,650	8,860	9,080
520,000	6,950	7,110	7,270	7,440	7,620	7,800	7,990	8,180	8,380	8,590
480,000	6,560	6,700	6,860	7,020	7,180	7,350	7,530	7,710	7,900	8,100
440,000	6,160	6,290	6,440	6,590	6,740	6,900	7,060	7,230	7,410	7,590
400,000	6,050	6,150	6,200	6,250	6,280	6,430	6,580	6,740	6,900	7,070
360,000	6,020	6,130	6,170	6,220	6,250	6,280	6,300	6,310	6,390	6,550
340,000	6,010	6,110	6,160	6,210	6,240	6,260	6,280	6,300	6,270	6,280

CORRECTIONS:

Headwind per kt	-20 feet
Tailwind per kt	+300 feet

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

Actual (unfactored) landing distances are 60% of the distances indicated.

FLAPS 30

MANUAL SPOILERS – DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	9,160	9,440	9,740	10,060	10,400	10,760	11,140	11,540	11,970	12,420
720,000	8,260	8,500	8,760	9,040	9,320	9,630	9,950	10,290	10,650	11,030
680,000	7,410	7,580	7,760	7,990	8,230	8,480	8,750	9,030	9,330	9,640
640,000	6,720	6,870	7,030	7,200	7,370	7,550	7,730	7,940	8,180	8,440
600,000	6,400	6,540	6,690	6,850	7,020	7,180	7,360	7,540	7,730	7,920
560,000	5,930	6,060	6,200	6,350	6,500	6,650	6,810	6,980	7,150	7,330
520,000	5,620	5,740	5,870	6,010	6,150	6,300	6,450	6,610	6,770	6,930
480,000	5,320	5,420	5,540	5,670	5,800	5,940	6,080	6,230	6,380	6,540
440,000	5,300	5,400	5,440	5,480	5,500	5,580	5,710	5,840	5,980	6,130
400,000	5,290	5,380	5,420	5,460	5,480	5,510	5,520	5,530	5,580	5,720
360,000	5,270	5,360	5,400	5,440	5,460	5,490	5,500	5,520	5,490	5,450
340,000	5,250	5,340	5,390	5,430	5,450	5,480	5,490	5,510	5,480	5,440

MANUAL SPOILERS - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	10,530	10,850	11,200	11,570	11,960	12,370	12,810	13,270	13,760	14,280
720,000	9,490	9,770	10,070	10,390	10,720	11,070	11,440	11,830	12,250	12,690
680,000	8,520	8,720	8,930	9,180	9,460	9,760	10,060	10,390	10,730	11,090
640,000	7,730	7,900	8,080	8,280	8,470	8,680	8,890	9,130	9,410	9,710
600,000	7,360	7,520	7,700	7,880	8,070	8,260	8,460	8,670	8,880	9,110
560,000	6,820	6,970	7,130	7,300	7,470	7,650	7,830	8,030	8,220	8,430
520,000	6,460	6,600	6,750	6,910	7,070	7,240	7,420	7,590	7,780	7,970
480,000	6,110	6,230	6,370	6,520	6,670	6,830	6,990	7,160	7,340	7,520
440,000	6,100	6,200	6,250	6,300	6,320	6,410	6,560	6,720	6,880	7,050
400,000	6,080	6,180	6,230	6,280	6,300	6,330	6,350	6,360	6,420	6,570
360,000	6,050	6,160	6,210	6,250	6,280	6,310	6,330	6,340	6,310	6,270
340,000	6,040	6,140	6,190	6,240	6,270	6,300	6,320	6,330	6,300	6,260

CORRECTIONS:

Headwind per kt	-20 feet
Tailwind per kt	+290 feet

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

FLAPS 25

Actual (unfactored) landing distances are 60% of the distances indicated.

ONE BRAKE INOPERATIVE – DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	9,620	9,940	10,290	10,660	11,060	11,470	11,920	12,390	12,900	13,440
720,000	8,780	9,060	9,370	9,690	10,030	10,400	10,780	11,190	11,620	12,080
680,000	7,900	8,140	8,400	8,680	8,970	9,280	9,600	9,950	10,310	10,700
640,000	7,130	7,310	7,530	7,770	8,020	8,280	8,550	8,840	9,150	9,470
600,000	6,680	6,830	6,990	7,170	7,350	7,530	7,720	7,920	8,120	8,390
560,000	6,330	6,480	6,630	6,800	6,960	7,140	7,320	7,500	7,700	7,900
520,000	5,990	6,120	6,270	6,420	6,580	6,750	6,910	7,090	7,270	7,460
480,000	5,640	5,770	5,910	6,050	6,200	6,350	6,510	6,670	6,840	7,020
440,000	5,290	5,400	5,530	5,670	5,800	5,950	6,090	6,240	6,400	6,570
400,000	5,190	5,280	5,320	5,370	5,400	5,530	5,670	5,810	5,960	6,110
360,000	5,160	5,250	5,300	5,340	5,370	5,400	5,410	5,430	5,500	5,640
340,000	5,150	5,240	5,280	5,330	5,350	5,380	5,400	5,420	5,390	5,410

ONE BRAKE INOPERATIVE - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	11,060	11,430	11,830	12,260	12,710	13,190	13,700	14,250	14,830	15,450
720,000	10,100	10,420	10,770	11,140	11,540	11,950	12,400	12,860	13,370	13,900
680,000	9,090	9,360	9,660	9,980	10,320	10,670	11,040	11,440	11,860	12,310
640,000	8,200	8,400	8,660	8,930	9,220	9,520	9,830	10,170	10,520	10,890
600,000	7,680	7,850	8,040	8,240	8,450	8,660	8,880	9,100	9,340	9,640
560,000	7,280	7,450	7,630	7,820	8,010	8,210	8,410	8,630	8,850	9,080
520,000	6,890	7,040	7,210	7,390	7,570	7,760	7,950	8,150	8,360	8,570
480,000	6,490	6,630	6,790	6,950	7,130	7,300	7,480	7,670	7,870	8,070
440,000	6,080	6,210	6,360	6,510	6,670	6,840	7,010	7,180	7,360	7,550
400,000	5,960	6,070	6,120	6,170	6,210	6,360	6,520	6,680	6,850	7,020
360,000	5,930	6,040	6,090	6,140	6,170	6,210	6,230	6,250	6,330	6,490
340,000	5,920	6,020	6,070	6,120	6,160	6,190	6,210	6,230	6,200	6,220

CORRECTIONS:

Headwind per kt	-20 feet
Tailwind per kt	+350 feet

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

Actual (unfactored) landing distances are 60% of the distances indicated.

FLAPS 30

ONE BRAKE INOPERATIVE – DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	9,480	9,780	10,120	10,490	10,870	11,270	11,700	12,150	12,640	13,160
720,000	8,470	8,740	9,020	9,330	9,650	9,990	10,350	10,740	11,140	11,570
680,000	7,450	7,670	7,910	8,170	8,430	8,720	9,010	9,320	9,660	10,010
640,000	6,680	6,830	7,000	7,170	7,370	7,600	7,850	8,100	8,370	8,660
600,000	6,350	6,500	6,650	6,820	6,990	7,160	7,340	7,530	7,720	7,920
560,000	5,870	6,010	6,150	6,300	6,460	6,620	6,780	6,950	7,130	7,320
520,000	5,560	5,680	5,820	5,960	6,100	6,250	6,410	6,570	6,740	6,910
480,000	5,250	5,350	5,480	5,610	5,750	5,890	6,040	6,190	6,340	6,500
440,000	5,230	5,330	5,370	5,410	5,440	5,520	5,650	5,790	5,940	6,090
400,000	5,210	5,310	5,350	5,390	5,420	5,450	5,460	5,480	5,530	5,670
360,000	5,190	5,280	5,320	5,370	5,400	5,430	5,440	5,460	5,430	5,400
340,000	5,180	5,270	5,310	5,360	5,390	5,410	5,430	5,450	5,420	5,390

ONE BRAKE INOPERATIVE - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	10,900	11,250	11,640	12,060	12,490	12,960	13,450	13,970	14,530	15,130
720,000	9,740	10,040	10,380	10,730	11,100	11,490	11,910	12,350	12,810	13,310
680,000	8,570	8,820	9,100	9,390	9,700	10,020	10,360	10,720	11,100	11,510
640,000	7,680	7,850	8,050	8,240	8,480	8,740	9,020	9,320	9,630	9,960
600,000	7,300	7,470	7,650	7,840	8,030	8,230	8,440	8,660	8,880	9,110
560,000	6,750	6,910	7,070	7,240	7,420	7,610	7,800	8,000	8,200	8,410
520,000	6,390	6,530	6,690	6,850	7,020	7,190	7,370	7,560	7,750	7,950
480,000	6,040	6,150	6,300	6,450	6,610	6,770	6,940	7,110	7,290	7,480
440,000	6,020	6,120	6,170	6,220	6,250	6,340	6,500	6,660	6,830	7,000
400,000	5,990	6,100	6,150	6,200	6,230	6,260	6,280	6,300	6,360	6,520
360,000	5,970	6,070	6,120	6,170	6,210	6,240	6,260	6,280	6,250	6,210
340,000	5,950	6,060	6,110	6,160	6,190	6,220	6,250	6,270	6,230	6,200

CORRECTIONS:

Headwind per kt	-20 ft
Tailwind per kt	+330 ft

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

FLAPS 25

Actual (unfactored) landing distances are 60% of the distances indicated.

TWO BRAKES INOPERATIVE – DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	10,540	10,900	11,310	11,730	12,190	12,670	13,180	13,730	14,320	14,950
720,000	9,580	9,900	10,250	10,620	11,010	11,430	11,870	12,340	12,840	13,380
680,000	8,580	8,850	9,150	9,470	9,800	10,150	10,520	10,920	11,340	11,790
640,000	7,680	7,910	8,160	8,430	8,710	9,010	9,320	9,650	10,000	10,380
600,000	7,080	7,240	7,420	7,610	7,800	8,000	8,250	8,530	8,820	9,130
560,000	6,710	6,870	7,040	7,210	7,390	7,580	7,770	7,970	8,180	8,390
520,000	6,350	6,490	6,650	6,810	6,980	7,160	7,340	7,530	7,720	7,920
480,000	5,970	6,110	6,260	6,410	6,570	6,730	6,900	7,080	7,260	7,450
440,000	5,600	5,720	5,860	6,000	6,150	6,300	6,460	6,620	6,790	6,970
400,000	5,490	5,580	5,630	5,680	5,720	5,860	6,010	6,160	6,320	6,480
360,000	5,460	5,550	5,600	5,650	5,680	5,710	5,730	5,760	5,830	5,980
340,000	5,440	5,530	5,580	5,630	5,670	5,700	5,720	5,740	5,720	5,730

TWO BRAKES INOPERATIVE - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	12,120	12,540	13,000	13,490	14,010	14,570	15,160	15,790	16,470	17,190
720,000	11,020	11,380	11,780	12,210	12,660	13,140	13,650	14,190	14,770	15,390
680,000	9,870	10,180	10,520	10,880	11,270	11,670	12,100	12,550	13,040	13,550
640,000	8,830	9,090	9,390	9,690	10,020	10,360	10,720	11,100	11,500	11,930
600,000	8,140	8,330	8,530	8,750	8,970	9,190	9,490	9,810	10,150	10,500
560,000	7,720	7,900	8,090	8,290	8,500	8,710	8,930	9,160	9,400	9,650
520,000	7,300	7,460	7,640	7,830	8,030	8,230	8,440	8,650	8,880	9,110
480,000	6,870	7,020	7,190	7,370	7,550	7,740	7,940	8,140	8,350	8,570
440,000	6,440	6,580	6,740	6,900	7,070	7,250	7,430	7,620	7,810	8,010
400,000	6,310	6,420	6,480	6,530	6,580	6,740	6,910	7,080	7,260	7,450
360,000	6,270	6,380	6,440	6,500	6,530	6,570	6,590	6,620	6,710	6,880
340,000	6,250	6,360	6,420	6,480	6,510	6,550	6,580	6,600	6,570	6,590

CORRECTIONS:

Headwind per kt	-30 ft
Tailwind per kt	+380 ft

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

Actual (unfactored) landing distances are 60% of the distances indicated.

FLAPS 30

TWO BRAKES INOPERATIVE – DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	10,350	10,700	11,080	11,500	11,930	12,390	12,880	13,410	13,970	14,570
720,000	9,210	9,510	9,840	10,190	10,550	10,940	11,350	11,790	12,260	12,760
680,000	8,070	8,310	8,580	8,870	9,180	9,490	9,830	10,190	10,570	10,970
640,000	7,080	7,270	7,490	7,730	7,980	8,240	8,510	8,810	9,110	9,440
600,000	6,730	6,880	7,050	7,230	7,410	7,600	7,790	7,990	8,200	8,410
560,000	6,220	6,360	6,520	6,680	6,850	7,020	7,200	7,380	7,570	7,770
520,000	5,880	6,010	6,160	6,310	6,470	6,630	6,800	6,970	7,150	7,340
480,000	5,560	5,660	5,800	5,940	6,090	6,240	6,400	6,560	6,730	6,900
440,000	5,530	5,630	5,680	5,730	5,760	5,840	5,990	6,140	6,300	6,460
400,000	5,510	5,610	5,660	5,700	5,740	5,760	5,780	5,800	5,860	6,010
360,000	5,480	5,580	5,630	5,680	5,710	5,740	5,760	5,780	5,750	5,720
340,000	5,460	5,560	5,610	5,660	5,690	5,720	5,740	5,770	5,740	5,710

TWO BRAKES INOPERATIVE - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET									
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
760,000	11,900	12,300	12,750	13,220	13,720	14,250	14,810	15,420	16,070	16,750
720,000	10,600	10,940	11,310	11,710	12,130	12,580	13,050	13,560	14,100	14,670
680,000	9,280	9,560	9,870	10,200	10,550	10,920	11,300	11,710	12,150	12,610
640,000	8,140	8,350	8,610	8,890	9,170	9,470	9,790	10,130	10,480	10,850
600,000	7,740	7,920	8,110	8,310	8,520	8,740	8,960	9,190	9,430	9,680
560,000	7,150	7,320	7,490	7,680	7,870	8,070	8,270	8,490	8,710	8,940
520,000	6,760	6,920	7,080	7,260	7,440	7,620	7,820	8,020	8,220	8,430
480,000	6,390	6,510	6,670	6,830	7,000	7,180	7,360	7,540	7,740	7,940
440,000	6,360	6,480	6,530	6,590	6,620	6,720	6,890	7,060	7,240	7,430
400,000	6,340	6,450	6,500	6,560	6,590	6,630	6,650	6,670	6,740	6,910
360,000	6,300	6,410	6,470	6,530	6,560	6,600	6,620	6,650	6,610	6,580
340,000	6,280	6,390	6,450	6,510	6,540	6,580	6,610	6,630	6,600	6,570

CORRECTIONS:

Headwind per kt	-30 ft
Tailwind per kt	+370 ft

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 chapter 40-60-05). Procedures outlined in those manuals must be strictly adhered to.

AVAILABLE FERRY CONFIGURATIONS

- Landing Gear Extended

NOTE: Data for landing gear extended configuration is also applicable to revenue flights

under certain conditions. See Note in Item 1 immediately below.

INSTRUCTIONS

1. Obtain a normal, unfiled flight plan using long range cruise (LRC) at the cruise altitude for the ferry configuration listed under the appropriate ferry configuration.

NOTE: If a computerized flight plan is available for the aircraft configuration (i.e. Landing Gear Extended), the computerized flight plan should be used in lieu of data contained in this section. Data contained in this section is conservative compared to the optimized data contained in the computerized flight plan.

2. Calculate the trip time and fuel load based on the values in the flight plan using the time and fuel values obtained 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.

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 Normal Thrust takeoff weights and the Landing Climb weight obtained from the ARM.
6. Data presented in this section assumes no cargo is carried.

LIMITATIONS

1. Do not combine two or more ferry configurations.
2. All ferry flight takeoffs will be done at full (NORMAL) thrust (FMC TO) and climb out will be made at Maximum Climb thrust (FMC CLB)

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.

LANDING GEAR EXTENDED

OPERATIONAL LIMITATIONS:

The following are the FAA Airplane Flight Manual mandated limitations for gear down operations. Limitations are unchanged from normal except as listed below.

1. All components required for a landing gear extended operation must be functional in accordance with the appropriate maintenance manual.
2. The use of speed increase for improved climb performance in order to increase maximum takeoff weight is prohibited.
3. Dispatch into known icing conditions is prohibited.
4. The airplane is not eligible for extended over-water operations when landing gear down lock pins are installed. "Extended over-water operation" includes any operation over water at a horizontal distance of more than 50 nautical miles from the nearest shoreline.
5. Use of reduced thrust takeoff is prohibited.
6. Limitations relating to engine-out drift down are contained in the ABNORMAL section of this Operational Data Manual (ODM).
7. Maximum takeoff weight for gear down dispatch is 600,000 pounds.
8. Takeoff is limited to Flaps 5, 15, and 20.
9. V_{MO} and M_{MO} are reduced to 270 KIAS and .73 Mach.
10. The airspeed indicator and Mach-airspeed warning switch must be reprogrammed for V_{MO} and M_{MO} .
11. The % N_1 indication system must be operational.
12. Emergency procedures are unchanged, except **emergency descent target speed is 270 KIAS**.
13. The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn and thrust-limited maximum altitude, and compute an overly shallow descent path. Use of VNAV during descent is not recommended.
14. Do not use autothrottles when operating the airplane above 20,000 feet.
15. Reduced Vertical Separation Minimum (RVSM) operations are prohibited when conducting landing gear extended operations.
16. Traffic Alert and Collision Avoidance System (TCAS): Move transponder mode selector switch to traffic advisory (TA) only.
17. Flap retraction speed schedule is unchanged except Final Segment Climb Speed is $V_{REF} + 70$ KIAS.
18. The conditions for severe turbulent air penetration are unchanged except that the recommended airspeed for flight in severe turbulence is $V_{REF} + 80$ KIAS. The maximum altitude is restricted as follows:

Altitude Restriction	
Gross Weight - Pounds	Maximum Altitude - Feet
Above 550,000	16,000
Above 500,000 and less than or equal to 550,000	20,000
Less than or equal to 500,000	24,000

FLIGHT PLANNING

Fuel Required / Trip Time (1,000 lb / hours):

PRESSURE ALTITUDE - FEET	RANGE - NAUTICAL GROUND MILES			
	500	1,000	1,500	2,000
10,000	39.0 / 2.1	78.0 / 4.0	119.0 / 5.9	162.0 / 7.6
14,000	37.0 / 2.0	73.0 / 3.8	104.0 / 5.5	152.0 / 7.2
18,000	35.0 / 1.9	69.0 / 3.6	105.5 / 5.3	143.0 / 6.9
22,000	34.0 / 1.8	67.0 / 3.4	99.0 / 5.0	134.5 / 6.5
26,000	32.5 / 1.7	63.0 / 3.2	94.5 / 4.8	128.0 / 6.2

NOTE: Based on Long Range Cruise, $V_{REF30} + 80$ climb/descent, standard day conditions, zero winds, reference landing weight of 400,000 lb.

LANDING GEAR EXTENDED (cont'd)

TAKEOFF

RATOW & Takeoff climb limit weight:	Use GRD TPI in AWABS
Takeoff V Speeds:	Use GRD TPI in AWABS
Takeoff Thrust Settings:	Use NORMAL only, ALTERNATE thrust NOT approved.
Takeoff Flap Settings:	Flaps 5, 15, or 20.
Operation from Contaminated Runway:	Permitted, use GRD TPI.

ENROUTE

Long Range Cruise Table – All Engine

GROSS WEIGHT - POUNDS	PRESSURE ALTITUDE - 1,000 FEET									
	CRUISE SPEED - KIAS %N1 FUEL FLOW / ENGINE - LB/HR									
	5	10	15	18	21	24	27	30	33	35
780,000	270 79.6 16530	270 84.1 16429	270 88.4 16700	270 91.4 17126						
740,000	270 78.9 16091	270 83.4 15979	270 87.6 16209	270 90.5 16529	270 94.5 17176					
700,000	270 78.1 15611	270 82.5 15500	268 86.5 15528	265 88.9 15529	263 91.8 15850					
660,000	269 77.1 15109	266 81.1 14795	262 84.8 14591	259 87.4 14575	257 89.8 14687	256 93.9 15185				
620,000	261 75.3 14180	259 79.4 13912	256 83.2 13703	253 85.8 13655	250 88.0 13653	248 90.9 13937				
580,000	254 73.5 13249	252 77.5 13010	249 81.4 12832	246 84.1 12750	244 86.3 12745	241 88.8 12823	240 92.9 13255			
540,000	245 71.4 12319	244 75.5 12102	242 79.5 11962	239 82.2 11869	237 84.6 11830	234 86.8 11813	232 89.7 12033	232 95.4 12773		
500,000	237 69.2 11381	236 73.4 11197	234 77.5 11077	232 80.1 11011	230 82.5 10935	227 84.9 10920	225 87.3 10956	224 91.1 11271		
460,000	227 66.8 10429	227 71.1 10296	225 75.3 10179	224 77.8 10150	222 80.4 10069	220 82.8 10018	217 85.0 10007	217 88.0 10211	217 93.4 10777	
420,000	217 64.4 9481	218 68.5 9394	217 72.8 9305	217 75.6 9338	217 78.5 9380	217 81.2 9438	216 83.9 9573	217 86.6 9721	217 90.7 10052	
380,000	217 63.4 9142	217 67.4 9030	217 71.9 8998	217 74.6 9017	217 77.5 9062	217 80.2 9111	216 83.0 9227	217 85.6 9342	217 88.9 9566	217 92.6 9877

LANDING GEAR EXTENDED (cont'd)

ENROUTE (cont'd.)

Long Range Cruise Table – One Engine Inoperative

GROSS WEIGHT - POUNDS	PRESSURE ALTITUDE - FEET CRUISE SPEED - KIAS %N1 FUEL FLOW / ENGINE- LB/HR							
	6,000	8,000	10,000	12,000	14,000	16,000	18,000	20,000
640,000	240 94.2 26290	241 96.7 26760						
600,000	236 92.4 24750	236 94.4 24952	236 97.3 25578					
560,000	230 90.5 23221	228 91.9 22969	228 94.0 23232	228 97.2 23836				
520,000	226 89.0 21981	222 90.0 21491	222 91.8 21601	222 94.1 21881	222 97.8 22537			
480,000	221 87.1 20517	218 88.2 20121	217 89.7 20064	217 91.6 20229	217 94.1 20501	217 98.2 21255		
440,000	217 85.1 19153	217 87.0 19170	217 88.6 19257	217 90.4 19395	217 92.5 19574	217 95.7 19993	217 100.4 21091	
400,000	217 83.9 18422	217 85.8 18420	217 87.6 18499	217 89.3 18641	217 91.2 18774	217 93.8 19046	217 98.0 19849	
360,000	217 82.8 17781	217 84.7 17754	217 86.6 17810	217 88.3 17949	217 90.1 18057	217 92.3 18259	217 95.8 18793	217 100.5 19898

LANDING GEAR EXTENDED (cont'd)

ENROUTE (cont'd.)

Driftdown Performance

GROSS WEIGHT - POUNDS		OPTIMUM DRIFTDOWN SPEED - KIAS	LEVEL OFF ALTITUDE - FEET		
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)		ISA + 10°C & COLDER	ISA + 15°C	ISA + 20°C
740,000	713,000	260	3,900	2,100	100
700,000	673,000	253	5,800	4,700	2,600
660,000	634,000	246	7,800	6,900	5,400
620,000	596,000	239	9,700	9,000	7,900
580,000	558,000	231	11,800	11,100	9,900
540,000	518,000	224	13,500	13,000	11,800
500,000	480,000	219	15,300	14,900	13,800
460,000	440,000	217	16,700	16,100	15,200
420,000	401,000	216	17,900	17,400	16,300
380,000	364,000	216	19,000	18,600	17,400
340,000	325,000	216	19,900	19,700	18,600

BASIS: One engine inoperative, Max Continuous Thrust, no anti-ice, one pack on, 100 ft/min residual rate of climb.

Altitude Capability – One Engine Inoperative

GROSS WEIGHT - POUNDS	ISA + 10°C & COLDER	ISA + 15°C	ISA + 20°C
760,000	1,200		
740,000	2,400		
720,000	3,800	1,600	
700,000	4,800	3,100	
680,000	5,800	4,600	2,200
660,000	6,800	5,800	3,900
640,000	7,800	6,900	5,300
620,000	8,700	8,000	6,500
600,000	9,500	8,800	7,700
580,000	10,700	10,000	8,900
560,000	11,700	11,000	9,900
540,000	12,600	12,000	10,800
520,000	13,500	12,900	11,700
500,000	14,400	13,900	12,800
480,000	15,300	14,900	13,800
460,000	16,000	15,500	14,500
440,000	16,700	16,100	15,200
420,000	17,300	16,700	15,700
400,000	17,900	17,400	16,300
380,000	18,500	18,000	16,800
360,000	19,100	18,700	17,400
340,000	19,600	19,300	18,100

BASIS: One engine inoperative, APU operating, Max Continuous Thrust limits, 100 ft/min residual rate of climb.

LANDING GEAR EXTENDED (cont'd)

LANDING

Landing Speed restrictions:

No additional restrictions

Flap Setting Restrictions:

No additional restrictions

Approach & Landing climb limit weights:

Use GRD LPI data if available, otherwise reduce standard landing climb limit by 102,000 lbs

HOLDING SPEED / THRUST (KIAS / % N1)

Weight - Pounds	Flaps Up Altitude - Feet		Flaps 1 Altitude - Feet	
	10,000	15,000	10,000	15,000
780,000			243 / 83.3	243 / 87.9
740,000			238 / 81.6	238 / 86.4
700,000			232 / 79.8	232 / 84.7
660,000	244 / 75.6		224 / 77.8	224 / 82.8
620,000	238 / 76.4		218 / 75.9	218 / 80.8
580,000	231 / 74.4	231 / 79.0	211 / 73.9	211 / 78.5
540,000	225 / 72.6	225 / 77.2	205 / 71.9	205 / 76.4
500,000	220 / 70.9	220 / 75.3	200 / 69.9	200 / 74.4
460,000	217 / 69.3	217 / 73.8	197 / 68.0	197 / 72.5
420,000	217 / 68.3	217 / 72.8	197 / 66.5	197 / 71.0
380,000	217 / 67.4	217 / 71.9	197 / 65.3	197 / 69.8
340,000	217 / 66.6	217 / 71.1	197 / 64.3	197 / 68.6

NOTE: Table includes 5% additional fuel for holding in a racetrack pattern.

End of Section

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ETOPS PERFORMANCE PROCEDURES

This section provides performance data for use in the event of an ETOPS enroute diversion and for flight planning to assure availability of engine-out terrain clearance and ETOPS fuel requirements. The performance levels in this section are based upon the following thrust setting and speed criteria:

1. Maximum Continuous Thrust.
2. Mach 0.84 / 300 KIAS driftdown speeds.
3. 300 KIAS engine-out cruise speed.

In the event of pressurization loss in addition to or independent of an engine shutdown, cruise at 300 KIAS (engine-out) or LRC (all-engines) following emergency descent to 10,000 feet or to 14,000 feet over terrain - critical areas of Greenland. Refer to the Airway Manual and QRH for driftdown and emergency descent procedures.

Refer to ETOPS Pages 6-3 and 6-4 for critical fuel reserve requirements for Forecast Icing Conditions and Anti-Ice Not Required, respectively.

FLIGHT PLANNING CONSIDERATIONS

Flight Planning data provided in ETOPS Pages 6-3 – 6-4 reflects the analysis used by Flight Control and the Flight Planning System to assure availability of required ETOPS fuel reserves. Critical Fuel Reserves are shown on the flight plan as “ETP Diversion Fuel” and are provided for both icing conditions and non-icing conditions. The ETOPS Critical Fuel Reserves are based upon the greater of engine-out or all-engines fuel consumption and reflect the following flight profile:

- Pressurization Inoperative
- Emergency descent to 10,000 feet
- Cruise at 10,000 feet / 300 KIAS (engine-out) or LRC (all engines)
- 250 KIAS descent to 1,500 feet
- Missed approach, approach, and land
- 7,500 lb. of hold fuel (approximately double AC120-42 requirement)
- 5% fuel added for wind errors
- APU operating

For icing conditions, eight percent additional fuel is added to account for both engine and wing anti-ice and ice accumulation on unheated surfaces. The normal mode of transatlantic operation assumes icing conditions. The flight planning system applies appropriate adjustment to these Reserves to account for performance deterioration of each specific ship number. These adjustments are updated weekly based upon Delta's aircraft/engine trend monitoring system.

Use of these procedures and Critical Fuel Reserves allows the following ETOPS Area of Operation (still air operating radius):

120 minutes - 835 NM

180 minutes - 1,245 NM

CRITICAL FUEL RESERVES
FORECAST ICING CONDITIONS
ISA + 10 °C & BELOW

INITIAL GROSS WT (1000 LB)	CRITICAL FUEL RESERVES - 1000 LB									
	DISTANCE TO ALTERNATE - NAM									
	400	500	600	700	800	900	1000	1100	1200	1300
780	29.3	35.3	41.3	47.3	53.4	59.1	64.8	70.7	76.2	82.2
740	27.8	33.6	39.1	44.8	50.5	55.9	61.4	66.6	71.9	77.3
700	26.5	31.6	36.7	42.2	47.6	52.5	57.6	62.8	68.0	73.2
660	25.3	30.5	35.3	40.5	45.3	50.3	55.1	60.0	64.9	69.7
620	24.2	29.4	33.9	38.8	43.3	48.3	52.8	57.4	62.0	66.6
580	23.3	28.3	32.6	37.1	41.7	46.0	50.6	55.1	59.5	63.8
540	22.8	27.1	31.4	36.0	40.3	44.3	48.8	52.9	57.2	61.3
500	21.7	26.2	30.3	34.5	38.6	42.6	46.6	50.9	54.9	59.0
460	21.1	25.4	29.4	33.1	37.2	41.1	44.9	48.6	52.9	56.7
420	20.5	24.5	28.3	32.0	36.0	39.7	43.5	47.2	51.3	54.7

NOTES

1. Based upon the greater of fuel burn for one-engine inoperative or for all-engines operating using the following flight profile:
 - a. Emergency descent to 10,000 ft.
 - b. Cruise @ 10,000 ft @ 300 KIAS
 - c. 250 KIAS descent to landing
 - d. 7500 lb. hold fuel
 - e. Missed approach, approach and land
 - f. APU Operating
2. Includes the following fuel allowances:
 - a. 5% for wind forecast errors
 - b. 10% for Engine/Wing Anti-Ice ON and ice accumulation
 - c. Does NOT include Extra Fuel at ETP allowance
3. This data reflects ETOPS data used by FLIGHT CONTROL for ETP Diversion Fuel analysis.
4. The flight planning system adjusts Critical Fuel Reserve data to account for individual ship number performance deterioration.
5. Increase above fuel burns by 0.8% per 10° C above ISA.

CRITICAL FUEL RESERVES

ANTI-ICE NOT REQUIRED

ISA + 10 °C & BELOW

INITIAL GROSS WT (1000 LB)	CRITICAL FUEL RESERVES - 1000 LB									
	DISTANCE TO ALTERNATE - NAM									
	400	500	600	700	800	900	1000	1100	1200	1300
780	26.6	32.1	37.5	43.0	48.5	53.7	58.9	64.3	69.3	74.7
740	25.3	30.5	35.5	40.7	45.9	50.8	55.8	60.5	65.4	70.3
700	24.1	28.7	33.4	38.4	43.3	47.7	52.4	57.1	61.8	66.5
660	23.0	27.7	32.1	36.8	41.2	45.7	50.1	54.5	59.0	63.4
620	22.0	26.7	30.8	35.3	39.4	43.9	48.0	52.2	56.4	60.5
580	21.2	25.7	29.6	33.7	37.9	41.8	46.0	50.1	54.1	58.0
540	20.7	24.6	28.5	32.7	36.6	40.3	44.4	48.1	52.0	55.7
500	19.7	23.8	27.5	31.4	35.1	38.7	42.4	46.3	49.9	53.6
460	19.2	23.1	26.7	30.1	33.8	37.4	40.8	44.2	48.1	51.5
420	18.6	22.3	25.7	29.1	32.7	36.1	39.5	42.9	46.6	49.7

NOTES:

1. Based upon the greater of fuel burn for one-engine inoperative or. all-engines operating using the following flight profile:
 - a. Emergency descent to 10,000 ft
 - b. Cruise @ 300 KIAS @ 10,000 ft.
 - c. 250 KIAS descent to landing.
 - d. 7500 lb. hold fuel.
 - e. Missed approach, approach and land.
 - f. APU Operating .
3. Includes a 5% fuel allowance for wind forecast errors.
4. Does NOT include Extra Fuel at ETP allowance.
4. This data reflects data used by FLIGHT CONTROL for ETP Diversion Fuel analysis.
5. The flight planning system adjusts this critical fuel data to account for individual ship number performance deterioration.
6. Increase above fuel burns by 0.8% per 10° C above ISA.

End of Section