
A319 Operational Data Manual (ODM)

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A319

Operational Data

Manual

Revision Number: 31
Revision Date: September 23, 2016

Issued by
Performance Engineering – Dept 088 ATG
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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

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

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Revision Notification

Publication: A319 OPERATIONAL DATA MANUAL

Date: 23 Sep 16

Revision Number: 31

Page: 1 of 1

REMOVE	INSERT	REMARKS
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
APPROACH/LANDING Pages: 3-5, 3-7	APPROACH/LANDING Pages: 3-5, 3-7	Eliminated fair nomenclature to make it consistent with new FAA policy.
ABNORMAL Pages: 4-33, 4-35	ABNORMAL Pages: 4-33, 4-35	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 #31

ODM REVISION LOG

Page	Date
	NO DATE

TOC / COVER PAGE

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TOC	22 Apr 16
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<i>i</i>	23 Sep 16

QUICK REFERENCE

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LAND DIST	23 Sep 16

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END

A319 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 39	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 29	
Poor	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	• Ice	1	20 or lower	6 – 12
Nil ⁽¹⁾	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	- Wet Ice - Water on top of Compacted Snow - Dry Snow or Wet Snow over Ice	0		5 & below
--	--	• Unreliable	9 (ICAO only)	N/A	N/A

⁽¹⁾ Operations on any runway with a PIREP or runway contaminant of nil are prohibited.

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

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

CROSSWIND

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

	DRY	GOOD	MEDIUM	POOR
Crosswind Limit	Aircraft Limits	Aircraft Limits	20KTS	15KTS
Tailwind Limit	10KTS	10KTS	5KTS	0KTS

A319 QUICK REFERENCE CHART

OPERATIONAL LANDING DISTANCES FEET

FLAPS FULL

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	DRY (6)			GOOD (5)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	8,800	6,400	5,500	8,800	6,500	6,500
150,000	8,600	6,200	5,300	8,600	6,300	6,300
145,000	8,400	6,100	5,200	8,400	6,200	6,200
140,000	8,100	5,900	5,100	8,100	6,000	6,000
135,000	7,900	5,800	5,000	7,900	5,800	5,800
134,481	7,200	5,100	4,000	7,200	5,200	5,000
130,000	7,000	5,000	3,900	7,000	5,000	4,800
125,000	6,800	4,900	3,800	6,800	4,900	4,600
120,000	6,600	4,700	3,700	6,600	4,700	4,500
115,000	6,400	4,600	3,600	6,400	4,600	4,300
110,000	6,200	4,400	3,500	6,200	4,400	4,200
105,000	5,900	4,300	3,400	5,900	4,300	4,000
100,000	5,800	4,200	3,300	5,800	4,200	3,900
95,000	5,700	4,200	3,300	5,700	4,200	3,800
90,000	5,700	4,200	3,300	5,700	4,200	3,800

BASIS: Zero wind • Standard approach procedure • Two Engines at Full Reverse Thrust • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes 15% safety margin and standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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

CORRECTIONS	DRY (6)			GOOD (5)		
PER 5 ADD'L APP SPD	500	350	250	500	400	400
PER 1 KT TAILWIND	150	100	100	150	150	150
PER 10°C ABOVE ISA	200	150	100	200	200	200
PER 1% DOWN SLOPE	100	50	50	100	150	150
1 REV INOP	0	0	0	0	0	0
2 REV INOP or NO REV USED	0	0	0	0	0	0
Autoland	1,100			1,300		

Note: Do not operate when Braking Action is Nil.

A319 QUICK REFERENCE CHART

OPERATIONAL LANDING DISTANCES FEET

FLAPS FULL

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	MEDIUM (3)			POOR (1)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	9,000	7,800	7,800	11,600	11,400	11,400
150,000	8,700	7,600	7,600	11,300	11,100	11,100
145,000	8,500	7,400	7,400	11,000	10,800	10,800
140,000	8,300	7,200	7,200	10,600	10,500	10,500
135,000	8,000	7,000	7,000	10,300	10,200	10,200
134,481	7,300	6,200	6,200	9,600	9,400	9,400
130,000	7,100	6,100	6,000	9,300	9,100	9,100
125,000	6,900	5,900	5,800	9,000	8,800	8,800
120,000	6,700	5,700	5,600	8,700	8,500	8,500
115,000	6,500	5,500	5,500	8,400	8,200	8,200
110,000	6,300	5,300	5,300	8,100	7,900	7,900
105,000	6,000	5,100	5,100	7,800	7,600	7,600
100,000	5,800	5,000	4,900	7,500	7,300	7,300
95,000	5,800	4,900	4,900	7,400	7,200	7,100
90,000	5,800	4,900	4,800	7,200	7,000	7,000

BASIS: Zero wind • Standard approach procedure • Two Engines at Full Reverse Thrust • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes 15% safety margin and standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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	-500	-500	-1,000	-1,000	-1,000
2,000	0	0	0	0	0	0
4,000	500	500	500	1,000	1,000	1,000
6,000	1,100	1,000	1,000	2,000	2,000	2,000
8,000	1,600	1,500	1,500	3,000	3,000	3,000

CORRECTIONS	MEDIUM (3)			POOR (1)		
PER 5 ADD'L APP SPD	500	400	400	550	550	550
PER 1 KT TAILWIND	150	150	150	400	400	400
PER 10°C ABOVE ISA	250	200	200	450	450	450
PER 1% DOWN SLOPE	350	400	350	2,950	2,950	2,900
1 REV INOP	0	100	100	700	700	700
2 REV INOP or NO REV USED	0	200	200	1,400	1,400	1,400
Autoland	1,300			1,500		

Note: Do not operate when Braking Action is Nil.

A319 QUICK REFERENCE CHART

OPERATIONAL LANDING DISTANCES FEET

FLAPS 3

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	DRY (6)			GOOD (5)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	9,700	6,900	6,100	9,700	7,300	7,300
150,000	9,400	6,700	6,000	9,400	7,100	7,100
145,000	9,200	6,600	5,800	9,200	6,900	6,900
140,000	8,900	6,400	5,700	8,900	6,700	6,700
135,000	8,600	6,200	5,500	8,600	6,500	6,500
134,481	7,900	5,600	4,200	7,900	5,600	5,500
130,000	7,700	6,400	4,100	7,700	5,500	5,300
125,000	7,500	5,300	4,000	7,500	5,300	5,100
120,000	7,200	5,100	3,900	7,200	5,200	4,900
115,000	7,000	5,000	3,800	7,000	5,000	4,700
110,000	6,700	4,800	3,700	6,700	4,800	4,600
105,000	6,500	4,600	3,600	6,500	4,700	4,400
100,000	6,300	4,500	3,500	6,300	4,500	4,200
95,000	6,000	4,300	3,300	6,000	4,300	4,000
90,000	5,800	4,200	3,300	5,800	4,200	3,900

BASIS: Zero wind • Standard approach procedure • Two Engines at Full Reverse Thrust • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes 15% safety margin and standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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

CORRECTIONS	DRY (6)			GOOD (5)		
PER 5 ADD'L APP SPD	550	350	250	550	450	450
PER 1 KT TAILWIND	150	100	100	150	150	150
PER 10°C ABOVE ISA	250	150	150	250	250	250
PER 1% DOWN SLOPE	100	50	50	100	200	200
1 REV INOP	0	0	0	0	0	0
2 REV INOP or NO REV USED	0	0	0	0	0	0
Autoland	900			1,100		

Note: Do not operate when Braking Action is Nil.

A319 QUICK REFERENCE CHART

OPERATIONAL LANDING DISTANCES FEET

FLAPS 3

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	MEDIUM (3)			POOR (1)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	9,800	8,700	8,700	13,000	12,900	12,900
150,000	9,600	8,500	8,500	12,600	12,500	12,500
145,000	9,300	8,300	8,300	12,200	12,200	12,200
140,000	9,000	8,000	8,000	11,900	11,800	11,800
135,000	8,800	7,800	7,800	11,500	11,400	11,400
134,481	8,000	6,800	6,800	10,700	10,600	10,600
130,000	7,800	6,600	6,600	10,400	10,200	10,200
125,000	7,600	6,400	6,400	10,000	9,900	9,900
120,000	7,300	6,200	6,200	9,700	9,500	9,500
115,000	7,100	6,000	6,000	9,300	9,200	9,200
110,000	6,900	5,800	5,800	9,000	8,800	8,800
105,000	6,600	5,600	5,500	8,600	8,500	8,500
100,000	6,400	5,400	5,300	8,300	8,100	8,100
95,000	6,100	5,200	5,100	7,900	7,800	7,800
90,000	5,900	5,000	5,000	7,600	7,500	7,500

BASIS: Zero wind • Standard approach procedure • Two Engines at Full Reverse Thrust • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes 15% safety margin and standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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	-600	-600	-600	-1,200	-1,200	-1,200
2,000	0	0	0	0	0	0
4,000	600	600	600	1,200	1,200	1,200
6,000	1,200	1,100	1,100	2,300	2,300	2,300
8,000	1,700	1,700	1,700	3,500	3,500	3,500

CORRECTIONS	MEDIUM (3)			POOR (1)		
PER 5 ADD'L APP SPD	550	450	400	650	650	650
PER 1 KT TAILWIND	200	150	150	450	450	450
PER 10°C ABOVE ISA	250	250	250	500	500	500
PER 1% DOWN SLOPE	400	450	450	3,600	3,600	3,600
1 REV INOP	0	100	100	1,000	1,000	900
2 REV INOP or NO REV USED	100	300	200	2,000	1,900	1,800
Autoland	1,200			1,500		

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.

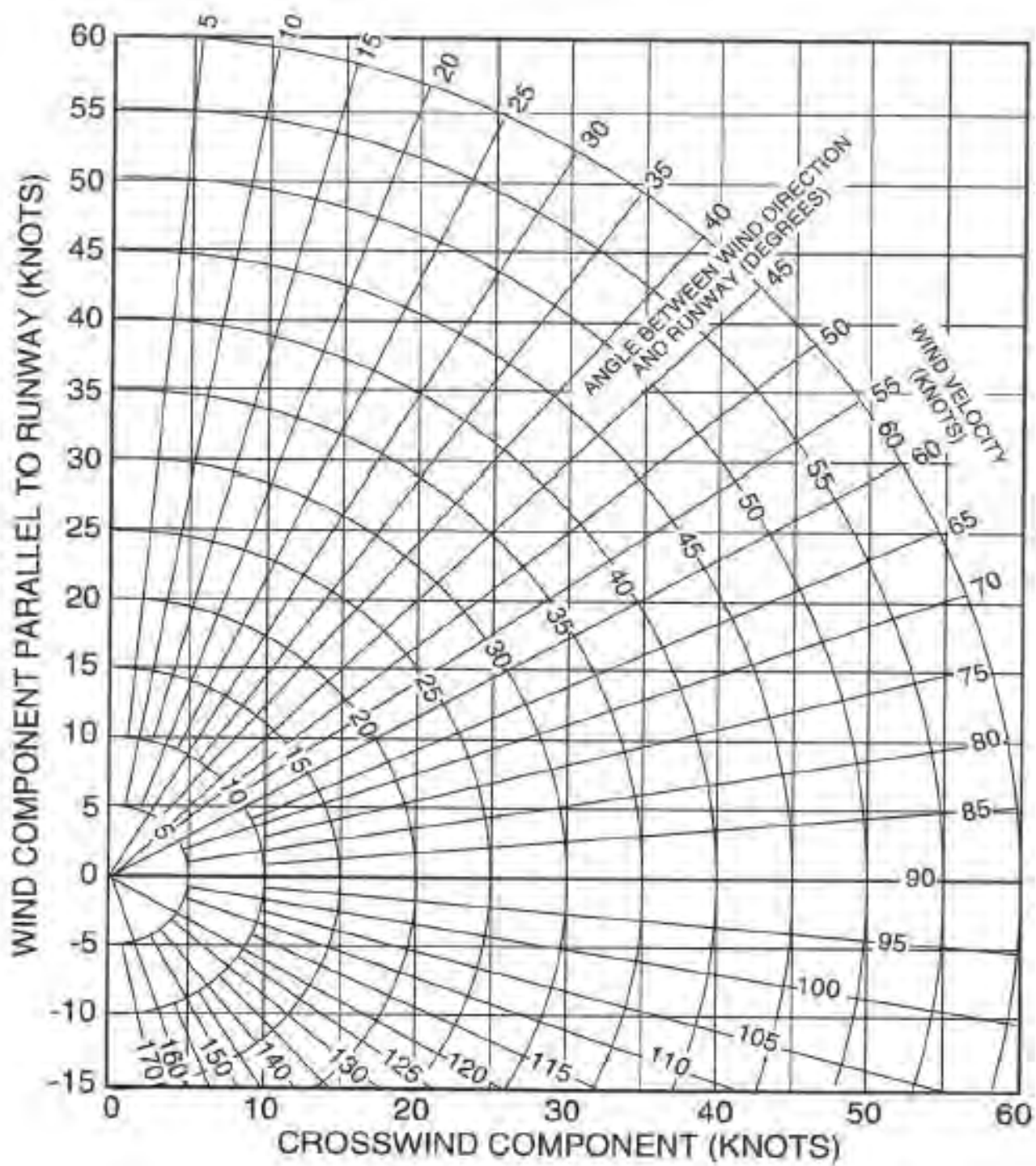
STATIC AIR TEMPERATURE (SAT) - The ambient still air temperature outside of the aircraft. Sometimes known as the Outside Air Temperature (OAT).

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.

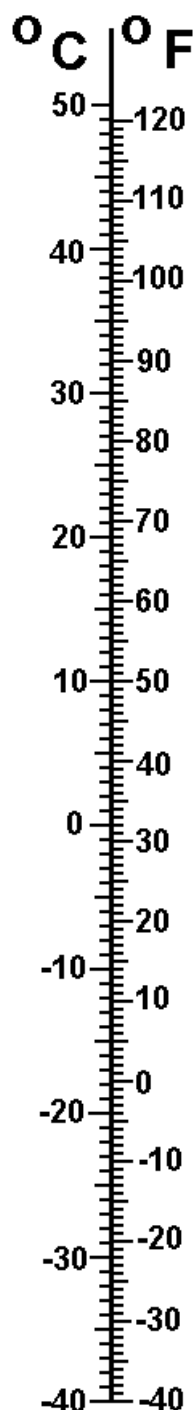
V_b - Buffet or severe turbulence target speed.

WIND COMPONENT CHART



TEMPERATURE CONVERSION AND STATIC AIR TEMPERATURE

°C



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

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

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

EXAMPLES:	<u>ALT</u>	<u>DOUBLE ALT</u>	<u>SUBTRACT 15</u>	<u>CHANGE SIGN</u>
	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

METRIC ALTIMETER CONVERSION CHART

MBS	Inch	MBS	Inch	MBS	Inch
940	27.76	977	28.85	1014	29.94
941	27.79	978	28.88	1015	29.97
942	27.82	979	28.91	1016	30.00
943	27.85	980	28.94	1017	30.03
944	27.88	981	28.97	1018	30.06
945	27.91	982	29.00	1019	30.09
946	27.94	983	29.03	1020	30.12
947	27.96	984	29.06	1021	30.15
948	27.99	985	29.09	1022	30.18
949	28.02	986	29.12	1023	30.21
950	28.05	987	29.15	1024	30.24
951	28.08	988	29.18	1025	30.27
952	28.11	989	29.21	1026	30.30
953	28.14	990	29.23	1027	30.33
954	28.17	991	29.26	1028	30.36
955	28.20	992	29.29	1029	30.39
956	28.23	993	29.32	1030	30.42
957	28.26	994	29.35	1031	30.45
958	28.29	995	29.38	1032	30.47
959	28.32	996	29.41	1033	30.50
960	28.35	997	29.44	1034	30.53
961	28.38	998	29.47	1035	30.56
962	28.41	999	29.50	1036	30.59
963	28.44	1000	29.53	1037	30.62
964	28.47	1001	29.56	1038	30.65
965	28.50	1002	29.59	1039	30.68
966	28.53	1003	29.62	1040	30.71
967	28.56	1004	29.65	1041	30.74
968	28.58	1005	29.68	1042	30.77
969	28.61	1006	29.71	1043	30.80
970	28.64	1007	29.74	1044	30.83
971	28.67	1008	29.77	1045	30.86
972	28.70	1009	29.80	1046	30.89
973	28.73	1010	29.83	1047	30.92
974	28.76	1011	29.85	1048	30.95
975	28.79	1012	29.88	1049	30.98
976	28.82	1013	29.91	1050	31.01

NORMAL OPERATING SPEED LIMIT

Vmo / Mmo

PRESSURE ALTITUDE	INDICATED Vmo (KIAS)	MACH Mmo
0	350	0.529
5,000	350	0.576
10,000	350	0.629
15,000	350	0.688
17,000	350	0.713
19,000	350	0.740
21,000	350	0.767
23,000	350	0.796
25,000	347	0.820
27,000	333	0.820
29,000	319	0.820
31,000	306	0.820
33,000	293	0.820
35,000	280	0.820
37,000	267	0.820
39,000	244	0.820

EN ROUTE FUEL TEMPERATURE

FOR DETERMINING DISPATCH CAPABILITY BASED ON FUEL FREEZE POINT.

FUEL TYPE		ISA	JET A	JP-5	JET A1	Jet B	TS-1
ADJUSTED FUEL FREEZE TEMP.			-37°C	-43°C	-44°C	-47°C	-57°C
MACH	FLT LEVEL		MAXIMUM ISA DEVIATION - °C				
0.77	330	-50	-12	-17	-18	-21	-30
	350	-54	-8	-13	-14	-17	-26
	370 & HIGHER	-57	-6	-11	-12	-14	-23
0.78	330	-50	-12	-18	-18	-21	-30
	350	-54	-8	-14	-15	-17	-26
	370 & HIGHER	-57	-6	-11	-12	-15	-24
0.79	330	-50	-13	-18	-19	-22	-31
	350	-54	-9	-14	-15	-18	-27
	370 & HIGHER	-57	-7	-12	-13	-16	-24
0.80	330	-50	-13	-19	-20	-22	-31
	350	-54	-9	-15	-16	-18	-27
	370 & HIGHER	-57	-7	-13	-14	-16	-25
0.81	330	-50	-14	-19	-20	-23	-32
	350	-54	-10	-15	-16	-19	-28
	370 & HIGHER	-57	-8	-13	-14	-17	-26

INSTRUCTIONS:

1. Locate type of fuel being used.

NOTE: THE ADJUSTED FUEL FREEZING TEMPERATURE IS THE BASIC FUEL FREEZING TEMPERATURE + 3°C (PER THE APPROVED AIRCRAFT FLIGHT MANUAL).

2. Move down to the Mach number and Altitude expected en route and read the Maximum ISA Deviation.
3. Do not dispatch aircraft into en route temperatures colder than the Maximum ISA Deviation obtained in Step 2 above.

EXAMPLE:

Fuel Type = Jet A (adjusted freeze point -37°C).

Expected Flight Level = 350.

Expected Mach Number = 0.81.

1. Enter the top of the Chart under JET A (Adjusted Fuel Freezing Temperature = -37°C).
2. Move down the chart to the flight conditions of Mach 0.81 and FL 350 and read the Maximum ISA Deviation (-10°C).
3. Do not dispatch aircraft into temperatures colder than ISA -10°C at FL 350.

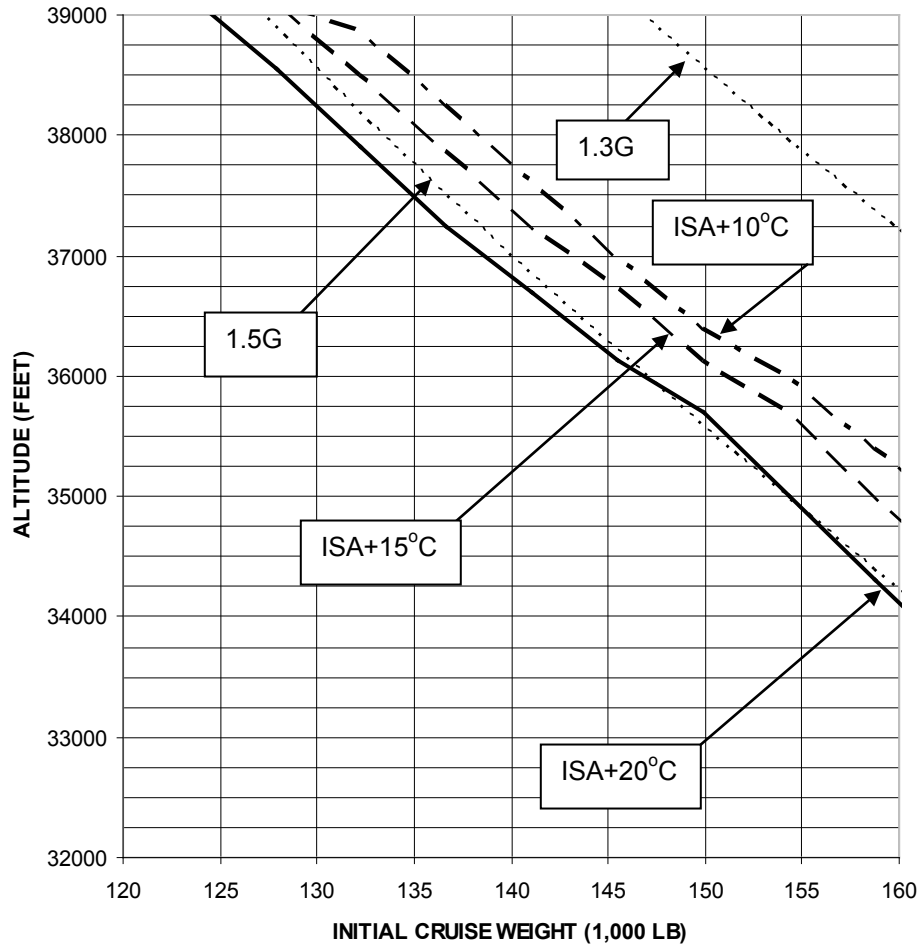
FUEL CONVERSION TABLE

Fuel Conversion Table — Kero @ 6.7 lbs/Gal							
Gallons	Pounds	Imperial Gallons	Liters	Gallons	Pounds	Imperial Gallons	Liters
100	670	83	379	3,300	22,110	2,748	12,501
200	1,340	167	758	3,400	22,780	2,831	12,879
300	2,010	250	1,136	3,500	23,450	2,914	13,258
400	2,680	333	1,515	3,600	24,120	2,998	13,636
500	3,350	416	1,894	3,700	24,790	3,081	14,051
600	4,020	500	2,273	3,800	25,460	3,164	14,394
700	4,690	583	2,652	3,900	26,130	3,247	14,773
800	5,360	666	3,030	4,000	26,800	3,331	15,152
900	6,030	749	3,409	4,100	27,470	3,414	15,530
1,000	6,700	833	3,788	4,200	28,140	3,497	15,909
1,100	7,370	916	4,167	4,300	28,810	3,580	16,288
1,200	8,040	999	4,545	4,400	29,480	3,664	16,667
1,300	8,710	1,082	4,924	4,500	30,150	3,747	17,045
1,400	9,380	1,166	5,303	4,600	30,820	3,830	17,424
1,500	10,050	1,249	5,682	4,700	31,490	3,913	17,803
1,600	10,720	1,332	6,061	4,800	32,160	3,997	18,182
1,700	11,390	1,415	6,439	4,900	32,830	4,080	18,561
1,800	12,060	1,499	6,818	5,000	33,500	4,163	18,939
1,900	12,730	1,582	7,197	5,100	34,170	4,246	19,318
2,000	13,400	1,665	7,576	5,200	34,840	4,330	19,697
2,100	14,070	1,749	7,955	5,300	35,510	4,413	20,076
2,200	14,740	1,832	8,333	5,400	36,180	4,496	20,455
2,300	15,410	1,915	8,712	5,500	36,850	4,580	20,833
2,400	16,080	1,998	9,091	5,600	37,520	4,663	21,212
2,500	16,750	2,082	9,470	5,700	38,190	4,746	21,591
2,600	17,420	2,165	9,848	5,800	38,860	4,829	21,970
2,700	18,090	2,248	10,227	5,900	39,530	4,913	22,348
2,800	18,760	2,331	10,606	6,000	40,200	4,996	22,727
2,900	19,430	2,415	10,985	6,100	40,870	5,079	23,106
3,000	20,100	2,498	11,364	6,200	41,540	5,162	23,485
3,100	20,770	2,581	11,742	6,300	42,210	5,245	23,864
3,200	21,440	2,664	12,121				

Given	Multiply By	To Find
Kilograms	2.205	Pounds
Liters	0.264	U.S. Gallons
Imperial Gallons	1.201	U.S. Gallons

MAXIMUM RECOMMENDED INITIAL CRUISE ALTITUDE

.79 MACH



Config	Corrections - Ft		
	≤ ISA+10	ISA+15	ISA+20
Engine Anti-Ice ON	-1,000	-1,100	-1,300
Engine and Wind Anti-Ice ON	-1,900	-2,200	-2,700

BUFFET ONSET BOUNDARY SPEEDS

KIAS

FLIGHT LEVEL	CRUISE WEIGHT LBS	Vb M KIAS	G / BANK ANGLE - DEGREES	
			1.0/0°	1.15/30°
390	160,000	0.79 244	206	224
	140,000		191	207
	120,000		176	190
	100,000		159	172
	80,000		138	151
370	160,000	0.79 256	205	221
	140,000		190	205
	120,000		175	189
	100,000		157	171
	80,000		136	149
350	160,000	0.79 268	203	220
	140,000		189	204
	120,000		174	188
	100,000		155	169
	80,000		133	146
330	160,000	0.79 281	202	218
	140,000		188	203
	120,000		172	186
	100,000		152	167
	80,000		130	144
310	160,000	0.79 293	201	217
	140,000		187	202
	120,000		169	185
	100,000		150	165
	80,000		127	141
290	160,000	0.79 306	200	216
	140,000		184	201
	120,000		167	182
	100,000		147	162
	80,000		124	138

End of Section

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INTENTIONALLY BLANK

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 takeoff speeds in this manual may only be used with a manual weight data record based on ARM takeoff performance weight limits. These speeds 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.

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.

$V_1 / V_R / V_2$

TO / 1

TAKEOFF WEIGHT 1,000 LBS	AIRPORT PRESS ALT FT	AMBIENT TEMPERATURE – °C					
		0 & below	10	20	30	40	50
170	8,000	160 / 160 / 163	160 / 160 / 163	160 / 160 / 163	160 / 160 / 163	161 / 161 / 163	
	6,000	160 / 160 / 162	160 / 160 / 162	160 / 160 / 162	160 / 160 / 162	160 / 160 / 162	
	4,000	158 / 158 / 163	159 / 159 / 163	159 / 159 / 163	159 / 159 / 162	159 / 159 / 162	159 / 159 / 162
	2,000	157 / 157 / 162	157 / 157 / 162	157 / 157 / 162	157 / 157 / 162	158 / 158 / 161	159 / 159 / 161
	0	156 / 156 / 162	156 / 156 / 162	157 / 157 / 162	157 / 157 / 162	157 / 157 / 162	158 / 158 / 161
165	8,000	157 / 157 / 160	157 / 157 / 160	157 / 157 / 160	158 / 158 / 160	158 / 158 / 161	
	6,000	157 / 157 / 160	157 / 157 / 160	157 / 157 / 160	157 / 157 / 160	157 / 157 / 160	
	4,000	156 / 156 / 161	156 / 156 / 161	156 / 156 / 161	156 / 156 / 159	157 / 157 / 159	157 / 157 / 159
	2,000	155 / 155 / 160	155 / 155 / 160	155 / 155 / 160	155 / 155 / 160	156 / 156 / 159	156 / 156 / 159
	0	154 / 154 / 160	154 / 154 / 160	154 / 154 / 160	154 / 154 / 160	155 / 155 / 160	156 / 156 / 159
160	8,000	155 / 155 / 158	155 / 155 / 158	155 / 155 / 158	155 / 155 / 158	155 / 155 / 158	
	6,000	154 / 154 / 157	154 / 154 / 157	154 / 154 / 157	154 / 154 / 157	154 / 154 / 157	
	4,000	153 / 153 / 158	153 / 153 / 158	153 / 153 / 158	153 / 153 / 157	154 / 154 / 157	154 / 154 / 157
	2,000	152 / 152 / 158	152 / 152 / 158	153 / 153 / 158	153 / 153 / 158	153 / 153 / 156	153 / 153 / 156
	0	152 / 152 / 157	152 / 152 / 157	152 / 152 / 157	152 / 152 / 157	152 / 152 / 157	153 / 153 / 156
155	8,000	152 / 152 / 156	152 / 152 / 156	152 / 152 / 156	152 / 152 / 155	153 / 153 / 155	
	6,000	151 / 151 / 156	151 / 151 / 156	151 / 151 / 156	151 / 151 / 156	151 / 151 / 155	
	4,000	150 / 150 / 155	150 / 150 / 155	150 / 150 / 155	150 / 150 / 155	151 / 151 / 155	151 / 151 / 155
	2,000	150 / 150 / 155	150 / 150 / 155	150 / 150 / 155	150 / 150 / 155	150 / 150 / 155	151 / 151 / 155
	0	149 / 149 / 155	149 / 149 / 155	149 / 149 / 155	149 / 149 / 155	150 / 150 / 155	150 / 150 / 155
150	8,000	149 / 149 / 153	149 / 149 / 153	149 / 149 / 153	149 / 149 / 153	150 / 150 / 153	
	6,000	148 / 148 / 153	148 / 148 / 153	148 / 148 / 153	148 / 148 / 153	149 / 149 / 152	
	4,000	147 / 147 / 153	148 / 148 / 153	148 / 148 / 153	148 / 148 / 153	148 / 148 / 153	148 / 148 / 152
	2,000	147 / 147 / 152	147 / 147 / 152	147 / 147 / 152	147 / 147 / 152	147 / 147 / 152	148 / 148 / 152
	0	146 / 146 / 152	147 / 147 / 152	147 / 147 / 152	147 / 147 / 152	147 / 147 / 152	147 / 147 / 152
145	8,000	146 / 146 / 150	146 / 146 / 150	146 / 146 / 150	146 / 146 / 150	147 / 147 / 150	
	6,000	145 / 145 / 150	145 / 145 / 150	145 / 145 / 150	146 / 146 / 150	146 / 146 / 150	
	4,000	145 / 145 / 150	145 / 145 / 150	145 / 145 / 150	145 / 145 / 150	145 / 145 / 150	146 / 146 / 149
	2,000	144 / 144 / 149	144 / 144 / 149	144 / 144 / 149	144 / 144 / 149	145 / 145 / 149	145 / 145 / 149
	0	143 / 143 / 149	144 / 144 / 149	144 / 144 / 149	144 / 144 / 149	144 / 144 / 149	145 / 145 / 149
140	8,000	143 / 143 / 148	143 / 143 / 148	143 / 143 / 148	144 / 144 / 147	144 / 144 / 148	
	6,000	142 / 142 / 147	143 / 143 / 147	143 / 143 / 147	143 / 143 / 147	143 / 143 / 147	
	4,000	142 / 142 / 147	142 / 142 / 147	142 / 142 / 147	142 / 142 / 147	143 / 143 / 147	143 / 143 / 147
	2,000	141 / 141 / 147	141 / 141 / 147	141 / 141 / 147	141 / 141 / 147	142 / 142 / 147	142 / 142 / 147
	0	141 / 141 / 147	141 / 141 / 147	141 / 141 / 147	141 / 141 / 147	141 / 141 / 147	142 / 142 / 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
TO / 1**

TAKEOFF WEIGHT 1,000 LBS	AIRPORT PRESS ALT FT	AMBIENT TEMPERATURE – °C					
		0 & below	10	20	30	40	50
135	8,000	140 / 140 / 145	140 / 140 / 145	140 / 140 / 145	141 / 141 / 145	141 / 141 / 145	
	6,000	139 / 139 / 145	140 / 140 / 145	140 / 140 / 145	140 / 140 / 145	140 / 140 / 145	
	4,000	139 / 139 / 144	139 / 139 / 144	139 / 139 / 144	139 / 139 / 144	140 / 140 / 144	140 / 140 / 144
	2,000	138 / 138 / 144	139 / 139 / 144	139 / 139 / 144	139 / 139 / 144	139 / 139 / 144	140 / 140 / 144
	0	138 / 138 / 144	138 / 138 / 144	138 / 138 / 144	138 / 138 / 144	139 / 139 / 144	139 / 139 / 144
130	8,000	137 / 137 / 142	138 / 138 / 142	138 / 138 / 142	138 / 138 / 142	138 / 138 / 142	
	6,000	137 / 137 / 142	137 / 137 / 142	137 / 137 / 142	137 / 137 / 142	138 / 138 / 142	
	4,000	136 / 136 / 142	136 / 136 / 142	136 / 136 / 142	137 / 137 / 142	137 / 137 / 142	138 / 138 / 142
	2,000	136 / 136 / 142	136 / 136 / 142	136 / 136 / 142	136 / 136 / 142	136 / 136 / 142	137 / 137 / 142
	0	135 / 135 / 142	136 / 136 / 142	136 / 136 / 142	136 / 136 / 142	136 / 136 / 142	137 / 137 / 142
125	8,000	135 / 135 / 140	135 / 135 / 140	135 / 135 / 140	135 / 135 / 140	136 / 136 / 140	
	6,000	134 / 134 / 139	134 / 134 / 139	134 / 134 / 139	134 / 134 / 139	135 / 135 / 139	
	4,000	133 / 133 / 139	134 / 134 / 139	134 / 134 / 139	134 / 134 / 139	134 / 134 / 139	135 / 135 / 139
	2,000	133 / 133 / 139	133 / 133 / 139	133 / 133 / 139	133 / 133 / 139	134 / 134 / 139	134 / 134 / 139
	0	132 / 132 / 139	133 / 133 / 139	133 / 133 / 139	133 / 133 / 139	133 / 133 / 139	134 / 134 / 139
120	8,000	132 / 132 / 137	132 / 132 / 137	132 / 132 / 137	132 / 132 / 137	133 / 133 / 137	
	6,000	131 / 131 / 137	131 / 131 / 137	131 / 131 / 137	132 / 132 / 137	132 / 132 / 137	
	4,000	130 / 130 / 137	131 / 131 / 137	131 / 131 / 137	131 / 131 / 137	132 / 132 / 137	132 / 132 / 137
	2,000	130 / 130 / 137	130 / 130 / 137	130 / 130 / 137	130 / 130 / 137	131 / 131 / 137	132 / 132 / 137
	0	129 / 129 / 137	130 / 130 / 137	130 / 130 / 137	130 / 130 / 137	130 / 130 / 137	131 / 131 / 137
115	8,000	129 / 129 / 134	129 / 129 / 134	129 / 129 / 134	129 / 129 / 134	130 / 130 / 134	
	6,000	128 / 128 / 134	128 / 128 / 134	128 / 128 / 134	129 / 129 / 134	129 / 129 / 134	
	4,000	127 / 127 / 134	128 / 128 / 134	128 / 128 / 134	128 / 128 / 134	129 / 129 / 134	129 / 129 / 134
	2,000	127 / 127 / 134	127 / 127 / 134	127 / 127 / 134	127 / 127 / 134	128 / 128 / 134	129 / 129 / 134
	0	126 / 126 / 134	127 / 127 / 134	127 / 127 / 134	127 / 127 / 134	127 / 127 / 134	128 / 128 / 134
110	8,000	125 / 125 / 131	126 / 126 / 131	126 / 126 / 131	126 / 126 / 131	127 / 127 / 131	
	6,000	125 / 125 / 131	125 / 125 / 131	125 / 125 / 131	125 / 125 / 131	126 / 126 / 131	
	4,000	124 / 124 / 131	125 / 125 / 131	125 / 125 / 131	125 / 125 / 131	125 / 125 / 131	126 / 126 / 131
	2,000	124 / 124 / 131	124 / 124 / 131	124 / 124 / 131	124 / 124 / 131	125 / 125 / 131	125 / 125 / 131
	0	123 / 123 / 131	124 / 124 / 131	124 / 124 / 131	124 / 124 / 131	124 / 124 / 131	125 / 125 / 131
105	8,000	122 / 122 / 128	122 / 122 / 128	122 / 122 / 128	123 / 123 / 128	123 / 123 / 128	
	6,000	121 / 121 / 128	122 / 122 / 128	122 / 122 / 128	122 / 122 / 128	123 / 123 / 128	
	4,000	121 / 121 / 128	121 / 121 / 128	121 / 121 / 128	121 / 121 / 128	122 / 122 / 128	123 / 123 / 128
	2,000	120 / 120 / 128	121 / 121 / 128	121 / 121 / 128	121 / 121 / 128	121 / 121 / 128	122 / 122 / 128
	0	120 / 120 / 128	120 / 120 / 128	120 / 120 / 128	120 / 120 / 128	121 / 121 / 128	122 / 122 / 128

Limited by either Maximum Brake Energy, Tire Limit Speed, Climb Limit 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 / 3

TAKEOFF WEIGHT 1,000 LBS	AIRPORT PRESS ALT FT	AMBIENT TEMPERATURE – °C					
		0 & below	10	20	30	40	50
170	8,000	151 / 151 / 152	151 / 151 / 152	151 / 151 / 152	151 / 151 / 152	154 / 154 / 155	
	6,000	150 / 150 / 152	151 / 151 / 152	151 / 151 / 152	151 / 151 / 152	151 / 151 / 152	
	4,000	150 / 150 / 152	150 / 150 / 152	150 / 150 / 152	150 / 150 / 152	150 / 150 / 152	151 / 151 / 152
	2,000	150 / 150 / 152	150 / 150 / 152	150 / 150 / 152	150 / 150 / 152	150 / 150 / 152	150 / 150 / 152
	0	149 / 149 / 153	149 / 149 / 153	149 / 149 / 151	149 / 149 / 151	149 / 149 / 151	149 / 149 / 151
165	8,000	148 / 148 / 150	148 / 148 / 150	148 / 148 / 150	149 / 149 / 150	151 / 151 / 152	
	6,000	148 / 148 / 150	148 / 148 / 150	148 / 148 / 150	148 / 148 / 150	148 / 148 / 150	
	4,000	147 / 147 / 150	148 / 148 / 150	148 / 148 / 150	148 / 148 / 150	148 / 148 / 150	148 / 148 / 150
	2,000	147 / 147 / 149	147 / 147 / 149	147 / 147 / 149	147 / 147 / 149	147 / 147 / 149	147 / 147 / 149
	0	146 / 146 / 150	146 / 146 / 150	146 / 146 / 149	146 / 146 / 149	146 / 146 / 149	147 / 147 / 149
160	8,000	146 / 146 / 148	146 / 146 / 148	146 / 146 / 148	146 / 146 / 148	148 / 148 / 149	
	6,000	145 / 145 / 148	145 / 145 / 148	145 / 145 / 148	146 / 146 / 148	146 / 146 / 148	
	4,000	145 / 145 / 147	145 / 145 / 147	145 / 145 / 147	145 / 145 / 147	145 / 145 / 147	146 / 146 / 148
	2,000	144 / 144 / 147	144 / 144 / 147	144 / 144 / 147	144 / 144 / 147	145 / 145 / 147	145 / 145 / 147
	0	143 / 143 / 148	144 / 144 / 148	144 / 144 / 146	144 / 144 / 146	144 / 144 / 146	144 / 144 / 146
155	8,000	143 / 143 / 146	143 / 143 / 146	143 / 143 / 146	143 / 143 / 145	145 / 145 / 147	
	6,000	143 / 143 / 146	143 / 143 / 146	143 / 143 / 146	143 / 143 / 146	143 / 143 / 145	
	4,000	142 / 142 / 146	142 / 142 / 146	142 / 142 / 146	143 / 143 / 146	142 / 142 / 145	143 / 143 / 145
	2,000	141 / 141 / 146	142 / 142 / 146	142 / 142 / 146	142 / 142 / 146	142 / 142 / 146	142 / 142 / 145
	0	141 / 141 / 145	141 / 141 / 145	141 / 141 / 145	141 / 141 / 145	141 / 141 / 145	142 / 142 / 145
150	8,000	140 / 140 / 143	140 / 140 / 143	140 / 140 / 143	141 / 141 / 143	143 / 143 / 144	
	6,000	140 / 140 / 144	140 / 140 / 144	140 / 140 / 144	140 / 140 / 143	141 / 141 / 143	
	4,000	139 / 139 / 143	140 / 140 / 143	140 / 140 / 143	140 / 140 / 143	140 / 140 / 143	141 / 141 / 143
	2,000	139 / 139 / 143	139 / 139 / 143	139 / 139 / 143	139 / 139 / 143	140 / 140 / 143	140 / 140 / 143
	0	138 / 138 / 143	139 / 139 / 143	139 / 139 / 143	139 / 139 / 143	139 / 139 / 143	139 / 139 / 143
145	8,000	138 / 138 / 141	138 / 138 / 141	138 / 138 / 141	138 / 138 / 141	140 / 140 / 142	
	6,000	137 / 137 / 141	138 / 138 / 141	138 / 138 / 141	138 / 138 / 141	138 / 138 / 141	
	4,000	137 / 137 / 141	137 / 137 / 141	137 / 137 / 141	137 / 137 / 141	137 / 137 / 140	138 / 138 / 140
	2,000	136 / 136 / 141	136 / 136 / 141	137 / 137 / 141	137 / 137 / 141	137 / 137 / 141	137 / 137 / 140
	0	136 / 136 / 140	136 / 136 / 140	136 / 136 / 140	136 / 136 / 140	136 / 136 / 140	137 / 137 / 140
140	8,000	135 / 135 / 139	135 / 135 / 139	135 / 135 / 139	136 / 136 / 138	137 / 137 / 139	
	6,000	135 / 135 / 138	135 / 135 / 138	135 / 135 / 138	135 / 135 / 138	136 / 136 / 138	
	4,000	134 / 134 / 138	134 / 134 / 138	134 / 134 / 138	135 / 135 / 138	135 / 135 / 138	136 / 136 / 138
	2,000	133 / 133 / 138	134 / 134 / 138	134 / 134 / 138	134 / 134 / 138	134 / 134 / 138	135 / 135 / 138
	0	133 / 133 / 138	133 / 133 / 138	133 / 133 / 138	133 / 133 / 138	134 / 134 / 138	134 / 134 / 138

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 / 3**

TAKEOFF WEIGHT 1,000 LBS	AIRPORT PRESS ALT FT	AMBIENT TEMPERATURE – °C					
		0 & below	10	20	30	40	50
135	8,000	133 / 133 / 136	133 / 133 / 136	133 / 133 / 136	133 / 133 / 136	134 / 134 / 137	
	6,000	132 / 132 / 136	132 / 132 / 136	132 / 132 / 136	133 / 133 / 136	133 / 133 / 136	
	4,000	132 / 132 / 136	132 / 132 / 136	132 / 132 / 136	132 / 132 / 136	132 / 132 / 136	133 / 133 / 136
	2,000	131 / 131 / 136	131 / 131 / 136	131 / 131 / 136	131 / 131 / 136	132 / 132 / 136	132 / 132 / 136
	0	130 / 130 / 135	131 / 131 / 135	131 / 131 / 135	131 / 131 / 135	131 / 131 / 135	132 / 132 / 135
130	8,000	130 / 130 / 134	130 / 130 / 134	130 / 130 / 134	131 / 131 / 134	132 / 132 / 134	
	6,000	130 / 130 / 134	130 / 130 / 134	130 / 130 / 134	130 / 130 / 134	131 / 131 / 134	
	4,000	129 / 129 / 133	129 / 129 / 133	129 / 129 / 133	130 / 130 / 133	130 / 130 / 133	130 / 130 / 133
	2,000	128 / 128 / 133	129 / 129 / 133	129 / 129 / 133	129 / 129 / 133	129 / 129 / 133	130 / 130 / 133
	0	128 / 128 / 133	128 / 128 / 133	128 / 128 / 133	128 / 128 / 133	129 / 129 / 133	129 / 129 / 133
125	8,000	128 / 128 / 132	128 / 128 / 132	128 / 128 / 132	128 / 128 / 132	129 / 129 / 132	
	6,000	127 / 127 / 131	127 / 127 / 131	127 / 127 / 131	128 / 128 / 131	128 / 128 / 131	
	4,000	126 / 126 / 131	127 / 127 / 131	127 / 127 / 131	127 / 127 / 131	127 / 127 / 131	128 / 128 / 131
	2,000	126 / 126 / 131	126 / 126 / 131	126 / 126 / 131	126 / 126 / 131	127 / 127 / 131	127 / 127 / 131
	0	125 / 125 / 131	126 / 126 / 131	126 / 126 / 131	126 / 126 / 131	126 / 126 / 131	127 / 127 / 131
120	8,000	125 / 125 / 129	125 / 125 / 129	125 / 125 / 129	126 / 126 / 129	126 / 126 / 129	
	6,000	124 / 124 / 129	125 / 125 / 129	125 / 125 / 129	125 / 125 / 129	125 / 125 / 129	
	4,000	124 / 124 / 129	124 / 124 / 129	124 / 124 / 129	124 / 124 / 129	125 / 125 / 129	125 / 125 / 129
	2,000	122 / 122 / 129	123 / 123 / 129	123 / 123 / 129	124 / 124 / 129	124 / 124 / 129	125 / 125 / 129
	0	122 / 122 / 129	123 / 123 / 129	123 / 123 / 129	123 / 123 / 129	123 / 123 / 129	124 / 124 / 129
115	8,000	122 / 122 / 127	122 / 122 / 127	122 / 122 / 127	123 / 123 / 127	123 / 123 / 127	
	6,000	121 / 121 / 126	122 / 122 / 126	122 / 122 / 126	122 / 122 / 126	123 / 123 / 126	
	4,000	121 / 121 / 126	121 / 121 / 126	121 / 121 / 126	121 / 121 / 126	122 / 122 / 126	122 / 122 / 126
	2,000	120 / 120 / 126	120 / 120 / 126	121 / 121 / 126	121 / 121 / 126	121 / 121 / 126	122 / 122 / 126
	0	120 / 120 / 126	120 / 120 / 126	120 / 120 / 126	120 / 120 / 126	121 / 121 / 126	121 / 121 / 126
110	8,000	119 / 119 / 124	119 / 119 / 124	119 / 119 / 124	120 / 120 / 124	120 / 120 / 124	
	6,000	118 / 118 / 124	119 / 119 / 124	119 / 119 / 124	119 / 119 / 124	120 / 120 / 124	
	4,000	118 / 118 / 124	118 / 118 / 124	118 / 118 / 124	118 / 118 / 124	119 / 119 / 124	119 / 119 / 124
	2,000	117 / 117 / 124	117 / 117 / 124	117 / 117 / 124	117 / 117 / 124	118 / 118 / 124	119 / 119 / 124
	0	117 / 117 / 124	117 / 117 / 124	117 / 117 / 124	117 / 117 / 124	117 / 117 / 124	118 / 118 / 124
105	8,000	116 / 116 / 121	116 / 116 / 121	116 / 116 / 121	117 / 117 / 121	117 / 117 / 121	
	6,000	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	116 / 116 / 121	116 / 116 / 121	
	4,000	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	116 / 116 / 121	116 / 116 / 121
	2,000	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	116 / 116 / 121
	0	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121	115 / 115 / 121

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

TAKEOFF STABILIZER SETTINGS

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

Valid for all weights and configurations

%MAC	Trim	%MAC	Trim
15	-3.5	28	-0.7
16	-3.5	29	-0.4
17	-3.5	30	-0.1
18	-3.5	31	+0.2
19	-3.2	32	+0.5
20	-2.9	33	+0.7
21	-2.7	34	+1.0
22	-2.4	35	+1.3
23	-2.1	36	+1.6
24	-1.8	37	+1.9
25	-1.5	38	+2.2
26	-1.2	39	+2.4
27	-1.0	40	+2.7

Negative units are Airplane Nose Up
Positive Units are Airplane Nose Down

End of Section

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DEFINITIONS AND ASSUMPTIONS

ACTUAL LANDING DISTANCE The actual distance required to land starting at 50 feet above the runway (usually at the threshold) to a complete stop on the runway. This distance is based on a 1.23 V_S speed at 50 feet and assumes maximum braking and NO reverse thrust.

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

F.A.R. LANDING FIELD LENGTH This is the landing field length as defined in the Federal Air Regulations Part 121. Actual demonstrated landing distance is 60% of the F.A.R landing distance. Dispatch is based on F.A.R. Landing Field Length at the destination airport.

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

V_S Indicated stall speed for the aircraft weight and configuration. 1.23 V_S is 1.23 times the stall speed, or an increase of 30% above stall speed.

OPERATIONAL LANDING DISTANCES FEET

FLAPS FULL

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	DRY (6)			GOOD (5)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	8,800	6,400	5,500	8,800	6,500	6,500
150,000	8,600	6,200	5,300	8,600	6,300	6,300
145,000	8,400	6,100	5,200	8,400	6,200	6,200
140,000	8,100	5,900	5,100	8,100	6,000	6,000
135,000	7,900	5,800	5,000	7,900	5,800	5,800
134,481	7,200	5,100	4,000	7,200	5,200	5,000
130,000	7,000	5,000	3,900	7,000	5,000	4,800
125,000	6,800	4,900	3,800	6,800	4,900	4,600
120,000	6,600	4,700	3,700	6,600	4,700	4,500
115,000	6,400	4,600	3,600	6,400	4,600	4,300
110,000	6,200	4,400	3,500	6,200	4,400	4,200
105,000	5,900	4,300	3,400	5,900	4,300	4,000
100,000	5,800	4,200	3,300	5,800	4,200	3,900
95,000	5,700	4,200	3,300	5,700	4,200	3,800
90,000	5,700	4,200	3,300	5,700	4,200	3,800

BASIS: Zero wind • Standard approach procedure • Two Engines at Full Reverse Thrust • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes 15% safety margin and standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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

CORRECTIONS	DRY (6)			GOOD (5)		
PER 5 ADD'L APP SPD	500	350	250	500	400	400
PER 1 KT TAILWIND	150	100	100	150	150	150
PER 10°C ABOVE ISA	200	150	100	200	200	200
PER 1% DOWN SLOPE	100	50	50	100	150	150
1 REV INOP	0	0	0	0	0	0
2 REV INOP or NO REV USED	0	0	0	0	0	0
Autoland	1,100			1,300		

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES FEET

FLAPS FULL

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	MEDIUM (3)			POOR (1)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	9,000	7,800	7,800	11,600	11,400	11,400
150,000	8,700	7,600	7,600	11,300	11,100	11,100
145,000	8,500	7,400	7,400	11,000	10,800	10,800
140,000	8,300	7,200	7,200	10,600	10,500	10,500
135,000	8,000	7,000	7,000	10,300	10,200	10,200
134,481	7,300	6,200	6,200	9,600	9,400	9,400
130,000	7,100	6,100	6,000	9,300	9,100	9,100
125,000	6,900	5,900	5,800	9,000	8,800	8,800
120,000	6,700	5,700	5,600	8,700	8,500	8,500
115,000	6,500	5,500	5,500	8,400	8,200	8,200
110,000	6,300	5,300	5,300	8,100	7,900	7,900
105,000	6,000	5,100	5,100	7,800	7,600	7,600
100,000	5,800	5,000	4,900	7,500	7,300	7,300
95,000	5,800	4,900	4,900	7,400	7,200	7,100
90,000	5,800	4,900	4,800	7,200	7,000	7,000

BASIS: Zero wind • Standard approach procedure • Two Engines at Full Reverse Thrust • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes 15% safety margin and standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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	-500	-500	-1,000	-1,000	-1,000
2,000	0	0	0	0	0	0
4,000	500	500	500	1,000	1,000	1,000
6,000	1,100	1,000	1,000	2,000	2,000	2,000
8,000	1,600	1,500	1,500	3,000	3,000	3,000

CORRECTIONS	MEDIUM (3)			POOR (1)		
PER 5 ADD'L APP SPD	500	400	400	550	550	550
PER 1 KT TAILWIND	150	150	150	400	400	400
PER 10°C ABOVE ISA	250	200	200	450	450	450
PER 1% DOWN SLOPE	350	400	350	2,950	2,950	2,900
1 REV INOP	0	100	100	700	700	700
2 REV INOP or NO REV USED	0	200	200	1,400	1,400	1,400
Autoland	1,300			1,500		

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES FEET

FLAPS 3

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	DRY (6)			GOOD (5)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	9,700	6,900	6,100	9,700	7,300	7,300
150,000	9,400	6,700	6,000	9,400	7,100	7,100
145,000	9,200	6,600	5,800	9,200	6,900	6,900
140,000	8,900	6,400	5,700	8,900	6,700	6,700
135,000	8,600	6,200	5,500	8,600	6,500	6,500
134,481	7,900	5,600	4,200	7,900	5,600	5,500
130,000	7,700	6,400	4,100	7,700	5,500	5,300
125,000	7,500	5,300	4,000	7,500	5,300	5,100
120,000	7,200	5,100	3,900	7,200	5,200	4,900
115,000	7,000	5,000	3,800	7,000	5,000	4,700
110,000	6,700	4,800	3,700	6,700	4,800	4,600
105,000	6,500	4,600	3,600	6,500	4,700	4,400
100,000	6,300	4,500	3,500	6,300	4,500	4,200
95,000	6,000	4,300	3,300	6,000	4,300	4,000
90,000	5,800	4,200	3,300	5,800	4,200	3,900

BASIS: Zero wind • Standard approach procedure • Two Engines at Full Reverse Thrust • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes 15% safety margin and standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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

CORRECTIONS	DRY (6)			GOOD (5)		
PER 5 ADD'L APP SPD	550	350	250	550	450	450
PER 1 KT TAILWIND	150	100	100	150	150	150
PER 10°C ABOVE ISA	250	150	150	250	250	250
PER 1% DOWN SLOPE	100	50	50	100	200	200
1 REV INOP	0	0	0	0	0	0
2 REV INOP or NO REV USED	0	0	0	0	0	0
Autoland	900			1,100		

Note: Do not operate when Braking Action is Nil.

OPERATIONAL LANDING DISTANCES FEET

FLAPS 3

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	MEDIUM (3)			POOR (1)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	9,800	8,700	8,700	13,000	12,900	12,900
150,000	9,600	8,500	8,500	12,600	12,500	12,500
145,000	9,300	8,300	8,300	12,200	12,200	12,200
140,000	9,000	8,000	8,000	11,900	11,800	11,800
135,000	8,800	7,800	7,800	11,500	11,400	11,400
134,481	8,000	6,800	6,800	10,700	10,600	10,600
130,000	7,800	6,600	6,600	10,400	10,200	10,200
125,000	7,600	6,400	6,400	10,000	9,900	9,900
120,000	7,300	6,200	6,200	9,700	9,500	9,500
115,000	7,100	6,000	6,000	9,300	9,200	9,200
110,000	6,900	5,800	5,800	9,000	8,800	8,800
105,000	6,600	5,600	5,500	8,600	8,500	8,500
100,000	6,400	5,400	5,300	8,300	8,100	8,100
95,000	6,100	5,200	5,100	7,900	7,800	7,800
90,000	5,900	5,000	5,000	7,600	7,500	7,500

BASIS: Zero wind • Standard approach procedure • Two Engines at Full Reverse Thrust • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes 15% safety margin and standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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	-600	-600	-600	-1,200	-1,200	-1,200
2,000	0	0	0	0	0	0
4,000	600	600	600	1,200	1,200	1,200
6,000	1,200	1,100	1,100	2,300	2,300	2,300
8,000	1,700	1,700	1,700	3,500	3,500	3,500

CORRECTIONS	MEDIUM (3)			POOR (1)		
PER 5 ADD'L APP SPD	550	450	400	650	650	650
PER 1 KT TAILWIND	200	150	150	450	450	450
PER 10°C ABOVE ISA	250	250	250	500	500	500
PER 1% DOWN SLOPE	400	450	450	3,600	3,600	3,600
1 REV INOP	0	100	100	1,000	1,000	900
2 REV INOP or NO REV USED	100	300	200	2,000	1,900	1,800
Autoland	1,200			1,500		

Note: Do not operate when Braking Action is Nil.

STALL SPEEDS**KCAS****Landing Gear UP**

Aircraft Weight (lb)	Configuration					
	CONF 0	CONF 1	CONF 1+F	CONF 2	CONF 3	CONF FULL
154,000	163	134	122	117	115	110
150,000	161	132	120	116	113	108
145,000	158	130	118	114	111	106
140,000	155	128	116	112	109	104
135,000	153	125	114	110	107	103
130,000	150	123	112	108	105	101
125,000	148	121	110	106	104	99
120,000	145	119	108	104	102	97
115,000	142	117	106	102	100	96
110,000	139	114	104	100	98	94
105,000	136	111	102	97	95	91
100,000	133	109	99	95	93	89
95,000	129	106	97	93	91	87
90,000	126	103	94	90	88	85

Landing Gear DOWN

Aircraft Weight (lb)	Configuration					
	CONF 0	CONF 1	CONF 1+F	CONF 2	CONF 3	CONF FULL
154,000	165	135	123	118	117	110
150,000	163	133	122	116	115	108
145,000	160	131	119	114	113	107
140,000	158	129	117	112	111	105
135,000	155	127	115	111	109	103
130,000	152	125	113	109	108	101
125,000	149	122	111	107	106	100
120,000	147	120	109	105	104	98
115,000	144	118	107	103	102	96
110,000	141	115	105	101	100	94
105,000	138	113	102	98	97	92
100,000	134	110	100	96	95	89
95,000	131	107	97	93	93	87
90,000	127	104	95	91	90	85

APPROACH AND LANDING SPEEDS

KIAS

FLAPS 3 - Approach
FLAPS FULL - Landing

Aircraft Weight	V_{LS}	F	S	O
154,300	136	152	199	225
150,000	134	150	197	221
145,000	132	148	193	217
140,000	130	146	190	212
135,000	127	144	187	207
130,000	125	141	183	203
125,000	122	138	181	198
120,000	120	136	177	194
115,000	117	132	172	189
110,000	115	130	169	185
105,000	112	127	165	180
100,000	110	124	161	176
95,000	107	121	157	171
90,000	107	118	154	167

F.A.R. DRY LANDING FIELD LENGTH

FEET

CFM56-5A5

FLAPS FULL

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE – FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
154,300	4,820	4,970	5,130	5,280	5,450	5,610	5,780	5,950	6,130	6,310	6,490
150,000	4,620	4,750	4,890	5,050	5,210	5,360	5,530	5,700	5,870	6,040	6,220
145,000	4,490	4,580	4,680	4,800	4,930	5,080	5,250	5,400	5,570	5,740	5,920
140,000	4,370	4,460	4,560	4,650	4,750	4,860	4,980	5,120	5,280	5,440	5,600
135,000	4,270	4,360	4,460	4,550	4,640	4,740	4,840	4,950	5,070	5,200	5,340
130,000	4,180	4,270	4,360	4,450	4,540	4,630	4,730	4,840	4,950	5,060	5,180
125,000	4,100	4,180	4,270	4,360	4,450	4,540	4,630	4,730	4,830	4,940	5,060
120,000	4,020	4,090	4,180	4,270	4,360	4,440	4,530	4,630	4,720	4,830	4,930
115,000	3,930	4,000	4,080	4,170	4,250	4,340	4,430	4,520	4,610	4,710	4,810
110,000	3,830	3,900	3,970	4,050	4,130	4,220	4,310	4,390	4,480	4,580	4,670
105,000	3,730	3,790	3,860	3,930	4,010	4,090	4,180	4,270	4,360	4,440	4,530
100,000	3,650	3,710	3,780	3,850	3,920	3,990	4,080	4,160	4,240	4,320	4,410
95,000	3,650	3,730	3,790	3,860	3,930	4,010	4,090	4,160	4,240	4,320	4,400
90,000	3,670	3,740	3,810	3,880	3,940	4,010	4,080	4,160	4,240	4,320	4,400

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 VLS.
- Based on Maximum Manual Braking, Ground Spoilers, anti-skid and No Reverse Thrust.

CONDITION	CORRECTION
Headwind	- 16 ft. per knot
Tailwind	+ 97 ft. per knot
Wet runway and/or Low Minima	increase distance by 15%

F.A.R. DRY LANDING FIELD LENGTH

FEET

CFM56-5A5

FLAPS 3

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE – FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
154,300	5,560	5,730	5,890	6,060	6,230	6,410	6,590	6,770	6,960	7,150	7,360
150,000	5,320	5,480	5,640	5,800	5,970	6,140	6,310	6,490	6,680	6,870	7,050
145,000	5,030	5,180	5,350	5,510	5,660	5,830	6,000	6,180	6,350	6,530	6,720
140,000	4,810	4,930	5,060	5,210	5,370	5,530	5,680	5,850	6,030	6,210	6,380
135,000	4,670	4,770	4,880	4,990	5,120	5,260	5,410	5,560	5,720	5,880	6,060
130,000	4,550	4,660	4,760	4,860	4,960	5,080	5,200	5,330	5,460	5,620	5,770
125,000	4,440	4,540	4,640	4,740	4,840	4,940	5,060	5,170	5,300	5,430	5,560
120,000	4,340	4,430	4,520	4,620	4,720	4,820	4,920	5,040	5,150	5,280	5,400
115,000	4,240	4,320	4,410	4,500	4,600	4,690	4,790	4,890	5,000	5,120	5,240
110,000	4,120	4,200	4,290	4,370	4,460	4,560	4,650	4,750	4,850	4,950	5,070
105,000	4,000	4,080	4,170	4,250	4,330	4,420	4,510	4,610	4,700	4,800	4,910
100,000	3,890	3,960	4,030	4,120	4,200	4,280	4,370	4,460	4,560	4,650	4,750
95,000	3,780	3,850	3,920	3,990	4,060	4,150	4,240	4,320	4,410	4,510	4,600
90,000	3,670	3,740	3,800	3,870	3,940	4,010	4,090	4,180	4,270	4,350	4,450

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 VLS.
- Based on Maximum Manual Braking, Ground Spoilers, anti-skid and No Reverse Thrust.

CONDITION	CORRECTION
Headwind	- 16 ft. per knot
Tailwind	+ 99 ft. per knot
Wet runway and/or Low Minima	increase distance by 15%

APPROACH AND LANDING CLIMB LIMITS

POUNDS

CFM56-5A5

APPROACH FLAPS 3
LANDING FLAPS FULL

OAT °C	AIRPORT PRESSURE ALTITUDE – FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
50	141,100	138,200	135,600								
45	148,100	144,700	141,400	137,200	133,200	129,200					
40	154,700	150,800	147,100	142,400	138,200	134,100	130,000	126,200			
35	158,500	156,700	152,700	147,700	143,500	139,200	135,200	130,900	125,500	120,700	115,900
32	158,600	156,800	155,000	150,900	146,600	142,300	138,200	133,700	128,200	123,400	118,500
30	158,700	156,900	155,100	151,900	148,700	144,300	140,300	135,600	130,000	125,100	120,300
28	158,800	156,900	155,200	152,000	149,700	146,400	142,200	137,400	131,800	126,900	122,000
26	158,900	157,000	155,300	152,000	149,800	147,300	144,200	139,100	133,600	128,600	123,600
24	159,000	157,100	155,300	152,100	149,800	147,400	145,100	140,800	135,200	130,200	125,300
22	159,100	157,200	155,400	152,200	149,900	147,500	145,200	141,600	136,800	131,800	126,900
20	159,200	157,300	155,500	152,300	150,000	147,500	145,300	141,700	137,500	133,400	128,400
18	159,300	157,400	155,600	152,400	150,000	147,600	145,300	141,700	137,600	134,100	130,000
16	159,400	157,500	155,700	152,400	150,100	147,700	145,400	141,800	137,600	134,200	130,600
14	159,500	157,600	155,800	152,500	150,200	147,700	145,500	141,800	137,700	134,200	130,700
12	159,600	157,700	155,800	152,600	150,300	147,800	145,500	141,900	137,800	134,300	130,700
10	159,700	157,800	155,900	152,700	150,300	147,900	145,600	142,000	137,800	134,300	130,800
8	159,800	157,900	156,000	152,700	150,400	147,900	145,600	142,000	137,900	134,400	130,800
6	159,900	157,900	156,100	152,800	150,500	148,000	145,700	142,100	137,900	134,400	130,900
4	159,900	158,000	156,200	152,900	150,500	148,000	145,700	142,100	138,000	134,500	130,900
2	160,000	158,100	156,200	153,000	150,600	148,100	145,800	142,200	138,000	134,500	131,000
0 & below	160,100	158,100	156,300	153,000	150,600	148,200	145,900	142,200	138,000	134,600	131,000

NOTES:

- AFM Maximum Structural Landing Weight should not be exceeded (unless overweight landing is deemed necessary in flight).
- Limit weights are for packs on.
- Reduce Limit Weight by 26,000 pounds when operating in icing conditions during any part of the flight and the forecast landing temperature is below 10°C.

Bleed Adjustments

Eng A/I on	-550
Eng & Wing A/I on	-7,500

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 LIMITS

POUNDS

CFM56-5A5
**APPROACH FLAPS 2
LANDING FLAPS 3**

OAT °C	AIRPORT PRESSURE ALTITUDE – FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
50	145,700	142,800	139,900								
45	153,000	149,500	146,100	141,700	137,600	133,500					
40	159,800	155,900	152,000	147,100	142,700	138,400	134,300	130,400			
35	163,800	161,900	157,800	152,600	148,300	143,900	139,600	135,200	129,600	124,600	119,700
32	163,900	162,000	160,200	155,900	151,500	147,100	142,800	138,100	132,500	127,400	122,400
30	164,000	162,100	160,300	157,000	153,600	149,200	145,000	140,000	134,300	129,200	124,200
28	164,100	162,200	160,400	157,100	154,700	151,300	147,000	141,900	136,200	131,000	125,900
26	164,200	162,300	160,400	157,100	154,800	152,300	149,100	143,800	137,900	132,800	127,700
24	164,300	162,400	160,500	157,200	154,800	152,300	150,000	145,600	139,600	134,500	129,400
22	164,400	162,500	160,600	157,300	154,900	152,400	150,100	146,400	141,400	136,200	131,000
20	164,500	162,600	160,700	157,400	155,000	152,500	150,100	146,400	142,100	137,800	132,600
18	164,500	162,600	160,800	157,400	155,100	152,500	150,200	146,500	142,200	138,500	134,300
16	164,600	162,700	160,900	157,500	155,100	152,600	150,300	146,600	142,200	138,600	135,000
14	164,700	162,800	161,000	157,600	155,200	152,700	150,300	146,600	142,300	138,600	135,000
12	164,700	162,900	161,000	157,700	155,300	152,700	150,400	146,700	142,400	138,700	135,100
10	164,800	163,000	161,100	157,800	155,400	152,800	150,500	146,700	142,400	138,700	135,100
8	164,900	163,100	161,200	157,800	155,400	152,900	150,500	146,800	142,500	138,800	135,200
6	165,000	163,200	161,300	157,900	155,500	152,900	150,600	146,900	142,500	138,800	135,200
4	165,000	163,300	161,400	158,000	155,600	153,000	150,700	146,900	142,600	138,900	135,200
2	165,100	163,400	161,400	158,100	155,600	153,100	150,700	147,000	142,600	138,900	135,300
0 & below	165,100	163,400	161,500	158,100	155,700	153,100	150,800	147,000	142,700	139,000	135,300

NOTES:

- AFM Maximum Structural Landing Weight should not be exceeded (unless overweight landing is deemed necessary in flight).
- Limit weights are for packs on.
- Reduce Limit Weight by 27,300 pounds when operating in icing conditions during any part of the flight and the forecast landing temperature is below 10 degrees C.

Bleed Adjustments

Eng A/I on	-500
Eng & Wing A/I on	-7,800

BASIS:

The limit weights shown are the more restrictive of:

- | | |
|---|--|
| APPROACH | LANDING |
| <ul style="list-style-type: none"> • One Engine Inoperative • Flaps at approach setting. • Landing gear retracted. | <ul style="list-style-type: none"> • All Engines Operating • Flaps at landing setting. • Landing gear extended. |

End of Section

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DEFINITIONS AND ASSUMPTIONS

GROSS LEVEL OFF ALTITUDE	Altitude at which the aircraft is expected to level off after the loss of one engine. No conservatism is built into this value. For use during flight, not for flight planning.
LONG RANGE CRUISE	The speed of the aircraft that will result in 99% of the maximum range of the aircraft in no wind conditions for a given weight and altitude.
MAXIMUM CONTINUOUS THRUST (MCT)	The maximum thrust level for which the engine is rated with no time constraint.
SPECIFIC AIR RANGE (SAR)	The gas mileage range an aircraft can fly per 1,000 lbs of fuel for a given weight, altitude, Mach number, and temperature. The SAR changes as the weight of the aircraft changes, all other parameters remaining constant. Fuel burn required for a given flight segment is the segment length divided by the average SAR for the leg.
STATIC AIR TEMPERATURE (SAT)	The static air temperature outside of the aircraft. Also referred to as the Outside Air Temperature or OAT.
TOTAL AIR TEMPERATURE (TAT)	The sum of both the ambient air temperature plus the total increase in temperature due to compression heating.

MEL RELATED PERFORMANCE ABBREVIATIONS DISPLAYED ON WDR

2SP	AWABS has automatically corrected the allowable weights and V1 speeds due to two pairs of ground spoilers (four spoilers) being inoperative.
ASP	AWABS has automatically corrected the allowable weights and V1 speeds due to the Ground Spoiler Control System being inoperative (all spoilers inoperative).
BKI	AWABS has automatically corrected the allowable weights and V1 speeds due to one inoperative brake.
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.
TRI	AWABS has automatically corrected the allowable weights and V1 speeds due to one thrust reverser inoperative.

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THRUST SETTINGS – ALL ENGINE

TAKE OFF %N1

NORMAL BLEED - PACKS ON / ANTI-ICE OFF

CFM56-5A5

OAT	PRESSURE ALTITUDE - FEET											
	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000		
54	90.7	91.3	91.9	OUTSIDE ENVIRONMENTAL ENVELOPE								
50	91.3	92.0	92.6								92.9	94.4
46	92.0	92.6	93.2								93.4	94.8
42	92.6	93.2	93.8	94.0	95.3	94.4	94.7	95.0	95.3	95.7		
38	92.3	93.5	94.5	94.6	95.4	94.8	95.2	95.4	95.7			
34	91.8	93.0	94.2	94.8	94.8	95.3	95.6	95.9	96.2			
30	91.2	92.4	93.6	94.2	94.2	95.4	96.0	96.2	96.6	96.7		
26	90.6	91.8	93.0	93.6	93.6	94.8	95.6	96.4	97.0	97.0		
22	90.0	91.2	92.4	93.0	93.0	94.2	95.0	95.7	96.6	97.1		
18	89.5	90.7	91.8	92.4	92.4	93.6	94.4	95.1	96.0	96.5		
14	88.9	90.1	91.2	91.8	91.7	93.0	93.8	94.5	95.3	95.8		
10	88.3	89.5	90.6	91.2	91.1	92.4	93.1	93.9	94.7	95.2		
6	87.7	88.9	90.0	90.6	90.5	91.7	92.5	93.3	94.1	94.6		
2	87.1	88.3	89.4	90.0	89.9	91.1	91.9	92.6	93.4	93.9		
-2	86.5	87.6	88.8	89.4	89.2	90.5	91.2	92.0	92.8	93.3		
-6	85.9	87.0	88.2	88.8	88.6	89.9	90.6	91.3	92.1	92.6		
-10	85.3	86.4	87.5	88.1	87.9	89.2	90.0	90.7	91.5	92.0		
-14	84.7	85.8	86.9	87.5	87.3	88.6	89.3	90.0	90.8	91.3		
-18	84.0	85.2	86.3	86.8	86.6	87.9	88.7	89.4	90.1	90.6		
-22	83.4	84.5	85.6	86.2	85.9	87.3	88.0	88.7	89.5	89.9		
-26	82.8	83.9	85.0	85.5	85.3	86.6	87.3	88.0	88.8	89.3		
-30	82.1	83.2	84.3	84.9	84.6	85.9	86.7	87.3	88.1	88.6		
-34	81.5	82.6	83.6	84.2	83.9	85.3	86.0	86.7	87.4	87.9		
-38	80.8	81.9	83.0	83.6	83.2	84.6	85.3	86.0	86.7	87.2		
-42	80.2	81.3	82.3	82.9	82.5	83.9	84.6	85.3	86.0	86.5		
-46	79.5	80.6	81.6	82.2	81.8	83.2	83.9	84.6	85.3	85.8		
-50	78.9	79.9	80.9	81.5	81.5	82.5	83.2	83.9	84.6	85.1		
-54	78.2	79.2	80.3	80.8	81.5	81.8	82.5	83.2	83.9	84.3		

Engine Bleed Adjustment

Packs Off	0.7
Eng A/I ON (OAT < ISA+10)	0.0
Eng A/I ON (OAT ≥ ISA+10)	-1.2
Eng & Wing A/I ON (OAT < ISA+10)	0.0
Eng & Wing A/I ON (OAT ≥ ISA+10)	-1.8

OAT ≥ to ISA + 10

THRUST SETTINGS – ALL ENGINE

CLIMB %N1

CFM56-5A5

Based on 250/300/.78

NORMAL BLEED - PACKS ON / ANTI-ICE OFF

TAT °C	PRESSURE ALTITUDE - FEET														
	-1,000	3,000	7,000	11,000	15,000	19,000	23,000	27,000	31,000	35,000	39,000				
54	88.4	89.9	OUTSIDE ENVIRONMENTAL ENVELOPE												
50	89.0	90.5											90.7	91.5	
46	89.7	91.1											91.3	92.0	92.1
42	90.3	91.6											91.8	92.4	92.5
38	90.9	92.2	92.3	92.8	93.0	92.9									
34	91.2	92.7	92.7	93.3	93.4	93.4	93.5								
30	90.6	93.1	93.1	93.6	93.8	93.7	93.8	93.9							
26	90.1	93.0	93.6	94.0	94.1	94.1	94.2	94.2	94.1						
22	89.5	92.4	94.0	94.3	94.5	94.4	94.5	94.6	94.5						
18	88.9	91.8	93.5	94.2	94.8	94.7	94.8	95.0	94.9						
14	88.3	91.2	92.9	93.6	95.0	95.0	95.2	95.3	95.0	94.6	94.0				
10	87.8	90.6	92.3	93.0	94.4	95.3	95.5	95.2	95.1	94.7	94.2				
6	87.2	90.0	91.7	92.4	93.8	95.0	95.5	95.2	95.1	94.7	94.2				
2	86.6	89.4	91.0	91.7	93.2	94.3	95.2	95.2	95.2	94.8	94.2				
-2	86.0	88.8	90.4	91.1	92.5	93.7	94.6	95.4	95.4	95.1	94.5				
-6	85.4	88.2	89.8	90.5	91.0	93.0	93.9	94.7	95.5	95.2	94.7				
-10	84.8	87.6	89.1	89.8	91.2	92.4	93.2	94.0	95.2	95.4	94.9				
-14	84.2	86.9	88.5	89.2	90.6	91.7	92.6	93.3	94.5	95.5	95.0				
-18	83.6	86.9	87.9	88.5	89.9	91.0	91.9	92.7	93.8	95.3	95.2				
-22	82.9	86.3	87.2	87.9	89.2	90.4	91.2	92.0	93.1	94.6	94.7				
-26	82.3	85.7	86.6	87.2	88.6	89.7	90.5	91.3	92.4	93.9	94.0				
-30	81.7	84.4	85.9	86.6	87.9	89.0	89.8	90.6	91.7	93.2	93.2				
-34	81.1	83.7	85.2	85.9	87.2	88.3	89.1	89.9	91.0	92.5	92.5				
-38	80.4	83.0	84.6	85.2	86.5	87.6	88.4	89.2	90.3	91.7	91.8				
-42	79.8	82.4	83.9	84.5	85.8	86.9	87.7	88.5	89.5	91.0	91.0				
-46	79.1	81.7	83.2	83.8	85.1	86.2	87.0	87.7	88.8	90.3	90.3				
-50	78.5	81.0	82.5	83.1	84.4	85.5	86.3	87.0	88.1	89.5	89.5				
-54	77.8	80.3	81.8	82.4	83.7	84.8	85.5	86.3	87.3	88.7	88.8				

Engine Bleed Adjustment

Packs Off	0.8
Eng A/I ON (OAT < ISA+10)	0.0
Eng A/I ON (OAT ≥ ISA+10)	-0.7
Eng & Wing A/I ON (OAT < ISA+10)	0.0
Eng & Wing A/I ON (OAT ≥ ISA+10)	-1.1

 OAT ≥ to ISA + 10

THRUST SETTINGS – ALL ENGINE

CRUISE %N1

Based on 250/300/.78

NORMAL BLEED - PACKS ON / ANTI-ICE OFF

CFM56-5A5

TAT	PRESSURE ALTITUDE - FEET												
°C	3,000	7,000	11,000	15,000	19,000	23,000	27,000	31,000	35,000	39,000			
54	87.5	OUTSIDE ENVIRONMENTAL ENVELOPE											
50	88.1										88.3	89.1	
46	88.7										88.9	89.6	89.7
42	89.2										89.4	90.0	90.1
38	89.8										89.9	90.4	90.6
34	90.3	90.3	90.9	91.0	91.0	91.1							
30	90.7	90.7	91.2	91.4	91.3	91.4	91.5						
26	90.6	91.2	91.6	91.7	91.7	91.8	91.8	91.7					
22	90.0	91.6	91.9	92.1	92.0	92.1	92.2	92.1					
18	89.4	91.1	91.0	92.4	92.3	92.4	92.6	92.5					
14	88.8	90.5	91.2	92.6	92.6	92.8	92.9	92.6	92.2	91.6			
10	88.2	89.9	90.6	92.0	92.9	93.1	92.8	92.7	92.3	91.8			
6	87.6	89.3	90.0	91.4	92.6	93.1	92.8	92.7	92.3	91.8			
2	87.0	88.6	89.3	90.8	91.9	92.8	92.8	92.8	92.4	91.8			
-2	86.4	88.0	88.7	90.1	91.3	92.2	93.0	93.0	92.7	92.1			
-6	85.8	87.4	88.1	89.5	90.6	91.5	92.3	93.1	92.8	92.3			
-10	85.2	86.7	87.4	88.8	90.0	90.8	91.6	92.8	93.0	92.5			
-14	84.5	86.1	86.8	88.2	89.3	90.2	90.9	92.1	93.1	92.6			
-18	83.9	85.5	86.1	87.5	88.6	89.5	90.3	91.4	92.9	92.8			
-22	83.3	84.8	85.5	86.8	88.0	88.8	89.6	90.7	92.2	92.3			
-26	82.6	84.2	84.8	86.2	87.3	88.1	88.9	90.0	91.5	91.6			
-30	82.0	83.5	84.2	85.5	86.6	87.4	88.2	89.3	90.8	90.8			
-34	81.3	82.8	83.5	84.8	85.9	86.7	87.5	88.6	90.1	90.1			
-38	80.6	82.2	82.8	84.1	85.2	86.0	86.8	87.9	89.3	89.4			
-42	80.0	81.5	82.1	83.4	84.5	85.3	86.1	87.1	88.6	88.6			
-46	79.3	80.8	81.4	82.7	83.8	84.6	85.3	86.4	87.9	87.9			
-50	78.6	80.1	80.7	82.0	83.1	83.9	84.6	85.7	87.1	87.1			
-54	77.9	79.4	80.0	81.3	82.4	83.1	83.9	84.9	86.3	86.4			

Engine Bleed Adjustment

Packs Off	0.800
Eng A/I ON (OAT < ISA+10)	0.000
Eng A/I ON (OAT ≥ ISA+10)	-0.700
Eng & Wing A/I ON (OAT < ISA+10)	0.000
Eng & Wing A/I ON (OAT ≥ ISA+10)	-1.100

 OAT ≥ to ISA + 10

THRUST SETTINGS – ALL ENGINE

GO AROUND %N1

CFM56-5A5

Based on Mach 0.225

NORMAL BLEED - PACKS ON / ANTI-ICE OFF

TAT °C	PRESSURE ALTITUDE - FEET									
	-2,000	-1,000	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000
54	92.9	93.5	94.1	94.7	95.3	OUTSIDE ENVIRONMENTAL ENVELOPE				
50	93.5	94.2	94.8	95.3	95.8					
46	94.2	94.8	95.4	95.9	96.3					
42	94.1	95.4	96.0	96.4	96.8	97.0	97.3	97.6	97.9	98.1
38	93.6	94.8	96.0	96.9	97.3	97.4	97.7	98.0	98.3	98.5
34	93.0	94.2	95.4	96.3	97.2	97.8	98.1	98.4	98.7	98.9
30	92.4	93.7	94.8	95.7	96.6	97.2	98.0	98.8	99.1	99.2
26	91.9	93.1	94.2	95.2	96.0	96.6	97.4	98.2	99.0	99.5
22	91.3	92.5	93.6	94.6	95.4	96.0	96.8	97.5	98.4	98.9
18	90.7	91.9	93.0	93.9	94.8	95.4	96.2	96.9	97.7	98.2
14	90.1	91.3	92.4	93.3	94.2	94.8	95.5	96.3	97.1	97.6
10	89.5	90.7	91.8	92.7	93.6	94.1	94.9	95.7	96.5	97.0
6	88.9	90.1	91.2	92.1	93.0	93.5	94.3	95.0	95.8	96.3
2	88.3	89.5	90.6	91.5	92.3	92.9	93.6	94.4	95.2	95.7
-2	87.7	88.9	90.0	90.9	91.7	92.3	93.0	93.7	94.5	95.0
-6	87.1	88.2	89.4	90.2	91.1	91.6	92.4	93.1	93.9	94.3
-10	86.5	87.6	88.7	89.6	90.4	91.0	91.7	92.4	93.2	93.7
-14	85.9	87.0	88.1	88.9	89.8	90.3	91.0	91.8	92.5	90.0
-18	85.2	86.4	87.5	88.3	89.1	89.7	90.4	91.1	91.9	92.3
-22	84.6	85.7	86.8	87.6	88.5	89.0	89.7	90.4	91.2	91.6
-26	84.0	85.1	86.2	87.0	87.8	88.3	89.0	89.7	90.5	91.0
-30	83.3	84.4	85.5	86.3	87.1	87.6	88.4	89.0	89.8	90.3
-34	82.7	83.8	84.8	85.6	86.4	87.0	87.7	88.4	89.1	89.6
-38	82.0	83.1	84.2	85.0	85.8	86.3	87.0	87.7	88.4	88.9
-42	81.4	82.4	83.5	84.3	85.1	85.6	86.3	87.0	87.7	88.1
-46	803.7	81.8	82.8	83.6	84.4	84.9	85.6	86.2	87.0	87.4
-50	80.0	81.1	82.1	82.9	83.7	84.2	84.9	85.5	86.3	86.7
-54	79.4	80.4	81.4	82.2	83.0	83.5	84.1	84.8	85.5	86.0

Engine Bleed Adjustment

Packs Off	0.6
Eng A/I ON (OAT < ISA+10)	0.0
Eng A/I ON (OAT ≥ ISA+10)	-1.2
Eng & Wing A/I ON (OAT < ISA+10)	0.0
Eng & Wing A/I ON (OAT ≥ ISA+10)	-1.8

 OAT ≥ to ISA + 10

ONE ENGINE INOPERATIVE

CONTINUOUS %N1

Based on 230 KIAS

NORMAL BLEED – ONE PACK ON / ANTI-ICE OFF

CFM56-5A5

TAT	PRESSURE ALTITUDE - FEET												
°C	-1,000	3,000	7,000	11,000	15,000	19,000	23,000	27,000	31,000	35,000	39,000		
54	88.5	90.0	OUTSIDE ENVIRONMENTAL ENVELOPE										
50	89.2	90.6										91.7	
46	89.9	91.2										92.2	
42	90.5	91.8										92.7	93.4
38	91.1	92.3	93.1	93.8									
34	91.7	92.8	93.5	94.2								94.6	
30	91.2	93.3	94.0	94.6								95.0	92.9
26	90.6	93.6	94.4	94.9								95.3	93.3
22	90.0	93.0	94.9	95.3	95.7	93.7	93.6						
18	89.4	92.4	94.8	95.7	96.0	94.1	94.0					93.8	
14	88.9	90.8	94.2	96.0	96.3	94.4	94.3					94.1	94.0
10	88.3	91.2	93.6	95.6	96.6	94.7	94.6					94.5	94.3
6	87.7	90.6	92.9	95.0	96.7	95.1	94.9	94.8	94.7	94.5	94.0		
2	87.1	90.0	92.3	94.3	96.1	95.4	95.3	95.1	94.9	94.5	93.9		
-2	86.5	89.3	91.7	93.7	95.4	95.2	95.5	95.2	95.0	94.4	94.0		
-6	85.9	88.7	91.0	93.0	94.7	94.5	95.7	95.3	95.1	94.6	94.3		
-10	85.3	88.1	90.4	92.4	94.1	93.8	95.0	95.5	95.3	94.9	94.5		
-14	84.7	87.5	89.7	91.7	93.4	93.2	94.3	95.3	95.4	95.0	94.7		
-18	84.1	86.8	89.1	91.0	92.7	92.5	93.6	94.6	95.4	95.2	94.8		
-22	83.4	86.2	88.4	90.3	92.0	91.8	93.0	93.9	94.7	95.3	94.8		
-26	82.8	85.5	87.8	89.7	91.3	91.1	92.3	93.2	94.0	94.7	94.0		
-30	82.2	84.9	87.1	89.0	90.6	90.4	91.5	92.5	93.3	94.0	93.3		
-34	81.5	84.2	86.4	88.3	89.9	89.7	90.8	91.8	92.6	93.3	92.6		
-38	80.9	83.6	85.7	87.6	89.2	89.0	90.1	91.0	91.9	92.5	91.9		
-42	80.2	82.9	85.0	86.9	88.5	88.3	89.4	90.3	91.1	91.8	91.1		
-46	79.6	82.2	84.3	86.2	87.8	87.6	88.7	89.6	90.4	91.0	90.4		
-50	78.9	81.5	83.6	85.5	87.1	86.8	87.9	88.8	89.6	90.3	89.6		
-54	79.1	80.8	82.9	84.7	86.3	86.1	87.2	88.1	88.9	89.5	88.9		

Engine Bleed Adjustment

Packs Off	0.8
Eng A/I ON (OAT < ISA+10)	0.0
Eng A/I ON (OAT ≥ ISA+10)	-0.9
Eng & Wing A/I ON (OAT < ISA+10)	0.0
Eng & Wing A/I ON (OAT ≥ ISA+10)	-2.1

OAT ≥ to ISA + 10

ONE ENGINE INOPERATIVE

LONG RANGE CRUISE ALTITUDE CAPABILITY

GROSS WEIGHT - POUNDS	PRESSURE ALTITUDE - FEET		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
155,000	17,300	16,400	14,500
150,000	17,900	17,000	16,200
145,000	19,100	17,700	16,700
140,000	20,300	18,500	17,300
135,000	21,500	20,100	17,800
130,000	22,700	21,500	19,600
125,000	23,900	22,800	21,100
120,000	25,100	24,000	22,500
115,000	26,300	25,200	24,000
110,000	27,600	26,400	25,400
105,000	28,900	27,800	26,800
100,000	30,200	29,200	28,200

BASIS:

- Max continuous thrust
- One Engine Inoperative

Engine Bleed Adjustment (lb.)

Eng A/I ON	-2,500
Engine & Wing A/I ON	-4,500

ONE ENGINE INOPERATIVE DRIFTDOWN GROSS LEVEL OFF ALTITUDE

ENGINE ANTI-ICE OFF

GROSS WEIGHT – POUNDS		APPROX GROSS LEVEL OFF ALTITUDE – FEET		
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA + 10°C & COLDER	ISA + 15°C	ISA + 20°C
150,000	144,500	21,700	20,900	19,800
140,000	135,000	23,600	22,900	21,900
130,000	125,500	25,500	24,900	24,100
120,000	116,100	27,500	26,900	26,200
110,000	106,700	29,600	29,100	28,500
100,000	97,400	31,800	31,300	30,900

ENGINE ANTI-ICE ON

GROSS WEIGHT – POUNDS		APPROX GROSS LEVEL OFF ALTITUDE – FEET		
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA + 10°C & COLDER	ISA + 15°C	ISA + 20°C
150,000	144,400	21,100	19,900	18,700
140,000	135,000	23,000	22,100	21,000
130,000	125,600	24,900	24,200	23,200
120,000	116,000	27,000	26,300	25,400
110,000	106,600	29,100	28,500	27,900
100,000	97,200	31,300	30,900	30,200

ENGINE & WING ANTI-ICE ON

GROSS WEIGHT – POUNDS		APPROX GROSS LEVEL OFF ALTITUDE – FEET		
AT ENGINE FAILURE	AT LEVEL OFF (APPROX)	ISA + 10°C & COLDER	ISA + 15°C	ISA + 20°C
150,000	144,100	19,600	18,300	17,300
140,000	134,700	21,600	20,500	19,200
130,000	125,300	23,700	22,700	21,600
120,000	115,900	25,800	24,900	23,900
110,000	106,500	28,000	27,300	26,300
100,000	97,100	30,300	29,600	28,800

BASED ON AN INITIAL ALTITUDE OF 35,000 FT.

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES FEET

BASIS:

- Sea level, standard day, no wind, no slope.
- MAX PEDAL braking.
- Approach Speed V_{APP} ($V_{LS} + 5$)
- No reverse thrust.
- Includes 7 second air run (approx. 850 to 1800 ft.)

FLAPS FULL

RWY COND.	LANDING WEIGHT – (1,000) POUNDS						
	90	100	110	120	130	140	150
DRY	2,320	2,320	2,430	2,540	2,640	2,740	2,960
GOOD	3,000	3,030	3,250	3,480	3,680	3,890	4,150
MEDIUM	3,960	4,030	4,330	4,630	4,900	5,220	5,600
POOR	7,540	7,700	8,160	8,620	9,020	9,450	9,950

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 ft	+4%	+4%	+4%	+4%
Wind	Per 5 kts. headwind	0%	0%	0%	0%
	Per 5 kts. tailwind	+10%	+12%	+13%	+18%
Two Reversers Operative		-3%	-7%	-9%	-21%

Procedure:

1. Determine Flaps Full stopping distance.
2. Determine total correction factor by summing all applicable correction percentages.
3. Apply total correction factor to the Flaps Full stopping distance to get the Corrected Landing Distance.
4. Determine Landing Distance Multiplier below.
5. Multiply the Corrected Landing Dist by the Landing Dist Multiplier to determine the landing distance required for the abnormal condition.

Abnormal Description	Multiply Full Flap Dist By:	Abnormal Description	Multiply Full Flap Dist By:
Flaps 3 Landing	1.20	Slats ≥ 1 but ≤ 3	1.15
Auto Flt FAC 1+2	1.35	Slats > 3	1.10
Elec Emer Config	2.35	Speed Brakes/Spoilers, one or two pair	1.10
Elec AC Bus 1 Fault	1.35	Speed Brakes/Spoilers, three or more pair	1.20
Elec DC Bus 1+2 Fault	1.75	Zero Flap/Zero Slat	1.80
Elec DC Bus 2 Fault	1.25	Fuel Leak	1.20
Elec DC Emer Config	2.40	Blue Hyd Pump	1.20
Elec DC ESS Bus Fault w/ Ice Accretion	1.40	Yellow Hyd Pump	1.30
Elec DC ESS Bus Fault w/o Ice Accretion	1.25	Blue + Yellow Hyd Pump	1.90
Avionics Smoke	1.20	Green Hyd Pump	1.35
Engine 1(2) Fail	1.20	Green + Blue Hyd Pump	2.05
F/Ctl Direct Law	1.20	Green + Yellow Hyd Pump	2.35
F/Ctl ELAC Fault	1.20	Wing Anti-Ice Fault with Ice Accretion	1.10
Flaps < 1	1.30	Anti-Skid Inop	1.30
Flaps ≥ 1 but < 2	1.20	Anti-Skid and Nose Wheel Steering	1.30
Flaps ≥ 2	1.15	Auto Brake Fault	1.30
Ground Spoiler, one or two pair	1.10	Brakes Release Fault	1.30
Ground Spoiler, three or more pair	1.30	ADR Fault(s)	1.35
SEC single failure	1.10	IR Fault (1&2 or 2&3)	1.20
SEC double failure	1.30	IR Fault (1&3)	1.95
SEC triple failure	1.50	Reverser Doors Unstowed (All), buffet persists	2.05
Slats < 1	1.35	Reverser Doors Unstowed (3 or less), buffet persists	1.40

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

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:

- One Brake Inoperative
- All Spoilers Inoperative
- Two Pairs of Spoilers 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:

- Standard day conditions
- No slope
- MAX PEDAL braking
- Includes 7 second air run from threshold to touchdown (850 to 1,800 feet of air distance depending on weight)
- 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
- No wind
- No thrust reverser credit
- Manual landing

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

AUTO FLT FAC 1 + 2 FAULT

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,130	3,120	3,280	3,430	3,560	3,700	3,990
GOOD	4,050	4,090	4,390	4,690	4,970	5,250	5,600
MEDIUM	5,340	5,440	5,840	6,250	6,610	7,050	7,560
POOR	10,170	10,390	11,010	11,640	12,180	12,750	13,430

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+210	+370	+530
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+79	+122	+173	+362
Reverse Thrust	Two Reversers Operative	-80	-290	-550	-2,800
Autoland	Automatic Landing	+220	+220	+220	+260

AUTO FLT YAW DAMPER SYS AVIONICS SMOKE

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	2,780	2,780	2,920	3,050	3,160	3,290	3,550
GOOD	3,600	3,640	3,900	4,170	4,420	4,670	4,980
MEDIUM	4,750	4,840	5,190	5,550	5,880	6,270	6,720
POOR	9,040	9,240	9,790	10,340	10,830	11,340	11,940

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+120	+180	+330	+470
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+70	+108	+154	+322
Reverse Thrust	Two Reversers Operative	-70	-260	-490	-2,490
Autoland	Automatic Landing	+220	+220	+220	+260

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

BRAKES ANTI SKID NWS FAULT (INCL. 1,000PSI BRAKING LIMIT) BRAKES ANTI SKID/NWS OFF (INCL. 1,000PSI BRAKING LIMIT)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	4,170	4,160	4,370	4,570	4,740	4,930	5,320
GOOD	4,170	4,160	4,370	4,570	4,780	5,060	5,390
MEDIUM	4,550	4,630	4,980	5,320	5,630	6,010	6,440
POOR	8,670	8,850	9,380	9,910	10,380	10,860	11,440

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+180	+200	+320	+450
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+105	+117	+148	+309
Reverse Thrust	Two Reversers Operative	-100	-280	-470	-2,390
Autoland	Automatic Landing	+320	+340	+340	+380

BRAKES AUTO BRK FAULT BRAKES RELEASE FAULT

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,240	3,240	3,400	3,560	3,690	3,840	4,140
GOOD	3,900	3,940	4,220	4,520	4,780	5,060	5,390
MEDIUM	4,940	5,040	5,410	5,790	6,120	6,530	7,000
POOR	9,420	9,620	10,200	10,770	11,280	11,810	12,440

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+200	+340	+490
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+82	+117	+160	+335
Reverse Thrust	Two Reversers Operative	-80	-280	-510	-2,600
Autoland	Automatic Landing	+320	+340	+340	+380

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

ELEC DC BUS 2 FAULT

ELEC AC BUS 1 FAULT

ELEC DC ESS BUS FAULT (WITHOUT ICE ACCRETION)

ELEC DC ESS BUS FAULT (WITH ICE ACCRETION)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,130	3,120	3,280	3,430	3,560	3,700	3,990
GOOD	4,200	4,240	4,550	4,860	5,150	5,450	5,810
MEDIUM	5,340	5,440	5,840	6,250	6,610	7,050	7,560
POOR	10,170	10,390	11,010	11,640	12,180	12,750	13,430

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+210	+370	+530
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+79	+126	+173	+362
Reverse Thrust	Per Reverser Operative	0	0	-100	-690
Autoland	Automatic Landing	+380	+410	+430	+500

ELEC DC BUS 1+2 FAULT (INCL. 1,000PSI BRAKING LIMIT)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	5,320	5,320	5,580	5,840	6,060	6,300	6,790
GOOD	5,550	5,600	6,010	6,420	6,810	7,200	7,670
MEDIUM	6,720	6,850	7,360	7,870	8,330	8,880	9,520
POOR	12,810	13,080	13,860	14,650	15,340	16,060	16,910

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+230	+280	+460	+670
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+134	+167	+218	+456
Reverse Thrust	Two Reversers Operative	0	0	0	0
Autoland	Automatic Landing	+380	+410	+430	+500

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

ELEC DC EMER CONF

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	6,940	6,940	7,280	7,620	7,900	8,220	8,860
GOOD	7,200	7,270	7,800	8,330	8,830	9,330	9,950
MEDIUM	8,500	8,660	9,300	9,950	10,530	11,220	12,040
POOR	16,200	16,550	17,530	18,530	19,390	20,310	21,390

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+300	+360	+590	+840
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+174	+216	+276	+577
Reverse Thrust	Two Reversers Operative	0	0	0	0
Autoland	Automatic Landing	+380	+410	+430	+500

ELEC EMER CONFIG (INCL. 1,000PSI BRAKING LIMIT)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	6,600	6,590	6,920	7,230	7,510	7,810	8,420
GOOD	7,050	7,120	7,630	8,160	8,640	9,140	9,750
MEDIUM	8,900	9,060	9,730	10,410	11,020	11,750	12,600
POOR	16,950	17,320	18,350	19,390	20,300	21,250	22,390

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+290	+360	+610	+880
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+166	+212	+288	+603
Reverse Thrust	Two Reversers Operative	0	0	0	0
Autoland	Automatic Landing	+380	+410	+430	+500

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

ENG 1 (2) EGT OVERLIMIT
ENG 1 (2) FADEC FAULT
ENG 1 (2) FAIL
ENG 1 (2) FIRE
ENG 1 (2) N1 OVERLIMIT
ENG 1 (2) N2 OVERLIMIT
ENG 1 (2) OIL HI TEMP
ENG 1 (2) OIL LO PR
ENGINE RELIGHT

FLAPS 3

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,680	3,780	3,880	3,980	4,080	4,180	4,880
GOOD	4,690	4,890	5,090	5,290	5,490	5,690	6,490
MEDIUM	6,080	6,280	6,480	6,680	6,880	7,080	7,780
POOR	9,740	10,240	10,740	11,240	11,740	12,240	13,540

CORRECTIONS		DRY	Good	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+280	+260	+510
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+80	+150	+150	+350
Reverse Thrust	Per Reverser Operative	-70	-200	-420	-1,540
Autoland	Automatic Landing	+170	+220	+220	+260

FLAPS FULL

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,270	3,370	3,470	3,570	3,670	3,770	4,370
GOOD	3,920	4,120	4,320	4,520	4,720	4,920	5,620
MEDIUM	5,220	5,420	5,620	5,820	6,020	6,220	6,820
POOR	7,830	8,330	8,830	9,330	9,830	10,330	11,430

CORRECTIONS		DRY	Good	MEDIUM	POOR
Altitude	Per 1,000 feet	+120	+230	+230	+430
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+70	+140	+150	+330
Reverse Thrust	Per Reverser Operative	-50	-140	-330	-1,150
Autoland	Automatic Landing	+170	+220	+220	+260

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

ENG 1 (2) REVERSE UNLOCKED (LITTLE TO NO BUFFETING)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,130	3,120	3,280	3,430	3,560	3,700	3,990
GOOD	4,200	4,240	4,550	4,860	5,150	5,450	5,810
MEDIUM	5,540	5,640	6,060	6,480	6,860	7,310	7,840
POOR	10,550	10,780	11,420	12,070	12,630	13,220	13,930

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+210	+380	+550
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+79	+126	+180	+376
Reverse Thrust	Per Reverser Operative	-50	-160	-380	-1,450
Autoland	Automatic Landing	+170	+220	+220	+260

ENG 1 (2) REVERSE UNLOCKED (HEAVY BUFFETING)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	4,400	4,400	4,610	4,820	5,010	5,210	5,610
GOOD	6,150	6,210	6,660	7,120	7,540	7,970	8,500
MEDIUM	8,300	8,460	9,080	9,720	10,280	10,960	11,760
POOR	15,820	16,160	17,120	18,100	18,940	19,830	20,890

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+190	+310	+570	+820
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+111	+185	+269	+563
Reverse Thrust	Per Reverser Operative	-50	-160	-380	-1,450
Autoland	Automatic Landing	+170	+220	+220	+260

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

ENG 1 (2) REVERSER FAULT
ENG 1 (2) SHUTDOWN
ENG 1 (2) STALL
ENG 1 (2) THR LEVER DISAGREE
ENG 1 (2) THR LEVER FAULT

FLAPS 3

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,680	3,780	3,880	3,980	4,080	4,180	4,880
GOOD	4,690	4,890	5,090	5,290	5,490	5,690	6,490
MEDIUM	6,080	6,280	6,480	6,680	6,880	7,080	7,780
POOR	9,740	10,240	10,740	11,240	11,740	12,240	13,540

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+280	+260	+510
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+80	+150	+150	+350
Reverse Thrust	Per Reverser Operative	-70	-200	-420	-1,540
Autoland	Automatic Landing	+170	+220	+220	+260

FLAPS FULL

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,270	3,370	3,470	3,570	3,670	3,770	4,370
GOOD	3,920	4,120	4,320	4,520	4,720	4,920	5,620
MEDIUM	5,220	5,420	5,620	5,820	6,020	6,220	6,820
POOR	7,830	8,330	8,830	9,330	9,830	10,330	11,430

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+120	+230	+230	+430
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+70	+140	+150	+330
Reverse Thrust	Per Reverser Operative	-50	-140	-330	-1,150
Autoland	Automatic Landing	+170	+220	+220	+260

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

F/CTL ALTN LAW

F/CTL DIRECT LAW

F/CTL ELAC 1 (2) FAULT

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,130	3,120	3,280	3,430	3,560	3,700	3,990
GOOD	4,050	4,090	4,390	4,690	4,970	5,250	5,600
MEDIUM	5,140	5,240	5,630	6,020	6,370	6,790	7,280
POOR	9,790	10,010	10,600	11,200	11,730	12,280	12,940

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+210	+360	+510
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+79	+122	+167	+349
Reverse Thrust	Two Reversers Operative	-80	-290	-530	-2,700
Autoland	Automatic Landing	+420	+560	+580	+660

F/CTL FLAPS FAULT (FLAPS < 1)

F/CTL FLAPS LOCKED (FLAPS < 1)

F/CTL SLATS FAULT (SLATS < 1)

F/CTL SLATS LOCKED (SLATS < 1)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,940	3,930	4,130	4,320	4,480	4,660	5,020
GOOD	5,100	5,150	5,520	5,900	6,250	6,610	7,050
MEDIUM	6,530	6,650	7,140	7,630	8,080	8,610	9,240
POOR	12,430	12,700	13,460	14,220	14,880	15,580	16,420

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+170	+260	+450	+650
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+99	+153	+212	+443
Reverse Thrust	Two Reversers Operative	-100	-370	-670	-3,430
Autoland	Automatic Landing	+230	+280	+290	+340

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

F/CTL FLAPS FAULT (FLAPS 1 TO LESS THAN 2)
F/CTL FLAPS LOCKED (FLAPS 1 TO LESS THAN 2)
F/CTL SLATS FAULT (SLATS 1 TO 3)
F/CTL SLATS LOCKED (SLATS 1 TO 3)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,360	3,360	3,520	3,680	3,820	3,980	4,290
GOOD	4,350	4,390	4,710	5,040	5,340	5,640	6,020
MEDIUM	5,540	5,640	6,060	6,480	6,860	7,310	7,840
POOR	10,550	10,780	11,420	12,070	12,630	13,220	13,930

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+150	+220	+380	+550
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+85	+131	+180	+376
Reverse Thrust	Two Reversers Operative	-80	-310	-570	-2,910
Autoland	Automatic Landing	+230	+280	+290	+340

F/CTL FLAPS FAULT (FLAPS 2 TO 3)
F/CTL FLAPS LOCKED (FLAPS 2 TO 3)
F/CTL SLATS FAULT (SLATS > 3)
F/CTL SLATS LOCKED (SLATS > 3)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,130	3,120	3,280	3,430	3,560	3,700	3,990
GOOD	3,900	3,940	4,220	4,520	4,780	5,060	5,390
MEDIUM	5,140	5,240	5,630	6,020	6,370	6,790	7,280
POOR	9,790	10,010	10,600	11,200	11,730	12,280	12,940

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+200	+360	+510
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+79	+117	+167	+349
Reverse Thrust	Two Reversers Operative	-80	-280	-530	-2,700
Autoland	Automatic Landing	+230	+280	+290	+340

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

F/CTL GND SPLR FAULT

F/CTL GND SPLR 1 + 2 (3 + 4) FAULT

F/CTL SPLR FAULT

F/CTL SPD BRK FAULT

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,470	3,470	3,640	3,810	3,950	4,110	4,430
GOOD	4,500	4,540	4,870	5,210	5,520	5,840	6,220
MEDIUM	5,540	5,640	6,060	6,480	6,860	7,310	7,840
POOR	10,550	10,780	11,420	12,070	12,630	13,220	13,930

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+150	+230	+380	+550
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+87	+135	+180	+376
Reverse Thrust	Two Reversers Operative	-90	-330	-570	-2,910
Autoland	Automatic Landing	+420	+560	+580	+660

F/CTL L (R) ELEV FAULT

F/CTL L + R ELEVATOR FAULT

F/CTL STABILIZER JAM

STABILIZER JAM

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,360	3,360	3,520	3,680	3,820	3,980	4,290
GOOD	4,200	4,240	4,550	4,860	5,150	5,450	5,810
MEDIUM	5,340	5,440	5,840	6,250	6,610	7,050	7,560
POOR	10,170	10,390	11,010	11,640	12,180	12,750	13,430

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+150	+210	+370	+530
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+85	+126	+173	+362
Reverse Thrust	Two Reversers Operative	-80	-300	-550	-2,800
Autoland	Automatic Landing	+420	+560	+580	+660

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

F/CTL SEC FAULT (IF SEC 1, 2, OR 3 IS INOPERATIVE)

F/CTL SEC FAULT (IF TWO SECS ARE INOPERATIVE)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,240	3,240	3,400	3,560	3,690	3,840	4,140
GOOD	4,350	4,390	4,710	5,040	5,340	5,640	6,020
MEDIUM	5,540	5,640	6,060	6,480	6,860	7,310	7,840
POOR	10,550	10,780	11,420	12,070	12,630	13,220	13,930

CORRECTIONS		DRY	Good	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+220	+380	+550
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+82	+131	+180	+376
Reverse Thrust	Per Reverser Operative	0	-10	-150	-990
Autoland	Automatic Landing	+420	+560	+580	+660

F/CTL SEC FAULT (ALL THREE SECS FAILED)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,710	3,700	3,890	4,060	4,220	4,390	4,730
GOOD	6,150	6,210	6,660	7,120	7,540	7,970	8,500
MEDIUM	8,700	8,860	9,520	10,180	10,770	11,480	12,320
POOR	16,570	16,930	17,940	18,960	19,840	20,780	21,890

CORRECTIONS		DRY	Good	MEDIUM	POOR
Altitude	Per 1,000 feet	+160	+310	+600	+860
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+93	+185	+282	+590
Reverse Thrust	Two Reversers Operative	0	0	0	0
Autoland	Automatic Landing	+420	+560	+580	+660

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

FMGC FAILURE OR RESET (DUAL) FUEL LEAK

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	2,780	2,780	2,920	3,050	3,160	3,290	3,550
GOOD	3,600	3,640	3,900	4,170	4,420	4,670	4,980
MEDIUM	4,750	4,840	5,190	5,550	5,880	6,270	6,720
POOR	9,040	9,240	9,790	10,340	10,830	11,340	11,940

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+120	+180	+330	+470
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+70	+108	+154	+322
Reverse Thrust	Two Reversers Operative	-70	-260	-490	-2,490
Autoland	Automatic Landing	+220	+220	+220	+260

HYD B ELEC PUMP LO PR HYD B ELEC PUMP OVHT HYD B RSVR LO AIR PR HYD B RSVR LO LVL HYD B RSVR OVHT

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	2,780	2,780	2,920	3,050	3,160	3,290	3,550
GOOD	3,600	3,640	3,900	4,170	4,420	4,670	4,980
MEDIUM	4,550	4,630	4,980	5,320	5,630	6,010	6,440
POOR	8,670	8,850	9,380	9,910	10,380	10,860	11,440

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+120	+180	+320	+450
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+70	+108	+148	+309
Reverse Thrust	Two Reversers Operative	-70	-260	-470	-2,390
Autoland	Automatic Landing	+320	+400	+410	+470

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

HYD G ENG PUMP LO PR
 HYD G RSVR LO AIR PR
 HYD G RSVR LO LVL
 HYD G RSVR OVHT

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,130	3,120	3,280	3,430	3,560	3,700	3,990
GOOD	4,050	4,090	4,390	4,690	4,970	5,250	5,600
MEDIUM	5,140	5,240	5,630	6,020	6,370	6,790	7,280
POOR	9,790	10,010	10,600	11,200	11,730	12,280	12,940

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+210	+360	+510
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+79	+122	+167	+349
Reverse Thrust	Per Reverser Operative	0	-10	-140	-850
Autoland	Automatic Landing	+320	+400	+410	+470

HYD Y ELEC PUMP LO PR
 HYD Y ELEC PUMP OVHT
 HYD Y ENG PUMP LO PR
 HYD Y RSVR LO AIR PR
 HYD Y RSVR LO LVL
 HYD Y RSVR OVHT

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	2,900	2,890	3,040	3,180	3,300	3,430	3,690
GOOD	3,900	3,940	4,220	4,520	4,780	5,060	5,390
MEDIUM	4,940	5,040	5,410	5,790	6,120	6,530	7,000
POOR	9,420	9,620	10,200	10,770	11,280	11,810	12,440

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+130	+200	+340	+490
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+73	+117	+160	+335
Reverse Thrust	Per Reverser Operative	0	0	-90	-100
Autoland	Automatic Landing	+320	+400	+410	+470

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

HYD B + Y SYS LO PR

HYD G + B SYS LO PR

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	4,170	4,160	4,370	4,570	4,740	4,930	5,320
GOOD	6,150	6,210	6,660	7,120	7,540	7,970	8,500
MEDIUM	7,910	8,060	8,650	9,250	9,790	10,440	11,200
POOR	15,070	15,390	16,310	17,240	18,040	18,890	19,900

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+180	+310	+540	+780
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+105	+185	+256	+536
Reverse Thrust	Per Reverser Operative	0	-10	-140	-170
Autoland	Automatic Landing	+320	+400	+410	+470

HYD G + Y SYS LO PR (INCL. 1,000PSI BRAKING LIMIT)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	6,480	6,480	6,800	7,110	7,380	7,670	8,270
GOOD	7,050	7,120	7,630	8,160	8,640	9,140	9,750
MEDIUM	9,490	9,670	10,380	11,100	11,750	12,530	13,440
POOR	18,080	18,470	19,570	20,680	21,650	22,670	23,880

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+280	+360	+650	+940
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+163	+212	+308	+644
Reverse Thrust	Two Reversers Operative	0	0	0	0
Autoland	Automatic Landing	+320	+400	+410	+470

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

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

NAV ADR DISAGREE

NAV RA 1 + 2 FAULT (DUAL FAILURE)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	2,780	2,780	2,920	3,050	3,160	3,290	3,550
GOOD	3,600	3,640	3,900	4,170	4,420	4,670	4,980
MEDIUM	4,750	4,840	5,190	5,550	5,880	6,270	6,720
POOR	9,040	9,240	9,790	10,340	10,830	11,340	11,940

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+120	+180	+330	+470
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+70	+108	+154	+322
Reverse Thrust	Two Reversers Operative	-70	-260	-490	-2,490
Autoland	Automatic Landing	+220	+220	+220	+190

NAV ADR FAULT (1 + 2)

NAV ADR FAULT (1 + 3)

NAV ADR FAULT (2 + 3)

NAV ADR FAULT (TRIPLE)

NAV IR FAULT (1 & 2 OR 2 & 3)

NAV IR FAULT (1 & 3)

WING A. ICE SYS FAULT (IF ICE ACCRETION)

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	3,130	3,120	3,280	3,430	3,560	3,700	3,990
GOOD	4,050	4,090	4,390	4,690	4,970	5,250	5,600
MEDIUM	5,340	5,440	5,840	6,250	6,610	7,050	7,560
POOR	10,170	10,390	11,010	11,640	12,180	12,750	13,430

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+140	+210	+370	+530
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+79	+122	+173	+362
Reverse Thrust	Two Reversers Operative	-80	-290	-550	-2,800
Autoland	Automatic Landing	+220	+220	+220	+260

ABNORMAL CONFIGURATION ACTUAL LANDING DISTANCES

FEET

NOTE: Data below assumes MAX PEDAL Braking and does NOT include 15% safety margin. Refer to Page 4-9 for all assumed conditions.

ZERO FLAP / ZERO SLAT APPROACH AND LANDING

BRAKING ACTION	LANDING WEIGHT – 1,000 POUNDS						
	90	100	110	120	130	140	150
DRY	5,090	5,090	5,340	5,590	5,800	6,030	6,500
GOOD	6,450	6,510	6,980	7,470	7,910	8,360	8,920
MEDIUM	8,700	8,860	9,520	10,180	10,770	11,480	12,320
POOR	16,570	16,930	17,940	18,960	19,840	20,780	21,890

CORRECTIONS		DRY	GOOD	MEDIUM	POOR
Altitude	Per 1,000 feet	+220	+330	+600	+860
Wind	Per 1 kt. headwind	-0	-0	-0	-0
	Per 1 kt. tailwind	+128	+194	+282	+590
Reverse Thrust	Two Reversers Operative	-130	-470	-900	-4,570
Autoland	Automatic Landing	+230	+280	+290	+340

EMERGENCY LANDING DISTANCES

FEET

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

FLAPS FULL

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)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	7,700	5,600	4,800	7,700	5,700	5,700
150,000	7,500	5,400	4,600	7,500	5,500	5,500
145,000	7,300	5,300	4,500	7,300	5,400	5,400
140,000	7,000	5,100	4,400	7,000	5,200	5,200
135,000	6,900	5,000	4,300	6,900	5,000	5,000
134,481	6,300	4,400	3,500	6,300	4,500	4,300
130,000	6,100	4,300	3,400	6,100	4,300	4,200
125,000	5,900	4,300	3,300	5,900	4,300	4,000
120,000	5,700	4,100	3,200	5,700	4,100	3,900
115,000	5,600	4,000	3,100	5,600	4,000	3,700
110,000	5,400	3,800	3,000	5,400	3,800	3,700
105,000	5,100	3,700	3,000	5,100	3,700	3,500
100,000	5,000	3,700	2,900	5,000	3,700	3,400
95,000	5,000	3,700	2,900	5,000	3,700	3,300
90,000	5,000	3,700	2,900	5,000	3,700	3,300

BASIS: Zero wind • Standard approach procedure • Both Reversers Operating • Approach speed V_{APP} ($V_{LS}+5$)
Data is advisory and includes a standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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

CORRECTIONS	DRY (6)			GOOD (5)		
PER 5 ADD'L APP SPD	450	300	250	450	350	350
PER 1 KT TAILWIND	150	100	50	150	150	150
PER 10°C ABOVE ISA	200	150	100	200	200	200
PER 1% DOWN SLOPE	100	50	50	100	150	150
1 REV INOPERATIVE	0	0	0	0	0	0
2 REV INOPERATIVE	0	0	0	0	0	0
Autoland	1,000			1,100		

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 FULL

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	MEDIUM (3)			POOR (1)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	7,800	6,800	6,800	10,100	9,900	9,900
150,000	7,600	6,600	6,600	9,800	9,700	9,700
145,000	7,400	6,400	6,400	9,600	9,400	9,400
140,000	7,200	6,300	6,300	9,200	9,100	9,100
135,000	7,000	6,100	6,100	9,000	8,900	8,900
134,481	6,300	5,400	5,400	8,300	8,200	8,200
130,000	6,200	5,300	5,200	8,100	7,900	7,900
125,000	6,000	5,100	5,000	7,800	7,700	7,700
120,000	5,800	5,000	4,900	7,600	7,400	7,400
115,000	5,700	4,800	4,800	7,300	7,100	7,100
110,000	5,500	4,600	4,600	7,000	6,900	6,900
105,000	5,200	4,400	4,400	6,800	6,600	6,600
100,000	5,000	4,300	4,300	6,500	6,300	6,300
95,000	5,000	4,300	4,300	6,400	6,300	6,200
90,000	5,000	4,300	4,200	6,300	6,100	6,100

BASIS: Zero wind • Standard approach procedure • Both Reversers Operating • Approach speed V_{APP} ($V_{LS}+5$)

Data is advisory and includes a standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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

CORRECTIONS	MEDIUM (3)			POOR (1)		
PER 5 ADD'L APP SPD	450	350	350	500	500	500
PER 1 KT TAILWIND	150	150	150	350	350	350
PER 10°C ABOVE ISA	200	200	200	350	350	350
PER 1% DOWN SLOPE	300	350	300	2,550	2,550	2,550
1 REV INOPERATIVE	0	100	100	600	600	600
2 REV INOPERATIVE	0	200	100	1,200	1,200	1,200
Autoland	1,200			1,300		

EMERGENCY LANDING DISTANCES

FEET

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

FLAPS 3

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)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	8,400	6,000	5,300	8,400	6,300	6,300
150,000	8,200	5,800	5,200	8,200	6,200	6,200
145,000	8,000	5,700	5,000	8,000	6,000	6,000
140,000	7,700	5,600	5,000	7,700	5,800	5,800
135,000	7,500	5,400	4,800	7,500	5,700	5,700
134,481	6,900	4,900	3,700	6,900	4,900	4,800
130,000	6,700	5,600	3,600	6,700	4,800	4,600
125,000	6,500	4,600	3,500	6,500	4,600	4,400
120,000	6,300	4,400	3,400	6,300	4,500	4,300
115,000	6,100	4,300	3,300	6,100	4,300	4,100
110,000	5,800	4,200	3,200	5,800	4,200	4,000
105,000	5,700	4,000	3,100	5,700	4,100	3,800
100,000	5,500	3,900	3,000	5,500	3,900	3,700
95,000	5,200	3,700	2,900	5,200	3,700	3,500
90,000	5,000	3,700	2,900	5,000	3,700	3,400

BASIS: Zero wind • Standard approach procedure • Both Reversers Operating • Approach speed V_{APP} ($V_{LS}+5$)

Data is advisory and includes a standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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

CORRECTIONS	DRY (6)			GOOD (5)		
PER 5 ADD'L APP SPD	450	300	250	450	400	400
PER 1 KT TAILWIND	150	100	50	150	150	150
PER 10°C ABOVE ISA	200	150	100	200	200	200
PER 1% DOWN SLOPE	100	50	50	100	200	200
1 REV INOPERATIVE	0	0	0	0	0	0
2 REV INOPERATIVE	0	0	0	0	0	0
Autoland	800			1,000		

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 3

Landing Weight (lb)	NOTE: Interpolate for GOOD-TO-MEDIUM (4) or MEDIUM-TO-POOR (2).					
	MEDIUM (3)			POOR (1)		
	Low AB	Med AB	Max Pedal	Low AB	Med AB	Max Pedal
155,000	8,500	7,600	7,600	11,300	11,200	11,200
150,000	8,300	7,400	7,400	11,000	10,900	10,900
145,000	8,100	7,200	7,200	10,600	10,600	10,600
140,000	7,800	7,000	7,000	10,300	10,300	10,300
135,000	7,700	6,800	6,800	10,000	9,900	9,900
134,481	7,000	5,900	5,900	9,300	9,200	9,200
130,000	6,800	5,700	5,700	9,000	8,900	8,900
125,000	6,600	5,600	5,600	8,700	8,600	8,600
120,000	6,300	5,400	5,400	8,400	8,300	8,300
115,000	6,200	5,200	5,200	8,100	8,000	8,000
110,000	6,000	5,000	5,000	7,800	7,700	7,700
105,000	5,700	4,900	4,800	7,500	7,400	7,400
100,000	5,600	4,700	4,600	7,200	7,000	7,000
95,000	5,300	4,500	4,400	6,900	6,800	6,800
90,000	5,100	4,300	4,300	6,600	6,500	6,500

BASIS: Zero wind • Standard approach procedure • Both Reversers Operating • Approach speed V_{APP} ($V_{LS}+5$)

Data is advisory and includes a standard air run from threshold to touchdown (approx. 1,200 ft to 2,000 ft depending on weight)

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)

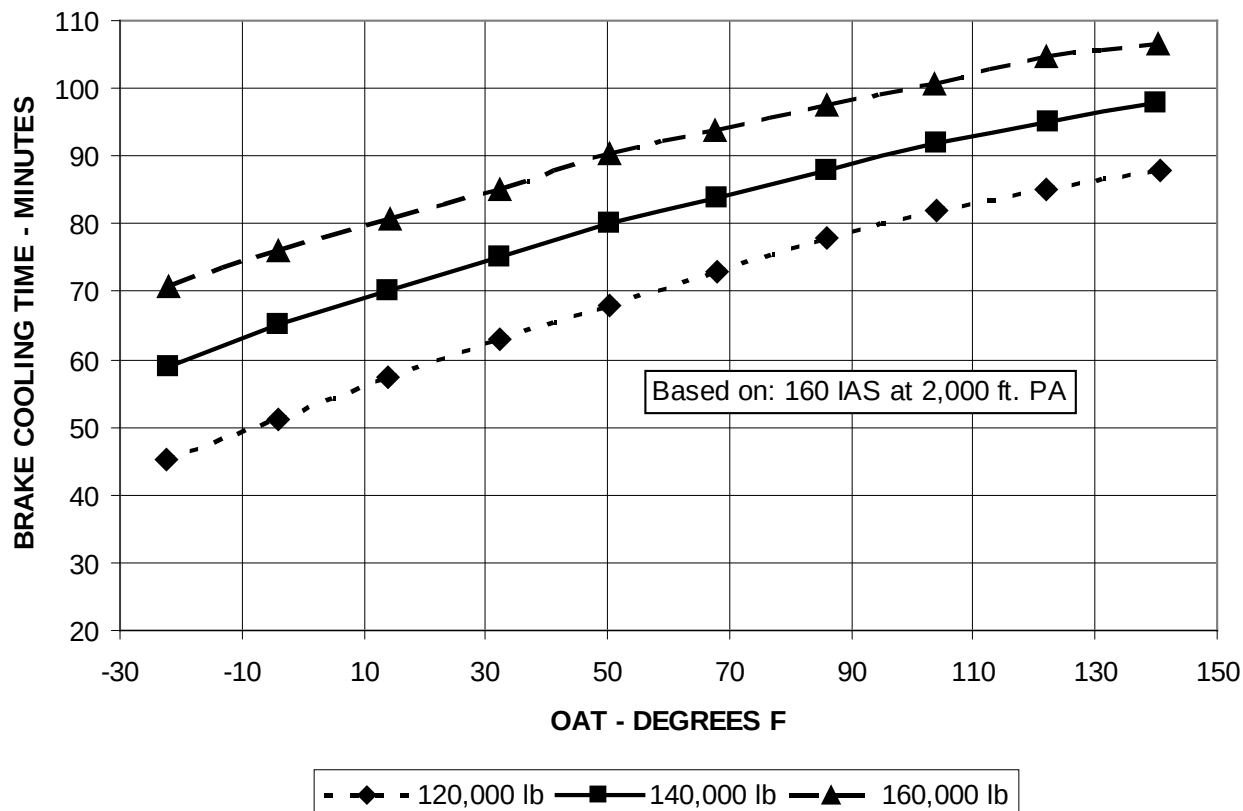
ALTITUDE ADJUSTMENT

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

CORRECTIONS	MEDIUM (3)			POOR (1)		
PER 5 ADD'L APP SPD	450	350	350	550	550	550
PER 1 KT TAILWIND	150	150	150	400	400	400
PER 10°C ABOVE ISA	250	200	200	450	450	450
PER 1% DOWN SLOPE	350	400	350	3,150	3,150	3,100
1 REV INOPERATIVE	0	100	100	900	800	800
2 REV INOPERATIVE	100	200	200	1,700	1,700	1,600
Autoland	1,000			1,300		

REQUIRED BRAKE COOLING TIME

REJECTED TAKEOFF



NOTE: The maximum brake temperature for takeoff is 300°C but a maximum of 275°C is suggested to prevent BRAKES HOT condition after takeoff.

NOTE: Do NOT taxi if the temperature difference between two brakes on the same gear is greater than 150°C and the temperature of one brake is above 600°C. This may be indicative of a brake binding.

Use this chart for planning purposes to determine the brake cooling time required following a high speed, rejected takeoff. Timing begins when the brakes are released after the chocks have been installed. The MDM contains the procedures/guidance for inoperative Brake Temperature indications.

Instructions: Enter chart from bottom using OAT – DEGREES F. Move vertically until crossing the weight closest to your weight at the time of the rejected takeoff. Move horizontally to the left scale to determine the anticipated cooling time.

REQUIRED BRAKE COOLING TIME**NORMAL QUICK TURNAROUND****(minutes)**

Gross Weight	Airport Altitude FT	OAT (°C)					
		0	10	20	30	40	50
142,000	0	14	19	23	27	60	62
	2000	14	19	23	57	60	62
	4000	14	51	54	57	60	62
	6000	48	51	54	57	60	62
	8000	48	51	54	57	60	62
135,000	0	14	19	23	27	31	35
	2000	14	19	23	27	31	35
	4000	14	19	23	57	60	62
	6000	14	19	54	57	60	62
	8000	48	51	54	57	60	62
130,000	0	14	19	23	27	31	35
	2000	14	19	23	27	31	35
	4000	14	19	23	27	31	35
	6000	14	19	54	57	60	62
	8000	14	51	54	57	60	62
125,000	0	14	19	23	27	31	35
	2000	14	19	23	27	31	35
	4000	14	19	23	27	31	35
	6000	14	19	23	27	31	62
	8000	14	19	23	27	31	62
120,000	0	14	19	23	27	31	35
	2000	14	19	23	27	31	35
	4000	14	19	23	27	31	35
	6000	14	19	23	27	31	35
	8000	14	19	23	27	31	62
115,000	0	14	19	23	27	31	35
	2000	14	19	23	27	31	35
	4000	14	19	23	27	31	35
	6000	14	19	23	27	31	35
	8000	14	19	23	27	31	35
110,000	0	14	19	23	27	31	35
	2000	14	19	23	27	31	35
	4000	14	19	23	27	31	35
	6000	14	19	23	27	31	35
	8000	14	19	23	27	31	35
105,000	0	0	0	23	27	31	35
	2000	0	19	23	27	31	35
	4000	14	19	23	27	31	35
	6000	14	19	23	27	31	35
	8000	14	19	23	27	31	35

Use this chart to determine the brake cooling time required following a norm landing when MEL 32-60-03H ECAM Brake Temp Indication is inoperative.

Enter chart with landing weight and destination airport elevation and OAT. Read the required cooling time in minutes prior to subsequent takeoff.

OPERATION WITHOUT AIRSPEED INDICATION

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

CLIMB				
SPEED: 250/275/0.76				
PRESSURE ALTITUDE FEET	SPEED	GROSS WEIGHT - LBS		
		Above 145,000	145,000 - 125,000	Below 125,000
		Pitch Attitude - degrees		
Above 32,000	M 0.76	+3.5	+3.5	+3.5
25,000 - 32,000	275	+4.0	+4.0	+4.0
20,000 - 25,000	275	+5.0	+5.0	+5.0
15,000 - 20,000	250	+6.0	+6.0	+6.5
10,000 - 15,000	250	+8.0	+8.5	+9.5
5,000 - 10,000	250	+9.5	+10.0	+11.0
Below 5,000	250	+10.5	+11.5	+12.5

CRUISE				
SPEED: 250/275/0.76		THRUST: N1 FOR LEVEL FLIGHT FLAPS: UP		
PRESSURE ALTITUDE FEET		GROSS WEIGHT - POUNDS		
		Above 145,000	145,000 - 125,000	Below 125,000
Above 32,000	PITCH ATTITUDE	+2.5	+2.5	+2.0
	Alt Mode %N1	88.4	86.8	84.5
20,000 - 32,000	PITCH ATTITUDE	+2.5	+2.0	+1.5
	Alt Mode %N1	83.3	81.4	79.7
Below 20,000	PITCH ATTITUDE	+3.5	+3.0	+2.0
	Alt Mode %N1	73.8	71.3	69.2

DESCENT				
SPEED: 240/260/0.80				
PRESSURE ALTITUDE FEET	SPEED	GROSS WEIGHT - LBS		
		Above 145,000	145,000 - 125,000	Below 125,000
		Pitch Attitude - degrees		
Above 32,000	M 0.76	-0.5	-1.0	-2.0
32,000 - 20,000	275	-0.5	-1.0	-2.0
20,000 - 10,000	250	0.5	-0.5	-1.5
Below 10,000	250	0.5	-0.5	-1.5
Below 10,000	G-Dot	3.5	3.5	3.5

OPERATION WITHOUT AIRSPEED INDICATION

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

TERMINAL AREA						
SPEED: see below			THRUST: N1 FOR LEVEL FLIGHT FLAPS: AS REQ'D			
PRESSURE ALTITUDE FEET	FLAPS / GEAR	SPEED		GROSS WEIGHT – POUNDS		
				Above 145,000	145,000 - 125,000	Below 125,000
5,000	0/Up	G-Dot	PITCH ATT (Alt Mode %N1)	+5.0 63.0	+5.5 58.3	+5.5 53.5
5,000	1/Up	S	PITCH ATT (Alt Mode %N1)	+7.5 64.9	+7.5 60.2	+7.5 55.3
5,000	1+F/Up	S	PITCH ATT (Alt Mode %N1)	+3.5 65.3	+3.5 60.7	+3.5 55.7
5,000	2/Up	F	PITCH ATT (Alt Mode %N1)	+8.5 65.8	+8.5 61.3	+8.5 56.7
5,000	3/Down	F	PITCH ATT (Alt Mode %N1)	+7.5 72.0	+7.0 67.4	+7.0 56.7

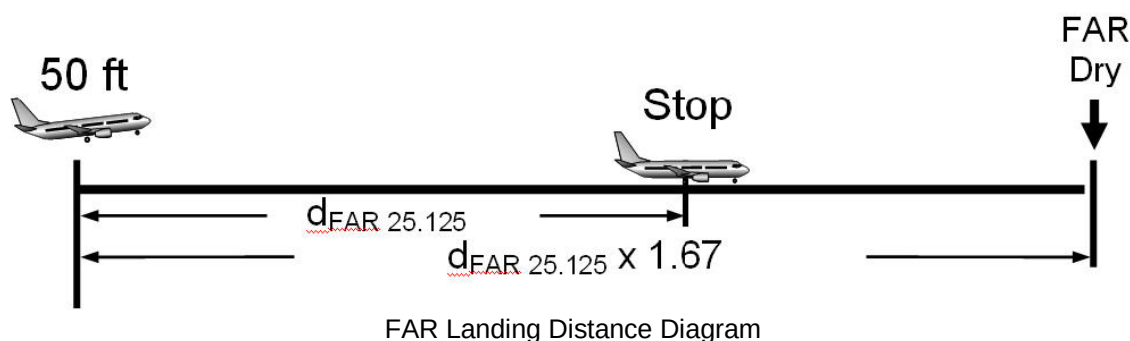
FINAL APPROACH						
SPEED: see below			THRUST: N1 FOR 3° GLIDESLOPE FLAPS: AS REQ'D			
PRESSURE ALTITUDE – FEET	FLAPS / GEAR	SPEED		GROSS WEIGHT – POUNDS		
				Above 145,000	145,000 - 125,000	Below 125,000
1,500	3/Down	VLS+10 VLS+10	PITCH ATT (Alt Mode %N1)	+ 4.5 54.2	+ 4.5 50.7	+ 4.0 47.0

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" page in this section of the ODM on Page 4-8 (distance multiplier table) or Pages 4-9 – 4-24 (lookup tables).

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
- MAX PEDAL braking
- Includes distance from 50 feet above threshold to stop

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

FLAPS FULL

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

ONE BRAKE INOP - DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	9,200
150,000	5,920	6,090	6,260	6,440	6,630	6,810	7,000	7,210	7,410	7,620	7,660
145,000	5,620	5,780	5,960	6,130	6,300	6,480	6,670	6,860	7,050	7,250	7,290
140,000	5,320	5,490	5,650	5,810	5,980	6,160	6,340	6,520	6,700	6,900	6,940
135,000	5,070	5,200	5,350	5,520	5,680	5,850	6,020	6,200	6,380	6,560	6,600
130,000	4,960	5,060	5,170	5,290	5,410	5,560	5,720	5,880	6,060	6,230	6,270
125,000	4,860	4,960	5,070	5,170	5,290	5,400	5,530	5,660	5,800	5,950	5,980
120,000	4,770	4,870	4,970	5,070	5,180	5,290	5,410	5,530	5,660	5,790	5,820
115,000	4,660	4,760	4,850	4,950	5,060	5,160	5,280	5,400	5,520	5,650	5,680
110,000	4,540	4,630	4,720	4,820	4,920	5,020	5,130	5,240	5,360	5,480	5,510
105,000	4,410	4,500	4,590	4,680	4,780	4,880	4,980	5,090	5,200	5,310	5,340
100,000	4,310	4,390	4,480	4,570	4,670	4,760	4,850	4,950	5,060	5,160	5,180

CORRECTIONS:

Headwind per kt	- 20 ft
Tailwind per kt	+ 135 ft

ONE BRAKE INOP - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	9,200
150,000	6,810	7,000	7,200	7,410	7,630	7,830	8,050	8,290	8,520	8,760	8,810
145,000	6,470	6,650	6,850	7,050	7,250	7,450	7,670	7,890	8,110	8,340	8,390
140,000	6,120	6,320	6,500	6,680	6,880	7,080	7,290	7,490	7,710	7,940	7,980
135,000	5,830	5,980	6,150	6,350	6,530	6,720	6,920	7,130	7,340	7,540	7,590
130,000	5,710	5,820	5,950	6,080	6,230	6,390	6,580	6,770	6,960	7,170	7,210
125,000	5,590	5,710	5,830	5,950	6,080	6,210	6,360	6,510	6,670	6,840	6,870
120,000	5,480	5,600	5,710	5,830	5,950	6,080	6,220	6,360	6,510	6,660	6,690
115,000	5,360	5,470	5,580	5,700	5,810	5,940	6,070	6,210	6,350	6,500	6,530
110,000	5,220	5,320	5,430	5,540	5,650	5,770	5,900	6,030	6,160	6,300	6,330
105,000	5,070	5,170	5,280	5,390	5,500	5,610	5,730	5,850	5,980	6,110	6,140
100,000	4,960	5,050	5,150	5,260	5,370	5,470	5,580	5,700	5,810	5,940	5,960

CORRECTIONS:

Headwind per kt	- 20 ft
Tailwind per kt	+ 155 ft

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

FLAPS FULL

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

ALL SPOILERS INOP - DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	9,200
150,000	6,300	6,460	6,640	6,820	7,000	7,190	7,380	7,590	7,800	8,010	8,050
145,000	6,140	6,290	6,440	6,600	6,780	6,970	7,150	7,340	7,540	7,750	7,800
140,000	5,980	6,130	6,280	6,430	6,590	6,760	6,940	7,120	7,300	7,500	7,540
135,000	5,860	6,010	6,150	6,300	6,450	6,610	6,780	6,960	7,140	7,320	7,360
130,000	5,740	5,890	6,030	6,170	6,320	6,480	6,640	6,820	7,000	7,170	7,210
125,000	5,630	5,770	5,910	6,050	6,190	6,340	6,510	6,680	6,850	7,030	7,060
120,000	5,520	5,650	5,790	5,930	6,070	6,210	6,370	6,530	6,710	6,880	6,920
115,000	5,400	5,520	5,650	5,790	5,930	6,070	6,220	6,370	6,540	6,710	6,750
110,000	5,250	5,360	5,490	5,620	5,750	5,890	6,030	6,180	6,330	6,490	6,530
105,000	5,100	5,210	5,330	5,450	5,570	5,710	5,840	5,980	6,130	6,280	6,310
100,000	5,000	5,100	5,220	5,330	5,450	5,580	5,710	5,830	5,960	6,100	6,130

CORRECTIONS:

Headwind per kt	- 20 ft
Tailwind per kt	+ 120 ft

ALL SPOILERS INOP - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	9,200
150,000	7,240	7,430	7,630	7,850	8,050	8,260	8,490	8,730	8,970	9,210	9,260
145,000	7,060	7,230	7,410	7,590	7,790	8,010	8,220	8,440	8,670	8,910	8,960
140,000	6,880	7,050	7,220	7,390	7,580	7,770	7,980	8,190	8,400	8,620	8,670
135,000	6,740	6,910	7,070	7,240	7,420	7,600	7,800	8,010	8,210	8,420	8,460
130,000	6,600	6,770	6,930	7,100	7,270	7,450	7,640	7,840	8,050	8,250	8,290
125,000	6,470	6,630	6,800	6,960	7,120	7,300	7,480	7,680	7,880	8,080	8,120
120,000	6,350	6,500	6,660	6,820	6,980	7,150	7,330	7,510	7,710	7,910	7,950
115,000	6,210	6,350	6,500	6,660	6,820	6,970	7,150	7,330	7,520	7,720	7,760
110,000	6,030	6,170	6,310	6,460	6,620	6,770	6,930	7,100	7,280	7,470	7,510
105,000	5,860	5,990	6,130	6,270	6,410	6,560	6,720	6,880	7,050	7,220	7,260
100,000	5,740	5,870	6,000	6,130	6,270	6,420	6,560	6,710	6,860	7,020	7,050

CORRECTIONS:

Headwind per kt	- 25 ft
Tailwind per kt	+ 140 ft

MEL SUPPORT

FAR LANDING DISTANCES (FACTORED)

FLAPS FULL

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

TWO PAIRS OF SPOILERS INOP - DRY RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	9,200
150,000	5,340	5,490	5,630	5,780	5,930	6,090	6,270	6,430	6,600	6,780	6,810
145,000	5,210	5,330	5,450	5,580	5,720	5,860	6,020	6,180	6,360	6,520	6,560
140,000	5,090	5,200	5,320	5,440	5,560	5,700	5,830	5,960	6,120	6,280	6,320
135,000	4,990	5,090	5,210	5,320	5,450	5,570	5,710	5,840	5,970	6,110	6,140
130,000	4,890	5,000	5,110	5,220	5,340	5,460	5,590	5,720	5,850	5,990	6,010
125,000	4,800	4,900	5,010	5,120	5,230	5,350	5,480	5,610	5,730	5,860	5,890
120,000	4,710	4,810	4,910	5,020	5,130	5,240	5,360	5,490	5,610	5,740	5,770
115,000	4,620	4,710	4,800	4,900	5,010	5,120	5,240	5,360	5,490	5,610	5,630
110,000	4,500	4,590	4,680	4,770	4,870	4,970	5,090	5,200	5,320	5,450	5,470
105,000	4,380	4,470	4,550	4,640	4,730	4,830	4,940	5,050	5,160	5,280	5,310
100,000	4,290	4,370	4,460	4,540	4,630	4,720	4,820	4,920	5,020	5,130	5,160

CORRECTIONS:

Headwind per kt	- 20 ft
Tailwind per kt	+ 110 ft

TWO PAIRS OF SPOILERS INOP - WET RUNWAY

AIRCRAFT WEIGHT LBS	AIRPORT PRESSURE ALTITUDE - FEET										
	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	9,200
150,000	6,150	6,310	6,480	6,640	6,820	7,010	7,210	7,390	7,590	7,790	7,840
145,000	5,990	6,130	6,270	6,420	6,580	6,740	6,920	7,110	7,310	7,500	7,540
140,000	5,850	5,980	6,110	6,250	6,400	6,550	6,700	6,860	7,040	7,220	7,260
135,000	5,740	5,860	5,990	6,120	6,260	6,410	6,560	6,710	6,870	7,030	7,060
130,000	5,630	5,750	5,870	6,000	6,140	6,280	6,430	6,580	6,730	6,880	6,920
125,000	5,520	5,640	5,760	5,880	6,010	6,150	6,300	6,450	6,590	6,740	6,770
120,000	5,420	5,530	5,650	5,770	5,890	6,030	6,170	6,310	6,460	6,600	6,630
115,000	5,310	5,410	5,520	5,640	5,760	5,890	6,020	6,160	6,310	6,450	6,480
110,000	5,170	5,280	5,380	5,480	5,600	5,720	5,850	5,980	6,120	6,270	6,290
105,000	5,030	5,140	5,240	5,340	5,440	5,560	5,680	5,800	5,940	6,070	6,100
100,000	4,930	5,030	5,130	5,230	5,330	5,430	5,540	5,660	5,780	5,900	5,930

CORRECTIONS:

Headwind per kt	- 20 ft
Tailwind per kt	+ 130 ft

MEL SUPPORT

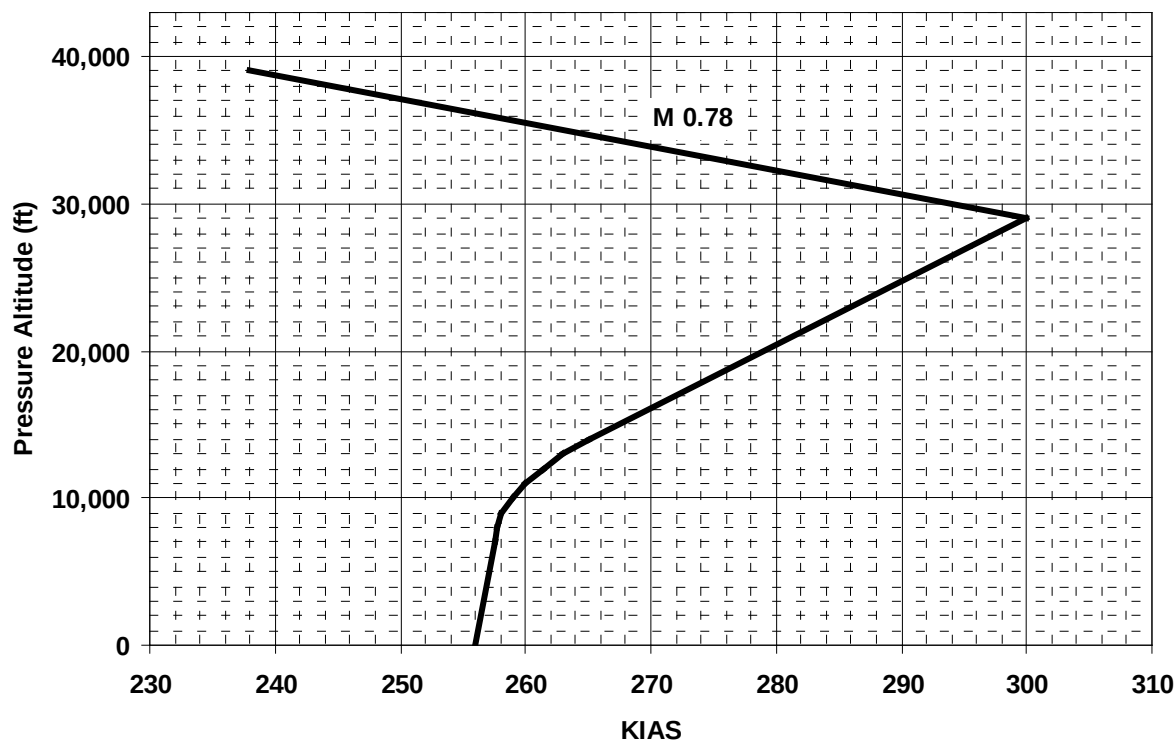
V_{MCG} – MINIMUM CONTROL SPEED, GROUND

Configuration	V_{MCG} – KIAS
Flaps 1+F	107
Flaps 3	107

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.

V_A – MAXIMUM DESIGN MANEUVERING SPEED



NOTES:

- This limitation only applies in alternate or direct flight control laws. If alternate or direct law is active:
 - o Full ailerons and rudder application should be confined to speeds below V_A .
 - o Maneuvers involving angle of attack near stall should be confined to speeds below V_A .

End of Section

FERRY FLIGHT PLANNING AND OPERATION

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AUTHORIZATION AND FLIGHT PLANNING

(DISPATCHER INSTRUCTIONS)

Ferry operational data is available for the following configuration:

- Flight with Landing Gear Down

The following method should be used for ferry flight planning and certain revenue flight planning (as noted) and operations:

1. Obtain a normal aircraft configuration (computerized or manual) unfilled flight plan using Long Range Cruise (LRC) at the proposed cruise altitude.
2. Calculate the trip time and fuel load based on the values displayed under the appropriate ferry configuration. Enter this data either in the Dispatcher Remarks section of the Computerized Flight Plan or on the Standby Flight Plan form (NS80172).
3. Add remarks containing the ferry speed, speed limit, altitude limit, total time, leg times if appropriate, and engine-out altitude capability.
Note: Suggested cruise altitudes are for reference, and reasonable adjustments may be made to accommodate ATC and direction of flight.
4. Assure adequate terrain clearance by referring to the Engine Out Altitude Limit table, if available. (See FERRY, ENROUTE heading)
5. Adjust the Runway Allowable and Climb Limit Takeoff Weights, and the Landing Climb Limit Weight as follows:
Go to the appropriate ferry configuration page and subtract the weight decrements indicated under headings for TAKEOFF and LANDING from the NORMAL Thrust takeoff weight and the Landing Climb weight, respectively, obtained from the ARM (Airport Sections).

The following limitations should be applied to all ferry flights:

1. Do not combine two or more ferry configurations.
2. All ferry flight takeoffs will be made using full (NORMAL) thrust and climb out will be made using Maximum Climb thrust unless otherwise specified on ferry configuration data page.
3. Observe additional limitations and restrictions as listed for each ferry configuration on the following data pages.

FLIGHT WITH LANDING GEAR DOWN

GENERAL

This section applies to dispatch with landing gear down. However, the limitations and inflight performance also apply in case of an inflight landing gear retraction failure. Revenue flight is permitted with the landing gear down and the gear doors closed in the conditions stated below.

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. VMO / MMO = 235 kt. IAS / M 0.60
2. Ditching with landing gear down has not been demonstrated.
3. Flight in forecasted icing conditions is not permitted.
4. Managed vertical modes CLB and DES must not be used.
5. Managed speed (except in approach) must not be used.
6. The FMS fuel predictions must be disregarded. Other predictions should also be disregarded (altitude, speed, and time), except time predictions at waypoints when in cruise.
7. Extended Operations (ETOPS) is not allowed to be used during Flight with Gear Down.
8. ALTITUDE ALERT is not available.
9. The APU must run during the whole flight. APU GEN must be available.
10. Failures that would normally lead to ALTN law will, with the landing gear extended, degrade flight control laws down to DIRECT law.

PROCEDURE (PREFLIGHT):

The L/G DOWN VMO/MMO switch located in the avionic bay on 188VU must be set to L/G DOWN position.

FLIGHT PLANNING (TAKEOFF)

RATOW & Takeoff climb limit weight:	Use GRD TPI in AWABS (Dispatchers)
Takeoff V Speeds:	Use GRD TPI in AWABS (Dispatchers)
Takeoff Thrust Settings:	Use TO only, use of AT (FLEX) settings NOT approved.
Takeoff Flap Settings:	Use GRD TPI in AWABS (Dispatchers)
Operation from Contaminated Runway:	Permitted, use GRD TPI (Dispatchers)

Note: Takeoff with tailwind is not recommended.

LANDING GEAR EXTENDED

FLIGHT PLANNING (ENROUTE)

-Use flight planning data in FPS if available. If no data is available, the following tables may be used as necessary.

MAXIMUM CRUISE ALTITUDE

WEIGHT (LB)	MAX ALTITUDE (FT)
160,000	22,600
150,000	24,400
140,000	26,200
130,000	28,100
120,000	30,100
110,000	32,300
100,000	34,500
90,000	36,600

BASIS:

- Buffet Margin = 1.0 G
- Landing Gear Extended, Doors Closed
- CG Position = 27.0%
- Anti-Ice OFF, Packs NORM
- Max Cruise thrust limits

LANDING GEAR EXTENDED (cont'd)

FLIGHT PLANNING (ENROUTE) (cont.)

CLIMB

-Climb at 230 kt / M 0.50 with all engines at maximum climb thrust. The tables below give the time, distance, and fuel consumption according to takeoff weight.

CLIMB - 230KT / 0.50M - ALL ENGINES - GEAR DOWN																
MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG = 27.0 %		FROM BRAKE RELEASE TIME (MIN) FUEL (LB) DISTANCE (NM)									
FL	WEIGHT AT BRAKE RELEASE (1000 LB)															
	90		100		110		120		130		140		150		155	
280	16	2823														
	74															
270	15	2690														
	68															
260	14	2560														
	64															
250	13	2432	15	2820												
	59		69													
240	12	2305	14	2665												
	54		64													
220	10	2050	12	2357	14	2704										
	46		53		62											
200	9	1788	10	2043	11	2327	13	2648								
	38		43		50		57									
180	7	1510	8	1716	9	1939	10	2186	12	2472						
	29		34		38		43		49							
160	6	1285	7	1454	8	1636	8	1834	9	2059						
	23		27		30		34		38							
140	5	1096	6	1237	6	1387	7	1550	8	1732						
	19		21		24		27		30							
120	4	930	5	1047	5	1171	6	1306	6	1454	7	1619				
	15		17		19		21		24		27					
100	3	778	4	874	4	975	5	1085	5	1205	6	1340				
	12		13		15		16		18		21					
50	2	439	2	489	2	542	3	600	3	662	3	731	3	805		
	5		6		7		7		8		9		10			
10	1	223	1	245	1	270	1	296	1	325	2	357	2	389	2	405
	2		2		2		2		3		3		3		3	

LANDING GEAR EXTENDED (cont'd)

FLIGHT PLANNING (ENROUTE) (cont.)

CRUISE

-The recommended cruise speed is 230 kt / M 0.50.

-The ceiling with an engine inoperative may be a limiting factor, and the choice of the route should reflect this concern.

CRUISE - 230KT / 0.50M - ALL ENGINES - GEAR DOWN													
MAX. CRUISE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF							ISA CG = 27.0 %		%N1 LB/H/ENG NM/1000 LB		MACH IAS (KT) TAS (KT)		
WEIGHT (1000 LB)	FL100		FL150		FL200		FL220		FL240		FL260		FL270
90	78.6	0.417	83.8	0.458	88.0	0.500	87.6	0.500	87.4	0.500	87.2	0.500	87.1
	3814	230	3921	230	4008	228	3712	219	3440	210	3193	201	3080
	34.9	266	36.6	287	38.3	307	41.0	305	43.9	302	46.9	300	48.4
100	79.0	0.417	84.1	0.458	88.4	0.500	88.1	0.500	87.9	0.500	87.9	0.500	88.1
	3871	230	3982	230	4074	228	3780	219	3516	210	3290	201	3200
	34.3	266	36.0	287	37.7	307	40.3	305	43.0	302	45.5	300	46.6
110	79.5	0.417	84.5	0.458	88.8	0.500	88.6	0.500	88.6	0.500	89.0	0.500	89.3
	3933	230	4047	230	4144	228	3861	219	3622	210	3438	201	3356
	33.8	266	35.4	287	37.1	307	39.5	305	41.7	302	43.6	300	44.5
120	80.0	0.417	85.0	0.458	89.3	0.500	89.3	0.500	89.7	0.500	90.2	0.500	90.5
	4004	230	4121	230	4227	228	3969	219	3772	210	3604	201	3527
	33.2	266	34.8	287	36.3	307	38.4	305	40.1	302	41.6	300	42.3
130	80.7	0.417	85.5	0.458	89.9	0.500	90.2	0.500	90.7	0.500	91.4	0.500	
	4092	230	4213	230	4334	228	4119	219	3938	210	3779	201	
	32.5	266	34.0	287	35.4	307	37.0	305	38.4	302	39.7	300	
140	81.4	0.417	86.2	0.458	90.7	0.500	91.2	0.500					
	4197	230	4325	230	4483	228	4285	219					
	31.7	266	33.2	287	34.3	307	35.6	305					
150	82.3	0.417	86.9	0.458									
	4317	230	4452	230									
	30.8	266	32.2	287									

LANDING GEAR EXTENDED (cont'd)

FLIGHT PLANNING (ENROUTE) (cont.)

DESCENT

-The recommended descent speed is 230 kt / M 0.55.

DESCENT - 230KT / 0.55M - ALL ENGINES - GEAR DOWN					
IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG = 27.0 %		
MAXIMUM CABIN RATE OF DESCENT 350 FT/MIN					
FL	TIME (MIN)	FUEL (LB)	DIST. (NM)	EPR	IAS (KT)
290	15.5	701	59	IDLE	208
280	14.8	644	56	IDLE	213
270	14.1	585	52	IDLE	217
260	13.5	522	48	IDLE	222
250	12.8	455	45	IDLE	227
240	12.2	390	42	IDLE	230
220	11.3	320	36	IDLE	230
200	10.8	314	34	IDLE	230
180	10.4	307	31	IDLE	230
160	9.9	300	29	IDLE	230
140	9.4	292	27	IDLE	230
120	8.9	284	25	IDLE	230
100	8.4	275	22	IDLE	230
50	7.0	248	17	IDLE	230
10	6.0	226	13	IDLE	230

LANDING GEAR EXTENDED (cont'd)

FLIGHT PLANNING (ENROUTE) (cont.)

HOLDING

-The chart below represents holding parameters with slats out, this configuration being the least penalizing for holding.

RACE TRACK HOLDING PATTERN - S SPEED - ALL ENGINES - GEAR DOWN									
MAX CRUISE THRUST LIMITS CONFIGURATION 1 NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG = 27.0 %		%N1 FF (LB/H/ENG)		
WEIGHT (1000 LB)	FL 15	FL 50	FL100	FL120	FL140	FL150	FL160	FL180	FL200
90	55.9 2265	58.4 2189	63.1 2169	65.0 2192	67.0 2209	68.0 2210	68.9 2211	70.9 2212	72.6 2217
100	58.5 2464	61.5 2420	66.4 2461	68.3 2472	70.2 2474	71.2 2475	72.1 2477	73.8 2483	75.7 2490
110	61.2 2679	64.6 2688	69.3 2736	71.2 2738	73.1 2742	73.9 2746	74.8 2750	76.7 2757	78.8 2755
120	64.0 2941	67.4 2985	72.0 3006	73.8 3010	75.6 3019	76.5 3024	77.5 3027	79.6 3022	81.5 3033
130	66.6 3231	69.9 3269	74.4 3280	76.2 3289	78.0 3297	79.0 3295	80.1 3294	82.1 3308	83.8 3330
140	69.0 3531	72.2 3542	76.6 3560	78.5 3568	80.5 3567	81.6 3571	82.5 3582	84.2 3607	86.0 3633
150	71.2 3811	74.4 3819	78.8 3842	80.8 3843	82.8 3858	83.7 3875	84.5 3886	86.2 3911	88.0 3945

LANDING GEAR EXTENDED (cont'd)

FLIGHT PLANNING (ENROUTE) (cont.)

ENGINE FAILURE

GROSS DRIFTDOWN FLIGHT PROFILE - GEAR DOWN					
MAX CONTINUOUS THRUST LIMITS			20,000 FT. INITIAL ALTITUDE		
HIGH AIR CONDITIONING			CG = 27.0%		
ANTI-ICING OFF					
INITIAL WEIGHT (1000 LB)	LEVEL OFF WEIGHT (1000 LB)	OPTIMUM DRIFTDOWN SPEED (KIAS)	GROSS LEVEL OFF ALTITUDE (FEET)		
			ISA + 10°C AND BELOW	ISA + 15°C	ISA + 20°C
150	142.9	216	3,800	1,700	
140	132.9	207	7,500	5,700	3,700
130	124	198	10,800	9,400	7,600
120	115.2	189	13,800	12,900	11,600
110	106.8	180	16,300	15,700	14,900
100	97.7	171	18,300	17,600	17,100
90	88.9	162	20,000	20,000	19,600

FLIGHT PLANNING (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 25,000 lbs. (Dispatchers)

End of Section

