

# Performance Dispatch

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## Section 10

### 777-200LR GE90-115BL KG FAA

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Performance Dispatch 777-200LR

Chapter PD

Takeoff

Section 10

Minimum Takeoff Weight

Weight Limit (1000 KG)

Flaps 15

Based on engine bleed for packs on and anti-ice off.

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)								
	S.L. & BELOW	1000	2000	3000	4000	5000	6000	7000	8000 & ABOVE
50	162.8	157.0							
45	172.8	165.9	158.8						
40	182.7	175.7	168.7	162.0	155.3				
35	192.4	184.9	176.9	169.6	162.6	155.9			
30	199.2	191.1	183.6	176.2	168.9	161.6			
25	199.3	193.8	188.0	181.1	174.0	167.8	159.6		
20	199.5	194.0	188.1	182.1	176.2	170.5	163.2	155.7	
15	199.7	194.1	188.2	182.2	176.3	170.6	164.2	157.6	
10	199.8	194.3	188.4	182.4	176.5	170.7	164.3	157.7	
0 & BELOW	200.1	194.5	188.7	182.7	176.7	170.9	164.5	157.9	

Light weight takeoffs at the GE90-115BL thrust rating may be limited by minimum takeoff weight in order to maintain airplane controllability during takeoff. For takeoff at weights below the minimum takeoff weight, use of a lower thrust rating and/or the assumed temperature method of thrust reduction is required.

Takeoff Field Corrections - Dry Runway  
Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1250	1240	1220	1210	1200	1190	1180	1160	1150
1400	1470	1450	1430	1420	1400	1380	1350	1330	1310
1600	1690	1670	1640	1620	1600	1570	1530	1500	1470
1800	1910	1880	1850	1830	1800	1760	1710	1670	1620
2000	2120	2090	2060	2030	2000	1950	1890	1840	1780
2200	2340	2310	2270	2240	2200	2130	2070	2000	1940
2400	2560	2520	2480	2440	2400	2320	2250	2170	2100
2600	2780	2730	2690	2640	2600	2510	2430	2340	2250
2800	3000	2950	2900	2850	2800	2700	2610	2510	2410
3000	3220	3160	3110	3050	3000	2890	2780	2680	2570
3200	3440	3380	3320	3260	3200	3080	2960	2850	2730
3400	3650	3590	3530	3460	3400	3270	3140	3010	2890
3600	3870	3800	3740	3670	3600	3460	3320	3180	3040
3800	4090	4020	3950	3870	3800	3650	3500	3350	3200
4000	4310	4230	4160	4080	4000	3840	3680	3520	3360
4200	4530	4450	4360	4280	4200	4030	3860	3690	3520
4400	4750	4660	4570	4490	4400	4220	4040	3860	3670
4600	4970	4870	4780	4690	4600	4410	4220	4020	3830
4800	5180	5090	4990	4900	4800	4600	4390	4190	3990
5000	5400	5300	5200	5100	5000	4790	4570	4360	4150

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	890	990	1100	1200	1270	1350	1430	1510
1400	1060	1170	1290	1400	1480	1560	1650	1740
1600	1220	1350	1470	1600	1690	1770	1870	1960
1800	1390	1530	1660	1800	1890	1990	2080	2180
2000	1550	1700	1850	2000	2100	2200	2300	2400
2200	1720	1880	2040	2200	2300	2410	2520	2630
2400	1890	2060	2230	2400	2510	2620	2730	2850
2600	2050	2230	2420	2600	2710	2830	2950	3070
2800	2220	2410	2610	2800	2920	3040	3170	3300
3000	2380	2590	2790	3000	3130	3250	3380	3520
3200	2550	2770	2980	3200	3330	3460	3600	3740
3400	2710	2940	3170	3400	3540	3680	3820	3970
3600	2880	3120	3360	3600	3740	3890	4040	4190
3800	3050	3300	3550	3800	3950	4100	4250	4410
4000	3210	3470	3740	4000	4150	4310	4470	4630
4200	3380	3650	3930	4200	4360	4520	4690	4860
4400	3540	3830	4110	4400	4560	4730	4900	5080
4600	3710	4010	4300	4600	4770	4940	5120	5300
4800	3880	4180	4490	4800	4980	5150	5340	5530
5000	4040	4360	4680	5000	5180	5370	5560	5750

**Takeoff Field & Climb Limit Weights - Dry Runway****Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1730	289.3	262.7	260.9	259.2	257.5	255.9	254.2	243.1	236.3	229.3	222.3
1800	295.9	268.7	266.9	265.1	263.4	261.7	260.1	248.7	241.7	234.6	227.4
2000	311.9	283.6	281.7	279.9	278.1	276.3	274.6	262.7	255.5	248.0	240.6
2200	326.9	297.5	295.6	293.7	291.8	290.0	288.2	275.8	268.3	260.6	252.9
2400	341.5	310.9	308.9	306.9	305.0	303.1	301.3	288.5	280.7	272.7	264.6
2600	357.1	325.3	323.2	321.1	319.1	317.1	315.2	301.9	293.8	285.4	277.0
2800	370.8	337.8	335.6	333.5	331.4	329.3	327.3	313.5	305.1	296.4	287.7
3000	378.7	348.2	345.9	343.7	341.6	339.5	337.4	323.1	314.4	305.5	296.5
3200	378.7	358.2	355.9	353.6	351.4	349.2	347.1	332.4	323.5	314.2	305.0
3400	378.7	367.7	365.3	363.0	360.7	358.5	356.3	341.3	332.1	322.6	313.2
3600	378.7	376.8	374.4	372.0	369.7	367.4	365.2	349.8	340.4	330.7	321.0
3800	378.7	378.7	378.7	378.7	378.1	375.7	373.5	357.7	348.2	338.3	328.4
4000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	365.4	355.7	345.6	335.5
4200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	373.0	363.0	352.8	342.5
4400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	370.2	359.8	349.4
4600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	377.3	366.7	356.1
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	373.5	362.7
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	369.2
CLIMB LIMIT WT (1000 KG)	364.6	364.6	364.5	364.4	364.3	364.1	364.0	337.3	322.4	307.6	292.9

**2000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1730	272.3	246.7	245.1	243.6	242.1	240.6	236.3	225.6	219.3	212.3	205.1
1800	278.6	252.4	250.7	249.2	247.6	246.1	241.7	230.8	224.3	217.1	209.8
2000	293.9	266.6	264.9	263.2	261.6	260.0	255.4	244.1	237.3	229.9	222.2
2200	308.2	279.8	278.1	276.4	274.7	273.1	268.3	256.5	249.5	241.7	233.8
2400	322.0	292.6	290.8	289.0	287.3	285.6	280.6	268.5	261.1	253.1	244.9
2600	336.9	306.2	304.3	302.5	300.6	298.9	293.7	281.0	273.4	265.0	256.4
2800	349.8	318.0	316.0	314.1	312.2	310.4	305.0	291.9	283.9	275.2	266.3
3000	360.6	327.8	325.7	323.7	321.8	319.9	314.4	300.8	292.6	283.7	274.5
3200	370.9	337.2	335.1	333.0	331.0	329.1	323.4	309.4	301.0	291.8	282.3
3400	378.7	346.2	344.0	341.9	339.9	337.9	332.0	317.7	309.1	299.6	289.9
3600	378.7	354.8	352.6	350.4	348.3	346.3	340.3	325.7	316.8	307.1	297.2
3800	378.7	362.8	360.6	358.4	356.3	354.2	348.1	333.1	324.1	314.2	304.1
4000	378.7	370.6	368.3	366.1	363.9	361.8	355.6	340.3	331.2	321.1	310.8
4200	378.7	378.2	375.9	373.7	371.4	369.3	363.0	347.4	338.1	327.8	317.3
4400	378.7	378.7	378.7	378.7	378.7	376.6	370.2	354.4	344.9	334.5	323.8
4600	378.7	378.7	378.7	378.7	378.7	378.7	377.2	361.2	351.6	341.0	330.1
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	367.9	358.1	347.3	336.3
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	374.4	364.5	353.6	342.4
CLIMB LIMIT WT (1000 KG)	344.2	344.3	344.1	344.0	343.8	343.7	334.2	311.4	297.9	283.0	269.5

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1750 kg.

With engine and wing anti-ice on, decrease field limit weight by 1850 kg and climb limit weight by 2250 kg.

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 15

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1730	251.7	230.9	229.4	228.0	226.6	223.3	219.1	208.9	202.3	195.4	189.3
1800	257.5	236.2	234.7	233.2	231.8	228.4	224.1	213.7	206.9	199.9	193.7
2000	271.9	249.7	248.2	246.6	245.1	241.6	237.1	226.3	219.2	211.9	205.4
2200	285.4	262.4	260.7	259.2	257.6	254.0	249.3	238.0	230.7	223.1	216.4
2400	298.4	274.5	272.8	271.2	269.5	265.8	260.9	249.3	241.6	233.7	226.8
2600	312.2	287.3	285.6	283.8	282.1	278.2	273.1	261.0	253.1	244.8	237.6
2800	324.2	298.4	296.6	294.8	293.0	289.0	283.7	271.1	262.9	254.3	246.8
3000	334.2	307.5	305.7	303.8	302.0	297.8	292.4	279.4	270.9	262.0	254.3
3200	343.8	316.3	314.4	312.5	310.6	306.3	300.7	287.4	278.6	269.5	261.6
3400	352.9	324.8	322.8	320.9	318.9	314.5	308.8	295.1	286.1	276.8	268.6
3600	361.7	332.9	330.9	328.9	326.9	322.4	316.5	302.5	293.3	283.8	275.4
3800	369.9	340.5	338.5	336.4	334.4	329.8	323.8	309.5	300.1	290.4	281.9
4000	377.8	347.9	345.8	343.7	341.7	337.0	330.9	316.3	306.7	296.8	288.1
4200	378.7	355.1	353.0	350.9	348.8	344.0	337.8	322.9	313.2	303.1	294.3
4400	378.7	362.2	360.0	357.9	355.7	350.9	344.6	329.5	319.6	309.3	300.3
4600	378.7	369.1	366.9	364.7	362.6	357.7	351.2	335.9	325.9	315.4	306.3
4800	378.7	375.9	373.7	371.5	369.3	364.3	357.8	342.2	332.0	321.4	312.1
5000	378.7	378.7	378.7	378.1	375.8	370.8	364.2	348.4	338.1	327.3	317.9
CLIMB LIMIT WT (1000 KG)	320.7	320.7	320.6	320.6	320.4	315.2	307.2	286.5	273.8	260.6	249.3

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1730	234.7	215.3	213.9	212.6	210.0	205.9	200.8	191.4	185.5	179.8	174.3
1800	240.1	220.2	218.8	217.4	214.8	210.6	205.4	195.8	189.8	183.9	178.4
2000	253.8	233.1	231.6	230.2	227.4	223.0	217.6	207.6	201.3	195.3	189.4
2200	266.6	245.1	243.6	242.1	239.2	234.7	229.1	218.6	212.1	205.9	199.8
2400	278.9	256.6	255.0	253.4	250.5	245.8	240.0	229.1	222.4	215.9	209.6
2600	291.9	268.6	267.0	265.4	262.3	257.3	251.3	240.0	233.0	226.2	219.6
2800	303.1	279.0	277.3	275.6	272.4	267.3	261.0	249.3	242.1	235.0	228.2
3000	312.4	287.5	285.8	284.1	280.7	275.5	269.0	256.9	249.4	242.1	235.1
3200	321.4	295.8	294.0	292.2	288.8	283.4	276.7	264.3	256.5	249.1	241.9
3400	330.0	303.7	301.9	300.0	296.5	291.0	284.1	271.4	263.5	255.8	248.4
3600	338.2	311.3	309.4	307.6	304.0	298.3	291.3	278.3	270.1	262.3	254.7
3800	345.9	318.5	316.6	314.7	311.0	305.2	298.1	284.7	276.5	268.4	260.7
4000	353.4	325.4	323.5	321.5	317.8	311.9	304.6	291.1	282.6	274.4	266.6
4200	360.7	332.3	330.3	328.3	324.5	318.5	311.1	297.3	288.7	280.3	272.3
4400	367.9	339.0	336.9	334.9	331.1	324.9	317.4	303.4	294.6	286.2	278.0
4600	374.9	345.5	343.5	341.4	337.5	331.3	323.6	309.4	300.5	291.9	283.6
4800	378.7	352.0	349.9	347.8	343.8	337.5	329.8	315.3	306.3	297.6	289.2
5000	378.7	358.3	356.2	354.0	350.0	343.6	335.8	321.1	312.0	303.1	294.6
CLIMB LIMIT WT (1000 KG)	297.9	297.9	297.9	297.8	294.4	287.6	278.6	261.8	250.8	240.1	230.1

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1750 kg.

With engine and wing anti-ice on, decrease field limit weight by 1850 kg and climb limit weight by 2250 kg.

**Takeoff Field & Climb Limit Weights - Dry Runway****Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1730	217.3	198.2	196.9	194.3	190.7	186.1	181.9	172.4	167.2	162.0	157.0
1800	222.3	202.8	201.4	198.8	195.1	190.4	186.1	176.4	171.0	165.8	160.6
2000	235.2	214.9	213.5	210.8	206.9	202.0	197.5	187.4	181.8	176.4	171.0
2200	247.3	226.2	224.7	221.9	217.9	212.8	208.2	197.7	191.9	186.2	180.6
2400	258.9	237.0	235.4	232.6	228.4	223.1	218.3	207.4	201.4	195.5	189.7
2600	271.0	248.2	246.6	243.6	239.2	233.8	228.7	217.4	211.1	205.0	198.9
2800	281.5	257.9	256.2	253.0	248.5	242.8	237.6	225.8	219.3	213.0	206.7
3000	290.1	265.7	264.0	260.7	256.1	250.2	244.8	232.7	225.9	219.4	212.9
3200	298.4	273.3	271.5	268.2	263.4	257.4	251.8	239.3	232.4	225.7	219.0
3400	306.4	280.7	278.8	275.4	270.5	264.3	258.6	245.8	238.7	231.8	225.0
3600	314.1	287.8	285.9	282.4	277.3	271.0	265.2	252.1	244.8	237.7	230.7
3800	321.3	294.5	292.5	289.0	283.8	277.3	271.4	258.0	250.6	243.4	236.3
4000	328.3	300.9	299.0	295.3	290.1	283.5	277.4	263.8	256.3	248.9	241.6
4200	335.2	307.3	305.3	301.6	296.3	289.6	283.4	269.5	261.8	254.4	247.0
4400	341.9	313.6	311.6	307.8	302.4	295.6	289.3	275.2	267.4	259.8	252.2
4600	348.5	319.8	317.7	313.9	308.4	301.5	295.1	280.7	272.8	265.1	257.4
4800	355.0	325.8	323.7	319.9	314.2	307.3	300.8	286.2	278.2	270.3	262.6
5000	361.4	331.8	329.7	325.7	320.0	312.9	306.4	291.6	283.5	275.5	267.7
CLIMB LIMIT WT (1000 KG)	273.8	273.9	273.7	270.6	264.7	256.7	249.5	232.4	222.5	213.2	204.0

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1750 kg.

With engine and wing anti-ice on, decrease field limit weight by 1850 kg and climb limit weight by 2250 kg.

Takeoff Field Corrections - Wet Runway  
Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1250	1230	1220	1210	1200	1190	1170	1160	1150
1400	1470	1450	1430	1420	1400	1380	1360	1340	1320
1600	1690	1670	1640	1620	1600	1570	1550	1520	1490
1800	1910	1880	1850	1830	1800	1770	1730	1700	1660
2000	2130	2100	2060	2030	2000	1960	1920	1880	1840
2200	2350	2310	2270	2240	2200	2150	2100	2060	2010
2400	2570	2530	2480	2440	2400	2350	2290	2240	2180
2600	2790	2740	2690	2650	2600	2540	2480	2420	2350
2800	3010	2960	2900	2850	2800	2730	2660	2600	2530
3000	3230	3170	3120	3060	3000	2930	2850	2780	2700
3200	3450	3390	3330	3260	3200	3120	3040	2950	2870
3400	3670	3600	3540	3470	3400	3310	3220	3130	3050
3600	3890	3820	3750	3670	3600	3500	3410	3310	3220
3800	4110	4030	3960	3880	3800	3700	3600	3490	3390
4000	4330	4250	4170	4080	4000	3890	3780	3670	3560
4200	4550	4460	4380	4290	4200	4080	3970	3850	3740
4400	4770	4680	4590	4490	4400	4280	4150	4030	3910
4600	4990	4900	4800	4700	4600	4470	4340	4210	4080
4800	5210	5110	5010	4900	4800	4660	4530	4390	4250
5000	5430	5330	5220	5110	5000	4860	4710	4570	4430

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	860	980	1090	1200	1280	1350	1430	1500
1400	1030	1150	1280	1400	1480	1560	1640	1720
1600	1200	1330	1470	1600	1690	1770	1860	1940
1800	1360	1510	1650	1800	1890	1980	2070	2160
2000	1530	1690	1840	2000	2100	2190	2290	2380
2200	1700	1860	2030	2200	2300	2400	2500	2600
2400	1860	2040	2220	2400	2510	2610	2720	2820
2600	2030	2220	2410	2600	2710	2820	2930	3040
2800	2200	2400	2600	2800	2920	3030	3150	3260
3000	2360	2580	2790	3000	3120	3240	3360	3480
3200	2530	2750	2980	3200	3330	3450	3580	3700
3400	2700	2930	3170	3400	3530	3660	3790	3920
3600	2860	3110	3350	3600	3740	3870	4010	4140
3800	3030	3290	3540	3800	3940	4080	4220	4360
4000	3200	3460	3730	4000	4150	4290	4440	4580
4200	3360	3640	3920	4200	4350	4500	4650	4800
4400	3530	3820	4110	4400	4560	4710	4870	5020
4600	3700	4000	4300	4600	4760	4920	5080	5240
4800	3860	4180	4490	4800	4970	5130	5300	5460
5000	4030	4350	4680	5000	5170	5340	5510	5680



Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 15

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
2300	330.9	298.8	296.7	294.6	292.6	290.7	288.9	275.6	267.6	259.4	251.3
2400	339.4	306.6	304.4	302.3	300.3	298.3	296.5	282.8	274.6	266.2	257.9
2600	355.8	321.1	318.8	316.6	314.5	312.4	310.4	296.0	287.4	278.5	269.8
2800	370.3	334.0	331.6	329.3	327.0	324.9	322.8	307.7	298.7	289.4	280.2
3000	378.7	345.1	342.6	340.2	337.8	335.6	333.4	317.7	308.3	298.7	289.1
3200	378.7	356.1	353.5	351.0	348.5	346.2	343.9	327.6	317.8	307.8	297.8
3400	378.7	366.7	364.1	361.4	358.9	356.5	354.2	337.2	327.1	316.6	306.3
3600	378.7	377.0	374.3	371.6	369.0	366.5	364.0	346.5	336.0	325.3	314.6
3800	378.7	378.7	378.7	378.7	378.5	376.0	373.5	355.5	344.7	333.6	322.6
4000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	364.2	353.1	341.8	330.5
4200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.7	361.3	349.7	338.1
4400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	369.3	357.4	345.6
4600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	377.2	365.0	352.9
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.3	360.0
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	366.9
5200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	373.6
5400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7
5600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7
CLIMB LIMIT WT (1000 KG)	364.6	364.6	364.5	364.4	364.3	364.1	364.0	337.3	322.4	307.6	292.9

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
2300	308.9	279.7	277.9	276.0	274.2	272.5	267.4	254.9	247.5	239.5	232.1
2400	316.9	287.1	285.2	283.3	281.4	279.7	274.4	261.6	254.1	245.9	238.3
2600	332.1	300.5	298.5	296.5	294.6	292.7	287.2	273.7	265.7	257.1	249.0
2800	345.5	312.4	310.3	308.3	306.2	304.2	298.5	284.3	276.0	266.9	258.5
3000	357.0	322.7	320.5	318.3	316.2	314.1	308.1	293.4	284.7	275.3	266.5
3200	368.5	332.7	330.4	328.2	326.0	323.8	317.6	302.3	293.3	283.4	274.3
3400	378.7	342.5	340.1	337.8	335.5	333.3	326.8	310.9	301.6	291.4	281.9
3600	378.7	352.0	349.6	347.1	344.8	342.5	335.8	319.4	309.7	299.2	289.4
3800	378.7	361.1	358.6	356.1	353.7	351.3	344.4	327.5	317.6	306.8	296.7
4000	378.7	370.0	367.4	364.8	362.3	359.9	352.9	335.5	325.3	314.2	303.9
4200	378.7	378.6	375.9	373.3	370.8	368.3	361.1	343.3	332.9	321.5	310.9
4400	378.7	378.7	378.7	378.7	378.7	376.5	369.1	350.9	340.2	328.6	317.7
4600	378.7	378.7	378.7	378.7	378.7	378.7	376.9	358.3	347.4	335.5	324.4
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	365.5	354.4	342.2	330.9
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.5	361.1	348.8	337.2
5200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	367.7	355.1	343.4
5400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	374.2	361.3	349.4
5600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	367.4	355.2
CLIMB LIMIT WT (1000 KG)	344.2	344.3	344.1	344.0	343.8	343.7	334.2	311.4	297.9	283.0	269.5

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.  
With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1750 kg.  
With engine and wing anti-ice on, decrease field limit weight by 2150 kg and climb limit weight by 2250 kg.

**Takeoff Field & Climb Limit Weights - Wet Runway**

**Flaps 15**

**4000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
2300	285.7	261.0	259.2	257.6	255.9	252.1	247.1	235.6	228.8	221.6	215.3
2400	293.2	267.9	266.1	264.4	262.6	258.7	253.7	241.9	234.9	227.6	221.1
2600	307.0	280.2	278.4	276.6	274.7	270.6	265.2	252.9	245.5	237.7	230.9
2800	319.2	291.2	289.2	287.3	285.4	281.1	275.5	262.5	254.7	246.6	239.5
3000	329.7	300.5	298.5	296.5	294.5	290.0	284.2	270.7	262.6	254.2	246.8
3200	340.0	309.7	307.6	305.5	303.5	298.8	292.7	278.6	270.2	261.5	253.7
3400	350.1	318.6	316.4	314.3	312.2	307.3	301.0	286.4	277.7	268.6	260.6
3600	359.9	327.3	325.1	322.8	320.6	315.6	309.1	294.0	285.0	275.6	267.4
3800	369.2	335.7	333.4	331.1	328.9	323.7	317.0	301.5	292.2	282.6	274.1
4000	378.3	343.9	341.5	339.2	336.9	331.6	324.7	308.8	299.3	289.4	280.7
4200	378.7	351.9	349.5	347.1	344.7	339.3	332.2	315.9	306.2	296.0	287.1
4400	378.7	359.7	357.2	354.8	352.3	346.8	339.5	322.9	312.9	302.5	293.4
4600	378.7	367.3	364.7	362.2	359.7	354.1	346.7	329.7	319.5	308.8	299.5
4800	378.7	374.7	372.1	369.5	367.0	361.2	353.7	336.3	325.9	315.0	305.5
5000	378.7	378.7	378.7	376.6	374.0	368.1	360.4	342.7	332.1	321.0	311.3
5200	378.7	378.7	378.7	378.7	378.7	374.9	367.0	349.0	338.2	326.9	317.0
5400	378.7	378.7	378.7	378.7	378.7	378.7	373.4	355.1	344.1	332.6	322.5
5600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	361.0	349.8	338.2	327.9
CLIMB LIMIT WT (1000 KG)	320.7	320.7	320.6	320.6	320.4	315.2	307.2	286.5	273.8	260.6	249.3

**6000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
2300	265.6	242.6	241.0	239.4	236.5	232.1	226.9	217.1	211.0	205.1	199.4
2400	272.6	249.1	247.4	245.8	242.8	238.4	233.0	222.9	216.7	210.7	204.8
2600	285.3	260.4	258.7	257.0	253.8	249.1	243.4	232.8	226.2	219.9	213.7
2800	296.4	270.4	268.6	266.8	263.4	258.6	252.6	241.5	234.6	227.9	221.5
3000	306.0	278.9	277.0	275.2	271.7	266.6	260.4	248.8	241.7	234.7	228.0
3200	315.4	287.2	285.3	283.3	279.7	274.4	267.9	255.9	248.5	241.2	234.2
3400	324.5	295.3	293.3	291.3	287.5	282.0	275.3	262.8	255.1	247.6	240.4
3600	333.4	303.2	301.1	299.0	295.1	289.5	282.5	269.7	261.7	253.9	246.4
3800	342.0	310.9	308.8	306.7	302.6	296.8	289.7	276.4	268.2	260.2	252.6
4000	350.4	318.5	316.3	314.1	310.0	304.0	296.7	283.1	274.7	266.5	258.6
4200	358.5	325.9	323.6	321.3	317.1	311.0	303.5	289.6	281.0	272.6	264.5
4400	366.5	333.0	330.7	328.4	324.1	317.8	310.2	295.9	287.1	278.5	270.2
4600	374.2	340.0	337.7	335.3	330.9	324.5	316.7	302.1	293.1	284.3	275.9
4800	378.7	346.9	344.5	342.1	337.6	331.0	323.0	308.2	298.9	290.0	281.4
5000	378.7	353.5	351.1	348.6	344.0	337.3	329.2	314.0	304.6	295.5	286.7
5200	378.7	360.0	357.5	355.0	350.3	343.5	335.2	319.8	310.2	300.9	291.9
5400	378.7	366.3	363.7	361.2	356.4	349.5	341.0	325.4	315.6	306.1	297.0
5600	378.7	372.4	369.8	367.2	362.4	355.3	346.7	330.8	320.9	311.3	302.0
CLIMB LIMIT WT (1000 KG)	297.9	297.9	297.9	297.8	294.4	287.6	278.6	261.8	250.8	240.1	230.1

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1750 kg.

With engine and wing anti-ice on, decrease field limit weight by 2150 kg and climb limit weight by 2250 kg.

**Takeoff Field & Climb Limit Weights - Wet Runway****Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
2300	245.4	224.1	222.6	219.9	216.1	211.4	207.0	197.1	191.7	186.4	181.2
2400	251.9	230.1	228.6	225.9	221.9	217.1	212.6	202.5	196.9	191.5	186.2
2600	263.4	240.4	238.8	235.9	231.8	226.6	221.9	211.3	205.4	199.6	194.0
2800	273.5	249.5	247.8	244.7	240.4	235.0	230.0	218.9	212.7	206.7	200.9
3000	282.1	257.1	255.4	252.2	247.7	242.1	236.9	225.3	218.9	212.7	206.6
3200	290.6	264.5	262.7	259.4	254.7	248.9	243.5	231.4	224.8	218.3	211.9
3400	298.8	271.8	269.9	266.5	261.6	255.6	250.0	237.5	230.5	223.8	217.2
3600	306.8	278.9	276.9	273.4	268.4	262.1	256.4	243.4	236.3	229.3	222.5
3800	314.6	285.9	283.9	280.3	275.1	268.7	262.8	249.5	242.1	235.0	227.9
4000	322.3	292.8	290.8	287.0	281.7	275.2	269.1	255.4	247.9	240.5	233.3
4200	329.7	299.6	297.4	293.6	288.2	281.5	275.2	261.2	253.5	246.0	238.6
4400	337.0	306.1	304.0	300.1	294.5	287.6	281.2	266.9	259.0	251.3	243.8
4600	344.1	312.6	310.3	306.4	300.7	293.6	287.1	272.5	264.4	256.5	248.8
4800	351.0	318.8	316.5	312.5	306.7	299.5	292.8	277.9	269.6	261.6	253.7
5000	357.8	324.9	322.6	318.5	312.5	305.2	298.4	283.2	274.8	266.6	258.6
5200	364.3	330.8	328.5	324.3	318.2	310.8	303.8	288.4	279.8	271.4	263.3
5400	370.7	336.6	334.2	329.9	323.8	316.2	309.1	293.4	284.6	276.2	267.9
5600	376.8	342.2	339.8	335.4	329.2	321.5	314.3	298.3	289.4	280.8	272.3
CLIMB LIMIT WT (1000 KG)	273.8	273.9	273.7	270.6	264.7	256.7	249.5	232.4	222.5	213.2	204.0

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1750 kg.

With engine and wing anti-ice on, decrease field limit weight by 2150 kg and climb limit weight by 2250 kg.

## Takeoff Obstacle Limit Weight

### Flaps 15

Sea Level, 33°C & Below, Zero Wind

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or Auto

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	302.7	328.0	352.3	369.5							
20	282.9	306.1	325.3	342.5	357.8	368.1					
40	261.7	284.9	303.2	318.9	332.6	345.7	355.9	363.4	369.3	374.2	
60	245.0	267.4	286.7	302.7	316.1	327.5	337.5	347.5	354.7	360.6	365.6
80	231.1	253.4	273.0	289.2	302.6	314.0	323.9	332.5	340.5	347.8	354.0
100	219.4	241.8	261.0	277.3	291.0	302.5	312.4	321.1	328.8	335.7	342.2
120	209.6	231.7	250.4	266.6	280.5	292.2	302.3	311.1	318.9	325.8	332.1
140		222.6	241.0	257.0	270.8	282.8	293.1	302.1	310.0	317.1	323.4
160		214.4	232.6	248.3	262.0	274.1	284.7	293.8	301.9	309.1	315.5
180		207.0	224.8	240.4	254.0	266.1	276.7	286.1	294.3	301.6	308.2
200			217.7	233.1	246.6	258.6	269.3	278.8	287.2	294.7	301.4
220			211.2	226.4	239.8	251.7	262.4	271.9	280.5	288.1	295.0
240			205.1	220.1	233.4	245.3	255.9	265.5	274.1	281.9	288.8
260			199.4	214.2	227.4	239.2	249.8	259.4	268.0	275.9	283.0
280				208.7	221.8	233.5	244.1	253.7	262.3	270.2	277.4
300				203.6	216.5	228.2	238.7	248.2	256.9	264.8	272.1

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

### OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
30 & BELOW	0	0	0	0	0	0	0
32	-2.5	-3.3	-4.0	-4.8	-5.6	-6.4	-7.2
34	-5.0	-6.5	-8.1	-9.7	-11.2	-12.8	-14.4
36	-7.4	-9.8	-12.1	-14.5	-16.8	-19.2	-21.5
38	-9.9	-13.0	-16.2	-19.3	-22.4	-25.6	-28.7
40	-12.4	-16.3	-20.2	-24.1	-28.1	-32.0	-35.9
42	-15.7	-20.4	-25.1	-29.7	-34.4	-39.1	-43.7
44	-19.1	-24.5	-29.9	-35.3	-40.8	-46.2	-51.6
46	-22.4	-28.6	-34.7	-40.9	-47.1	-53.3	-59.5
48	-25.7	-32.6	-39.6	-46.5	-53.5	-60.4	-67.3
50	-29.0	-36.7	-44.4	-52.1	-59.8	-67.5	-75.2

### Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
S.L. & BELOW	0	0	0	0	0	0	0
1000	-6.9	-8.5	-10.1	-11.6	-13.2	-14.8	-16.3
2000	-13.9	-17.0	-20.1	-23.3	-26.4	-29.6	-32.7
3000	-19.7	-24.2	-28.8	-33.4	-38.0	-42.5	-47.1
4000	-25.4	-31.4	-37.5	-43.5	-49.5	-55.5	-61.5
5000	-32.1	-39.6	-47.0	-54.5	-62.0	-69.5	-77.0
6000	-38.7	-47.7	-56.6	-65.6	-74.5	-83.5	-92.4
7000	-44.8	-55.3	-65.9	-76.5	-87.1	-97.7	-108.2
8000	-50.8	-63.0	-75.2	-87.4	-99.6	-111.8	-124.0

Takeoff Obstacle Limit Weight

Flaps 15

Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
15 TW	-36.1	-35.8	-35.4	-35.1	-34.7	-34.4	-34.0
10 TW	-24.1	-23.8	-23.6	-23.4	-23.1	-22.9	-22.7
5 TW	-12.0	-11.9	-11.8	-11.7	-11.6	-11.5	-11.3
0	0	0	0	0	0	0	0
10 HW	4.3	3.9	3.6	3.3	3.0	2.6	2.3
20 HW	8.6	7.9	7.2	6.6	5.9	5.3	4.6
30 HW	13.2	12.1	11.1	10.0	8.9	7.9	6.8
40 HW	17.8	16.3	14.9	13.4	11.9	10.4	9.0

With engine bleed for packs off, increase weight by 900 kg.

With engine and wing anti-ice on, decrease weight by 2400 kg.

Tire Speed Limit

Flaps 15

AIRPORT OAT		TIRE SPEED LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	378.7	365.2	330.4	305.8	283.4
52	126	378.7	367.2	332.4	307.6	285.0
50	122	378.7	369.2	334.5	309.3	286.6
48	118	378.7	371.3	336.6	311.1	288.3
46	115	378.7	373.3	338.7	312.9	290.0
44	111	378.7	375.2	340.9	314.7	291.6
42	108	378.7	377.5	350.8	316.5	293.4
40	104	378.7	378.7	352.8	318.3	295.1
38	100	378.7	378.7	354.8	320.2	296.8
36	97	378.7	378.7	356.9	322.2	298.6
34	93	378.7	378.7	358.9	324.1	300.4
32	90	378.7	378.7	360.8	325.9	302.1
30	86	378.7	378.7	362.7	327.7	303.7
28	82	378.7	378.7	364.6	329.6	305.4
26	79	378.7	378.7	366.7	331.6	307.1
24	75	378.7	378.7	368.7	333.6	308.8
22	72	378.7	378.7	370.9	335.8	310.5
20	68	378.7	378.7	373.2	338.0	312.3
18	64	378.7	378.7	375.4	340.6	314.1
16	61	378.7	378.7	377.7	350.3	316.0
14	57	378.7	378.7	378.7	352.5	317.9
12	54	378.7	378.7	378.7	354.7	320.0
10	50	378.7	378.7	378.7	356.9	322.0
-40	-40	378.7	378.7	378.7	378.7	378.7

Increase tire speed limit weight by 2450 kg per knot headwind.

Decrease tire speed limit weight by 5600 kg per knot tailwind.

**Takeoff Speeds - Dry Runway**

**Flaps 15**

**V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 KG)	KIAS		
	V1	VR	V2
360	166	174	179
340	162	170	176
320	156	164	172
300	150	158	167
280	144	151	162
260	137	144	156
240	129	137	151
220	121	130	145
200	112	122	139
180	102	113	132
160	91	104	125
140	83	94	118

Check V1(MCG), Minimum V2, and Minimum Takeoff Weight.

**V1, VR, V2 Adjustments\***

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	13	16					7	8					-3	-3				
60	140	9	11	14	16			5	6	7	9			-2	-2	-3	-3		
50	122	5	7	9	12	15	19	3	4	5	7	8	10	-1	-1	-2	-2	-3	-3
40	104	2	3	6	8	11	16	1	2	3	5	6	9	0	-1	-1	-2	-2	-3
30	86	0	0	3	6	9	13	0	0	2	3	5	7	0	0	-1	-1	-2	-2
20	68	0	0	2	4	7	10	0	0	1	2	4	6	0	0	0	-1	-1	-2
-60	-76	0	0	2	4	6	9	0	0	1	2	4	5	0	0	0	-1	-1	-2

**Slope and Wind V1 Adjustments\***

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
360	-4	-2	0	3	6		-3	-2	0	0	1	3	3	4
340	-4	-1	0	3	5		-2	-1	0	0	1	2	3	4
320	-3	-1	0	3	5		-2	-1	0	0	1	2	3	3
300	-3	-1	0	3	4		-2	-1	0	0	1	2	3	3
280	-2	-1	0	3	4		-2	-1	0	0	1	2	3	3
260	-2	-1	0	3	4		-1	-1	0	0	1	2	3	3
240	-2	0	0	3	4		-1	0	0	0	1	2	3	3
220	-2	0	0	3	4		-1	0	0	0	1	2	3	3
200	-1	0	0	3	4		-1	0	1	0	1	2	3	3
180	-1	0	0	3	4		-1	0	1	0	1	2	3	4
160	-1	0	0	3	4		-1	0	1	0	1	3	3	4
140	-1	0	0	3	4		-1	0	1	0	1	3	4	4

\*V1 not to exceed VR

Takeoff Speeds - Dry Runway  
Flaps 15  
V1(MCG)  
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	127	123	120	118		
50	122	130	127	121	118	116	111
40	104	138	135	129	123	117	111
30	86	141	141	135	129	123	116
20	68	142	141	137	132	127	120
-60	-76	143	143	138	133	128	122

Minimum V2  
Max Takeoff Thrust

PRESSURE ALTITUDE (FT)	-2000	0	2000	4000	6000	8000
SPEED (KIAS)	138	135	132	129	127	124

Takeoff Speeds - Wet Runway  
Flaps 15  
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	KIAS		
	V1	VR	V2
360	157	174	179
340	153	170	176
320	146	164	172
300	139	158	167
280	132	151	162
260	124	144	156
240	116	137	151
220	109	130	145
200	99	122	139
180	90	113	132
160	80	104	125
140	70	94	118

Check V1(MCG), Minimum V2, and Minimum Takeoff Weight.

V1, VR, V2 Adjustment\*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	16	18					7	8					-3	-3				
60	140	11	13	15	18			5	6	7	9			-2	-2	-3	-3		
50	122	6	8	11	13	16	20	3	4	5	7	8	10	-1	-1	-2	-2	-3	-3
40	104	2	4	7	9	13	17	1	2	3	5	6	9	0	-1	-1	-2	-2	-3
30	86	0	0	3	6	10	14	0	0	2	3	5	7	0	0	-1	-1	-2	-2
20	68	0	0	2	5	7	11	0	0	1	2	4	6	0	0	0	-1	-1	-2
-60	-76	0	0	2	5	7	10	0	0	1	2	4	5	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustment\*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
360	-6	-3	0	3	6		-4	-3	-1	0	1	2	3	4		
340	-6	-3	0	3	6		-4	-3	-1	0	1	2	3	4		
320	-5	-3	0	3	6		-5	-3	-1	0	1	2	3	4		
300	-5	-2	0	3	5		-5	-3	-1	0	1	2	3	4		
280	-5	-2	0	3	5		-5	-3	-1	0	1	3	4	5		
260	-4	-2	0	3	5		-5	-3	-1	0	1	3	4	5		
240	-4	-1	0	3	5		-4	-3	-1	0	1	3	4	5		
220	-3	-1	0	3	5		-4	-2	0	0	2	3	4	5		
200	-3	0	0	4	5		-4	-2	0	0	2	4	5	6		
180	-2	0	0	4	6		-3	-1	0	0	2	4	5	6		
160	-1	1	0	4	6		-2	-1	1	0	2	5	5	6		
140	0	1	0	5	6		-2	0	1	0	2	5	6	7		

\*V1 not to exceed VR



Takeoff Speeds - Wet Runway

Flaps 15

V1(MCG)

Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	127	123	120	118		
50	122	130	127	121	118	116	111
40	104	138	135	129	123	117	111
30	86	141	141	135	129	123	116
20	68	142	141	137	132	127	120
-60	-76	143	143	138	133	128	122

Minimum V2

Max Takeoff Thrust

PRESSURE ALTITUDE (FT)	-2000	0	2000	4000	6000	8000
SPEED (KIAS)	138	135	132	129	127	124

Intentionally  
Blank

Performance Dispatch

Chapter PD

Enroute

Section 11

Long Range Cruise Maximum Operating Altitude

Max Climb Thrust

ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	5	30400	28800	27200
350	27900	4	31000	29400	27800
340	28500	3	31700	30000	28500
330	29200	1	32200	30500	29000
320	29900	0	32700	31000	29500
310	30600	-2	33200	31600	30000
300	31300	-4	33700	32100	30600
290	32000	-5	34300	32700	31200
280	32800	-7	34900	33300	31800
270	33600	-9	35500	33900	32400
260	34400	-11	36100	34500	33100
250	35200	-12	36800	35200	33800
240	36000	-14	37500	35900	34500
230	36900	-15	38200	36600	35200
220	37800	-15	39000	37400	36000
210	38800	-15	39800	38200	36800
200	39800	-15	40600	39000	37700
190	40900	-15	41500	39900	38600
180	42000	-15	42500	40900	39600
170	43100	-15	43100	42100	40800
160	43100	-15	43100	43100	42000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	11	30400	28800	27200
350	27900	10	31000	29400	27800
340	28500	8	31700	30000	28500
330	29200	7	32200	30500	29000
320	29900	5	32700	31000	29500
310	30600	4	33200	31600	30000
300	31300	2	33700	32100	30600
290	32000	0	34300	32700	31200
280	32800	-1	34900	33300	31800
270	33600	-3	35500	33900	32400
260	34400	-5	36100	34500	33100
250	35200	-7	36800	35200	33800
240	36000	-9	37500	35900	34500
230	36900	-9	38200	36600	35200
220	37800	-9	39000	37400	36000
210	38800	-9	39800	38200	36800
200	39800	-9	40600	39000	37700
190	40900	-9	41500	39900	38600
180	42000	-9	42500	40900	39600
170	43100	-9	43100	42100	40800
160	43100	-9	43100	43100	42000

**Long Range Cruise Maximum Operating Altitude**  
**Max Climb Thrust**  
**ISA + 20°C**

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	17	30400	28800	27200
350	27900	15	31000	29400	27800
340	28500	14	31700	30000	28500
330	29200	12	32200	30500	29000
320	29900	11	32700	31000	29500
310	30600	9	33200	31600	30000
300	31300	8	33700	32100	30600
290	32000	6	34300	32700	31200
280	32800	4	34900	33300	31800
270	33600	3	35500	33900	32400
260	34400	1	36100	34500	33100
250	35200	-1	36800	35200	33800
240	36000	-3	37500	35900	34500
230	36900	-3	38200	36600	35200
220	37800	-3	39000	37400	36000
210	38800	-3	39800	38200	36800
200	39800	-3	40600	39000	37700
190	40900	-3	41500	39900	38600
180	42000	-3	42500	40900	39600
170	43100	-3	43100	42100	40800
160	43100	-3	43100	43100	42000

Long Range Cruise Trip Fuel and Time  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
665	625	588	556	526	500	479	458	440	423	407
1320	1242	1171	1108	1052	1000	958	919	883	850	820
1973	1857	1752	1660	1576	1500	1438	1381	1327	1278	1233
2623	2471	2333	2211	2101	2000	1918	1842	1771	1706	1647
3271	3083	2913	2761	2625	2500	2398	2304	2216	2135	2061
3915	3693	3491	3311	3149	3000	2879	2766	2661	2564	2475
4556	4301	4068	3860	3672	3500	3359	3228	3106	2993	2890
5195	4906	4643	4407	4195	4000	3840	3690	3551	3422	3304
5831	5510	5216	4954	4717	4500	4320	4152	3995	3851	3719
6465	6112	5788	5500	5240	5000	4800	4613	4440	4280	4133
7096	6712	6360	6046	5762	5500	5280	5075	4885	4709	4547
7726	7311	6931	6591	6283	6000	5761	5537	5329	5137	4961
8354	7909	7501	7136	6805	6500	6240	5998	5773	5565	5375
8981	8506	8070	7680	7326	7000	6720	6460	6217	5993	5788
9607	9102	8639	8224	7847	7500	7201	6921	6661	6421	6201
10233	9698	9208	8768	8368	8000	7681	7382	7105	6849	6614
10858	10294	9777	9312	8890	8500	8161	7844	7549	7277	7028
11483	10890	10345	9856	9411	9000	8641	8305	7993	7705	7441
12108	11486	10914	10399	9932	9500	9121	8766	8437	8133	7854
12732	12081	11482	10943	10453	10000	9601	9228	8881	8561	8267

Reference Fuel and Time Required

AIR DIST( NM)	PRESSURE ALTITUDE (1000 FT)									
	27		29		31		33		35	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
500	8.6	1:19	8.4	1:18	8.4	1:17	8.3	1:15	8.2	1:14
1000	15.8	2:30	15.5	2:28	15.2	2:24	14.9	2:20	14.6	2:17
1500	23.2	3:40	22.7	3:36	22.2	3:29	21.8	3:23	21.3	3:20
2000	30.7	4:50	29.9	4:43	29.3	4:34	28.6	4:27	27.9	4:23
2500	38.4	5:58	37.4	5:49	36.6	5:38	35.7	5:29	34.9	5:25
3000	46.1	7:06	45.0	6:55	43.9	6:42	42.8	6:32	41.8	6:27
3500	54.2	8:11	52.8	7:58	51.5	7:44	50.2	7:34	49.1	7:29
4000	62.3	9:17	60.6	9:02	59.1	8:47	57.6	8:36	56.4	8:31
4500	70.7	10:21	68.8	10:04	67.0	9:48	65.3	9:38	64.0	9:34
5000	79.1	11:25	76.9	11:07	74.9	10:50	73.1	10:39	71.7	10:36
5500	87.8	12:27	85.4	12:08	83.1	11:51	81.2	11:41	79.9	11:38
6000	96.6	13:29	93.8	13:10	91.3	12:53	89.3	12:42	88.1	12:40
6500	105.7	14:30	102.7	14:11	100.0	13:54	97.9	13:44	97.0	13:43
7000	114.8	15:32	111.5	15:11	108.6	14:55	106.5	14:46	105.8	14:46
7500	124.3	16:32	120.7	16:12	117.8	15:56	115.8	15:48	115.6	15:49
8000	133.8	17:33	130.0	17:13	126.9	16:57	125.1	16:50	125.3	16:52
8500	143.9	18:33	139.8	18:13	136.7	17:58	135.3	17:52		
9000	153.9	19:33	149.7	19:14	146.5	19:00	145.5	18:54		
9500	164.4	20:33	160.1	20:15	157.2	20:01	156.8	19:57		
10000	175.0	21:33	170.5	21:15	167.9	21:03	168.0	21:00		

**Long Range Cruise Trip Fuel and Time**  
**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	160	180	200	220	240
20	-2.1	-1.1	0.0	1.2	2.7
30	-3.1	-1.6	0.0	1.9	4.3
40	-4.2	-2.1	0.0	2.7	6.2
50	-5.3	-2.7	0.0	3.6	8.3
60	-6.4	-3.2	0.0	4.7	10.7
70	-7.5	-3.8	0.0	5.9	13.4
80	-8.7	-4.4	0.0	7.2	16.3
90	-9.8	-5.0	0.0	8.6	19.5
100	-11.0	-5.6	0.0	10.2	23.0
110	-12.2	-6.2	0.0	11.9	26.7
120	-13.4	-6.8	0.0	13.7	30.7
130	-14.6	-7.5	0.0	15.7	35.0
140	-15.9	-8.1	0.0	17.8	39.5
150	-17.1	-8.8	0.0	20.0	44.3
160	-18.4	-9.5	0.0	22.3	49.4
170	-19.7	-10.2	0.0	24.8	54.7
180	-21.0	-10.9	0.0	27.3	60.3

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

Long Range Cruise Step Climb Trip Fuel and Time  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
1292	1221	1157	1099	1047	1000	957	917	881	847	816
1923	1820	1728	1645	1569	1500	1437	1379	1325	1276	1229
2554	2420	2299	2190	2091	2000	1917	1840	1770	1704	1643
3185	3020	2871	2735	2612	2500	2397	2302	2214	2133	2057
3816	3619	3442	3281	3134	3000	2877	2764	2659	2562	2472
4446	4218	4012	3826	3656	3500	3357	3225	3104	2991	2886
5077	4817	4583	4371	4177	4000	3837	3687	3548	3420	3300
5707	5416	5154	4916	4699	4500	4317	4149	3993	3849	3715
6336	6015	5724	5461	5220	5000	4798	4611	4438	4278	4129
6966	6613	6295	6006	5742	5500	5278	5073	4883	4707	4544
7595	7212	6865	6550	6263	6000	5758	5535	5329	5137	4959
8224	7810	7435	7095	6784	6500	6238	5997	5774	5566	5373
8853	8408	8005	7640	7306	7000	6719	6459	6219	5996	5788
9481	9006	8575	8184	7827	7500	7199	6921	6664	6426	6204
10110	9603	9145	8729	8348	8000	7679	7384	7110	6855	6619
10738	10201	9715	9273	8870	8500	8160	7846	7555	7285	7034
11366	10798	10284	9817	9391	9000	8640	8308	8001	7715	7449
11993	11395	10854	10362	9912	9500	9121	8771	8446	8145	7865
12621	11992	11423	10906	10433	10000	9601	9233	8892	8575	8280

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)									TIME (HRS:MIN)
	LANDING WEIGHT (1000 KG)									
	150	160	170	180	190	200	210	220	230	
1000	11.8	12.2	12.7	13.3	13.8	14.5	14.9	15.5	16.0	2:16
1500	16.9	17.6	18.3	19.1	20.0	20.9	21.6	22.4	23.3	3:18
2000	22.1	23.0	24.1	25.2	26.4	27.5	28.5	29.6	30.9	4:20
2500	27.4	28.6	29.9	31.4	32.9	34.3	35.6	37.1	38.6	5:23
3000	32.9	34.4	36.0	37.8	39.5	41.3	42.9	44.7	46.5	6:25
3500	38.5	40.3	42.3	44.3	46.4	48.4	50.4	52.5	54.6	7:27
4000	44.2	46.3	48.7	51.0	53.4	55.8	58.1	60.5	63.0	8:29
4500	50.1	52.6	55.2	57.9	60.6	63.4	66.0	68.8	71.5	9:31
5000	56.2	59.0	61.9	64.9	68.1	71.2	74.1	77.2	80.3	10:33
5500	62.5	65.6	68.8	72.2	75.7	79.2	82.5	85.9	89.4	11:34
6000	68.9	72.3	75.9	79.7	83.6	87.4	91.0	94.8	98.8	12:36
6500	75.4	79.2	83.2	87.4	91.6	95.8	99.8	104.1	108.5	13:38
7000	82.1	86.3	90.8	95.3	99.9	104.4	108.9	113.6	118.4	14:39
7500	89.0	93.6	98.5	103.4	108.3	113.3	118.2	123.4	128.6	15:40
8000	96.1	101.2	106.4	111.7	117.0	122.5	127.9	133.4	139.0	16:42
8500	103.4	108.9	114.5	120.2	126.1	132.0	137.8	143.8	149.8	17:43
9000	111.0	116.8	122.8	129.0	135.3	141.7	148.0	154.4	160.9	18:44
9500	118.7	124.9	131.4	138.0	144.9	151.7	158.4	165.3	172.2	19:45
10000	126.6	133.3	140.2	147.4	154.7	162.0	169.2	176.5	183.9	20:46

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.  
Valid for all pressure altitudes with 4000 ft step climb to 2000 ft above optimum altitude.

777 Flight Crew Operations Manual

Short Trip Fuel and Time  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
95	81	70	62	55	50	46	42	39	36	34
161	143	129	118	108	100	93	87	82	77	73
225	205	187	173	161	150	141	132	125	118	113
288	264	245	228	213	200	189	178	169	161	153
349	323	301	282	265	250	237	225	214	204	195
410	382	357	336	317	300	285	271	258	247	237
471	440	414	390	369	350	333	317	303	290	279
532	499	470	444	421	400	381	364	348	334	320
595	559	527	499	473	450	429	410	393	376	362
660	621	585	554	526	500	477	456	436	419	402

Trip Fuel and Time

AIR DIST (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		160	180	200	220	240	
50	FUEL (1000 KG)	1.6	1.8	1.9	2.0	2.1	0:14
	ALT (FT)	11000	9000	9000	7000	5000	
100	FUEL (1000 KG)	2.4	2.6	2.7	2.8	3.0	0:23
	ALT (FT)	15000	13000	13000	13000	13000	
150	FUEL (1000 KG)	3.2	3.4	3.5	3.7	3.9	0:30
	ALT (FT)	21000	21000	21000	21000	21000	
200	FUEL (1000 KG)	3.8	4.1	4.3	4.5	4.8	0:37
	ALT (FT)	27000	27000	27000	25000	25000	
250	FUEL (1000 KG)	4.4	4.7	5.0	5.3	5.6	0:43
	ALT (FT)	37000	31000	29000	29000	29000	
300	FUEL (1000 KG)	5.0	5.3	5.6	6.0	6.3	0:48
	ALT (FT)	41000	39000	37000	35000	33000	
350	FUEL (1000 KG)	5.5	5.9	6.2	6.6	7.0	0:54
	ALT (FT)	43000	39000	37000	35000	35000	
400	FUEL (1000 KG)	6.0	6.4	6.9	7.3	7.8	1:00
	ALT (FT)	43000	39000	37000	37000	35000	
450	FUEL (1000 KG)	6.5	7.0	7.5	8.0	8.5	1:06
	ALT (FT)	43000	41000	39000	37000	35000	
500	FUEL (1000 KG)	7.0	7.6	8.1	8.7	9.2	1:13
	ALT (FT)	43000	41000	39000	37000	35000	



Holding Planning  
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
360	9310	9240	9140	9180	9690	10040	10600			
340	8810	8730	8620	8620	9080	9360	9780			
320	8250	8160	8050	8030	8430	8630	8950	9950		
300	7720	7630	7510	7480	7600	7980	8260	8850		
280	7250	7150	7030	6970	7000	7380	7620	8060		
260	6790	6670	6530	6470	6470	6800	6990	7250	8510	
240	6350	6220	6060	5980	5970	6030	6380	6590	7270	
220	5940	5790	5610	5530	5490	5490	5770	5960	6450	7070
200	5590	5430	5230	5140	5070	5040	5150	5350	5660	6020
180	5270	5100	4900	4800	4710	4760	4650	4750	5000	5210
160	5120	4940	4750	4610	4500	4440	4330	4310	4460	4560

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	10290	10260	10210	10300	10530
340	9680	9630	9570	9620	9830
320	9080	9030	8960	8980	9160
300	8510	8450	8370	8380	8520
280	7940	7870	7770	7770	7860
260	7390	7300	7190	7190	7240
240	6860	6740	6630	6600	6620
220	6340	6200	6070	6010	6020
200	5880	5720	5550	5470	5430
180	5480	5300	5110	5020	4960
160	5260	5080	4860	4760	4660

These tables include 5% additional fuel for holding in a racetrack pattern.

Crew Oxygen Requirements

Required Pressure (PSI) for One 114/115 Cubic Ft. Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°C	°F	2	3	4
50	122	530	735	945
45	113	520	725	930
40	104	510	715	915
35	95	505	700	900
30	86	495	690	885
25	77	485	680	870
20	68	480	670	860
15	59	470	655	840
10	50	460	645	830
5	41	455	635	815
0	32	445	620	800
-5	23	440	610	785
-10	14	430	600	770

For more extensive than normal crew usage, add 1.2 psi/person/minute.

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Net Level Off Weight**

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
32	166.0	164.5	161.0
30	183.7	181.5	175.5
28	197.9	193.2	185.8
26	213.1	207.2	199.2
24	229.4	222.1	213.9
22	246.8	238.7	230.1
20	271.4	264.3	254.0
18	293.8	284.5	273.3
16	318.2	306.9	294.9
14	339.7	326.4	313.5
12	361.3	347.4	334.2

**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALTITUDE (1000 FT)								
	14	16	18	20	22	24	26	28	30
ENGINE ONLY	-0.7	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ENGINE AND WING	-2.7	-2.0	-1.6	-1.2	-1.3	-1.4	-1.5	-1.5	-1.5

## ALL ENGINES

### Decompression Critical Fuel Reserves - LRC Cruise Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
283	261	243	227	212	200	189	179	170	162	155
567	523	486	453	425	400	378	358	340	324	309
851	785	729	680	638	600	567	537	510	486	463
1134	1047	972	907	850	800	755	716	680	647	618
1418	1309	1215	1134	1063	1000	944	895	850	809	772
1702	1570	1458	1360	1275	1200	1133	1073	1020	971	927
1985	1832	1701	1587	1488	1400	1322	1252	1190	1133	1081
2269	2094	1944	1814	1700	1600	1511	1431	1360	1295	1236
2553	2356	2187	2041	1913	1800	1700	1610	1529	1456	1390
2836	2617	2430	2267	2125	2000	1889	1789	1699	1618	1545
3120	2879	2673	2494	2338	2200	2077	1968	1869	1780	1699
3404	3141	2916	2721	2550	2400	2266	2147	2039	1942	1853
3687	3403	3159	2948	2763	2600	2455	2326	2209	2104	2008
3971	3665	3402	3174	2976	2800	2644	2505	2379	2266	2162
4255	3926	3645	3401	3188	3000	2833	2683	2549	2427	2317

### Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)										
	160	180	200	220	240	260	280	300	320	340	360
200	4.2	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	6.0	6.2
400	7.6	7.9	8.1	8.5	8.9	9.3	9.6	9.9	10.3	10.7	11.1
600	11.0	11.4	11.8	12.3	12.8	13.3	13.8	14.3	14.8	15.4	16.0
800	14.4	14.9	15.4	16.1	16.7	17.4	18.0	18.6	19.3	20.0	20.8
1000	17.8	18.4	19.1	19.8	20.6	21.4	22.2	22.9	23.7	24.6	25.6
1200	21.1	21.9	22.7	23.6	24.5	25.4	26.4	27.2	28.1	29.2	30.3
1400	24.5	25.3	26.2	27.2	28.3	29.4	30.5	31.5	32.6	33.8	35.1
1600	27.8	28.7	29.7	30.9	32.1	33.3	34.5	35.7	36.9	38.2	39.7
1800	31.1	32.1	33.2	34.5	35.9	37.2	38.5	39.9	41.2	42.6	44.3
2000	34.5	35.5	36.8	38.2	39.6	41.1	42.6	44.0	45.5	47.1	48.8
2200	37.8	38.8	40.2	41.8	43.4	45.0	46.6	48.2	49.8	51.5	53.4
2400	41.1	42.2	43.6	45.3	47.0	48.8	50.5	52.3	54.0	55.8	57.9
2600	44.5	45.5	47.0	48.8	50.7	52.6	54.4	56.3	58.2	60.1	62.3
2800	47.8	48.8	50.4	52.3	54.3	56.3	58.4	60.3	62.3	64.5	66.7
3000	51.1	52.1	53.8	55.9	58.0	60.1	62.3	64.4	66.5	68.8	71.2

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

#### Adjustments:

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (3%) for the total forecast time or engine and wing anti-ice on and ice drag (7%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engine cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - LRC Cruise  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
286	263	244	227	213	200	189	179	169	161	154
572	527	488	455	426	400	377	357	339	322	308
858	790	732	682	638	600	566	536	508	484	461
1145	1054	976	910	851	800	755	714	678	645	615
1431	1317	1221	1137	1064	1000	943	892	847	806	769
1717	1581	1465	1364	1277	1200	1132	1071	1016	967	922
2003	1844	1709	1592	1490	1400	1320	1249	1186	1128	1076
2290	2108	1953	1819	1703	1600	1509	1428	1355	1289	1230
2576	2372	2197	2047	1915	1800	1698	1606	1524	1450	1383
2862	2635	2441	2274	2128	2000	1886	1785	1694	1612	1537
3149	2899	2685	2501	2341	2200	2075	1963	1863	1773	1691
3435	3162	2930	2729	2554	2400	2264	2142	2033	1934	1844
3721	3426	3174	2956	2767	2600	2452	2320	2202	2095	1998
4007	3689	3418	3184	2980	2800	2641	2499	2371	2256	2152
4294	3953	3662	3411	3192	3000	2829	2677	2541	2417	2305

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)										
	160	180	200	220	240	260	280	300	320	340	360
200	4.0	4.1	4.4	4.7	4.9	5.1	5.4	5.6	5.8	6.1	6.4
400	7.2	7.6	8.0	8.4	8.9	9.4	9.8	10.2	10.7	11.1	11.6
600	10.5	11.0	11.6	12.2	12.9	13.5	14.1	14.8	15.4	16.2	16.8
800	13.8	14.5	15.2	16.0	16.8	17.6	18.4	19.3	20.1	21.0	21.9
1000	17.0	17.9	18.8	19.8	20.8	21.8	22.7	23.7	24.7	25.8	26.9
1200	20.1	21.2	22.3	23.5	24.7	25.9	27.0	28.2	29.4	30.6	31.9
1400	23.2	24.5	25.7	27.1	28.5	29.9	31.2	32.6	33.9	35.4	36.9
1600	26.3	27.7	29.2	30.7	32.3	33.8	35.3	36.9	38.4	40.1	41.8
1800	29.4	31.0	32.6	34.3	36.0	37.8	39.5	41.2	42.9	44.7	46.6
2000	32.5	34.3	36.1	37.9	39.8	41.7	43.6	45.5	47.4	49.3	51.4
2200	35.6	37.5	39.4	41.5	43.5	45.6	47.7	49.7	51.8	53.9	56.2
2400	38.7	40.6	42.7	44.9	47.2	49.4	51.6	53.8	56.1	58.4	60.8
2600	41.8	43.7	46.0	48.4	50.8	53.2	55.6	57.9	60.4	62.9	65.4
2800	44.9	46.8	49.2	51.8	54.4	57.0	59.5	62.1	64.7	67.3	70.1
3000	48.0	49.9	52.5	55.2	58.0	60.7	63.5	66.2	68.9	71.7	74.6

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (9%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inop-erative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
264	248	234	221	210	200	190	182	174	167	160
531	498	469	444	420	400	381	363	348	333	320
800	750	706	666	631	600	571	545	521	499	479
1072	1003	943	890	842	800	761	726	694	665	638
1344	1257	1181	1114	1054	1000	951	906	866	829	795
1618	1513	1420	1338	1265	1200	1140	1087	1038	994	953
1894	1769	1659	1563	1477	1400	1330	1267	1210	1158	1110
2170	2026	1899	1788	1688	1600	1520	1447	1382	1321	1266
2447	2283	2139	2013	1900	1800	1709	1627	1553	1485	1423
2725	2541	2380	2238	2112	2000	1898	1807	1724	1648	1579
3003	2799	2620	2463	2324	2200	2088	1987	1895	1812	1735
3281	3056	2861	2688	2536	2400	2277	2167	2066	1975	1891
3559	3314	3101	2914	2748	2600	2467	2346	2238	2138	2047
3836	3572	3341	3139	2959	2800	2656	2526	2409	2302	2204
4113	3829	3581	3364	3171	3000	2845	2706	2580	2465	2360

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)										
	160	180	200	220	240	260	280	300	320	340	360
200	4.6	4.8	5.1	5.3	5.5	5.6	5.8	6.1	6.3	6.5	6.8
400	7.1	7.6	8.1	8.6	9.1	9.5	10.0	10.4	11.0	11.5	12.2
600	9.5	10.2	11.1	11.8	12.5	13.2	13.9	14.6	15.4	16.3	17.3
800	11.9	12.9	13.9	15.0	15.9	16.8	17.8	18.7	19.8	21.1	22.3
1000	14.2	15.4	16.8	18.1	19.2	20.4	21.6	22.8	24.2	25.7	27.3
1200	16.5	18.0	19.6	21.1	22.5	24.0	25.4	26.9	28.5	30.3	32.2
1400	18.7	20.5	22.3	24.1	25.8	27.5	29.2	30.9	32.7	34.8	37.1
1600	21.0	23.0	25.0	27.1	29.0	31.0	32.9	34.8	36.9	39.3	41.8
1800	23.1	25.4	27.7	30.0	32.1	34.4	36.6	38.7	41.0	43.7	46.5
2000	25.3	27.8	30.4	32.9	35.3	37.8	40.2	42.6	45.1	48.0	51.1
2200	27.5	30.2	33.0	35.7	38.4	41.1	43.8	46.4	49.2	52.3	55.7
2400	29.6	32.6	35.6	38.5	41.5	44.4	47.3	50.2	53.2	56.6	60.2
2600	31.7	34.9	38.1	41.3	44.5	47.7	50.8	53.9	57.1	60.8	64.6
2800	33.8	37.2	40.7	44.1	47.5	51.0	54.3	57.6	61.1	65.0	69.0
3000	35.8	39.5	43.2	46.8	50.4	54.2	57.7	61.3	64.9	69.1	73.4

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (12%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Intentionally  
Blank

Performance Dispatch

Chapter PD

Landing

Section 12

Landing Field Limit Weight - Dry Runway

Flaps 30

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1400	1140	1220	1310	1400	1450	1520	1570	1610
1600	1280	1380	1490	1600	1670	1750	1820	1890
1800	1420	1540	1670	1800	1890	1980	2070	2160
2000	1570	1700	1850	2000	2100	2220	2320	2440
2200	1710	1860	2030	2200	2320	2450	2580	2710
2400	1860	2020	2200	2400	2530	2680	2830	2990
2600	2000	2190	2380	2600	2750	2910	3080	3260
2800	2150	2350	2560	2800	2970	3150	3330	3540
3000	2290	2510	2740	3000	3180	3380	3590	3810
3200	2440	2670	2920	3200	3400	3610	3840	4090
3400	2580	2830	3100	3400	3610	3850	4090	4360
3600	2730	2990	3280	3600	3830	4080	4340	4640
3800	2870	3150	3460	3800	4040	4310	4600	4910
4000	3020	3310	3640	4000	4260	4550	4850	5190
4200	3160	3480	3820	4200	4480	4780	5100	5460
4400	3310	3640	4000	4400	4690	5010	5350	5740

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1600	223.4	194.0	186.1	187.5	175.6
1800	263.8	249.9	234.4	219.5	205.4
2000	293.0	277.5	265.6	252.5	236.4
2200	309.3	301.2	292.7	276.4	264.6
2400	322.0	313.1	305.0	296.9	287.0
2600	334.7	324.6	315.2	307.0	298.7
2800	347.9	336.1	325.8	316.1	307.8
3000	360.6	348.5	336.3	325.9	316.1
3200	372.1	359.6	347.0	335.3	324.9
3400	383.1	369.9	357.6	344.9	333.5
3600		379.7	366.7	354.7	341.7
3800			375.4	362.8	351.2
4000			384.0	370.5	358.4
4200				377.8	365.3
4400				385.0	371.8

With manual speedbrakes, decrease weight by 21450 kg.

With 1 brake deactivated, decrease weight by 20600 kg.

With 2 brakes deactivated, decrease weight by 41900 kg.

777 Flight Crew Operations Manual

Landing Field Limit Weight - Wet Runway

Flaps 30

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1600	1300	1390	1500	1600	1660	1730	1790	1840
1800	1440	1550	1670	1800	1880	1960	2040	2110
2000	1580	1710	1850	2000	2090	2200	2290	2390
2200	1730	1880	2030	2200	2310	2430	2540	2660
2400	1870	2040	2210	2400	2530	2660	2800	2940
2600	2020	2200	2390	2600	2740	2900	3050	3210
2800	2160	2360	2570	2800	2960	3130	3300	3490
3000	2310	2520	2750	3000	3170	3360	3550	3760
3200	2450	2680	2930	3200	3390	3600	3810	4040
3400	2600	2840	3110	3400	3600	3830	4060	4310
3600	2740	3000	3290	3600	3820	4060	4310	4590
3800	2890	3170	3470	3800	4040	4300	4560	4860
4000	3030	3330	3650	4000	4250	4530	4820	5140
4200	3180	3490	3830	4200	4470	4760	5070	5410
4400	3320	3650	4000	4400	4680	4990	5320	5690

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
2000	253.4	238.7	223.8	209.7	196.3
2200	278.4	266.6	253.6	238.1	222.9
2400	300.4	291.1	275.9	263.7	250.0
2600	313.2	305.1	296.8	285.0	270.5
2800	324.2	315.0	306.8	298.7	289.3
3000	335.2	325.1	315.7	307.4	299.1
3200	346.5	335.1	324.9	315.4	307.0
3400	357.9	345.5	334.0	323.8	314.3
3600	368.1	355.8	343.0	332.1	321.8
3800	377.9	365.0	353.0	340.1	329.4
4000	387.4	373.7	361.2	349.2	336.7
4200		382.3	369.0	356.8	344.1
4400			376.5	363.8	352.1

With manual speedbrakes, decrease weight by 21450 kg.

With 1 brake deactivated, decrease weight by 20600 kg.

With 2 brakes deactivated, decrease weight by 41900 kg.



**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	303.3	283.2				
52	126	311.7	290.0				
50	122	320.1	297.1	273.2			
48	118	328.2	305.9	279.6			
46	115	336.9	314.7	286.5	261.4		
44	111	349.2	322.9	294.1	270.3		
42	108	356.2	331.4	302.9	277.2	251.7	
40	104	363.4	340.2	311.6	284.0	257.4	
38	100	370.8	352.8	319.7	290.5	263.8	233.8
36	97	377.4	360.1	326.9	296.6	270.2	238.4
34	93	378.7	367.2	334.9	303.0	275.0	243.0
32	90	378.7	374.6	342.5	309.1	278.9	247.2
30	86	378.7	378.7	351.0	315.8	283.1	250.9
28	82	378.7	378.7	355.6	321.0	287.7	254.6
26	79	378.7	378.7	361.2	324.9	292.3	258.2
24	75	378.7	378.7	361.3	328.1	296.9	262.7
22	72	378.7	378.7	361.4	331.5	300.4	268.3
20	68	378.7	378.7	361.4	331.5	302.5	272.8
18	64	378.7	378.7	361.5	331.6	304.7	275.3
16	61	378.7	378.7	361.6	331.7	304.7	277.0
14	57	378.7	378.7	361.7	331.8	304.8	278.6
12	54	378.7	378.7	361.7	331.8	304.9	278.6
10	50	378.7	378.7	361.8	331.9	304.9	278.7
8	46	378.7	378.7	361.9	332.0	304.9	278.7
6	43	378.7	378.7	359.6	332.1	304.9	272.8
4	40	378.7	378.7	350.0	316.7	286.7	255.0
2	36	378.7	378.7	350.0	316.8	286.8	255.0
0	32	378.7	378.7	350.0	316.8	286.8	255.0
-40	-40	378.7	378.7	350.0	316.8	286.8	255.0

**Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.****With engine bleed for packs off, increase weight by 1250 kg.****With engine anti-ice on, decrease weight by 150 kg.****With engine and wing anti-ice on, decrease weight by 2250 kg.****When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26600 kg.**

# ENGINE INOP

## ADVISORY INFORMATION

### Go-Around Climb Gradient

#### Flaps 20, Gear Up

Based on engine bleed for packs on and anti-ice off.

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)						
	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
54	9.49	8.32	6.82	5.46	4.08	2.48	1.02
50	10.46	9.22	7.59	6.13	4.72	3.07	1.56
46	11.42	10.18	8.47	6.84	5.38	3.66	2.09
42	12.34	11.18	9.41	7.71	6.06	4.26	2.63
38	13.23	12.17	10.33	8.51	6.75	4.88	3.19
34	13.76	13.06	11.16	9.22	7.30	5.41	3.75
30	13.78	13.79	11.80	9.87	7.84	5.90	4.24
26	13.80	13.79	12.33	10.38	8.45	6.38	4.69
22	13.82	13.80	12.34	10.75	8.89	6.94	5.14
18	13.84	13.81	12.35	10.76	9.15	7.32	5.64
14	13.86	13.82	12.35	10.76	9.15	7.55	5.96
10	13.88	13.83	12.36	10.77	9.15	7.55	6.13

### Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)											
	2	3	4	5	6	7	8	9	10	11	12	13
320	-4.29	-4.78	-5.25	-5.78	-6.11	-6.60	-7.07	-7.51	-7.99	-8.49	-8.96	-9.44
300	-4.01	-4.45	-4.87	-5.36	-5.65	-6.09	-6.52	-6.92	-7.35	-7.81	-8.24	-8.68
280	-3.56	-3.94	-4.32	-4.76	-5.00	-5.39	-5.77	-6.12	-6.50	-6.92	-7.31	-7.70
260	-3.12	-3.43	-3.75	-4.14	-4.32	-4.67	-4.98	-5.27	-5.61	-5.98	-6.32	-6.65
240	-2.44	-2.68	-2.93	-3.26	-3.38	-3.66	-3.90	-4.13	-4.40	-4.71	-4.99	-5.25
220	-1.61	-1.76	-1.96	-2.18	-2.24	-2.43	-2.59	-2.74	-2.94	-3.17	-3.36	-3.50
200	-0.60	-0.66	-0.76	-0.80	-0.84	-0.90	-0.96	-1.03	-1.12	-1.19	-1.23	-1.26
190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01
180	0.66	0.76	0.84	0.87	0.93	0.99	1.06	1.17	1.26	1.27	1.31	1.34
160	2.41	2.67	2.86	2.96	3.19	3.43	3.67	3.92	4.08	4.14	4.25	4.37

### Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)									
	0	2	4	6	8	10	12	14	16	18
VREF	-0.22	-0.24	-0.26	-0.28	-0.26	-0.22	-0.14	-0.05	0.05	0.14
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.17	0.18	0.19	0.20	0.18	0.13	0.05	-0.04	-0.12	-0.17
VREF+20	0.37	0.39	0.41	0.41	0.35	0.19	-0.06	-0.28	-0.46	-0.65
VREF+30	0.40	0.40	0.40	0.37	0.25	0.00	-0.36	-0.68	-0.96	-1.28

With engine bleed for packs off, increase gradient by 0.1%.

With engine and wing anti-ice on, decrease gradient by 0.1%.

When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C, decrease gradient by 1.4%.

Quick Turnaround Limit Weight  
Flaps 30 Limit Weight (1000 KG)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	235.5				
50	122	237.0	228.2			
45	113	239.0	230.0	221.4		
40	104	240.9	231.9	223.2	214.8	
35	95	242.9	233.9	225.1	216.6	208.1
30	86	245.0	235.9	227.0	218.4	209.9
25	77	247.1	237.9	228.9	220.3	211.7
20	68	249.2	240.0	231.0	222.2	213.6
15	59	251.5	242.2	233.0	224.1	215.6
10	50	253.8	244.4	235.2	226.2	217.5
5	41	256.2	246.6	237.4	228.3	219.5
0	32	258.6	248.9	239.6	230.4	221.5
-5	23	261.0	251.3	241.9	232.6	223.6
-10	14	262.9	253.8	244.2	234.9	225.8
-15	5	264.8	256.4	246.7	237.3	228.1
-20	-4	266.8	259.0	249.2	239.7	230.4
-30	-22	270.8	263.5	254.4	244.7	235.3
-40	-40	276.0	267.7	260.0	250.1	240.4
-50	-58	282.2	272.0	264.6	255.7	245.8
-54	-65	284.7	274.4	266.4	258.1	248.0

Increase weight by 2100 kg per 1% uphill slope. Decrease weight by 3450 kg per 1% downhill slope.  
Increase weight by 6100 kg per 10 knots headwind. Decrease weight by 32300 kg per 10 knots tailwind.  
Decrease weight by 12450 kg when one brake is deactivated. Decrease weight by 29400 kg when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, no waiting period is required if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking.

Intentionally  
Blank

Performance Dispatch

Chapter PD

Gear Down

Section 13

GEAR DOWN

Takeoff Climb Limit Weight

Flaps 15

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	236.8	226.2	210.7	189.5	158.8
52	126	242.3	226.1	215.9	195.1	165.9
50	122	248.1	227.3	217.1	200.5	173.2
48	118	254.1	232.9	217.0	205.8	178.4
46	115	259.9	238.4	218.2	206.1	183.5
44	111	264.7	243.7	223.0	206.0	188.5
42	108	269.1	249.0	227.8	207.1	191.2
40	104	273.8	254.4	233.0	211.6	191.1
38	100	280.0	260.1	238.4	216.4	192.3
36	97	286.2	264.9	243.9	221.5	196.7
34	93	292.5	269.6	249.6	226.7	201.3
32	90	298.2	274.8	255.0	231.8	206.2
30	86	303.6	280.9	260.5	237.2	211.1
28	82	309.0	286.8	265.2	242.4	215.9
26	79	313.9	292.3	269.3	247.6	221.0
24	75	316.3	297.2	273.4	252.4	225.6
22	72	316.4	301.6	277.8	256.5	230.7
20	68	316.5	303.2	281.6	259.8	235.3
18	65	316.6	303.3	283.7	262.6	238.9
16	61	316.7	303.3	283.7	263.7	240.7
14	58	316.7	303.4	283.7	263.7	242.0
10	50	316.8	303.5	283.8	263.7	242.2
-40	-40	315.0	301.7	283.7	263.7	242.1

With engine bleed for packs off, increase weight by 700 kg.

With engine anti-ice on, decrease weight by 1850 kg.

With engine and wing anti-ice on, decrease weight by 3850 kg.

GEAR DOWN

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	253.3				
52	126	259.5				
50	122	266.7	244.3			
48	118	274.2	250.2			
46	115	281.1	256.7	236.3		
44	111	287.8	264.3	242.6		
42	108	294.7	272.4	248.6	227.8	
40	104	302.2	279.0	254.9	233.0	
38	100	309.3	284.7	260.4	238.1	211.3
36	97	316.2	290.4	266.3	242.1	215.6
34	93	322.9	296.4	271.5	246.0	219.8
32	90	329.0	301.8	276.1	249.4	223.5
30	86	335.1	306.8	280.9	253.3	226.8
28	82	335.2	311.1	285.1	257.3	230.1
26	79	335.3	315.8	288.3	261.8	233.4
24	75	335.4	315.9	290.7	266.3	237.0
22	72	335.5	315.9	293.2	269.2	240.7
20	68	335.6	316.0	293.3	271.0	243.9
18	64	335.7	316.1	293.3	272.8	246.0
16	61	335.8	316.1	293.4	272.8	247.5
14	57	335.8	316.2	293.4	272.9	249.0
12	54	335.9	316.3	293.4	272.9	249.0
10	50	335.9	316.4	293.4	272.9	249.0
-40	-40	336.2	316.6	293.7	273.1	249.2

With engine bleed for packs off, increase weight 1600 kg.  
With engine and wing anti-ice on, decrease weight by 1950 kg.  
When operating in icing conditions during any part of the flight when forecast landing temperature is below 10°C, decrease weight by 31550 kg.

**GEAR DOWN****Takeoff Obstacle Limit Weight****Flaps 15****Sea Level, 30°C & Below, Zero Wind****Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or Auto**

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	299.7										
20	277.1	297.1									
40	256.4	276.1	291.1	302.6							
60	240.9	260.1	275.4	287.6	297.2						
80		247.0	262.3	274.9	285.1	293.5	300.4	306.0			
100		235.9	251.2	263.8	274.4	283.2	290.6	296.9	302.2	306.2	308.7
120			226.2	241.4	254.1	264.8	274.0	281.8	288.4	294.1	299.0
140				232.6	245.4	256.2	265.6	273.6	280.6	286.6	291.8
160				224.8	237.5	248.4	257.9	266.1	273.2	279.5	285.0
180				217.6	230.3	241.2	250.8	259.1	266.4	272.9	278.6
200				210.9	223.6	234.6	244.2	252.6	260.1	266.7	272.6
220				204.8	217.4	228.4	238.1	246.6	254.1	260.8	266.9
240				199.2	211.7	222.7	232.3	240.9	248.5	255.3	261.5
260					206.3	217.2	226.9	235.5	243.2	250.1	256.3
280					201.3	212.1	221.8	230.5	238.2	245.2	251.4
300					196.5	207.3	217.0	225.7	233.4	240.4	246.8

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

**OAT Adjustment**

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
30 & BELOW	0	0	0	0	0	0	0	0
32	-3.0	-3.5	-3.9	-4.4	-4.8	-5.3	-5.7	-6.2
34	-6.1	-7.0	-7.9	-8.8	-9.7	-10.6	-11.5	-12.4
36	-9.1	-10.4	-11.8	-13.1	-14.5	-15.8	-17.2	-18.5
38	-12.1	-13.9	-15.7	-17.5	-19.3	-21.1	-22.9	-24.7
40	-15.1	-17.4	-19.6	-21.9	-24.1	-26.4	-28.7	-30.9
42	-18.4	-21.0	-23.6	-26.2	-28.8	-31.4	-34.0	-36.6
44	-21.8	-24.7	-27.6	-30.6	-33.5	-36.4	-39.4	-42.3
46	-25.1	-28.3	-31.6	-34.9	-38.2	-41.5	-44.7	-48.0
48	-28.4	-32.0	-35.6	-39.2	-42.9	-46.5	-50.1	-53.7
50	-31.7	-35.6	-39.6	-43.6	-47.5	-51.5	-55.5	-59.4

**Pressure Altitude Adjustment**

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
S.L. & BELOW	0	0	0	0	0	0	0	0
1000	-7.8	-8.4	-9.1	-9.7	-10.4	-11.0	-11.7	-12.3
2000	-15.6	-16.9	-18.2	-19.5	-20.8	-22.1	-23.3	-24.6
3000	-22.1	-24.2	-26.2	-28.3	-30.3	-32.4	-34.4	-36.5
4000	-28.6	-31.4	-34.3	-37.1	-39.9	-42.7	-45.5	-48.4
5000	-36.1	-39.7	-43.3	-46.9	-50.4	-54.0	-57.6	-61.2
6000	-43.5	-47.9	-52.3	-56.6	-61.0	-65.3	-69.7	-74.1
7000	-50.5	-55.7	-60.9	-66.1	-71.2	-76.4	-81.6	-86.8
8000	-57.5	-63.5	-69.5	-75.5	-81.5	-87.5	-93.5	-99.5

## GEAR DOWN

### Takeoff Obstacle Limit Weight

#### Flaps 15

#### Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
15 TW	-36.4	-35.1	-33.8	-32.5	-31.2	-29.9	-28.6	-27.3
10 TW	-24.3	-23.4	-22.5	-21.7	-20.8	-19.9	-19.1	-18.2
5 TW	-12.1	-11.7	-11.3	-10.8	-10.4	-10.0	-9.5	-9.1
0	0	0	0	0	0	0	0	0
10 HW	4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7
20 HW	8.0	7.3	6.7	6.0	5.3	4.7	4.0	3.3
30 HW	12.0	11.0	10.0	9.0	8.0	7.0	6.0	5.0
40 HW	16.0	14.7	13.3	12.0	10.7	9.3	8.0	6.7

With engine bleed for packs off, increase weight by 950 kg.

With engine and wing anti-ice on, decrease weight by 3450 kg.

### Long Range Cruise Altitude Capability

#### Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300



GEAR DOWN

Long Range Cruise Trip Fuel and Time  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
326	291	261	237	217	200	188	177	167	158	150
488	436	391	355	326	300	282	266	251	238	227
649	580	521	473	434	400	376	354	335	318	303
809	724	650	591	543	500	470	443	419	398	380
968	867	779	709	651	600	565	533	504	479	456
1127	1009	908	826	759	700	659	622	589	559	533
1285	1152	1036	944	867	800	754	712	673	639	609
1442	1293	1165	1061	975	900	848	801	758	720	686
1599	1435	1293	1178	1083	1000	943	890	843	800	763
1755	1576	1421	1295	1191	1100	1037	980	928	881	840
1910	1716	1548	1412	1299	1200	1131	1069	1012	962	917
2065	1856	1675	1529	1407	1300	1226	1158	1097	1042	994
2219	1996	1802	1646	1515	1400	1320	1248	1182	1123	1072
2373	2135	1929	1762	1623	1500	1415	1337	1267	1204	1149
2526	2274	2056	1878	1730	1600	1509	1427	1352	1285	1226
2679	2413	2182	1994	1838	1700	1604	1516	1437	1366	1304
2831	2551	2308	2110	1945	1800	1699	1606	1522	1447	1382
2982	2689	2434	2226	2053	1900	1793	1696	1608	1529	1459
3133	2826	2559	2342	2160	2000	1888	1786	1693	1610	1537

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	7.8	0:51	7.4	0:49	7.2	0:47	7.0	0:46	6.9	0:44
300	11.4	1:13	10.8	1:10	10.4	1:07	10.0	1:05	9.7	1:03
400	15.0	1:36	14.2	1:32	13.6	1:28	13.0	1:25	12.6	1:22
500	18.6	1:59	17.6	1:53	16.7	1:48	16.0	1:44	15.4	1:40
600	22.3	2:21	21.1	2:14	20.0	2:08	19.1	2:03	18.4	1:58
700	26.1	2:43	24.6	2:35	23.3	2:28	22.2	2:22	21.3	2:17
800	29.8	3:05	28.1	2:56	26.6	2:48	25.3	2:41	24.2	2:35
900	33.6	3:27	31.6	3:17	29.9	3:08	28.4	3:00	27.2	2:53
1000	37.3	3:49	35.1	3:38	33.2	3:28	31.5	3:20	30.1	3:11
1100	41.3	4:10	38.8	3:59	36.7	3:48	34.7	3:38	33.2	3:29
1200	45.2	4:32	42.4	4:19	40.1	4:07	37.9	3:57	36.2	3:47
1300	49.1	4:53	46.1	4:39	43.5	4:27	41.2	4:15	39.3	4:04
1400	53.0	5:14	49.8	5:00	47.0	4:46	44.4	4:34	42.4	4:22
1500	57.0	5:36	53.4	5:20	50.4	5:05	47.6	4:52	45.5	4:40
1600	61.1	5:56	57.3	5:40	54.0	5:24	51.0	5:11	48.7	4:57
1700	65.2	6:17	61.1	5:59	57.6	5:43	54.4	5:29	51.9	5:15
1800	69.3	6:37	64.9	6:19	61.1	6:02	57.8	5:47	55.2	5:32
1900	73.4	6:58	68.7	6:39	64.7	6:21	61.2	6:05	58.4	5:49
2000	77.5	7:19	72.6	6:58	68.3	6:40	64.6	6:23	61.6	6:07

GEAR DOWN

Long Range Cruise Trip Fuel and Time  
Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	160	180	200	220	240
5	-0.4	-0.2	0.0	0.3	0.7
10	-0.9	-0.5	0.0	0.6	1.3
15	-1.3	-0.7	0.0	0.9	2.0
20	-1.8	-1.0	0.0	1.3	2.7
25	-2.3	-1.3	0.0	1.6	3.5
30	-2.8	-1.6	0.0	2.0	4.2
35	-3.3	-1.9	0.0	2.3	5.0
40	-3.9	-2.1	0.0	2.7	5.9
45	-4.4	-2.4	0.0	3.1	6.7
50	-4.9	-2.7	0.0	3.5	7.6
55	-5.4	-2.9	0.0	3.9	8.5
60	-6.0	-3.2	0.0	4.4	9.4
65	-6.5	-3.5	0.0	4.8	10.4
70	-7.0	-3.7	0.0	5.2	11.3
75	-7.6	-4.0	0.0	5.7	12.3
80	-8.1	-4.2	0.0	6.2	13.4

Based on VREF+80 climb, Long Range Cruise and VREF+80 descent.

GEAR DOWN

Short Trip Fuel and Time  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
101	84	72	63	56	50	45	42	38	36	33
171	150	133	120	109	100	92	86	80	75	71
242	215	194	177	162	150	139	130	122	115	109
311	280	255	233	215	200	187	175	165	156	147
380	344	315	290	268	250	234	220	207	196	186
448	408	374	346	321	300	281	265	250	237	225
517	472	434	402	374	350	329	310	293	278	265
586	536	494	458	427	400	376	355	336	319	304
655	600	554	514	480	450	423	400	379	360	343
726	666	615	571	533	500	471	445	421	400	381

Trip Fuel and Time

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		160	180	200	220	240	
50	FUEL (1000 KG)	2.2	2.3	2.5	2.6	2.7	0:15
	ALT (FT)	13000	11000	11000	11000	11000	
100	FUEL (1000 KG)	3.7	3.9	4.1	4.3	4.5	0:25
	ALT (FT)	23000	21000	21000	19000	19000	
150	FUEL (1000 KG)	5.0	5.2	5.5	5.8	6.2	0:34
	ALT (FT)	29000	27000	25000	25000	23000	
200	FUEL (1000 KG)	6.2	6.5	6.9	7.3	7.8	0:43
	ALT (FT)	31000	29000	29000	27000	25000	
250	FUEL (1000 KG)	7.4	7.8	8.3	8.8	9.4	0:51
	ALT (FT)	33000	31000	29000	27000	25000	
300	FUEL (1000 KG)	8.6	9.1	9.6	10.3	11.0	1:00
	ALT (FT)	33000	31000	31000	29000	27000	
350	FUEL (1000 KG)	9.8	10.3	11.0	11.7	12.6	1:08
	ALT (FT)	33000	33000	31000	29000	27000	
400	FUEL (1000 KG)	11.0	11.6	12.3	13.2	14.2	1:16
	ALT (FT)	33000	33000	31000	29000	27000	
450	FUEL (1000 KG)	12.2	12.9	13.7	14.7	15.8	1:25
	ALT (FT)	33000	33000	31000	29000	27000	
500	FUEL (1000 KG)	13.4	14.2	15.1	16.2	17.5	1:33
	ALT (FT)	33000	33000	31000	29000	27000	

GEAR DOWN

Holding Planning  
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)						
	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
360	15490						
340	14720	14710					
320	13780	13740					
300	12760	12730	12670				
280	11940	11920	11840				
260	11030	11010	10930	10980			
240	10300	10270	10190	10210			
220	9600	9550	9460	9460	9550		
200	9210	9140	9050	9030	9100	9210	
180	8900	8820	8720	8690	8750	8840	9040
160	8630	8540	8430	8390	8430	8510	8690

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	15330	15400	15380	15620	16410
340	14470	14510	14490	14690	15250
320	13540	13550	13540	13670	14090
300	12540	12540	12530	12650	12900
280	11680	11670	11630	11750	11960
260	10760	10730	10680	10790	10930
240	9970	9920	9860	9940	10050
220	9210	9140	9070	9110	9210
200	8700	8610	8520	8540	8620
180	8290	8190	8090	8090	8140
160	7950	7850	7720	7710	7730

These tables include 5% additional fuel for holding in a racetrack pattern.

**GEAR DOWN**  
**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Net Level Off Weight**

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
20	171.5	171.5	166.7
18	182.0	180.0	175.8
16	194.2	192.5	188.4
14	207.3	206.6	201.2
12	223.4	221.2	214.5
10	239.5	236.8	229.8
8	256.5	252.7	246.2
6	275.8	268.7	258.8
4	292.6	281.7	268.8
2	306.2	293.1	279.3
0	318.4	303.7	288.9

**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)											
	PRESSURE ALTITUDE (1000 FT)											
	0	2	4	6	8	10	12	14	16	18	20	
ENGINE ONLY	0.0	-0.7	-1.2	-1.2	-1.1	-0.9	-0.7	-0.2	0.0	0.0	0.0	
ENGINE AND WING	-2.3	-3.0	-3.0	-3.2	-2.7	-2.4	-1.9	-1.6	-1.3	-1.0	-0.7	

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**Performance Dispatch****Text****Chapter PD****Section 14**

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**Introduction**

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

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**Takeoff**

The maximum allowable takeoff weight will be the least of the Field, Climb, Tire Speed, and Obstacle Limit Weights as determined from the following tables. Brake Energy Limit is not shown as it is not limiting for the range of conditions shown in this chapter. When determining a maximum weight for a wet runway, the dry runway limit weight must also be checked and the lower of the two weights used.

**Minimum Takeoff Weight**

Light weight takeoffs at the GE90-115BL thrust rating may be limited by minimum takeoff weight in order to maintain airplane controllability during takeoff. For takeoff at weights below the minimum takeoff weight, use of a lower thrust rating and/or the assumed temperature method of thrust reduction is required.

**Field Limit Weight - Slope and Wind Corrections**

These tables for wet and dry runways provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction table with slope corrected field length and wind component to determine the slope and wind corrected field length.

**Field and Climb Limit Weight**

Tables are presented for selected airport pressure altitudes and runway condition and show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude and runway condition with "Slope and Wind Corrected Field Length" determined above and airport OAT to

obtain Field Limit Weight. Also read Climb Limit Weight for the same OAT. Intermediate altitudes may be interpolated or use next higher altitude.

When finding a maximum weight for a wet runway, the dry runway limit weight must also be determined and the lower of the two weights used.

## Obstacle Limit Weight

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct the reference Obstacle Limit Weight for the effects of OAT, pressure altitude and wind as indicated. In the case of multiple obstacles, enter the tables successively with each obstacle and determine the most limiting weight.

## Tire Speed Limit

Maximum tire speed limited weights are presented for 235 MPH tires. To determine the tire speed limit weight, enter the table with OAT, move to airport pressure altitude and read the tire speed limit weight. Adjust the tire speed limit weight according to the notes below the table to account for wind.

## Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. This typically occurs at full rated thrust and light weights and is shown in the Minimum Takeoff Weight tables provided. The options are to select a smaller flaps setting, use reduced takeoff thrust and/or add weight (fuel). Selecting derate thrust is the preferred method of reduced takeoff thrust as this will reduce the minimum control speeds.



Normal takeoff speeds, V1, VR, and V2 are read from either the wet or dry table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

## Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than the minimum V1 for control on the ground, V1(MCG). It is therefore necessary to compare the adjusted V1 to V1(MCG). To find V1(MCG), enter the V1(MCG) table with airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than V1(MCG), set VR equal to V1(MCG) and determine a new V2 by adding the difference between the normal VR and V1(MCG) to the normal V2. No weight adjustment is required provided that the field length available exceeds the minimum field length required shown in the Field and Climb Limit Weight table.

## Minimum V2

Minimum takeoff safety speeds (V2) are provided to ensure an adequate margin between the normal operating speed and the in-air minimum control speed is maintained for directional control with high thrust asymmetry during a light weight takeoff.

Data are presented as a function of airport pressure altitude and are valid for all temperatures. To obtain the proper V2 speed for takeoff, first determine the normal takeoff V2 using the takeoff speeds tables provided, adjusted for pressure altitude, temperature, and VR correction (if applicable). Compare this V2 with the minimum V2. If the calculated V2 is less than the minimum V2, set V2 equal to minimum V2 and determine a new VR by adding the difference between calculated V2 and minimum V2 to the original VR obtained from the V1, VR, V2 Adjustments table or Minimum VR table (if applicable).

## Brakes Deactivated

When operating with brakes deactivated, the field limit weight and the V1 must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 6500 kg for a dry runway or 4750 kg for a wet runway and the V1 associated with the reduced weight by 2 knots. With two brakes deactivated, reduce the normal runway limited weight by 11350 kg for a dry runway or 8650 kg for a wet runway and the V1 associated with the

reduced weight by 5 knots for a dry runway or 3 knots for a wet runway. If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the dry accelerate stop distance corrected for wind and slope exceeds approximately 1850 m for one brake deactivated or 1950 m for two brakes deactivated. For wet runways, the corrected accelerate stop distance should exceed approximately 2450 m for one brake deactivated or 2550 m for two brakes deactivated.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

## One Thrust Reverser Inoperative

Wet runway takeoff performance presented for all brakes operating is based on the use of one thrust reverser during deceleration. When operating with a thrust reverser inoperative, the runway/obstacle limited takeoff weight and V1 speed must be reduced to account for the reduced deceleration capability. A simplified method which conservatively accounts for this is to reduce the normal wet runway/obstacle limited weight by 8700 kg and the V1 associated with the reduced weight by 3 knots.

If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate stop distance available corrected for wind and slope exceeds approximately 2500 m.

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## Enroute

### Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

---

## Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time Table with air distance from the Ground to Air Miles Conversion Table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment Table with the Reference Fuel and the planned landing weight to obtain fuel required at the planned landing weight.

## Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

## Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time table with air distance and read trip fuel required for the expected landing weight, together with time to alternate at right. For distances greater than shown or other altitudes, use the Long Range Cruise Trip Fuel and Time tables.

## Holding Planning

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 holding and reserve fuel requirements. Data is based on the FMC holding speed schedule which is the higher of the maximum

endurance and flaps up maneuver speeds. As noted, the fuel flow is based on flight in a racetrack holding pattern. For holding in straight and level flight, reduce table values by 5%.

## Oxygen Requirements

### Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with these requirements is achieved with the minimum dispatch oxygen cylinder pressure. Enter the Crew Oxygen Requirements table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature.

An additional quantity of oxygen is required when flight altitudes above 41000 ft are planned. Regulations require that one active duty pilot must don the oxygen mask and breathe diluted oxygen for the duration of the flight above 41000 ft. The additional quantity of oxygen required is 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system), or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

### Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

### Extended Range Operations

Regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one engine inoperative speed" from an adequate diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

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## Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for in-service deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

---

## Landing

Tables are provided for determining the maximum landing weight as limited by field length or climb requirements for Flaps 30.

Maximum landing weight is the lowest of the field length limit weight, climb limit weight or maximum certified landing weight.

### Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

### Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required.

### Go-Around Climb Gradient

Enter the Reference Go-around Gradient table with airport OAT and pressure altitude to determine the reference Go-Around Gradient. Then adjust the reference gradient for airplane weight and speed using the tables provided to determine the weight and speed adjusted Go-Around Gradient. Apply the necessary engine bleed corrections as noted. Note that data is for one engine inoperative.

### Quick Turnaround Limit Weight

Enter table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

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If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

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## **Gear Down**

This section provides flight planning data for revenue operation with gear down.

### **Takeoff/Landing Climb Limit Weight**

Enter table with airport OAT and pressure altitude to determine Takeoff Climb Limit Weight with gear down. Correct the weight obtained for engine bleed configuration as required.

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

# Performance Inflight

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Engine Inoperative .....	PI.17.8
Alternate Mode EEC .....	PI.17.11
Gear Down .....	PI.17.11

Intentionally  
Blank

Performance Inflight 777-200LR  
General

Chapter PI  
Section 10

Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	175
2000	220
2500	260
3000	300
3500	340
4000	400
4500	450

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
300	-2	-3	-3	-3				
200	-2	-3	-3	-2				
100	0	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-100	5	5	3	3	4	3	2	2
-200	7	7	6	5	6	4	4	4
-300	8	7	6	6	8	6	5	5

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VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
360	186	184	198
340	180	181	192
320	173	176	186
300	165	170	180
280	158	164	174
260	150	158	167
240	144	152	161
220	140	146	154
200	140	140	147
180	140	140	140
160	140	140	140

Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

ADVISORY INFORMATION

Slush/Standing Water Takeoff  
Maximum Reverse Thrust  
Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-39.9	-45.3	-50.8	-47.7	-53.2	-58.6	-61.3	-66.7	-72.1
380	-38.0	-43.4	-48.9	-45.2	-50.6	-56.1	-57.5	-62.9	-68.3
360	-36.0	-41.5	-46.9	-42.7	-48.1	-53.5	-53.7	-59.1	-64.6
340	-34.0	-39.5	-44.9	-40.0	-45.4	-50.9	-49.8	-55.2	-60.7
320	-31.7	-37.2	-42.6	-37.1	-42.5	-48.0	-45.7	-51.1	-56.5
300	-29.2	-34.6	-40.0	-33.9	-39.3	-44.7	-41.3	-46.7	-52.2
280	-26.3	-31.8	-37.2	-30.4	-35.8	-41.2	-36.7	-42.1	-47.5
260	-23.2	-28.7	-34.1	-26.6	-32.0	-37.5	-31.8	-37.2	-42.7
240	-19.8	-25.3	-30.7	-22.5	-28.0	-33.4	-26.7	-32.1	-37.6
220	-16.2	-21.6	-27.1	-18.2	-23.6	-29.0	-21.3	-26.8	-32.2
200	-12.3	-17.7	-23.1	-13.5	-19.0	-24.4	-15.7	-21.2	-26.6
180	-8.1	-13.5	-18.9	-8.6	-14.1	-19.5	-9.9	-15.3	-20.8
160	-3.8	-9.2	-14.6	-3.6	-9.0	-14.5	-3.9	-9.4	-14.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2200							144.9		
2400	143.9			156.3			177.8		
2600	175.8			188.8	133.4		210.8	154.6	
2800	208.0	153.3		221.6	165.9		244.2	187.5	131.3
3000	240.7	185.2	130.7	254.9	198.4	143.0	278.0	220.6	164.2
3200	274.0	217.5	162.7	288.7	231.3	175.4	312.2	254.1	197.2
3400	307.9	250.4	194.7	323.1	264.8	208.0	346.9	288.0	230.4
3600	342.6	283.9	227.1	358.0	298.7	241.1	381.9	322.4	264.0
3800	377.8	318.0	260.2	393.2	333.3	274.7		357.1	298.1
4000		352.9	293.9		368.4	308.8		392.1	332.5
4200		388.2	328.2			343.5			367.4
4400			363.3			378.7			

1. Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -70 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

Slush/Standing Water Takeoff  
Maximum Reverse Thrust  
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-27	-25	-23	-23	-21	-19	-14	-12	-10
340	-29	-27	-25	-25	-23	-21	-16	-14	-12
320	-31	-29	-27	-26	-24	-22	-17	-15	-13
300	-32	-30	-28	-28	-26	-24	-19	-17	-15
280	-32	-30	-28	-29	-27	-25	-21	-19	-17
260	-32	-30	-28	-29	-27	-25	-23	-21	-19
240	-32	-30	-28	-30	-28	-26	-24	-22	-20
220	-32	-30	-28	-30	-28	-26	-25	-23	-21
200	-31	-29	-27	-29	-27	-25	-25	-23	-21
180	-30	-28	-26	-28	-26	-24	-25	-23	-21
160	-29	-27	-25	-27	-25	-23	-24	-22	-20

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

Slush/Standing Water Takeoff

No Reverse Thrust

Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-55.2	-61.2	-67.1	-64.3	-70.3	-76.3	-79.7	-85.7	-91.7
380	-52.1	-58.1	-64.0	-60.4	-66.4	-72.4	-74.2	-80.2	-86.2
360	-49.0	-55.0	-60.9	-56.6	-62.5	-68.5	-68.8	-74.8	-80.7
340	-45.8	-51.8	-57.8	-52.6	-58.6	-64.6	-63.3	-69.3	-75.2
320	-42.5	-48.5	-54.5	-48.5	-54.5	-60.5	-57.7	-63.7	-69.7
300	-39.0	-45.0	-51.0	-44.3	-50.3	-56.3	-52.1	-58.1	-64.1
280	-35.4	-41.4	-47.4	-39.9	-45.9	-51.9	-46.5	-52.4	-58.4
260	-31.7	-37.7	-43.7	-35.4	-41.4	-47.4	-40.7	-46.7	-52.7
240	-27.8	-33.8	-39.8	-30.7	-36.7	-42.7	-35.0	-41.0	-46.9
220	-23.7	-29.7	-35.7	-25.9	-31.9	-37.9	-29.1	-35.1	-41.1
200	-19.5	-25.5	-31.5	-21.0	-26.9	-32.9	-23.3	-29.3	-35.2
180	-15.2	-21.2	-27.2	-15.9	-21.8	-27.8	-17.3	-23.3	-29.3
160	-10.8	-16.8	-22.8	-10.7	-16.7	-22.7	-11.4	-17.4	-23.4

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
3400							156.0		
3600							196.7	132.2	
3800				142.9			235.9	173.0	
4000				186.7			273.6	213.2	149.2
4200	163.5			228.9	161.1		310.0	251.8	189.9
4400	208.4	136.8		268.7	204.6	135.5	345.0	288.9	229.4
4600	250.5	182.4		306.6	245.7	179.3	379.2	324.7	267.4
4800	290.1	226.3	155.8	342.7	284.7	222.0		359.3	303.9
5000	327.6	267.3	201.1	377.6	321.8	262.2		393.4	339.2
5200	363.3	306.0	243.6		357.3	300.4			373.5
5400	398.5	342.7	283.6		392.0	336.8			

1. Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -105 m/+105 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.



ADVISORY INFORMATION

Slush/Standing Water Takeoff  
No Reverse Thrust  
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-43	-39	-35	-37	-33	-29	-24	-20	-16
340	-45	-41	-37	-39	-35	-31	-27	-23	-19
320	-47	-43	-39	-41	-37	-33	-29	-25	-21
300	-48	-44	-40	-43	-39	-35	-32	-28	-24
280	-48	-44	-40	-44	-40	-36	-35	-31	-27
260	-49	-45	-41	-45	-41	-37	-37	-33	-29
240	-49	-45	-41	-46	-42	-38	-39	-35	-31
220	-49	-45	-41	-46	-42	-38	-41	-37	-33
200	-48	-44	-40	-46	-42	-38	-42	-38	-34
180	-48	-44	-40	-46	-42	-38	-42	-38	-34
160	-48	-44	-40	-46	-42	-38	-41	-37	-33

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

Slippery Runway Takeoff  
Maximum Reverse Thrust  
Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	0.0	0.0	-23.0	-24.8	-26.7	-43.0	-44.8	-46.7
380	0.0	0.0	0.0	-22.5	-24.3	-26.1	-40.8	-42.6	-44.4
360	0.0	-0.4	-2.2	-22.0	-23.8	-25.6	-38.5	-40.4	-42.2
340	-1.7	-3.5	-5.3	-21.5	-23.3	-25.1	-36.4	-38.2	-40.0
320	-3.9	-5.7	-7.6	-21.2	-23.0	-24.8	-34.6	-36.4	-38.3
300	-5.3	-7.2	-9.0	-21.0	-22.8	-24.6	-33.2	-35.0	-36.8
280	-6.0	-7.8	-9.6	-20.6	-22.4	-24.2	-31.7	-33.5	-35.3
260	-6.0	-7.8	-9.6	-19.2	-21.1	-22.9	-29.0	-30.8	-32.6
240	-5.3	-7.1	-9.0	-16.8	-18.7	-20.5	-25.2	-27.0	-28.8
220	-4.0	-5.9	-7.7	-13.4	-15.2	-17.0	-20.1	-21.9	-23.8
200	-2.1	-4.0	-5.8	-8.9	-10.7	-12.5	-13.9	-15.7	-17.5
180	0.0	-1.4	-3.2	-3.4	-5.2	-7.0	-6.5	-8.3	-10.2
160	0.0	0.0	-0.4	0.0	0.0	-1.1	0.0	-0.5	-2.3

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	125.3								
1800	191.7	135.0							
2000	257.9	201.4	144.7						
2200	323.9	267.6	211.0	152.6					
2400	389.7	333.5	277.2	198.8	142.5				
2600		399.3	343.1	246.2	188.6	132.4			
2800			409.0	295.5	235.7	178.4	159.3		
3000				346.7	284.5	225.2	189.2	134.5	
3200				399.4	335.2	273.6	219.8	164.4	
3400					387.8	323.9	251.5	194.4	139.7
3600						376.2	284.3	225.2	169.6
3800							318.5	257.0	199.6
4000							354.1	290.1	230.6
4200							390.8	324.5	262.6
4400								360.4	295.9

1. Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -35 m/+35 m for every 5°C above/below 4°C.  
Adjust “Medium” field length available by -50 m/+50 m for every 5°C above/below 4°C.  
Adjust “Poor” field length available by -70 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

Slippery Runway Takeoff  
Maximum Reverse Thrust  
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-7	-5	-3	-20	-18	-16	-35	-33	-31
340	-9	-7	-5	-22	-20	-18	-37	-35	-33
320	-11	-9	-7	-24	-22	-20	-40	-38	-36
300	-12	-10	-8	-26	-24	-22	-42	-40	-38
280	-13	-11	-9	-28	-26	-24	-44	-42	-40
260	-14	-12	-10	-29	-27	-25	-45	-43	-41
240	-15	-13	-11	-29	-27	-25	-46	-44	-42
220	-15	-13	-11	-30	-28	-26	-46	-44	-42
200	-16	-14	-12	-30	-28	-26	-46	-44	-42
180	-16	-14	-12	-30	-28	-26	-45	-43	-41
160	-16	-14	-12	-31	-29	-27	-45	-43	-41

- 1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
- 2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

Slippery Runway Takeoff  
No Reverse Thrust  
Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-1.2	-2.4	-3.7	-35.5	-36.8	-38.1	-61.3	-62.6	-63.8
380	-3.7	-5.0	-6.2	-34.6	-35.9	-37.2	-57.8	-59.1	-60.3
360	-6.2	-7.5	-8.8	-33.7	-35.0	-36.3	-54.3	-55.6	-56.9
340	-8.6	-9.8	-11.1	-32.9	-34.1	-35.4	-51.1	-52.3	-53.6
320	-10.3	-11.6	-12.9	-32.1	-33.4	-34.7	-48.3	-49.6	-50.9
300	-11.6	-12.8	-14.1	-31.5	-32.7	-34.0	-46.1	-47.4	-48.7
280	-12.2	-13.5	-14.7	-30.6	-31.8	-33.1	-44.1	-45.4	-46.6
260	-12.0	-13.3	-14.5	-28.6	-29.8	-31.1	-41.3	-42.5	-43.8
240	-11.0	-12.2	-13.5	-25.4	-26.6	-27.9	-37.5	-38.8	-40.1
220	-9.1	-10.4	-11.7	-21.0	-22.3	-23.5	-33.0	-34.3	-35.5
200	-6.4	-7.7	-9.0	-15.5	-16.8	-18.0	-27.6	-28.8	-30.1
180	-3.0	-4.2	-5.5	-8.8	-10.1	-11.3	-21.3	-22.6	-23.8
160	0.0	-0.4	-1.7	-1.7	-2.9	-4.2	-14.7	-15.9	-17.2

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2000	122.2								
2200	231.9	152.6							
2400	321.2	257.7	182.9						
2600	397.9	342.4	282.0						
2800		418.2	362.9						
3200				155.3					
3400				264.5	158.3				
3600				344.2	266.7	161.3			
3800				413.0	345.9	268.8			
4000					414.7	347.6			
4200						416.3			
5400							256.7		
5600							338.7		
5800							385.1	322.9	
6000								372.5	304.1

1. Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -40 m/+40 m for every 5°C above/below 4°C.  
Adjust “Medium” field length available by -60 m/+60 m for every 5°C above/below 4°C.  
Adjust “Poor” field length available by -95 m/+95 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

Slippery Runway Takeoff  
No Reverse Thrust  
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-11	-7	-3	-29	-25	-21	-56	-52	-48
340	-13	-9	-5	-32	-28	-24	-60	-56	-52
320	-15	-11	-7	-35	-31	-27	-63	-59	-55
300	-17	-13	-9	-38	-34	-30	-67	-63	-59
280	-18	-14	-10	-40	-36	-32	-69	-65	-61
260	-20	-16	-12	-42	-38	-34	-72	-68	-64
240	-21	-17	-13	-44	-40	-36	-74	-70	-66
220	-22	-18	-14	-46	-42	-38	-75	-71	-67
200	-23	-19	-15	-47	-43	-39	-76	-72	-68
180	-23	-19	-15	-49	-45	-41	-77	-73	-69
160	-24	-20	-16	-50	-46	-42	-78	-74	-70

- 1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
- 2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

TOB Slush/Standing Water Takeoff

GE90-115BL1 Thrust Bump

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TOB DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-39.9	-45.3	-50.8	-47.7	-53.2	-58.6	-61.3	-66.7	-72.1
380	-38.0	-43.4	-48.9	-45.2	-50.6	-56.1	-57.5	-62.9	-68.3
360	-36.0	-41.5	-46.9	-42.7	-48.1	-53.5	-53.7	-59.1	-64.6
340	-34.0	-39.5	-44.9	-40.0	-45.4	-50.9	-49.8	-55.2	-60.7
320	-31.7	-37.2	-42.6	-37.1	-42.5	-48.0	-45.7	-51.1	-56.5
300	-29.2	-34.6	-40.0	-33.9	-39.3	-44.7	-41.3	-46.7	-52.2
280	-26.3	-31.8	-37.2	-30.4	-35.8	-41.2	-36.7	-42.1	-47.5
260	-23.2	-28.7	-34.1	-26.6	-32.0	-37.5	-31.8	-37.2	-42.7
240	-19.8	-25.3	-30.7	-22.5	-28.0	-33.4	-26.7	-32.1	-37.6
220	-16.2	-21.6	-27.1	-18.2	-23.6	-29.0	-21.3	-26.8	-32.2
200	-12.3	-17.7	-23.1	-13.5	-19.0	-24.4	-15.7	-21.2	-26.6
180	-8.1	-13.5	-18.9	-8.6	-14.1	-19.5	-9.9	-15.3	-20.8
160	-3.8	-9.2	-14.6	-3.6	-9.0	-14.5	-3.9	-9.4	-14.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2200							144.9		
2400	143.9			156.3			177.8		
2600	175.8			188.8	133.4		210.8	154.6	
2800	208.0	153.3		221.6	165.9		244.2	187.5	131.3
3000	240.7	185.2	130.7	254.9	198.4	143.0	278.0	220.6	164.2
3200	274.0	217.5	162.7	288.7	231.3	175.4	312.2	254.1	197.2
3400	307.9	250.4	194.7	323.1	264.8	208.0	346.9	288.0	230.4
3600	342.6	283.9	227.1	358.0	298.7	241.1	381.9	322.4	264.0
3800	377.8	318.0	260.2	393.2	333.3	274.7		357.1	298.1
4000		352.9	293.9		368.4	308.8		392.1	332.5
4200		388.2	328.2			343.5			367.4
4400			363.3			378.7			

1. Enter Weight Adjustment table with slush/standing water depth and TOB dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -70 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

TOB Slush/Standing Water Takeoff

GE90-115BL1 Thrust Bump

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-27	-25	-23	-23	-21	-19	-14	-12	-10
340	-29	-27	-25	-25	-23	-21	-16	-14	-12
320	-31	-29	-27	-26	-24	-22	-17	-15	-13
300	-32	-30	-28	-28	-26	-24	-19	-17	-15
280	-32	-30	-28	-29	-27	-25	-21	-19	-17
260	-32	-30	-28	-29	-27	-25	-23	-21	-19
240	-32	-30	-28	-30	-28	-26	-24	-22	-20
220	-32	-30	-28	-30	-28	-26	-25	-23	-21
200	-31	-29	-27	-29	-27	-25	-25	-23	-21
180	-30	-28	-26	-28	-26	-24	-25	-23	-21
160	-29	-27	-25	-27	-25	-23	-24	-22	-20

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

TOB Slush/Standing Water Takeoff  
GE90-115BL1 Thrust Bump

No Reverse Thrust

Weight Adjustment (1000 KG)

TOB DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-55.2	-61.2	-67.1	-64.3	-70.3	-76.3	-79.7	-85.7	-91.7
380	-52.1	-58.1	-64.0	-60.4	-66.4	-72.4	-74.2	-80.2	-86.2
360	-49.0	-55.0	-60.9	-56.6	-62.5	-68.5	-68.8	-74.8	-80.7
340	-45.8	-51.8	-57.8	-52.6	-58.6	-64.6	-63.3	-69.3	-75.2
320	-42.5	-48.5	-54.5	-48.5	-54.5	-60.5	-57.7	-63.7	-69.7
300	-39.0	-45.0	-51.0	-44.3	-50.3	-56.3	-52.1	-58.1	-64.1
280	-35.4	-41.4	-47.4	-39.9	-45.9	-51.9	-46.5	-52.4	-58.4
260	-31.7	-37.7	-43.7	-35.4	-41.4	-47.4	-40.7	-46.7	-52.7
240	-27.8	-33.8	-39.8	-30.7	-36.7	-42.7	-35.0	-41.0	-46.9
220	-23.7	-29.7	-35.7	-25.9	-31.9	-37.9	-29.1	-35.1	-41.1
200	-19.5	-25.5	-31.5	-21.0	-26.9	-32.9	-23.3	-29.3	-35.2
180	-15.2	-21.2	-27.2	-15.9	-21.8	-27.8	-17.3	-23.3	-29.3
160	-10.8	-16.8	-22.8	-10.7	-16.7	-22.7	-11.4	-17.4	-23.4

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
3400							156.0		
3600							196.7	132.2	
3800				142.9			235.9	173.0	
4000				186.7			273.6	213.2	149.2
4200	163.5			228.9	161.1		310.0	251.8	189.9
4400	208.4	136.8		268.7	204.6	135.5	345.0	288.9	229.4
4600	250.5	182.4		306.6	245.7	179.3	379.2	324.7	267.4
4800	290.1	226.3	155.8	342.7	284.7	222.0		359.3	303.9
5000	327.6	267.3	201.1	377.6	321.8	262.2		393.4	339.2
5200	363.3	306.0	243.6		357.3	300.4			373.5
5400	398.5	342.7	283.6		392.0	336.8			

1. Enter Weight Adjustment table with slush/standing water depth and TOB dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -105 m/+105 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.



ADVISORY INFORMATION

**TOB Slush/Standing Water Takeoff**  
**GE90-115BL1 Thrust Bump**  
**No Reverse Thrust**  
**V1 Adjustment (KIAS)**

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-43	-39	-35	-37	-33	-29	-24	-20	-16
340	-45	-41	-37	-39	-35	-31	-27	-23	-19
320	-47	-43	-39	-41	-37	-33	-29	-25	-21
300	-48	-44	-40	-43	-39	-35	-32	-28	-24
280	-48	-44	-40	-44	-40	-36	-35	-31	-27
260	-49	-45	-41	-45	-41	-37	-37	-33	-29
240	-49	-45	-41	-46	-42	-38	-39	-35	-31
220	-49	-45	-41	-46	-42	-38	-41	-37	-33
200	-48	-44	-40	-46	-42	-38	-42	-38	-34
180	-48	-44	-40	-46	-42	-38	-42	-38	-34
160	-48	-44	-40	-46	-42	-38	-41	-37	-33

- Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
- If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

**TOB Slippery Runway Takeoff**  
**GE90-110B1L1 Thrust Bump**  
**Maximum Reverse Thrust**  
**Weight Adjustments (1000 KG)**

TOB DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	0.0	0.0	-23.0	-24.8	-26.7	-43.0	-44.8	-46.7
380	0.0	0.0	0.0	-22.5	-24.3	-26.1	-40.8	-42.6	-44.4
360	0.0	-0.4	-2.2	-22.0	-23.8	-25.6	-38.5	-40.4	-42.2
340	-1.7	-3.5	-5.3	-21.5	-23.3	-25.1	-36.4	-38.2	-40.0
320	-3.9	-5.7	-7.6	-21.2	-23.0	-24.8	-34.6	-36.4	-38.3
300	-5.3	-7.2	-9.0	-21.0	-22.8	-24.6	-33.2	-35.0	-36.8
280	-6.0	-7.8	-9.6	-20.6	-22.4	-24.2	-31.7	-33.5	-35.3
260	-6.0	-7.8	-9.6	-19.2	-21.1	-22.9	-29.0	-30.8	-32.6
240	-5.3	-7.1	-9.0	-16.8	-18.7	-20.5	-25.2	-27.0	-28.8
220	-4.0	-5.9	-7.7	-13.4	-15.2	-17.0	-20.1	-21.9	-23.8
200	-2.1	-4.0	-5.8	-8.9	-10.7	-12.5	-13.9	-15.7	-17.5
180	0.0	-1.4	-3.2	-3.4	-5.2	-7.0	-6.5	-8.3	-10.2
160	0.0	0.0	-0.4	0.0	0.0	-1.1	0.0	-0.5	-2.3

**V1(MCG) Limit Weight (1000 KG)**

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	125.3								
1800	191.7	135.0							
2000	257.9	201.4	144.7						
2200	323.9	267.6	211.0	152.6					
2400	389.7	333.5	277.2	198.8	142.5				
2600		399.3	343.1	246.2	188.6	132.4			
2800			409.0	295.5	235.7	178.4	159.3		
3000				346.7	284.5	225.2	189.2	134.5	
3200				399.4	335.2	273.6	219.8	164.4	
3400					387.8	323.9	251.5	194.4	139.7
3600						376.2	284.3	225.2	169.6
3800							318.5	257.0	199.6
4000							354.1	290.1	230.6
4200							390.8	324.5	262.6
4400								360.4	295.9

1. Enter Weight Adjustment table with reported braking action and TOB dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -35 m/+35 m for every 5°C above/below 4°C.  
Adjust “Medium” field length available by -50 m/+50 m for every 5°C above/below 4°C.  
Adjust “Poor” field length available by -70 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

TOB Slippery Runway Takeoff  
GE90-110B1L1 Thrust Bump  
Maximum Reverse Thrust  
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-7	-5	-3	-20	-18	-16	-35	-33	-31
340	-9	-7	-5	-22	-20	-18	-37	-35	-33
320	-11	-9	-7	-24	-22	-20	-40	-38	-36
300	-12	-10	-8	-26	-24	-22	-42	-40	-38
280	-13	-11	-9	-28	-26	-24	-44	-42	-40
260	-14	-12	-10	-29	-27	-25	-45	-43	-41
240	-15	-13	-11	-29	-27	-25	-46	-44	-42
220	-15	-13	-11	-30	-28	-26	-46	-44	-42
200	-16	-14	-12	-30	-28	-26	-46	-44	-42
180	-16	-14	-12	-30	-28	-26	-45	-43	-41
160	-16	-14	-12	-31	-29	-27	-45	-43	-41

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

**TOB Slippery Runway Takeoff**  
**GE90-110B1L1 Thrust Bump**  
**No Reverse Thrust**  
**Weight Adjustment (1000 KG)**

TOB DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-1.2	-2.4	-3.7	-35.5	-36.8	-38.1	-61.3	-62.6	-63.8
380	-3.7	-5.0	-6.2	-34.6	-35.9	-37.2	-57.8	-59.1	-60.3
360	-6.2	-7.5	-8.8	-33.7	-35.0	-36.3	-54.3	-55.6	-56.9
340	-8.6	-9.8	-11.1	-32.9	-34.1	-35.4	-51.1	-52.3	-53.6
320	-10.3	-11.6	-12.9	-32.1	-33.4	-34.7	-48.3	-49.6	-50.9
300	-11.6	-12.8	-14.1	-31.5	-32.7	-34.0	-46.1	-47.4	-48.7
280	-12.2	-13.5	-14.7	-30.6	-31.8	-33.1	-44.1	-45.4	-46.6
260	-12.0	-13.3	-14.5	-28.6	-29.8	-31.1	-41.3	-42.5	-43.8
240	-11.0	-12.2	-13.5	-25.4	-26.6	-27.9	-37.5	-38.8	-40.1
220	-9.1	-10.4	-11.7	-21.0	-22.3	-23.5	-33.0	-34.3	-35.5
200	-6.4	-7.7	-9.0	-15.5	-16.8	-18.0	-27.6	-28.8	-30.1
180	-3.0	-4.2	-5.5	-8.8	-10.1	-11.3	-21.3	-22.6	-23.8
160	0.0	-0.4	-1.7	-1.7	-2.9	-4.2	-14.7	-15.9	-17.2

**V1(MCG) Limit Weight (1000 KG)**

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2000	122.2								
2200	231.9	152.6							
2400	321.2	257.7	182.9						
2600	397.9	342.4	282.0						
2800		418.2	362.9						
3200				155.3					
3400				264.5	158.3				
3600				344.2	266.7	161.3			
3800				413.0	345.9	268.8			
4000					414.7	347.6			
4200						416.3			
5400							256.7		
5600							338.7		
5800							385.1	322.9	
6000								372.5	304.1

1. Enter Weight Adjustment table with reported braking action and TOB dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -40 m/+40 m for every 5°C above/below 4°C.  
Adjust “Medium” field length available by -60 m/+60 m for every 5°C above/below 4°C.  
Adjust “Poor” field length available by -95 m/+95 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

**TOB Slippery Runway Takeoff**  
**GE90-110B1L1 Thrust Bump**  
**No Reverse Thrust**  
**V1 Adjustment (KIAS)**

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-11	-7	-3	-29	-25	-21	-56	-52	-48
340	-13	-9	-5	-32	-28	-24	-60	-56	-52
320	-15	-11	-7	-35	-31	-27	-63	-59	-55
300	-17	-13	-9	-38	-34	-30	-67	-63	-59
280	-18	-14	-10	-40	-36	-32	-69	-65	-61
260	-20	-16	-12	-42	-38	-34	-72	-68	-64
240	-21	-17	-13	-44	-40	-36	-74	-70	-66
220	-22	-18	-14	-46	-42	-38	-75	-71	-67
200	-23	-19	-15	-47	-43	-39	-76	-72	-68
180	-23	-19	-15	-49	-45	-41	-77	-73	-69
160	-24	-20	-16	-50	-46	-42	-78	-74	-70

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

ADVISORY INFORMATION

**TO1 Slush/Standing Water Takeoff**  
**10% Thrust Reduction**  
**Maximum Reverse Thrust**  
**Weight Adjustment (1000 KG)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-37.5	-42.9	-48.4	-45.2	-50.7	-56.1	-58.8	-64.3	-69.7
380	-35.6	-41.0	-46.5	-42.7	-48.1	-53.6	-55.1	-60.5	-66.0
360	-33.7	-39.1	-44.6	-40.2	-45.7	-51.1	-51.5	-57.0	-62.4
340	-32.0	-37.4	-42.9	-38.0	-43.5	-48.9	-48.2	-53.7	-59.1
320	-30.5	-35.9	-41.4	-36.0	-41.4	-46.9	-45.0	-50.5	-55.9
300	-28.7	-34.1	-39.6	-33.6	-39.0	-44.5	-41.5	-47.0	-52.4
280	-26.5	-32.0	-37.4	-30.8	-36.3	-41.7	-37.7	-43.1	-48.5
260	-24.0	-29.4	-34.9	-27.7	-33.1	-38.6	-33.4	-38.9	-44.3
240	-21.1	-26.6	-32.0	-24.2	-29.6	-35.0	-28.9	-34.3	-39.8
220	-17.9	-23.4	-28.8	-20.3	-25.7	-31.2	-24.0	-29.4	-34.9
200	-14.4	-19.8	-25.2	-16.0	-21.5	-26.9	-18.8	-24.2	-29.7
180	-10.5	-15.9	-21.4	-11.5	-16.9	-22.3	-13.3	-18.7	-24.1
160	-6.2	-11.7	-17.1	-6.5	-11.9	-17.4	-7.4	-12.8	-18.2

**V1(MCG) Limit Weight (1000 KG)**

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2000							135.0		
2200	136.5			148.8			170.1		
2400	170.7			183.6			205.5	145.4	
2600	205.4	146.5		219.0	159.0		241.6	180.5	
2800	241.0	180.9		255.2	193.9	134.5	278.3	216.0	155.7
3000	277.5	215.8	156.6	292.3	229.5	169.2	315.9	252.3	190.9
3200	315.2	251.6	191.0	330.4	266.0	204.3	354.2	289.3	226.6
3400	353.9	288.5	226.2	369.4	303.4	240.2	393.2	327.1	263.1
3600	393.3	326.4	262.3		341.7	276.9		365.6	300.3
3800		365.5	299.5		381.0	314.6			338.3
4000			337.8			353.2			377.1
4200			377.1			392.5			

1. Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -70 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

TO1 Slush/Standing Water Takeoff  
10% Thrust Reduction  
Maximum Reverse Thrust  
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-25	-23	-21	-20	-18	-16	-11	-9	-7
340	-27	-25	-23	-22	-20	-18	-12	-10	-8
320	-29	-27	-25	-24	-22	-20	-14	-12	-10
300	-30	-28	-26	-25	-23	-21	-16	-14	-12
280	-30	-28	-26	-26	-24	-22	-18	-16	-14
260	-31	-29	-27	-27	-25	-23	-20	-18	-16
240	-30	-28	-26	-28	-26	-24	-22	-20	-18
220	-30	-28	-26	-28	-26	-24	-22	-20	-18
200	-29	-27	-25	-27	-25	-23	-23	-21	-19
180	-28	-26	-24	-26	-24	-22	-22	-20	-18
160	-27	-25	-23	-24	-22	-20	-21	-19	-17

- Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
- If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

**ADVISORY INFORMATION**

**TO1 Slush/Standing Water Takeoff**

**10% Thrust Reduction**

**No Reverse Thrust**

**Weight Adjustment (1000 KG)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-53.0	-59.0	-64.9	-62.2	-68.1	-74.1	-78.1	-84.1	-90.1
380	-49.9	-55.9	-61.8	-58.3	-64.3	-70.3	-72.8	-78.8	-84.8
360	-46.9	-52.9	-58.9	-54.7	-60.6	-66.6	-67.7	-73.7	-79.7
340	-44.2	-50.1	-56.1	-51.2	-57.2	-63.2	-62.7	-68.7	-74.7
320	-41.5	-47.5	-53.5	-47.8	-53.8	-59.8	-57.8	-63.8	-69.8
300	-38.7	-44.7	-50.7	-44.3	-50.3	-56.3	-52.9	-58.8	-64.8
280	-35.7	-41.7	-47.6	-40.5	-46.5	-52.5	-47.7	-53.7	-59.7
260	-32.4	-38.4	-44.4	-36.5	-42.5	-48.5	-42.5	-48.5	-54.5
240	-29.0	-34.9	-40.9	-32.3	-38.3	-44.3	-37.1	-43.1	-49.1
220	-25.3	-31.3	-37.3	-27.9	-33.9	-39.9	-31.7	-37.7	-43.6
200	-21.4	-27.4	-33.4	-23.3	-29.3	-35.3	-26.1	-32.1	-38.1
180	-17.3	-23.3	-29.3	-18.4	-24.4	-30.4	-20.3	-26.3	-32.3
160	-13.0	-19.0	-24.9	-13.3	-19.3	-25.3	-14.4	-20.4	-26.4

**V1(MCG) Limit Weight (1000 KG)**

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
3200							172.0		
3400				122.0			217.4	145.5	
3600				172.3			261.4	191.1	
3800	156.3			222.4	142.8		304.4	235.9	164.4
4000	210.0	125.0		270.1	193.5		346.3	279.4	209.8
4200	260.8	178.8		315.9	242.5	163.8	387.8	321.9	254.1
4400	308.9	231.5	147.2	360.0	289.4	214.2		363.5	297.2
4600	355.0	281.1	201.2		334.4	262.3			339.3
4800	399.9	328.3	252.4		378.2	308.3			380.8
5000		373.7	301.0			352.7			
5200			347.4			396.6			
5400			392.3						

1. Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -105 m/+105 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.



ADVISORY INFORMATION

TO1 Slush/Standing Water Takeoff

10% Thrust Reduction

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-39	-35	-31	-32	-28	-24	-17	-13	-9
340	-42	-38	-34	-35	-31	-27	-20	-16	-12
320	-43	-39	-35	-37	-33	-29	-23	-19	-15
300	-45	-41	-37	-39	-35	-31	-26	-22	-18
280	-45	-41	-37	-41	-37	-33	-29	-25	-21
260	-46	-42	-38	-42	-38	-34	-32	-28	-24
240	-46	-42	-38	-42	-38	-34	-35	-31	-27
220	-46	-42	-38	-43	-39	-35	-37	-33	-29
200	-45	-41	-37	-43	-39	-35	-38	-34	-30
180	-45	-41	-37	-43	-39	-35	-38	-34	-30
160	-45	-41	-37	-42	-38	-34	-37	-33	-29

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

TO1 Slippery Runway Takeoff  
10% Thrust Reduction  
Maximum Reverse Thrust  
Weight Adjustments (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	0.0	0.0	-21.0	-22.8	-24.6	-41.0	-42.8	-44.7
380	0.0	0.0	0.0	-20.5	-22.3	-24.1	-38.8	-40.6	-42.4
360	0.0	0.0	0.0	-20.0	-21.8	-23.6	-36.6	-38.4	-40.2
340	0.0	0.0	-1.8	-19.5	-21.3	-23.1	-34.6	-36.5	-38.3
320	-1.4	-3.2	-5.0	-19.3	-21.1	-22.9	-33.0	-34.8	-36.6
300	-3.7	-5.5	-7.3	-19.3	-21.1	-22.9	-31.7	-33.5	-35.3
280	-5.1	-6.9	-8.7	-19.4	-21.3	-23.1	-30.7	-32.5	-34.4
260	-5.6	-7.5	-9.3	-19.2	-21.0	-22.8	-29.4	-31.2	-33.1
240	-5.6	-7.4	-9.2	-17.8	-19.6	-21.4	-26.8	-28.6	-30.4
220	-4.8	-6.6	-8.4	-15.3	-17.1	-18.9	-22.9	-24.7	-26.5
200	-3.3	-5.1	-7.0	-11.6	-13.4	-15.2	-17.6	-19.4	-21.3
180	-1.2	-3.0	-4.8	-6.8	-8.6	-10.5	-11.1	-12.9	-14.7
160	0.0	-0.3	-2.1	-1.0	-2.9	-4.7	-3.4	-5.2	-7.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	156.2								
1800	226.3	166.4							
2000	296.3	236.6	176.7	133.4					
2200	366.1	306.5	246.8	182.2	122.6				
2400		376.3	316.7	231.9	171.4				
2600			386.5	283.5	220.8	160.7	152.1		
2800				337.3	272.0	209.8	183.8		
3000				393.1	325.3	260.5	216.1	157.5	
3200					380.8	313.3	249.6	189.3	131.3
3400						368.5	284.4	221.8	163.0
3600							320.7	255.5	194.8
3800							358.7	290.5	227.5
4000							397.6	327.1	261.4
4200								365.4	296.7
4400									333.6
4600									372.1

1. Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -35 m/+35 m for every 5°C above/below 4°C.  
Adjust “Medium” field length available by -50 m/+50 m for every 5°C above/below 4°C.  
Adjust “Poor” field length available by -70 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

TO1 Slippery Runway Takeoff  
10% Thrust Reduction  
Maximum Reverse Thrust  
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-8	-6	-4	-19	-17	-15	-33	-31	-29
340	-10	-8	-6	-21	-19	-17	-35	-33	-31
320	-11	-9	-7	-23	-21	-19	-38	-36	-34
300	-12	-10	-8	-25	-23	-21	-39	-37	-35
280	-13	-11	-9	-26	-24	-22	-41	-39	-37
260	-14	-12	-10	-27	-25	-23	-42	-40	-38
240	-15	-13	-11	-28	-26	-24	-43	-41	-39
220	-15	-13	-11	-28	-26	-24	-43	-41	-39
200	-15	-13	-11	-29	-27	-25	-43	-41	-39
180	-16	-14	-12	-29	-27	-25	-43	-41	-39
160	-16	-14	-12	-29	-27	-25	-42	-40	-38

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

TO1 Slippery Runway Takeoff

10% Thrust Reduction

No Reverse Thrust

Weight Adjustment (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	0.0	0.0	-32.7	-33.9	-35.2	-59.0	-60.3	-61.6
380	0.0	-1.3	-2.6	-31.8	-33.0	-34.3	-55.6	-56.9	-58.1
360	-2.6	-3.8	-5.1	-30.9	-32.1	-33.4	-52.4	-53.6	-54.9
340	-5.1	-6.4	-7.6	-30.2	-31.5	-32.7	-49.3	-50.6	-51.9
320	-7.6	-8.8	-10.1	-29.8	-31.0	-32.3	-46.6	-47.9	-49.1
300	-9.5	-10.7	-12.0	-29.4	-30.7	-32.0	-44.4	-45.7	-47.0
280	-10.8	-12.1	-13.4	-29.2	-30.5	-31.7	-42.8	-44.1	-45.4
260	-11.4	-12.7	-14.0	-28.5	-29.8	-31.0	-41.2	-42.5	-43.8
240	-11.2	-12.5	-13.7	-26.5	-27.8	-29.0	-38.6	-39.9	-41.1
220	-10.0	-11.3	-12.6	-23.2	-24.5	-25.7	-35.0	-36.3	-37.6
200	-8.0	-9.3	-10.5	-18.6	-19.9	-21.2	-30.5	-31.7	-33.0
180	-5.1	-6.4	-7.6	-12.8	-14.1	-15.4	-24.9	-26.2	-27.4
160	-1.4	-2.7	-3.9	-5.8	-7.1	-8.4	-18.4	-19.7	-20.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2000	198.2								
2200	301.6	228.6	141.4						
2400	386.9	325.7	256.8						
2600		409.0	348.6						
2800			431.1						
3000				171.7					
3200				284.3	175.0				
3400				366.5	286.5	178.3			
3600					368.3	288.7			
3800						370.1			
5000							274.8		
5200							350.1		
5400							400.1	334.4	
5600								386.1	316.0
5800									372.2

1. Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -40 m/+40 m for every 5°C above/below 4°C.  
Adjust “Medium” field length available by -60 m/+60 m for every 5°C above/below 4°C.  
Adjust “Poor” field length available by -95 m/+95 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

TO1 Slippery Runway Takeoff  
10% Thrust Reduction  
No Reverse Thrust  
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-11	-7	-3	-27	-23	-19	-51	-47	-43
340	-13	-9	-5	-30	-26	-22	-55	-51	-47
320	-15	-11	-7	-32	-28	-24	-58	-54	-50
300	-16	-12	-8	-35	-31	-27	-62	-58	-54
280	-18	-14	-10	-37	-33	-29	-64	-60	-56
260	-19	-15	-11	-39	-35	-31	-67	-63	-59
240	-20	-16	-12	-40	-36	-32	-68	-64	-60
220	-21	-17	-13	-42	-38	-34	-70	-66	-62
200	-21	-17	-13	-43	-39	-35	-71	-67	-63
180	-22	-18	-14	-45	-41	-37	-72	-68	-64
160	-22	-18	-14	-46	-42	-38	-72	-68	-64

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

TO2 Slush/Standing Water Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-36.2	-41.7	-47.1	-44.1	-49.5	-54.9	-58.0	-63.5	-68.9
380	-34.3	-39.8	-45.2	-41.5	-47.0	-52.4	-54.2	-59.7	-65.1
360	-32.4	-37.8	-43.3	-39.0	-44.4	-49.9	-50.5	-55.9	-61.3
340	-30.5	-35.9	-41.4	-36.5	-41.9	-47.3	-46.9	-52.3	-57.8
320	-28.8	-34.3	-39.7	-34.4	-39.8	-45.3	-43.8	-49.3	-54.7
300	-27.7	-33.1	-38.5	-32.7	-38.1	-43.6	-41.1	-46.5	-51.9
280	-26.1	-31.6	-37.0	-30.6	-36.1	-41.5	-37.9	-43.4	-48.8
260	-24.2	-29.6	-35.1	-28.1	-33.6	-39.0	-34.4	-39.8	-45.2
240	-21.8	-27.3	-32.7	-25.1	-30.6	-36.0	-30.4	-35.8	-41.2
220	-19.0	-24.5	-29.9	-21.7	-27.2	-32.6	-25.9	-31.4	-36.8
200	-15.8	-21.3	-26.7	-17.9	-23.3	-28.8	-21.1	-26.5	-32.0
180	-12.3	-17.7	-23.1	-13.6	-19.0	-24.5	-15.9	-21.3	-26.8
160	-8.3	-13.7	-19.2	-8.9	-14.3	-19.8	-10.2	-15.7	-21.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800							122.4		
2000	127.0			139.2			160.4		
2200	164.0			176.8			198.6	133.6	
2400	201.7	137.8		215.2	150.2		237.7	171.5	
2600	240.6	175.0		254.8	188.0	123.7	277.9	210.0	144.7
2800	281.0	213.0	148.7	295.8	226.7	161.2	319.4	249.4	182.7
3000	322.9	252.3	186.0	338.2	266.7	199.2	362.0	290.0	221.4
3200	366.5	293.1	224.4	381.9	308.1	238.3		331.8	261.2
3400		335.5	264.1		350.9	278.7		374.8	302.2
3600		379.4	305.4		394.8	320.5			344.3
3800			348.4			363.8			387.6
4000			392.4						

1. Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -70 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

TO2 Slush/Standing Water Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-21	-19	-17	-16	-14	-12	-5	-3	-1
340	-24	-22	-20	-18	-16	-14	-7	-5	-3
320	-25	-23	-21	-20	-18	-16	-9	-7	-5
300	-27	-25	-23	-22	-20	-18	-12	-10	-8
280	-27	-25	-23	-23	-21	-19	-14	-12	-10
260	-28	-26	-24	-24	-22	-20	-16	-14	-12
240	-28	-26	-24	-24	-22	-20	-18	-16	-14
220	-27	-25	-23	-24	-22	-20	-19	-17	-15
200	-26	-24	-22	-24	-22	-20	-19	-17	-15
180	-25	-23	-21	-22	-20	-18	-18	-16	-14
160	-23	-21	-19	-21	-19	-17	-17	-15	-13

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

TO2 Slush/Standing Water Takeoff

20% Thrust Reduction

No Reverse Thrust

Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-52.4	-58.4	-64.4	-61.8	-67.8	-73.8	-78.6	-84.6	-90.5
380	-49.3	-55.3	-61.3	-58.0	-63.9	-69.9	-73.1	-79.1	-85.1
360	-46.2	-52.2	-58.2	-54.1	-60.1	-66.1	-67.8	-73.8	-79.8
340	-43.2	-49.2	-55.2	-50.4	-56.4	-62.4	-62.7	-68.7	-74.7
320	-40.5	-46.5	-52.5	-47.1	-53.0	-59.0	-57.9	-63.9	-69.9
300	-38.1	-44.1	-50.0	-43.9	-49.9	-55.9	-53.3	-59.2	-65.2
280	-35.5	-41.4	-47.4	-40.6	-46.6	-52.6	-48.5	-54.5	-60.5
260	-32.6	-38.6	-44.6	-37.0	-43.0	-49.0	-43.6	-49.6	-55.6
240	-29.4	-35.4	-41.4	-33.1	-39.1	-45.1	-38.5	-44.5	-50.5
220	-26.1	-32.0	-38.0	-29.0	-35.0	-41.0	-33.2	-39.2	-45.2
200	-22.4	-28.4	-34.4	-24.6	-30.6	-36.6	-27.8	-33.8	-39.8
180	-18.6	-24.6	-30.5	-20.0	-26.0	-32.0	-22.3	-28.3	-34.3
160	-14.4	-20.4	-26.3	-15.1	-21.0	-27.0	-16.5	-22.5	-28.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2800							135.9		
3000							189.3		
3200				150.0			242.2	158.0	
3400	143.1			210.4			293.9	211.4	126.9
3600	208.3			268.6	175.1		344.9	263.8	180.2
3800	270.4	170.2		324.7	234.9	140.0	396.1	315.2	233.4
4000	329.6	234.6	132.4	379.5	292.2	200.4		366.0	285.3
4200	386.8	295.4	197.5		347.5	259.0			336.4
4400		353.6	260.2		402.7	315.4			387.4
4600		410.4	319.9			370.2			
4800			377.3						

1. Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -105 m/+105 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.



ADVISORY INFORMATION

TO2 Slush/Standing Water Takeoff

20% Thrust Reduction

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-34	-30	-26	-25	-21	-17	-8	-4	0
340	-37	-33	-29	-29	-25	-21	-11	-7	-3
320	-39	-35	-31	-31	-27	-23	-15	-11	-7
300	-40	-36	-32	-34	-30	-26	-18	-14	-10
280	-41	-37	-33	-35	-31	-27	-22	-18	-14
260	-41	-37	-33	-37	-33	-29	-26	-22	-18
240	-41	-37	-33	-38	-34	-30	-29	-25	-21
220	-41	-37	-33	-38	-34	-30	-31	-27	-23
200	-41	-37	-33	-38	-34	-30	-32	-28	-24
180	-41	-37	-33	-38	-34	-30	-32	-28	-24
160	-40	-36	-32	-37	-33	-29	-31	-27	-23

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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ADVISORY INFORMATION

TO2 Slippery Runway Takeoff  
20% Thrust Reduction  
Maximum Reverse Thrust  
Weight Adjustments (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	0.0	0.0	-20.1	-21.9	-23.7	-40.7	-42.6	-44.4
380	0.0	0.0	0.0	-19.5	-21.3	-23.2	-38.5	-40.3	-42.1
360	0.0	0.0	0.0	-19.0	-20.8	-22.6	-36.2	-38.1	-39.9
340	0.0	0.0	0.0	-18.5	-20.3	-22.1	-34.0	-35.8	-37.7
320	0.0	0.0	-1.8	-18.0	-19.8	-21.6	-32.1	-33.9	-35.8
300	-1.3	-3.1	-4.9	-17.9	-19.7	-21.5	-30.6	-32.4	-34.2
280	-3.6	-5.4	-7.2	-18.0	-19.8	-21.6	-29.5	-31.3	-33.1
260	-4.9	-6.7	-8.5	-18.2	-20.0	-21.8	-28.7	-30.5	-32.3
240	-5.3	-7.1	-9.0	-17.8	-19.6	-21.4	-27.2	-29.0	-30.8
220	-5.1	-6.9	-8.7	-16.2	-18.0	-19.8	-24.3	-26.1	-28.0
200	-4.1	-5.9	-7.7	-13.3	-15.2	-17.0	-20.0	-21.8	-23.7
180	-2.4	-4.2	-6.0	-9.3	-11.1	-12.9	-14.3	-16.1	-18.0
160	0.0	-1.8	-3.6	-4.0	-5.8	-7.6	-7.2	-9.1	-10.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	188.4	124.7							
1800	262.8	199.3	135.6						
2000	337.1	273.7	210.1	161.9					
2200	411.2	347.9	284.5	214.1	150.5				
2400		422.1	358.7	268.4	202.5	139.0	142.9		
2600			432.9	325.0	256.2	190.9	176.7		
2800				384.2	312.4	244.2	210.9	148.7	
3000					371.1	299.8	246.4	182.5	
3200						358.0	283.4	216.9	154.5
3400						417.6	322.2	252.6	188.3
3600							362.9	290.0	222.9
3800								329.0	258.9
4000								370.0	296.5
4200									335.9
4400									377.2

1. Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -35 m/+35 m for every 5°C above/below 4°C.  
Adjust “Medium” field length available by -50 m/+50 m for every 5°C above/below 4°C.  
Adjust “Poor” field length available by -70 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

TO2 Slippery Runway Takeoff  
20% Thrust Reduction  
Maximum Reverse Thrust  
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-7	-5	-3	-17	-15	-13	-30	-28	-26
340	-9	-7	-5	-19	-17	-15	-32	-30	-28
320	-10	-8	-6	-21	-19	-17	-34	-32	-30
300	-11	-9	-7	-23	-21	-19	-36	-34	-32
280	-12	-10	-8	-24	-22	-20	-38	-36	-34
260	-13	-11	-9	-25	-23	-21	-39	-37	-35
240	-14	-12	-10	-25	-23	-21	-39	-37	-35
220	-14	-12	-10	-26	-24	-22	-40	-38	-36
200	-14	-12	-10	-26	-24	-22	-40	-38	-36
180	-14	-12	-10	-26	-24	-22	-39	-37	-35
160	-14	-12	-10	-26	-24	-22	-39	-37	-35

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

ADVISORY INFORMATION

TO2 Slippery Runway Takeoff  
20% Thrust Reduction  
No Reverse Thrust  
Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	0.0	0.0	-31.1	-32.4	-33.7	-58.8	-60.1	-61.3
380	0.0	0.0	0.0	-30.2	-31.5	-32.8	-55.3	-56.6	-57.8
360	0.0	-0.6	-1.9	-29.3	-30.6	-31.9	-51.8	-53.1	-54.4
340	-1.9	-3.2	-4.5	-28.4	-29.7	-31.0	-48.6	-49.9	-51.2
320	-4.4	-5.7	-7.0	-27.8	-29.1	-30.3	-45.7	-47.0	-48.2
300	-7.0	-8.2	-9.5	-27.5	-28.8	-30.0	-43.2	-44.5	-45.7
280	-8.9	-10.2	-11.4	-27.3	-28.6	-29.9	-41.3	-42.5	-43.8
260	-10.2	-11.5	-12.8	-27.2	-28.5	-29.8	-39.9	-41.2	-42.5
240	-10.8	-12.0	-13.3	-26.4	-27.7	-29.0	-38.3	-39.6	-40.8
220	-10.3	-11.6	-12.9	-24.2	-25.5	-26.8	-35.6	-36.9	-38.1
200	-8.9	-10.2	-11.5	-20.6	-21.9	-23.2	-31.8	-33.1	-34.4
180	-6.6	-7.9	-9.1	-15.7	-16.9	-18.2	-27.0	-28.3	-29.5
160	-3.3	-4.6	-5.9	-9.3	-10.6	-11.8	-21.0	-22.3	-23.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800	148.3								
2000	271.8	184.4							
2200	368.9	299.7	218.7						
2400		393.1	326.1						
2600			417.3						
2800				181.6					
3000				299.8	185.2				
3200				386.9	302.1	188.7			
3400					388.9	304.4			
3600						390.9			
4600							275.2		
4800							355.9		
5000							411.0	339.2	
5200								395.6	319.6
5400									380.1

1. Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -40 m/+40 m for every 5°C above/below 4°C.  
Adjust “Medium” field length available by -60 m/+60 m for every 5°C above/below 4°C.  
Adjust “Poor” field length available by -95 m/+95 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

**TO2 Slippery Runway Takeoff**  
**20% Thrust Reduction**  
**No Reverse Thrust**  
**V1 Adjustment (KIAS)**

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-10	-6	-2	-24	-20	-16	-46	-42	-38
340	-12	-8	-4	-27	-23	-19	-50	-46	-42
320	-13	-9	-5	-29	-25	-21	-53	-49	-45
300	-15	-11	-7	-31	-27	-23	-56	-52	-48
280	-16	-12	-8	-33	-29	-25	-58	-54	-50
260	-17	-13	-9	-35	-31	-27	-60	-56	-52
240	-18	-14	-10	-36	-32	-28	-62	-58	-54
220	-19	-15	-11	-38	-34	-30	-64	-60	-56
200	-19	-15	-11	-39	-35	-31	-65	-61	-57
180	-20	-16	-12	-40	-36	-32	-65	-61	-57
160	-20	-16	-12	-41	-37	-33	-66	-62	-58

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

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Minimum Control Speeds

V1(MCG)

Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	127	123	120	118		
50	122	130	127	121	118	116	111
40	104	138	135	129	123	117	111
30	86	141	141	135	129	123	116
20	68	142	141	137	132	127	120
-60	-76	143	143	138	133	128	122

TOB V1(MCG)

GE90-115BL1 Thrust Bump

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	122	118	111	107		
50	122	130	127	121	115	111	105
40	104	138	135	131	123	117	110
30	86	141	141	135	129	123	116
20	68	142	141	137	132	127	120
-60	-76	143	143	138	133	128	122

TO1 V1(MCG)

10% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	120	117	114	112		
50	122	123	120	114	112	110	106
40	104	131	128	122	117	111	106
30	86	134	133	127	122	116	110
20	68	134	133	129	125	120	113
-60	-76	136	135	131	126	121	115

TO2 V1(MCG)

20% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	113	110	108	106		
50	122	116	113	108	106	103	100
40	104	123	121	115	110	105	100
30	86	126	125	120	114	109	103
20	68	126	126	122	117	113	107
-60	-76	128	127	123	119	114	109

Go-around %N1

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off

REPORTED OAT		TAT °C	AIRPORT PRESSURE ALTITUDE (1000 FT)												
°C	°F		-2	-1	0	1	2	3	4	5	6	7	8	9	10
66	150	70	93.7	93.8	94.1	93.9	93.8	93.7	93.6	93.4	93.3	92.6	91.5	90.5	89.6
56	133	60	96.5	96.6	96.9	96.7	96.6	96.5	96.4	96.2	96.1	95.4	94.3	93.4	92.5
51	124	55	97.8	98.0	98.3	98.1	97.9	97.9	97.7	97.6	97.4	96.7	95.7	94.7	93.9
46	115	50	99.1	99.3	99.6	99.4	99.3	99.2	99.1	98.9	98.7	98.0	97.0	96.1	95.2
41	106	45	100.2	100.7	101.1	101.0	100.9	100.7	100.5	100.4	100.0	99.3	98.3	97.3	96.5
36	97	40	101.5	102.4	103.2	103.2	102.8	102.6	102.3	102.0	101.4	100.5	99.5	98.6	97.8
31	88	35	101.2	103.9	105.8	105.4	105.1	104.7	104.3	103.8	102.7	101.7	100.6	99.7	98.9
26	79	30	100.4	103.1	105.9	106.8	107.3	106.8	106.6	106.4	105.0	103.4	101.9	100.8	100.0
21	70	25	99.5	102.2	105.0	105.9	106.5	107.0	107.4	107.4	106.8	105.7	104.0	102.3	101.3
16	61	20	98.7	101.4	104.1	105.0	105.6	106.1	106.5	107.0	106.8	106.3	105.2	104.2	103.3
11	53	15	97.9	100.5	103.2	104.1	104.7	105.2	105.6	106.1	105.9	105.5	104.9	104.4	104.0
7	44	10	97.0	99.6	102.3	103.2	103.8	104.3	104.7	105.1	105.0	104.6	104.0	103.5	103.4
2	35	5	96.1	98.7	101.4	102.3	102.9	103.4	103.8	104.2	104.1	103.7	103.1	102.6	102.5
-3	26	0	95.3	97.8	100.5	101.4	102.0	102.4	102.8	103.3	103.1	102.7	102.2	101.7	101.6
-13	8	-10	93.5	96.0	98.6	99.5	100.1	100.5	100.9	101.4	101.2	100.8	100.3	99.8	99.7
-23	-10	-20	91.7	94.2	96.7	97.6	98.2	98.6	99.0	99.4	99.3	98.9	98.3	97.9	97.8
-33	-27	-30	89.9	92.3	94.8	95.6	96.2	96.6	97.0	97.4	97.3	96.9	96.4	95.9	95.8
-43	-45	-40	88.0	90.4	92.8	93.6	94.2	94.6	95.0	95.4	95.3	94.9	94.4	93.9	93.9
-53	-63	-50	86.1	88.4	90.8	91.6	92.2	92.6	93.0	93.3	93.2	92.9	92.3	91.9	91.8

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)												
	-2	-1	0	1	2	3	4	5	6	7	8	9	10
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
1 PACK ON	-0.2	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

\*Packs on or packs off with 2 bleed sources.

\*\*Packs off with 1 bleed source.



**Flight With Unreliable Airspeed / Turbulent Air Penetration**

Altitude and/or vertical speed indications may also be unreliable.

**Climb****Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>5.0</b> 2500	<b>4.5</b> 1500			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>6.5</b> 3700	<b>5.5</b> 2600	<b>5.5</b> 1800	<b>5.0</b> 1300	<b>4.5</b> 900
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>9.5</b> 5000	<b>8.5</b> 3600	<b>8.0</b> 2700	<b>7.5</b> 2000	<b>7.5</b> 1400
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>14.0</b> 6700	<b>11.5</b> 4900	<b>10.0</b> 3700	<b>9.5</b> 2900	<b>9.5</b> 2200
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>17.5</b> 7800	<b>14.5</b> 5700	<b>12.5</b> 4400	<b>11.5</b> 3500	<b>11.0</b> 2800

**Cruise****Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> %N1	<b>2.0</b> 78.6	<b>3.0</b> 83.2			
35000 (.82M)	<b>PITCH ATT</b> %N1	<b>1.5</b> 76.5	<b>2.0</b> 78.9	<b>3.0</b> 82.8	<b>3.5</b> 88.0	
30000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 72.6	<b>2.5</b> 74.7	<b>3.0</b> 78.1	<b>3.5</b> 82.4	<b>3.5</b> 87.3
25000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 68.6	<b>2.5</b> 70.7	<b>3.5</b> 73.8	<b>4.0</b> 77.7	<b>4.0</b> 82.3
20000 (270 KIAS)	<b>PITCH ATT</b> %N1	<b>2.0</b> 63.4	<b>2.5</b> 65.8	<b>3.5</b> 69.0	<b>4.5</b> 72.8	<b>5.5</b> 77.4
15000 (270 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 59.6	<b>2.5</b> 61.8	<b>3.5</b> 65.0	<b>4.5</b> 68.2	<b>5.5</b> 72.5

**Descent****Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -2900	<b>0.0</b> -2600			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -2500	<b>-0.5</b> -2000	<b>0.5</b> -1900	<b>1.0</b> -1900	<b>0.5</b> -2400
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -1900	<b>0.5</b> -1600	<b>1.5</b> -1500	<b>2.5</b> -1400	<b>3.0</b> -1400
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -1700	<b>0.0</b> -1400	<b>1.0</b> -1300	<b>2.0</b> -1300	<b>3.0</b> -1300
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-2.0</b> -1500	<b>-0.5</b> -1300	<b>1.0</b> -1200	<b>2.0</b> -1200	<b>3.0</b> -1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

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**Flight With Unreliable Airspeed / Turbulent Air Penetration**  
Altitude and/or vertical speed indications may also be unreliable.

**Holding**  
**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		150	200	250	300	350
10000	PITCH ATT	3.0	4.5	5.5	6.0	6.0
	%N1	50.2	54.4	59.1	63.9	68.2
	KIAS	216	216	226	244	262
5000	PITCH ATT	3.0	4.5	5.5	6.0	6.0
	%N1	46.6	50.9	55.4	59.7	64.2
	KIAS	216	216	226	244	262

**Terminal Area (5000 FT)**  
**%N1 for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS UP GEAR UP (VREF 30 + 80)	PITCH ATT	3.5	5.0	6.0	6.0	6.5
	%N1	47.7	52.4	57.2	62.0	66.4
	KIAS	220	220	227	244	262
FLAPS 1 GEAR UP (VREF 30 + 60)	PITCH ATT	4.5	6.5	7.5	8.0	8.0
	%N1	48.5	53.4	58.8	63.9	68.2
	KIAS	200	200	207	224	242
FLAPS 5 GEAR UP (VREF 30 + 40)	PITCH ATT	3.5	5.5	6.5	6.5	6.5
	%N1	48.9	54.0	59.7	64.7	69.0
	KIAS	180	180	187	204	222
FLAPS 15 GEAR UP (VREF 30 + 20)	PITCH ATT	3.5	6.0	7.5	7.0	7.0
	%N1	49.0	55.2	61.9	66.8	71.2
	KIAS	160	160	167	184	202
FLAPS 20 GEAR DOWN (VREF 30 + 20)	PITCH ATT	2.0	4.5	6.0	5.5	5.5
	%N1	56.3	61.4	67.3	73.1	78.1
	KIAS	160	160	167	184	202

**Final Approach (1500 FT)**  
**Gear Down, %N1 for 3° Glideslope**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS 20 (VREF 20 + 10)	PITCH ATT	0.0	1.5	2.0	2.0	2.5
	%N1	36.9	40.7	45.1	59.3	52.6
	KIAS	150	157	174	189	201
FLAPS 25 (VREF 25 + 10)	PITCH ATT	0.5	1.5	2.0	2.0	2.5
	%N1	51.5	49.8	54.7	59.2	63.3
	KIAS	150	150	165	180	191
FLAPS 30 (VREF 30 + 10)	PITCH ATT	0.0	0.5	1.5	1.5	
	%N1	56.9	55.6	60.2	65.4	
	KIAS	150	150	157	174	

Performance Inflight  
All Engine

Chapter PI  
Section 11

Long Range Cruise Maximum Operating Altitude

Max Climb Thrust

ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30(39°)	1.40(44°)	1.50(48°)
360	27300	5	30400	28800	27200
350	27900	4	31000	29400	27800
340	28500	3	31700	30000	28500
330	29200	1	32200	30500	29000
320	29900	0	32700	31000	29500
310	30600	-2	33200	31600	30000
300	31300	-4	33700	32100	30600
290	32000	-5	34300	32700	31200
280	32800	-7	34900	33300	31800
270	33600	-9	35500	33900	32400
260	34400	-11	36100	34500	33100
250	35200	-12	36800	35200	33800
240	36000	-14	37500	35900	34500
230	36900	-15	38200	36600	35200
220	37800	-15	39000	37400	36000
210	38800	-15	39800	38200	36800
200	39800	-15	40600	39000	37700
190	40900	-15	41500	39900	38600
180	42000	-15	42500	40900	39600
170	43100	-15	43100	42100	40800
160	43100	-15	43100	43100	42000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	11	30400	28800	27200
350	27900	10	31000	29400	27800
340	28500	8	31700	30000	28500
330	29200	7	32200	30500	29000
320	29900	5	32700	31000	29500
310	30600	4	33200	31600	30000
300	31300	2	33700	32100	30600
290	32000	0	34300	32700	31200
280	32800	-1	34900	33300	31800
270	33600	-3	35500	33900	32400
260	34400	-5	36100	34500	33100
250	35200	-7	36800	35200	33800
240	36000	-9	37500	35900	34500
230	36900	-9	38200	36600	35200
220	37800	-9	39000	37400	36000
210	38800	-9	39800	38200	36800
200	39800	-9	40600	39000	37700
190	40900	-9	41500	39900	38600
180	42000	-9	42500	40900	39600
170	43100	-9	43100	42100	40800
160	43100	-9	43100	43100	42000

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Long Range Cruise Maximum Operating Altitude  
Max Climb Thrust  
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	17	30400	28800	27200
350	27900	15	31000	29400	27800
340	28500	14	31700	30000	28500
330	29200	12	32200	30500	29000
320	29900	11	32700	31000	29500
310	30600	9	33200	31600	30000
300	31300	8	33700	32100	30600
290	32000	6	34300	32700	31200
280	32800	4	34900	33300	31800
270	33600	3	35500	33900	32400
260	34400	1	36100	34500	33100
250	35200	-1	36800	35200	33800
240	36000	-3	37500	35900	34500
230	36900	-3	38200	36600	35200
220	37800	-3	39000	37400	36000
210	38800	-3	39800	38200	36800
200	39800	-3	40600	39000	37700
190	40900	-3	41500	39900	38600
180	42000	-3	42500	40900	39600
170	43100	-3	43100	42100	40800
160	43100	-3	43100	43100	42000

## Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		25	27	29	31	33	35	37	39	41	43
360	%N1	84.0	86.0	87.6	90.1						
	MACH	.819	.840	.837	.830						
	KIAS	346	342	326	310						
	FF/ENG	5139	5211	5162	5303						
340	%N1	83.0	84.7	86.1	88.1						
	MACH	.819	.839	.840	.835						
	KIAS	346	341	328	312						
	FF/ENG	4943	4959	4875	4910						
320	%N1	81.9	83.1	84.6	86.0	88.3					
	MACH	.818	.833	.840	.839	.833					
	KIAS	346	339	327	313	297					
	FF/ENG	4735	4662	4585	4523	4633					
300	%N1	80.2	81.8	82.9	84.5	86.1					
	MACH	.800	.823	.836	.840	.837					
	KIAS	337	334	326	314	299					
	FF/ENG	4416	4391	4316	4248	4232					
280	%N1	78.4	80.1	81.6	82.9	84.4	86.2				
	MACH	.775	.806	.827	.838	.840	.836				
	KIAS	326	326	322	313	300	285				
	FF/ENG	4088	4112	4069	4004	3948	3972				
260	%N1	76.6	78.3	80.0	81.3	82.8	84.2	86.6			
	MACH	.746	.780	.810	.830	.839	.839	.834			
	KIAS	313	315	315	309	300	287	272			
	FF/ENG	3751	3796	3803	3758	3703	3653	3726			
240	%N1	74.7	76.3	78.0	79.7	81.0	82.5	84.3			
	MACH	.720	.749	.783	.813	.831	.839	.839			
	KIAS	302	302	303	303	297	287	274			
	FF/ENG	3448	3464	3501	3503	3460	3406	3378			
220	%N1	73.1	74.2	75.8	77.6	79.3	80.6	82.5	84.7		
	MACH	.701	.721	.750	.785	.815	.832	.840	.838		
	KIAS	293	289	289	291	290	284	274	261		
	FF/ENG	3203	3158	3175	3207	3211	3165	3130	3132		
200	%N1	71.1	72.5	73.6	75.2	77.0	78.8	80.4	82.7	84.9	
	MACH	.680	.700	.719	.748	.784	.814	.832	.840	.838	
	KIAS	284	280	277	276	278	277	271	262	249	
	FF/ENG	2958	2915	2872	2886	2917	2918	2888	2878	2879	
180	%N1	68.6	70.2	71.7	72.8	74.4	76.2	78.4	80.4	82.7	84.8
	MACH	.648	.675	.697	.715	.744	.780	.812	.831	.839	.839
	KIAS	270	270	267	263	263	264	264	259	250	238
	FF/ENG	2673	2665	2631	2592	2599	2622	2636	2634	2624	2609
160	%N1	65.8	67.4	69.1	70.7	71.9	73.3	75.5	78.1	80.2	82.5
	MACH	.612	.639	.667	.691	.710	.735	.772	.806	.828	.838
	KIAS	254	254	255	253	250	248	249	250	246	238
	FF/ENG	2392	2386	2375	2356	2321	2308	2335	2372	2379	2356

Shaded area approximates optimum altitude.

777 Flight Crew Operations Manual

Long Range Cruise Enroute Fuel and Time - Low Altitude  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
282	261	242	226	213	200	191	182	174	167	160
559	519	482	451	424	400	382	366	351	337	325
837	777	723	677	637	600	574	550	528	508	489
1115	1035	964	902	849	800	766	734	705	678	653
1395	1295	1206	1129	1061	1000	957	918	881	848	817
1675	1555	1447	1354	1273	1200	1149	1101	1057	1017	980
1956	1815	1689	1581	1486	1400	1340	1285	1234	1187	1144
2237	2075	1931	1807	1698	1600	1532	1469	1410	1356	1307
2520	2338	2174	2034	1911	1800	1723	1652	1586	1525	1470
2803	2599	2417	2260	2124	2000	1915	1835	1762	1695	1633

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.8	0:38	3.3	0:37	2.8	0:35	2.5	0:35	2.2	0:34
400	7.9	1:11	7.2	1:09	6.3	1:04	5.7	1:02	5.3	1:00
600	11.9	1:45	11.0	1:40	9.8	1:33	9.0	1:30	8.4	1:26
800	15.9	2:19	14.8	2:13	13.2	2:02	12.2	1:58	11.5	1:52
1000	19.9	2:53	18.6	2:45	16.6	2:31	15.4	2:26	14.5	2:19
1200	23.8	3:27	22.3	3:17	20.0	3:01	18.6	2:54	17.5	2:45
1400	27.8	4:02	26.0	3:50	23.4	3:31	21.8	3:23	20.5	3:12
1600	31.6	4:37	29.7	4:23	26.8	4:01	24.9	3:51	23.5	3:39
1800	35.5	5:12	33.3	4:56	30.1	4:31	28.1	4:19	26.5	4:06
2000	39.3	5:47	36.9	5:30	33.4	5:01	31.2	4:48	29.4	4:33

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.7	-0.4	0.0	0.4	1.1
10	-1.6	-0.8	0.0	1.1	2.5
15	-2.5	-1.3	0.0	1.7	3.9
20	-3.3	-1.7	0.0	2.3	5.2
25	-4.1	-2.2	0.0	2.9	6.5
30	-4.9	-2.6	0.0	3.6	7.8
35	-5.7	-3.1	0.0	4.2	9.0
40	-6.4	-3.5	0.0	4.8	10.2

Long Range Cruise Enroute Fuel and Time - High Altitude  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
649	613	580	551	524	500	479	459	441	424	409
1286	1217	1154	1098	1047	1000	959	921	886	853	823
1926	1824	1730	1646	1570	1500	1439	1383	1330	1282	1237
2569	2432	2307	2195	2094	2000	1920	1845	1775	1710	1651
3215	3043	2886	2745	2617	2500	2400	2306	2219	2139	2065
3864	3656	3466	3296	3142	3000	2880	2768	2664	2568	2479
4516	4271	4047	3847	3666	3500	3360	3229	3108	2996	2893
5170	4888	4630	4400	4192	4000	3840	3691	3552	3424	3306
5826	5506	5214	4953	4717	4500	4320	4152	3996	3852	3719
6485	6126	5798	5506	5242	5000	4800	4613	4440	4279	4132
7146	6748	6384	6061	5768	5500	5280	5074	4883	4706	4545
7809	7371	6972	6616	6295	6000	5759	5534	5326	5133	4956
8474	7996	7559	7171	6821	6500	6238	5994	5768	5558	5367
9144	8624	8149	7728	7348	7000	6717	6454	6209	5983	5776
9818	9255	8741	8286	7876	7500	7196	6912	6649	6406	6184
10496	9889	9335	8845	8404	8000	7674	7371	7089	6829	6591
11179	10526	9932	9406	8933	8500	8153	7829	7528	7251	6997
11866	11167	10530	9968	9462	9000	8631	8286	7966	7671	7401
12559	11811	11131	10531	9993	9500	9108	8742	8403	8090	7804
13256	12459	11735	11096	10523	10000	9585	9198	8839	8508	8206

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
500	6.9	1:10	6.7	1:10	6.5	1:10	6.4	1:10	6.4	1:11
1000	14.3	2:17	13.8	2:13	13.5	2:12	13.2	2:12	13.2	2:13
1500	21.6	3:23	21.0	3:17	20.4	3:15	20.1	3:14	20.0	3:15
2000	29.0	4:29	28.2	4:21	27.4	4:17	26.9	4:17	26.8	4:18
2500	36.0	5:37	35.1	5:27	34.2	5:21	33.5	5:19	33.2	5:20
3000	43.1	6:46	42.0	6:33	40.9	6:25	40.0	6:22	39.7	6:22
3500	49.9	7:56	48.6	7:41	47.4	7:30	46.3	7:25	45.8	7:25
4000	56.7	9:06	55.2	8:49	53.8	8:35	52.7	8:29	52.0	8:27
4500	63.2	10:18	61.6	9:59	60.1	9:42	58.7	9:34	57.9	9:31
5000	69.7	11:30	68.0	11:09	66.3	10:50	64.8	10:38	63.9	10:34
5500	76.0	12:44	74.1	12:21	72.3	11:59	70.7	11:45	69.6	11:38
6000	82.3	13:57	80.2	13:32	78.3	13:09	76.5	12:52	75.3	12:42
6500	88.4	15:13	86.1	14:46	84.1	14:21	82.1	14:01	80.7	13:48
7000	94.5	16:28	92.0	15:59	89.8	15:32	87.8	15:10	86.2	14:54
7500	100.4	17:46	97.7	17:14	95.4	16:46	93.2	16:21	91.5	16:02
8000	106.2	19:05	103.4	18:30	100.9	17:59	98.6	17:32	96.8	17:10
8500	112.0	20:26	109.0	19:47	106.3	19:14	103.8	18:45	101.9	18:20
9000	117.7	21:48	114.5	21:05	111.7	20:29	109.0	19:58	106.9	19:30
9500	123.3	23:12	119.9	22:26	116.9	21:46	114.1	21:13	111.8	20:43
10000	129.0	24:37	125.3	23:47	122.0	23:03	119.1	22:28	116.7	21:55

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Long Range Cruise Enroute Fuel and Time - High Altitude  
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
10	-2.3	-1.2	0.0	3.2	13.1
20	-4.4	-2.4	0.0	5.4	18.3
30	-6.5	-3.6	0.0	7.4	23.1
40	-8.6	-4.8	0.0	9.3	27.5
50	-10.8	-5.9	0.0	11.1	31.4
60	-13.0	-7.0	0.0	12.7	35.0
70	-15.2	-8.1	0.0	14.2	38.1
80	-17.5	-9.2	0.0	15.6	40.9
90	-19.8	-10.3	0.0	16.8	43.2
100	-22.1	-11.3	0.0	18.0	45.1
110	-24.4	-12.3	0.0	19.0	46.6
120	-26.8	-13.3	0.0	19.8	47.7
130	-29.2	-14.3	0.0	20.6	48.4

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)										
	360	340	320	300	280	260	240	220	200	180	160
43							120	55	17	1	3
41						105	50	17	2	1	12
39					87	43	15	2	1	10	25
37			119	68	33	11	1	1	9	22	40
35		89	50	24	8	1	1	9	21	36	54
33	64	35	15	4	0	2	9	21	35	50	67
31	22	9	2	0	4	11	21	34	49	64	79
29	4	0	1	5	13	23	35	48	62	76	89
27	0	3	8	16	25	36	48	61	74	86	97
25	5	11	19	28	38	50	61	73	84	94	104

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. Read wind factors for present and new altitudes from table.
2. Determine difference (new altitude wind factor minus present altitude wind factor);  
This difference may be negative or positive.
3. Break-even wind at new altitude is present altitude wind plus difference from step 2.

Descent at .84M/310/250

PRESSURE ALTITUDE (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	96	103	110	117	123	128	133	139	145	150
TIME (MINUTES)	20	21	22	23	24	24	25	26	26	27



Holding  
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
360	%N1	62.0	64.9	69.0	73.3	78.3	83.1	88.2			
	KIAS	264	264	265	269	308	312	310			
	FF/ENG	4660	4620	4570	4590	4840	5020	5300			
340	%N1	60.5	63.4	67.5	71.7	76.7	81.6	86.4			
	KIAS	260	260	260	260	299	302	307			
	FF/ENG	4410	4360	4310	4310	4540	4680	4890			
320	%N1	58.8	61.5	65.7	69.8	74.9	79.6	84.4	91.3		
	KIAS	253	253	253	253	289	293	297	278		
	FF/ENG	4130	4080	4030	4020	4210	4320	4480	4980		
300	%N1	57.2	59.7	63.9	67.9	72.6	77.6	82.3	88.0		
	KIAS	244	244	244	244	259	283	287	278		
	FF/ENG	3860	3810	3760	3740	3800	3990	4130	4430		
280	%N1	55.6	58.0	62.1	66.1	70.7	75.7	80.5	85.6		
	KIAS	238	238	238	238	238	272	276	278		
	FF/ENG	3630	3570	3510	3480	3500	3690	3810	4030		
260	%N1	53.9	56.3	60.1	64.3	68.6	73.7	78.5	83.5	93.7	
	KIAS	229	229	229	229	229	262	265	269	247	
	FF/ENG	3390	3330	3270	3230	3240	3400	3500	3630	4260	
240	%N1	52.2	54.5	58.2	62.3	66.5	71.1	76.2	81.2	88.6	
	KIAS	223	223	223	223	223	228	254	258	247	
	FF/ENG	3180	3110	3030	2990	2990	3010	3190	3290	3640	
220	%N1	50.4	52.7	56.2	60.1	64.3	68.7	73.9	78.9	85.6	92.1
	KIAS	217	217	217	217	217	217	242	246	247	231
	FF/ENG	2970	2890	2800	2760	2740	2740	2890	2980	3220	3530
200	%N1	48.4	50.9	54.4	58.0	62.2	66.3	71.3	76.3	82.8	87.4
	KIAS	217	217	217	217	217	217	226	233	237	231
	FF/ENG	2790	2710	2610	2570	2530	2520	2570	2670	2830	3010
180	%N1	46.6	49.1	52.7	56.2	60.1	64.3	68.7	73.4	79.9	84.1
	KIAS	217	217	217	217	217	217	217	220	223	226
	FF/ENG	2630	2550	2450	2400	2360	2380	2320	2370	2500	2610
160	%N1	45.1	47.4	51.0	54.5	58.2	62.3	66.5	71.0	77.1	81.1
	KIAS	217	217	217	217	217	217	217	217	217	217
	FF/ENG	2560	2470	2370	2300	2250	2220	2170	2160	2230	2280

This table includes 5% additional fuel for holding in a racetrack pattern.

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Holding  
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	64.8	67.6	72.3	76.7	81.7
	KIAS	244	244	244	244	244
	FF/ENG	5150	5130	5110	5150	5270
340	%N1	63.2	66.0	70.3	74.9	79.9
	KIAS	240	240	240	240	240
	FF/ENG	4840	4810	4790	4810	4920
320	%N1	61.5	64.4	68.5	73.1	78.0
	KIAS	233	233	233	233	233
	FF/ENG	4540	4510	4480	4490	4580
300	%N1	59.7	62.6	66.6	71.3	76.1
	KIAS	224	224	224	224	224
	FF/ENG	4250	4220	4190	4190	4260
280	%N1	57.9	60.6	64.7	69.1	74.0
	KIAS	218	218	218	218	218
	FF/ENG	3970	3930	3890	3880	3930
260	%N1	56.1	58.6	62.8	66.9	71.8
	KIAS	209	209	209	209	209
	FF/ENG	3700	3650	3600	3600	3620
240	%N1	54.2	56.6	60.6	64.6	69.4
	KIAS	203	203	203	203	203
	FF/ENG	3430	3370	3310	3300	3310
220	%N1	52.1	54.5	58.2	62.3	66.7
	KIAS	197	197	197	197	197
	FF/ENG	3170	3100	3030	3010	3010
200	%N1	50.1	52.3	55.9	59.8	64.0
	KIAS	197	197	197	197	197
	FF/ENG	2940	2860	2770	2730	2720
180	%N1	47.9	50.3	53.8	57.4	61.6
	KIAS	197	197	197	197	197
	FF/ENG	2740	2650	2550	2510	2480
160	%N1	45.9	48.4	51.8	55.2	59.2
	KIAS	197	197	197	197	197
	FF/ENG	2630	2540	2430	2380	2330

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight

Advisory Information

Chapter PI

Section 12

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

Dry Runway

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
	190000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 190000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	890	+20/0	10	-35	125	10	-10	20	-20	65	20	45
MAX AUTO	1210	+25/0	10	-50	180	0	0	30	-30	125	0	0
AUTOBRAKE 4	1565	+30/0	15	-75	255	5	-5	40	-40	170	10	10
AUTOBRAKE 3	1845	+40/-20	25	-90	310	15	-35	50	-50	140	45	50
AUTOBRAKE 2	2025	+45/-25	35	-100	350	45	-50	50	-55	135	165	175
AUTOBRAKE 1	2180	+55/-30	45	-115	400	65	-60	55	-55	135	290	440

Good Reported Braking Action

MAX MANUAL	1220	+25/-10	20	-60	215	30	-25	30	-30	90	85	205
MAX AUTO	1330	+25/0	15	-60	215	15	-10	30	-30	125	80	210
AUTOBRAKE 4	1570	+30/0	15	-75	260	10	-5	40	-40	170	15	45
AUTOBRAKE 3	1845	+40/-20	25	-90	310	15	-35	50	-50	140	45	50
AUTOBRAKE 2	2025	+45/-25	35	-100	350	45	-50	50	-55	135	165	175
AUTOBRAKE 1	2180	+55/-30	45	-115	400	65	-60	55	-55	135	290	440

Medium Reported Braking Action

MAX MANUAL	1585	+40/-15	30	-90	340	65	-55	40	-40	110	215	590
MAX AUTO	1665	+40/-15	30	-90	335	65	-45	40	-40	125	210	585
AUTOBRAKE 4	1730	+40/-5	25	-95	350	40	-30	45	-45	170	155	550
AUTOBRAKE 3	1905	+45/-20	25	-100	375	45	-50	50	-50	140	115	410
AUTOBRAKE 2	2055	+50/-25	40	-105	390	70	-60	55	-55	135	210	410
AUTOBRAKE 1	2185	+55/-30	45	-115	410	80	-65	55	-55	135	315	550

Poor Reported Braking Action

MAX MANUAL	1955	+50/-25	45	-130	515	140	-95	55	-55	125	435	1410
MAX AUTO	2060	+50/-25	45	-130	510	140	-95	55	-55	125	435	1415
AUTOBRAKE 4	2060	+55/-20	45	-130	510	135	-80	55	-55	160	440	1415
AUTOBRAKE 3	2140	+55/-30	40	-135	520	120	-95	60	-60	140	360	1350
AUTOBRAKE 2	2225	+55/-30	50	-135	530	140	-100	60	-60	135	405	1310
AUTOBRAKE 1	2300	+60/-35	55	-140	540	150	-105	60	-60	135	460	1320

\*Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

777 Flight Crew Operations Manual

ADVISORY INFORMATION

Normal Configuration Landing Distance  
Flaps 25  
Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	190000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 190000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	890	+20/0	15	-35	125	10	-10	20	-20	65	20	45
MAX AUTO	1210	+20/0	25	-50	180	0	0	30	-30	125	0	0
AUTOBRAKE 4	1565	+30/0	35	-75	255	5	-5	40	-40	170	5	5
AUTOBRAKE 3	1845	+35/-15	45	-90	310	15	-25	50	-50	160	35	40
AUTOBRAKE 2	2040	+45/-25	55	-100	350	40	-50	55	-55	140	155	165
AUTOBRAKE 1	2205	+50/-30	65	-115	405	70	-65	60	-60	140	310	430

Medium Reported Braking Action

MAX MANUAL	1600	+35/-15	45	-90	340	65	-55	40	-45	115	220	620
MAX AUTO	1680	+35/-15	45	-90	335	65	-45	40	-40	125	220	615
AUTOBRAKE 4	1735	+35/-5	45	-95	350	40	-30	45	-45	170	165	575
AUTOBRAKE 3	1915	+40/-20	50	-105	375	45	-45	50	-50	160	110	420
AUTOBRAKE 2	2070	+45/-25	60	-110	390	65	-65	55	-55	140	200	410
AUTOBRAKE 1	2205	+55/-30	70	-115	415	85	-65	60	-60	140	335	550

Good Reported Braking Action

MAX MANUAL	1225	+25/-10	30	-60	215	30	-25	30	-30	90	85	210
MAX AUTO	1330	+25/0	30	-60	215	15	-10	30	-30	125	80	215
AUTOBRAKE 4	1570	+30/0	35	-75	260	10	-5	40	-40	170	15	45
AUTOBRAKE 3	1845	+35/-15	45	-90	310	15	-25	50	-50	160	35	40
AUTOBRAKE 2	2040	+45/-25	55	-100	350	40	-50	55	-55	140	155	165
AUTOBRAKE 1	2205	+50/-30	65	-115	405	70	-65	60	-60	140	310	430

Poor Reported Braking Action

MAX MANUAL	1980	+50/-25	65	-130	515	145	-100	55	-55	130	455	1505
MAX AUTO	2090	+50/-25	65	-130	510	145	-95	55	-55	130	460	1515
AUTOBRAKE 4	2090	+50/-20	65	-130	515	145	-85	55	-55	155	460	1505
AUTOBRAKE 3	2155	+50/-25	65	-135	525	120	-85	60	-60	160	375	1440
AUTOBRAKE 2	2250	+55/-30	70	-140	535	135	-105	60	-60	140	405	1405
AUTOBRAKE 1	2325	+60/-35	75	-140	545	150	-105	65	-65	140	485	1390

\*Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.  
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.  
Autobrake data valid for both auto and manual speedbrakes.  
Actual (unfactored) distances are shown.  
Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

## Normal Configuration Landing Distance

## Flaps 20

## Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	190000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 190000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF20	ONE REV	NO REV
MAX MANUAL	925	+25/-5	20	-35	125	10	-10	20	-20	65	20	50
MAX AUTO	1255	+25/-10	30	-55	185	0	0	30	-30	130	0	0
AUTOBRAKE 4	1630	+35/-15	45	-75	260	0	-5	45	-45	175	5	5
AUTOBRAKE 3	1895	+45/-25	55	-95	320	10	-25	55	-55	180	30	30
AUTOBRAKE 2	2045	+50/-35	70	-105	365	40	-50	55	-60	160	145	155
AUTOBRAKE 1	2185	+60/-40	80	-120	420	70	-70	60	-60	150	350	450

## Good Reported Braking Action

MAX MANUAL	1290	+25/-15	35	-60	220	30	-25	30	-30	95	95	235
MAX AUTO	1320	+25/-10	35	-65	220	20	-10	35	-35	130	90	240
AUTOBRAKE 4	1630	+35/-15	45	-75	265	5	-5	45	-45	175	10	45
AUTOBRAKE 3	1895	+45/-25	55	-95	320	10	-25	55	-55	180	30	30
AUTOBRAKE 2	2045	+50/-35	70	-105	365	40	-50	55	-60	160	145	155
AUTOBRAKE 1	2185	+60/-40	80	-120	420	70	-70	60	-60	150	350	450

## Medium Reported Braking Action

MAX MANUAL	1710	+40/-25	55	-95	350	70	-55	45	-45	120	250	705
MAX AUTO	1710	+40/-25	55	-95	345	70	-55	45	-45	120	245	705
AUTOBRAKE 4	1770	+40/-15	55	-95	360	45	-30	50	-50	175	190	660
AUTOBRAKE 3	1970	+45/-25	60	-105	385	45	-40	55	-55	180	110	485
AUTOBRAKE 2	2085	+55/-35	70	-115	405	65	-65	60	-60	160	195	445
AUTOBRAKE 1	2190	+60/-40	80	-120	430	85	-75	60	-65	150	375	585

## Poor Reported Braking Action

MAX MANUAL	2145	+60/-35	80	-135	530	155	-105	60	-60	140	515	1735
MAX AUTO	2145	+60/-35	75	-135	525	155	-105	60	-60	140	520	1750
AUTOBRAKE 4	2145	+60/-35	80	-135	525	155	-100	60	-60	150	515	1740
AUTOBRAKE 3	2200	+60/-35	75	-140	540	135	-85	65	-65	180	435	1665
AUTOBRAKE 2	2275	+60/-40	80	-145	550	140	-105	65	-65	160	430	1615
AUTOBRAKE 1	2335	+65/-45	90	-145	560	155	-115	70	-70	150	540	1585

\*Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 65 meters.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

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ADVISORY INFORMATION

Non-Normal Configuration Landing Distance  
Dry Runway

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1625	35/-15	45	-90/340	65/-55	40/-45	115	220	62
ANTISKID (FLAPS 30)	VREF30	1615	35/-15	30	-90/340	65/-55	40/-40	110	215	590
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	930	25/-5	20	-35/130	10/-10	20/-20	70	-	45
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	905	20/0	10	-35/125	10/-10	20/-20	70	-	40
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1125	40/-5	15	-40/140	10/-10	25/-25	65	35	80
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1035	30/-5	15	-40/135	10/-10	25/-25	70	30	70
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	925	25/-5	20	-35/125	10/-10	20/-20	70	20	50
FLAPS PRIMARY FAIL	VREF20	1055	25/-5	25	-40/140	15/-10	20/-25	90	30	65
FLAP/SLAT CONTROL	VREF20	925	25/-5	20	-35/125	10/-10	20/-20	70	20	50
FLIGHT CONTROL MODE	VREF20	1065	25/-5	25	-40/140	15/-10	25/-25	90	30	70
HYD PRESS SYS C	VREF20	1055	25/-5	25	-40/140	15/-10	20/-25	90	30	65
HYD PRESS SYS L+C	VREF30+20	1320	25/0	15	-50/165	20/-20	30/-30	125	-	65
HYD PRESS SYS L+R	VREF30+20	1425	25/5	15	-60/195	35/-30	35/-35	140	-	-
HYD PRESS SYS R+C	VREF30+20	1610	25/0	20	-65/225	40/-35	40/-40	155	-	150
HYD PRESS SYS L (FLAPS 25)	VREF25	965	20/0	20	-40/135	15/-10	20/-20	85	-	30
HYD PRESS SYS L (FLAPS 30)	VREF30	975	20/0	10	-40/135	15/-10	20/-20	85	-	35
HYD PRESS SYS R (FLAPS 25)	VREF25	1055	15/0	20	-45/155	20/-15	25/-25	95	-	50
HYD PRESS SYS R (FLAPS 30)	VREF30	1060	15/0	10	-45/155	20/-15	25/-25	95	-	50
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1165	35/-5	15	-40/145	15/-10	25/-25	70	40	90
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1040	25/-5	15	-40/135	10/-10	25/-25	70	30	70
PRI FLIGHT COMPUTERS	VREF20	1065	25/-5	25	-40/140	15/-10	25/-25	90	30	70
SLATS DRIVE	VREF30+30	1115	30/-5	15	-40/140	15/-10	25/-25	75	35	80
STABILIZER	VREF30+20	1040	25/-5	15	-40/135	10/-10	25/-25	70	30	70

Actual (unfactored) distances are shown.  
Includes distances from 50 ft above threshold (305 meters air distance).  
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance  
Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1625	35/-15	45	-90/340	65/-55	40/-45	115	220	620
ANTISKID (FLAPS 30)	VREF30	1615	35/-15	30	-90/340	65/-55	40/-40	110	215	590
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1345	25/-10	35	-65/230	35/-30	35/-35	105	-	180
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1280	25/-5	15	-65/225	35/-30	30/-30	100	-	160
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1610	30/-10	30	-70/240	35/-30	40/-40	95	145	375
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1455	25/-10	25	-65/230	35/-30	35/-35	100	120	310
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1290	25/-10	35	-60/220	30/-25	30/-30	95	95	235
FLAPS PRIMARY FAIL	VREF20	1440	25/-10	40	-65/235	35/-30	35/-35	120	115	295
FLAP/SLAT CONTROL	VREF20	1290	25/-10	35	-60/220	30/-25	30/-30	95	95	235
FLIGHT CONTROL MODE	VREF20	1465	25/-10	40	-70/240	35/-30	35/-35	125	120	315
HYD PRESS SYS C	VREF20	1440	25/-10	40	-65/235	35/-30	35/-35	120	115	295
HYD PRESS SYS L+C	VREF30+20	1905	35/-5	30	-85/295	65/-55	50/-50	170	-	280
HYD PRESS SYS L+R	VREF30+20	2060	35/0	30	-95/330	90/-75	60/-60	195	-	-
HYD PRESS SYS R+C	VREF30+20	1935	35/-5	30	-85/295	65/-55	50/-50	180	-	300
HYD PRESS SYS L (FLAPS 25)	VREF25	1405	25/-5	35	-70/245	40/-35	35/-35	120	-	155
HYD PRESS SYS L (FLAPS 30)	VREF30	1415	25/-5	20	-70/245	45/-35	35/-35	125	-	155
HYD PRESS SYS R (FLAPS 25)	VREF25	1405	25/-5	35	-70/245	40/-35	35/-35	120	-	155
HYD PRESS SYS R (FLAPS 30)	VREF30	1400	25/-5	20	-70/245	40/-35	35/-35	120	-	150
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1640	30/-10	30	-70/245	35/-30	40/-45	100	145	370
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1455	25/-10	25	-65/230	35/-30	35/-35	100	115	285
PRI FLIGHT COMPUTERS	VREF20	1465	25/-10	40	-70/240	35/-30	35/-35	125	120	315
SLATS DRIVE	VREF30+30	1560	25/-10	30	-70/240	35/-30	40/-40	100	130	325
STABILIZER	VREF30+20	1455	25/-10	25	-65/230	35/-30	35/-35	100	115	285

Actual (unfactored) distances are shown.  
Includes distances from 50 ft above threshold (305 meters air distance).  
Assumes maximum manual braking and maximum available reverse thrust.

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ADVISORY INFORMATION

Non-Normal Configuration Landing Distance  
Medium Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2035	45/-25	65	-130/515	145/-100	55/-55	130	455	1505
ANTISKID (FLAPS 30)	VREF30	2010	50/-25	45	-130/515	140/-95	55/-55	125	435	1410
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1875	40/-25	60	-105/385	95/-75	50/-50	140	-	540
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1750	40/-15	30	-100/370	85/-65	50/-50	130	-	455
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2155	45/-25	55	-105/380	80/-65	60/-60	120	380	1140
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1930	40/-20	45	-100/370	75/-60	50/-50	125	315	915
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1710	35/-20	55	-95/350	70/-55	45/-45	120	250	705
FLAPS PRIMARY FAIL	VREF20	1875	40/-20	60	-100/370	80/-65	50/-50	145	295	860
FLAP/SLAT CONTROL	VREF20	1710	35/-20	55	-95/350	70/-55	45/-45	120	250	705
FLIGHT CONTROL MODE	VREF20	1910	40/-20	65	-105/375	85/-65	50/-50	150	310	925
HYD PRESS SYS C	VREF20	1875	40/-20	60	-100/370	80/-65	50/-50	145	295	860
HYD PRESS SYS L+C	VREF30+20	2615	55/-20	55	-135/485	155/-120	75/-75	205	-	815
HYD PRESS SYS L+R	VREF30+20	3275	55/-10	60	-175/620	305/-215	100/-100	260	-	-
HYD PRESS SYS R+C	VREF30+20	2650	55/-20	55	-135/490	160/-120	75/-75	210	-	850
HYD PRESS SYS L (FLAPS 25)	VREF25	1975	40/-15	55	-115/420	110/-85	55/-55	155	-	485
HYD PRESS SYS L (FLAPS 30)	VREF30	1975	40/-15	35	-115/420	110/-85	55/-55	155	-	475
HYD PRESS SYS R (FLAPS 25)	VREF25	1960	40/-15	55	-115/415	110/-85	55/-55	155	-	480
HYD PRESS SYS R (FLAPS 30)	VREF30	1925	40/-15	35	-110/410	105/-80	55/-55	145	-	445
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2155	45/-25	55	-105/385	80/-65	60/-60	120	355	1025
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1905	40/-20	40	-100/365	75/-60	50/-50	120	285	805
PRI FLIGHT COMPUTERS	VREF20	1910	40/-20	65	-105/375	85/-65	50/-50	150	310	925
SLATS DRIVE	VREF30+30	2045	40/-20	45	-105/375	80/-65	55/-55	120	315	895
STABILIZER	VREF30+20	1905	40/-20	40	-100/365	75/-60	50/-50	120	285	805

Actual (unfactored) distances are shown.  
Includes distances from 50 ft above threshold (305 meters air distance).  
Assumes maximum manual braking and maximum available reverse thrust.



ADVISORY INFORMATION

Non-Normal Configuration Landing Distance  
Poor Reported Braking Action

LANDING DISTANCES AND ADJUSTMENTS (M)										
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2665	70/-45	100	-210/935	665/-215	80/-80	140	1280	5000
ANTISKID (FLAPS 30)	VREF30	2615	70/-45	75	-210/925	645/-210	75/-75	135	1215	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2480	60/-40	90	-160/610	230/-150	75/-75	170	-	1400
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2280	55/-30	50	-150/585	205/-135	65/-65	150	-	1135
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2710	65/-35	80	-150/575	170/-120	80/-80	140	760	2825
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2415	60/-30	65	-145/555	165/-115	70/-70	140	630	2225
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2150	55/-30	80	-135/530	155/-105	60/-60	140	515	1735
FLAPS PRIMARY FAIL	VREF20	2320	55/-35	85	-145/555	170/-115	65/-65	160	590	2085
FLAP/SLAT CONTROL	VREF20	2150	55/-30	80	-135/530	155/-105	60/-60	140	515	1735
FLIGHT CONTROL MODE	VREF20	2370	60/-35	90	-145/560	175/-120	65/-65	165	625	2265
HYD PRESS SYS C	VREF20	2320	55/-35	85	-145/555	170/-115	65/-65	160	590	2085
HYD PRESS SYS L+C	VREF30+20	3435	75/-35	90	-210/790	390/-235	105/-105	225	-	1980
HYD PRESS SYS L+R	VREF30+20	5210	85/-20	115	-335/1260	1405/-580	165/-165	320	-	-
HYD PRESS SYS R+C	VREF30+20	3470	80/-40	95	-210/795	395/-240	105/-105	230	-	2045
HYD PRESS SYS L (FLAPS 25)	VREF25	2660	60/-30	90	-180/705	305/-180	80/-80	180	-	1275
HYD PRESS SYS L (FLAPS 30)	VREF30	2645	60/-30	65	-180/705	305/-180	80/-80	180	-	1225
HYD PRESS SYS R (FLAPS 25)	VREF25	2630	55/-30	85	-180/700	300/-180	75/-80	175	-	1230
HYD PRESS SYS R (FLAPS 30)	VREF30	2550	60/-30	60	-175/690	285/-170	75/-75	165	-	1105
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2665	60/-35	75	-150/570	170/-120	75/-80	135	685	2360
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2365	55/-30	65	-140/550	160/-110	65/-70	135	565	1875
PRI FLIGHT COMPUTERS	VREF20	2370	60/-35	90	-145/560	175/-120	65/-65	165	625	2265
SLATS DRIVE	VREF30+30	2525	60/-35	70	-145/560	165/-115	75/-75	135	610	2040
STABILIZER	VREF30+20	2365	55/-30	65	-140/550	160/-110	65/-70	135	565	1875

Actual (unfactored) distances are shown.  
Includes distances from 50 ft above threshold (305 meters air distance).  
Assumes maximum manual braking and maximum available reverse thrust.

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ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	303.3	283.2				
52	126	311.7	290.0				
50	122	320.1	297.1	273.2			
48	118	328.2	305.9	279.6			
46	115	336.9	314.7	286.5	261.4		
44	111	349.2	322.9	294.1	270.3		
42	108	356.2	331.4	302.9	277.2	251.7	
40	104	363.4	340.2	311.6	284.0	257.4	
38	100	370.8	352.8	319.7	290.5	263.8	233.8
36	97	377.4	360.1	326.9	296.6	270.2	238.4
34	93	378.7	367.2	334.9	303.0	275.0	243.0
32	90	378.7	374.6	342.5	309.1	278.9	247.2
30	86	378.7	378.7	351.0	315.8	283.1	250.9
28	82	378.7	378.7	355.6	321.0	287.7	254.6
26	79	378.7	378.7	361.2	324.9	292.3	258.2
24	75	378.7	378.7	361.3	328.1	296.9	262.7
22	72	378.7	378.7	361.4	331.5	300.4	268.3
20	68	378.7	378.7	361.4	331.5	302.5	272.8
18	64	378.7	378.7	361.5	331.6	304.7	275.3
16	61	378.7	378.7	361.6	331.7	304.7	277.0
14	57	378.7	378.7	361.7	331.8	304.8	278.6
12	54	378.7	378.7	361.7	331.8	304.9	278.6
10	50	378.7	378.7	361.8	331.9	304.9	278.7
8	46	378.7	378.7	361.9	332.0	304.9	278.7
6	43	378.7	378.7	359.6	332.1	304.9	272.8
4	40	378.7	378.7	350.0	316.7	286.7	255.0
2	36	378.7	378.7	350.0	316.8	286.8	255.0
0	32	378.7	378.7	350.0	316.8	286.8	255.0
-40	-40	378.7	378.7	350.0	316.8	286.8	255.0

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.

With engine bleed for packs off, increase weight by 1250 kg.

With engine anti-ice on, decrease weight by 150 kg.

With engine and wing anti-ice on, decrease weight by 2250 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26600 kg.

ADVISORY INFORMATION

Landing Climb Limit Weight  
Valid for approach with flaps 20 and landing with flaps 25

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	307.3	288.4				
52	126	314.5	295.3				
50	122	321.8	302.2	278.3			
48	118	329.5	309.5	284.8			
46	115	337.5	317.0	291.7	268.7		
44	111	347.9	324.5	299.3	275.5		
42	108	355.1	332.4	307.0	282.2	259.0	
40	104	362.3	340.5	314.3	289.1	265.0	
38	100	369.6	351.7	321.6	296.1	270.9	241.1
36	97	376.1	358.9	328.4	302.1	276.1	245.9
34	93	378.7	366.0	335.7	307.6	280.5	250.6
32	90	378.7	373.1	342.5	312.6	284.8	255.2
30	86	378.7	378.7	349.8	318.3	288.9	259.0
28	82	378.7	378.7	354.3	322.9	293.7	262.9
26	79	378.7	378.7	359.7	326.5	298.3	266.5
24	75	378.7	378.7	359.8	329.6	302.7	270.5
22	72	378.7	378.7	359.9	332.7	305.6	274.8
20	68	378.7	378.7	359.9	332.7	307.3	278.5
18	64	378.7	378.7	360.0	332.8	309.0	281.0
16	61	378.7	378.7	360.1	332.9	309.1	282.8
14	57	378.7	378.7	360.2	332.9	309.1	284.4
12	54	378.7	378.7	360.2	333.0	309.2	284.5
10	50	378.7	378.7	360.3	333.1	309.2	284.5
8	46	378.7	378.7	360.4	333.1	309.3	284.5
6	43	378.7	378.7	360.4	333.2	309.3	284.5
4	40	378.7	378.7	360.5	333.3	309.3	278.4
2	36	378.7	378.7	360.5	333.3	309.4	278.4
0	32	378.7	378.7	360.5	333.3	309.4	278.4
-40	-40	378.7	378.7	360.6	333.4	309.5	278.5

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.

With engine bleed for packs off, increase weight by 1400 kg.

With engine anti-ice on, decrease weight by 100 kg.

With engine and wing anti-ice on, decrease weight by 1950 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24500 kg.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule  
Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																																			
		80						100						120						140						160						180					
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																																			
		0			4			8			0			4			8			0			4			8			0			4			8		
360	0	23.3	25.7	28.3	33.8	37.7	41.9	46.1	51.6	57.8	59.8	67.3	75.6	74.5	84.0	94.5	89.8	101.1	113.6																		
	10	23.9	26.4	29.2	34.8	38.8	43.2	47.5	53.2	59.6	61.7	69.4	78.0	76.9	86.6	97.4	92.6	104.1	116.9																		
	15	24.4	26.9	29.7	35.5	39.5	44.0	48.4	54.2	60.7	62.8	70.6	79.4	78.3	88.1	99.1	94.2	105.9	118.8																		
	20	24.8	27.4	30.2	36.1	40.2	44.8	49.2	55.2	61.8	63.9	71.9	80.8	79.6	89.6	100.8	95.8	107.6	120.6																		
	30	25.5	28.1	31.0	37.1	41.3	46.1	50.6	56.7	63.6	65.8	74.0	83.1	81.9	92.2	103.6	98.5	110.6	123.9																		
340	0	22.2	24.4	27.0	32.3	35.9	39.9	43.9	49.1	55.0	56.9	64.0	71.9	71.0	79.9	90.0	85.6	96.4	108.4																		
	10	22.9	25.2	27.8	33.2	37.0	41.1	45.2	50.6	56.7	58.7	66.0	74.2	73.2	82.4	92.8	88.3	99.3	111.6																		
	15	23.3	25.7	28.3	33.9	37.7	41.9	46.1	51.6	57.7	59.8	67.2	75.5	74.5	83.9	94.4	89.8	101.0	113.4																		
	20	23.7	26.2	28.8	34.5	38.4	42.7	46.9	52.5	58.8	60.8	68.4	76.8	75.8	85.4	96.0	91.3	102.7	115.3																		
	30	24.3	26.8	29.6	35.4	39.4	43.9	48.2	54.0	60.5	62.6	70.3	79.0	78.0	87.8	98.7	94.0	105.6	118.4																		
320	0	21.2	23.4	25.7	30.7	34.2	37.9	41.7	46.6	52.2	54.0	60.7	68.1	67.3	75.8	85.3	81.3	91.5	103.0																		
	10	21.8	24.0	26.5	31.6	35.2	39.1	43.0	48.1	53.8	55.7	62.6	70.3	69.5	78.2	88.0	83.8	94.4	106.1																		
	15	22.2	24.5	27.0	32.2	35.8	39.8	43.8	49.0	54.8	56.7	63.7	71.5	70.7	79.6	89.5	85.3	96.0	107.9																		
	20	22.6	24.9	27.5	32.8	36.5	40.5	44.6	49.8	55.7	57.7	64.8	72.8	72.0	81.0	91.1	86.8	97.6	109.7																		
	30	23.2	25.6	28.2	33.7	37.5	41.6	45.8	51.2	57.3	59.4	66.7	74.9	74.0	83.3	93.7	89.3	100.4	112.7																		
300	0	20.2	22.8	25.5	30.7	34.2	38.0	42.3	46.6	52.2	54.0	60.7	68.1	67.3	75.8	85.3	81.3	91.5	103.0																		
	10	20.8	22.9	25.1	30.0	33.4	37.0	40.7	45.5	50.8	52.7	59.1	66.4	65.7	73.9	83.1	79.3	89.3	100.4																		
	15	21.2	23.3	25.6	30.6	34.0	37.7	41.5	46.3	51.8	53.6	60.2	67.6	66.8	75.2	84.6	80.7	90.8	102.1																		
	20	21.6	23.7	26.1	31.2	34.6	38.4	42.2	47.2	52.7	54.6	61.3	68.8	68.0	76.5	86.1	82.1	92.4	103.8																		
	30	22.1	24.3	26.8	32.0	35.5	39.4	43.4	48.5	54.2	56.1	63.0	70.7	70.0	78.8	88.5	84.4	95.0	106.7																		
260	0	18.2	20.0	21.9	26.1	28.9	32.0	35.1	39.1	43.6	45.2	50.6	56.6	56.1	63.1	70.9	67.7	76.2	85.8																		
	10	18.7	20.6	22.5	26.9	29.7	32.9	36.2	40.3	44.9	46.5	52.1	58.4	57.9	65.1	73.1	69.8	78.6	88.5																		
	15	19.1	20.9	23.0	27.4	30.3	33.6	36.8	41.1	45.8	47.4	53.1	59.5	58.9	66.2	74.4	71.1	80.0	90.0																		
	20	19.4	21.3	23.4	27.9	30.9	34.2	37.5	41.8	46.6	48.3	54.1	60.6	60.0	67.4	75.7	72.4	81.4	91.6																		
	30	19.9	21.9	24.0	28.6	31.7	35.1	38.5	43.0	47.9	49.6	55.6	62.3	61.7	69.4	77.9	74.4	83.8	94.2																		
220	0	16.3	17.8	19.5	23.1	25.4	28.1	30.7	34.1	37.9	39.2	43.7	48.9	48.4	54.2	60.8	58.2	65.4	73.5																		
	10	16.7	18.3	20.0	23.7	26.2	28.9	31.6	35.1	39.0	40.3	45.1	50.4	49.9	55.9	62.7	60.0	67.4	75.8																		
	15	17.1	18.7	20.4	24.2	26.7	29.4	32.2	35.8	39.8	41.1	45.9	51.3	50.8	57.0	63.9	61.1	68.7	77.2																		
	20	17.4	19.0	20.8	24.6	27.1	30.0	32.8	36.4	40.5	41.8	46.7	52.2	51.7	58.0	65.0	62.2	69.9	78.5																		
	30	17.8	19.5	21.3	25.2	27.8	30.7	33.7	37.4	41.6	43.0	48.1	53.7	53.2	59.6	66.9	63.9	71.9	80.8																		
180	0	14.4	15.7	17.1	20.0	22.0	24.2	26.3	29.1	32.2	33.1	36.8	41.0	40.4	45.2	50.5	48.2	54.0	60.6																		
	10	14.8	16.1	17.6	20.6	22.6	24.9	27.0	29.9	33.1	34.1	37.9	42.2	41.6	46.5	52.0	49.7	55.7	62.5																		
	15	15.1	16.4	17.9	21.0	23.0	25.3	27.5	30.5	33.7	34.7	38.6	43.0	42.4	47.4	53.0	50.6	56.7	63.6																		
	20	15.4	16.7	18.2	21.3	23.5	25.8	28.0	31.0	34.4	35.3	39.3	43.8	43.2	48.3	53.9	51.5	57.8	64.8																		
	30	15.7	17.1	18.7	21.9	24.1	26.5	28.8	31.8	35.3	36.3	40.4	45.0	44.4	49.6	55.5	53.0	59.4	66.6																		
	40	15.8	17.2	18.8	22.1	24.3	26.8	29.1	32.3	35.8	36.8	41.0	45.7	45.1	50.5	56.5	53.9	60.5	68.0																		

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

## ADVISORY INFORMATION

## Recommended Brake Cooling Schedule

Event Adjusted Brake Energy (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.6	13.6	23.5	33.2	42.8	52.3	61.8	71.4	81.0	90.6	100.5	110.4
	MAX AUTO	3.5	12.5	21.4	30.2	39.0	47.8	56.8	66.0	75.5	85.5	95.9	106.8
	AUTOBRAKE 4	3.2	11.7	20.0	28.0	36.0	44.0	52.2	60.6	69.4	78.7	88.6	99.2
	AUTOBRAKE 3	2.7	11.0	18.8	26.3	33.7	41.0	48.4	56.1	64.2	72.8	82.0	92.2
	AUTOBRAKE 2	2.3	10.2	17.5	24.5	31.2	37.9	44.6	51.5	58.9	66.7	75.2	84.6
	AUTOBRAKE 1	1.9	9.0	15.6	21.8	27.8	33.8	39.8	45.9	52.4	59.4	66.9	75.1

## 2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.4	12.0	21.2	30.6	39.7	48.6	57.4	65.9	74.4	82.8	91.3	99.7
	MAX AUTO	2.0	8.8	15.9	23.2	30.5	38.0	45.7	53.7	62.1	71.0	80.6	90.9
	AUTOBRAKE 4	1.3	5.6	10.9	16.6	22.5	28.3	34.3	40.7	47.5	54.9	63.0	72.0
	AUTOBRAKE 3	0.8	3.1	7.0	11.6	16.2	20.9	25.8	30.9	36.6	42.7	49.6	57.3
	AUTOBRAKE 2	0.0	2.3	5.0	7.8	10.8	14.0	17.4	21.2	25.6	30.4	36.0	42.4
	AUTOBRAKE 1	0.0	1.6	3.3	5.2	7.2	9.4	11.8	14.4	17.4	20.8	24.7	29.2

## Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
		16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE	
GROUND	REQUIRED	11	18	26	42	55	66	73			
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9			
									5.0 TO 6.3	6.3 & ABOVE	

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule.

(When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

Intentionally  
Blank

Performance Inflight  
Engine Inoperative

Chapter PI  
Section 13

ENGINE INOP

Initial Max Continuous %N1  
Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

777 Flight Crew Operations Manual

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT												TAT (°C)	
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT												TAT (°C)	
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT												TAT (°C)	
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.0	99.3	97.9	96.4	
31000 FT PRESS ALT												TAT (°C)	
CIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT												TAT (°C)	
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT												TAT (°C)	
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4



ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off  
25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT			TAT (°C)										
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT			TAT (°C)										
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT			TAT (°C)										
KLAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT			TAT (°C)										
KLAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT			TAT (°C)										
KLAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT			TAT (°C)										
CIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT			TAT (°C)										
CIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	103.6	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.0	102.0	102.7	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT			TAT (°C)										
CIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT			TAT (°C)										
CIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT			TAT (°C)										
CIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	301	18000	16900	15700
340	331	293	19500	18400	17300
320	312	285	20900	20200	19100
300	291	276	22400	21500	20600
280	272	266	24200	23200	22000
260	252	257	26200	25300	24000
240	233	248	28500	27700	26300
220	214	238	30500	30000	28900
200	195	227	32300	32000	31300
180	175	215	34300	34100	33800
160	155	203	36500	36400	36200

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
134	125	118	111	105	100	95	90	86	82	79
268	251	236	222	210	200	190	181	173	166	159
402	376	354	333	316	300	285	272	260	249	239
535	501	471	445	421	400	380	363	347	332	319
668	626	588	555	526	500	476	454	434	416	399
800	750	706	666	631	600	571	545	521	499	479
932	874	823	777	736	700	666	636	608	583	560
1064	998	940	888	841	800	762	727	696	667	640
1196	1122	1057	998	946	900	857	818	783	751	721
1327	1246	1173	1109	1051	1000	952	910	870	835	801
1459	1369	1290	1220	1156	1100	1048	1001	958	918	882
1590	1493	1407	1330	1262	1200	1143	1092	1045	1002	963
1722	1617	1524	1441	1367	1300	1239	1183	1133	1086	1043
1854	1741	1641	1552	1472	1400	1334	1275	1220	1170	1124
1986	1865	1758	1662	1577	1500	1430	1366	1307	1254	1205
2118	1989	1875	1773	1682	1600	1525	1457	1395	1338	1285
2250	2113	1992	1884	1787	1700	1620	1548	1482	1421	1365
2383	2238	2109	1995	1892	1800	1716	1639	1569	1505	1446

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)											TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)											
	160	180	200	220	240	260	280	300	320	340	360	
100	1.0	1.1	1.2	1.4	1.4	1.6	1.7	1.7	1.8	1.9	2.0	0:15
200	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	0:31
300	3.6	3.9	4.4	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.2	0:46
400	4.9	5.4	6.0	6.6	7.0	7.5	7.9	8.4	8.9	9.5	10.0	1:01
500	6.2	6.8	7.5	8.2	8.8	9.4	10.0	10.6	11.2	11.9	12.6	1:16
600	7.4	8.1	9.0	9.8	10.6	11.3	12.0	12.7	13.4	14.3	15.2	1:30
700	8.6	9.4	10.4	11.4	12.3	13.1	13.9	14.8	15.6	16.6	17.7	1:45
800	9.7	10.7	11.9	13.0	14.0	14.9	15.9	16.8	17.8	19.0	20.2	1:59
900	10.9	12.0	13.3	14.5	15.6	16.8	17.8	18.9	20.0	21.3	22.7	2:14
1000	12.1	13.3	14.7	16.1	17.3	18.5	19.7	20.9	22.1	23.6	25.2	2:28
1100	13.2	14.6	16.1	17.6	19.0	20.3	21.6	22.9	24.3	25.9	27.6	2:43
1200	14.4	15.9	17.5	19.1	20.6	22.1	23.5	24.9	26.4	28.1	30.0	2:57
1300	15.5	17.2	18.9	20.6	22.3	23.8	25.4	26.9	28.5	30.4	32.4	3:11
1400	16.6	18.4	20.3	22.1	23.9	25.6	27.2	28.9	30.6	32.6	34.8	3:26
1500	17.7	19.6	21.7	23.6	25.5	27.3	29.1	30.9	32.7	34.8	37.2	3:40
1600	18.8	20.9	23.0	25.1	27.1	29.0	30.9	32.8	34.8	37.0	39.5	3:55
1700	19.9	22.1	24.4	26.6	28.7	30.7	32.8	34.8	36.8	39.2	41.9	4:10
1800	21.0	23.3	25.7	28.0	30.2	32.4	34.6	36.7	38.9	41.4	44.2	4:24

Includes APU fuel burn.

Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability  
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	15600	14200	12700
350	16000	14700	13200
340	16900	15200	13700
330	17800	16300	14600
320	18800	17300	15600
310	19800	18300	16600
300	20500	19300	17700
290	21100	20200	18700
280	21800	20800	19800
270	22700	21500	20600
260	23600	22300	21200
250	24600	23400	21900
240	25800	24600	23100
230	27100	25900	24300
220	28500	27300	25600
210	29900	28600	27100
200	30900	30000	28500
190	31900	31200	30100
180	32900	32500	31400
170	34000	33700	32800
160	35200	35100	34300

With engine anti-ice on, no altitude capability adjustment is required.  
With engine and wing anti-ice on, decrease altitude capability by 300 ft.

777 Flight Crew Operations Manual

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	90.9	96.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10070	10778								
340	%N1	89.9	94.9	97.6							
	MACH	.602	.664	.683							
	KIAS	334	337	335							
	FF/ENG	9696	10338	10505							
320	%N1	88.7	92.9	94.8	97.7						
	MACH	.602	.653	.670	.689						
	KIAS	334	332	328	325						
	FF/ENG	9267	9589	9644	9735						
300	%N1	86.8	91.0	92.7	94.7	97.9					
	MACH	.592	.638	.657	.674	.694					
	KIAS	329	324	321	317	315					
	FF/ENG	8693	8874	8919	8944	9073					
280	%N1	85.0	89.2	90.8	92.6	94.8	98.3				
	MACH	.574	.622	.641	.660	.677	.700				
	KIAS	319	315	313	310	306	305				
	FF/ENG	8068	8218	8264	8284	8332	8544				
260	%N1	82.9	87.2	88.8	90.5	92.3	94.7	98.4			
	MACH	.557	.605	.623	.643	.662	.679	.704			
	KIAS	309	306	304	302	299	295	294			
	FF/ENG	7484	7593	7619	7642	7676	7747	8011			
240	%N1	80.8	84.8	86.8	88.3	90.0	91.8	94.5	98.3		
	MACH	.540	.585	.605	.624	.644	.663	.681	.707		
	KIAS	299	296	295	293	291	288	284	283		
	FF/ENG	6926	6949	7005	7013	7041	7088	7163	7427		
220	%N1	78.6	82.5	84.2	86.1	87.7	89.4	91.2	93.8	97.8	
	MACH	.522	.564	.584	.604	.623	.644	.663	.681	.708	
	KIAS	289	285	284	283	281	279	276	272	272	
	FF/ENG	6372	6314	6372	6413	6419	6456	6501	6563	6820	
200	%N1	76.2	79.9	81.7	83.4	85.3	86.9	88.6	90.4	93.0	96.9
	MACH	.503	.543	.561	.581	.601	.621	.642	.661	.680	.706
	KIAS	278	274	272	271	270	268	267	264	260	260
	FF/ENG	5827	5717	5752	5795	5829	5836	5870	5906	5957	6195
180	%N1	73.8	77.2	78.9	80.7	82.3	84.2	85.8	87.5	89.3	91.9
	MACH	.484	.521	.538	.556	.575	.596	.616	.638	.658	.677
	KIAS	268	263	261	259	258	257	256	254	251	248
	FF/ENG	5301	5135	5167	5198	5215	5244	5254	5279	5309	5352
160	%N1	71.0	74.3	76.0	77.6	79.3	81.0	82.7	84.5	86.1	88.0
	MACH	.464	.498	.514	.530	.548	.567	.589	.609	.631	.652
	KIAS	257	251	249	247	246	244	243	242	240	238
	FF/ENG	4797	4574	4596	4632	4637	4636	4658	4673	4689	4716

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
284	263	244	227	213	200	190	181	173	166	159
565	523	485	453	425	400	381	364	348	334	321
847	784	728	680	638	600	572	546	522	501	482
1129	1045	970	906	850	800	763	729	698	669	643
1413	1308	1214	1133	1063	1000	954	911	872	836	804
1697	1570	1457	1361	1276	1200	1145	1094	1047	1004	965
1982	1834	1701	1588	1489	1400	1336	1276	1221	1171	1125
2268	2097	1945	1815	1702	1600	1526	1458	1395	1338	1286
2554	2362	2190	2043	1915	1800	1717	1640	1569	1505	1446
2842	2626	2434	2270	2128	2000	1908	1822	1743	1671	1606

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.8	0:39	3.3	0:38	3.0	0:36	2.7	0:36	2.5	0:35
400	8.0	1:13	7.3	1:10	6.8	1:08	6.4	1:05	6.1	1:03
600	12.1	1:48	11.2	1:44	10.6	1:39	10.0	1:35	9.7	1:32
800	16.2	2:23	15.1	2:17	14.3	2:11	13.6	2:06	13.2	2:01
1000	20.2	2:59	18.9	2:50	18.0	2:43	17.1	2:36	16.7	2:30
1200	24.2	3:34	22.7	3:24	21.7	3:15	20.7	3:06	20.2	2:59
1400	28.2	4:10	26.5	3:58	25.3	3:47	24.1	3:37	23.6	3:29
1600	32.1	4:46	30.2	4:33	28.9	4:19	27.6	4:08	26.9	3:58
1800	36.0	5:22	33.8	5:07	32.4	4:52	31.0	4:39	30.2	4:28
2000	39.8	5:59	37.5	5:42	36.0	5:25	34.4	5:10	33.5	4:58

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
5	-1.0	-0.8	-0.6	-0.4	-0.2	0.0	0.3	0.7	1.1	1.7	2.4
10	-2.1	-1.7	-1.3	-0.9	-0.4	0.0	0.7	1.5	2.5	3.7	5.0
15	-3.3	-2.6	-2.0	-1.3	-0.7	0.0	1.0	2.3	3.8	5.6	7.6
20	-4.4	-3.5	-2.7	-1.8	-0.9	0.0	1.4	3.1	5.1	7.4	9.9
25	-5.5	-4.4	-3.4	-2.2	-1.1	0.0	1.8	3.9	6.3	9.1	12.2
30	-6.7	-5.4	-4.0	-2.7	-1.3	0.0	2.1	4.6	7.5	10.7	14.3
35	-7.8	-6.3	-4.7	-3.2	-1.6	0.0	2.5	5.3	8.6	12.2	16.2
40	-8.9	-7.2	-5.4	-3.6	-1.8	0.0	2.8	6.0	9.7	13.7	18.1

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding  
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	80.5	83.9	88.6	93.4			
	KIAS	264	264	265	269			
	FF/ENG	9070	9130	9370	9670			
340	%N1	78.7	81.9	86.7	91.4	100.4		
	KIAS	260	260	260	260	299		
	FF/ENG	8520	8560	8730	8950	10320		
320	%N1	76.7	79.7	84.6	89.2	96.4		
	KIAS	253	253	253	253	289		
	FF/ENG	7930	7940	8050	8210	9240		
300	%N1	74.7	77.7	82.3	87.1	92.4		
	KIAS	244	244	244	244	259		
	FF/ENG	7380	7360	7430	7550	8120		
280	%N1	72.8	75.7	80.1	85.0	90.1		
	KIAS	238	238	238	238	238		
	FF/ENG	6880	6850	6880	6950	7350		
260	%N1	70.7	73.6	77.8	82.8	87.8	95.1	
	KIAS	229	229	229	229	229	262	
	FF/ENG	6380	6340	6330	6380	6690	7470	
240	%N1	68.5	71.5	75.6	80.3	85.4	90.5	
	KIAS	223	223	223	223	223	228	
	FF/ENG	5910	5870	5820	5850	6110	6420	
220	%N1	66.2	69.1	73.2	77.7	82.8	87.7	96.7
	KIAS	217	217	217	217	217	217	242
	FF/ENG	5440	5400	5330	5350	5530	5760	6550
200	%N1	64.1	66.7	71.0	75.3	80.1	85.0	91.2
	KIAS	217	217	217	217	217	217	226
	FF/ENG	5010	4970	4910	4900	5040	5200	5550
180	%N1	62.0	64.6	68.6	72.9	77.6	82.5	87.2
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4630	4580	4520	4500	4630	4730	4880
160	%N1	59.9	62.6	66.3	70.7	75.2	80.0	84.7
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4300	4240	4160	4140	4250	4340	4450

This table includes 5% additional fuel for holding in a racetrack pattern.



ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available  
Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	760	640				
50	810	700	540			
48	860	760	590			
46	920	810	650	490		
44	970	870	710	550		
42	1020	930	760	590	420	
40	1070	980	810	640	450	
38	1110	1040	860	680	490	270
36	1110	1080	900	720	520	300
34	1120	1120	940	760	550	330
32	1120	1150	980	800	590	360
30	1130	1150	1010	830	630	390
20	1150	1170	1040	890	730	530
10	1180	1200	1030	880	510	320
0	1200	1220	980	740	500	250
-20	1250	1260	1020	770	520	260
-40	1300	1320	1060	800	540	270

Rate of climb capability shown is valid for 190000 kg, gear down at VREF20 + 5.

Decrease rate of climb 50 ft/min per 5000 kg greater than 190000 kg.

Increase rate of climb 60 ft/min per 5000 kg less than 190000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	80	-50				
50	130	0	-80			
48	180	60	-30			
46	230	110	20	-100		
44	270	170	80	-50		
42	330	220	120	-10	-160	
40	370	270	170	30	-130	
38	400	320	210	70	-100	-310
36	410	360	260	100	-70	-280
34	410	400	290	140	-50	-260
32	410	420	320	170	-10	-230
30	420	430	350	200	20	-200
20	430	440	370	260	110	-80
10	440	440	330	170	10	-150
0	450	450	300	100	-120	-360
-20	470	470	310	100	-120	-370
-40	490	490	320	100	-130	-390

Rate of climb capability shown is valid for 190000 kg, gear down at VREF30 + 5.

Decrease rate of climb 30 ft/min per 5000 kg greater than 190000 kg.

Increase rate of climb 40 ft/min per 5000 kg less than 190000 kg.

Intentionally  
Blank

Performance Inflight  
Alternate Mode EEC

Chapter PI  
Section 14

ALTERNATE MODE EEC

Alternate Mode EEC Max Takeoff %N1

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (1000 FT)											
°C	°F	-2	-1	0	1	2	3	4	5	6	7	8	8.4
55	131	94.3	96.7	97.0	96.7	96.5	96.6	96.4	96.3	96.1	95.5	94.6	94.2
50	122	95.7	98.1	98.6	98.2	97.9	97.9	97.8	97.6	97.4	96.8	95.9	95.6
45	113	97.2	99.6	100.1	99.8	99.4	99.3	99.1	98.9	98.8	98.2	97.3	96.9
40	104	98.9	101.2	101.9	101.4	101.0	100.8	100.6	100.4	100.0	99.4	98.6	98.2
35	95	100.9	102.7	104.7	104.2	103.1	102.6	102.1	101.7	101.1	100.4	99.6	99.3
30	86	100.5	103.7	106.9	106.4	105.6	105.0	104.3	103.7	102.6	101.5	100.7	100.3
25	77	99.7	102.8	106.0	106.7	107.3	107.2	106.7	106.5	105.3	103.8	102.4	101.8
20	68	98.8	101.9	105.1	105.8	106.4	106.8	107.1	107.5	106.8	105.9	104.8	104.3
15	59	98.0	101.1	104.2	104.9	105.5	105.8	106.2	106.5	106.4	106.1	105.6	105.3
10	50	97.1	100.2	103.3	104.0	104.6	104.9	105.3	105.6	105.5	105.2	104.9	104.8
5	41	96.3	99.3	102.4	103.0	103.7	104.0	104.3	104.7	104.5	104.2	104.0	103.8
0	32	95.4	98.4	101.4	102.1	102.7	103.1	103.4	103.7	103.6	103.3	103.0	102.9
-10	14	93.6	96.6	99.6	100.2	100.8	101.2	101.5	101.8	101.7	101.4	101.1	101.0
-20	-4	91.8	94.7	97.7	98.3	98.9	99.2	99.5	99.9	99.7	99.5	99.2	99.0
-30	-22	90.0	92.8	95.7	96.3	96.9	97.2	97.5	97.9	97.7	97.5	97.2	97.1
-40	-40	88.1	90.9	93.7	94.3	94.9	95.2	95.5	95.8	95.7	95.4	95.2	95.0
-50	-58	86.2	88.9	91.7	92.3	92.9	93.1	93.4	93.8	93.6	93.4	93.1	93.0

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)											
	-2	-1	0	1	2	3	4	5	6	7	8	8.4
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Intentionally  
Blank

Performance Inflight

Gear Down

Chapter PI

Section 15

GEAR DOWN

220 KIAS Max Climb %N1

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.6	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

Anti-ice Adjustment

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

\* Packs on or off with 2 bleed sources.

\*\* Packs off with 1 bleed source.

GEAR DOWN

Long Range Cruise Altitude Capability  
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	84.4	88.7	90.7	93.0						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7524	7653	7775	7993						
340	%N1	83.5	87.8	89.7	91.8						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7296	7405	7486	7646						
320	%N1	82.6	86.7	88.3	90.0	92.1					
	MACH	.488	.534	.550	.568	.588					
	KIAS	270	269	267	265	264					
	FF/ENG	7058	7105	7101	7142	7267					
300	%N1	81.2	84.9	86.6	88.2	89.9	92.1				
	MACH	.481	.520	.537	.554	.572	.594				
	KIAS	266	262	260	258	257	256				
	FF/ENG	6725	6632	6624	6623	6679	6806				
280	%N1	79.3	83.1	84.9	86.4	87.9	89.7	92.3			
	MACH	.468	.507	.523	.540	.557	.576	.598			
	KIAS	259	255	253	252	250	248	248			
	FF/ENG	6283	6189	6167	6168	6164	6230	6361			
260	%N1	77.2	81.1	82.9	84.6	86.0	87.6	89.4	92.3	96.7	
	MACH	.453	.492	.508	.525	.542	.559	.579	.602	.628	
	KIAS	251	248	246	244	243	241	239	239	239	
	FF/ENG	5831	5754	5724	5709	5711	5706	5778	5910	6239	
240	%N1	75.0	79.0	80.8	82.4	84.1	85.5	87.1	89.0	92.0	
	MACH	.438	.476	.492	.508	.525	.543	.561	.581	.605	
	KIAS	242	240	238	237	235	233	231	230	230	
	FF/ENG	5377	5317	5292	5266	5254	5253	5252	5320	5450	
220	%N1	72.6	76.7	78.4	80.2	81.7	83.4	84.9	86.4	88.4	91.5
	MACH	.421	.459	.475	.491	.508	.525	.543	.561	.582	.606
	KIAS	232	231	230	228	227	225	224	222	221	220
	FF/ENG	4925	4872	4859	4836	4811	4800	4799	4799	4859	4983
200	%N1	69.9	74.1	75.8	77.5	79.3	80.9	82.7	84.4	86.3	88.5
	MACH	.403	.441	.456	.473	.489	.506	.526	.548	.571	.596
	KIAS	223	221	220	219	218	217	217	216	217	217
	FF/ENG	4476	4425	4418	4408	4384	4360	4387	4432	4481	4565
180	%N1	67.8	72.2	74.1	75.9	77.9	79.8	81.5	83.3	85.1	87.0
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4152	4138	4141	4159	4170	4182	4208	4249	4283	4335
160	%N1	66.8	71.3	73.1	74.9	76.9	78.7	80.5	82.4	84.1	85.9
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4013	3995	3994	4006	4019	4031	4053	4088	4125	4159

GEAR DOWN

Long Range Cruise Enroute Fuel and Time  
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
310	280	254	233	216	200	189	179	170	162	155
622	562	510	467	431	400	378	358	340	324	311
936	845	766	702	648	600	567	538	511	487	466
1253	1131	1024	937	864	800	757	718	682	650	621
1573	1418	1283	1173	1081	1000	946	897	852	812	776
1896	1706	1542	1409	1298	1200	1135	1076	1022	973	930
2222	1997	1803	1646	1515	1400	1324	1254	1191	1134	1084
2552	2291	2066	1884	1733	1600	1513	1433	1361	1296	1238
2883	2586	2329	2122	1951	1800	1702	1612	1530	1457	1392
3215	2881	2593	2361	2169	2000	1890	1790	1699	1618	1545
3547	3177	2857	2600	2387	2200	2079	1968	1868	1778	1699
3880	3472	3120	2838	2604	2400	2268	2147	2038	1940	1853
4213	3768	3384	3076	2822	2600	2457	2326	2207	2101	2007
4545	4063	3648	3315	3040	2800	2646	2505	2377	2262	2161
4878	4359	3912	3554	3258	3000	2835	2683	2546	2424	2315
5211	4655	4176	3792	3476	3200	3023	2862	2716	2585	2468
5544	4951	4440	4031	3694	3400	3212	3041	2885	2746	2622
5876	5246	4703	4269	3912	3600	3401	3220	3055	2907	2776
6209	5541	4967	4507	4130	3800	3590	3398	3224	3068	2930
6542	5837	5230	4746	4348	4000	3778	3576	3393	3229	3084

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	7.4	0:46	6.7	0:44	5.8	0:42	5.3	0:41	5.0	0:39
400	15.0	1:29	13.9	1:25	12.4	1:20	11.6	1:17	11.1	1:13
600	22.6	2:13	21.1	2:06	19.0	1:58	17.9	1:53	17.2	1:48
800	30.0	2:57	28.0	2:48	25.4	2:37	24.0	2:30	23.0	2:23
1000	37.3	3:42	34.9	3:30	31.8	3:15	30.1	3:07	28.9	2:57
1200	44.4	4:28	41.6	4:14	38.0	3:55	35.9	3:44	34.5	3:33
1400	51.5	5:14	48.3	4:57	44.1	4:35	41.8	4:22	40.1	4:09
1600	58.3	6:01	54.7	5:41	50.1	5:15	47.5	5:00	45.6	4:45
1800	65.1	6:49	61.2	6:26	56.1	5:56	53.1	5:38	51.0	5:21
2000	71.7	7:37	67.5	7:11	61.9	6:37	58.7	6:17	56.3	5:57
2200	78.3	8:25	73.7	7:56	67.7	7:18	64.2	6:55	61.6	6:33
2400	84.8	9:13	79.9	8:41	73.4	7:59	69.6	7:34	66.8	7:09
2600	91.3	10:00	86.0	9:26	79.1	8:40	75.0	8:12	72.0	7:45
2800	97.6	10:48	92.0	10:11	84.6	9:21	80.3	8:51	77.1	8:21
3000	104.0	11:36	98.0	10:56	90.2	10:02	85.6	9:29	82.1	8:57
3200	110.2	12:24	103.9	11:41	95.7	10:43	90.8	10:08	87.1	9:33
3400	116.5	13:12	109.8	12:27	101.1	11:24	96.0	10:46	92.1	10:09
3600	122.6	14:00	115.6	13:12	106.5	12:05	101.1	11:25	97.0	10:45
3800	128.7	14:48	121.4	13:57	111.9	12:46	106.2	12:03	101.9	11:21
4000	134.8	15:36	127.2	14:42	117.2	13:27	111.3	12:42	106.8	11:57



GEAR DOWN

Long Range Cruise Enroute Fuel and Time  
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
10	-1.8	-1.6	-1.3	-0.9	-0.4	0.0	0.8	1.8	2.9	4.1	5.5
20	-3.6	-3.2	-2.6	-1.8	-0.9	0.0	1.6	3.4	5.5	7.9	10.5
30	-5.3	-4.7	-3.8	-2.7	-1.4	0.0	2.2	4.9	7.9	11.3	15.1
40	-6.8	-6.0	-5.0	-3.5	-1.8	0.0	2.9	6.2	10.1	14.4	19.2
50	-8.3	-7.3	-6.0	-4.2	-2.2	0.0	3.4	7.4	12.0	17.1	22.9
60	-9.5	-8.4	-6.9	-4.9	-2.5	0.0	3.9	8.4	13.7	19.6	26.1
70	-10.7	-9.5	-7.8	-5.5	-2.8	0.0	4.3	9.3	15.1	21.6	28.9
80	-11.7	-10.4	-8.5	-6.1	-3.1	0.0	4.6	10.1	16.3	23.4	31.2
90	-12.6	-11.2	-9.2	-6.5	-3.4	0.0	4.9	10.7	17.3	24.8	33.1
100	-13.4	-11.9	-9.8	-7.0	-3.7	0.0	5.1	11.1	18.0	25.9	34.6
110	-14.1	-12.5	-10.3	-7.3	-3.9	0.0	5.2	11.4	18.5	26.6	35.6
120	-14.6	-12.9	-10.7	-7.6	-4.0	0.0	5.3	11.6	18.8	27.0	36.1
130	-15.0	-13.3	-11.0	-7.9	-4.2	0.0	5.3	11.6	18.8	27.0	36.2
140	-15.2	-13.5	-11.2	-8.1	-4.3	0.0	5.2	11.5	18.6	26.7	35.8

Descent at VREF30 + 80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	40	44	48	52	57	61	65	69	74
TIME (MINUTES)	11	12	13	14	15	15	16	17	18	18

GEAR DOWN

Holding  
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	76.1						
	KIAS	264						
	FF/ENG	7750						
340	%N1	74.6	77.7					
	KIAS	260	260					
	FF/ENG	7360	7350					
320	%N1	72.8	75.8					
	KIAS	253	253					
	FF/ENG	6890	6870					
300	%N1	70.6	73.7	78.1				
	KIAS	244	244	244				
	FF/ENG	6380	6370	6340				
280	%N1	68.8	72.0	76.3				
	KIAS	238	238	238				
	FF/ENG	5970	5960	5920				
260	%N1	66.7	69.7	74.1	78.6			
	KIAS	229	229	229	229			
	FF/ENG	5520	5510	5470	5490			
240	%N1	64.9	67.7	72.2	76.7			
	KIAS	223	223	223	223			
	FF/ENG	5150	5130	5100	5100			
220	%N1	63.1	65.8	70.1	74.6	79.4		
	KIAS	217	217	217	217	217		
	FF/ENG	4800	4770	4730	4730	4770		
200	%N1	61.9	64.7	68.8	73.3	78.0	82.7	
	KIAS	217	217	217	217	217	217	
	FF/ENG	4610	4570	4520	4520	4550	4610	
180	%N1	61.0	63.8	67.8	72.2	76.9	81.5	86.0
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4450	4410	4360	4350	4370	4420	4520
160	%N1	60.1	62.9	66.8	71.3	75.9	80.5	84.9
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4320	4270	4210	4190	4210	4260	4350

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding  
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	75.9	79.0	83.8	88.3	94.3
	KIAS	244	244	244	244	244
	FF/ENG	7660	7700	7690	7810	8200
340	%N1	74.3	77.4	82.1	86.8	91.8
	KIAS	240	240	240	240	240
	FF/ENG	7240	7260	7250	7350	7630
320	%N1	72.5	75.5	80.0	84.9	89.7
	KIAS	233	233	233	233	233
	FF/ENG	6770	6780	6770	6830	7040
300	%N1	70.3	73.4	77.8	82.9	87.6
	KIAS	224	224	224	224	224
	FF/ENG	6270	6270	6270	6320	6450
280	%N1	68.3	71.5	75.8	80.6	85.6
	KIAS	218	218	218	218	218
	FF/ENG	5840	5840	5820	5870	5980
260	%N1	66.0	69.1	73.5	78.1	83.3
	KIAS	209	209	209	209	209
	FF/ENG	5380	5370	5340	5400	5460
240	%N1	64.1	66.9	71.4	75.9	81.0
	KIAS	203	203	203	203	203
	FF/ENG	4980	4960	4930	4970	5020
220	%N1	62.0	64.7	69.0	73.6	78.4
	KIAS	197	197	197	197	197
	FF/ENG	4600	4570	4530	4550	4610
200	%N1	60.5	63.2	67.3	71.8	76.5
	KIAS	197	197	197	197	197
	FF/ENG	4350	4310	4260	4270	4310
180	%N1	59.1	61.8	65.8	70.3	74.9
	KIAS	197	197	197	197	197
	FF/ENG	4140	4100	4040	4050	4070
160	%N1	57.9	60.7	64.6	69.0	73.5
	KIAS	197	197	197	197	197
	FF/ENG	3970	3920	3860	3860	3860

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally  
Blank

Performance Inflight

Gear Down, Engine INOP

Chapter PI

Section 16

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude  
100 ft/min residual rate of climb  
Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
320	307	254	5600	4400	2200
300	288	246	7700	6800	5300
280	269	238	9800	9100	8100
260	250	230	12100	11400	10300
240	230	223	14000	13500	12400
220	210	217	15900	15400	14400
200	191	216	17300	16700	15700
180	172	216	18500	18100	16900
160	153	216	19700	19400	18200

Long Range Cruise Altitude Capability  
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
340	1800		
330	3300	1000	
320	4500	2700	
310	5700	4400	1900
300	6800	5700	3800
290	7800	7000	5300
280	8800	8100	6700
270	9800	9100	8100
260	11100	10400	9300
250	12100	11400	10300
240	13100	12500	11300
230	14000	13600	12400
220	15100	14600	13600
210	15900	15400	14400
200	16700	16100	15100
190	17400	16700	15800
180	18000	17500	16400
170	18700	18200	16900
160	19300	18900	17700

**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		5	7	9	11	13	15	17	19
300	%N1	94.3	96.8						
	MACH	.403	.418						
	KIAS	244	244						
	FF/ENG	12328	12507						
280	%N1	92.3	94.1	96.8					
	MACH	.393	.407	.422					
	KIAS	238	238	238					
	FF/ENG	11514	11566	11807					
260	%N1	90.5	91.6	93.6	96.4				
	MACH	.385	.393	.408	.423				
	KIAS	233	229	229	229				
	FF/ENG	10870	10626	10714	10945				
240	%N1	88.9	89.8	91.3	93.4	96.5			
	MACH	.379	.385	.397	.412	.428			
	KIAS	229	225	223	223	223			
	FF/ENG	10228	9966	9915	10023	10245			
220	%N1	86.6	88.0	89.1	90.9	93.1	96.4		
	MACH	.368	.377	.387	.401	.417	.433		
	KIAS	223	220	217	217	217	217		
	FF/ENG	9452	9309	9167	9222	9323	9542		
200	%N1	84.2	86.0	87.8	89.5	91.4	94.0	98.1	
	MACH	.358	.371	.385	.400	.415	.431	.448	
	KIAS	217	217	217	217	217	217	217	
	FF/ENG	8693	8698	8718	8773	8844	8956	9300	
180	%N1	82.9	84.7	86.7	88.4	90.2	92.3	95.5	100.2
	MACH	.358	.371	.385	.400	.415	.431	.448	.466
	KIAS	217	217	217	217	217	217	217	217
	FF/ENG	8330	8328	8342	8399	8458	8533	8740	9239
160	%N1	81.7	83.6	85.4	87.3	89.0	90.9	93.5	97.7
	MACH	.358	.371	.385	.400	.415	.431	.448	.466
	KIAS	217	217	217	217	217	217	217	217
	FF/ENG	8019	8011	8010	8058	8115	8168	8310	8670

**GEAR DOWN**  
**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Diversion Fuel and Time**  
**Ground to Air Miles Conversion**

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
165	145	129	118	108	100	95	90	84	78	73
332	295	263	238	218	200	187	175	165	155	147
500	444	396	358	327	300	280	262	246	233	221
669	593	528	477	436	400	374	350	329	310	294
837	742	661	597	545	500	467	437	410	387	367
1007	893	795	718	655	600	560	524	492	464	440
1177	1043	928	838	764	700	653	611	574	541	513
1347	1193	1061	958	873	800	746	698	655	618	586
1519	1344	1195	1078	983	900	839	785	737	695	659
1691	1496	1329	1198	1092	1000	933	873	819	772	731

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	4.0	0:27	3.8	0:26	3.5	0:26	3.4	0:25	3.3	0:25
200	8.2	0:51	7.8	0:50	7.5	0:49	7.3	0:48	7.2	0:47
300	12.3	1:15	11.8	1:14	11.4	1:12	11.1	1:10	11.1	1:09
400	16.4	1:40	15.8	1:38	15.3	1:36	14.9	1:33	14.9	1:30
500	20.5	2:04	19.7	2:02	19.1	1:59	18.7	1:56	18.7	1:53
600	24.5	2:29	23.6	2:27	22.9	2:23	22.5	2:19	22.4	2:15
700	28.5	2:53	27.5	2:51	26.7	2:46	26.1	2:42	26.0	2:37
800	32.5	3:18	31.3	3:16	30.4	3:10	29.8	3:05	29.6	2:59
900	36.4	3:43	35.1	3:40	34.1	3:34	33.4	3:28	33.2	3:22
1000	40.3	4:08	38.8	4:05	37.8	3:58	37.0	3:51	36.7	3:44

**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.8	-0.5	0.0	1.6	2.6
10	-1.8	-1.1	0.0	3.0	5.6
15	-2.8	-1.6	0.0	4.4	8.6
20	-3.7	-2.2	0.0	5.6	11.6
25	-4.5	-2.7	0.0	6.8	14.4
30	-5.4	-3.2	0.0	7.8	17.3
35	-6.2	-3.7	0.0	8.7	20.0
40	-7.0	-4.2	0.0	9.5	22.7
45	-7.7	-4.7	0.0	10.2	25.3

Includes APU fuel burn.

777 Flight Crew Operations Manual

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Holding  
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
340	%N1	95.5			
	KIAS	260			
	FF/ENG	14970			
320	%N1	93.4	97.2		
	KIAS	253	253		
	FF/ENG	13980	14120		
300	%N1	91.1	94.3		
	KIAS	244	244		
	FF/ENG	12970	12940		
280	%N1	89.3	92.3	98.8	
	KIAS	238	238	238	
	FF/ENG	12100	12090	12660	
260	%N1	86.8	90.0	94.8	
	KIAS	229	229	229	
	FF/ENG	11100	11180	11340	
240	%N1	84.6	88.0	92.2	
	KIAS	223	223	223	
	FF/ENG	10310	10380	10460	
220	%N1	82.3	85.7	90.0	96.4
	KIAS	217	217	217	217
	FF/ENG	9540	9590	9650	10020
200	%N1	80.8	84.2	88.6	94.0
	KIAS	217	217	217	217
	FF/ENG	9080	9130	9180	9400
180	%N1	79.6	82.9	87.5	92.3
	KIAS	217	217	217	217
	FF/ENG	8700	8750	8780	8960
160	%N1	78.6	81.7	86.4	90.9
	KIAS	217	217	217	217
	FF/ENG	8380	8420	8430	8580

This table includes 5% additional fuel for holding in a racetrack pattern.



**Performance Inflight****Text****Chapter PI****Section 17**

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**Introduction**

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

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**General****FMC Takeoff Speeds**

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. This typically occurs at full rated thrust and light weights and is shown in the Minimum Takeoff Weight tables provided in the Performance Dispatch Takeoff section. The options are to select a smaller flaps setting, use reduced takeoff thrust and/or add weight (fuel). Selecting derate thrust is the preferred method of reduced takeoff thrust as this will reduce the minimum control speeds.

**Clearway and Stopway V1 Adjustments**

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

## VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

## Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

## Slush/Standing Water

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight is determined as follows:

- (1) Determine the dry field/obstacle limit weight for the takeoff flap setting.
- (2) Enter the Weight Adjustment table with the dry field/obstacle limit weight to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.
- (3) Adjust field length available for temperature by amount shown on chart.

(4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

(1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.

(2) If V1(MCG) limited, set  $V1 = V1(MCG)$ . If not limited by V1(MCG) considerations, enter the V1 Adjustment table with actual brake release weight to determine the V1 reduction to apply to V1 speed. If the adjusted V1 is less than V1(MCG), set  $V1 = V1(MCG)$ .

## Slippery Runway

Airplane braking action is reported as good, medium or poor, depending on existing runway conditions. If braking action is reported as good, conditions should not be expected to be as good as on clean, dry runways. The value “good” is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when stopping. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

## Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than the minimum V1 for control on the ground, V1(MCG). It is therefore necessary to compare the adjusted V1 to V1(MCG). To find V1(MCG), enter the V1(MCG) table with airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than V1(MCG), set VR equal to V1(MCG) and determine a new V2 by adding the difference between the normal VR and V1(MCG) to the normal V2. No weight adjustment is required provided that the field length available exceeds the minimum field length required shown in the Field and Climb Limit Weight table.

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## Go-Around %N1

To find Go-Around %N1 based on normal engine bleed for packs on and anti-ice off, enter the Go-Around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. %N1 adjustments are shown for engine bleeds for various conditions.

## Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

## Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

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## All Engines

### Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

## Long Range Cruise Control

These tables provide target %N1, Long Range Cruise Mach number, IAS and standard day fuel flow per engine for the airplane weight and pressure altitude. As indicated by the shaded area, at optimum altitude, .84 Mach approximates the Long Range Cruise Mach schedule.

## APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

## Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table with air distance from the Ground to Air Miles Conversion table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment table with the Reference Fuel and the actual weight at checkpoint to obtain fuel required to destination.

## Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

## Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 at the outer marker.

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## Holding

Target %N1, indicated airspeed and fuel flow per engine information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the maneuvering speed for the selected flap setting. Flaps 1 is based on VREF30 + 60 speed schedule. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, IAS and fuel flow per engine.

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## Advisory Information

### Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

## Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each correction is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

## Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

## Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of

braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

## Engine Inoperative

### Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

### Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.



## Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

## Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown.

Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

## Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

## Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.