PART VI

OPERATING DATA

91. Loading and C.G. data

(a) *C.G. limitations*

The following are the C.G. limits, with undercarriage down:

Forward limit	3·24 in. fwd. of datum.
Aft limit (normal)	4·404 in. aft of datum.
Aft limit (ferrying only) ..	4·812 in. aft of datum.
Total permissible normal C.G. range of movement	7·644 in.

(b) *Loading restrictions*

The loading restrictions are dependent upon the number of guns fitted and are in accordance with the following tables:—

(i) *With two guns*

Configuration	Clean	With R.P.'s and drop tanks	With practise bombs	With 500 lb. bombs	With 1,000 lb. bombs
No. of crew .. (See NOTE)	2	2	2	2	2
Max. ammo. ..	300	300	300	300	300
A.U.W. ..	10,998	13,560	11,337	12,128	13,238

NOTE.—When flown solo and with full drop tanks, 300 rounds of ammo. or 8 × 60 lb. R.P.'s must be retained (or equivalent ballast carried) until fuel transfer from the drop tanks is complete. This does *not* apply in the ferrying case.

(ii) *With four guns*

Configuration	Clean	With R.P.'s and drop tanks	With practise bombs	With 500 lb. bombs	With 1,000 lb. bombs
No. of crew .. (See NOTE)	1	1	1	1	1
Max. ammo. ..	600	360	600	600	360
A.U.W. ..	11,195	13,607	11,534	12,325	13,285

NOTE.—When flown with two crew, ammunition *must not* be carried in any of the above configurations in order that the C.G. is kept within the forward limit.

(c) *Effect of expendable stores*

(i) Consumption of drop tank fuel causes the C.G. to move aft.

(ii) Consumption of internal fuel causes the C.G. to move forward, reaching the most forward position when about 230 pounds remain.

(iii) Firing of ammunition and R.P.'s or dropping bombs causes the C.G. to move aft.

92. Pressure error corrections

(a) The following are the A.S.I. corrections at sea level:—

At	150	200	300 and above	knots
Add	0	2	3	knots

(b) The machmeter correction between 0·7 and 0·8 is + 0·01.

93. Take-off distances

The approximate take-off distances at sea level, in yards, for various wind and temperature conditions are given

below. For every 1,000 ft. the aerodrome altitude is above sea level increase the above distances by:—

10 per cent. for ground run.
8 per cent. to clear 50 ft.

(a) *Clean aircraft*

Temperature °C.		−15	0	+15	+30	+45
Zero Wind	Ground run ..	560	630	720	820	940
	To clear 50 ft.	1,000	1,140	1,300	1,460	1,640
30 knot Wind	Ground run ..	290	330	380	430	490
	To clear 50 ft.	610	700	800	900	1,000

(b) *With drop tanks*

Temperature °C.		−15	0	+15	+30	+45
Zero Wind	Ground run ..	830	980	1,120	1,280	1,480
	To clear 50 ft.	1,480	1,680	1,920	2,200	2,520
30 knot Wind	Ground run ..	380	550	630	710	820
	To clear 50 ft.	950	1,100	1,250	1,410	1,600

94. Fuel consumptions

The following are the approximate fuel consumptions in pounds per hour for various altitudes and power settings.

Altitude (feet)	At 10,600 r.p.m.	At 10,250 r.p.m.	At best range speed	
			Clean	With tanks
Sea level	4,910	4,235	1,925	2,150
10,000 ft.	3,850	3,310	1,425	1,690
20,000 ft.	2,920	2,460	1,115	1,230
30,000 ft.	2,230	2,000	962	1,078
40,000 ft.	1,540	1,540	880	1,078

95. Endurance

Maximum endurance is obtained at 30,000 ft. Climb to this height at maximum permitted power and cruise at 160–185 knots, depending on the weight. If less than 1,540 pounds remain it will be better to maintain height than expend fuel in a climb. At 160 knots the fuel consumption varies from about 1,380 pounds per hour at sea level to 850 pounds per hour at 30,000 ft.

96. Flight planning data

(a) The tables on the following pages show the flight planning data for:—

(i) *Climbing*

The climb table gives the data for climbs in I.S.A. conditions using the speed recommended in para. 64.

(ii) *Cruising*

Each separate altitude block in the cruise table shows:—

1. The speed for maximum range, the approximate A.N.M./100 lb. and the approximate fuel consumption for the particular height. In addition a speed is given, use of any speed between it and the max range speed should not cause more than a 5 per cent. reduction in range.
2. The range obtainable for various amounts of available fuel when flying at the best range speeds for the height. The range given is to the point of let-down, allowance being made for the descent fuel required.
3. The range obtainable for various amounts of available fuel including the distance covered on the climb, if a climb is made to another altitude. In this case the climb must be made at the speed given in para. 64 and the flight continued at the new altitude at the best range speed for that height.

NOTE.—The range at any altitude is independent of temperature, but dependent on the weight of fuel carried.

[*Contd. on p. 74*]

CLEAN AIRCRAFT

FUEL CONTENTS .. 2,540 lb. AVTAG (7·7 lb./gall.)
2,640 lb. AVTUR (8 lb./gall.)

START-UP, TAXY AND TAKE-OFF ALLOWANCE .. .. 230 lb.

LANDING ALLOWANCE (excluding descent fuel) .. .. 460 lb.

CLIMB DATA

From	To	Fuel lb.	Dist. (N.M.)	Time (Mins.)
Sea Level	10,000 ft.	385	10	3
	20,000 ft.	540	30	6½
	30,000 ft.	690	60	12
	40,000 ft.	920	100	20
10,000 ft.	20,000 ft.	155	20	3½
	30,000 ft.	305	50	9
	40,000 ft.	535	90	17
20,000 ft.	30,000 ft.	150	30	5½
	40,000 ft.	380	70	13½
30,000 ft.	40,000 ft.	230	40	8

Fuel and time figures are from start-up and wheels rolling respectively.
Climb at 10,600 r.p.m. reducing to 10,500 above 25,000 ft.

DESCENT DATA

From	To	Lb.	Dist.	Mins.
40,000 ft.	30,000 ft.	23	20	4
	20,000 ft.	53	40	8
	10,000 ft.	114	65	11
	Sea Level	177	80	15
30,000 ft.	20,000 ft.	30	20	4
	10,000 ft.	91	45	7
	Sea Level	154	60	11
20,000 ft.	10,000 ft.	61	25	3
	Sea Level	124	40	7
10,000 ft.	Sea Level	63	15	4

AIRBRAKES .. IN
THROTTLE .. .. CLOSED
SPEED .. .. .. 0·65M above 25,000 ft.
250K below 25,000 ft.

CRUISE DATA—CLEAN AIRCRAFT

FUEL AVAILABLE	POUNDS	2,310	2,000	1,500	1,000
Sea Level	Range	240	200	135	70
	10,000 ft.	320	260	170	**75**
ANM/100 lb.–13·0	20,000 ft.	400	320	190	60
Lb./min.–31·8	30,000 ft.	445	350	**195**	45
Best Range Speed–250K	40,000 ft.	**480**	**360**	165	—
95 per cent. Range Speed–360K					
10,000 ft.	Range		280	185	90
	20,000 ft.		350	220	**90**
ANM/100 lb.–18·8	30,000 ft.		390	**235**	80
Lb./min. 23·8	40,000 ft.		**410**	215	
Best Range Speed–230K					
95 per cent. Range Speed–300K					
20,000 ft.	Range		370	240	**110**
	30,000 ft.		415	**260**	105
ANM/100 lb.–26·0	40,000 ft.		**450**	255	60
Lb./min.–18·5					
Best Range Speed–210K					
95 per cent. Range Speed–270K					
30,000 ft.					
ANM/100 lb.–31·2	Range		430	275	**120**
Lb./min.–16·2	40,000 ft.		**480**	**285**	90
Best Range Speed–190K					
95 per cent. Range Speed–230K					
40,000 ft.					
ANM/100 lb.–39·0	Range		**530**	**335**	**140**
Lb./min.–14·6					
Best Range Speed–190K					
95 per cent. Range Speed–200K					
FUEL AVAILABLE POUNDS		2,310	2,000	1,500	1,000

WITH DROP TANKS

FUEL CONTENTS .. 4,080 lb. AVTAG (7·7 lb./gall.)
4,240 lb. AVTUR (8 lb./gall.)

START-UP, TAXY AND TAKE-OFF ALLOWANCE .. .. 230 lb.

LANDING ALLOWANCE (excluding descent fuel) .. .. 460 lb.

CLIMB DATA

From	To	Fuel lb.	Dist. (N.M.)	Time (Mins.)
Sea Level	10,000 ft.	440	10	5
	20,000 ft.	750	40	10
	30,000 ft.	960	80	19½
	35,000 ft.	1,170	120	27½
10,000 ft.	20,000 ft.	310	30	5
	30,000 ft.	520	70	14½
	35,000 ft.	730	110	22½
20,000 ft.	30,000 ft.	210	40	9½
	35,000 ft.	420	80	17½
30,000 ft.	35,000 ft.	210	40	8

Fuel and time figures are from start-up and wheels rolling respectively.
Climb at 10,600 r.p.m. reducing to 10,500 above 25,000 ft.

DESCENT DATA

From	To	Lb.	Dist.	Mins.
35,000 ft. ..	30,000 ft.	23	10	2
	20,000 ft.	53	30	6
	10,000 ft.	114	55	9
	Sea Level	177	70	13
30,000 ft. ..	20,000 ft.	30	20	4
	10,000 ft.	91	45	7
	Sea Level	154	60	11
20,000 ft. ..	10,000 ft.	61	25	3
	Sea Level	124	40	7
10,000 ft. ..	Sea Level	63	15	4

AIRBRAKES .. IN
THROTTLE .. CLOSED
SPEED .. .. 0·65M above 25,000 ft.
250K below 25,000 ft.

CRUISE DATA—WITH DROP TANKS

FUEL AVAILABLE POUNDS		3,850	2,640	2,000	1,500	1,000
Sea Level	Range	395	255	180	120	60
	10,000 ft.	485	320	220	140	**60**
ANM/100 lb.–11·7	20,000 ft.	625	425	270	**155**	40
Lb./min.–35·9	30,000 ft.	**670**	**455**	**265**	120	—
Best Range Speed–250K	35,000 ft.	640	445	255	110	—
95 per cent. Range Speed–310K						
10,000 ft.	Range	—	330	230	155	**80**
	20,000 ft.	—	450	300	**185**	70
ANM/100 lb.–15·6	30,000 ft.	—	**495**	**315**	175	—
Lb./min.–28.2	35,000 ft.	—	485	305	165	—
Best Range Speed–225K						
95 per cent. Range Speed–280K						
20,000 ft.	Range		470	320	205	**90**
ANM/100 lb.–23·4	30,000 ft.		**540**	**360**	**220**	80
Lb./min.–20·2	35,000 ft.		530	350	210	—
Best Range Speed–200K						
95 per cent. Range Speed—250K						
30,000 ft. ANM/100 lb.–28·6	Range		**580**	**400**	**260**	**120**
Lb./min.–17·9	35,000 ft.		570	390	250	110
Best Range Speed–190K						
95 per cent. Range Speed—220K						
35,000 ft. ANM/100 lb.–28·6	Range		**575**	**395**	**255**	**115**
Lb./min.–17·9						
Best Range Speed–185K						
95 per cent. Range Speed—200K						
FUEL AVAILABLE POUNDS		3,850	2,640	2,000	1,500	1,000

(iii) *Descent*

The descent table gives the data for descending from one height to another.

(b) *Use of the tables*

(i) *Pre-flight planning*

Enter the cruise data table in the sea level block at the fuel stage applying immediately after take-off. Select the height at which maximum range is available at that fuel state. The distance available includes distance covered on the climb, but not on the descent. (Absolute maximum range is obtained by adding on the descent distance provided that the let-down is commenced at that distance from the destination). For short range flights inspect the sea level block and select the height at which the distance to be covered requires the least amount of fuel. This is the best altitude for the flight.

(ii) *In-flight planning*

At any stage of a flight the available range may be ascertained by applying the fuel state to the level flight range in the particular block. If an increase in range is required, or if a climb has to be made, the new available range may be obtained by entering the existing block at the particular fuel state and moving vertically downwards within the block until the new altitude is reached. Figures in heavy type indicate the best altitude for the maximum increase in range. Above these heights no further range increase is possible. If a descent is necessitated the new range is shown by moving direct from the existing altitude level flight range for the particular fuel state to the new altitude level flight range.