

## PART V

# OPERATING DATA

### 104. Loading and C.G. data

#### (a) C.G. limitations

- (i) The C.G. limits, undercarriage down, are as follows:—

Forward limit                      2.0 ins. aft of datum

Aft limit                              14.5 ins. aft of datum

- (ii) Ballast must be carried if any of the following items are not carried:—

Radar head and ranging unit

I.F.F.

D.M.E.

#### (b) Effects of consumption of expendable stores

- (i) *Ammunition*

Firing the guns causes the C.G. to move aft (about  $\frac{1}{4}$ " per 100 rounds).

- (ii) *Fuel*

Consumption of fuel from the rear and centre tanks causes the C.G. to move progressively forward. Consumption of fuel from the front tanks causes the C.G. to move aft again, reaching a similar position to that obtaining with all tanks full when about 60 gallons remain. (30 gallons per tank.)

#### (c) Typical service loads

Condition	Approx. all-up weight-lb.
Full ammunition	16,100
Full fuel	
No ammunition	15,400
Full fuel	
Full ammunition	15,100
200 gallons fuel	
No ammunition	14,400
200 gallons fuel	
Full ammunition	14,000
55 gallons fuel	
No ammunition	13,300
55 gallons fuel	

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105. Pressure error corrections

- (a) The ASI sea-level pressure error, over the speed range of the aircraft, is negligible.
- (b) The following are the Machmeter pressure error corrections for all heights.

I.M.N.	0.90	0.95	0.98	1.00	1.05	1.10 and above
Correction	0	-0.01	0	+0.02	+0.05	+0.07

106. Fuel consumptions

The approximate fuel consumptions for varying r.p.m. at different altitudes are given below.

Height	At 7,900 r.p.m.		At 7,750 r.p.m.		At best range speed	
	lb./min.	gall./min.	lb./min.	gall./min.	lb./min.	gall./min.
Sea Level	155	20	125	16	55 (380 K)	7
10,000 ft.	125	16	90	12	45 (360 K)	6
20,000 ft.	90	12	80	10	40 (325 K)	5
30,000 ft.	65	8½	60	7½	30 (280 K)	4
40,000 ft.	45	6	40	5	25 (210 K)	3½

107. Take-off distances

The approximate take-off distances, in yards, for various wind and temperature conditions are given below.

Temperature °C.		-15	0	+15	+30	+45
Zero Wind	Ground run	550	650	750	880	1,050
	To clear 50 feet	1,120	1,300	1,500	1,700	2,000
30 knot Wind	Ground run	320	380		520	620
	To clear 50 feet	750	860	1,000	1,130	1,330

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.

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108. Snake climbs

For tactical snake climbs use the recommended climbing speeds and 7,600 r.p.m.

109. Descents

The descent recommended in the flight planning data tables is a best range descent. Other recommended forms of descent are:—

(a) Snake descent

Descend at 6,500 r.p.m., airbrake out at 0.8M down to 23,000 feet (approx.), thereafter at 350 knots.

(b) Clear weather descent

Descend at 6,500 r.p.m., airbrake out at 0.9M down to 23,000 feet (approx.), thereafter at 400 knots.

(c) QGH descent

Descend at 6,300 r.p.m., airbrake out, at 280 knots.

110. 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 speeds recommended in para. 67.

(ii) Cruising

Each separate altitude block in the cruise table shows:—

(1) The speed for maximum range, the approximate A.N.M.P.G. and the approximate fuel consumption for the particular height. In addition a speed band is given, use of any speed within which should not cause more than a 5 % reduction in range.

(2) The range obtainable for various amounts of available fuel when flying at the best range speed

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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. 67 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.

### (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 state 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 altitude 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 altitude block at the particular fuel state and moving vertically down-

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wards 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.

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TOTAL FUEL

334 gall.  
2,570 lb. AVTAG (7.7 lb./gall.)

TAXY AND TAKE-OFF ALLOWANCE 34 gall. (260 lb.)

LANDING ALLOWANCE (excluding descent fuel) 60 gall. (460 lb.)

### CLIMB DATA (Climb at full throttle—See para. 67 (a))

FROM	TO	FUEL USED		DIST.	MINS.
		GALL.	LB.		
Sea Level *	10,000'	40	375	10	2½
	20,000'	65	490	20	3¾
	30,000'	80	605	35	5½
	40,000'	95	720	55	8
	45,000'	110	835	75	10½
10,000'	20,000'	15	115	10	1½
	30,000'	30	230	25	3¼
	40,000'	45	345	45	5½
	45,000'	60	460	65	8
20,000'	30,000'	15	115	15	1½
	40,000'	30	230	30	4½
	45,000'	45	345	55	6½
30,000'	40,000'	15	115	15	2½
	45,000'	30	230	40	4¾
40,000'	45,000'	15	115	25	2½

\* In this block times are from wheels rolling ; fuel used includes taxi and take-off allowance.

### DESCENT DATA (Excluding landing allowance.)

FROM	TO	GALL.	LB.	DIST.	MINS.
45,000'	40,000'	1	8	5	1
	30,000'	3	23	10	2
	20,000'	8	61	20	3
	10,000'	13	100	27	4½
	Sea Level	23	177	35	6
40,000'	30,000'	2	15	5	1
	20,000'	7	53	15	2
	10,000'	12	92	22	3½
	Sea Level	22	170	30	5
30,000'	20,000'	5	38	10	1
	10,000'	10	77	17	2½
	Sea Level	20	155	25	4
20,000'	10,000'	5	39	7	1½
	Sea Level	15	117	15	3
10,000'	Sea Level	10	77	8	1¾
AIRBRAKE ...	...	...	In, Flap 40° Down		
R.P.M. ...	...	...	6,750		
SPEED ...	...	...	280K.		

## PART V—OPERATING DATA CRUISE DATA

FUEL STATE—GALLONS		AVTAG (7.7 lb./gall.)				
		300	250	200	150	100
Sea Level	Range	215	170	125	80	35
ANMPG—0.9	10,000'	265	205	145	85	25
GPH —420	20,000'	315	240	165	85	—
Best Range IAS —380K	30,000'	365	270	175	80	—
95% Range—290 to 420K	40,000'	400	290	180	70	—
	45,000'	385	275	165	—	—
10,000 ft.	Range	—	215	155	95	35
ANMPG—1.2	20,000'	—	255	180	100	20
GPH —350	30,000'	—	290	195	100	—
Best Range IAS—360K	—					
0.65M	40,000'	—	315	205	95	—
95% Range—275 to 390K	45,000'	—	300	190	80	—
20,000 ft.	Range	—	270	195	120	40
ANMPG—1.55	30,000'	—	310	215	120	25
GPH —290	40,000'	—	340	230	120	—
Best Range IAS—325K	—					
0.7M	45,000'	—	325	215	105	—
95% Range—260 to 350K	—					
30,000 ft.	Range	—	325	230	135	40
ANMPG—1.9	40,000'	—	360	250	140	30
GPH —240	—					
Best Range IAS—280	—					
0.75M	45,000'	—	340	230	120	—
95% Range—230 to 310K	—					
40,000 ft.	Range	—	370	260	150	40
ANMPG—2.2	—					
GPH —210	45,000'	—	350	240	130	20
Best Range IAS—250K	—					
0.82M	—					
95% Range—220 to 260K	—					
45,000 ft.	Range	—	370	260	150	40
ANMPG—2.2	—					
GPH —210	—					
Best Range IAS—230K	—					
0.85M	—					
95% Range—210 to 240K	—					
FUEL STATE—LB.		2,310	1,925	1,540	1,155	770

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