PART V

OPERATING DATA

98. **Loading and C.G. data**

NOTE.—1. When making C.G. calculations, reference should always be made to A.P.4360A, Vol. 1, Section 2, Chapter 3.

2. All data below assumes the use of AVTUR fuel (8 lb./gall.).

(a) *Weight and C.G. limitations*

These are given in Part II (Limitations) para. 51.

(b) *Loading data*

(i) *Take-off*

The following loading conditions must be observed:—

1. *Pilot only—tip tanks empty.* The aircraft may be flown without equivalent ballast for the observer or ammunition.
2. *Pilot only—tip tanks full.* The aircraft may only be flown with full ammunition or ballast in lieu. If ammunition is carried, it may only be fired when at least 50 gallons of fuel have been used.
3. *Pilot and observer.* If a crew of two is carried, the ammunition may be fired at any stage of the flight, provided that the C.G. is not aft of 10.6 ins. a.o.d. initially.

(ii) *Landings*

Landings may be made at any time, provided that the wing-tip fuel has been used or jettisoned.

(c) *Effect of expendable stores*

(i) Consumption of tip-tank fuel causes the C.G. to move forward.

(ii) Consumption of internal fuel causes the C.G. to move aft initially, reaching the aftmost position when 2,320 lb. (290 galls.) remain. The C.G. then moves forward, reaching the most forward point when 280 lb. (35 galls.) remain.

(iii) Firing ammunition causes the C.G. to move aft.

(iv) Firing 60 lb. head R.P.s causes negligible C.G. movement.

(v) Firing other R.P.s causes the C.G. to move forward.

(d) *Typical service loadings*

The following are approximate weights for various loading conditions:—

Loading	A.U.W. (lb.)
2 crew, full fuel, full ammo. (600 rds.), R.P.s. ..	15,090
2 crew, full fuel, full ammo.	14,270
2 crew, full internal fuel, full ammo. R.P.s. ..	13,890
2 crew, full internal fuel, full ammo.	13,070
2 crew+130 galls., full ammo. .. .. } 2 crew+180 galls., no ammo. .. .. }	11,600

99. **Pressure error correction**

(a) *Airspeed*

The corrections (in knots) shown in the table below should be applied to the A.S.I. reading to obtain R.A.S. A Mk. 4 computor should be used to convert R.A.S. to T.A.S., as this computor allows for calibration compressibility error.

Height	A.S.I. reading	150	200	250	300	350	400	450	500
Sea Level	Correction	−2	−1	−1	−1	−1	−1	−2	−4
35,000 ft.	Correction	−2	−1	−2	−6				

(b) *Altitude*

The corrections shown below should be applied to the altimeter to obtain the true height.

Height	A.S.I. reading	150	200	250	300	350	400	450	500
Sea Level	Correction ft.	−20	−20	−20	−20	−30	−50	−110	−250

100. **Fuel consumptions**

The following are the approximate fuel consumptions in pounds per hour for various altitudes and power settings. If it is required to know the consumptions in gallons per hour, divide the figures by the weight of fuel per gallon:—

Normal AVTAG=7.7 lb./gallon

AVTUR=8.0 lb./gallon

Normal AVCAT=8.3 lb./gallon

Height feet	At Max. r.p.m.	At 10,000 r.p.m.	At 9,750 r.p.m.	At best range speed
0	7,080	6,240	5,520	2,560
10,000	5,460	5,220	4,380	1,720
20,000	4,080	3,600	3,360	1,330
30,000	3,000	2,520	2,400	1,190
40,000	1,860	1,800	2,340	1,130

101. **Take-off distances**

The approximate distances (in yards) to unstick and to clear 50 ft., for various wind and temperature conditions, are given below:—

Aircraft configuration and weight	Temperature °C.		−15	0	+15	+30	+45
Clean 14,270 lb.	Zero wind	Ground run	520	630	740	850	960
		To clear 50 ft.	850	1,030	1,220	1,400	1,590
	20 Kt. wind	Ground run	350	440	530	620	710
		To clear 50 ft.	610	770	920	1,070	1,220
With 8×60 lb. R.P.s.	Zero wind	Ground run	590	720	850	980	1,100
		To clear 50 ft.	970	1,190	1,410	1,620	1,840
15,090 lb.	20 Kt. wind	Ground run	410	520	630	730	840
		To clear 50 ft.	710	890	1,080	1,260	1,450

102. **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 climb in I.S.A. conditions, using the speeds recommended in para. 66. Since the climb performance is dependent on temperature, corrections are given for each 10° C. rise in temperature above I.S.A.

(ii) *Cruising at best range speed*

Each separate altitude block in the cruise table shows:—

1. The speed for maximum range, the approximate A.N.M. per 100 lb. fuel and the approximate fuel consumption for the particular height. In addition, a speed band is given; use of any speed within this band 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 for that 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 speeds quoted in para. 66 and the flight continued at the new altitude, at the best speed for that height.

(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 commences 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 the 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 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.

(c) *Cruise data charts*

The cruise data charts show aircraft performance and fuel consumption in level flight at various heights and r.p.m., both for the clean aircraft and when carrying rockets.

103. **Endurance**

At any altitude, maximum endurance will be obtained by flying at the I.A.S. which requires the lowest r.p.m. to maintain height. This speed is about 150 knots but the minimum comfortable speed is 175 knots. Increase in altitude gives increase in endurance; however, the overall endurance may not be improved by climbing above 15,000 feet, except when maximum fuel is available, owing to the proportion of fuel used on the climb and the descent. All climbs should be made at full power (within the limitations) and the descent made as quickly as is practicable.

CLIMB DATA—CLEAN AIRCRAFT

Climb at 10,250 r.p.m. below 25,000 ft.
10,100 r.p.m. above 25,000 ft.
and at speeds quoted in para. 66.

From	To	Lb. Fuel	Dist. N.M.	Mins.
Sea Level	10,000 ft.	220	12	2.5
	20,000 ft.	440	29	6.0
	30,000 ft.	655	52	10.0
	40,000 ft.	905	92	17.0
10,000 ft.	20,000 ft.	220	17	3.5
	30,000 ft.	435	40	7.5
	40,000 ft.	685	80	14.5
20,000 ft.	30,000 ft.	215	23	4.0
	40,000 ft.	465	63	11.0
30,000 ft.	40,000 ft.	250	40	7.0

Temperature correction to climb. For each 10° C. rise in ambient temperature apply the following corrections:—

From	To	Fuel	Dist.	Time
Sea Level	10,000 ft.	18%	17%	15%
10,000 ft.	20,000 ft.	19%	19%	15%
20,000 ft.	30,000 ft.	20%	21%	17.5%
30,000 ft.	40,000 ft.	21%	23%	20%

FUEL CONTENTS: 463 galls.
3,704 lb. AVTUR (8 lb./gall)
3,838 lb. Normal AVCAT (8.3 lb./gall)

TAXY AND TAKE-OFF ALLOWANCE . . . . 370 lb.

LANDING ALLOWANCE (excluding descent fuel) 620 lb.
(20 min. loiter 500 lb. unusable 120 lb.)

CRUISE DATA

NO EXTERNAL STORES

FUEL AVAILABLE	Pounds	3,400	3,000	2,500	2,000	1,500	1,000
	Gall. (AVCAT)	410	362	301	241	181	121
Sea Level	Range	309	264	209	153	98	**42**
ANM/100 lb.=11.1	10,000 ft.	406	344	267	190	112	35
Lb./min.=42.7	20,000 ft.	512	429	325	221	**116**	—
Best range IAS=285 kts.	30,000 ft.	590	487	359	**230**	102	—
	40,000 ft.	**658**	**535**	**381**	226	—	—
95% range 210 kts.—0.51M							
10,000 ft.	Range	—	366	289	212	134	**57**
ANM/100 lb.=15.5	20,000 ft.	—	463	359	254	**150**	46
Lb./min.=28.7	30,000 ft.	—	531	403	275	146	—
Best range IAS=233 kts.	40,000 ft.	—	**591**	**436**	**282**	128	—
95% range 175 kts.—0.535M							
20,000 ft.	Range	—	492	387	283	179	**75**
ANM/100 lb.=20.8	30,000 ft.	—	571	442	314	**186**	58
Lb./min.=22.2	40,000 ft.	—	**642**	**488**	**333**	179	—
Best range IAS=206 kts.							
95% range 175 kts.—0.56M							
30,000 ft.	Range	—	—	475	346	218	**90**
ANM/100 lb.=25.7	40,000 ft.	—	—	**531**	**376**	**222**	68
Lb./min.=19.8							
Best range IAS=194 kts. (0.52M)							
95% range 175 kts.—0.625M							
40,000 ft.	Range	—	—	**568**	**414**	**259**	**105**
ANM/100 lb.=30.9							
Lb./min.=18.8							
Best range IAS=181 kts. (0.61M)							
95% range 0.575M—0.67M							
FUEL AVAILABLE	**Pounds**	3,400	3,000	2,500	2,000	1,500	1,000
	Gall. (AVTUR)	425	375	313	250	188	125

DESCENT DATA—CLEAN AIRCRAFT

Airbrakes .. .. Out
R.P.M. 6,500
Speed .. .. .. 0.67 M above 25,000 ft.
270 knots below 25,000 ft.

From	To	Lb. Fuel	Dist. N.M.	Mins.
40,000 ft.	30,000 ft.	10	9	1.5
	20,000 ft.	20	15	2.5
	10,000 ft.	30	24	4.0
	Sea Level	40	35	6.0
30,000 ft.	20,000 ft.	10	6	1.0
	10,000 ft.	20	15	2.5
	Sea Level	30	26	4.5
20,000 ft.	10,000 ft.	10	9	1.5
	Sea Level	20	20	3.5
10,000 ft.	Sea Level	10	11	2.0

CLIMB DATA

WITH 8×60 LB. R.P.s

Climb at 10,250 r.p.m. below 25,000 ft.
10,100 r.p.m. above 25,000 ft.
and at speeds quoted in para. 66.

From	To	Lb. Fuel	Dist. N.M.	Mins.
Sea Level	10,000 ft.	290	17	3.5
	20,000 ft.	580	41	8.0
	30,000 ft.	880	79	14.5
	40,000 ft.	1,290	155	27.0
10,000 ft.	20,000 ft.	290	24	4.5
	30,000 ft.	590	62	11.0
	40,000 ft.	1,000	138	23.5
20,000 ft.	30,000 ft.	300	38	6.5
	40,000 ft.	710	114	19.0
30,000 ft.	40,000 ft.	410	76	12.5

Temperature correction: As for clean aircraft.
Fuel contents and allowances: As for clean aircraft.

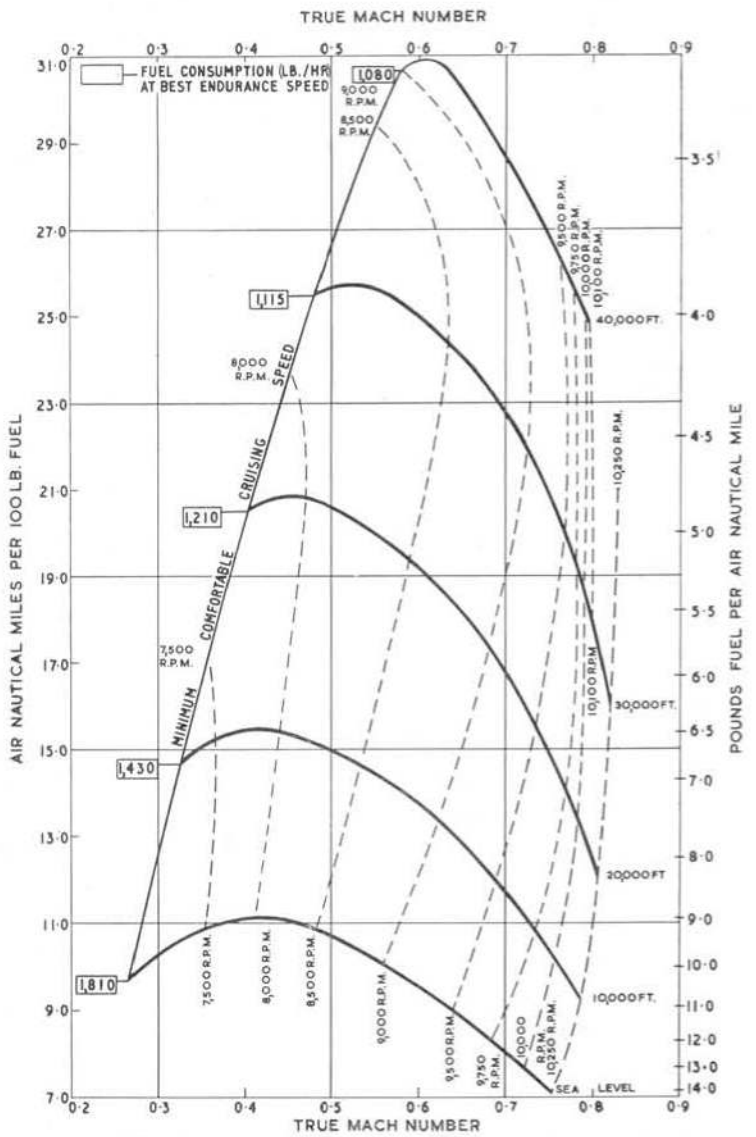
DESCENT DATA

As for clean aircraft.

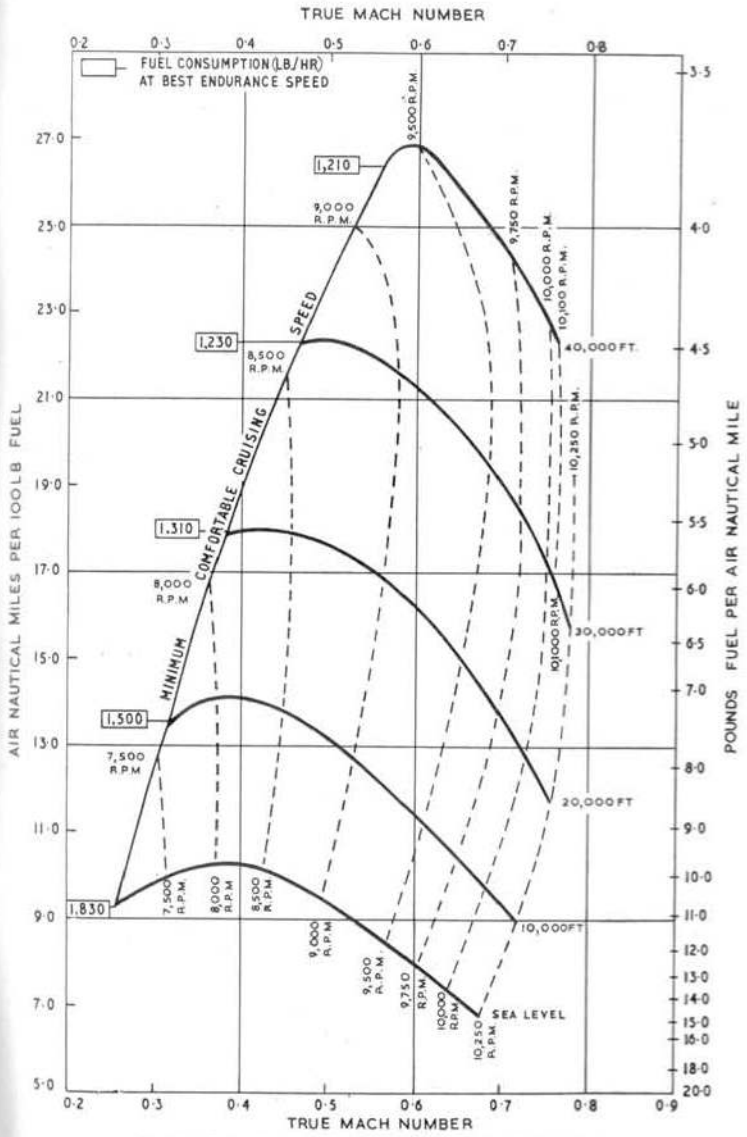
CRUISE DATA

WITH 8×60 LB. R.P.s

FUEL AVAILABLE	Pounds	3,400	3,000	2,500	2,000	1,500	1,000
	Gall. (AVCAT)	410	362	301	241	181	121
Sea Level	Range	286	245	194	142	91	**39**
ANM/100 lb.=10.3	10,000 ft.	365	310	240	169	**99**	28
Lb./min.=43.3	20,000 ft.	433	361	271	181	91	—
Best range IAS=268 kts.	30,000 ft.	498	408	298	**184**	—	—
	40,000 ft.	**546**	**438**	**303**	169	—	—
95% range 200 kts.—310 kts.							
10,000 ft.	Range	—	334	264	193	123	**52**
ANM/100 lb.=14.15	20,000 ft.	—	397	307	217	**127**	37
Lb./min.=29.5	30,000 ft.	—	456	344	**232**	120	—
Best range IAS=218 kts.	40,000 ft.	—	**499**	**364**	230	—	—
95% range 165 kts.—260 kts.							
20,000 ft.	Range	—	—	335	245	155	**65**
ANM/100 lb.=18.0	30,000 ft.	—	—	385	273	**161**	49
Lb./min.=24.0	40,000 ft.	—	—	**418**	**284**	149	—
Best range IAS=191 kts.							
95% range 165 kts.—0.546M							
30,000 ft.	Range	—	—	414	302	190	**78**
ANM/100 lb.=22.4	40,000 ft.	—	—	**461**	**327**	**192**	—
Lb./min.=21.3							
Best range IAS=180 kts.							
95% range 165 kts.—0.598M							
40,000 ft.	Range	—	—	—	**361**	**226**	**92**
ANM/100 lb.=26.9							
Lb./min.=20.7							
Best range IAS=173 kts. (0.584M)							
95% range 0.562M—0.66M							
FUEL AVAILABLE	Pounds	3,400	3,000	2,500	2,000	1,500	1,000
	Gall. (AVTUR)	425	375	313	250	188	125



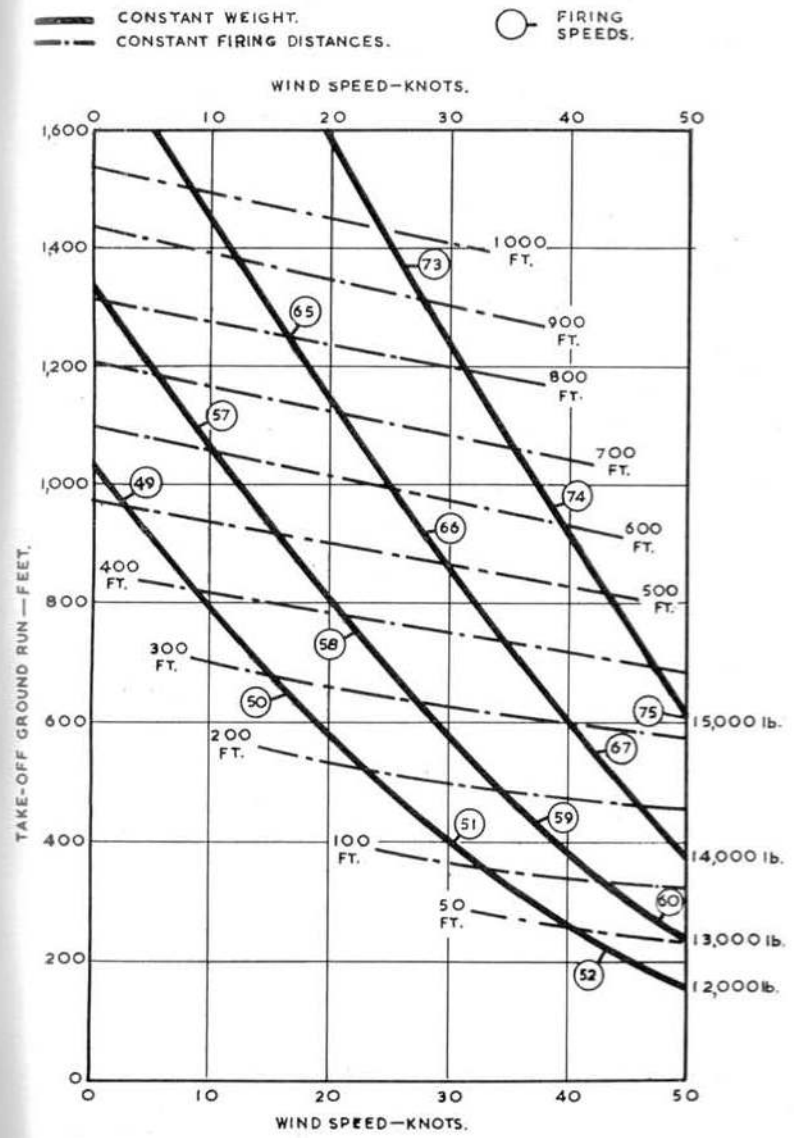
CRUISE DATA CHART – NO EXTERNAL STORES



CRUISE DATA CHART — 8 X 60 LB RPs

104. **Use of the R.A.T.O. chart**

The chart is used to determine the take-off distance for a given A.U.W. and wind speed when using 4×1,100 lb. thrust rockets. The dotted lines show the distance from the start of the run at which the rockets should be fired and the numbers in the circles show the appropriate airspeed (in knots) for firing.



ROCKET-ASSISTED TAKE-OFF.

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