PART VI

OPERATING DATA

114. Loading and C.G. data

(a) *C.G. limits*

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

Forward limit 0.3 in. aft of datum
Aft limit 12.5 in. aft of datum

(ii) Ballast must be carried if the radar head and ranging unit are not fitted.

(iii) The aircraft is at a forward C.G. loading when carrying full internal fuel and ammunition.

(b) *Effects of consumption of expendable stores*

(i) *Ammunition*

Firing ammunition causes the C.G. to move aft (1 in. approximately per 100 rounds).

(ii) *Fuel*

Consumption from	C.G. movement
Outboard drop tanks	Forward
Inboard drop tanks	Negligible
Wing tanks	Slight aft
Centre tanks	Slight forward
Front tanks	Aft

(iii) *Bomb release or inboard drop tank jettison*

Bomb release or inboard drop tank jettison has a negligible effect on C.G.

(iv) *R.P. firing or outboard drop tank jettison*

R.P. firing or outboard drop tank jettison causes a forward C.G. movement.

(c) *Typical service loads*

The figures given below are approximate and are intended only as a guide. Reference should always be made to R.A.F. Form 4801 or to A.P.4347D, Vol. 1, Sect, 2, Chap. 3.

	Configuration	Approx. A.U.W. (lb.)
(1)	Clean, plus full internal fuel and ammo.	17,400
(2)	As (1), plus 2 drop tanks	19,300
(3)	As (1), plus 4 drop tanks	21,200
(4)	As (1), plus 2×1,000 lb. bombs	19,700
(5)	As (2), plus 2×1,000 lb. bombs	21,600
(6)	As (2), plus 24 R.P.s.	21,000

NOTE.—Full ammo. =676 lb.
2 pylons+2 empty drop tanks=355 lb.

115. **Pressure error corrections**

(a) The A.S.I. sea level pressure error corrections are as follows:—

I.A.S.—Knots	200	300	400	500	600
Clean or with any stores combination *excluding* a port outboard drop tank	+1	+3	+4	+3	0
With any stores combination *including* a port outboard drop tank	0	+4	+6	+9	+12

(b) The machmeter pressure error corrections are as follows:—

Configuration	Height (feet)	Level Flight—I.M.N.				Diving—I.M.N.				
		0.7	0.8	0.85	0.9	0.93	0.94	0.985	1.0	1.1
Clean, or with any stores combination *excluding* a port outboard drop tank	All	← Negligible →						+0.015	+0.03	+0.13
With any stores combination *including* a port outboard drop tank	S.L.	+0.02	+0.03	+0.03	+0.05			—	—	—
	40,000	Negligible		+0.02	+0.04					
	—	—	—	—	—	+0.07	+0.09			

(c) Both p.e.c. tables apply irrespective of whether extended leading edges are fitted or not. The only factor which

affects p.e.c.'s to any degree is the presence of a port outboard drop tank.

116. **Fuel consumptions**

The approximate fuel consumptions in lb./hr. for various r.p.m. and altitudes are given below:—

Height	6,800 r.p.m.	7,000 r.p.m.	7,200 r.p.m.	7,400 r.p.m.	7,700 r.p.m.	8,100 r.p.m.
Sea level	3,040	3,560	4,170	5,290	7,150	9,600
10,000 ft.	2,350	2,880	3,550	4,360	6,080	7,550
20,000 ft.	—	2,260	2,880	3,640	4,460	5,470
30,000 ft.	—	1,780	2,250	2,770	3,250	4,080
40,000 ft.	—	—	1,330	1,780	2,250	2,790

117. **Take-off distances**

The approximate sea level take-off distances, in yards, for various configurations, and wind and temperature conditions are given below. For every 1,000 ft. the airfield is above sea level increase the appropriate distance by 12% for ground run and 10% to clear 50 ft.

(a) *Clean (17,400 lb.)*

Temperature °C.		−15	0	+15	+30	+45
Zero wind	Ground run	700	750	810	900	1,010
	Clear 50 ft.	1,080	1,180	1,300	1,430	1,610
30 K wind	Ground run	410	450	500	550	610
	Clear 50 ft.	720	800	890	970	1,100

(b) *2×100 gallon drop tanks (or 2×1,000-lb. bombs) (19,300 lb.)*

Temperature °C.		−15	0	+15	+30	+45
Zero wind	Ground run	870	940	1,020	1,130	1,280
	Clear 50 ft.	1,290	1,390	1,560	1,730	1,970
30 K wind	Ground run	540	590	640	710	790
	Clear 50 ft.	890	970	1,070	1,180	1,360

(c) *2×100 gallon drop tanks+24×R.P. (21,000 lb.)*

Temperature °C.		−15	0	+15	+30	+45
Zero wind	Ground run	1,030	1,120	1,220	1,350	1,530
	Clear 50 ft.	1,510	1,660	1,820	2,010	2,320
30 K wind	Ground run	660	720	780	870	990
	Clear 50 ft.	1,060	1,150	1,280	1,420	1,660

(d) *2×100 gallon drop tanks+2×1,000-lb. bombs (21,600 lb.)*

Temperature °C.		−15	0	+15	+30	+45
Zero wind	Ground run	1,100	1,200	1,310	1,440	1,640
	Clear 50 ft.	1,610	1,760	1,900	2,150	2,480
30 K wind	Ground run	710	770	840	930	1,060
	Clear 50 ft.	1,130	1,230	1,370	1,510	1,780

(e) *4×100 gallon drop tanks (21,200 lb.)*

Temperature °C.		−15	0	+15	+30	+45
Zero wind	Ground run	1,060	1,150	1,300	1,440	1,610
	Clear 50 ft.	1,550	1,700	1,860	2,070	2,380
30 K wind	Ground run	680	740	800	890	1,010
	Clear 50 ft.	1,090	1,180	1,320	1,450	1,710

118. **Snake climbs**

For tactical snake climbs use the recommended climbing speeds and 7,800 r.p.m. (7,600 r.p.m.—Mk. 115).

119. **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 ft. (approximately), thereafter at 350 knots.

(b) *Clear weather descent*

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

(c) *QGH descent*

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

120. **Flight planning data**

(a) *ANM/100 lb. curves*

The curves on pages 124 to 126 show the approximate ANM/100 lb. for various altitudes, true mach numbers, and r.p.m. settings. The horizontal curves are the ANM/100 lb. curves for the altitudes shown; the vertical dotted curves are the approximate r.p.m. settings required to achieve various true mach numbers. For heights other than those given interpolation is possible.

(b) *Flight planning data tables*

The tables preceding the ANM/100 lb. curves are based on the curves and show the flight planning data for:—

(i) *Climbing*

The climb tables give the data for climbs in I.S.A. conditions using the speeds recommended in para. 73.

(ii) *Cruising*

Each separate altitude block in the cruise tables shows:—

(1) The speed for maximum range, the approximate ANM/100 lb. 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 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. 73 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.

(c) *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 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.

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121. Altimeter pressure error corrections

(a) The altimeter pressure error corrections at approach speeds, clean or with drop tanks, are negligible.

(b) The following are the p.e.c.'s in feet, at the higher speeds:—

With a Port Outboard Drop Tank

Mach. No.	Sea Level	5,000 ft.	10,000 ft.	15,000 ft.	20,000 ft.	25,000 ft.	30,000 ft.	35,000 ft.	40,000 ft.
0·7	+ 400	+ 370	+ 320	+ 260	+200	+120	+ 40	− 80	−200
0·8	+ 670	+ 610	+ 540	+ 460	+390	+300	+200	+ 80	− 40
0·85	+ 1,000	+ 920	+ 820	+ 720	+620	+520	+400	+270	+140
0·87	+ 1,200	+ 1,120	+ 1,020	+ 910	+800	+690	+560	+430	+300
0·88	+ 1,320	+ 1,240	+ 1,160	+ 1,060	+960	+860	+760	+640	+520

Without a Port Outboard Drop Tank

0·7	+ 190	+ 170	+ 150	+ 120	+ 90	+ 60	+ 20	− 20	− 60
0·8	+ 200	+ 170	+ 130	+ 90	+ 60	+ 10	− 20	− 50	− 90
0·85	+ 180	+ 140	+ 100	+ 50	+ 0	− 30	− 60	−100	−140
0·9	+ 40	+ 50	+ 50	− 40	− 50	− 80	−110	−160	−200

CLEAN AIRCRAFT

Fuel contents 3,188 lb. AVTAG (7.7 lb./gal.)
Start-up, Taxy and Take-off Allowance 200 lb.
Landing Allowance (~~including~~ excluding descent fuel) 620 lb.

CLIMB DATA

FROM	TO	FUEL (LB.)	DIST. (N.M.)	TIME (MINS.)
Sea Level*	10,000 ft.	310	10	2½
	20,000 ft.	430	25	4¼
	30,000 ft.	565	40	6
	40,000 ft.	700	65	8¾
	45,000 ft.	820	90	11
10,000 ft.	20,000 ft.	120	15	1¾
	30,000 ft.	255	30	3½
	40,000 ft.	390	55	6¼
	45,000 ft.	510	80	8½
20,000 ft.	30,000 ft.	135	15	1¾
	40,000 ft.	270	40	4½
	45,000 ft.	390	65	6¾
30,000 ft.	40,000 ft.	135	25	2¾
	45,000 ft.	255	50	5
40,000 ft.	45,000 ft.	120	25	2¼

* In this block, fuel used is from start-up, times are from wheels rolling.
CLIMB AS RECOMMENDED IN PARA. 73.

DESCENT DATA (Q.G.H.)

FROM	TO	FUEL (LB.)	DIST. (N.M.)	TIME (MINS.)
45,000 ft.	30,000 ft.	25	12	2
	20,000 ft.	60	19	3
	10,000 ft.	105	27	4¼
	Sea Level	185	35	7¼
30,000 ft.	20,000 ft.	35	7	1
	10,000 ft.	80	15	2¼
	Sea Level	160	23	5¼
20,000 ft.	10,000 ft.	45	8	1¼
	Sea Level	125	16	4¼
10,000 ft.	Sea Level	80	8	3

AIRBRAKE .. .. .. OUT, FLAPS DOWN 23°
R.P.M. 6,600
SPEED .. .. 280K.

CRUISE DATA—CLEAN AIRCRAFT

FUEL AVAILABLE	POUNDS	GAUGED FUEL (Actual fuel state)				
		2,988*	2,500	2,000	1,500	1,000
Sea Level	Range	245	190	140	90	40
ANM/100 lb.—10.2	10,000 ft.	320	255	185	115	40
Lb./min.—56.2	20,000 ft.	415	320	230	135	**40**
Best Range Speed—340K	30,000 ft.	490	375	255	140	—
	40,000 ft.	**575**	**430**	**285**	**140**	—
95% Range Speed—260–440K	45,000 ft.	540	415	265	120	—
10,000 ft.	Range	—	260	190	120	50
ANM/100 lb.—14.1	20,000 ft.	—	335	240	145	**50**
Lb./min.—43.8	30,000 ft.	—	390	270	155	35
Best Range Speed—325K	40,000 ft.	—	**450**	**305**	**160**	—
	45,000 ft.	—	425	285	140	—
95% Range Speed—240–400K						
20,000 ft.	Range	—	340	245	150	**60**
ANM/100 lb.—18.8						
Lb./min.—32.7	30,000 ft.	—	405	285	170	50
Best Range Speed—280K	40,000 ft.	—	**470**	**325**	**180**	—
	45,000 ft.	—	445	305	160	—
95% Range Speed—210K–0.74M						
30,000 ft.	Range	—	420	305	185	**65**
ANM/100 lb.—23.7						
Lb./min.—30.3	40,000 ft.	—	**495**	**350**	**205**	60
Best Range Speed—0.7M	45,000 ft.	—	465	325	185	—
95% Range Speed—220K–0.82M						
40,000 ft.	Range	—	—	**365**	**220**	**75**
ANM/100 lb.—29.1						
Lb./min.—26.4	45,000 ft.	—	—	340	195	55
Best Range Speed—0.8M						
95% Range Speed—0.7–0.85M						
45,000 ft.	Range	—	—	350	205	65
ANM/100 lb.—28.3						
Lb./min.—27						
Best Range Speed—0.8M						
95% Range Speed—0.75–0.86M						
FUEL AVAILABLE	**POUNDS**	2,988*	2,500	2,000	1,500	1,000

* Excludes start-up, taxy and take-off allowance (200 lb.)

WITH 2× 100 GALLON DROP TANKS

Fuel contents 4,728 lb. AVTAG (7.7 lb./gal.)
Start-up, Taxy and Take-off Allowance 250 lb.
Landing Allowance (excluding descent fuel) 620 lb.

CLIMB DATA

FROM	TO	FUEL (LB.)	DIST. (N.M.)	TIME (MINS.)
Sea Level*	10,000 ft.	375	10	3
	20,000 ft.	530	30	5¼
	30,000 ft.	690	50	7½
	40,000 ft.	860	80	10¾
10,000 ft.	20,000 ft.	155	20	2¼
	30,000 ft.	315	40	4½
	40,000 ft.	485	70	7¾
20,000 ft.	30,000 ft.	160	20	2¼
	40,000 ft.	330	50	5½
30,000 ft.	40,000 ft.	170	30	3¼

* In this block times are from wheels rolling and fuel used is from start-up.
CLIMB AS RECOMMENDED IN PARA. 73.

DESCENT DATA

As for Clean Aircraft.

CRUISE DATA
WITH 2×100 GALLON DROP TANKS

FUEL AVAILABLE POUNDS		Full* Fuel	GAUGED FUEL (Actual fuel state)				
		4,478	3,188	2,500	2,000	1,500	1,000
Sea Level	Range	375	255	185	135	85	**40**
ANM/100 lb.—9.9	10,000 ft.	510	325	235	170	105	35
Lb./min.—55.8	20,000 ft.	635	410	295	205	120	30
Best Range Speed—330K	30,000 ft.	785	500	350	235	**120**	—
95% Range Speed—260–410K	40,000 ft.	**905**	**566**	**380**	**245**	110	—
10,000 ft.	Range	—	340	245	180	115	45
ANM/100 lb.—13.4	20,000 ft.	—	430	310	220	135	**45**
Lb./min.—43.5	30,000 ft.	—	525	370	255	**145**	—
Best Range Speed—310K	40,000 ft.	—	**595**	**410**	**275**	140	—
95% Range Speed—240–370K							
20,000 ft.	Range	—	435	320	230	140	**55**
ANM/100 lb.—17.6							
Lb./min.—35.5	30,000 ft.	—	545	390	275	160	50
Best Range Speed—280K	40,000 ft.	—	**615**	**435**	**300**	**165**	—
95% Range Speed—230K–0.73M							
30,000 ft.	Range	—	560	405	290	175	**65**
ANM/100 lb.—22.7							
Lb./min.—30.3	40,000 ft.	—	**630**	**455**	**320**	**185**	50
Best Range Speed—0.7M							
95% Range Speed—220K–0.79M							
40,000 ft.	Range	—	655	470	335	200	65
ANM/100 lb.—26.9							
Lb./min.—26.3							
Best Range Speed—0.8M							
95% Range Speed—0.75–0.84M							
FUEL AVAILABLE POUNDS		4,478*	3,188	2,500	2,000	1,500	1,000

* Excluding start-up taxy and take-off allowance (250 lb.)

WITH 4×100 GALLON DROP TANKS

Fuel Contents 6,268 lb. AVTAG (7.7 lb./gal.).
Start-up, Taxy and Take-off Allowance 250 lb.
Landing Allowance (excluding descent fuel) 620 lb.

CLIMB DATA

FROM	TO	FUEL (LB.)	DIST. (N.M.)	TIME (MINS.)
Sea Level*	10,000 ft.	405	15	3¼
	20,000 ft.	575	35	5¾
	30,000 ft.	775	55	8¾
	35,000 ft.	880	75	13½
10,000 ft.	20,000 ft.	170	20	2½
	30,000 ft.	370	40	5½
	35,000 ft.	475	60	10¼
20,000 ft.	30,000 ft.	200	20	3
	35,000 ft.	305	40	7¾
30,000 ft.	35,000 ft.	105	20	4¾

* In this block fuel used is from start-up, times are from wheels rolling. CLIMB AS RECOMMENDED IN PARA. 73.

DESCENT DATA

As for Clean Aircraft.

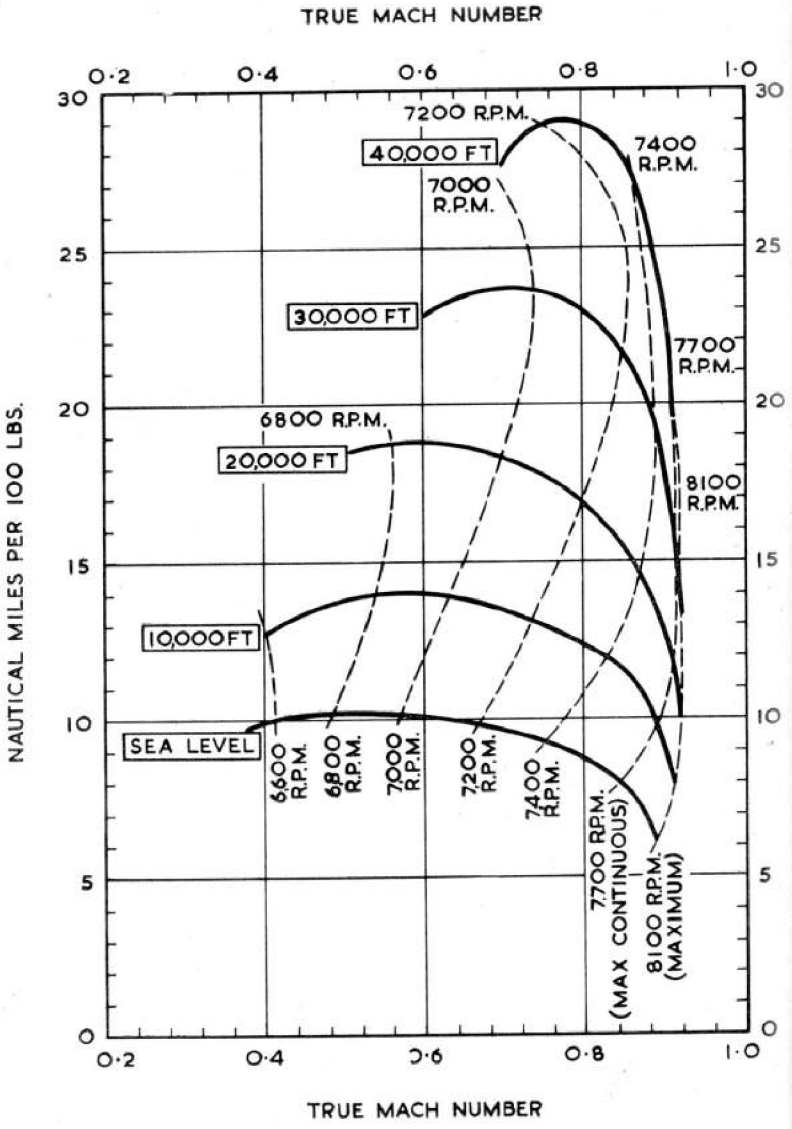
CRUISE DATA

WITH 4×100 GALLON DROP TANKS

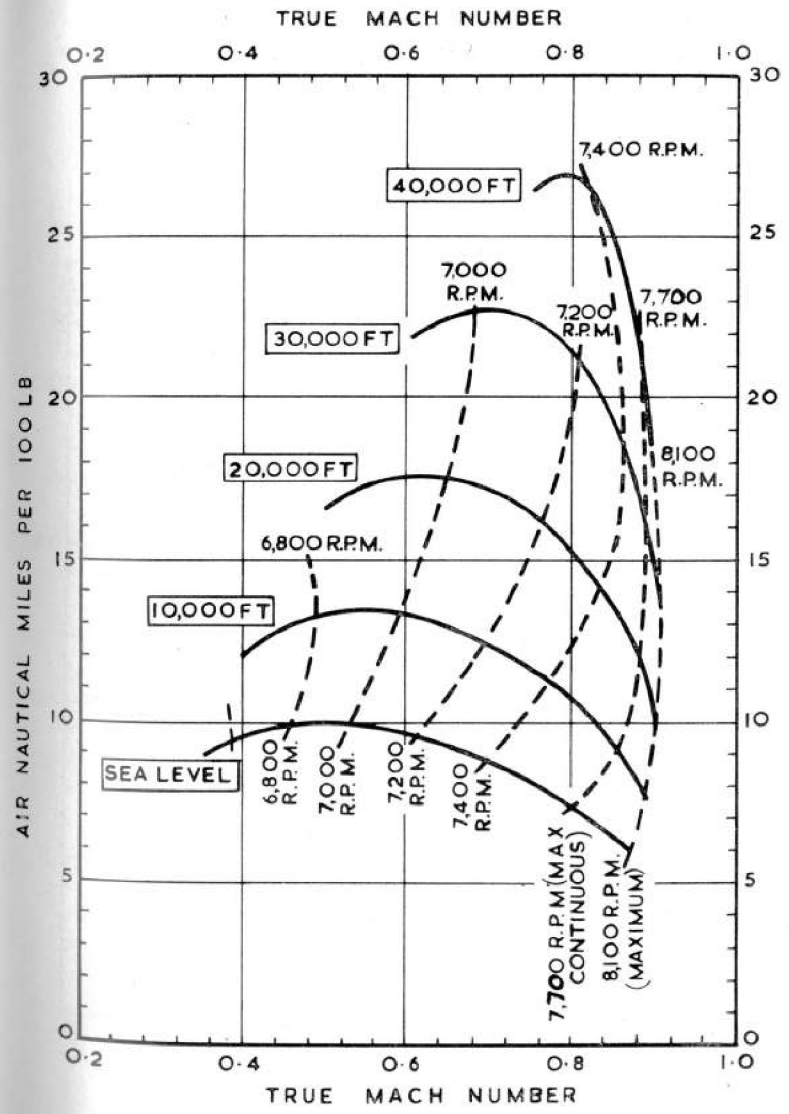
FUEL AVAILABLE POUNDS		Full* Fuel 6,018	Out-boards Empty 4,728	GAUGED FUEL (Actual fuel state) 3,188	2,500	2,000	1,500	1,000
Sea Level	Range	485	375	230	170	125	80	35
ANM/100 lb.—9.1	10,000 ft.	645	490	300	220	160	95	**35**
Lb./min.—58.1	20,000 ft.	780	595	355	255	180	105	—
Best Range Speed—310K	30,000 ft.	995	745	435	300	200	**105**	—
95% Range Speed—240–380K	35,000 ft.	**1,070**	**795**	**465**	**315**	**205**	100	—
10,000 ft.	Range	—	500	310	230	165	105	**45**
ANM/100 lb.—12.3	20,000 ft.	—	600	375	270	195	120	40
Lb./min.—45.3	30,000 ft.	—	760	455	325	225	125	—
Best Range Speed—280K	35,000 ft.	—	**820**	**490**	**340**	**230**	**125**	—
95% Range Speed—240–340K								
20,000 ft.	Range	—	615	380	275	200	125	**50**
ANM/100 lb.—15.2								
Lb./min.—40.5	30,000 ft.	—	780	475	340	240	140	40
Best Range Speed—270K	35,000 ft.	—	**835**	**505**	**360**	**250**	**140**	—
95% Range Speed—220K–0.7M								
30,000 ft.	Range	—	800	495	355	255	155	55
ANM/100 lb.—19.9								
Lb./min.—33.6	35,000 ft.	—	**860**	**525**	**380**	**270**	**165**	**55**
Best Range Speed—250K								
95% Range Speed—210K–0.75M								
35,000 ft.	Range	—	865	530	338	225	165	60
ANM/100 lb.—21.6								
Lb./min.—33.3								
Best Range Speed—0.72M								
95% Range Speed—230K–0.77M								
FUEL AVAILABLE	POUNDS	6,018*	4,728	3,188	2,500	2,000	1,500	1,000

* Excluding start-up, taxy and take-off allowance (250 lb.)

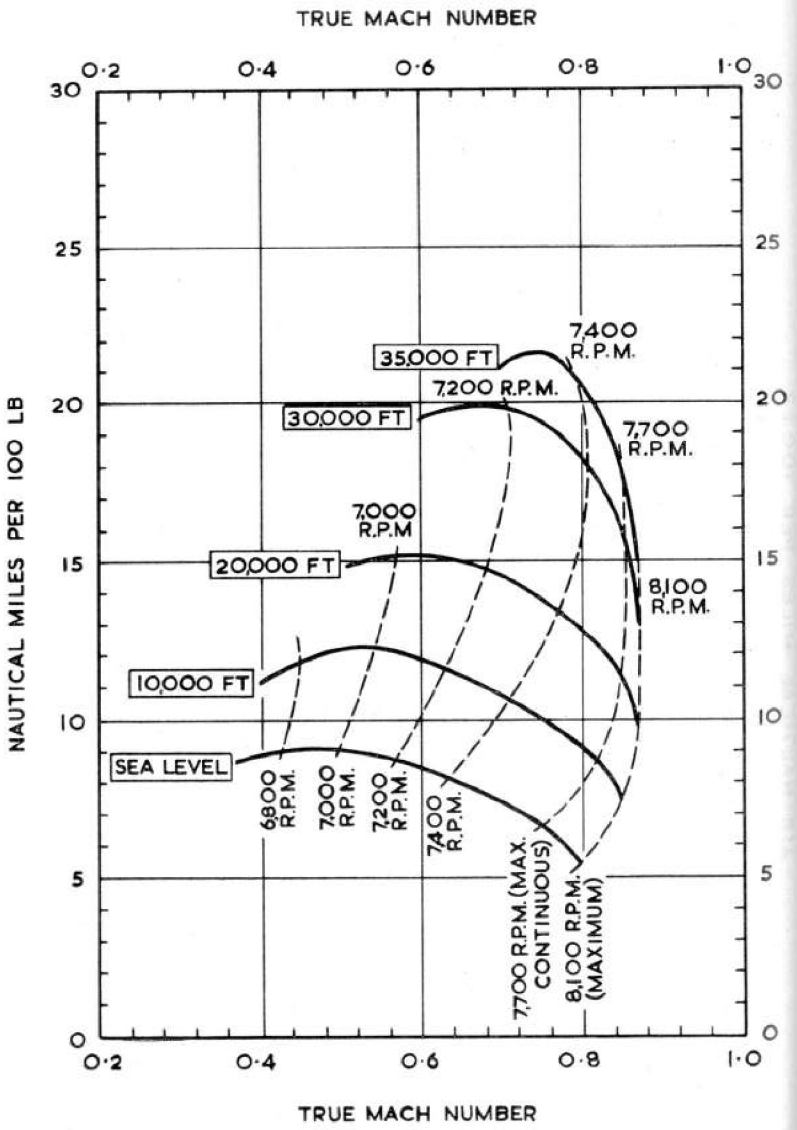
CLEAN AIRCRAFT



WITH 2 X 100 GALLON DROP TANKS



WITH 4 X 100 GALLON DROP TANKS



Issued with A.L.2.

122. Target towing

(a) *Limitations*

(i) When Mod. 315 is embodied the aircraft is cleared for use as a target tug in ICAN and temperate summer conditions using a standard 6 ft. by 30 ft. banner target, with or without drop tanks on inboard pylons.

(ii) Prepared runways, with clear approaches, of not less than 2,000 yards, are to be used.

(iii) The maximum permissible A.U.W. is 18,650 lb.

(iv) The ground snatch method of target launching is to be used.

(v) Speed while towing must not exceed 250 knots.

(vi) Rate of turn while towing must not exceed Rate 1.

(vii) If the target breaks away from the tow line speed must be reduced to 220 knots until the cable has been jettisoned.

(b) *Take-off*

It is recommended that 38° flap is used for take-off.

(c) *Precautions during towing*

The airbrake must not be operated during towing, since this will release the target. Care should be taken to avoid inadvertant operation of the airbrake switch due to its close proximity to the "press-to-transmit" switch.

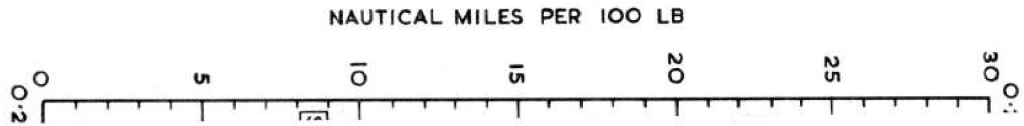
(d) *Target release*

(i) It is recommended that the target is released at 160 knots at 400 feet with 38° flap selected. Target release is by pressing the camera button, or the gun firing trigger or by selecting airbrake out.

(ii) If the target fails to release, the aircraft may safely be landed with the target on tow. Alternately increasing speed to 300 knots should break the tow cable.

(e) *Manual reversion*

If manual reversion occurs the target must be released over a safe area.



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