

Chapter 3 LOADING AND C.G. DATA

(Completely revised)

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Introduction

1. These loading and C.G. data give general limitations applicable to the Vampire T Mk. 11 aircraft, irrespective of the modification standard and the number of guns fitted, but as fixed provision is made for the fitment of two or four guns, loading data relevant to these aircraft are given in the Appendices 1 and 2, respectively, to this Chapter.

Note . . .

The following fuels are cleared for use in the aircraft:—

Fuel		Density (lb./gall.)
AVTAG	7.7
AVTUR	8.0
AVCAT	8.3

The fuel weights given in fig. 2 refer to AVTUR, and must be adjusted when another fuel is used.

GENERAL INFORMATION AND LIMITATIONS

C.G. position

2. The C.G. position is determined with the aircraft in the rigging position (*i.e.*, with the fuselage datum line horizontal and the undercarriage down), and is defined by its distance measured parallel to the fuselage datum, from the C.G. datum point. This distance is

known as the “moment arm” of the C.G. and is given by the following expression:—

$$\frac{(\text{Tare weight} \times \text{tare C.G. arm}) + (\text{loads} \times \text{respective arms})}{\text{Tare weight} + \text{total weight of loads}}$$

$$= \frac{\text{Tare moment} + \text{load moments}}{\text{Total weight}}$$

All moment arms are measured in feet and are positive when they refer to items aft of the C.G. datum and negative when they refer to items forward of this datum.

C.G. datum point

3. The position of the C.G. datum point is indicated by a peg on the port side of the fuselage. This peg is located at the intersection of a line (normal to the fuselage datum) through the lower wing/fuselage attachment fitting (transverse datum), with a line parallel to and 15 inches below the fuselage datum line.

Permissible limits of C.G. travel

4. The approved limits of C.G. travel, with the undercarriage down, are as follows:—

Forward limit	—0.270 feet (0.167 S.M.C.)
Aft limit	+0.367 feet (0.260 S.M.C.)

For ferrying only, the aft limit is extended as follows:—

Aft limit	+0.401 feet (0.265 S.M.C.)
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Note . . .

Refer to Pilot's Notes for restrictions pertinent to ferrying conditions.

The aircraft C.G. must be kept within the above limits even when load or fuel are wholly or partially expended.

Maximum permissible all-up weight

5. The weight limitations applicable to aircraft covered by these loading data are:—

Take-off

- (1) All forms of flying (clean a/c. or with eight R.Ps. only) 11 860 lb.
- (2) Speed restricted (with bombs) 13 290 lb.
- (3) Gentle manoeuvres (with drop tanks) 13 610 lb.

Note . . .

It is an over-ruling requirement that the all-up weight, less the weight of the bombs and carriers or drop tanks and their fuel, must not exceed 11 860 lbs

Landing

- (1) Normal (clean a/c. or with external stores including empty drop tanks) 13 290 lb.
- (2) Emergency 13 480 lb.

Note . . .

Refer to Pilot's Notes for speed, manoeuvre and emergency landing restrictions.

Modification standard

6. The basic modification standard listed below includes all modifications which have negligible effects on the aircraft weight and/or C.G. position.

Airframe:—

50, 72, 77, 86, 90, 100, 108, 112-114, 118, 124, 138, 139, 142, 146, 154, 158, 177, 183, 205, 206, 220, 222, 228, 239, 246, 251, 253, 254, 259, 265, 267, 270, 272, 273, 275-277, 295, 297, 307, 310, 312, 314, 317, 319, 339, 356, 359, 361, 363, 364, 369, 383, 384, 389-391, 397, 398, 402, 411, 413, 415, 425, 426, 429, 442, 492, 493, 498, 500, 520, 529, 542, 543, 545, 589, 591, 604, 607, 612, 614, 615, 622, 625, 626, 652, 654, 656-658, 664, 666, 669, 676, 682, 688, 692, 694, 696, 698, 720, 722, 728, 737, 739, 764, 766, 767, 769, 785-787, 791, 805, 806, 809, 810, 812, 815, 816, 818, 840, 842, 844, 846, 871, 880, 882, 884, 899, 910, 921, 923, 926, 930, 934, 936, 947, 950, 960, 964, 967, 978, 980, 983, 996, 997, 3032, 3034, 3036, 3041, 3042, 3045, 3049, 3053, 3054, 3059, 3064, 3065, 3068, 3075, 3082, 3085, 3088, 3089, 3095, 3107, 3108, 3110, 3116, 3126, 3132, 3134, 3135, 3138, 3140, 3142, 3147, 3149, 3151-3153, 3159, 3161, 3163-3165, 3167 Pt. A and B, 3169, 3173-3178, 3183, 3184, 3186, 3188, 3192-3194, 3198, 3200, 3201, 3203, 3204, 3207-3210, 3212, 3214, 3218, 3220-3222, 3224-3226, 3232, 3234-3236, 3238, 3240, 3245-3249, 3251, 3253, 3256, 3257, 3259, 3262-3265, 3267, 3272, 3273, 3275-3277, 3282, 3283, 3285, 3288, 3289, 3292, 3296, 3298, 3304, 3306, 3310, 3314, 3320, 3321, 3324, 3328, 3329, 3333, 3335, 3336, 3338-3340, 3343, 3344, 3348, 3351, 3353-3355, 3357, 3359-3364, 3367, 3368, 3370, 3371, 3373, 3384-3390, 3396-3399, 3401, 3403-3405, 3408, 3413, 3415, 3416, 3424, 3426, 3429, 3430, 3436, 3437, 3439, 3448, 3449, 3453, 3460, 3464, 3471.

Power plant:—

6, 20, 24, 25, 27.

Removal or non-fitment of equipment

Removable equipment items

7. If, for any reason, items of non-expendable equipment specified in the Table No. 1 of Appendices 1 and 2 are omitted, the effect on the aircraft C.G. position must be calculated and, if necessary, equivalent ballast substituted to counteract the C.G. movement.

Item	No. off	Weight (lb.)	Moment (lb.ft.)
Mounting, gyro gunsight, Type 3, Mk. 3	2	57.0	— 456
Batteries, lead acid, 12 volt, 40 amp.hr.	2	106.0	— 1240
Cylinders, oxygen, 750 litre, Mk. 5D	4	64.0	— 669

Ballast

9. When ballast is required, due to the removal or non-fitment of equipment (*para. 7 and 8*), this may be installed as follows:—

(a) Ballast of the same weight may be secured in the same manner and on the same mounting as the item it replaces.

(b) Ballast having equivalent effect on the aircraft C.G. may be installed in the ammunition boxes. When ballast (other than dummy ammunition) is installed in the ammunition boxes, an entry to that effect is to be made in column (2) of the Fitness for Flight Certificate of the Form F.700 including the instruction "Gentle manoeuvres only". The weight of such ballast may be calculated using weights and moments, or by using the following formula:—

$$B_A = \frac{M + 0.4W_E}{3.4}$$

where:— B_A = Weight of the ballast in the ammunition boxes.

M = Total moment change due to the equipment items removed.

W_E = Total weight of the equipment removed.

Example:—

To find the ballast required in the ammunition boxes to counteract the effect of the removal of 250 lb. of equipment having a total moment change of +1000 lb.ft.

i.e., $M = 1000$

$W_E = 250$

Fixed equipment items

8. If any items of fixed equipment (included in the tare weight) are omitted, the effect on the aircraft C.G. position must be calculated. The weight and moment of certain major items in this category are listed below for reference.

$$\text{Ballast required} = \frac{1000 + 0.4 \times 250}{3.4} = 324 \text{ lb.}$$

Note . . .

Dummy ammunition may be used for this purpose:—

Ref. No. 12C/881, Cartridges, S.A., 20 mm. Hispano, ballast, Grade B, Mk. 1, L.H. feed, belted in Hispano links Mk. 1.

Ref. No. 12C/882, Cartridges, S.A., 20 mm. Hispano, ballast, Grade B, Mk. 1, R.H. feed, belted in Hispano links Mk. 1.

Weight = 62.5 lb. per 100 rounds.

Max. capacity of ammunition boxes = 150 rounds each = 600 rounds per aircraft.

(c) Ballast having equivalent effect on the aircraft C.G. may be carried on the stowage bar (Mod. 3298) in the nose. This stowage is designed to carry up to six standard lead ballast weights (A.G.S.670) of 17½ lb. each. The weights and moments of ballast on this stowage are:—

	Weight (lb.)	Moment (lb.ft.)
1 weight	17.5	— 216
2 weights	35.0	— 427
3 weights	52.5	— 635
4 weights	70.0	— 840
5 weights	87.5	— 1041
6 weights	105.0	— 1239

The number of weights required may be calculated using weights and moments, or by using the following formula:—

$$B_N = \frac{M + 0.4W_E}{215}$$

Where:— B_N = Number of $17\frac{1}{2}$ lb. weights required.

M = Total moment change due to the equipment removed.
 W_E = Total weight of the equipment removed.

Example:—

To find the number of ballast weights required on the stowage in the nose to counteract the effect of the removal of 250 lb. of equipment having a total moment change of +1000 lb.ft.

i.e., $M = 1000$
 $W_E = 250$

$$\text{No. of weights required} = \frac{1000 + 0.4 \times 250}{215} = 5$$

Note . . .

When Mod. 3298 is embodied, ballast (other than dummy ammunition) is to be carried on the stowage bar and not in the ammunition boxes.

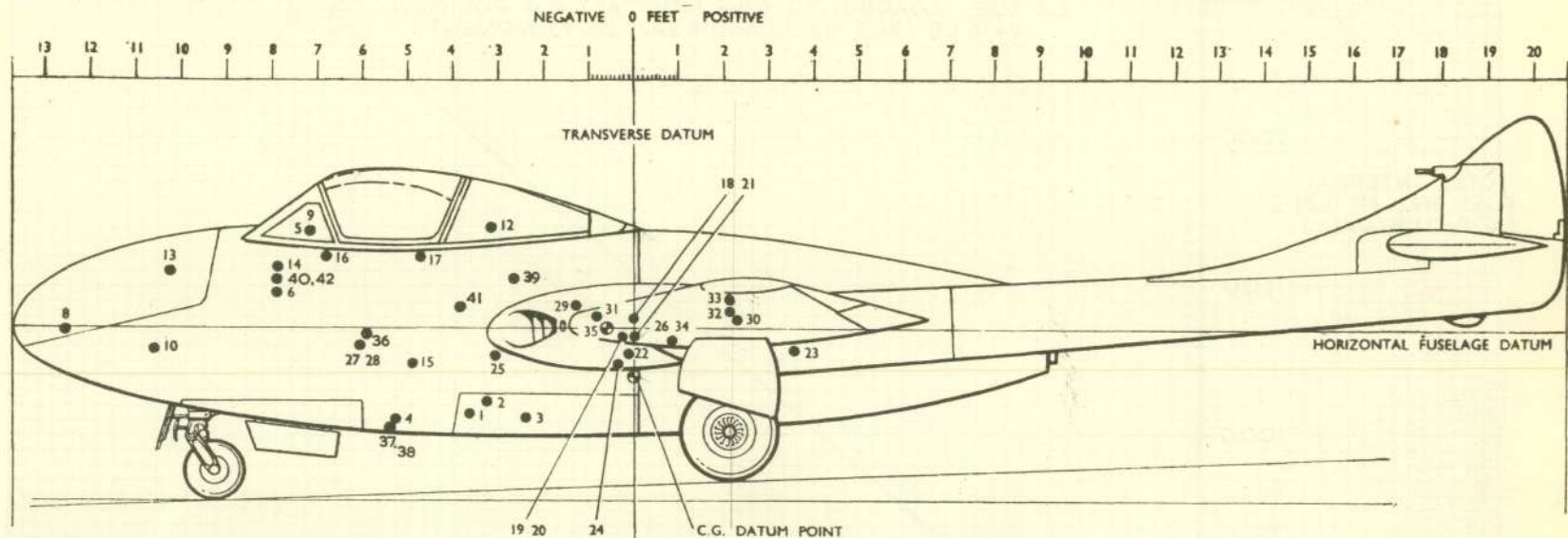


Fig. 1. Loading and C.G. diagram

Consumable load

10. The normal consumption of fuel or expendable stores from the loadings given in App. 1, Table No. 2, and App. 2, Table No. 2, will not cause the aircraft C.G. position to move beyond the limits quoted in para. 4. The data contained in the following paragraphs will, however, enable the aircraft C.G. position to be determined for any load condition.

Internal fuel

11. The weight and corresponding moment for full internal fuel (330 gall.) are given in App. 1, Table No. 2, and App. 2, Table No. 2. However, when partial fuel loads are carried, the distribution between the various internal

tanks is not proportional to their capacities. The plotting of fuel weight against moment is given in fig. 2 to ensure that the correct fuel moment is used for any given fuel weight. Point "A" in fig. 2 defines the fuel loading which gives the most forward aircraft C.G. position, and point "B" defines the most aft position due to internal fuel loading.

Auxiliary fuel

12. When drop tank fuel is carried in addition to internal fuel, an aircraft C.G. position aft of that given by internal fuel loading point "B" in fig. 2 is obtained. The order of fuel consumption via the transfer system is:—

- (1) Drop tank fuel.
- (2) Internal fuel.

Expendable stores

13. The aircraft C.G. position moves *aft* when ammunition is consumed or the bombs or R.P.s are jettisoned.

Miscellaneous data

14. Length of Standard Mean Chord = 6.87 ft. Equation to express C.G. position as a decimal of the Standard Mean Chord from its leading edge (C.G. to S.M.C.) is:—
 $\bar{x} + 1.42$

$\frac{\quad}{6.87}$, where \bar{x} is the moment arm (ft.) of the condition under consideration.

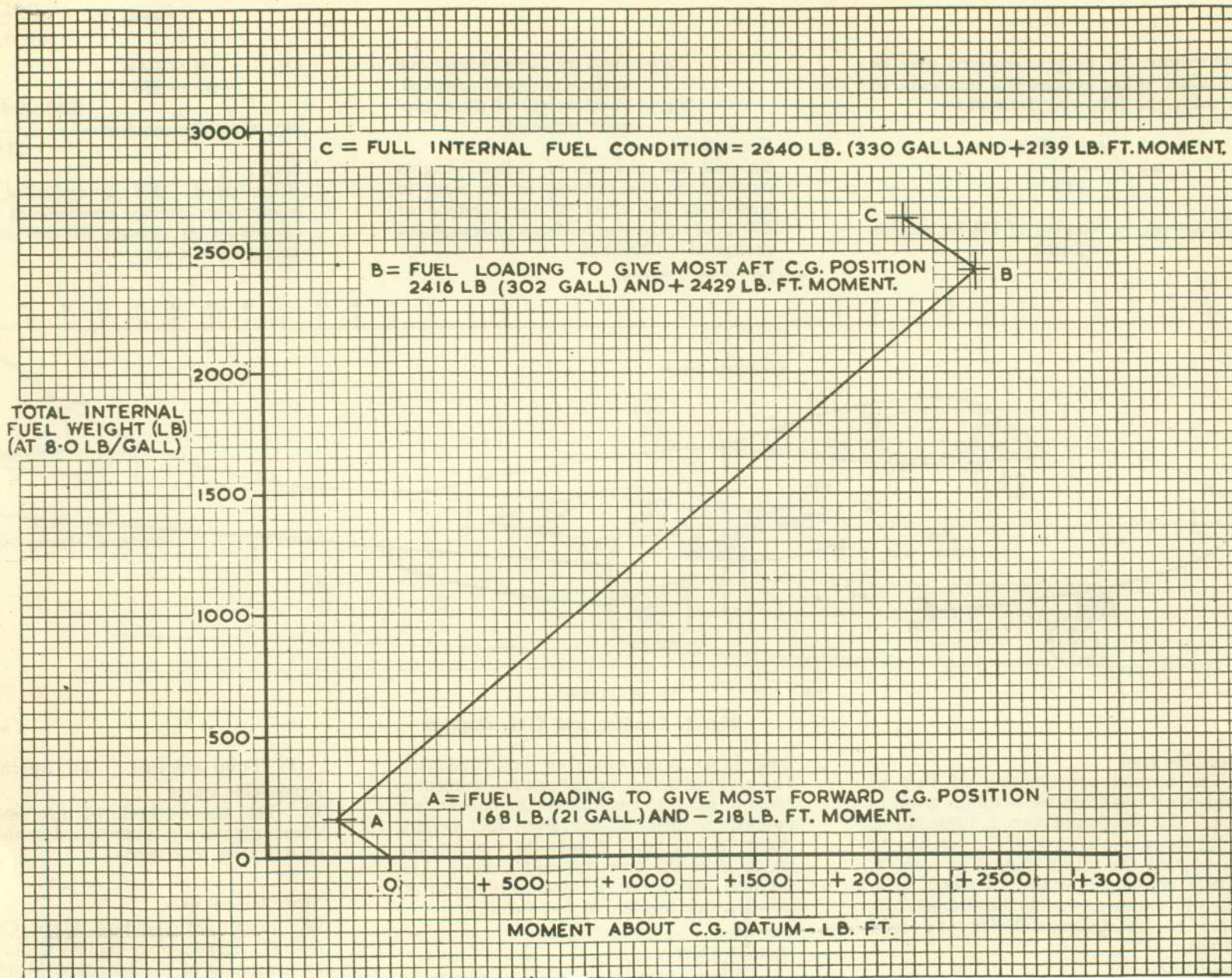


Fig. 2. Fuel loading curve (internal fuel)

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Appendix I LOADING DATA FOR AIRCRAFT WITH TWO GUNS

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Introduction

1. This Appendix gives the loading data for the Vampire T Mk.11 aircraft fitted with two 20 mm. Hispano guns. General information and limitations, irrespective of the modification standard and the number of guns fitted, are contained in Chapter 3 of this Section.

NOTE ...

The following fuels are cleared for use in the aircraft :-

Fuel	Density (lb./gall.)
AVTAG	7.7
AVTUR	8.0
AVCAT	8.3

The fuel weights given in para. 7 to 10 and Table No. 2 refer to AVTUR, and must be adjusted when another fuel is used.

Tare weight

2. The tare weight given on Table No. 1 includes all

fixed fittings and equipment not listed in the Table, and conforms with the basic modification standard defined by Chap. 3, para. 6.

Typical service loads

3. The items of removable equipment common to all roles are listed in Table No. 1. Removable equipment items, crew, and fuel to complete the various roles are given in Table No. 2. In each Table, the numbers in the column headed "Item No" are the key to the numbered spots in Chap. 3, Fig. 1.

Effect of modifications

4. The following modifications having significant effect on weight and/or C.G. are included in the tare weight. If any of these modifications are not incorporated, their effect must be calculated and, if necessary, load adjusted to counteract the effect of their omission on the aircraft C.G. The effect of modifications other than those listed may be ignored.

Mod. No.	Description	Fixed parts		Removable parts	
		Weight (lb.)	Moment (lb. ft.)	Weight (lb.)	Moment (lb. ft.)
3142	Introducing Rebecca, Mk. 7	+26.1	-56	+48.6	-185
3298	Provision for ballast weights in nose (including bar)	+6.3	-74	Chap. 3, para 9(c)	

5. The following modifications are not included in tare weight given in Table 1. When any of these modifications are introduced, their effect must be calculated and, if necessary, load adjusted to counteract their effect on aircraft C.G. position.

Mod. No.	Description	Fixed parts		Removable parts	
		Weight (lb.)	Moment (lb. ft.)	Weight (lb.)	Moment (lb. ft.)
3243	Introducing I. F. F. Mk. 10 in lieu of Mk. 3	+30.9	+ 72	+2.3	+9
3287	Introducing redesigned fire extinguisher system single high rate discharge bottle	+ 1.13	+ 13	-	-
3311	Introducing windscreen wiper	+10.5	- 93	-	-
3312	Introducing fireproof screens over flying controls passing through engine bay	+12.84	+ 39	-	-
3325	Introducing 2 inverters 100A Ref. 5UB/4938 and control panel 5UC/439 in lieu. 1 inverter 100B Ref. 5UB/4935.	+21.28	-176	-	-
3356	Introducing stand-by battery for turn and slip indicator	+ 4.1	- 33	-	-

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Mod. No.	Description	Fixed parts		Removable parts	
		Weight (lb.)	Moment (lb. ft.)	Weight (lb.)	Moment (lb. ft.)
3400	Remove starboard G. 4B gyro repeater	- 6.0	+ 46	-	-
3414	Introducing manually-operated fire extinguisher	+ 3.1	- 18	-	-
3431	Introducing locating spigots and sealing fuselage tank filler neck	+ 1.10	- 1	-	-
3432	Introducing valve line oxygen automatic Mk. 1-60/1782	+ 2.27	- 13	-	-
3473	Introducing cannon mtg. slides in steel in lieu of Duralumin	+ 1.00	- 3	-	-
3475	Delete 8 "Splitcan" resetting fire detectors round engine	- 2.90	- 6	-	-
3477	Introducing additional A. V. mountings on main instrument panel	+ 0.90	- 7	-	-
3494	Introducing additional stiffener rib 2 and U/C diaphragm main wings	+ 5.82	+ 12	-	-
3508	Introducing reinforcing top rudder hinge in fin	+ 0.70	+ 13	-	-
3511	Introducing additional stiffeners . Top and bottom skin air intake duct	+ 2.00	- 5	-	-
3545	Introducing guard for elevator control quadrant in cockpit	+ 1.98	- 10	-	-
3555	Introducing U/C ground lock interconnected with A. S. I.	+ 1.50	- 12	-	-
3569	Re-route hydraulic vent pipe to common drain box	+ 1.10	+ 1	-	-
3572	Introducing positive up-lock etc. for nose wheel door	+ 3.96	- 34	-	-
3619	Introducing Uninyvin cables and flex conduit for generator leads	- 4.00	- 3	-	-
3620	Introducing guard for flexible hoses on seats and revise hose lengths	- 1.75	- 8	-	-
3627	Introducing 2 additional hydraulic accumulators and control valve	+20.00	-199	-	-
3631	Delete interconnection between U/C ground lock and A. S. I.	- 1.50	+ 12	-	-

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Loading restrictions

6. When the aircraft is flown with one crew and with full drop tanks, 300 rounds of ammunition (or alternatively 8 x 60 lb. hd. R.P.s) must be retained or equivalent ballast carried until the fuel transfer from the drop tanks is complete.

NOTE ...

This restriction does not apply to aircraft flown under ferrying conditions (Chap. 3, para. 4).

Examples on the determination of the C.G. position

7. The most forward possible C.G. occurs when the aircraft carries two crew, full ammunition (300 rounds), and 8 x 60 lb. hd. R.P.s (i.e., role 2 as shown on Table No. 2 less drop tanks) and with fuel consumed to approx. 21 gall. (Point A in Chap. 3, Fig. 2).

	Weight (lb.)	Moment (lb. ft.)
A. U. W., role 2 from Table No. 2	13 560	+1275
Deduct drop tanks	- 150	- 135
Deduct drop tank fuel	- 1600	-1270
Deduct internal fuel	- 2640	-2139
Add internal fuel (to a point A in Chap. 3, Fig. 2)	+ 168	- 218
Totals	9338	-2487

$$\text{C.G. position} = \frac{-2487}{9338} = -0.266 \text{ ft.} \\ \text{(0.168 S.M.C.)}$$

This is within the range quoted in Chap. 3, para. 4.

8. The most aft possible C.G. with drop tanks empty occurs when the aircraft carries one Pilot, rocket projectors, and empty drop tanks only (i.e., role 2 as shown on Table No. 2 less expendable stores and 2nd Pilot), and with fuel consumed to approx. 302 gall. (Point B in Chap. 3, Fig. 2).

	Weight (lb.)	Moment (lb. ft.)
A. U. W., role 2 from Table No. 2	13 560	+1275
Deduct R.P.s	- 784	+ 353
Deduct ammunition	- 188	+ 564
Deduct 2nd Pilot	- 222	+1359
Deduct drop tank fuel	- 1600	-1270
Deduct internal fuel	- 2640	-2139
Add internal fuel (to Point B in Chap. 3, Fig. 2)	+ 2416	+2429
Totals	10 542	+2571

$$\text{C.G. position} = \frac{+2571}{10542} = +0.244 \text{ ft.} \\ \text{(0.242 S.M.C.)}$$

This is within the range quoted in Chap. 3, para. 4.

9. The most aft possible C.G. with drop tanks full is identical with that given in para. 8 above, except that drop tanks fuel is added and 300 rounds of ammunition are carried (para. 6). The most aft C.G. in this condition occurs at take-off with full tanks.

	Weight (lb.)	Moment (lb. ft.)
Totals from para. 8	10 542	+2571
Add fuel to fill internal tanks	+ 224	- 290
Add drop tank fuel	+ 1600	+1270
Add 300 rounds of ammunition	+ 188	- 564
Totals	<u>12 554</u>	<u>+2987</u>

C.G. position = $\frac{+2987}{12\ 554} = +0.238$ ft.
(0.241 S.M.C.)

This is within the range quoted in Chap. 3, para. 4.

10. The ferrying C.G. position occurs when the aircraft carries the Pilot only and full drop tanks, but without Service fit items (marked with asterisks in Table No. 1).

	Weight (lb.)	Moment (lb. ft.)
A.U.W., role 1 from Table No. 2	10 998	+ 176
Deduct ammunition	- 188	+ 564
Deduct 2nd Pilot	- 222	+1359
Add drop tanks	+ 150	+ 135
Add drop tank fuel	+ 1600	+1270
Deduct Service fit items marked with asterisks in Table No. 1	- 81	+ 386
Totals	<u>12 257</u>	<u>+3890</u>

Ferrying C.G. position = $\frac{+3890}{12\ 257} = +0.317$ ft.
(0.253 S.M.C.)

This is within the normal limit quoted in Chap. 3, para. 4 and the ferrying restriction need not be applied.

11. The above examples show the extreme C.G. positions obtainable with any permissible combination of crew, ammunition, and external stores on aircraft with full Service equipment as listed in Table No. 1. Further correction to the examples given, in accordance with the instructions given in Chap. 3, para. 7 and 8, and para. 4 and 5 of this Appendix, will determine the extreme C.G. positions obtainable in Service for the particular aircraft or group of aircraft under consideration.

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TABLE 1
Basic weight, with two 20 mm. guns

Note ref.	Item no.	Item	No. off	Weight (lb.)	Arm (ft.)	Moment (lb.ft.)
		Armament				
(1)	1	Guns, Hispano 20 mm., Mk. 5, No. 2	2	171.0	- 3.67	- 628
	2	Belt feed mechanism, Mk. 5	2	27.0	- 3.21	- 87
	3	Firing units, Maxiflux, Mk. 2	2	8.3	- 2.38	- 20
(2)	4	Accessories, guns	2 sets	26.0	- 5.20	- 135
	5	Gyro gunsight, Mk. 5	2	18.5	- 7.02	- 130
	36*	Electrical Torches, Type O	2	1.5	- 6.0	- 9
	6*	Instrument Clock, Mk. 4	1	0.5	- 7.74	- 4
(3)	8*	Camera, G.45B and accessories	1	7.3	- 12.33	- 90
(4)	9*	G.G.S. recorder, Mk. 3 and accessories	1	2.2	- 7.02	- 15
	10	Oxygen, charge for cylinders	4	9.4	- 10.53	- 99
	12*	Miscellaneous First aid outfit, A.P.3130	1	3.0	- 3.50	- 11
		Radio				
	13	V.H.F. trans.-rec. T.R.1934 or T.R.1985	1	27.0	- 10.21	- 276
	13	V.H.F. trans.-rec. T.R.1935 or T.R.1986	1	27.0	- 10.21	- 276
	14	V.H.F. control unit, Type 382	2	1.2	- 7.84	- 9
	15*	I.F.F. rec. R.3121	1	34.3	- 4.78	- 164
	16*	I.F.F. control unit, Type 89	1	0.7	- 6.50	- 5
	17*	I.F.F. control unit, Type 90	1	1.1	- 4.73	- 5
	37	Rebecca Mk. 7, aerial, Type 90	4	9.0	- 5.50	- 50
	38	Rebecca Mk. 7, aerial, Type 91	2	2.4	- 5.40	- 13
	39*	Rebecca Mk. 7, trans.-rec. T.R.3708	1	30.8	- 2.70	- 83
	40	Rebecca Mk. 7, control unit, Type 909	1	2.6	- 7.80	- 20
	41	Rebecca Mk. 7, junction box 4527	1	2.6	- 3.70	- 10
	42	Rebecca Mk. 7, meter range and head	1	1.2	- 7.80	- 9
		TOTAL REMOVABLE MILITARY LOAD ITEMS COMMON TO ALL ROLES		415		- 2148
	35	TARE WEIGHT		7311	+ 0.474	+ 3467
		BASIC WEIGHT		7726	+ 0.171	+ 1319

Note . . .

- (1) Gun weight includes rack operating lever.
- (2) Gun accessories comprise ammunition chutes, empty case and link chutes, blast tubes, magazine stay tubes, and cocking unit.
- (3) Camera and accessories comprise camera, adapter, mounting and side covers.
- (4) Recorder and accessories comprise recorder and magazines.
- (5) Items marked * are "Service Fit" and are not available for fitment to aircraft prior to delivery.

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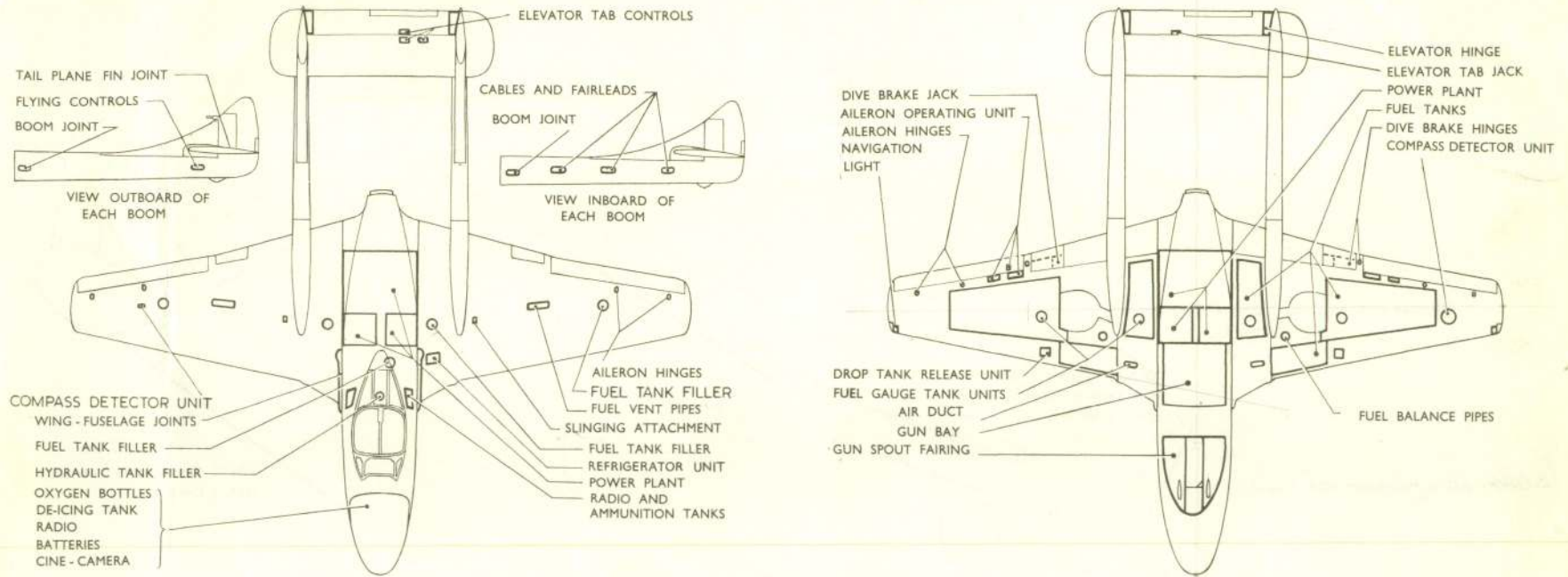


Fig. 2 Access panels

The following are the angular measurements and tolerances for aircraft in service :-

Main plane incidence at Rib 3, port and stbd. ... Zero $\pm 10'$

Main plane incidence at Rib 10, port and stbd. ... Zero $\pm 24'$
- 10'

Max. permissible difference of incidence at Rib 10 between port and stbd. ... 20'

Mean incidence of Rib 10, port and stbd. ... Zero $\pm 18'$
- 10'

Tail plane incidence ... Zero $\pm 24'$
- 10'

Difference between mean incidence of Rib 10 and tail plane incidence ... + 24' - 14'

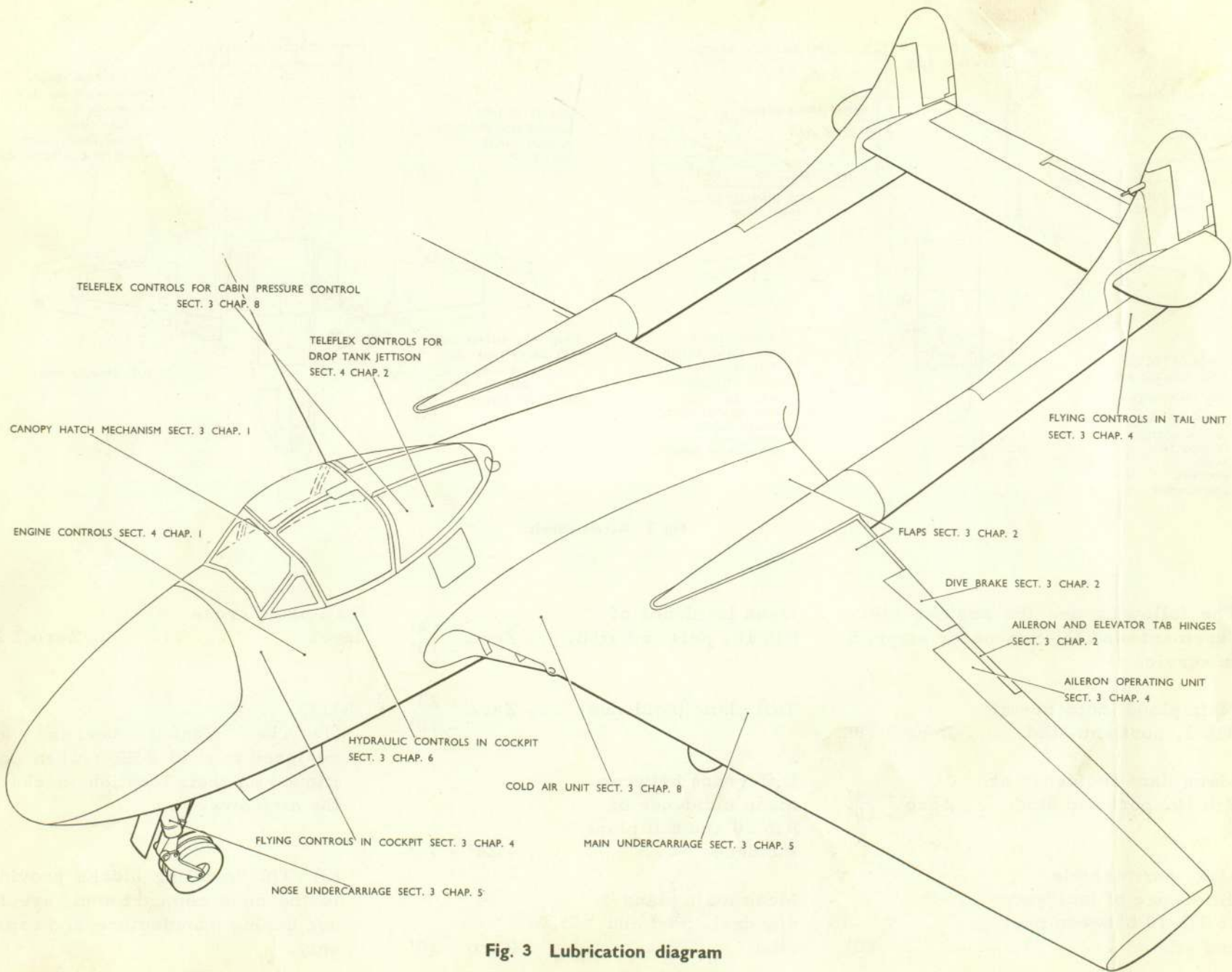
Mean main plane dihedral, port and stbd. ... Zero $\pm 10'$

Tail plane cross level ... Zero $\pm 24'$

NOTE ...
(1) The rigging boards are designed to read ZERO when positioned on their location marks on the airframe.

(2) The levelling blocks provided in the nose compartment, are for use during manufacture and repair only.

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Fig. 3 Lubrication diagram

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INTRODUCTION

1. The Vampire T Mk. 11 is a development of the Vampire NF Mk. 10 aircraft, having a modified pressurised cockpit to provide side-by-side accommodation for pupil and instructor, referred to in this volume as the 1st and 2nd pilot respectively. The 1st pilot is seated on the port side and is provided with a full set of controls, whilst the 2nd pilot, seated on the starboard side, is only provided with dual control for the principal flying and engine controls. The armament consists of two 20 mm. guns and R.P. and bombing equipment can be fitted.

2. The aircraft is fitted with Martin Baker Mk. 3B ejection seats.

3. The aircraft is powered by a D.H. Goblin Mk. 3 gas turbine engine, mounted on a tubular steel structure at the rear of the fuselage. In addition to driving the usual engine accessories, the impellor casing of the engine also provides the air supply for the pressurised cabin. The fuel is carried

in a single rigid fuselage tank, four flexible tanks in each wing and, when required, in two under wing drop tanks.

4. The fuselage or nacelle, which is oval in cross-section, is constructed in two shell halves of balsa sandwiched between plywood sheets. The halves are joined together along the top and bottom centre lines. The metal nose cap, the light-alloy engine cowlings and the jet pipe fairing are separate assemblies.

5. The main plane is a metal cantilever structure with one main spar, to which a false rear spar is joined by alclad ribs. The whole structure is covered with a light-alloy skin supported with spanwise stringers. Flaps, dive brakes and ailerons are hinged upon the rear spar of the main plane. Extending aft from each wing is a metal tail boom, the front portions of which are integral with the wing structure. The fins are an integral part of the rear end of each tail boom and support the

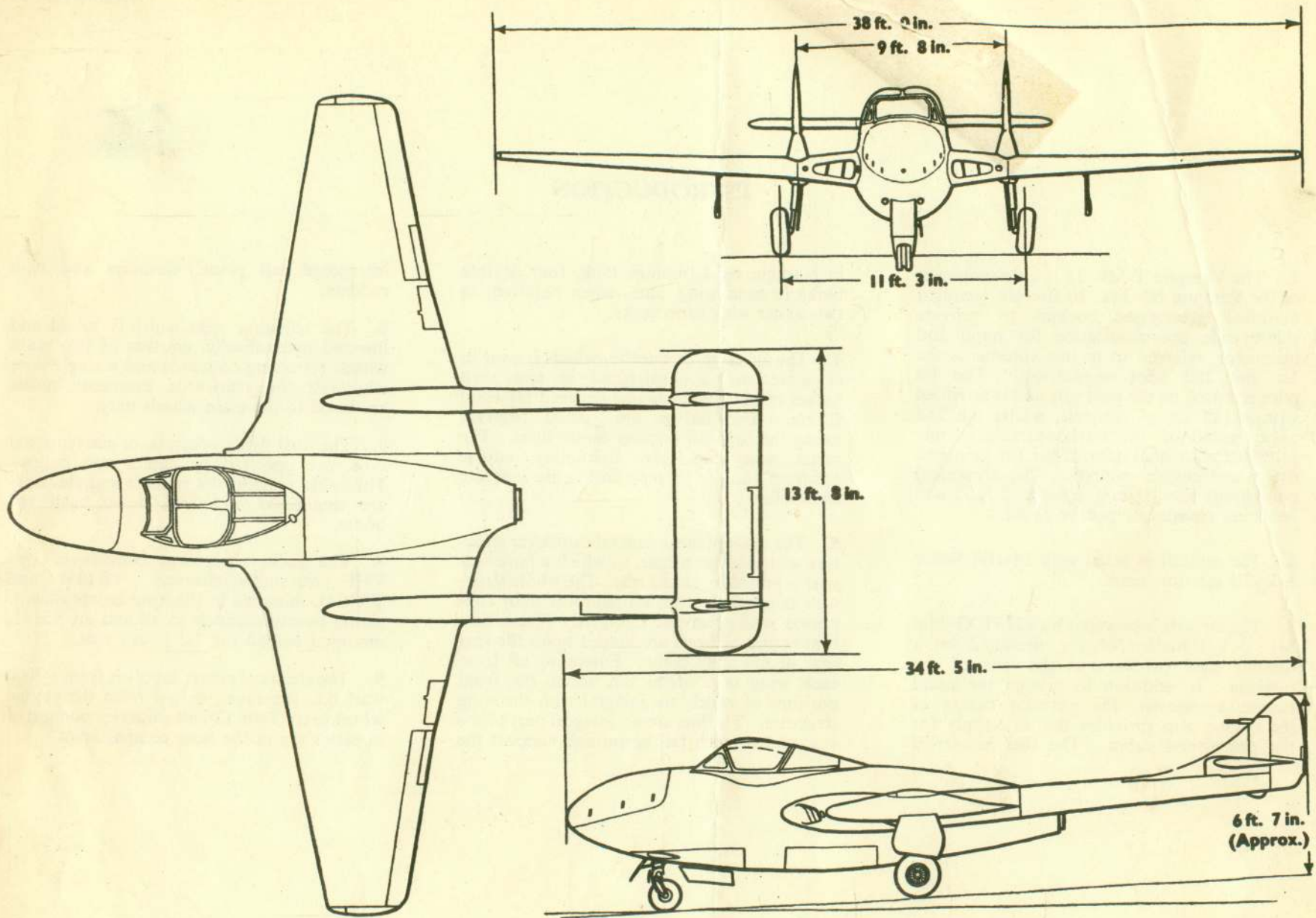
interposed tail plane, elevators and twin rudders.

6. The alighting gear which is raised and lowered hydraulically, consists of two main wheels retracting outwards and a single nose wheel retracting rearwards. Pneumatic brakes are fitted to the main wheels only.

7. The dual flying controls, of conventional type, are operated by cables and pulleys. The cable runs for the rudders and elevators are duplicated and lead down each tail boom.

8. The radio equipment consists of two VHF transmitter-receivers, TR1934 and TR1935, mounted in the nose compartment, giving twenty channels in all and an R3121, mounted behind the 1st pilot's seat.

9. The electrical power supply is from a 3000 watt d.c. generator, driven from the engine wheelcase. Two 12-volt batteries connected in series are in the nose compartment.



General Arrangement

RESTRICTED

May, 1957

AIR MINISTRY

Air Publication 4099J
Volume 1

VAMPIRE T MK.11 AIRCRAFT

ADVANCE INFORMATION LEAFLET NO.1/57

Note.- This leaflet is to be inserted in its correct numerical order following the Marker Card for Advance Information Leaflets at the beginning of the book.

FUEL CONTENTS SYSTEM

1. Cases have been reported where the ingress of fuel and moisture into the Pacitor unit has caused the incorrect reading of the fuel gauge.
2. Where an incorrect reading has been observed, it is advisable to check all tank units for the serviceability of the seal between the unit and the tank flange.
3. Where any sign of fuel leakage or delamination of the gasket is found, renew the gasket using material Hallite Aero D.T.D. 368A, Stores Ref. 32B/689, plain. No sealant is necessary.
4. Before the tank unit is replaced, the unit should be checked for insulation resistance and capacity.

The insulation resistance, when using a 250-volt insulation resistance tester, should not be less than 3 megohms.

The capacity test of the tank unit should be carried out using a Pacitor test set, Stores Ref. 6C/962, and the following capacity values obtained.

Vampire Aircraft - Tank Units

Part No.	G.P.352-059	Capacity (pFs)	159-147
Part No.	G.P.352-058	Capacity (pFs)	106-98
Part No.	G.P.352-057	Capacity (pFs)	86-80

5. Seal the tank connector cable after connection, using Boscoprene No.2100 (without hardner) around the milled nut and replace the rubber sleeve.
6. When replacing the access panel to the wing, use Boscoprene No.2100 (without hardner).

Z.14350.R.

R E S T R I C T E D

TABLE 2

Typical service loads, with two 20 mm. guns

Note ref.	Item no.	Items of removable military load	No. off	Role 1 Clean aircraft			Role 2 Clean aircraft with R.P.s and drop tanks			Role 3 Clean aircraft with practice bombs			Role 4 Clean aircraft with 500 lb. bombs			Role 5 Clean aircraft with 1000 lb. bombs			
				Weight (lb.)	Arm (ft.)	Moment (lb.ft.)	Weight (lb.)	Arm (ft.)	Moment (lb.ft.)	Weight (lb.)	Arm (ft.)	Moment (lb.ft.)	Weight (lb.)	Arm (ft.)	Moment (lb.ft.)	Weight (lb.)	Arm (ft.)	Moment (lb.ft.)	
1	ARMAMENT																		
	18	Bomb carrier and fairing	2	—	—	—	—	—	—	139	0-00	0	80	0-00	0	80	0-00	0	
	19	Bombs, 500 lb. ...	2	—	—	—	—	—	—	—	—	1050	-0-27	-284	—	—	—		
	20	Bombs, 1000 lb. ...	2	—	—	—	—	—	—	—	—	—	—	—	2160	-0-225	-486		
	21	Bombs, practice... ..	8	—	—	—	—	—	—	200	0-00	0	—	—	—	—	—		
	22, 23	Rocket projectors, Mk. 8	4Sets	—	—	—	28	+1-68	+47	—	—	—	—	—	—	—	—	—	
	24	Rocket projectiles, 60 lb. head	8	—	—	—	784	-0-45	-353	—	—	—	—	—	—	—	—	—	
	25	Cartridges, 20 mm. Hispano	300	188	-3-00	-564	188	-3-00	-564	188	-3-00	-564	188	-3-00	-564	188	-3-00	-564	
	AUXILIARY FUEL TANKS																		
	26	Under-wing drop tanks (100 gall. capacity) ...	2	—	—	—	150	+0-90	+135	—	—	—	—	—	—	—	—	—	
2	CREW																		
	27	1st Pilot	1	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359	
28	2nd Pilot	1	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359		
	TOTAL ROLE EQUIPMENT PLUS CREW				632	—	-3282	1594	—	-3453	971	—	-3282	1762	—	-3566	2872	—	-3768
	FUEL (at 8-0 lb./gall)																		
29	Fuselage tank	96 gall.	768	-1-30	-998														
30	Stub-wing tanks	106 gall.	848	+2-23	+1891														
31	L/E tanks	39 gall.	312	-0-80	-250														
32	Inboard wing tanks	47 gall.	376	+2-10	+790		(As role 1)				(As role 1)			(As role 1)			(As role 1)		
33	Outboard wing tanks	42 gall.	336	+2-10	+706														
	TOTAL INTERNAL FUEL				2640	—	+2139	2640	—	+2139	2640	—	+2139	2640	—	+2139	2640	—	+2139
34	Fuel in drop tanks 200 gall.				—	—	—	1600	+0-794	+1270	—	—	—	—	—	—	—	—	
	TOTAL ROLE EQUIPMENT PLUS CREW AND FUEL				3272	—	-1143	5834	—	—44	3611	—	-1143	4402	—	-1427	5512	—	-1629
	BASIC WEIGHT from Table No. 1				7726	+0-171	+1319	7726	+0-171	+1319	7726	+0-171	+1319	7726	+0-171	+1319	7726	+0-171	+1319
	A.U.W.				10 998	+0-016	+176	13 560	+0-094	+1275	11 337	+0-016	+176	12 128	-0-009	-108	13 238	-0-023	-310

Note . . . (1) Bomb carrier weight for role 3 includes light series carrier and adapter.

(2) Crew weight includes:— Pilot and parachute 200 lb.
Emergency oxygen 4 lb.
Dinghy, Type K 18 lb.

Total 222 lb.

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Appendix 2

LOADING DATA FOR AIRCRAFT WITH FOUR GUNS

(Completely revised)

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Typical service loads	3
Effect of modifications	4

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Loading restrictions	5
Examples on the determination of the C.G. position	6

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Effect of modifications

4. Refer to App. 1, para. 4 and 5 for the effect of modifications common to aircraft fitted with either two or four guns.

Loading restrictions

5. The restriction given in App. 1, para. 6 for aircraft with two guns does *not* apply when four guns are fitted owing to the forward C.G. shift due to the additional two guns. Refer to the notes at the foot of Table No. 2 for the restriction on ammunition load for roles 2 and 5.

Examples on the determination of the C.G. position

6. The most forward possible C.G. occurs when the aircraft is loaded to role 4 as shown in Table No. 2 when fuel has been consumed to approx. 21 gall. (Point A in Chap. 3, fig. 2).

	Weight (lb.)	Moment (lb.ft.)
A.U.W., role 4 from Table No. 2	12 325	+ 1
Deduct internal fuel	-2640	-2139
Add fuel (to Point A in Chap. 3, fig. 2)	+ 168	- 218
Totals	9853	-2356

C.G. position = $\frac{-2356}{9853} = -0.239$ ft.
(0.172 S.M.C.)

This is within the range quoted in Chap. 3, para. 4.

7. The most aft possible C.G. occurs when the aircraft carries rocket projectors and full drop tanks only (*i.e.*, role 2 as shown on Table No. 2, less expendable stores). The most aft C.G. in this condition occurs at take-off with full tanks.

	Weight (lb.)	Moment (lb.ft.)
A.U.W., role 2 from Table No. 2	13 607	+1834
Deduct R.P.s	- 784	+ 353
Deduct ammunition	- 225	+ 675
Totals	12 598	+2862

C.G. position = $\frac{+2862}{12 598} = +0.228$ ft.
(0.240 S.M.C.)

This is within the range quoted in Chap. 3, para. 4.

8. The ferrying C.G. position occurs in an aircraft with full drop tanks but without Service fit items marked with asterisks in Table No. 1.

	Weight (lb.)	Moment (lb.ft.)
A.U.W., role 1 from Table No. 2	11 195	+ 285
Deduct ammunition	- 375	+1125
Add drop tanks	+ 150	+ 135
Add drop tank fuel	+1600	+1270
Deduct Service fit items	- 81	+ 386
Totals	12 489	+3201

Ferrying C.G. position = $\frac{+3201}{12 489} = +0.257$ ft.
(0.244 S.M.C.)

Introduction

1. This Appendix gives the loading data for the Vampire T Mk. 11 aircraft fitted with four 20 mm. Hispano guns. General information and limitations, irrespective of the modification standard and the numbers of guns fitted, are contained in Chap. 3 of this Section.

Note . . .

The following fuels are cleared for use in the aircraft:—

Fuel	Density (lb./gall.)
AVTAG	7.7
AVTUR	8.0
AVCAT	8.3

The fuel weights given in para. 6 to 8 and Table No. 2 refer to AVTUR, and must be adjusted when another fuel is used.

Tare weight

2. The tare weight given on Table No. 1 includes all fixed fittings and equipment not listed in the Table, and conforms with the basic modification standard defined by Chap. 3, para. 6.

Typical service loads

3. Items of removable equipment common to all roles are listed in Table No. 1. Removable equipment items, crew and fuel to complete the various roles are given in Table No. 2. In each Table, the numbers in the column headed "Item No." are the key to the numbered spots in Chap. 3, fig. 1.

9. The above examples show the extreme C.G. positions obtainable with any permissible combination of ammunition and external stores on aircraft with full Service equipment as listed in Table No. 1 and in the modification condition defined in para. 2, with ONE PILOT. Further correction to the examples given, in accordance with instructions given in Chap. 3, para. 7 and 8, and para. 4 of this Appendix, will determine the extreme C.G. positions obtainable in service for the particular aircraft or group of aircraft under consideration.

Load restrictions when 2nd Pilot is carried

10. The typical loads given in Table No. 2 and the examples showing the most forward and most aft C.G. positions in para. 6 to 9 refer to the aircraft with ONE PILOT. If the 2nd Pilot is added to the loads given in Table No. 2, the following restrictions (which replace those given in Notes 3 and 4 in the Table) must be observed in order that either the forward C.G. limit given in Chap. 3, para. 4, or the A.U.W. limits given in Chap. 3, para. 5 are not exceeded:—

(a) *Role 1, clean aircraft*

Ammunition must not be carried, *i.e.*, permissible ammunition load = ZERO rounds (restricted by forward C.G. limit).

(b) *Role 2, clean aircraft plus R.P.s and drop tanks*

Ammunition must NOT be carried, *i.e.*, permissible ammunition load = ZERO rounds (restricted by both A.U.W. and forward C.G. limits).

Note . . .

R.P.s may only be carried if drop tanks are fitted (restricted by forward C.G. limits).

(c) *Role 3, clean aircraft plus practice bombs*

Ammunition must NOT be carried, *i.e.*, permissible ammunition load = ZERO rounds (restricted by forward C.G. limit).

(d) *Role 4, clean aircraft plus 500 lb. bombs*

Ammunition must NOT be carried, *i.e.*, permissible ammunition load = ZERO rounds (restricted by forward C.G. limit).

(e) *Role 5, clean aircraft plus 1000 lb. bombs*

Ammunition must NOT be carried, *i.e.*, permissible ammunition load = ZERO rounds (restricted by both A.U.W. and forward C.G. limits).

TABLE 1

Basic weight, with four 20 mm. guns

Note ref.	Item no.	Item	No. off	Weight (lb.)	Arm (ft.)	Moment (lb.ft.)
(1)	1	Armament				
	2	Guns, Hispano 20 mm., Mk. 5, No. 2	4	342.0	- 3.28	-1121
	3	Belt feed mechanism, Mk. 5	4	54.0	- 2.84	-153
(2)	4	Firing units, Maxiflux, Mk. 2	4	16.6	- 1.99	- 33
	5	Accessories, guns	4 sets	52.5	- 4.80	-252
		Gyro gunsight, Mk. 5	2	18.5	- 7.02	-130
	36*	Electrical Torches, Type O	2	1.5	- 6.0	- 9
	6*	Instrument Clock, Mk. 4	1	0.5	- 7.74	- 4
(3)	8*	Camera, G.45B and accessories	1	7.3	-12.33	- 90
(4)	9*	G.G.S. recorder, Mk. 3 and accessories	1	2.2	- 7.02	- 15
	10	Oxygen, charge for cylinders	4	9.4	-10.53	- 99
	12*	Miscellaneous First aid outfit, A.P.3130	1	3.0	- 3.50	- 11
	13	Radio V.H.F. trans.-rec. T.R.1934 or T.R.1985	1	27.0	-10.21	-276
	13	V.H.F. trans.-rec. T.R.1935 or T.R.1986	1	27.0	-10.21	-276
	14	V.H.F. control unit, Type 382	2	1.2	- 7.84	- 9
	15*	I.F.F. rec. R.3121	1	34.3	- 4.78	-164
	16*	I.F.F. control unit, Type 89	1	0.7	- 6.50	- 5
	17*	I.F.F. control unit, Type 90	1	1.1	- 4.73	- 5
	37	Rebecca Mk. 7, aerial, Type 90	4	9.0	- 5.50	- 50
	38	Rebecca Mk. 7, aerial, Type 91	2	2.4	- 5.40	- 13
	39*	Rebecca Mk. 7, trans.-rec. T.R.3708	1	30.8	- 2.70	- 83
	40	Rebecca Mk. 7, control unit, Type 909	1	2.6	- 7.80	- 20
	41	Rebecca Mk. 7, junction box 4527	1	2.6	- 3.70	- 10
	42	Rebecca Mk. 7, meter range and head	1	1.2	- 7.80	- 9
		TOTAL REMOVABLE MILITARY LOAD ITEMS COMMON TO ALL ROLES		647	-	-2837
	35	TARE WEIGHT		7311	+0.474	+3467
		BASIC WEIGHT		7958	+0.079	+630

Note . . .

- (1) Gun weight includes rack operating lever.
- (2) Gun accessories comprise ammunition chutes, empty case and link chutes, blast tubes, magazine stay tubes, and cocking unit.
- (3) Camera and accessories comprise camera, adapter, mounting and side covers.
- (4) Recorder and accessories comprise recorder and magazines.
- (5) Items marked * are "Service Fit" and are not available for fitment to aircraft prior to delivery.

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TABLE 2
Typical service loads, with four 20 mm. guns

Note ref.	Item no.	Items of removable military load	No. off	Role 1 Clean aircraft			Role 2 Clean aircraft with R.P.s and drop tanks			Role 3 Clean aircraft with practice bombs			Role 4 Clean aircraft with 500 lb. bombs			Role 5 Clean aircraft with 1000 lb. bombs		
				Weight (lb.)	Arm (ft.)	Moment (lb. ft.)	Weight (lb.)	Arm (ft.)	Moment (lb. ft.)	Weight (lb.)	Arm (ft.)	Moment (lb. ft.)	Weight (lb.)	Arm (ft.)	Moment (lb. ft.)	Weight (lb.)	Arm (ft.)	Moment (lb. ft.)
1	18	ARMAMENT																
	19	Bomb carrier and fairing	2	—	—	—	—	—	—	139	0-00	0	80	0-00	0	80	0-00	0
	20	Bombs, 500 lb. ...	2	—	—	—	—	—	—	(Note 1)	—	—	1050	-0-27	-284	—	—	—
	21	Bombs, 1000 lb. ...	2	—	—	—	—	—	—	—	—	—	—	—	—	2160	-0-225	-486
	22, 23	Bombs, practice... Rocket projectors, Mk. 8	8 4Sets	—	—	—	—	—	—	200	0-00	0	—	—	—	—	—	—
3, 4	24	Rocket projectiles, 60 lb. head ...	8	—	—	—	28	+1-68	+47	—	—	—	—	—	—	—	—	—
	25	Cartridges, 20 mm. Hispano ...	8	375 (600 rounds)	-3-00	-1125	784 225 (360 rounds)	-0-45 -3-00	-353 -675	375 (600 rounds)	-3-00	-1125	375 (600 rounds)	-3-00	-1125	225 (360 rounds)	-3-00	-675
2	26	AUXILIARY FUEL TANKS Under-wing drop tanks (100 gall. capacity) ...	2	—	—	—	150	+0-90	+135	—	—	—	—	—	—	—	—	—
	27	CREW 1st Pilot ...	1	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359	222	-6-12	-1359
5	28	2nd Pilot ...	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
		TOTAL ROLE EQUIPMENT PLUS CREW		597	—	-2484	1409	—	-2205	936	—	2484	1727	—	-2768	2687	—	-2520
	29	FUEL (at 8-0 lb./gall) Fuselage tank 96 gall.		768	-1-30	-998												
	30	Stub-wing tanks 106 gall.		848	+2-23	+1891												
	31	L/E tanks 39 gall.		312	-0-80	-250		(As role 1)			(As role 1)			(As role 1)			(As role 1)	
	32	Inboard wing tanks 47 gall.		376	+2-10	+790												
	33	Outboard wing tanks 42 gall.		336	+2-10	+706												
		TOTAL INTERNAL FUEL 330 gall.		2640	—	+2139	2640	—	+2139	2640	—	+2139	2640	—	+2139	2640	—	+2139
	34	Fuel in drop tanks 200 gall.		—	—	—	1600	+0-794	+1270	—	—	—	—	—	—	—	—	—
		TOTAL ROLE EQUIPMENT PLUS CREW AND FUEL ...		3237	—	-345	5649	—	+1204	3576	—	-345	4367	—	-629	5327	—	-381
		BASIC WEIGHT from Table No. 1		7958	+0-079	+630	7958	+0-079	+630	7958	+0-079	+630	7958	+0-079	+630	7958	+0-079	+630
		A.U.W.		11 195	+0-025	+285	13 607	+0-135	+1834	11 534	+0-025	+285	12 325	+0-000	+1	13 285	+0-019	+249

Note . . .

(1) Bomb carrier weight for role 3 includes light series carrier and adapter.

(2) Crew weight includes:—
 Pilot and parachute 200 lb.
 Dinghy, Type K 18 lb.
 Emergency oxygen 4 lb.
Total 222 lb.

(3) Ammunition load is limited to 360 rounds in role 2 by the A.U.W. limitation of 13610 lb. with drop tanks fitted or, if drop tanks are not carried, by the clean aircraft + R.P.s limitation of 11860 lb. (Chap. 3, para. 5).

(4) Ammunition load is limited to 360 rounds in role 5 by the A.U.W. limitation of 13290 lb. with bombs (Chap. 3, para. 5).

(5) If the 2nd Pilot is added to the above loadings, the restrictions on ammunition load given in para. 10 must be observed.

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