Chapter 3A

LOADING AND C.G. DATA

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General

1. It is essential that the loading of an aircraft be kept within the limitations of the approved C.G. range and the all up weight. So far as the C.G. range of this aircraft is concerned only the fore-and-aft location of C.G. need be calculated. To determine the C.G. position the aircraft is considered standing with the fuselage datum horizontal and the undercarriage down. Reference should be made to ◀ A.P.119W–0001–1 for general information on ▶ aircraft loading.

Datum point

2. This is the foremost face of a spigot hole situated in the wheel bay on the fuselage skin just forward of the undercarriage door hydraulic jack. This fixed point is located 19 inches aft of the main spar frame and 4 inches below the fuselage datum.

Weight limitations

3. The weight limitations are as follows:-

(1) *Clean.* The maximum permissable all-up weight of the clean aircraft for take-off and all forms of flying is 17 000 lb.

(2) *With External Stores.* When carrying external stores, the maximum permissable all-up weight of the aircraft for take-off and all forms of flying is 20 800 lb.

(3) *Landing.* The maximum permissable landing weight of the aircraft (except in an emergency) is 16 250 lb.

Note . . .

Pilots are warned to exercise particular care when landing at this weight on rough or semi-prepared airfields, or in other conditions likely to create high undercarriage loads.

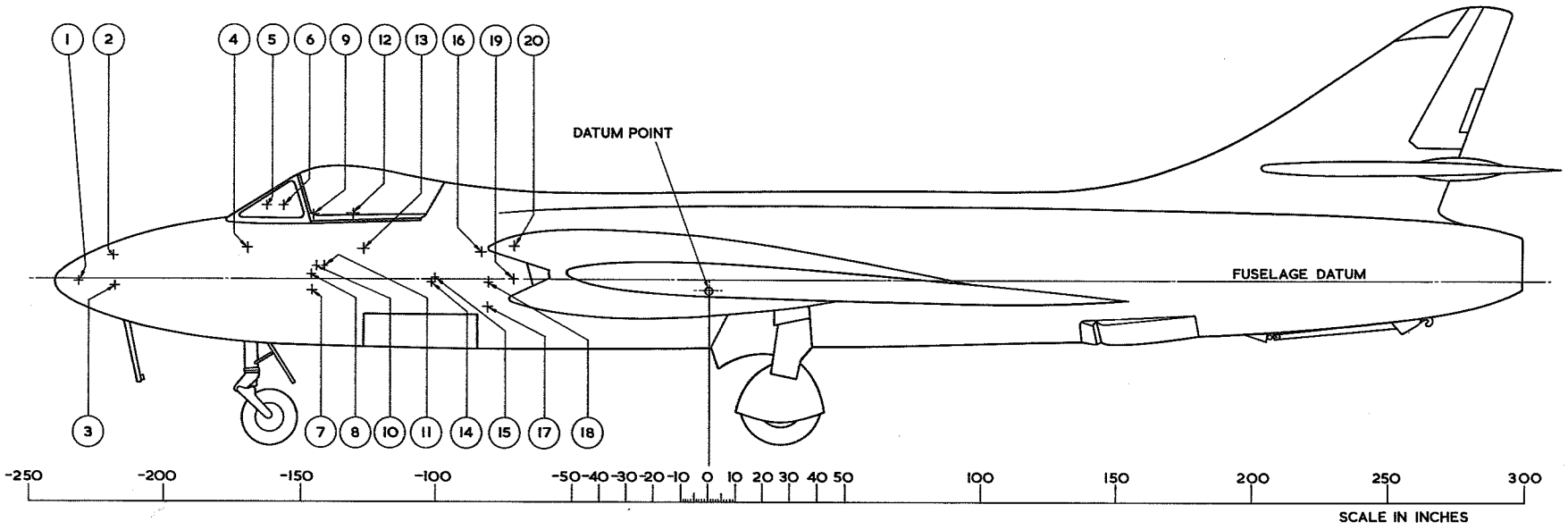

FIG. I. LOADING AND C.G. DIAGRAM
FOR TABLE I ONLY

TABLE 1 Removable equipment included in basic weight

Item No.	Ref.No.	Description	Weight (lb.)	Moment (lb.in.) −	+	
A.R.I.18124						
9	10L/9428543	Control unit, type C.1607	3.0	437		
19	10D/9428542	Trans/rec. unit, type 5	47.0	3 403		
A.R.I.23057						
17	5J/3458	Battery	17.0	1 387		
18	10D/20773	Trans/rec. unit, type T.R.10056	10.5	853		
A.R.I.18107 (Post mod.1009)						
8	10L/16324	Control unit, type 9273	1.7	248		
14	10D/22534	Coupling unit, type 9546	7.5	776		
15	5826/00/610/2395	Trans/rec. unit, type RT-220/HRN21	61.0	6 243		
or	5826/00/691/4896	Trans/rec. unit, type RT-220C/ARN21				
A.R.I.5848						
10	R-5895-238-2683	Control unit, type C.544/APX.6	1.5	217		
11	R-16-AN-C1272/ APA-89-R.5841-323-0226	Control unit, type C1272/APA-89	1.0	142		
16	R-16-AN-KY81-APA -89R.5841-569-1796	Coder unit, type KY81/APA-89	10.5	877		
20	R-5840-036-6952	Trans/rec. unit, type R.T.82/APX.6	38.0	2 717		
Miscellaneous equipment						
*1	14A/5557	F.95 Camera with 12" lens *(frontal)*	18.5	4 291		PR MK.11 only
2	14A/1380	Camera gun, G45	6.0	1 313		
3	14A/4984	Two F.95 Cameras with 4" lens *(lateral)*	32.0	7 037		P.R.MK.11 only
4	6A/2958	Clock Mk.4B	0.5	85		
or	6A/2089	Clock Mk.5ACA				
5	8B/3585	Gunsight Mk.5A	9.0	1 463		
6	14A/4196	Camera recorder	2.5	391		
7	27C/2557	Personal survival pack, type R	33.0	4 818		
	27C/2428	Seat cushion				
12	15A/1149	Parachute Assy, Back type Mk.36A	34.0	4 437		
13	12K/1314	Seat cartridges	1.0	127		

* Alternative F.95 Camera with 4" lens, weight 16.0 lb. with a moment of − 3 762 lb.in.

The figures opposite are typical but should be used only if the basic weight and moment record card, Form A.700 is out of date or inaccurate.

AIRCRAFT AT BASIC WEIGHT			
GA Mk.11	Pre-Mod.228	12 765	208 710
	Post Mod.228	13 320	152 510
PR.Mk.11		13 290	152 170

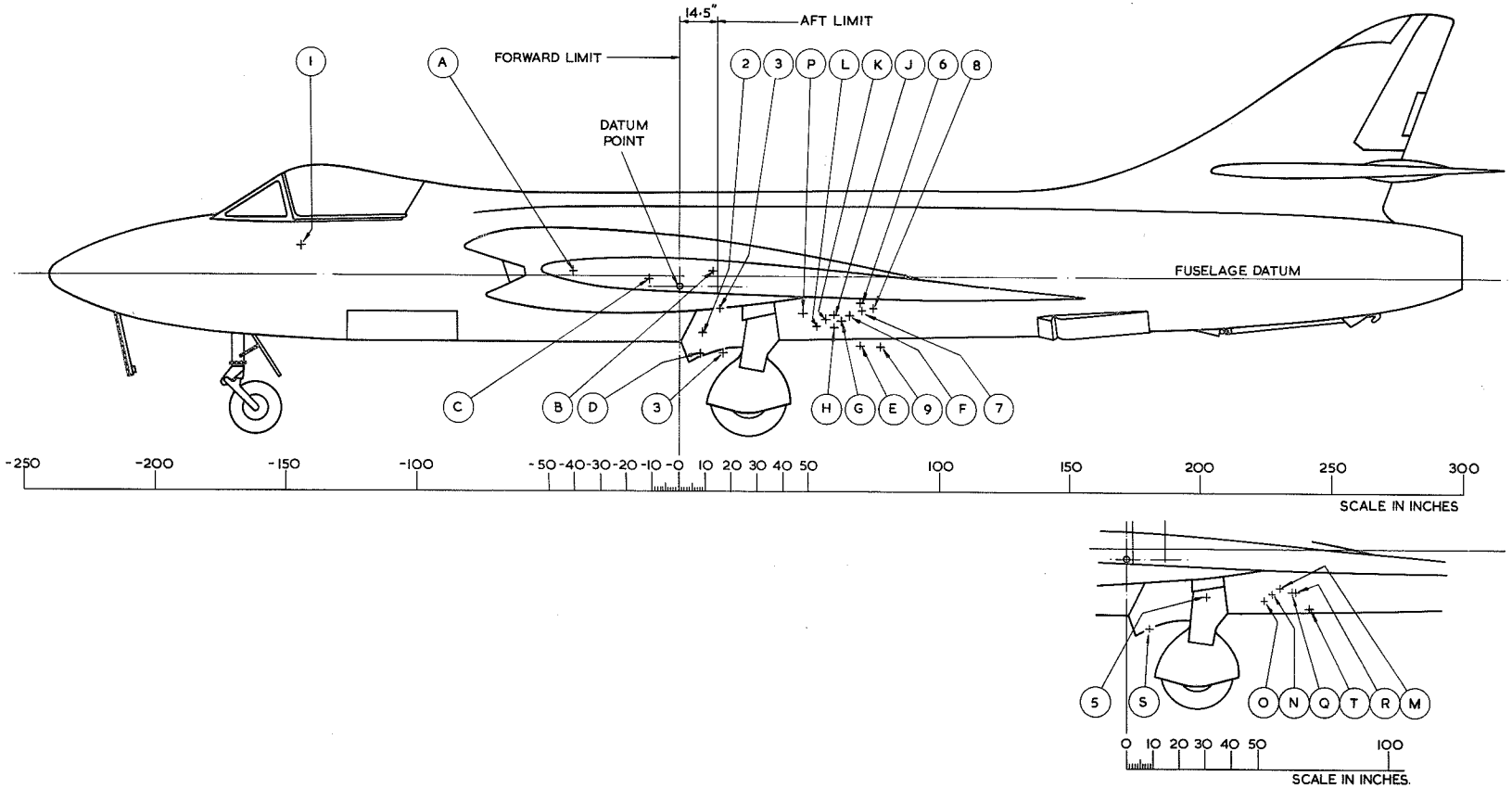

Fig.2 Loading and C.G. diagram for Tables 2 and 3

T.P.17789

TABLE 2 Operational load items

Item No.	Description	Weight (lb)	Arm (in.)	Moment (lb in.) –	Moment (lb in.) +
1	Pilot	180.00	–145.90	26 262	
2	Two light series carriers on inboard pylons	48.0	9.55		458
3	Two inboard pylons	118.0	15.80		1 864
4	Two 100 gal. drop tanks on inboard pylons	300.0	16.40		4 920
5	Spare starter cartridges in stowage	10.5	30.50		320
6	R.P. removable mountings, comprising:-	130.0	70.00		9 100
	Launchers 'A' (Outboard)	32.5	86.05		2 797
	Launchers 'B'	32.5	79.00		2 568
	Launchers 'C'	32.5	63.25		2 056
	Launchers 'D' (Inboard)	32.5	51.55		1 675
7	Two light series carriers on outboard pylons	48.0	70.40		3 379
8	Two outboard pylons	72.0	74.65		5 375
9	Two 100 gal. drop tanks on outboard pylons	300.0	77.25		23 175

TABLE 3 Expendable load items

Item Letter	Description	Weight (lb)	Arm (in.)	Moment (lb in.) –	Moment (lb in.) +
A	Fuel, front tanks (202 gal.)	1 555.0	–40.50	62 978	
B	Fuel, centre tanks (72 gal.)	554.0	13.30		7 368
C	Fuel, wing tanks (140 gal.), without drop tanks fitted	1 078.0	–11.50	12 397	
	Fuel, wing tanks (146 gal.), with inboard drop tanks fitted	1 124.0	–11.50	12 926	
	Fuel, wing tanks (150 gal.), with inboard and outboard drop tanks fitted	1 155.0	–11.50	13 283	
D	Overload fuel in 100 gal. inboard drop tanks (200 gal.)	1 540.0	8.80		13 552
E	Overload fuel in 100 gal. outboard drop tanks (198 gal.)	1 525.0	69.65		106 216
F	8 R.P. single tier, 12 lb head	376.0	65.75		24 722
G	16 R.P. double tier, 12 lb head	752.0	62.60		47 075
H	24 R.P. triple tier, 12 lb head	1 128.0	59.45		67 060
J	8 R.P. single tier, 18 lb head	424.0	59.55		25 249
K	16 R.P. double tier, 18 lb head	848.0	56.40		47 827
L	24 R.P. triple tier, 18 lb head	1 272.0	53.25		67 734
M	8 R.P. single tier, 25 lb head	480.0	58.45		28 056
N	16 R.P. double tier, 25 lb head	960.0	55.30		53 088
O	24 R.P. triple tier, 25 lb head	1 440.0	52.15		75 096
P	8 R.P. single tier, 60 lb head	760.0	47.55		36 138
Q	6 H.V.A.R. single tier 35 lb head	984.0	64.65		63 616
R	6 H.V.A.R. single tier 52 lb head	1 120.0	63.05		70 616
S	Four 25 lb practice bombs on inboard pylons	100.0	8.80		880
T	Four 25 lb practice bombs on outboard pylons	100.0	69.65		6 965

C.G. range

4. The approved limits of C.G. travel, measured parallel to the fuselage datum are 0 inches to 14.5 inches aft of the C.G. datum point.

◀ **Note . . .**

The aft limit (14·5 in. aft of the datum) as originally approved by A. & A.E.E. Boscombe Down was obtained by assuming that fuel was completely consumed. ▶

Operational notes

5.(1) *GA.Mk.11*

Quantities of ballast are located in the front fuselage in order to maintain the C.G. of the aircraft within the C.G. range. Aircraft capable of carrying R.P. or outboard drop tanks *(Post Mod.228)* are provided with additional ballast to compensate for these loads.

Note . . .

Under no circumstances should any of this ballast be removed.

(2) *PR.Mk.11*

When the cameras are removed, no compensating ballast is required when the aircraft is flown in the 'clean' condition or with drop tanks. If R.P. are carried with the cameras removed, it is essential that compensating ballast is fitted.

Changes in weight and moment due to modifications

6. When the modification state of an aircraft is changed, the appropriate aircraft basic weight and moment record card (Form A.700) should be amended in accordance with the weight and moment figures to be found in paragraph 12 of the relevant modification leaflet.

E.C.U. included in the given basic weight

7. The E.C.U. is an Avon Mk.12201 having an average weight of 2597 lb with a C.G. position 26.2 in. forward of engine C.G. datum.

Changes of E.C.U.

8. When an E.C.U. is changed, reference should be made to the appropriate Form 701B for its weight and C.G. position. If the Form 701B quotes two weights and two C.G. positions, the average figures are to be used for any aircraft weight and moment records.

The aircraft C.G. datum point is 97.2 in. forward of the engine C.G. datum point (the C.L. rear engine mounting trunnion), therefore the dimension for the C.G. of the E.C.U. must be subtracted from this dimension to obtain the moment for the aircraft C.G. datum, e.g.:-

Form 701B quotes 2629 lb /2565 lb

C.G.26.45 in./25.95 in. forward C.L. rear engine mounting trunnion.
Average weight 2597 lb
Average C.G. position 26.2 in forward.

Moment of E.C.U. weight about aircraft datum is:-

$$2597 \times (97.2 - 26.2) = 2597 \times 71.0$$
$$= 184387 \text{ lb in.}$$

In this manner it is possible to ascertain the weight difference and change in moment for a change of E.C.U. for inclusion in the information recorded on the Aircraft Basic Weight and Moment Record. (Form A.700).