Chapter 3 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 the C.G. need be calculated. To determine the C.G. position the aircraft is considered standing with the fuselage datum line horizontal and the undercarriage down. Reference should be made to A.P.4747A, 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. (1) *Clean.* The maximum permissible all-up weight of the clean aircraft for take-off and all forms of flying is 18 400 lb.

(2) *With external stores.* When carrying external stores, the maximum permissible all-up weight of the aircraft for take-off and all forms of flying is 25 000 lb.

(3) *Landing.* The maximum permissible landing weight of the aircraft (except in an emergency) is 18 500 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.

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, as illustrated on Fig. 2.

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.* ▶

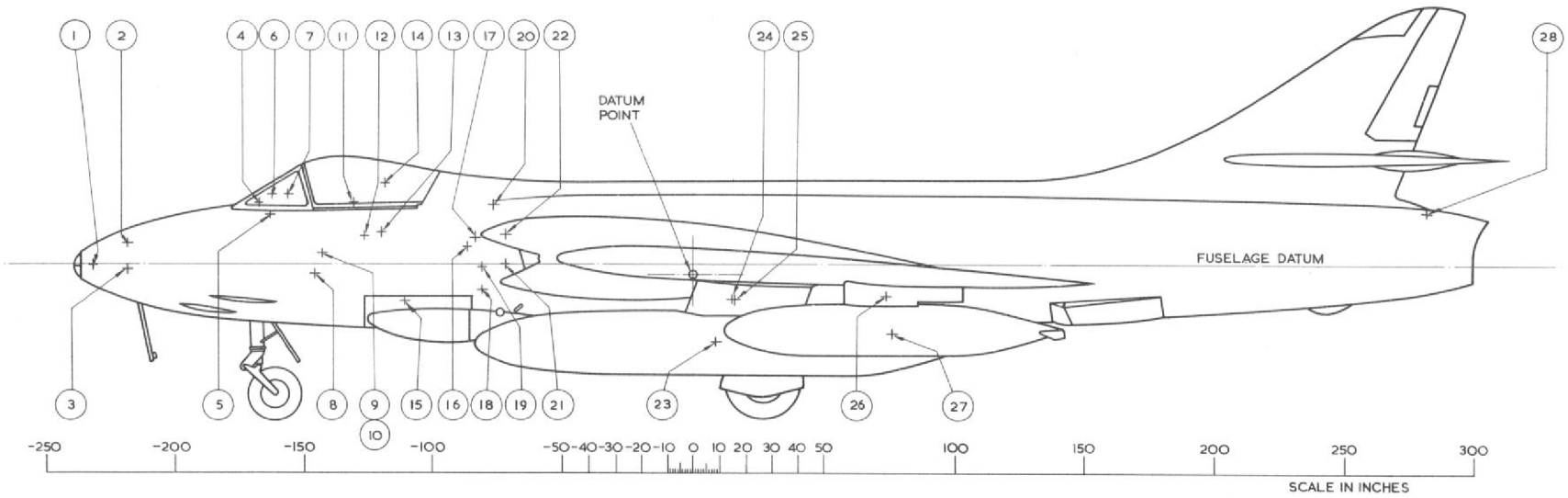

FIG. 1 LOADING AND C.G. DIAGRAM
FOR TABLE 1 ONLY.

TABLE 1
Removable equipment included in basic weight

Item No.	Ref. No.	Description	Weight (lb.)	Moment (lb. in.) −	+
A.R.I. 18124/1					
4	10L/9990839	Control unit, Type C.1607/2	3·0	503	
21	10D/9428542	Trans/rec. unit, Type 5	47·0	3 375	
A.R.I. 23057					
18	5J/3458	Battery	17·0	1 377	
19	10D/20773	Trans/rec. unit, Type T.R.10056	10·5	855	
A.R.I. 5848					
9	10L/16192	Control unit, Type 927	1·5	215	
10	16K–1660–036290585	Control unit, Type C.1128/APX-25	1·0	143	
17	16K–1660–036290932	Coder unit, Type KY-95A-APX-25	10·5	870	
22	10D/20334	Trans/rec. unit, Type T.R.4585	33·0	2 366	
A.R.I. 5877					
14	10U/17211	R.F. amplifier, Type 8281	5·0	590	
20	10U/17212	I.F. amplifier, Type 8282	9·0	693	

(Continued overleaf)

TABLE 1

Removable equipment included in basic weight (Contd.)

Item No.	Ref. No.	Description	Weight (lb.)	Moment (lb. in.) −	Moment (lb. in.) +
Miscellaneous equipment					
1	14A/5557	F.95 camera with 12″ lens (frontal)	18·5	4 291	
2	14A/4929 or 14A/4981	Camera gun, G90	4·0	880	
3	14A/4984	Two F.95 cameras with 4″ lens (lateral)	32·0	7 037	
5	6B/9101001	Stop watch	0·5	82	
6	8B/3593	Gunsight, Mk. 8	9·0	1 463	
7	14A/4196	Camera recorder	2·5	391	
8	27C/2319 or	Survival pack, Type Q c/w seat cushion 15A/729 (Pre ejection seat Mod. 421)	33·0	4 818	
	27C/2393 or	Survival pack, Type R c/w seat cushion 27C/2428 (Post ejection seat Mod. 421)			
	27C/2228	Survival pack, Type J (Pre Mod. 282)			
11	15A/671 or	Parachute assembly, back type Mk. 9 c/w Back pad 15A/780 (Post Mod. 282)	34·0	4 437	
	15A/684	Parachute assembly, back type Mk. 13 (Pre, Mod. 282)			
12	12K/1300	Seat cartridges	1·0	127	
13	27C/2380–1	Survival packs (Mod. 847)	14·0	1 659	
15		Guns and accessories	827·4	91 301	
16	10U/17479	Voice recorder unit	10·0	865	
23		Two 230 gal. drop tanks on inboard pylons	500·0		4 200
24		Two inboard pylons	130·0		2 054
25		Side struts for 230 gal. drop tanks	16·0		◀ 256 ▶
26		Two outboard pylons	72·0		5 375
27		Two 100 gal. drop tanks on outboard pylons	300·0		23 175
28	15D/732	Brake parachute, Type L.B. 52 Mk. 3	12·0		3 384

AIRCRAFT AT BASIC WEIGHT 15 381 lb Moment 253 293 lb. in.

(These are typical figures and should only be used if the basic weight and moment record card, R.A.F. Form 4908, is out of date or inaccurate).

Operational note

5. When external link collectors are fitted, the weight of 540 retained links is 67·5 lb. with a load arm of −98·75 in. (Moment −6 666 lb. in.). In all C.G. calculations which allow for the expenditure of ammunition the effect of these retained links must be taken into consideration.

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 (R.A.F. Form 4908) should be ammended in accordance with the weight and moment figures to be found in paragraph 12 of the relevant modification leaflet.

E.C.U. included in given basic weight

7. The E.C.U. is an Avon Mk. 20701 having an average weight of 2883 lb. with a C.G. position 21·58 in. aft of engine C.G. datum (centre line of front suspension).

Changes of E.C.U.

8. When an E.C.U. is changed, reference should be made to the appropriate Form 1125 for its weight and C.G. position. If the Form 1125 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 51·05 in. forward of the engine C.G. datum point, therefore this dimension must be added to the dimension for the C.G. of the E.C.U. to obtain the moment for the E.C.U. weight about the aircraft C.G. datum, e.g.:—

Form 1125 quotes :—

> 2847/2919 lb. C.G. 21·33 in./21·83 in. aft of centre line front suspension. Average weight 2883 lb. Average C.G. position 21·58 in. aft.

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

> 2883 × (21·58 + 51·05) = 2883 × 72·63 = 209392 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 (R.A.F. Form 4908).

Note . . .

> *It is known that twenty five Forms 1125 were issued prior to 27.11.59 for Avons Mk. 20701, quoting weight 2892/2964 lb. with C.G. 21·15 in./21·65 in. aft of centre line front suspension. These figures do not represent the actual weights of the first twenty five engines. They are quoted under existing Engine Design Memorandum No. 25 procedure and are based on the type approval engine only. There is no procedure for the amendment of these weight figures and they should be ignored, the figure quoted in the above paragraph being assumed in lieu, i.e., when Form 1125 quotes weight 2892/2964 lb. with C.G. 21·15 in./21·65 in. aft, it is to be assumed that the E.C.U. weight is 2883 lb. with C.G. position 21·58 in. aft of centre line of front suspension.*

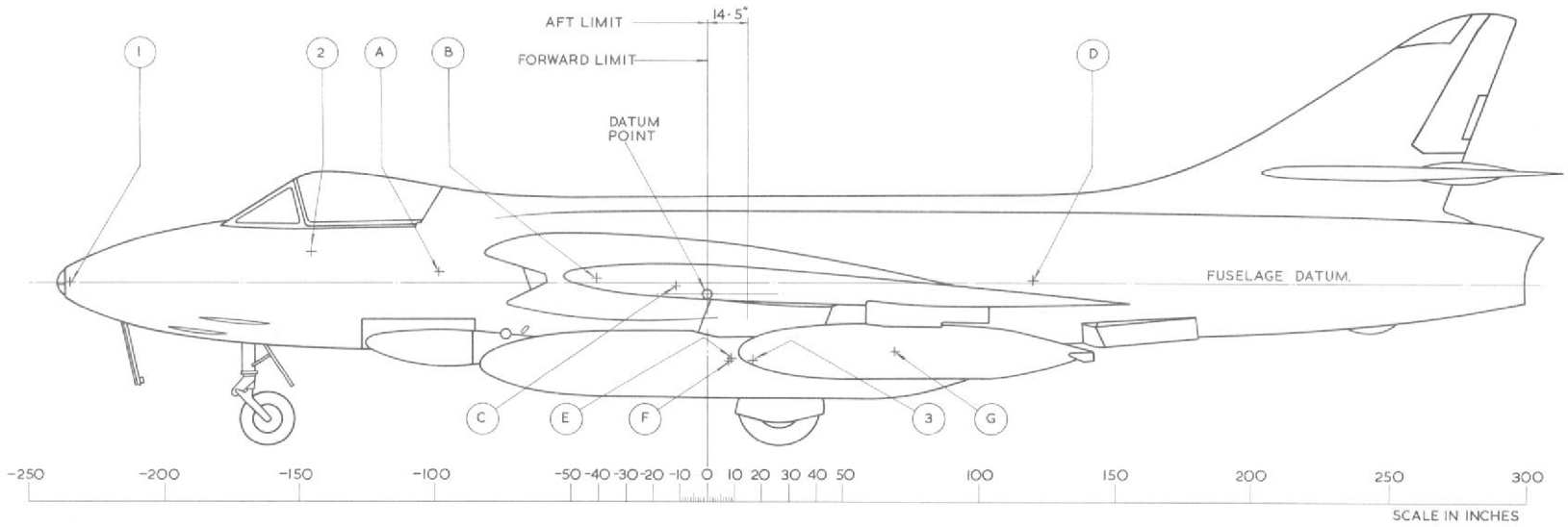

FIG. 2. LOADING AND C.G. DIAGRAM
FOR TABLES 2 & 3.

TABLE 2

Operational load items

Item No.	Description	Weight (lb.)	Arm (in.)	Moment (lb. in.) −	Moment (lb. in.) +
1	F.95 camera with 4″ lens (frontal)	16·0	−235·10	3 762	
2	Pilot	180·0	−145·90	26 262	
3	Two 100 gal. drop tanks on inboard pylons	300·0	16·40		4 920

TABLE 3

Expendable load items

Item Letter	Description	Weight (lb.)	Arm (in.)	Moment (lb. in.) −	Moment (lb. in.) +
A	Ammunition	582·00	−98·75	57 473	
B	Fuel, front tanks, (202 gal)	1 555·00	−40·50	62 978	
C	Fuel, wing tanks, (150 gal.)	1 155·00	−11·50	13 283	
D	Fuel, rear tanks	400·00	119·50		47 800
E	Overload fuel in 230 gal. inboard drop tanks (478 gal.)	3 681·00	8·80		32 393
F	Overload fuel in 100 gal. inboard drop tanks (200 gal.)	1 540·00	8·80		13 552
G	Overload fuel in 100 gal. outboard drop tanks (198 gal.)	1 525·00	69·65		106 216