

## INSTRUCTIONS FOR WEIGHT AND BALANCE

### OF THE SAILPLANE FAUVEL A.V.36.

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#### WEIGHT AND BALANCE

PAGE 1

The A. V. 36 having its pilot very close to the Cg can accommodate, in spite of its light weight, large variation of pilot weights (normally 120 lbs. to 198 lbs.),

However, ballasting becomes a requirement for pilots lighter than 120 lbs. The limits of Cg and corresponding ballasting are shown on a chart which must be placed. on the forward face of the cockpit fairing where it can be easily seen when changing pilot on the field.

#### Weights

With instruments and ready to fly, the empty weight of the sailplane must be between 235 lbs. and 258 lbs. with a maximum of 264 lbs.

#### Balance

In order to carry out weighing and balance, proceed as indicated on Sheet 6 using, level and triangle or use a plumb-line to check the main bulkhead position. Draw on the side of the fuselage a line parallel to the underside of the flat part of the ribs (i.e. perpendicular to the main bulkhead) and 30 m/m below the wing surface. Mark on this line the exact position of the wing spar forward face (this is also the forward face of the main bulkhead) and starting from this point (origin 0), mark one point at 130 m/m FWD (extreme aft limit of Cg) and one point at 180 m/m FWD (Practical FWD limit of Cg).

1. The sailplane being empty but fully equipped and proceeding as explained on Sheet 6, the Cg must remain within the limits of the wing spar thickness ( - thickness of main bulkhead) i.e. between 0 and 30 m/m aft of origin 0 defined above. The normal position of the Cg then should be 10 to 15 m/rm aft of point 0.

If the Cg falls within these limits (10 to 15 m/m), use ballast chart No. 1. If Cg falls close to 30 m/m, use ballast chart No. 2. If the Cg falls out of these limits, first check to see if nothing has been omitted or misplaced. If this is not the cause, it will be necessary to add a fixed ballast to bring the Cg within the limits.

(a) If the Cg is too far aft, i.e. farther than 30 m/m, install enough lead plates in the ballast box and attach them by means of a couple of countersunk head screws so that there will be no interference when installing other ballast plates. These fixed plates will not enter in the chart and it will be useful to paint them of a different color to avoid confusion.

(b) In the case where the Cg falls too far forward, lead plates of equal weight will be fitted below the lower fins and solidly attached in such a way that they do not modify the fairing lines.

2. Sailplane fully equipped, with pilot and parachute. The pilot well strapped in the seat. Measure the distance  $d$  between the forward bar and the Fwd. face of the spar.

The distance of the  $C_g$  to the Fwd. face of the spar is  $d-X$  where  $X = DP_2/(P_1 - P_2)$  as shown on Sheet 6

In the case (never advised) where the glider is flown without parachute, it is mandatory to place behind the pilot a cushion of the Same thickness as that of the parachute: i.e., about 10 cm(4"). This is most important with a light pilot and the ballasting table is established for pilots equipped with parachute.

NOTE 1.

The weight of the pilots as considered in the ballasting table consider him wearing average weight shoes. It can be seen that for a light glider of concentrated masses, the pilot's body is very close to the  $C_g$ . while his feet are relatively far away. In the case of the A.V. 36, the feet of the pilot are just aft of the blast box so that for the same pilot wearing either light sandals or ski boots (or rubber boots), the  $C_g$  will, be either equivalent to that of a 5 to 10 Kg (11 to 22 lbs.) lighter pilot or 5 to 10 Kg (11 to 22 lbs.) heavier pilot wearing average weight shoes.

Also a pilot leaning forward as far as he can will be equivalent to a 5 to 10 Kg (11 to 22 lbs.) heavier pilot. Then, a light pilot having neglected to ballast the glider before take-off will be able to alleviate the inconvenience by leaning forward as far he can even if in so doing he is less comfortable.

NOTE 2.

The method of locating the Coisitor by using a roller will give results only if the following precautions are taken.

- The roller should be on a cement floor checked for horizontality and the glider placed exactly perpendicular to it.
- The vertical position of the  $C_g$  must be known.
- The pilot must be aboard, in position and perfectly still.
- The whole operation to be made with great care.

This method will be considered only as an alternative to be used in such cases where an obviously light pilot ignores his weight and no scale is available. Reference will be taken on a parallel 30 m/m below the wing chord and the Cg shall fall within the prescribed limits 130 to 160 m/m forward of the front face of the wing spar.

A practical method consists of finding where the vertical falls by using a plumb-line. The string should pass both by the point marked on the fuselage as explained above and through the axis of the roller, when the glider stays in equilibrium.

#### REMARK

Since there is no problem of ballasting for pilots heavier than 57 Kg (125 lbs.) with clothing, the importance given to the lighter pilots may seem exaggerated since they are the only Ones concerned with this instruction. The reason of this is the fact that glider pilots start young (particularly in France) and are often very light. There is of course no reason put them in conditions less favorable than pilots of more standard weight.

#### NOTE 3

On sheet 6 of the file, is shown a method of determining the position of the Cg along the vertical. This position is not susceptible to vary appreciably and at any rate within limits which cannot be of any concern.

However, it would be useful for the designer of the A.V. 36 to know this position. He will therefore be grateful to those who will be kind enough to do carefully this determination and send him the results.

Also he will be grateful to those who will have weighed the components of the glider at the various stages of the construction and who will send him the results.

## BALLASTING TABLE

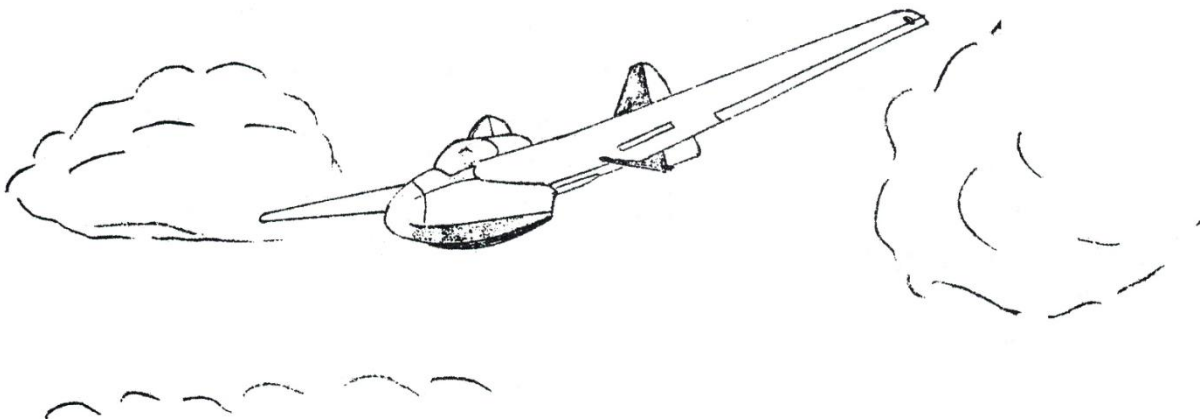
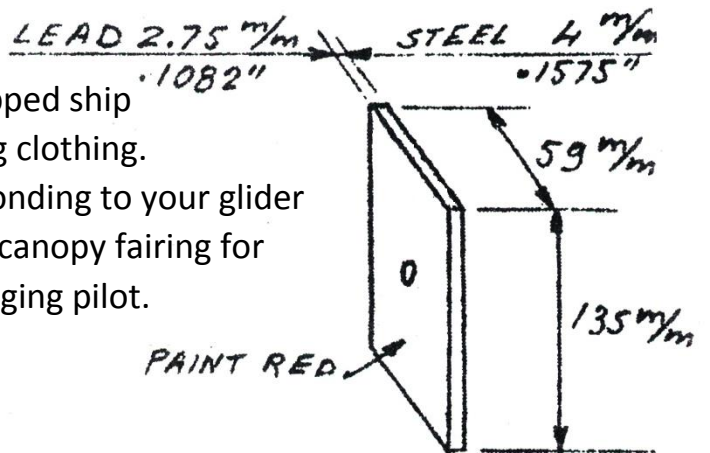
1 NORMAL CASE		
Empty. Cg at 10 to 15 m/m aft of front face of the spar		
Ballasting chart 1		
Pilot's weight	Number of lead	
	Pilot wearing:	
	Light shoes	Heavy shoes
125 lbs.	0	0
121 lbs.	2	1
110 lbs.	4	3
99 lbs.	6	5
88 lbs	9	7

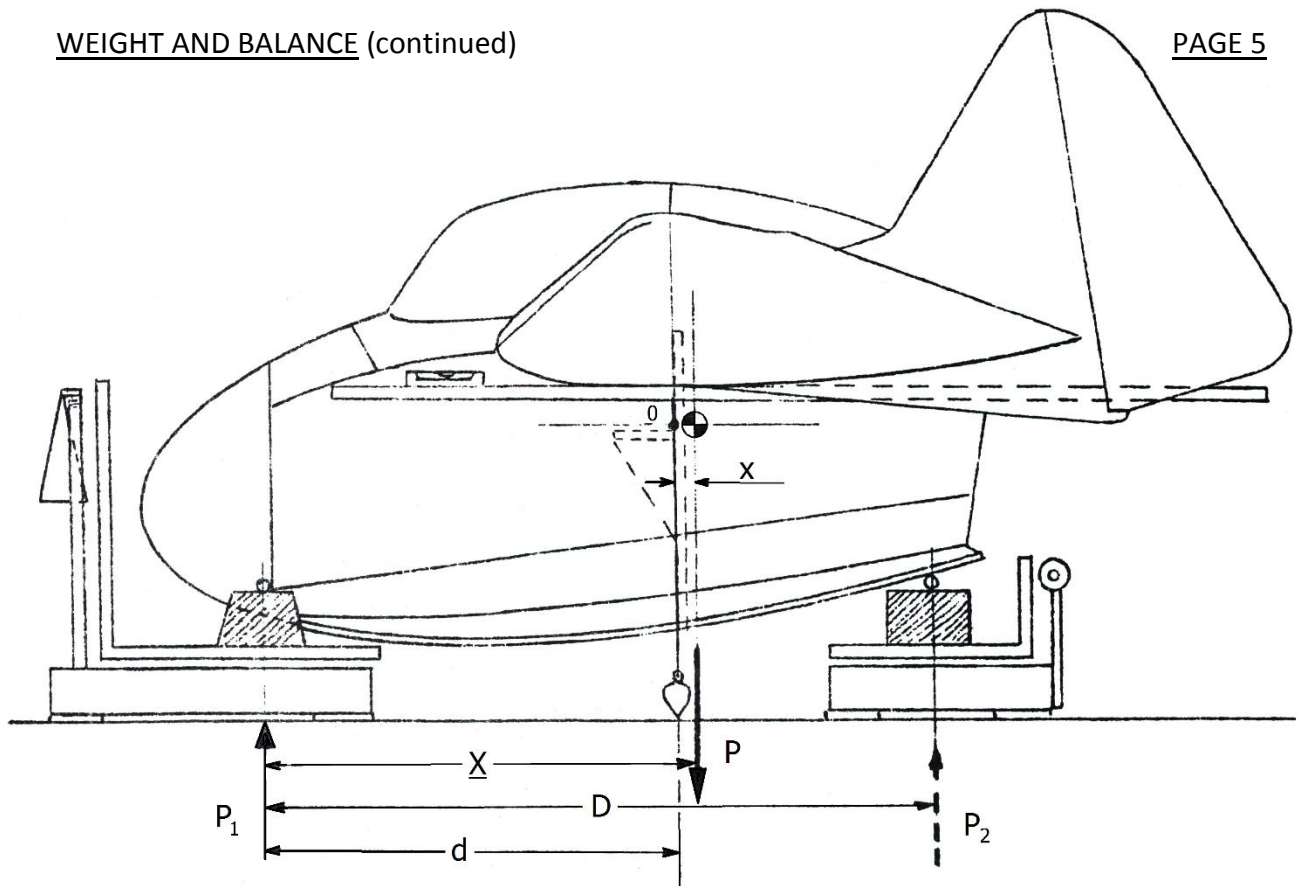
2 AFT CASE		
Empty. Cg at 30 m/m aft of the front face of wing spar		
Ballasting chart 2		
Pilot's weight	Number of lead	
	Pilot wearing:	
	Light shoes	Heavy shoes
198 lbs.	0	0
187	2	0
176	3	3
165	6	5
154	7	6
143	8	7
132	10	9
121	11	10
110	13	12
99	15	14
88	18	17

3 FORWARD CASE		
Empty. CG coincident with the front face of wing spar		
Ballasting chart 3		
Pilot's weight	Number of lead	
	Pilot wearing:	
	Light shoes	Heavy shoes
110 lbs.	0	0
99	2	1
88	5	4

**NOTE:**

1. Empty. Cg of fully equipped ship
2. Weight of pilot including clothing.
3. Place this table corresponding to your glider on the front face of the canopy fairing for easy reading when changing pilot.





- A. IT IS PREFERABLE FIRST TO WEIGH THE JACKING BLOCKS REQUIRED TO LEVEL OFF THE GLIDER ON THE SCALES. ALSO WEIGH PILOT AND GEAR, AND PARACHUTE (THE AVERAGE WEIGHT OF 75 KG. (165.347 LBS.) IS ACCEPTABLE FOR A PILOT PARACHUTE NOT INCLUDED.
- B. WRITE DOWN THE DISTANCES AND WEIGHTS MEASURED, AS OUTLINED ON DRAWING.

DATA:  $d$  FIXED DISTANCE BETWEEN THE CENTER AXIS OF THE LIFTING BAR THAT IS INSERTED IN THE RUDDER PEDAL TUBES AND THE PLAN OF THE FORWARD FACE OF THE LONGERON. POINT "O" AS DEFINED ON PAGE 1 OF THIS MANUAL AND SHOWN ABOVE.

$D$  DISTANCE BETWEEN AXIS OF THIS SAME BAR AND JACKING POINT AT REAR OF SKID ON THE SECOND BAR PLACED PERPENDICULAR TO AXIS OF GLIDER. MAKE SURE THAT DISTANCE "D" DOES NOT VARY WHILE CARRYING OUT THE ACTUAL WEIGHING.

$P_1$  WEIGHT RECORDED ON FRONT SCALE LESS WEIGHT OF JACKING BLOCK.

$P_2$  WEIGHT RECORDED ON REAR SCALE LESS WEIGHT OF JACKING BLOCK.

$$\underline{X} = \frac{D \times P_2}{P_1 + P_2} = \text{DISTANCE BETWEEN CENTER AXIS OF FRONT BAR AND THE VERTICAL OF THE C. OF G. TO BE PLOTTED ON THE REFERENCE LINE OF THE MEASUREMENTS INDICATED IN THE INSTRUCTION SHEET FOR WEIGHT AND BALANCE.}$$

C. Results: d = (CONSTANT)

a) COMPLETE LESS PILOT

D = \_\_\_\_\_

P<sub>1</sub> = \_\_\_\_\_

P<sub>2</sub> = \_\_\_\_\_

TOTAL WEIGHT = P<sub>1</sub> + P<sub>2</sub>

$$\underline{X} = \frac{D \times P_1}{Total\ Weight} \quad \underline{\hspace{2cm}}$$

X - d = \_\_\_\_\_ NORMALLY BETWEEN 0 AND 30 mm AFT of point 0.

b) READY FOR FLIGHT WITH PILOT ABOARD

D = \_\_\_\_\_

P<sub>1</sub> = \_\_\_\_\_ (pilot)

P<sub>2</sub> = \_\_\_\_\_ (Parachute)

TOTAL WEIGHT = P<sub>1</sub> + P<sub>2</sub>

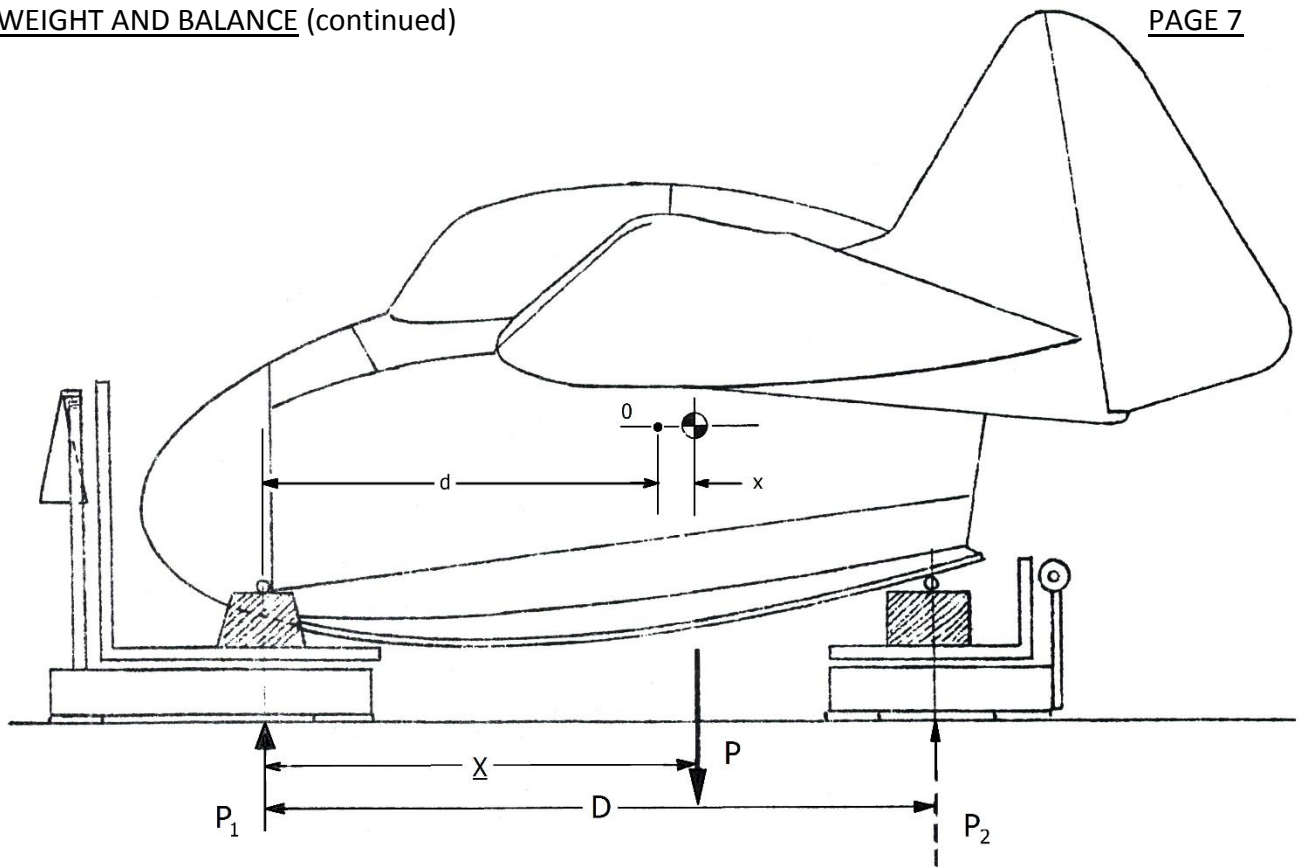
$$X = \frac{D \times P_2}{Total\ Weight} \quad \underline{\hspace{2cm}}$$

d - X = \_\_\_\_\_ BETWEEN 130 and 180 mm FORWARD of point 0.  
(ready for flight)

THE EVENTUAL INDICATION OF THE POINT WHERE THE VERTICAL LINE OF THE C. OF G. CUTS THE REFERENCED DATUM LINE. C. OF G. POSITION CHECKED AND IS IN ACCORDANCE WITH THE SPECIFICATION.

DATE \_\_\_\_\_ "B" ENGINEER

Department of Transport No. \_\_\_\_\_



THIS SHEET TO BE RETURNED TO THE DESIGNER OR HIS REPRESENTATIVE AFTER WEIGHING BALANCE HAVE BEEN CARRIED OUT.

Indicate below figures from calculation sheet, page 5 & 6 of Weight and Balance Manual.

Sailplane must be completely equipped but without pilot and parachute.

Distance  $D$  : \_\_\_\_\_ inches

Weight  $P_1$  : \_\_\_\_\_ lbs.

Weight  $P_2$  : \_\_\_\_\_ lbs.

Total empty weight  $P_1 + P_2 = P$  : \_\_\_\_\_ lbs.

Distance  $X$  : \_\_\_\_\_ inches

Distance  $x = X - d$  : \_\_\_\_\_ inches  
(limits 0 to 30 m/m aft of point 0 - EMPTY)

Sailplane fully equipped with average weight pilot aboard and parachute -  
pilot wearing average weight shoes.

Pilot + parachute weight : \_\_\_\_\_ lbs.

Distance D : \_\_\_\_\_ inches

Weight  $P_1$  : \_\_\_\_\_ lbs.

Weight  $P_2$  : \_\_\_\_\_ lbs.

Total weight  $P_1 + P_2 = P$  : \_\_\_\_\_ lbs.

Distance  $\bar{X}$  : \_\_\_\_\_ inches

Distance  $x$  : \_\_\_\_\_ inches  
(limits 130 to 160 m/m FORWARD of point O).

DATE \_\_\_\_\_ "B"  
ENGINEER \_\_\_\_\_

Department of Transport No. \_\_\_\_\_