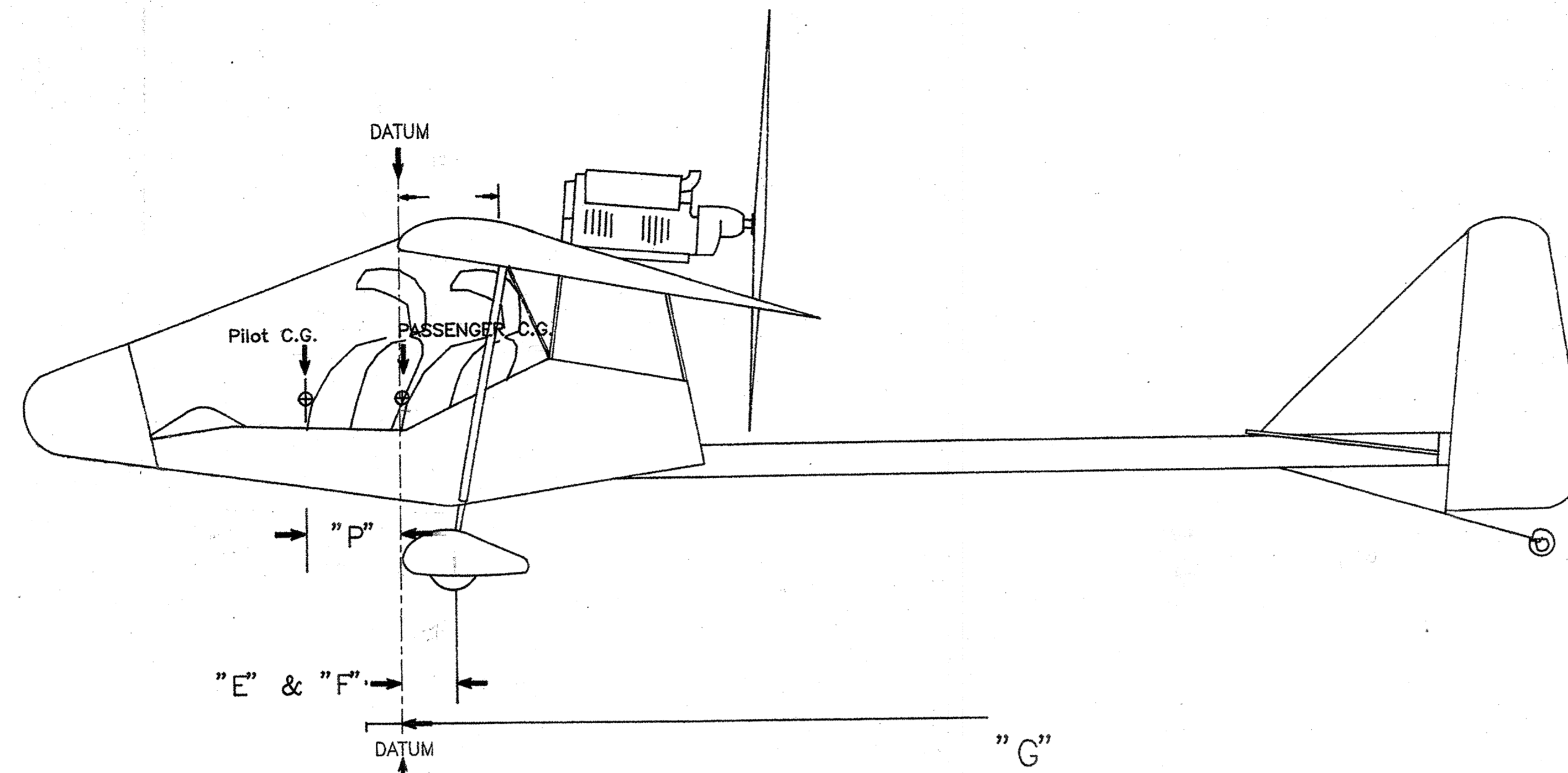# WEIGHT AND BALANCE CALCULATIONS

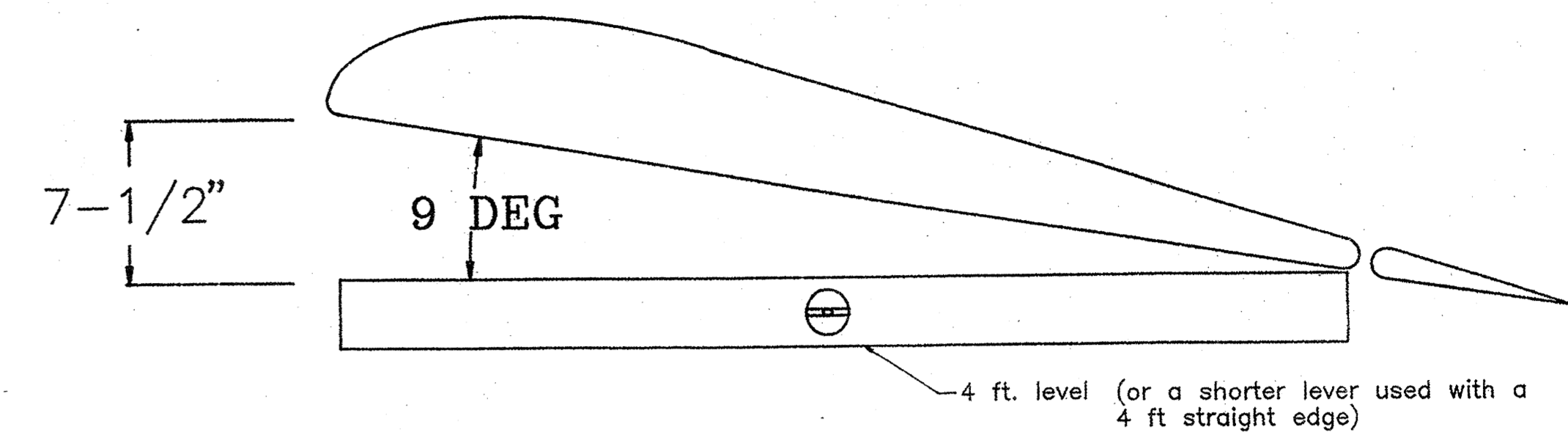Set-up the airplane on your scales under the 3 wheels.

Set attitude of airplane so that the bottom of wing is at 9 degrees angle of attack as shown.

When attitude of airplane has been set, set the level vertically against the leading edge of wing to ensure a vertical datum line — then make all measurements from the rear edge of the level.

NOTE: The pilot and anything else forward of the datum will have a negative distance. (This is only significant for those who weigh the airplane separately and then factor in the weight of the pilot.)

7-1/2"   9 DEG

4 ft. level (or a shorter lever used with a 4 ft straight edge)

RAISE THE TAIL FROM THE 3-POINT POSITION UNTIL THE WING IS AT A 9 DEGREE ANGLE OF ATTACK. THE WEIGHT AND BALANCE IS DONE AT THIS ATTITUDE.

DATUM

Pilot C.G.   PASSENGER C.G.

"P"

"E" & "F"

DATUM

"G"

NOTE: Do not use the dimensions given here — take your own measurements. The dimensions given here are only for illustrative use.

Left column table

	Weight (lbs)	Distance from L.E of Wing (inches)	Moment (in-lbs)
Left wheel	A	E	M1 = A x E
Right wheel	B	F	M2 = B x F
Tailwheel	C	G	M3 = C x G
Pilot*	J	N	M4 = J x N
Passenger*	K	O	M5 = K x O
Gas	L	P	M6 = L x P
Parachute	M	Q	M7 = M x Q
Total Weight = A+B+C+(whichever items of J, K, L, M)			
Total Moment = M1+M2+M3+(whichever of M4 thru M7)			
$H = \dfrac{\text{Total Moments}}{\text{Total Weight}}$ = Resultant Distance			
$\%\ C.G. = \dfrac{H \times 100}{61}$	The % C.G. should be: greater than 20% and less than 35%		

* The C.G. of a seated person is approximately at the front of the stomach (navel).

Middle column

A) Set airplane on scales with wings at 9 degrees angle of attack. (Refer to drawing)

B) Set a scale under each wheel.

C) Aft C.G. will be more likely with the lighter pilots with full fuel.

D) Forward C.G. is not likely, unless the pilot is very heavy.

For each loading condition find the following:

1) Find weights: A, B & C ....

(Weigh items A, B & C plus whichever of items J thru M that you are including in the weight and balance calculations)

2) Measure: E, F & G ....

3) Calculate: M1, M2 & M3 ....

4) Calculate: H

5) Calculate: %C.G.

Right column intro

This is the easiest method for determining weight and balance — weighing the airplane and pilot together. However, one bathroom type scale may not have sufficient capacity for the main wheels. We have found that even though such scales may read upto 300 pounds, they may not be very accurate with that much weight on them. So you may need to use 2 scales for each main wheel and then add the readings together. Bridge the two scales (for each wheel) with a piece of 2 x 6 lumber or the equivalent. Arrange it so that the weight is placed at the center of the scales.

	Weight (lbs)	Distance from L.E of Wing (inches)	Moment (in-lbs)
Left wheel	A	E	M1 = A x E
Right wheel	B	F	M2 = B x F
Tailwheel	C	G	M3 = C x G
Total weight D=A+B+C	D		H = Resultant Distance (in inches) $H = \dfrac{M1 + M2 + M3}{D}$
% C.G.	$\dfrac{H \times 100}{61}$	The % C.G. should be: greater than 20% and less than 35%	

Far right column

A) Set airplane on scales with wings at 9 degrees angle of attack. (Refer to drawing)

B) Have 2 bathroom type scales under each main wheel so you can weigh airplane with occupant(s)

C) The critical aft C.G. will occur with the lighter pilots with full fuel.

D) A too far forward C.G. is not likely, unless the pilot is very heavy.

For each loading condition find the following:

1) Find weights: A, B & C

2) Measure: E, F & G

3) Calculate: M1, M2 & M3

4) Calculate: H

5) Calculate: %C.G.

Kolb FIRESTAR

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