

## Weight and Balance Formulas:

### Finding the empty CG

#### Weight x arm = moment method

	Weight	x Arm	= Moment
main wheel	589	88.75	52273.75
tail Wheel	23	285	6555
	<u>612</u>		<u>58828.75</u>

$$\frac{58828.75}{612} = 96.13$$

#### Combined formula

$\frac{\text{tail weight} \times \text{distance from main wheel to tail}}{\text{main wheel weight} + \text{tail wheel weight}} + \text{distance from datum to main wheel} = \text{Empty Weight CG}$

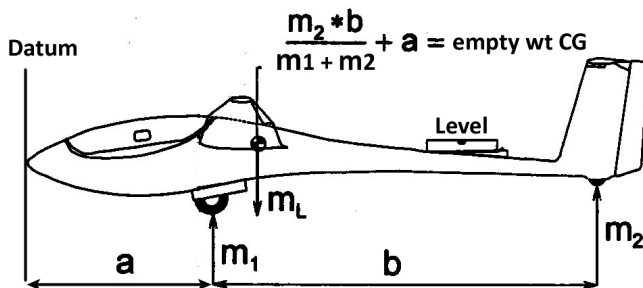
a=88.75 in

b=196.25 in

main wt: 589 lbs

tail wt: 23 lbs

$$\frac{23 \times 196.25}{589 + 23} + 88.75 = 96.13$$



#### Loaded weight and balance

	Weight	x Arm	= Moment
Empty Wt	612	96.12	58825.44
Front pilot	120	43.8	5256
Rear passenger	0	74.7	0
Ballast	19.5	13.05	254.48
	<u>751.5</u>		<u>64335.92</u>

$$\frac{64335.92}{751.5} = 85.61$$

Maximum weight: 1040

Allowable CG Range: 78.2 to 86.1

## Finding the minimum or maximum for a seat

Minimum weight brings CG to aft limit

Maximum weight brings CG to forward limit

Basic formula

$$\frac{\text{starting weight} \times \text{distance to move CG}}{\text{distance from loading point to CG limit}} = \text{required weight at loading point}$$

Solve for minimum or maximum seat weight

$$\frac{\text{Empty weight} \times (\text{empty CG} - \text{aft CG limit})}{\text{Distance from seat position to aft CG limit}} = \text{minimum seat weight for CG}$$

$$\frac{\text{Empty weight} \times (\text{empty CG} - \text{forward CG limit})}{\text{Distance from seat position to forward CG limit}} = \text{maximum seat weight CG}$$

Also check for maximum seat weight and total gross weight limits

Example:

Minimum pilot front seat weight solo for sample SGS-233 above

$$\frac{612 \times (96.12 - 86.1)}{86.1 - 43.8} = \frac{612 \times 10.02}{42.3} = \frac{6132.24}{42.3} = 144.97 \text{ lbs}$$