

## WEIGHT AND BALANCE

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Before proceeding, it is necessary for you to understand the law of multiplication of positive and negative numbers. When two numbers having the same sign are multiplied, the product is positive. When two numbers having a different sign are multiplied, the product is negative.

$$+3 \times +5 = +15.$$

$$-3 \times -5 = +15.$$

$$+3 \times -5 = -15.$$

All items installed from the datum line toward the propeller are considered to have a negative arm, and all items installed from the datum line toward the tail of the airplane are considered to have a positive arm. If you install an item on an airplane, the weight is added to the AEW, and such weight will be "positive." The weight of any removed item is "negative," because such weight would have to be subtracted from the AEW. Therefore, the removal or installation of any item which tends to lower the nose of the plane will create a negative moment, and the removal or installation of any item which tends to lower the tail of the plane will create a positive moment.

You should now be able to find the new CG location of an airplane when negative quantities are involved. The following example will serve as an illustration.

Find the new CG location of an airplane having an AEW of 1050 lbs., a CG location of 12.5, and from which the following items were removed:

Battery: 25 lbs., arm -4  
Radio Receiver: 10 lbs., arm +40.

	Wt. (lbs.)	arm (in.)	Moment (in.lb.)
AEW	1050	12.5	13125
Battery	- 25	- 4.0	100
Radio	- 10	40.0	- 400
	<u>1015</u>		<u>12825</u>

$$\text{New CG Location} = \frac{12825}{1015} = 12.64$$

PROBLEM:

AEW: 690 lbs.

CG location: 15.00.

The following equipment was installed:

Air filter -- 2.5 lbs., arm -33,  
Power pack -- 7 lbs., arm +9,  
Radio Receiver -- 4.5 lbs., arm +42.

The fire extinguisher -- 7 lbs., arm +30 -- was removed.

Find new CG location.

Answer: 14.73

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