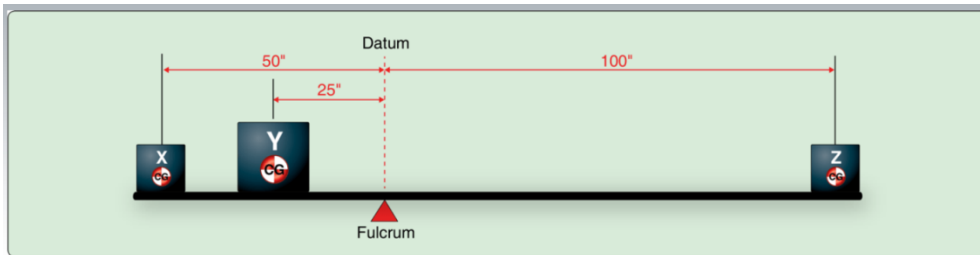
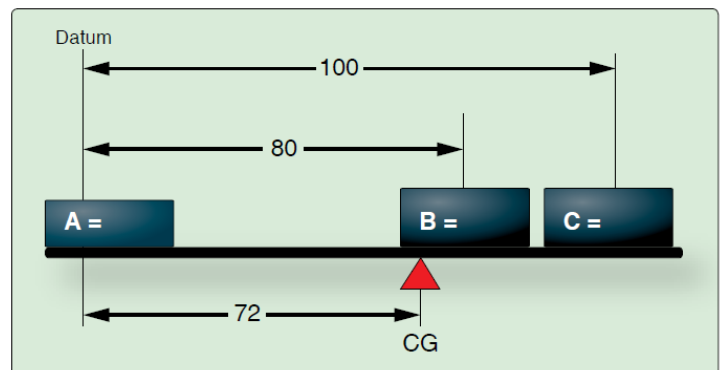


Weight and Balance

1. What is the *Basic Empty Weight* of an aircraft and how does it compare to the *Standard Empty Weight*?
2. What is the *Useful Load* of an aircraft and how does it compare to *Payload*?
3. What is the *datum* point with regard to weight and balance?
4. Most general aviation aircraft have the center of lift behind (aft of) the center of gravity, although the distance the center of gravity is from (in front of) the center of lift varies.
 - a. What are the advantages and disadvantages of a center of gravity that is in the far forward part of the weight and balance envelope?
 - b. What are the advantages and disadvantages of a center of gravity that is in the far aft part of the weight and balance envelope?
 - c. What particular hazard risk is increased when the center of gravity is very far aft (aft of the back of the envelope, near or even aft of the center of lift)?
5. It is commonly heard that in straight and level, constant speed flight that “*thrust equals drag and lift equals weight*”. But, this is not really correct. Lift (the vertical component of lift) does equal the sum of the downward forces but that value is different than the weight of the aircraft. Why?
6. How does increased weight affect the takeoff distance of an airplane?
7. There are 50 pounds of weight is located at point X and 100 pounds at point Z
 - a. If there are 220 pounds of weight at point Y, is the beam in balance?
 - b. If it is not in balance, how much weight must be located at point Y to balance the plank?



8. If weigh A (at the datum point) is 60 lb., weight B is 120 lb. and weight C is 120 lb. how much do you have to move weight B and in which direction do you have to move it to change the Center of gravity (CG) to 60 inches to the right of datum?



9. You have done the weight and balance on your aircraft.

Total weight – 2950 lb

Center of gravity – 83.5 inches aft of datum

Another friend arrives at the airport and asks to go along. You have a rear seat open. Your friend weighs 210 lb. and the rear seat moment arm is 136 inches.

- a. What will the center of gravity be if your friend joins you and occupies a rear seat?
- b. Based on the Weight / Center of Gravity envelope shown here, will the weight and CG be within the recommended limits?

10. Using the following weights and moment, how far from datum will the CG be located?

Weight A - 140 lb at 22" aft of datum

Weight B - 215 lb at 127" aft of datum

Weight C - 75 lb at 190" aft of datum

Weight D - 45 lb at 26" **forward** of datum

11. An aircraft departs with the following weight and total moment

Weight 2910 lb, total moment/100 = 2407 (total moment of 240,700 in-lb.

- a. Where is your center of gravity (CG) at takeoff?
- b. You burn 37 gallons of 100LL Avgas from the main tanks, moment arm 75 in. You are on final approach at your destination – what will your landing weight be and where will the CG be located?

12. You have your aircraft loaded as follows:

Total weight = 3,115 lb

Total moment / 100 = 2660 (total moment of 266,000 in-lb)

Fuel – 44 gal. 100LL Avgas, moment arm 75 in.

Front passenger – 114 lb., moment arm 86 in.

Heaviest rear passenger – 212 lb., moment arm 136 in.

Baggage 76 lb., moment arm 150 in.

- a. What is the current center of gravity? Is it within the allowable limits? (Refer to the Weight / CG envelope used in question #9).
- b. If the current center of gravity is not within the allowable limits what can you do to adjust your payload and fuel to correct the issue?

