

# AIRCRAFT WEIGHT AND BALANCE



## WEIGHTY CONCEPTS AND CALCULATIONS

Name \_\_\_\_\_

Class \_\_\_\_\_

*Working individually, complete the following activities to demonstrate your understanding of these concepts from the lesson:*

- *The relationship between weight and balance*
- *How weight and balance are determined on an aircraft*
- *The effects on an aircraft when operating outside of weight and balance limitations*

### FUNDAMENTALS

1. Define the following terms:

Weight -

Datum -

Arm -

Moment -

Center of gravity (CG) -

2. Describe the concept of "CG range" on an aircraft.

3. Why is it important for an aircraft to have an acceptable range of CG?



4. Does the CG of an aircraft change if the passenger in the front seat moves to the back seat? Why or why not?

### CALCULATIONS

Refer to the graphs in **Aircraft Weight and Balance Student Notes 1** to complete the scenario below.

Consider the following loading scenario for the Cessna 172S, which has a maximum gross weight of 2,550 lbs:

Aircraft empty weight	1,547 lbs
Empty load moment	58,331 in-lbs
Weight of pilot	184 lbs
Weight of front-seat passenger	215 lbs
Weight of backseat passenger 1	96 lbs
Weight of backseat passenger 2	174 lbs
Weight of cargo in baggage area A	55 lbs
Gallons of fuel	53 gallons



5. Is the aircraft legal and safe to fly, based on your weight and balance calculations? Why or why not?

ITEM	WEIGHT	MOMENT
Basic Empty Weight		
Usable Fuel		
Pilot and Front Passenger		
Rear Passengers		
Baggage Area A		
Baggage Area B		
<b>RAMP WEIGHT &amp; MOMENTS</b>		
Fuel allowance for start, taxi, runup	- 8	- .4
<b>TAKEOFF WEIGHT &amp; MOMENT</b>		
<b>CG =</b>		

6. If the configuration is not within limits, what actions could you take to bring it into compliance?

7. If no changes were made, what effect would this loading scenario have on the aircraft's takeoff performance?



## APPLICATIONS

Answer the questions below the following scenarios.

### SCENARIO 1

- An aircraft is loaded to maximum gross takeoff weight.
- It's CG is 2 inches in front of its forward CG limit.

Is this aircraft safe and legal to fly?

What effect does a forward CG have on:

- Aircraft handling during takeoff and landing?

- Stall speed and recovery factors?



## SCENARIO 2

- An aircraft is loaded 50 pounds below gross weight.
- It's CG is 3 inches aft of its rear CG limit.

Is this aircraft safe and legal to fly?

What effect does an aft CG have on:

- Aircraft handling during takeoff and landing?

- Stall speed and recovery factors?