WEIGHT AND BALANCE

Definitions

Empty weight of an airplane includes the airframe and powerplant, unusable fuel, hydraulic fluid, and undrainable oil, or in some aircraft, all of the oil.

Useful load consists of the pilot, passengers, usable fuel, oil and baggage. Fuel weighs 6 lbs per gallon, and oil weighs 75 lbs/gal. As items are installed in the aircraft in addition to the original equipment, allowable useful load is decreased.

Datum line is an arbitrary point from which all measurements of arm are measured. If all index units are positive, the location of the datum is at the nose, or out in front of the airplane.

Arm is the distance in inches from the datum line to the center of gravity of each item.

Moment is a number derived by multiplying the weight of an item by the distance from the datum line (arm).

Weight X Arm = Moment.

To find the loaded center of gravity, add the moments for all items, including the empty aircraft. Divide this by the total loaded weight.

If the center of gravity (CG) is aft of limits the airplane will be less stable about its lateral axis, and stall recovery becomes progressively more difficult.

To find the new center of gravity after fuel burnout, subtract the weight of the fuel from the loaded aircraft weight, and the moment of the fuel burned from the loaded moment. Divide the new moment by the new weight to get the new CG position.

When computing weight and balance, the empty weight includes the weight of the airframe, engine(s), and all items of operating equipment permanently installed. Empty weight also includes:

A) the unusable fuel, full operating fluids, and full oil.
B) all usable fuel, maximum oil, hydraulic fluid, but does not include the weight of pilot, passengers, or baggage.
C) all usable fuel and oil, but does not include any radio equipment or instruments that were installed by someone other than the manufacturer.

NOTE: CORRECT ANSWER IN BOLD ITALICS
5638.
GIVEN:

Weight A. 135 pounds at 15 inches aft of datum
Weight B. 205 pounds at 117 inches aft of datum
Weight C. 85 pounds at 195 inches aft of datum

Based on this information, the CG would be located how far aft of datum?

A) 100.2 inches.
B) 109.0 inches.
C) 121.7 inches.

5639.
GIVEN:

Weight A. 175 pounds at 135 inches aft of datum
Weight B. 135 pounds at 115 inches aft of datum
Weight C. 75 pounds at 85 inches aft of datum

The CG for the combined weights would be located how far aft of datum?

A) 91.76 inches.
B) 111.67 inches.
C) 118.24 inches.

5646. H105 COM
GIVEN:

Total weight 4,137 lb
CG location station 67.8
Fuel consumption 13.7 GPH
Fuel CG station 68.0

After 1 hour 30 minutes of flight time, the CG would be located at station

A) 67.79.
B) 68.79.
C) 70.78.

5647. H105 COM
An aircraft is loaded with a ramp weight of 3,650 pounds and having a CG of 94.0, approximately how much baggage would have to be moved from the rear baggage area at station 180 to the forward baggage area at station 40 in order to move the CG to 92.0?

A) 52.14 pounds.
B) 62.24 pounds.
C) 78.14 pounds.

5648.
An airplane is loaded to a gross weight of 4,800 pounds, with three pieces of luggage in the rear baggage compartment. The CG is located 98 inches aft of datum, which is 1 inch aft of limits. If luggage which weighs 90 pounds is moved from the rear baggage compartment (145 inches aft of datum) to the front compartment (45 inches aft of datum), what is the new CG?

A) 96.13 inches aft of datum.
B) 95.50 inches aft of datum.
C) 99.87 inches aft of datum.

5649. H105 COM
GIVEN:
Total weight 3,037 lb
CG location station 68.8
Fuel consumption 12.7 GPH
Fuel CG station 68.0

After 1 hour 45 minutes of flight time, the CG would be located at station

A) 68.77.
B) 68.83.
C) 69.77.

NOTE: CORRECT ANSWER IN BOLD ITALICS
Given:
Weight and Balance 68
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5650. H105 COM
(Refer to figure 38.)

Given:
Empty weight (oil is included) 1,271 lb
Empty weight moment (in-lb/1,000) 102.04
Pilot and copilot 400 lb
Rear seat passenger 140 lb
Cargo 100 lb
Fuel 37 gal

Is the airplane loaded within limits?

A) Yes, the weight and CG is within limits.
B) No, the weight exceeds the maximum allowable.
C) No, the weight is acceptable, but the CG is aft of the aft limit.

5651. (Refer to figure 38.)

Given:
Empty weight (oil is included) 1,271 lb
Empty weight moment (in-lb/1,000) 102.04
Pilot and copilot 260 lb
Rear seat passenger 140 lb
Cargo 100 lb
Fuel 37 gal

Under these conditions, the CG is determined to be located
A) within the CG envelope.
B) on the forward limit of the CG envelope.
C) within the shaded area of the CG envelope.

5652. (Refer to figure 38.)

Given:
Empty weight (oil is included) 1,271 lb
Empty weight moment (in-lb/1,000) 102.04
Pilot and copilot 360 lb
Cargo 340 lb
Fuel 37 gal

Will the CG remain within limits after 30 gallons of fuel has been used in flight?

A) Yes, the CG will remain within limits.
B) No, the CG will be located aft of the aft CG limit.
C) Yes, but the CG will be located in the shaded area of the CG envelope.

5682. H719 COM
With respect to using the weight information given in a typical aircraft owner's manual for computing gross weight, it is important to know that if items have been installed in the aircraft in addition to the original equipment, the

A) allowable useful load is decreased.
B) allowable useful load remains unchanged.
C) maximum allowable gross weight is increased.

Note: Correct answer in bold italics.