

FLIGHT PERFORMANCE AND PLANNING (1)
MASS AND BALANCE



- 1 The centre of gravity of an aircraft
- A is in a fixed position and is unaffected by aircraft loading.
 - B must be maintained in a fixed position by careful distribution of the load.
 - C can be allowed to move between defined limits.
 - D may only be moved if permitted by the regulating authority and endorsed in the aircraft's certificate of airworthiness.
- 2 During take-off you notice that, for a given elevator input, the aeroplane rotates much more rapidly than expected. This is an indication that:
- A the aeroplane is overloaded.
 - B the centre of gravity may be towards the aft limit.
 - C the centre of pressure is aft of the centre of gravity.
 - D the centre of gravity is too far forward.
- 3 The floor limit of an aircraft cargo hold is 5 000 N/m². It is planned to load-up a cubic container measuring 0,4 m of side. It's maximum gross mass must not exceed: (assume $g=10\text{m/s}^2$)
- A 80 kg
 - B 800 kg
 - C 32 kg
 - D 320 kg
- 4 An aeroplane is weighed and the following recordings are made:
- | | |
|---------------------------------|----------|
| nose wheel assembly scale | 5330 kg |
| left main wheel assembly scale | 12370 kg |
| right main wheel assembly scale | 12480 kg |
- If the 'operational items' amount to a mass of 1780 kg with a crew mass of 545 kg, the empty mass, as entered in the weight schedule, is
- A 32505 kg
 - B 31960 kg
 - C 28400 kg
 - D 30180 kg
- 5 The take-off mass of a helicopter is 8600 kg which includes a traffic load of 1890 kg and a usable fuel load of 1230 kg. If the standard mass for the crew is 190 kg the dry operating mass is
- A 5290 kg
 - B 5480 kg
 - C 8410 kg
 - D 6710 kg
- 6 The zero fuel mass of an aeroplane is always:
- A The maximum take-off mass minus the take-off fuel mass.
 - B The take-off mass minus the fuselage fuel mass.
 - C The take-off mass minus the wing fuel mass.
 - D The take-off mass minus the take-off fuel mass.

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- 7 The standard mass for a child is
- A 35 kg for holiday charters and 38 kg for all other flights.
 - B 35 kg for all flights.
 - C 30 kg for holiday charters and 35 kg for all other flights.
 - D 38 kg for all flights.
- 8 The Traffic Load is defined as:
- A The total mass of flight crew, passengers, baggage, cargo and usable fuel
 - B The total mass of crew and passengers excluding any baggage or cargo
 - C The total mass of passengers, baggage and cargo, including any non revenue load
 - D The total mass of passengers, baggage, cargo and usable fuel
- 9 Given:
- | | |
|----------------------------------|-----------|
| Dry Operating Mass= | 29 800 kg |
| Maximum Take-Off Mass= | 52 400 kg |
| Maximum Zero-Fuel Mass= | 43 100 kg |
| Maximum Landing Mass= | 46 700 kg |
| Trip fuel= | 4 000 kg |
| Fuel quantity at brakes release= | 8 000 kg |
- The maximum traffic load is:
- A 13 300 kg
 - B 12 900 kg
 - C 14 600 kg
 - D 9 300 kg
- 10 In centre of gravity calculations the datum is
- A The fixed reference about which moments are taken to calculate the position of the centre of pressure
 - B The fixed reference about which moments are taken to calculate the position of the centre of gravity
 - C The horizontal reference used to calculate the helicopter's empty centre of gravity
 - D The point through which the centre of gravity acts

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- 11 The mass and balance information gives:
Basic mass: 1 200 kg ; Basic balance arm: 3.00 m

Under these conditions the Basic centre of gravity is at 25% of the mean aerodynamic chord (MAC). The length of MAC is 2m.

In the mass and balance section of the flight manual the following information is given:

Position Arm
front seats: 2.5 m
rear seats: 3.5 m
rear hold: 4.5 m
fuel tanks: 3.0 m

The pilot and one passenger embark; each weighs 80 kg. Fuel tanks contain 140 litres of petrol with a density of 0.714. The rear seats are not occupied. Taxi fuel is negligible. The position of the centre of gravity at take-off (as % MAC) is:

- A 34 %
 - B 17 %
 - C 22 %
 - D 29 %
- 12 (For this question use annex A)
Using the data given in the Load & Trim sheet, determine which of the following gives the correct values for the Zero Fuel Mass and position of the centre of gravity (% MAC) at that mass.
- A 51300 Kg and 20,8%
 - B 46130 Kg and 20,8%
 - C 46130 Kg and 17,8%
 - D 41300 Kg and 17,8%

