4. If an aeroplane is at a higher mass than anticipated, for a given airspeed the angle of attack will:

A – remain constant, drag will decrease and endurance will decrease
B – be decreased, drag will decrease and endurance will increase
C – be greater, drag will increase and endurance will decrease
D – remain constant, drag will increase and endurance will increase

Ref: AIR: atpl, cpl

Ans: C

5. Fuel loaded onto an aeroplane is 15,400 kg but is erroneously entered into the load and trim sheet as 14,500 kg. This error is not detected by the flight crew but they will notice that:

A – V1 will be reached sooner than expected
B – speed at un-stick will be higher than expected
C – V1 will be increased
D – the aeroplane will rotate much earlier than expected

Ref: AIR: atpl, cpl

Ans: B

6. In order to provide an adequate BUFFET BOUNDARY at the commencement of the cruise a speed of 1.3 Vs is used. At a mass of 120,000 kg this is a CAS of 180 knots. If the mass of the aeroplane is increased to 155,000 kg the value of 1.3Vs will be:

A – increased to 20[illegible] knots but since the same angle of attack is used, drag and range will remain the same
B – unaffected as Vs always occurs at the same angle of attack
C – increased to 191 knots, drag will decrease and air distance per kg of fuel will increase
D – increased to 191 knots drag will increase and air distance per kg of fuel will decrease

Ref: AIR: atpl, cpl

Ans: D

031-01-02 CG limitations

1. Which of the following statements is correct?

A – The station (STA) is always the location of the centre of gravity in relation to a referenced point, normally the leading edge of the wing at MAC
B – A tail heavy aeroplane is less stable and stalls at a lower speed than a nose heavy aeroplane
C – The centre of gravity is given in percent of MAC calculated from the leading edge of the wing, where MAC always = the wing chord halfway between the centre line of the fuselage and the wing tip
D – if the actual centre of gravity is located behind the aft limit the aeroplane longitudinal stability increases

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

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 gravity is too far forward
D – the centre of pressure is aft of the centre of gravity

Ref: AIR: atpl, cpl

Ans: B

3. If the aeroplane is neutrally stable this would suggest that:

A – the CG is forward
B – the CG is in mid range
C – the CG is on the rear limit
D – the CG is behind the rear limit

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

18. Who establishes the limits of C of G?

A – The CAA
B – The JAA
C – The manufacturer
D – The insurers

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

19. What effect does the CG on the aft limit have on the fuel consumption of an aeroplane?

A – Increases
B – Decreases
C – No effect
D – Marginal increase

Ref: AIR: atpl, cpl

Ans: B

20. Which combination of weight and CG position will produce the highest stalling speed?

A – Heavy weight and aft CG
B – Heavy weight and forward CG
C – Low weight and aft CG
D – Low weight and forward CG

Ref: AIR: atpl, cpl

Ans: B

21. If the CG is aft of the neutral point it results in:

A – increased stability with increased elevator trim
B – Decreased stability with decreased elevator trim
C – Neutral stability
D – Longitudinal instability

Ref: AIR: atpl, cpl

Ans: D

16. For the purpose of completing the Mass and Balance documentation, the Dry Operating Mass is defined as:

A – The total mass of the aeroplane ready for a specific type of operation excluding all usable fuel and traffic load
B – The total mass of the aeroplane ready for a specific type of operation excluding all usable fuel
C – The total mass of the aeroplane ready for a specific type of operation excluding all traffic load
D – The total mass of the aeroplane ready for a specific type of operation excluding crew and crew baggage

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

17. At the flight preparation stage, the following parameters in particular are available for determining the mass of the aircraft:

1. Dry operating mass
2. Operating mass

Which statement is correct?

A – The dry operating mass includes fixed equipment needed to carry out a specific flight
B – The operating mass is the mass of the aeroplane without take-off fuel
C – The dry operating mass includes take-off fuel
D – The operating mass includes the traffic load

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

18. The Dry Operating Mass of an aeroplane includes:

A – Fuel and passengers baggage and cargo
B – Unusable fuel and reserve fuel
C – Crew and crew baggage, catering, removable passenger service equipment, potable water and lavatory chemicals
D – Passengers baggage and cargo

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

19. The total mass of the aeroplane including crew, crew baggage; plus catering and removable passenger equipment; plus potable water and lavatory chemicals but excluding usable fuel and traffic load, is referred to as:

A – Maximum Zero Fuel Mass
B – Zero Fuel Mass
C – Aeroplane Prepared for Service (APS) Mass
D – Dry Operating Mass

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

20. Allowed traffic load is the difference between:

A – operating mass and basic means
B – allowed take off mass and basic mass plus trip fuel
C – allowed take off mass and basic mass
D – allowed take off mass and operating mass

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

21. The Maximum Zero Fuel Mass is a structural limiting mass. It is made up of the aeroplane Dry Operational Mass plus:

A – traffic load and unusable fuel
B – traffic load, unusable fuel and crew standard mass
C – unusable and crew standard mass
D – traffic load and crew standard mass

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

22. The Zero Fuel Mass and the Dry Operating Mass:

A – differ by the sum of the mass of usable fuel plus traffic load mass
B – are the same value
C – differ by the value of the traffic load mass
D – differ by the mass of usable fuel

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

30. In mass and balance calculations which of the following describes the datum?

A – It is the most aft position of the centre of gravity
B – It is the most forward position of the centre of gravity
C – It is the point on the aeroplane designated by the manufacturers from which all centre of gravity measurements and calculations are made
D – It is the distance from the centre of gravity to the point through which the weight of the component acts

Ref: AIR: atpl, cpl; HELI: atpl, cpl

31. Ans: C

32. The datum is a reference from which all moment (balance) arms are measured. Its precise position is given in the control and loading manual and it is located:

A – at or near the focal point of the aeroplane axis system
B – at or near the forward limit of the centre of gravity
C – at a convenient point which may not physically be on the aeroplane
D – at or near the natural balance point of the empty aeroplane

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

33. With reference to mass and balance calculations (on an aeroplane) a datum point is used. This datum point is:

A – a point near the centre of the aeroplane. It moves longitudinally as masses are added forward and aft of its location
B – the point through which the sum of the mass values (of the aeroplane and its contents) is assumed to act vertically
C – a fixed point from which all balance arms are measured. It may be located anywhere on the aeroplane's longitudinal axis or on the extensions to that axis
D – a point from which all balance arms are measured. The location of this point varies with the distribution of loads on the aeroplane

Ref: AIR: atpl, cpl

Ans: C

52. In mass and balance calculations the “index” is:

A – an imaginary vertical plane or line from which all measurements are taken
B – the range of moments the centre of gravity (cg) can have without making the aeroplane unsafe to fly
C – is a figure without unit of measurement which represents a moment
D – a location is the aeroplane identified by a number

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

53. The Dry Operating Mass of a helicopter:

A – includes fuel and passengers baggage and cargo
B – includes passengers and cargo
C – is the total mass of the helicopter ready for a specific type of operation
D – includes unusable fuel and reserve fuel

Ref: HELI: atpl, cpl

Ans: C

54. The Dry Operating Mass of a helicopter is the sum of the following:

A – Basic Empty Mass + crew + traffic load
B – Basic Empty Mass + crew + operating items
C – Basic Empty Mass + crew + usable fuel
D – Basic Empty Mass + crew + traffic load + usable fuel

Ref: HELI: atpl, cpl

Ans: B

55. The Dry Operating Mass of a helicopter is the sum of the following:

A – Basic Empty Mass + crew + traffic load + taxi fuel
B – Basic Empty Mass + crew + taxi fuel
C – Basic Empty Mass + crew + traffic load
D – Basic Empty mass = crew + operating items

Ref: HELI: atpl, cpl

Ans: D

A – 762 lbs
B – 314.5 kg
C – 483 kg
D – 8.47 kg

Ref: AIR: atpl, cpl

Ans: C

9. Given:

Dry operating mass = 38000 kg
Maximum structural take-off mass = 72000 kg
Maximum landing mass = 65000 kg
Maximum zero fuel mass = 61000 kg
Fuel burn = 8000 kg
Take-off Fuel = 10300 kg

The maximum allowed take-off mass and payload are respectively:

A – 73000 kg and 27000 kg
B – 71300 kg and 25300 kg
C – 73000 kg and 24700 kg
D – 71300 kg and 23000 kg

Allowed take-off mass=ZFM+TAKE OFF FUEL
=61000+10300=**71300 Ans**

	MTOM	MLM	MZFM
	72000	65000	61000
Less DOM	(38000)	(38000)	(38000)
Less Fuel	(10300)	(2300)	**23000 Ans**
	23700	24700	

Maximum traffic load is the lower of the three calculated values i.e. **23000 kg**. This is the only traffic load that will not exceed either the MTOW, MLW or the MZFW limitations

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

10. The empty mass of an aeroplane, as given in the weighing schedule, is 61300 kg. The operational items (including crew) is given as a mass of 2300 kg. If the take-off mass is 132000 kg (including a usable fuel quantity of 43800 kg) the useful load is:

A – 26900 kg
B – 70700 kg
C – 29600 kg
D – 68400 kg

Useful load= TOM-DOM
DOM= basic empty mass+crew
61300+2300=**63600**
Useful load=132000-63600=**68400 Ans**

14. 964. (For this question use CAP 696 – Figures 4.5 and 4.6)

For the medium range transport aeroplane, from the loading manual, determine the maximum total volume of fuel which can be loaded into the main wing tanks. (Fuel density value 0.78)

A – 11349 litres
B – 8850 litres
C – 11646 litres
D – 5674 litres

Ref: AIR: atpl, cpl

Ans: A

15. An aircraft basic empty mass is 3000 kg. The maximum take off landing, and zero-fuel mass are identical, at 5200 kg. Ramp fuel is 650 kg, the taxi fuel is 50 kg. The payload available is:

A – 2150 kg
B – 1550 kg
C – 2200 kg
D – 1600 kg

	MTOM	MLM	MZFM
	5200	5200	5200
Less DOM	(3000)	(3000)	(3000)
Less Fuel	(600)	2200	
	1600 Ans	2200	

Maximum traffic load is the lower of the three calculated values i.e. **1600 kg**. This is the only traffic load that will not exceed either the MTOW, MLW or the MZFW limitations

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

A – 21500 kg
B – 21080 kg
C – 21220 kg
D – 20870 kg

	MTOM		MLM		MZFM
MTOM	89430	MLM	71520	MZFM	62050
Less DOM	(40970)		(40970)		(40970)
Less Fuel	(26860)		(9030)		**21080**
	21600		21520		

Maximum traffic load is the lower of the three calculated values i.e. **21080 kg**. This is the only traffic load that will not exceed either the MTOW, MLW or the MZFW limitations

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

24. (For this question use CAP 696 – Figure 4.14)

The medium range twin jet transport is scheduled to operate from a departure airfield where conditions limit the take-off mass to 65050 kg. The destination airfield has a performance limited landing mass of 54500 kg. The Dry Operating mass is 34900 kg. Loading data is as follows:

Taxi fuel:	350 kg
Trip fuel:	9250 kg
Contingency and final reserve fuel	1100 kg
Alternate fuel:	1000 kg
Traffic load:	18600 kg

Check the load and ensure that the flight may be operated without exceeding any of the aeroplane limits. Choose, from those given below, the most appropriate answer.

A – The flight may be safely operated with the stated traffic and fuel load
B – The flight is 'zero fuel mass' limited and the traffic load must be reduced to 14170 kg
C – The flight is 'landing mass' limited and the traffic load must be reduced to 17500 kg
D – The flight may be safely operated with an additional 200 kg of traffic load

Ref: AIR: atpl, cpl

Ans: C

25. The Dry Operating Mass of an aircraft is 2000 kg. The maximum take-off mass landing and zero fuel mass are identical at 3500 kg. The block fuel mass is 550 kg, and the taxi fuel mass is 50 kg. The available mass of payload is:

A – 1500 kg
B – 950 kg
C – 1000 kg
D – 1450 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

C – 71000 kg
D – 99000 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

60. (Refer to figure 031_L401)

From the data contained in the attached appendix, the maximum allowable take-off mass and traffic load is respectively:

A – 66770 kg and 17320 kg
B – 60425 kg and 10975 kg
C – 61600 kg and 12150 kg
D – 68038 kg and 18588 kg

Ref: AIR: atpl, cpl

Ans: C

61. (Refer to figure 031_L401)

An aeroplane is carrying a traffic load of 10320 kg. Complete the necessary sections of the attached appendix and determine which of the answers given below represents the maximum increase in the traffic load:

A – 7000 kg
B – 8268 kg
C – 650 kg
D – 1830 kg

Ref: AIR: atpl, cpl

Ans: D

62. (Refer to figure L225)

Using the data given in the Load & Trim sheet, determine from the following the correct value for the limiting take off mass for this flight.

A – 64200 kg
B – 63800 kg
C – 62650 kg
D – 54900 kg

Ref: AIR: atpl, cpl

Ans: C

75. An aircraft has an average fuel consumption of 7500 kg per hour at 480 kts. Calculate its maximum range and endurance for a bulk fuel load of 80000 litres at SG 0.8, the start, run up + taxi allowance is 1200 kg and a minimum reserve fuel of 10000 kg.

A – Range 3379.2 nm & Endurance 7.04 hr
B – Range 3360 nm & Endurance 7.0 hr
C – Range 3379.2 nm & Endurance 7.0 hr
D – Range 3360 nm & Endurance 7.04 hr

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

76. The mass of 729 US Gallons of fuel at SG 0.78 is:

A – 2153 kg
B – 2579 kg
C – 3095 kg
D – 568 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

77. The weight of 867 US Gallons of fuel (SG 0.78) is:

A – 8122 lbs
B – 5663 lbs12510. If 1250 lbs of fuel at SG 0.812 are on board an aircraft, the amount of fuel in US Gallons is:

A – 128 US Gallons
B – 185 US Gallons
C – 122 US Gallons
D – 153 US Gallons

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

C – 2560 lbs
D – 5361 lbs

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

91. Given:

Dry Operating Mass: 5320 kg
Zero Fuel Mass: 6790 kg
Trip Fuel: 770 kg
Take-Off Fuel: 1310 kg

The Traffic Load is:

A – 1470 kg
B – 3080 kg
C – 1610 kg
D – 2940 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

92. Given:

Dry Operating Mass: 4920 kg
Zero Fuel Mass: 5740 kg
Trip Fuel: 670 kg
Take-Off Fuel: 1050 kg

The Traffic Load is:

A – 2160 kg
B – 1340 kg
C – 2480 kg
D – 820 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

126. The Take-Off Mass of an aircraft is 3620 kg, the Landing Mass is 3280 kg and the Basic Empty Mass is 1875 kg. The fuel load on take-off is 380 kg and the traffic load is 1150 kg. The Dry Operating Mass is:

A – 3025 kg
B – 1660 kg
C – 2130 kg
D – 2090 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

127. An aircraft has a Dry Operating Mass of 37400 kg. The Performance Limited Take-Off Mass is 67400 kg and the Performance Limited Landing Mass 52800 kg. The Certificate of Airworthiness Maximum Structural Take-Off Mass is 66000 kg, the Maximum Structural Landing Mass is 54000 kg and the Maximum Zero Fuel Mass is 52000 kg. The fuel load before taxi is 16000 kg. Allowing 500 kg for start, taxi and take-off and 12400 kg for trip fuel the maximum allowed traffic load is:

A – 12300 kg
B – 13500 kg
C – 14600 kg
D – 13100 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

128. An aircraft fuel tank can hold a maximum volume equivalent to 2300 kg of fuel at 0.80 SG. The tank is loaded with fuel at 0.78 SG, the volume of fuel that can be loaded is:

A – 1840 litres
B – 2243 litres
C – 2359 litres
D – 2875 litres

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

8. The CG position is:

A – set by the pilot
B – set by the manufacturer
C – able to exist within a range
D – fixed

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

9. The distance from the datum to the Centre of Gravity of a mass is known as:

A – the index
B – the lever
C – the moment
D – the moment arm or balance arm

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

10. 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

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

11. (Refer to CAP 696 figure 3-1)

For the light twin engine piston propeller aeroplane the datum is located:

A – At the leading edge of the MAC
B – 78.4" FWD of the wing leading edge at the inboard edge of the inboard fuel tank
C – On the nose of the aeroplane
D – 78.4 cm FWD of the wing leading edge at the inboard edge of the inboard fuel tank

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

031-03-03 Basic calculations of CG

1. An aeroplane has its centre of gravity located 7 metres from the datum line and it has a mass of 49000 N. The moment about the datum is:

A – 343000 Nm
B – 1.43 Nm
C – 7000 Nm
D – 34300 Nm

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

2. Which one of the following is correct?

A – Arm = Force/Moment
B – Arm = Moment/Force
C – Moment = Force/Arm
D – Arm = Force x Moment

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

3. (Refer to CAP 696 figure 3-2)

Block fuel = 100 gal
Trip fuel = 35 gal
Fuel density = 6 lbs/gal

Determine block fuel moment:

A – 9360
B – 56160
C – 30888
D – 430546

Ref: AIR: atpl, cpl

Ans: B

4. If all the moments are positive when calculating mass (weight) and balance, the position of the datum would be at the:

A – trailing edge of the wing
B – main wheels centreline
C – nose, or forward of the aircraft
D – centre line of the nose or tail wheel depending on the aircraft type

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

5. The position of the centre of gravity can always be determined by:

A – subtracting the total mass from the total moment
B – subtracting the total moment from the total mass
C – dividing the total mass by the total moment
D – dividing the total moment by the total mass

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

6. (Refer to CAP 696 figure 3-2)

From data sheet attached select the volume of the fuel allowance for start, run up and taxi as per the worked example

A – 3.8 US gallons
B – 3.8 Imp gallons
C – 3.8 litres
D – 3.8 US pints

Ref: AIR: atpl, cpl

Ans: A

7. A load placed aft of the datum:

A – Has a positive arm and therefore generates a positive moment but negative mass
B – Has a negative arm and therefore generates a negative moment but a positive mass
C – Has a negative arm and therefore generates a negative moment and mass
D – Has a positive arm and therefore generates a positive moment

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

031-04 MASS AND BALANCE DETAILS OF AIRCRAFT

031-04-01 Contents of Mass and Balance Documentation

1. (For this question use CAP 696 – Figure 4.11)

At the maximum landing mass the range of safe CG positions, as determined from the appropriate graph in the loading manual, is:

A – Forward limit 8.0% MAC aft limit 26.8% MAC
B – Forward limit 8.0% MAC aft limit 27.2% MAC
C – Forward limit 8.6% MAC aft limit 27.0% MAC
D – Forward limit 7.4% MAC aft limit 27.0% MAC

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

2. (For this question use CAP 696 – Figure 4.11)

An aeroplane has a landing mass of 53000 kg. The range of safe CG positions, as determined from the appropriate graph in the loading manual, is:

A – Forward limit 8.2% MAC aft limit 27.0% MAC
B – Forward limit 7.8% MAC aft limit 27.0% MAC
C – Forward limit 7.3% MAC aft limit 26.8% MAC
D – Forward limit 8.7% MAC aft limit 26.8% MAC

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

3. (For this question use CAP 696 – Figure 4.11)

The aeroplane has a mass of 61000 kg in the cruise. The range of safe CG positions, as determined from the appropriate graph in the loading manual, is:

A – forward limit 7.7% aft limit 25.2% MAC
B – forward limit 8.0% aft limit 27.2% MAC
C – forward limit 7.6% aft limit 26.9% MAC
D – forward limit 8.3% aft limit 26.3% MAC

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

7. (Refer to CAP 696 Figure 4-4)

With reference to the attached chart, the distance of the leading edge of the MAC from the datum is:

A – Undefined
B – 525.6 m
C – 625.6 in
D – 525.6 in

Ref: AIR: atpl, cpl

Ans: C

8. (Refer to CAP 696 Figure 2-5)

From the attached data sheet, what is the fwd CG limit for an aircraft with a mass of 3500 lb?

A - +78.0 inches
B - +79.0 inches
C - +79.5 inches
D - +80.0 inches

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

9. (Refer to CAP 696 Figures 4-7 & 4-8)

From the data sheet for a medium range twinjet determine the moment effect of 20 passengers without hand baggage located in zon E:

A – 108780 kg force inches
B – 1181040 kg force inches
C – 1305360 force inches
D – 1212120 kg force inches

Ref: AIR: atpl, cpl

Ans: D

2. If individual masses are used, the mass of an aeroplane must be determined prior to initial entry into service and thereafter:

A – at intervals of 4 years if no modifications have taken place
B – at regular annual intervals
C – only if major modifications have taken place
D – at intervals of 9 years

Ref: AIR: atpl, cpl

Ans: A

3. An aeroplane may be weighed:

A – in an area of the airfield set aside for maintenance
B – in a quiet parking area clear of the normal manoeuvring area
C – in an enclosed, non-air conditioned, hangar
D – at a specified 'weighing location' on the airfield

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

4. An aeroplane must be re-weighed at certain intervals. Where an operator uses fleet masses and provided that changes have been correctly documented, this interval is:

A – 4 years for each aeroplane
B – 9 years for each aeroplane
C – whenever a major modification is carried out
D – whenever the Certificate of Airworthiness is renewed

Ref: AIR: atpl, cpl

Ans: B

5. To measure the mass and CG-position of an aircraft, it should be weighed with a minimum of:

A – 1 point of support
B – 2 points of support
C – 3 points of support
D – 4 points of support

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: C

15. The following results were obtained after weighing a helicopter:

Mass at front point: 300 kg
Mass at right rear point: 1100 kg
Mass at left rear point: 950 kg

It is given that the front point is located 0.30m left of the longitudinal axis and the rear points are symmetrically located 1.20m from this axis. The helicopter lateral CG-position relative to the longitudinal axis is:

A – 11 cm left
B – 4 cm right
C – 4 cm left
D – 11 cm right

Ref: HELI: atpl, cpl

Ans: B

16. After weighing a helicopter the following values are noted:

Forward point: 350 kg
Aft right point: 995 kg
Aft left point: 1205 kg

What is the longitudinal CG-position in relation to the datum situated 4m in front of the rotor axis, knowing that the forward point is at 2.5m forward of the rotor axis and the aft points are 1m aft of the rotor axis?

A – 4.12m
B – 4.09m
C – 4.21m
D – 4.15m

Ref: HELI: atpl, cpl

Ans: A

4. The Maximum Zero Fuel Mass is the mass of the aeroplane with no usable fuel on board. It is a limitation which is:

A – listed in the Flight Manual as a fixed value. It is a structural limit
B – governed by the requirements of the centre of gravity limits and the structural limits of the aeroplane
C – tabulated in the Flight Manual against arguments of airfield elevation and temperature
D – governed by the traffic load to be carried. It also provides protection from excessive 'wing bending'

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A

5. In relation to an aeroplane, the term BASIC EMPTY MASS includes the mass of the aeroplane structure complete with its power plants, systems, furnishings and other items of equipment considered to be an integral part of the particular aeroplane configuration. Its value is:

A – inclusive of an allowance for crew, crew baggage and other operating items. It is entered in the loading manifest
B – found in the latest version of the weighing schedule as corrected to allow for modifications
C – found in the flight manual and is inclusive of unusable fuel plus fluids contained in closed systems
D – printed in the loading manual and includes unusable fuel

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

6. The aircraft basic mass and G position is found in:

A – The weighing schedule in the Aircraft Flight Manual and the aeroplane must be re-weighed if equipment change causes a change in mass or balance
B – The loading manifest and is DOM – traffic load
C – In the loading manifest and is ZFM – useful load
D – The weighing schedule in the Aircraft Flight Manual and is adjusted to take account of any mass changes

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

18. The planned take-off mass of an aeroplane is 180000 kg, with its centre of gravity located at 31% MAC (Mean Aerodynamic Chord). Distance from reference point to leading edge = 14m. Length of MAC = 4.6m. Shortly prior to engine start, the local staff informs the crew that an additional load of 4000 kg must be loaded in cargo 1 (located at 2.73m aft of the reference point). After loading this cargo, the new centre of gravity location will be:

A – 34%
B – 25%
C – 28%
D – 37%

Ref: AIR: atpl, cpl

Ans: B

19. A turbojet aeroplane is parked with the following data:

Corrected Dry Operating Mass:	110 100 kg
Basic corrected index:	118.6
Take-off mass:	200 000 kg
Centre of gravity location:	32% MAC
Distance from reference point	
To leading edge:	14 m
Length of MAC:	4.6 m

Initial cargo distribution:
Cargo 1 = 4000 kg (2.73 m from reference point)
Cargo 2 = 2000 kg (8.55 m from reference point)
Cargo 3 = 2000 kg (16.49 m from reference point)
Cargo 4 = empty (21.12 m from reference point)

To maximise performance, the captain decides to redistribute part of the cargo load between cargo 1 and cargo 4, in order to take off with a new centre of gravity location at 35% MAC. After loading, the new load distribution between cargo 1 and cargo 4 is:

A – 2000 kg in cargo 1;
2000 kg in cargo 4
B – 1000 kg in cargo 1;
3000 kg in cargo 4
C – 2500 kg in cargo 1;
1500 kg in cargo 4
D – 3000 kg in cargo 1
1000 kg in cargo 4

Ref: AIR: atpl, cpl

Ans: C

10. (Refer to figure 031_L404)

Using the data given at the appendix to this question, if the fuel index corrections (from ZFM index) are as follows:

9500 kg – 0.9
6500 kg – 6.1
3500 kg – 4.7
3000 kg – 4.3

Which of the following represent the correct values for landing mass of the aeroplane and the position of the centre of gravity for this condition?

A – 52900 kg and 19%
B – 32900 kg and 21.6%
C – 49130 kg and 21.8%
D – 49130 kg and 19%

Ref: AIR: atpl

Ans: D

11. (Refer to figure 031_L403)

Using the data given at the appendix, determine which of the following correctly gives the values of the Zero Fuel Mass (ZFM) of the aeroplane and the load index at ZFM:

A – 35100 kg and 20.5
B – 48600 kg and 57.0
C – 51300 kg and 57.0
D – 46300 kg and 20.5

Ref: AIR: atpl

Ans: B

12. (Refer to figure 031_L403)

From the data given at the appendix and assuming a fuel index shift of 5.7 from the ZFM loaded index, determine which of the following is the correct value (percentage MAC) for the position of the centre of gravity at Take Off Mass:

A – 18%
B – 19%
C – 15%
D – 14%

Ref: AIR: atpl

Ans: A

19. (Refer to figures 031_L500, 031_L503 and 031_L504)

Knowing that:

Dry operating mass:	110000 kg
Basic index:	119.1
Number of passengers:	185
Distributed as shown in the annex (75 kg per Pax)	
Cargo load + luggage:	14000 kg
Distributed as shown in the annex	
Fuel:	42000 kg

Stages (1) to (7) and (11) having already been calculated, the centre of gravity in % MAC (Mean Aerodynamic Chord) at take-off is located at:

A – 30.5%
B – 32.5%
C – 28.0%
D – 31.5%

Ref: AIR: atpl

Ans: D

20. (Refer to figure 031_9-1)

The empty mass of your helicopter is 1100 kg with a CG-position at 3.05m. The load is as follows:

- Total mass of pilot and co-pilot: 150 kg
- Total mass of passengers at rear: 200 kg

In order not to exceed the limitations the minimum remaining fuel on board should be:

A – 450 kg
B – 350 kg
C – 250 kg
D – 125 kg

Ref: HELI: atpl, cpl

Ans: D

10. Given that the total mass of an aeroplane is 112000 kg with a centre of gravity position at 22.62m aft of the datum. The centre of gravity limits are between 18m and 22m. How much mass must be removed from the rear hold (30m aft of the datum) to move the centre of gravity to the middle of the limits:

A – 43120 kt
B – 16529 kg
C – 8680 kg
D – 29344 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

11. If 390 lbs of cargo are moved from compartment B (aft) to compartment A (forward), what is the station number of the new centre of gravity (CG)?

Given:

Gross mass:	116500 lbs
Present CG station:	435.0
Compartment A station:	285.5
Compartment B station:	792.5

A – 463.7
B – 506.3
C – 436.7
D – 433.3

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

12. (Refer to figure 031_8-1)

The total mass of an aeroplane is 145000 kg and the centre of gravity limits are between 4.7m and 6.9m aft of the datum. The loaded centre of gravity position is 4.4m aft. How much mass must be transferred from the front to the rear hold in order to bring the out of limit centre of gravity position to the foremost limit?

A – 3500 kg
B – 35000 kg
C – 62500 kg
D – 7500 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

13. (Refer to figure 031_8-3)

38. If the loaded mass is 28,220 kg how much load should be transferred 9.16m forward from No. 2 hold to the No. 1 hold in order to move the centre of gravity of an aircraft from the out of limits value of 13 metres aft to the forward limits value of 11.6 metres aft?

A – 590 kg
B – 1790 kg
C – 2980 kg
D – 4160 kg

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: D

39. An aircraft is loaded to a mass of 25000 lbs. A passenger weighing 150 lb moves back 10 seat rows, a distance of 330 inches. The centre of gravity will move:

A – 0.5" rearward
B – 2.00" rearward
C – 5.00" rearward
D – 2.00" forward

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: B

40. Assuming that an aircraft CG has to remain within limits, what is the maximum weight which could be added to a cargo hold located at station 125, if the CG is at station 85 and the aft limit is positioned at station 100. The aircraft loaded weight is 5000 lbs.

A – 3000 lbs
B – 1687.5 lbs
C – 1800.7 lbs
D – 1945 lbs

Ref: AIR: atpl, cpl; HELI: atpl, cpl

Ans: A