

## Controls and effects

- 1 An aircraft keeps yawing to the left, it would be trimmed by:
  - a) moving the trim tab on the rudder to the left
  - b) moving the trim tab on the rudder to the right
  - c) adjusting the rudder spring tension to keep the right rudder pedal forward
  - d) adjust the roll trim to roll right so the sideslip will cause a yaw to the right and maintain constant heading
  
- 2 To retrim after failure of the starboard engine on a twin engined aircraft:
  - a) the rudder trim tab will move right and the rudder left
  - b) the rudder trim tab will move right and the aircraft will yaw right to balance asymmetric thrust
  - c) the rudder trim tab will move left and the rudder right
  - d) the rudder trim tab will move left and the aircraft will yaw left to balance asymmetric thrust
  
- 3 A balance tab is an auxillary surface fitted to a main control surface:
  - a) operating automatically to assist the pilot in moving the control
  - b) operating automatically to provide feel to the control
  - c) operated independently by the pilot to remove excessive loads from the control
  - d) operated independently by the pilot to trim the aircraft
  
- 4 On an aircraft with a variable incidence tailplane, the tailplane incidence changes:
  - a) automatically if the elevators move
  - b) if the control column is moved back and forward
  - c) only as speed changes
  - d) if the pitch trim is changed
  
- 5 The purpose of a trim tab is to;
  - a) provide feel when flying at high speeds
  - b) assist the pilot in initiating movement of the controls in both directions
  - c) zero the loads on the pilots controls in the flight attitude required
  - d) give more feel to the control column at all speeds

- 6 When operating a single engine propeller aircraft at high power and low indicated airspeed:
- a) ailerons are more effective than elevators.
  - b) The effectiveness of elevators and rudder are improved, the effectiveness of ailerons is reduced.
  - c) rudder is less effective than ailerons.
  - d) all controls are less effective.
- 7 When an aileron trim control in the cockpit is moved to counteract a tendency to fly right wing low, an aileron trim tab fitted to the left aileron will move:
- a) up and this will cause the left aileron to move down while the right aileron will move up
  - b) down and this will cause the left aileron to move up while the right aileron moves down
  - b) down and this will cause the left aileron to move down and the right aileron to move up
  - c) up and this will cause the aircraft to yaw to the left
- 8 To trim for a nose down attitude , the elevator trim tab will
- a) move up and cause a localised lift force moving the elevator down
  - b) move up and cause a localised lift force moving the elevator up
  - c) move down and cause a localised lift force moving the elevator up
  - d) move down and cause a localised lift force moving the elevator down
- 9 With the aircraft standing stationary on the ground, if the control column is moved back, a spring tab on the elevator:
- a) will remain in the neutral position relative to the elevator
  - b) will move down relative to the elevator
  - c) will move up relative to the elevator
  - d) will only move when the spring tension is adjusted by a ground engineer
- 10 Rotation about the lateral axis is known as
- a) pitching and is controlled with the elevator
  - b) rolling and is controlled with the ailerons
  - c) yawing and is controlled with the ailerons
  - d) rolling and is controlled with the rudder

- 11 An anti-balance tab is designed to:
- a) provide a force to move the main control surface so relieve, control column effort.
  - b) Provide a force to increase feel and increase the pilot's awareness of the loads imposed by control surface deployment.
  - c) position the control surface in the streamed position in flight after balance tab deployment.
  - d) provide a back-up in case the main control surface falls.
- 12 Aileron drag, or adverse yaw, is most likely at:
- a) high speed
  - b) low angle of attack
  - c) low speed
  - d) high altitude
- 13 If an aircraft has almost full nose up trim in order to zero the control forces in level flight:
- a) elevator authority in pitch is unaffected
  - b) elevator authority in the nose up sense is reduced
  - c) only trim tab movement is unaffected
  - d) none of the above answers is correct
- 14 With the trim tab in neutral, when the elevator is moved up:
- a) the tab will move down
  - b) the tab will move up
  - c) the tab will remain in line with the elevator
  - d) the tab chord will remain parallel to the tailplane chord line
- 15 When an aircraft is rolled to port adverse yaw will be reduced by:
- a) a Frise aileron being effective on the port wing
  - b) a Frise ailerons producing increased profile leading edge drag on both surfaces
  - c) the leading edge of the down going aileron protruding into the airflow
  - d) the down going aileron producing a greater angle of deflection than the up going aileron

- 16 On an aircraft fitted with spoilers, movement of the control column to the right will cause:
- a) starboard spoiler to move up and the port spoiler down
  - b) starboard spoiler to move up and the port spoiler to remain flush with the wing surface
  - c) port and starboard spoilers to move up
  - d) port and starboard spoilers to move down
- 17 The angle of deflection of a differential aileron when the aircraft is being rolled will be greatest::
- a) on the up going aileron on the up going wing
  - b) on the down going aileron on the up going wing
  - c) on the up going aileron on the down going wing
  - d) on the down going aileron on the down going wing
- 18 The purpose of a control surface inset hinge is to:
- a) increase control surface feel
  - b) reduce control column loading
  - c) prevent control surface flutter
  - d) increase control surface deflection angle
- 19 Control forces may be reduced by:
- a) increasing the distance between the control hinge and the C of G of the surface
  - b) decreasing the distance between the control hinge and the C of G of the surface
  - c) reducing the distance between the control hinge and the C of P of the surface
  - d) fitting spring loaded anti-balance tabs
- 20 A spring tab fitted to a control system:
- a) only operates at a high TAS or high deflection
  - b) operates in the same direction as the main control surface
  - c) is normally fitted to the rudder only
  - d) is designed to reduce stick forces at high EAS
- 21 To reduce the stick forces required to deflect large control surfaces, they may have:
- a) mass balance
  - b) aerodynamic balance
  - c) static balance
  - d) the hinge line moved toward the leading edge

- 22 An aircraft would be fitted with differential ailerons to give:
- a) a nose up pitch to counteract the tendency of the nose to drop in a turn
  - b) a reduction in yawing movement which opposes roll
  - c) an increase in yawing movement which opposes roll
  - d) an increase in yawing movement to compliment roll
- 23 To produce the desired effect, trim tabs must be adjusted
- a) in the same direction as the primary control surfaces they affect
  - b) in the opposite direction to the primary control surfaces they affect
  - c) depending upon the design of the trim tab controls
  - d) in small increments
- 24 Differential flight spoilers are often used on large aircraft to assist roll control. Which of the following would occur if the pilot rolled the control column towards the right to initiate a right turn?
- a) If the flight spoilers are extended, they will both retract
  - b) If the spoilers are retracted, the left spoiler will extend, and the right spoiler will remain retracted
  - c) If the spoilers are retracted, they will both remain retracted
  - d) If the spoilers are extended, the left spoiler will retract and the right spoiler will remain extended
- 25 Large fast high flying jet transport aircraft use flight spoilers for:
- a) pitch control
  - b) altitude control
  - c) yaw control
  - d) roll control
- 26 A Frise type aileron is designed to:
- a) counteract roll with yaw
  - b) produce greater drag on the inner wing when commencing a turn
  - c) assist the aerodynamic balance on the outer aileron
  - d) reduce drag on the outer wing during a turn
- 27 The effect of increasing IAS on primary flight control movement is that
- a) all primary flight controls become less effective
  - b) the rudder and elevator become more effective but aileron effectiveness is unchanged
  - c) all primary flight controls become more effective
  - d) the ailerons become more effective but rudder and elevator effectiveness is unchanged

- 28 To achieve the same degree of longitudinal trim, the trim drag:
- a) would be higher for a variable incidence tail than an elevator.
  - b) will be the same for both a variable incidence tail and an elevator.
  - c) from an elevator would be higher than a variable incidence tail.
  - d) will be higher from an elevator if assisted by the ailerons.
- 29 A flying control mass balance weight :
- a) keeps the control surface C of G as close to the trailing edge as possible.
  - b) tends to move the control surface C of G close to the hinge line.
  - c) ensures that the C of G always acts to aid the pilot thus relieving control column load.
  - d) keeps the control surface C of G at the leading edge.
- 30 The design feature known as a "Frise" aileron; is incorporated to :
- a) provide aerodynamic balancing so assisting the pilot to move the control.
  - b) equalise aileron drag in a turn.
  - c) ensure aileron control is retained at high angles of attack.
  - d) To prevent aileron flutter
- 31 The method employed to mass balance control surfaces is to:
- a) fit bias strips to the trailing edge of the surfaces.
  - b) attach weights forward of the hinge line.
  - c) allow the leading edge of the surface to project into the airflow.
  - d) minimise the weight of the control surface.
- 32 In an aircraft flying control system employing servo-tabs, the installation of external ground locks to the main control surface :
- a) is unnecessary since the system is irreversible and therefore the control surface cannot be displaced by the wind.
  - b) would not prevent movement of the control column.
  - c) would also prevent movement of the control column.
  - d) locks the servo-tabs as well as the control surface.
- 33 If the left rudder pedal is pushed forward, the aircraft nose will:
- a) yaw to the right possibly causing the left wing to lift.
  - b) yaw to the left possibly causing the left wing to lift.
  - c) yaw to the left possibly causing the right wing to lift.
  - d) yaw right causing aircraft to roll left.

- 34 Ailerons may be arranged such that the up-going aileron moves further than the down-going aileron in order to:
- a) equalise adverse yawing moments due to drag in a banked turn.
  - b) provide the pilot with assistance to move the control.
  - c) reduce the tendency to control reversal near the stall.
  - d) to counter dutch-roll.
- 35 The action of the spring in a spring tab:
- a) reduces the angle through which the tab moves at high speed.
  - b) makes the tab move through a greater angle at high speed.
  - c) varies the effectiveness of the tab automatically so that with large aerodynamic loads the movement of the tab is reduced.
  - d) Holds the tab in a preset position until air loads at high speed or large deflection angles become greater than spring tension
- 36 Which of the following design feature would be used to reduce high speed wing twist and aileron reversal
- a) frise ailerons
  - b) spoilers
  - b) balance tabs
  - c) trim tabs
- 37 An anti-balance tab is a moveable tab on the trailing edge of a control surface which is geared to move in the same direction of the primary control surface. Why is this design incorporated
- a) to reduce wing twisting moment when large control inputs are introduced
  - b) to resist the movement of the control surface when control forces are too light
  - b) to reduce control surface flutter
  - c) to relieve control forces at high wing loadings
- 38 Mass balances are included on some control surfaces. Their purpose is to
- a) relieve control forces at high speeds
  - b) relieve control forces at high wing loadings
  - c) reduce control surface flutter
  - c) reduce adverse aileron yaw

- 39 Control surface flutter may be reduced by:
- a) mass balance weights in front of the hinge line
  - b) fitting an anti flutter tab
  - c) fitting an anti balance tab
  - d) fitting a bias tab
- 40 An aircraft is rolling to the right in the cruise. When the aileron trim is used to correct this
- a) the tab on the right aileron will move up
  - b) the tab on the right aileron will move down
  - c) the tab on the left aileron will move up
  - d) it will move the right aileron up
- 41 If the pilot moves the control column back and to the right
- a) the elevators will move down and the left aileron down and right aileron up
  - b) the elevators will move down and the left aileron up and right aileron down
  - c) the elevators will move up and the left aileron up and right aileron down
  - d) the elevators will move up and the left aileron down and right aileron up
- 42 If an aircraft is flying at 100 knots and the ailerons are moved to full deflection, it has a roll rate of 100 deg per second. If the speed is doubled it should roll at 200 deg per sec because of control effectiveness increasing with the square of the speed. However, it only rolls at 150 deg per sec. This is because
- a) the ailerons cannot be fully deflected at this speed
  - b) the ailerons are not large enough
  - c) of roll damping due to the increased angle of attack of the down going wing
  - d) of roll damping due to the increased angle of attack of the up going wing



## **Answers**

**1.a 2.a 3.a 4.d 5.c 6.b 7.b 8.a 9.a 10.a 11.b 12.c  
13.b 14.c 15.a 16.b 17.c 18.b 19.c 20.a 21.b 22.b  
23.b 24.d 25.d 26.b 27.c 28.c 29.b 30.b 31.b 32.b  
33.c 34.a 35.d 36.b 37.b 38.c 39.a 40.a 41.d 42.c**