

Professione Volare Domande Aerodynamics

149) In what way is the longitudinal stability affected by the degree of positive camber of the aerofoil?

- A** Positive, because the centre of pressure shifts rearward at increasing angle of attack.
- B** Negative, because the lift vector rotates forward at increasing angle of attack.
- C** Positive, because the lift vector rotates backward at increasing angle of attack.
- D** No effect, because camber of the aerofoil produces a constant pitch down moment coefficient, independent of angle of attack.

137) How would the exterior appearance of an aeroplane change, when trimming for speed increase ?

- A** The elevator is deflected further up by a downward deflected trim tab
- B** The elevator is deflected further downward by means of a movable horizontal stabiliser
- C** The exterior appearance of the aeroplane will not change
- D** Elevator deflection is increased further downward by an upward deflected trim tab

138) Trailing edge flap extension will:

- A** decrease the critical angle of attack and decrease the value of CL_{max} .
- B** increase the critical angle of attack and decrease the value of CL_{max} .
- C** decrease the critical angle of attack and increase the value of CL_{max} .
- D** increase the critical angle of attack and increase the value of CL_{max} .

139) The polar curve of an aerofoil is a graphic relation between :

- A** TAS and stall speed
- B** Angle of attack and CL
- C** CD and angle of attack
- D** CL and CD

140) The lift coefficient (CL) of an aeroplane in steady horizontal flight is 0.35. Increase in angle of attack of 1 degree will increase CL by 0.079. A vertical up gust instantly changes the angle of attack by 2 degrees. The load factor will be :

- A** 1.9
- B** 1.45
- C** 0.9
- D** 0.45

141) Which aeroplane behaviour will be corrected by a yaw damper ?

- A** Spiral dive.
- B** Buffeting.
- C** Dutch roll.
- D** Tuck under.

142) The aft movement of the centre of pressure during the acceleration through the transonic flight regime will:

- A** decrease the static lateral stability.
- B** increase the static longitudinal stability.
- C** decrease the longitudinal stability.
- D** increase the static lateral stability.

143) The relative thickness of an aerofoil is expressed in:

- A** camber.
- B** meters.
- C** degrees cross section tail angle.
- D** % chord.

144) The frontal area of a body, placed in a certain airstream is increased by a factor 3. The shape will not alter. The aerodynamic drag will increase with a factor :

- A** 1.5 .
- B** 3 .
- C** 9 .
- D** 6 .

Professione Volare Domande Aerodynamics

205) The Mach-trim function is installed on most commercial jets in order to minimize the adverse effects of :

- A** compressibility effects on the stabilizer
- B** changes in the position of centre of pressure
- C** increased drag due to shock wave formation
- D** uncontrolled changes in stabilizer setting

206) After take-off the slats (when installed) are always retracted later than the flaps. Why ?

- A** Because FLAPS EXTENDED gives a large decrease in stall speed with relatively less drag.
- B** Because SLATS EXTENDED gives a large decrease in stall speed with relatively less drag.
- C** Because SLATS EXTENDED provides a better view from the cockpit than FLAPS EXTENDED.
- D** Because VMCA with SLATS EXTENDED is more favourable compared to the FLAPS EXTENDED situation.

207) What increases the stalling angle of attack ? Use of :

- A** flaps
- B** spoilers
- C** fuselage mounted speed-brakes
- D** slats

208) What data may be obtained from the Buffet Onset Boundary chart ?

- A** The values of MMO at different weights and altitudes.
- B** The values of Mcrit at different weights and altitudes.
- C** The values of the Mach Number at which low speed and shock-stall occur at different weights and altitudes.
- D** The values of the Mach Number at which low speed and Mach Buffet occur at different weights and altitudes.

209) The regime of flight from the critical Mach number up to $M = 1.3$ is called the

- A** transonic range.
- B** supersonic range.
- C** hypersonic range.
- D** subsonic range.

210) The positive manoeuvring limit load factor for a light aeroplane in the utility category in the clean configuration is:

- A** 6.0
- B** 4.4
- C** 2.5
- D** 3.8

211) The trailing edge flaps when extended :

- A** significantly increase the angle of attack for maximum lift
- B** significantly lower the drag
- C** worsen the best angle of glide
- D** increase the zero lift angle of attack

212) Sensitivity for spiral dive will occur when :

- A** the dutch roll tendency is too strongly suppressed by the yaw damper.
- B** the static directional stability is positive and the static lateral stability is relatively weak.
- C** the static directional stability is negative and the static lateral stability is positive.
- D** the static lateral and directional stability are both negative.

213) Extension of FOWLER type trailing edge lift augmentation devices, will produce:

- A** a force which reduces drag.
- B** a nose-down pitching moment.
- C** no pitching moment.
- D** a nose-up pitching moment.

214) The additional increase of drag at Mach Numbers above the critical Mach Number is due to:

- A** wave drag.
- B** increased angle of attack.
- C** increased interference drag.
- D** increased skin friction.

Professione Volare Domande Aerodynamics

99) In a twin-engined jet powered aeroplane (engines mounted below the low wings) the thrust is suddenly increased. Which elevator deflection will be required to maintain the pitching moment zero ?

- A** No elevator movement will be required because the thrust line of the engines remains unchanged.
- B** It depends on the position of the centre of gravity.
- C** Down.
- D** Up.

100) **V_A** is:

- A** the speed that should not be exceeded in the climb.
- B** the maximum speed at which maximum elevator deflection up is allowed.
- C** the maximum speed at which rolls are allowed.
- D** the speed at which a heavy transport aeroplane should fly in turbulence.

101) If the altitude is increased and the TAS remains constant in the standard troposphere the Mach Number will:

- A** decrease.
- B** not change.
- C** increase or decrease, depends of the type of aeroplane.
- D** increase.

102) An aeroplane has a stall speed of 100 kt at a load factor $n=1$. In a turn with a load factor of $n=2$, the stall speed is:

- A** 70 kt
- B** 200 kt
- C** 141 kt
- D** 282 kt

103) Which statement is correct?
The lift to drag ratio provides directly the

- A** distance for climb up to a certain altitude.
- B** glide distance from a given altitude at zero wind.
- C** glide distance from a given altitude.
- D** distance for horizontal flight.

104) In the transonic range lift will decrease at the shock stall due to the

- A** first appearance of a shock wave at the upper side of the wing.
- B** appearance of the bow wave.
- C** separation of the boundary layer at the shock waves.
- D** attachment of the shock wave on the trailing edge of the wing.

105) **V_{MO}** :

- A** should be chosen in between **V_C** and **V_D**
- B** is equal to the design speed for maximum gust intensity.
- C** is the calibrated airspeed at which **MMO** is reached at 35 000 ft.
- D** should be not greater than **V_C**.

106) The speed for minimum glide angle occurs at a certain angle of attack. Which are the corresponding aerodynamic coefficients(s) ?

- A** $(C_L/C_D)_{\max}$
- B** $C_{L_{\max}}$
- C** $(C_L/C_D^2)_{\max}$
- D** $(C_L^{1/2}/C_D)_{\max}$

217) The pitch up effect of an aeroplane with swept wing in a stall is due to the

- A** aft movement of the centre of gravity.
- B** forward movement of the centre of gravity.
- C** wing root stalling first.
- D** wing tip stalling first.

94) The function of the stick pusher is:

- A** to activate and push the stick forward at or beyond a certain value of angle of attack.
- B** to activate and push the stick forward prior to stick shaker.
- C** to vibrate the controls.
- D** to pull the stick, to avoid a high speed stall.

Professione Volare Domande Aerodynamics

391) (For this question use annex 081-6261A)
Which point shown in the figure corresponds with CL for minimum horizontal flight speed?

- A** Point d
- B** Point a
- C** Point b
- D** Point c

377) There are two types of boundary layer: laminar and turbulent. One important advantage the turbulent boundary layer has over the laminar type is that :

- A** it has less tendency to separate from the surface
- B** it is thinner
- C** skin friction drag is less
- D** energy is less

393) Which statement is correct about a spring tab ?

- A** At high IAS it behaves like a servo tab
- B** At low IAS it behaves like a servo tab
- C** At high IAS it behaves like a fixed extension of the elevator
- D** Its main purpose is to increase stick force per g

394) A propeller is turning to the right, seen from behind. The asymmetric thrust effect in the climb will:

- A** roll the aeroplane to the right.
- B** yaw the aeroplane to the left.
- C** roll the aeroplane to the left.
- D** yaw the aeroplane to the right.

395) Which statement is correct about a normal shock wave ?

- A** The airflow changes from supersonic to subsonic
- B** The airflow changes direction
- C** The airflow changes from subsonic to supersonic
- D** The airflow expands when passing the aerofoil

396) To increase the critical Mach number a conventional aerofoil should

- A** have a low thickness to chord ratio.
- B** have a large camber.
- C** be used with a high angle of attack.
- D** have a large leading edge radius.

397) Increasing air pressure will have the following effect on the drag of an aeroplane (angle of attack, OAT and TAS are constant):

- A** The drag is only affected by the ground speed.
- B** The drag increases.
- C** This has no effect.
- D** The drag decreases.

398) Which statement regarding the gust load factor on an aeroplane is correct (all other factors of importance being constant) ?

1. Increasing the aspect-ratio of the wing will increase the gust load factor.

2. Increasing the speed will increase the gust load factor.

- A** 1 and 2 are correct.
- B** 1 is incorrect and 2 is correct.
- C** 1 and 2 are incorrect.
- D** 1 is correct and 2 is incorrect.

399) Which of the following statements about the stall of a straight wing aeroplane is correct?

- A** The nose down effect is the result of increasing downwash, due to flow separation.
- B** The horizontal tail will stall at a higher speed than the wing.
- C** Just before the stall the aeroplane will be have a nose-down tendency.
- D** Buffeting is the result of flow separation on the tail plane.

Professione Volare Domande Aerodynamics

232) When are outboard ailerons (if present) de-activated ?

- A** Landing gear retracted.
- B** Landing gear extended.
- C** Flaps (and slats) retracted or speed above a certain value.
- D** Flaps (and/or slats) extended or speed below a certain value..

233) Increase of wing loading will:

- A** increase the stall speeds.
- B** decrease the minimum gliding angle.
- C** increase CLmax.
- D** decrease take off speeds.

234) (For this question use annex 081-6263A)
Which point in the diagram gives the best glide condition?

- A** Point c
- B** Point d
- C** Point b
- D** Point a

235) In a mechanically controlled aeroplane, the most forward allowable position of the centre of gravity could be limited by the:

- A** engine thrust, engine location.
- B** trim system, trim tab surface.
- C** wing surface, stabilizer surface.
- D** elevator capability, elevator control forces.

236) Induced drag at constant IAS is affected by:

- A** engine thrust.
- B** aeroplane weight.
- C** aeroplane wing location.
- D** angle between wing chord and fuselage centre line.

237) The speed of sound is affected by the:

- A** temperature of the air.
- B** density of the air.
- C** pressure of the air.
- D** humidity of the air.

226) For an aeroplane with one fixed value of VA the following applies. VA is :

- A** the speed at which the aeroplane stalls at the manoeuvring limit load factor at MTOW.
- B** the maximum speed in smooth air
- C** the speed at which unrestricted application of elevator control can be used, without exceeding the maximum manoeuvring limit load factor
- D** just another symbol for the rough air speed

239) (For this question use annex 081-6269A)
Which type of flap is shown in the picture?

- A** Plain flap
- B** Split flap
- C** Fowler flap
- D** Double slotted flap

431) Deploying a Fowler flap, the flap will:

- A** turn down, then move aft.
- B** just move aft.
- C** just turn down.
- D** move aft, then turn down.

241) When an aeroplane is flying through the transonic range with increasing Mach Number the centre of the pressure of the wing will move aft. This requires:

- A** a stability augmentation system.
- B** much more thrust from the engine.
- C** a higher IAS to compensate the nose down effect.
- D** a pitch up input of the stabilizer.

Professione Volare Domande Aerodynamics

242) The (1) stick force stability and the (2) manoeuvre stability are positively affected by:

- A** (1) forward C.G. position (2) forward CG. position.
- B** (1) forward C.G. position (2) aeroplane nose up trim.
- C** (1) aft C.G. position (2) aft CG. position.
- D** (1) aeroplane nose up trim (2) aeroplane nose up trim.

243) What happens during an engine failure with two similar aeroplanes with wing mounted engines, one of them with jet engines, the other one with co-rotating propellers:

- A** More roll tendency for the propeller aeroplane.
- B** The same yaw tendency for both aeroplanes regardless of left or right engine failure.
- C** The same roll tendency for both aeroplanes.
- D** Less roll tendency for the propeller aeroplane.

244) Lift is generated when:

- A** a certain mass of air is accelerated downwards.
- B** the shape of the aerofoil is slightly cambered.
- C** an aerofoil is placed in a high velocity air stream.
- D** a certain mass of air is retarded.

245) An aeroplane accelerates from 80 kt to 160 kt at a load factor equal to 2. The induced drag coefficient (induced drag) (i) after with the following factors:

- A** (i) 1/2 (ii) 1/16
- B** (i) 4 (ii) 1/2
- C** (i) 1/16 (ii) 1/4
- D** (i) 1/4 (ii) 2

246) Flaperons are controls which are used simultaneously as

- A** flaps and speed brakes.
- B** flaps and elevator.
- C** ailerons and flaps.
- D** ailerons and elevator.

247) The stalling speed in IAS will change according to the following factors:

- A** May increase when the c.g. moves forward, with higher altitude and due to the slip stream from a propeller on an engine located forward of the wing
- B** Will increase in a turn, higher temperature and will increase when the c.g. moves aft
- C** Will increase with increased load factor, more flaps and increased bank angle in a turn
- D** May increase with altitude, especially high altitude, will increase during icing conditions and will increase when the c.g. moves forward

248) The angle of attack for a propeller blade is the angle between blade chord line and:

- A** Local air speed vector.
- B** Direction of propeller axis.
- C** Aeroplane heading.
- D** Principal direction of propeller blade.

249) A Machtrimmer:

- A** is necessary for compensation of the autopilot at high Mach Numbers
- B** has no effect on the shape of the elevator position versus speed (IAS) curve for a fully hydraulic controlled aeroplane.
- C** corrects insufficient stick force stability at high Mach Numbers.
- D** increases the stick force per g at high Mach Numbers.

250) The normal stall recovery procedure for a light single engined aeroplane is:

- A** idle power and stick roll-neutral nose-down and no other corrections.
- B** idle power and stick neutral, waiting for the natural nose-down tendency.
- C** full power and stick roll-neutral nose-down, correcting for angle of bank with rudder.
- D** full power and stick roll-neutral nose-down, correction for angle of bank with stick.

Professione Volare Domande Aerodynamics

314) In the transonic range the aeroplane characteristics are strongly determined by:

- A** the IAS.
- B** the CAS.
- C** the Mach Number.
- D** the TAS.

315) On a swept wing aeroplane at low airspeed, the "pitch up" phenomenon:

- A** is caused by boundary layer fences mounted on the wings.
- B** is caused by wingtip stall.
- C** never occurs, since a swept wing is a "remedy" to pitch up.
- D** is caused by extension of trailing edge lift augmentation devices.

316) The unit of measurement of pressure is:

- A** lb/gal
- B** kg/dm²
- C** psi
- D** kg/m³

317) Which of the following will reduce induced drag?

- A** Extending the flap.
- B** Elliptical lift distribution.
- C** Low aspect ratio.
- D** Flying at high angles of attack.

318) (For this question use annex 081-6264A)
Which point in the diagram gives the lowest speed in horizontal flight?

- A** Point b
- B** Point c
- C** Point d
- D** Point a

319) Should a transport aeroplane fly at a higher Mach number than the 'buffet-onset' Mach number?

- A** Yes, but only during approach.
- B** Yes, if you want to fly fast at very high altitudes.
- C** No, this is not acceptable
- D** Yes, this causes no problems.

320) Which of the following statements is correct ?
I When the critical engine fails during take-off the speed VMCL can be limiting.
II The speed VMCL can be limited by the available maximum roll rate

- A** I is correct, II is incorrect
- B** I is incorrect, II is correct
- C** I is correct, II is correct
- D** I is incorrect, II is incorrect

321) What will happen in ground effect ?

- A** a significant increase in thrust required
- B** the induced angle of attack and induced drag decreases
- C** the wing downwash on the tail surfaces increases
- D** an increase in strength of the wing tip vortices

322) Mcrit is the free stream Mach Number at which:

- A** shockstall occurs.
- B** the critical angle of attack is reached.
- C** somewhere about the airframe Mach 1 is reached locally.
- D** Mach buffet occurs.

309) The extreme right limitation for both V-n (gust and manoeuvre) diagrams is created by the speed:

- A** VMO
- B** VD
- C** VC
- D** Vflutter