

PRINCIPLES OF FLIGHT

1. The static pressure of gases work...

in all directions

only in flow direction.

only in the direction of the total pressure.

only vertical to the flow direction.

2. Bernoulli's equation for frictionless, incompressible gases states that...

total pressure = dynamic pressure - static pressure.

static pressure = total pressure + dynamic pressure.

dynamic pressure = total pressure + static pressure.

total pressure = dynamic pressure + static pressure.

3. When air flows through a pipe with changing cross sections, the static pressure changes. The total pressure ..

increases proportionally.

reduces proportionally.

does not change.

changes proportionally.

4. If surrounded by airflow ($v > 0$), any arbitrarily shaped body produces...

drag.

constant drag at any speed.

drag and lift.

lift without drag.

5. The "angle of attack" is the angle between...

the aircraft's longitudinal axis and the relative airflow.

the aircraft's longitudinal axis and the chord line.

the chord line and the relative airflow.

the chord line of the elevator and the chord line of the wing.

6. All aerodynamic forces can be considered to act on a single point. This point is called...

center of gravity.

center of pressure.

lift point.

transition point.

7. Which answer describes the term "aerodynamic force"?

Component of the lifting force in airflow direction

Sum of the vectors of lift and weight force

Sum of the vectors of lift and drag force

Difference of the vectors of lift and weight force

8. "Profile depth" is the distance between the...

leading edge and trailing edge of a profile.

wing root and the wing tip.

profile's lower and upper edge at the thickest point.

profile's lower and upper edge at the thinnest point.

9. The illustrated profile is a / an ...

normal profile.

symmetrical profile.

laminar profile.

S-profile.

10. The ratio of span and mean chord length is referred to as...

wing sweep.

trapezium shape.

tapering.

aspect ratio.

11. Which wing shape has the highest induced drag?

Rectangular wing

Trapeze-shaped wing

Ellipsoidal wing

Triangular-shaped wing

12. When the rigging angle of incidence of a wing is smaller on the outer side than on the inner (on the root), that is called...

geometric twist.

V-shape.

aerodynamic twist.

aerodynamic torsion.

13. The start of vortex development is created during which phase of flight?

While setting take-off power during take-off run

While setting flaps to lower position

As soon as the aircraft starts moving

When lift is being generated during rotation

14. What occurs at the "transition point"?

The change from turbulent to laminar airflow

The change from laminar to turbulent airflow

The lateral tilting of the aircraft with stall

Reaching the maximum lift coefficient

15. What pattern can be found at the stagnation point?

The laminar boundary layer changes into a turbulent boundary layer

Streamlines are divided into airflow above and below the profile

The boundary layer starts separating on the upper surface of the profile

All aerodynamic forces can be considered as attacking at this single point

16. Which of the following options describes the pressure pattern at a lift-generating wing profile passed by airflow?

Pressure below remains unchanged, lower pressure is created above the profile

High pressure is created above, lower pressure below the profile

Low pressure is created above, higher pressure below the profile

Pressure above remains unchanged, higher pressure is created below the profile

17. The position of the the center of pressure at a positively shaped profile...

moves to the trailing edge while the angle of attack becomes smaller.

does not move since it is independent of the angle of attack.

moves to the leading edge while the angle of attack becomes smaller.

is located at approximately 25% of the chord, measured from the leading edge.

18. A symmetrical profile...

does not produce lift.

has the least induced drag with a positive attack angle.

has a non-moving center of pressure.

can only be flown upside-down.

19. Which statement about lift and angle of attack is correct?

Increasing the angle of attack too far may result in a loss of lift and an airflow separation
Increasing the angle of attack results in less lift being generated by the aerofoil

Decreasing the angle of attack results in more lift being generated by the aerofoil

Too large angles of attack can lead to an exponential increase in lift

20. Which statement about the airflow around an aerofoil is correct if the angle of attack decreases?

The center of pressure moves forward

The stagnation point moves down

The stagnation point remains constant

The center of pressure moves aft

21. The lift on an airfoil can be directly changed during flight...

by changing the angle of incidence.

by changing the angle of attack.

by changing the trim.

under no circumstances.

22. Which option states a benefit of aerodynamic washout?

At high angles of attack the effectiveness of the aileron is retained as long as possible

Structurally the wing is made more rigid against rotation

Greater hardness because the wing can withstand more torsion forces

With the washout the form drag reduces at high speeds

23. Where does "separation" on the aerofoil set in and in which direction does it move with increasing angle of attack?

On the leading edge of the profile, movement in airflow direction

On the entire upper side of the profile at the same time

At the profile's upper side at the trailing edge, movement opposite to the airflow direction

On the profile's lower side behind the transition point, movement in airflow direction

24. Which statement concerning the angle of attack is correct?

Increasing the angle of attack results in decreasing lift

The angle of attack cannot be negative

The angle of attack is constant throughout the flight

A too large angle of attack may result in a loss of lift

25. How do lift and drag change with decreasing air density (all other parameters remaining constant)?

They do not change

Lift will increase, drag will decrease

Lift and drag will decrease

Lift will decrease, drag will increase

26. Lift depends on...

lift coefficient, speed, air temperature, projected airfoil area.

lift coefficient, square of the speed, air density, projected airfoil area.

flight weight force, speed, air density, projected airfoil area.

flight weight force, engine power, air density, projected airfoil area.

27. The drag coefficient...

cannot be lower than a non-negative, minimal value.

may range from zero to an infinite positive value.

increases with increasing airspeed.

is proportional to the lift coefficient.

28. Which of the following answers characterises a thick profile compared to a thin profile at the same speed? The thick profile generates...

more drag and less lift.

more drag and more lift.

more drag and equal lift.

equal drag and more lift.

29. How does the drag of the aircraft change when the speed is doubled? It...

doubles.

remains the same.

quadruples.

Triples

30. Pressure compensation on an aerofoil occurs at the...

leading edge.

wing tips.

trailing edge.

wing roots.

31. Which of the following options is likely to produce large induced drag?

Large aspect ratio

Tapered wings

Small aspect ratio

Low lift coefficients

32. Induced drag is generated...

at the outer part of the ailerons.

at the trailing edge of the wing.

at the front part of the aileron.

at the lower part of the gear.

33. Where is interference drag generated?

At the ailerons

At the gear

Near the wing tips

At the wing root

34. Pressure drag, interference drag and friction drag belong to the group of the...

induced drag.

total drag.

parasite drag.

main resistance.

35. Which effect does a decreasing airspeed have on the induced drag during a horizontal and stable cruise flight?

The induced drag will increase

The induced drag will slightly decrease

The induced drag will remain constant

The induced drag will collapse

36. How do induced drag and parasite drag change with increasing airspeed during a horizontal and stable cruise flight?

Induced drag decreases and parasite drag increases

Induced drag increases and parasite drag increases

Parasite drag decreases and induced drag increases

Parasite drag decreases and induced drag decreases

37. Which body of the same cross-sectional area has the smallest drag with the same inflowing air speed?

Plain disc

Streamlined body

Hollow hemisphere

Sphere

38. How do lift and drag change when approaching a stall condition?

Lift and drag increase

Lift and drag decrease

Lift decreases and drag increases

Lift increases and drag decreases

39. During a stall, the lift...

increases and drag decreases.

increases and drag increases.

decreases and drag decreases.

decreases and drag increases.

40. The critical angle of attack...

is independent of the weight.

decreases with forward center of gravity position.

increases with backward center of gravity position.

changes with increasing weight.

41. A strong decrease of lift can suddenly occur...

when getting close to the stall speed.

when the flaps are extended.

when the engine power is reduced.

when the propeller is set to low RPM / large pitch.

42. The stall warning will be activated just before reaching which speed?

VNE

VS

VR

VX

43. With increasing wing load, the minimum flight speed...

decreases.

increases.

remains constant.

is dependent only on the flap position.

44. The "twist" of the aerofoil causes...

the airflow on the outer wing to stall sooner at high angles of attack and the induced drag to decrease.

the airflow on the inner wing to stall sooner at high angles of attack and the induced drag to decrease.

the airflow to stall later in the area of the aileron and the induced drag to increase.

the airflow to stall sooner in the area of the aileron and the induced drag to decrease.

45. In motorplanes the stall warning is usually activated by a change of...

the center of pressure.

the center of gravity.

the stagnation point.

the transition point.

46. Which statement regarding a spin is correct?

During recovery the ailerons should be kept neutral

During the spin the speed constantly increases

Only very old aeroplanes have a risk of spinning

During recovery the ailerons should be crossed

47. How do lift and drag change when setting flaps to a lower position?

Lift increases, drag increases

Lift increases, drag decreases

Lift decreases, drag increases

Lift decreases, drag decreases

48. With regard to flaps, which of the following options provides a lift-increasing effect?

Decreasing the form drag

Increasing the aerofoil camber

Decreasing the angle of attack

Lowering the induced drag

49. What kind of landing aids may not be retracted suddenly near the ground?

Spoilers

Airbrakes

Flaps

Schempp-Hirth flaps

50. A take-off with flaps in take-off position causes...

an increased rate of climb.

a decrease in drag.

an increased acceleration.

a shortening of the take-off run.

51. Which effect (among others) causes lift to increase when extending the landing flaps?

Reduction of the form drag

Enlargement of the profile camber

Reduction of the angle of attack

Reduction of the induced drag

52. How does extending the flaps to landing position affect the final approach (engine idle)?

Minimum speed is smaller, the glide path remains the same

Minimum speed is greater, the glide path remains the same

Minimum speed remains the same, the glide path is steeper

Minimum speed is smaller, the glide path is steeper

53. When taking off with the flaps extended (take-off position)...

the climb rate increases.

the rotation speed increases.

the take-off ground roll is shortened.

the acceleration increases.

54. The laminar layer on the aerofoil is located between...

the transition point and the separation point.

the stagnation point and the transition point.

the stagnation point and the center of pressure.

the transition point and the center of pressure.

55. What types of boundary layers can be found on an aerofoil?

Laminar boundary layer along the complete upper surface with non-separated airflow

Turbulent boundary layer along the complete upper surface with separated airflow

Turbulent layer at the leading wing areas, laminar boundary layer at the trailing areas

Laminar layer at the leading wing areas, turbulent boundary layer at the trailing areas

56. Which answer explains the term "boundary layer"?

The turbulences which arise with the combination of different assemblies of the aircraft

The layer in which the airflow speed increases from zero up to full speed of the airflow

The circulating part of the airfoil-fuselage flows

The air molecules which are subject to turbulence after the transition point

57. The laminar boundary layer is situated between...

transition point and trim edge.

transition point and separation point.

stagnation point and pressure point.

stagnation point and transition point.

58. In icing conditions, at which point will the most ice arise on an aeroplane?

On the upper and lower side of the control surfaces

On the pitot tube and the static pressure ports

On the upper and lower side of the wing's trailing edge

On all frontal areas of the airframe, the wings, and the tail

59. What structural item provides lateral stability to an airplane?

Vertical tail

Elevator

Differential aileron deflection

Wing dihedral

60. Which statement describes a situation of static stability?

An aircraft distorted by external impact will maintain the deflected position

An aircraft distorted by external impact will return to the original position

An aircraft distorted by external impact will tend to an even more deflected position

An aircraft distorted by external impact can return to its original position by rudder input

61. Which force does NOT act during straight and level flight?

Lift force

Centrifugal force

Gravitational force

Drag force

62. Stability around the lateral axis (longitudinal stability) is achieved by...

the effects and construction of the elevator unit.

the use of a V-tail.

a variable rigging angle of incidence of the wing.

a swept back wing.

63. Stability of the vertical axis can be achieved...

by the vertical stabilizer only.

only by the rudder.

by the pendulum effect of the fuselage and wing dihedral.

by the vertical tail and the fuselage shape.

64. Which constructive feature provides longitudinal stability to an airplane in normal configuration (empennage at tail)?

Differential aileron deflection

Downforce at the elevator

Positive wing dihedral

Trim plate at the tailfin

65. "Longitudinal stability" is referred to as stability around which axis?

Vertical axis

Longitudinal axis

Lateral axis

Propeller axis

66. What is the purpose of the horizontal stabiliser?

Commencing turns around the vertical axis

Stabilising the aircraft around the longitudinal axis

Stabilising the aircraft around the vertical axis

Stabilising the aircraft around the lateral axis

67. Stability around which axis is strongly influenced by the center of gravity's position?

Longitudinal axis

Vertical axis

Gravity axis

Lateral axis

68. What structural item provides directional stability to an airplane?

Wing dihedral

Large vertical tail

Large elevator

Differential aileron deflection

69. Rotation around the vertical axis is called...

yawing.

slipping.

rolling.

pitching.

70. The movement around the vertical axis of the aircraft is called...

rolling.

pitching.

yawing.

slipping.

71. The critical angle of attack...

decreases with a rear centre of gravity.

is not changed by different aircraft weights.

increases with a front centre of gravity.

is changed by different aircraft weights.

72. The elevator moves an aeroplane around the...

vertical axis.

lateral axis.

longitudinal axis.

elevator axis.

73. The elevator deflection for a specific maneuver...

is increased with a front centre of gravity.

is increased at high speeds.

is increased with a rear centre of gravity.

is independent of the speed.

74. How can a pilot maintain the altitude during a co-ordinated steep turn?

The rudder is operated into the opposite direction

The rudder is operated in the rotating direction

The elevator is pulled accordingly

The trim is set to nose-heavy

75. What has to be considered with regard to the center of gravity position?

Only correct loading can assure a correct and safe center of gravity position.

By moving the elevator trim tab, the center of gravity can be shifted into a correct position.

By moving the aileron trim tab, the center of gravity can be shifted into a correct position.

The center of gravity's position can only be determined during flight.

76. Deflecting the rudder to the left causes...

yawing of the aircraft to the right.

yawing of the aircraft to the left.

pitching of the aircraft to the left.

pitching of the aircraft to the right.

77. The adverse-yaw effect can occur...

during steep turns with more than 45° bank angle.

with rudder deflection.

on the elevator at every speed range.

with aileron deflection during slow-flight conditions.

78. Which control affects primarily the movement around the longitudinal axis?

Rudder

Aileron

Elevator

Trim

79. Differential aileron deflection is used to...

reduce wake turbulence.

avoid a stall at low angles of attack.

keep the adverse yaw low.

increase the rate of descent.

80. What is the advantage of differential aileron movement?

The adverse yaw is higher

The ratio of the drag coefficient to lift coefficient is increased

The drag of the downwards deflected aileron is lowered and the adverse yaw is smaller

The total lift remains constant during aileron deflection

81. Which answer describes the term "adverse yaw momentum"?

A yawing momentum in the same direction as the rolling momentum

A yawing momentum opposite to the direction of the rolling momentum

A rotation momentum around the longitudinal axis opposite to the aileron deflection

A rolling momentum additional to the rudder deflection

82. The aerodynamic rudder balance...

reduces the control surfaces.

reduces the control stick forces.

delays the stall.

improves the rudder effectiveness.

83. What is the function of the static rudder balance?

To prevent control surface flutter

To limit the control stick forces

To increase the control stick forces

To trim the controls almost without any force

84. During cruise flight with constant power setting, an aircraft shows a permanent tendency to raise the nose. How can this tendency be eliminated?

By shifting the center of gravity backwards

By elevator deflection upwards

By deflecting the elevator trim tab downwards

By deflecting the elevator trim tab upwards

85. What is a bendable trim tab?

A balance mass at a control surface

A term for a rudder balance

A trim device adjustable in flight

A fixed tab attached to the rudder or the aileron

86. The trim tab at the elevator is deflected upwards. In which position is the corresponding indicator?

Neutral position

Laterally trimmed

Nose-up position

Nose-down position

87. What describes "wing loading"?

Wing area per weight

Drag per wing area

Drag per weight

Weight per wing area

88. The maximum permissible speed for an aircraft...

is compulsory for aerobatics.

cannot be achieved by a vertical nose down diving flight.

must never be exceeded.

should only be exceeded in still air.

89. Which answer describes the "manoeuvring speed"?

Maximum speed with which abrupt, full control deflection

Maximum speed for steep turns

Minimum speed for steep turns

Initial speed for aerobatic figures

90. Through which factor listed below does the load factor increase during cruise flight?

An upward gust

Higher aeroplane weight

A forward centre of gravity

Lower air density

91. Through which factor listed below does the load factor decrease during cruise flight?

A downward gust

An aft centre of gravity

Higher air density

Lower aeroplane weight

92. Which statement regarding the "constant-speed propeller" is correct?

The propeller keeps the airspeed constant

The pitch of the propeller rises with higher speeds

The RPM decreases with lower speeds

The set RPM is kept constant by the motor power (MAP)

93. The change in pitch at a propeller blade from the root to the tip ensures...

a nearly constant load by a constant effective angle of attack over the entire length of the blade.

the largest possible angle of attack at the blade tip.

that the most thrust is produced at the blade root.

that the most thrust is produced at the blade tip.

94. After an engine failure, the windmilling propeller...

generates drag rather than thrust.

generates neither thrust nor drag.

improves the properties of the glide.

has a greater pitch in feathered position.

95. During a descent at idle power with constant speed, the propeller lever is moved backwards. How do the propeller pitch and sink rate change?

Propeller pitch is increased, sink rate is decreased

Propeller pitch is increased, sink rate is increased

Propeller pitch is decreased, sink rate is decreased

Propeller pitch is decreased, sink rate is increased

96. How is the spin influenced when power is added during a left spin with a clockwise spinning engine?

It is enforced

It is not influenced at all

It is strongly decreased

It decreases minimally

97. Which answer defines the term "wing load"?

Maximum mass an aircraft can carry

Maximum take-off mass

Mass of the aircraft per wing surface area

Mass of the air which the aircraft displaces

98. After increasing the angle of attack during flight with best gliding speed, initially...

lift and drag increase.

lift and drag decrease.

lift decreases and drag increases.

lift increases and drag decreases.

99. How is the balance of forces affected during a turn?

Lift force must be increased to compensate for the sum of centrifugal and gravitational force

A lower lift force compensates for a lower net force as compared to level flight

The horizontal component of the lift force during a turn is the centrifugal force

The net force results from superposition of gravity and centripetal forces

100. The spin tendency of an aircraft is greater...

with a forward center of gravity position.

when trim is "nose-heavy".

with an aft center of gravity position.

when trim is "tail-heavy".