Definitions

Angle of attack is the angle between the wing chord line and the direction of the relative wind. An increase in angle of attack will increase impact pressure below the wing to increase lift and drag, and will cause the center of pressure to move forward. By changing the angle of attack, the pilot controls the airplane’s lift, airspeed and drag.

Chord line is the line between the leading and the trailing edges of the airfoil.

Relative wind is the direction of the airflow with respect to the wing. It is also the direction opposite and parallel to the flight path.

Forces Acting On The Aircraft

Lift is the differential pressure between the higher air pressure below the wing’s surface and the lower air pressure above the wing’s surface. It acts perpendicular to the relative wind and flight path.

Drag is the rearward force of wind resistance, and acts parallel to the relative wind.

Thrust is the forward acting force, produced by the propeller. It is equal to drag whenever your airspeed is constant:

Lift equals weight whenever you are in straight and level flight, or climbing or descending at a constant rate. In steady-state flight (straight and level or steady climb or descent), the sum of the opposing forces is equal to zero.

If airspeed is doubled and the angle of attack remains constant, lift and drag will be four times greater.

Angle Of Attack And Stalling Speeds

The angle of attack at which a wing stalls remains constant regardless of weight, dynamic pressure, bank angle, or pitch attitude.

There is a corresponding indicated airspeed required for every angle of attack to generate sufficient lift to maintain altitude.

Indicated stalling speed is increased by added weight, increased load factor and bank angle, decreased power, and is most affected by variations in loading. Turbulent air can cause an Increase in stalling speed when there is an abrupt change in relative wind.

An airplane will spin only after having been stalled. If the CG is too far rearward, stall recovery becomes more difficult and normal spin recovery may become difficult. The airplane may become uncontrollable if the most rearward CG position is exceeded.

Types Of Drag

Drag is comprised of parasite drag and induced drag. As speed increases, parasite drag Increases and induced drag decreases.

The velocity Indicated by points ‘A’ and ‘B’ (on next page) shows the maximum L/D speed (lift divided by drag). The maximum L/D speed decreases as weight decreases. Maintaining maximum L/D speed will result in the maximum range and maximum distance glide.
Load factor is the actual load on the wings at any time divided by the weight of the airplane.

Load factor in a constant altitude turn depends strictly on angle of bank. As long as bank remains constant, load factor is also constant.

If an airplane is listed as utility category, it can perform limited acrobatics, including spins.

**Functions Of The Flight Controls**

Elevators pitch the airplane about the lateral axis to change the angle of attack.

Rudder controls yaw about the vertical axis, not to turn the airplane, but to overcome adverse yaw produced by the depressed aileron on the high wing.

Wing flaps increase lift and drag. This decreases stalling speed and increases the angle of descent during landing without increasing airspeed.

The proper technique for crosswind takeoffs is to use rudder as required to maintain directional control, aileron pressure into the wind, and a higher-than-normal lift-off speed. During landing, the direction of motion of the airplane and its longitudinal axis should be parallel to the runway.

During gusty wind conditions, make a power-on approach and power-on landing.

**Air Density**

High temperatures, high elevations, high humidity, and low atmospheric pressure result in lower air density and decreased performance.

Uphill runway slope will increase takeoff distance.

Regardless of altitude and air density, the indicated airspeed at which an airplane stalls will remain the same. At higher elevations, the airplane will have a higher true airspeed, and a higher groundspeed at touchdown.

**Ground Effect**

Ground effect cushions the air beneath the wing, increasing lift and decreasing drag.

An airplane leaving ground effect will experience an increase in induced drag, require more thrust and a greater angle of attack.
Stability

Longitudinal stability (the nose pitching up or down) involves the motion of the airplane about the lateral axis. If the airplane center of gravity is to the rear of its range, the airplane will be unstable about its lateral axis.

If the airplane attitude initially tends to return to its original position after the elevator control is pressed forward and released, the airplane displays positive static stability.

If the airplane attitude remains in a new position after the elevator control is pressed forward and released, the airplane displays neutral static stability.

AIRCRAFT AND ENGINE OPERATION

Propellers

Propeller efficiency is the ratio of thrust horsepower to brake horsepower. A fixed pitch propeller can be efficient only at a given combination of airspeed and RPM.

The reason for ‘twisting’ along a propeller blade is that it permits a relatively constant angle of attack along its length when in cruising flight.

‘P’ Factor And Torque

A propeller rotating clockwise, as seen from the rear, creates a spiraling slipstream that tends to rotate the airplane to the left around the vertical axis, and to the right around the longitudinal axis.

Engine Operation

Dual Ignition, in addition to providing an increased safety factor, also provides improved engine performance.

Aircraft magnetos receive their electrical energy from magnets and coil. If the ground wire between magnetos and Ignition switch becomes disconnected, the engine cannot be shut down by turning the Ignition switch to the OFF position.

Constant Speed Propellers

A constant speed propeller permits the pilot to select the blade angle for the most efficient performance. Pitch angle of the blades changes through the use of governor-regulated oil pressure so that engine speed remains at selected RPM.

For takeoff or maximum power, a constant-speed propeller should be set to a blade angle that will produce a small angle of attack and high RPM.

When increasing power in an aircraft equipped with a constant speed propeller, avoid high manifold pressure setting with low RPM. First Increase RPM, then manifold pressure.

When decreasing power, first decrease manifold pressure, then RPM.

Engine Cooling

Engine cooling is caused by airflow and is especially dependent on the circulation of lubricating oil. An abnormally high engine oil temperature may be caused by the oil level being too low.

Detonation occurs when the unburned charge (fuel) in the cylinders explodes instead of burning evenly. Detonation may be caused by too lean a mixture.

Preignition is the uncontrolled firing of the fuel/air charge in advance of normal spark ignition.

Fuel Mixture

Fuel/air ratio is the ratio between the weight of fuel and weight of air entering the cylinder.

The main purpose of the fuel/air mixture control is to adjust the fuel flow (in both carburetor and fuel-injected engines) to obtain the proper fuel/air ratio.

The best power mixture is the fuel/air ratio that gives the most power for any given throttle setting.

As you climb out to a higher altitude, if no adjustment is made to the mixture, your mixture will become richer. The density (weight) of the air decreases and the amount of fuel remains the same.

An excessively rich mixture may cause spark plug fouling.

Induction Icing

Carburetor heat reduces the density of the air by heating it, and this enriches the fuel/air mixture. It decreases engine horsepower output and increases operating temperatures.

Emergencies And Miscellaneous Information

The four fundamentals involved in maneuvering an aircraft are straight-and-level flight, turns, climbs, and descents.

A detuning of the engine crankshaft counterweights may be caused by rapid opening and closing of the throttle.
If necessary to takeoff from a slushy runway, the freezing of landing gear mechanisms can be minimized by recycling the gear.

In cold weather, crankcase breather lines should receive special attention because they are susceptible to being clogged by ice from crankcase vapors that have condensed and subsequently frozen.

If preheating an aircraft during cold weather operations, preheat the cabin area as well as the engine.

Frequent inspections should be made of aircraft exhaust manifold-type heating systems to minimize the possibility of exhaust gases leaking into the cockpit.

When diverting to an alternate airport because of an emergency, apply rule-of-thumb computations, estimates, and other appropriate shortcuts to divert to the new course as soon as possible.

Minimize the possibility of gear-up landings by completing a prelanding checklist.

If you lose power immediately after takeoff, maintain a safe airspeed.

5017. If the operational category of an airplane is listed as utility, it would mean that this airplane could be operated in which of the following maneuvers?

A) Limited acrobatics, excluding spins.
B) Limited acrobatics, including spins.
C) Any maneuver except acrobatics or spins.

5151. H303 COM
The ratio between the total airload imposed on the wing and the gross weight of an aircraft in flight is known as

A) load factor and directly affects stall speed.
B) aspect load and directly affects stall speed.
C) load factor and has no relation with stall speed.

5152. H303 COM
Load factor is the lift generated by the wings of an aircraft at any given time

A) divided by the total weight of the aircraft.
B) multiplied by the total weight of the aircraft.
C) divided by the basic empty weight of the aircraft.

5153. H303 COM
For a given angle of bank, in any airplane, the load factor imposed in a coordinated constant-altitude turn

A) is constant and the stall speed increases.
B) varies with the rate of turn.
C) is constant and the stall speed decreases.

5154. H303 COM
Airplane wing loading during a level coordinated turn in smooth air depends upon the

A) rate of turn.
B) angle of bank.
C) true airspeed.

5155. H303 COM
In a rapid recovery from a dive, the effects of load factor would cause the stall speed to

A) increase.
B) decrease.
C) not vary.

5156. H303 COM
If an aircraft with a gross weight of 2,000 pounds was subjected to a 60° constant-altitude bank, the total load would be

A) 3,000 pounds.
B) 4,000 pounds.
C) 12,000 pounds.

5157. H303 COM
While maintaining a constant angle of bank and altitude in a coordinated turn, an increase in airspeed will

A) decrease the rate of turn resulting in a decreased load factor.
B) decrease the rate of turn resulting in no change in load factor.
C) increase the rate of turn resulting in no change in load factor.

5158. H300 COM
Lift on a wing is most properly defined as the

A) force acting perpendicular to the relative wind.
B) differential pressure acting perpendicular to the chord of the wing.
C) reduced pressure resulting from a laminar flow over the upper camber of an airfoil, which acts perpendicular to the mean camber.

5159. H303 COM
While holding the angle of bank constant in a level turn, if the rate of turn is varied the load factor would

A) remain constant regardless of air density and the resultant lift vector.
B) vary depending upon speed and air density provided the resultant lift vector varies proportionately.
C) vary depending upon the resultant lift vector.

NOTE: CORRECT ANSWER IN BOLD ITALICS
The need to slow an aircraft below VA is brought about by the following weather phenomenon:

A) High density altitude which increases the indicated stall speed.
B) Turbulence which causes an increase in stall speed.
C) Turbulence which causes a decrease in stall speed.

In theory, if the airspeed of an airplane is doubled while in level flight, parasite drag will become

A) twice as great.
B) half as great.
C) four times greater.

As airspeed decreases in level flight below that speed for maximum lift/drag ratio, total drag of an airplane

A) decreases because of lower parasite drag.
B) increases because of increased induced drag.
C) increases because of increased parasite drag.

If the airspeed is increased from 90 knots to 135 knots during a level 60° banked turn, the load factor will

A) increase as well as the stall speed.
B) decrease and the stall speed will increase.
C) remain the same but the radius of turn will increase.

Baggage weighing 90 pounds is placed in a normal category airplane’s baggage compartment which is placarded at 100 pounds. If this airplane is subjected to a positive load factor of 3.5 G’s, the total load of the baggage would be

A) 315 pounds and would be excessive.
B) 315 pounds and would not be excessive.
C) 350 pounds and would not be excessive.

(Refer to figure 1.) At the airspeed represented by point A, in steady flight, the airplane will

A) have its maximum L/D ratio.
B) have its minimum L/D ratio.
C) be developing its maximum coefficient of lift.

(Refer to figure 1.) At an airspeed represented by point B, in steady flight, the pilot can expect to obtain the airplane’s maximum

A) endurance.
B) glide range.
C) coefficient of lift.

Which statement is true relative to changing angle of attack?

A) A decrease in angle of attack will increase pressure below the wing, and decrease drag.
B) An increase in angle of attack will decrease pressure below the wing, and increase drag.
C) An increase in angle of attack will increase drag.

Leaving the carburetor heat on while taking off

A) leans the mixture for more power on takeoff.
B) will decrease the takeoff distance.
C) will increase the ground roll.

A way to detect a broken magneto primary grounding lead is to

A) idle the engine and momentarily turn the ignition off.
B) add full power, while holding the brakes, and momentarily turn off the ignition.
C) run on one magneto, lean the mixture, and look for a rise in manifold pressure.

A way to detect a broken magneto primary grounding lead is to

A) idle the engine and momentarily turn the ignition off.
B) add full power, while holding the brakes, and momentarily turn off the ignition.
C) run on one magneto, lean the mixture, and look for a rise in manifold pressure.

Fouling of spark plugs is more apt to occur if the aircraft

A) gains altitude with no mixture adjustment.
B) descends from altitude with no mixture adjustment.
C) throttle is advanced very abruptly.

The most probable reason an engine continues to run after the ignition switch has been turned off is

A) carbon deposits glowing on the spark plugs.
B) a magneto ground wire is in contact with the engine casing.
C) a broken magneto ground wire.

NOTE: CORRECT ANSWER IN BOLD ITALICS
5174. H307 COM
If the ground wire between the magneto and the ignition switch becomes disconnected, the engine
A) will not operate on one magneto.
B) cannot be started with the switch in the BOTH position.
C) could accidentally start if the propeller is moved with fuel in the cylinder.

5175. H307 COM
For internal cooling, reciprocating aircraft engines are especially dependent on
A) a properly functioning cowl flap augmenter.
B) the circulation of lubricating oil.
C) the proper freon/compressor output ratio.

5176. H307 COM
The pilot controls the air/fuel ratio with the
A) throttle
B) manifold pressure
C) mixture control

<table>
<thead>
<tr>
<th>GROSS WEIGHT</th>
<th>ANGLE OF BANK</th>
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<tr>
<td>2750 LBS</td>
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<tr>
<td>GEAR AND FLAPS DOWN</td>
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<tr>
<td>ON</td>
<td>MPH KTS</td>
</tr>
<tr>
<td>OFF</td>
<td>MPH KTS</td>
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</tbody>
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Figure 2 - Stall Speeds

5179. H303 COM
(Refer to figure 2.) Select the correct statement regarding stall speeds.
A) Power-off stalls occur at higher airspeeds with the gear and flaps down.
B) In a 60° bank the airplane stalls at a lower airspeed with the gear up.
C) Power-on stalls occur at lower airspeeds in shallower banks.

5180. H303 COM
(Refer to figure 2.) Select the correct statement regarding stall speeds. The airplane will stall
A) 10 knots higher in a power-on, 60° bank, with gear and flaps up, than with gear and flaps down.
B) 25 knots lower in a power-off, flaps-up, 60° bank, than in a power-off, flaps-down, wings-level configuration.
C) 10 knots higher in a 45° bank, power-on stall, than in a wings-level stall with flaps up.

5181. H305 COM
Which is true regarding the use of flaps during level turns?
A) The lowering of flaps increases the stall speed.
B) The raising of flaps increases the stall speed.
C) Raising flaps will require added forward pressure on the yoke or stick.

5182. H305 COM
One of the main functions of flaps during the approach and landing is to
A) decrease the angle of descent without increasing the airspeed.
B) provide the same amount of lift at a slower airspeed.
C) decrease lift, thus enabling a steeper-than-normal approach to be made.

5183. H308 COM
Which statement best describes the operating principle of a constant-speed propeller?
A) As throttle setting is changed by the pilot, the prop governor causes pitch angle of the propeller blades to remain unchanged.
B) A high blade angle, or increased pitch, reduces the propeller drag and allows more engine power for takeoffs.
C) The propeller control regulates the engine RPM, and in turn, the propeller RPM.

5184. In aircraft equipped with constant speed propellers and normally-aspirated engines, which procedure should be used to avoid placing undue stress on the engine components? When power is being
A) decreased reduce the RPM before reducing the manifold pressure.
B) increased, increase the RPM before increasing the manifold pressure.
C) increased or decreased, the RPM should be adjusted before the manifold pressure.

NOTE: CORRECT ANSWER IN BOLD ITALICS
Detonation may occur at high-power settings when

A) the fuel mixture ignites instantaneously instead of burning progressively and evenly.
B) an excessively rich fuel mixture causes an explosive gain in power.
C) the fuel mixture is ignited too early by hot carbon deposits in the cylinder.

The uncontrolled firing of the fuel air charge in advance of normal spark ignition is known as

A) instantaneous combustion.
B) detonation.
C) pre-ignition.

Fuel/air ratio is the ratio between the

A) volume of fuel and volume of air entering the cylinder.
B) weight of fuel and weight of air entering the cylinder.
C) weight of fuel and weight of air entering the carburetor.

The mixture control can be adjusted, which

A) prevents the fuel/air combination from becoming too rich at higher altitudes.
B) regulates the amount of air flow through the carburetor's venturi.
C) prevents the fuel/air combination from becoming lean as the airplane climbs.

Which statement is true concerning the effect of the application of carburetor heat?

A) It enriches the fuel/air mixture.
B) It leans the fuel/air mixture.
C) It has no effect on the fuel/air mixture.

Detonation occurs in a reciprocating aircraft engine when

A) there is an explosive increase of fuel caused by too rich a fuel/air mixture.
B) the spark plugs receive an electrical jolt caused by a short in the wiring.
C) the unburned charge in the cylinders is subjected to instantaneous combustion.

Name the four fundamentals involved in maneuvering an aircraft.

A) Power, pitch, bank, and trim.
B) Thrust, lift, turns, and glides.
C) Straight-and-level flight, turns, climbs, and descents.

Why is it necessary to increase back elevator pressure to maintain altitude during a turn? To compensate for the

A) loss of the vertical component of lift.
B) loss of the horizontal component of lift and the increase in centrifugal force.
C) rudder deflection and slight opposite aileron throughout the turn.

To maintain altitude during a turn, the angle of attack must be increased to compensate for the decrease in the

A) forces opposing the resultant component of drag.
B) vertical component of lift.
C) horizontal component of lift.

Stall speed is affected by

A) weight, load factor, and power.
B) load factor, angle of attack, and power.
C) angle of attack, weight, and air density.

A rectangular wing, as compared to other wing planforms, has a tendency to stall first at the

A) wingtip, with the stall progression toward the wing root.
B) wing root, with the stall progression toward the wing tip.
C) center trailing edge, with the stall progression outward toward the wing root and tip.

By changing the angle of attack of a wing, the pilot can control the airplane's

A) lift, airspeed, and drag.
B) lift, airspeed, and CG.
C) lift and airspeed, but not drag.

The angle of attack of a wing directly controls the

A) angle of incidence of the wing.
B) amount of airflow above and below the wing.
C) distribution of pressures acting on the wing.
5200. H300 COM
In theory, if the angle of attack and other factors remain constant and the airspeed is doubled, the lift produced at the higher speed will be

A) the same as at the lower speed.
B) two times greater than at the lower speed.
C) four times greater than at the lower speed.

5201. H300 COM
An aircraft wing is designed to produce lift resulting from a difference in the

A) negative air pressure below and a vacuum above the wing's surface.
B) vacuum below the wing's surface and greater air pressure above the wing's surface.
C) higher air pressure below the wing's surface and lower air pressure above the wing's surface.

5202.
On a wing, the force of lift acts perpendicular to and the force of drag acts parallel to the

A) chord line.
B) flight path.
C) longitudinal axis.

5203. H300 COM
Which statement is true, regarding the opposing forces acting on an airplane in steady-state level flight?

A) These forces are equal.
B) Thrust is greater than drag and weight and lift are equal.
C) Thrust is greater than drag and lift is greater than weight.

5204. H300 COM
The angle of attack at which a wing stalls remains constant regardless of

A) weight, dynamic pressure, bank angle, or pitch attitude.
B) dynamic pressure, but varies with weight, bank angle, and pitch attitude.
C) weight and pitch attitude, but varies with dynamic pressure and bank angle.

5205.
In light airplanes, normal recovery from spins may become difficult if the

A) CG is too far rearward and rotation is around the longitudinal axis.
B) CG is too far rearward and rotation is around the CG.
C) spin is entered before the stall is fully developed.

NOTE: CORRECT ANSWER IN BOLD ITALICS

5207. H316 COM
If an airplane is loaded to the rear of its CG range, it will tend to be unstable about its

A) vertical axis.
B) lateral axis.
C) longitudinal axis.

5208. H317 COM
At higher elevation airports the pilot should know that indicated airspeed

A) will be unchanged, but groundspeed will be faster.
B) will be higher, but groundspeed will be unchanged.
C) should be increased to compensate for the thinner air.

5209. H317 COM
An airplane leaving ground effect will

A) experience a reduction in ground friction and require a slight power reduction.
B) experience an increase in induced drag and require more thrust.
C) require a lower angle of attack to maintain the same lift coefficient.

5210. H300 COM
If airspeed is increased during a level turn, what action would be necessary to maintain altitude? The angle of attack

A) and angle of bank must be decreased.
B) must be increased or angle of bank decreased.
C) must be decreased or angle of bank increased.

5211. H303 COM
The stalling speed of an airplane is most affected by

A) changes in air density.
B) variations in flight altitude.
C) variations in airplane loading.

5212. H300 COM
An airplane will stall at the same

A) angle of attack regardless of the attitude with relation to the horizon.
B) airspeed regardless of the attitude with relation to the horizon.
C) angle of attack and attitude with relation to the horizon.

5213. (Refer to figure 3.) If an airplane glides at an angle of attack of 10°, how much altitude will it lose in 1 mile?

A) 240 feet.
B) 480 feet.
C) 960 feet.
5214. (Refer to figure 3.) How much altitude will this airplane lose in 3 miles of gliding at an angle of attack of 8°?

A) 440 feet.
B) 880 feet.
C) 1,320 feet.

5215. (Refer to figure 3.) The L/D ratio at a 2° angle of attack is approximately the same as the LID ratio for a

A) 9.75° angle of attack.
B) 10.5° angle of attack.
C) 16.5° angle of attack.

5216. H317 COM
If the same angle of attack is maintained in ground effect as when out of ground effect, lift will

A) increase, and induced drag will decrease.
B) decrease, and parasite drag will increase.
C) increase, and induced drag will increase.

5217. H300 COM
What performance is characteristic of flight at maximum lift/drag ratio in a propeller-driven airplane? Maximum

A) gain in altitude over a given distance.
B) range and maximum distance glide.
C) coefficient of lift and minimum coefficient of drag.

5218. H300 COM
Which is true regarding the forces acting on an aircraft in a steady-state descent? The sum of all

A) upward forces is less than the sum of all downward forces.
B) rearward forces is greater than the sum of all forward forces.
C) forward forces is equal to the sum of all rearward forces.

5219. H300 COM
Which is true regarding the force of lift in steady, unaccelerated flight?

A) At lower airspeeds the angle of attack must be less to generate sufficient lift to maintain altitude.
B) There is a corresponding indicated airspeed required for every angle of attack to generate sufficient lift to maintain altitude.
C) An airfoil will always stall at the same indicated airspeed; therefore, an increase in weight will require an increase in speed to generate sufficient lift to maintain altitude.

5220. During the transition from straight and level flight to a climb, the angle of attack is increased and lift

A) is momentarily decreased.
B) remains the same.
C) is momentarily increased.

NOTE: CORRECT ANSWER IN BOLD ITALICS
5221. H303 COM
(Refer to figure 4.) What is the stall speed of an airplane under a load factor of 2 G's if the unaccelerated stall speed is 60 knots?

A) 66 knots.
B) 74 knots.
C) 84 knots.

5222.
(Refer to figure 4.) What increase in load factor would take place if the angle of bank were increased from 60° to 80°?

A) 3 G's.
B) 3.5 G's.
C) 4G's.

5223.
To generate the same amount of lift as altitude is increased, an airplane must be flown at

A) the same true airspeed regardless of angle of attack.
B) a lower true airspeed and a greater angle of attack.
C) a higher true airspeed for any given angle of attack.

5224.
To produce the same lift while in ground effect as when out of ground effect, the airplane requires

A) a lower angle of attack.
B) the same angle of attack.
C) a greater angle of attack.

NOTE: CORRECT ANSWER IN BOLD ITALICS

5225.
As the angle of bank is increased, the vertical component of lift

A) decreases and the horizontal component of lift increases.
B) increases and the horizontal component of lift decreases.
C) decreases and the horizontal component of lift remains constant.

5226. H302 COM
If the airplane attitude remains in a new position after the elevator control is pressed forward and released, the airplane displays

A) neutral longitudinal static stability.
B) positive longitudinal static stability.
C) neutral longitudinal dynamic stability.

5227. H302 COM
Longitudinal dynamic instability in an airplane can be identified by

A) bank oscillations becoming progressively steeper.
B) pitch oscillations becoming progressively steeper.
C) Trilatitudinal roll oscillations becoming progressively steeper.

5206. H316 COM
Recovery from a stall in any airplane becomes more difficult when its

A) center of gravity moves forward.
B) elevator trim is adjusted nosedown.
C) center of gravity moves aft.
5228. H302 COM  
Longitudinal stability involves the motion of the airplane controlled by its

A) rudder.  
B) elevator.  
C) ailerons.  

5229.  
What changes in airplane longitudinal control must be made to maintain altitude while the airspeed is being decreased?

A) Increase the angle of attack to produce more lift than drag.  
B) Increase the angle of attack to compensate for the decreasing lift.  
C) Decrease the angle of attack to compensate for the increasing drag.  

5230. H302 COM  
If the airplane attitude initially tends to return to its original position after the elevator control is pressed forward and released, the airplane displays

A) positive dynamic stability.  
B) positive static stability.  
C) neutral dynamic stability.  

5231.  
(Refer to figure 5.) The horizontal dashed line from point C to point E represents the

A) ultimate load factor.  
B) positive limit load factor.  
C) airspeed range for normal operations.  

5232.  
(Refer to figure 5.) The vertical line from point E to point F is represented on the airspeed indicator by the

A) upper limit of the yellow arc.  
B) upper limit of the green arc.  
C) blue radial line.  

5233.  
H303 COM  
(Refer to figure 5.) The vertical line from point D to point G is represented on the airspeed indicator by the

A) green arc.  
B) yellow arc.  
C) white arc.  

5235. H308 COM  
Propeller efficiency is the

A) ratio of thrust horsepower to brake horsepower.  
B) actual distance a propeller advances in one revolution.  
C) ratio of geometric pitch to effective pitch.  

5236. H308 COM  
A fixed-pitch propeller is designed for best efficiency only at a given combination of

A) altitude and RPM.  
B) airspeed and RPM.  
C) airspeed and altitude.  

NOTE: CORRECT ANSWER IN BOLD ITALICS
The reason for variations in geometric pitch (twisting) along a propeller blade is that it
A) permits a relatively constant angle of incidence along its length when in cruising flight.
B) prevents the portion of the blade near the hub from stalling during cruising flight.
C) permits a relatively constant angle of attack along its length when in cruising flight.

A propeller rotating clockwise as seen from the rear, creates a spiraling slipstream. The spiraling slipstream, along with torque effect, tends to rotate the airplane to
A) right around the vertical axis, and to the left around the longitudinal axis.
B) left around the vertical axis, and to the right around the longitudinal axis.
C) left around the vertical axis, and to the left around the longitudinal axis.

When the angle of attack of a symmetrical airfoil is increased, the center of pressure will
A) have very limited movement.
B) move aft along the airfoil surface.
C) remain unaffected.

A detuning of engine crankshaft counterweights is a source of overstress that may be caused by
A) rapid opening and closing of the throttle.
B) carburetor ice forming on the throttle valve.
C) operating with an excessively rich fuel/air mixture.

The best power mixture is that fuel/air ratio at which
A) cylinder head temperatures are the coolest.
B) the most power can be obtained for any given throttle setting.
C) a given power can be obtained with the highest manifold pressure or throttle setting.

Detonation can be caused by
A) a 'rich' mixture.
B) low engine temperatures.
C) using a lower grade of fuel than recommended.

What effect, if any, would a change in ambient temperature or air density have on gas turbine engine performance?
A) As air density decreases, thrust increases.
B) As temperature increases, thrust increases.
C) As temperature increases, thrust decreases.

When diverting to an alternate airport because of an emergency, pilots should
A) rely upon radio as the primary method of navigation.
B) climb to a higher altitude because it will be easier to identify checkpoints.
C) apply rule-of-thumb computations, estimates, and other appropriate shortcuts to divert to the new course as soon as possible.

Which maximum range factor decreases as weight decreases?
A) Altitude.
B) Airspeed.
C) Angle of attack.

Applying carburetor heat will
A) not affect the mixture.
B) lean the fuel/air mixture.
C) enrich the fuel/air mixture.

An abnormally high engine oil temperature indication may be caused by
A) a defective bearing.
B) the oil level being too low.
C) operating with an excessively rich mixture.

What will occur if no leaning is made with the mixture control as the flight altitude increases?
A) The volume of air entering the carburetor decreases and the amount of fuel decreases.
B) The density of air entering the carburetor decreases and the amount of fuel increases.
C) The density of air entering the carburetor decreases and the amount of fuel remains constant.

NOTE: CORRECT ANSWER IN BOLD ITALICS
Unless adjusted, the fuel/air mixture becomes richer with an increase in altitude because the amount of fuel
A) decreases while the volume of air decreases.
B) remains constant while the volume of air decreases.
C) remains constant while the density of air decreases.

The basic purpose of adjusting the fuel/air mixture control at altitude is to

A) decrease the fuel flow to compensate for decreased air density.
B) decrease the amount of fuel in the mixture to compensate for increased air density.
C) increase the amount of fuel in the mixture to compensate for the decrease in pressure and density of the air.

At high altitudes, an excessively rich mixture will cause the

A) engine to overheat.
B) fouling of spark plugs.
C) engine to operate smoother even though fuel consumption is increased.

Frequent inspections should be made of aircraft exhaust manifold-type heating systems to minimize the possibility of

A) exhaust gases leaking into the cockpit.
B) a power loss due to back pressure in the exhaust system.
C) a cold-running engine due to the heat withdrawn by the heater.

To establish a climb after takeoff in an aircraft equipped with a constant-speed propeller, the output of the engine is reduced to climb power by decreasing manifold pressure and

A) increasing RPM by decreasing propeller blade angle.
B) decreasing RPM by decreasing propeller blade angle.
C) decreasing RPM by increasing propeller blade angle.

When taxiing during strong quartering tailwinds, which aileron positions should be used?

A) Neutral.
B) Aileron up on the side from which the wind is blowing.
C) Aileron down on the side from which the wind is blowing.

While taxiing a light, high-wing airplane during strong quartering tailwinds, the aileron control should be positioned

A) neutral at all times.
B) toward the direction from which the wind is blowing.
C) opposite the direction from which the wind is blowing.

Which type of approach and landing is recommended during gusty wind conditions?

A) A power-on approach and power-on landing.
B) A power-off approach and power-on landing.
C) A power-on approach and power-off landing.

A proper crosswind landing on a runway requires that, at the moment of touchdown, the

A) direction of motion of the airplane and its lateral axis be perpendicular to the runway.
B) direction of motion of the airplane and its longitudinal axis be parallel to the runway.
C) downwind wing be lowered sufficiently to eliminate the tendency for the airplane to drift.

To develop maximum power and thrust, a constant-speed propeller should be set to a blade angle that will produce a

A) large angle of attack and low RPM.
B) small angle of attack and high RPM.
C) large angle of attack and high RPM.

For takeoff, the blade angle of a controllable-pitch propeller should be set at a

A) small angle of attack and high RPM.
B) large angle of attack and low RPM.
C) large angle of attack and high RPM.

During preflight in cold weather, crankcase breather lines should receive special attention because they are susceptible to being clogged by

A) congealed oil from the crankcase.
B) moisture from the outside air which has frozen.
C) ice from crankcase vapors that have condensed and subsequently frozen.

NOTE: CORRECT ANSWER IN BOLD ITALICS
Which is true regarding preheating an aircraft during cold weather operations?

A) The cabin area as well as the engine should be preheated.
B) The cabin area should not be preheated with portable heaters.
C) Hot air should be blown directly at the engine through the air intakes.

If necessary to take off from a slushy runway, the freezing of landing gear mechanisms can be minimized by

A) recycling the gear.
B) delaying gear retraction.
C) increasing the airspeed to VLE before retraction.