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Commercial Pilot Test Prep
2021 Edition

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Updates and Practice Tests

Free Test Updates for the One-Year Life Cycle of Test Prep Books

The FAA modifies tests as needed throughout the year. ASA keeps abreast of changes to the tests and posts free Test Updates on the ASA website. Before taking your test, be certain you have the most current information by visiting the ASA Test Updates webpage: asa2fly.com/testupdate. Additionally, sign up for free email notifications, which are sent when new Test Updates are available.

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Introduction

Welcome to the Aviation Supplies & Academics, Inc., (ASA) Test Prep Series. This series has been helping pilots prepare for the FAA Knowledge Tests for more than 60 years with great success. We are confident that with proper use of this book you will score very well on your Commercial Pilot certificate test.

Begin your studies with a classroom or home-study ground school course, which will involve reading a comprehensive textbook. Visit the dedicated Reader Resource webpage for this Test Prep (**asa2fly.com/reader/TPC**) and become familiar with the FAA guidance materials available for this certification exam. Then use this Test Prep to prepare for your exam: read the question, select your choice for the correct answer, and then read the explanation. Use the references that conclude each explanation to identify additional resources for further study of a subject. Upon completion of your studies, take practice tests at **prepware.com** (see inside the front cover for your five free practice tests).

The questions in this book have been arranged into chapters based on subject matter to promote better understanding, aid recall, and provide a more efficient study guide. Place emphasis on questions most likely to be included in your test (identified by the aircraft category above each question). For example, a pilot preparing for the Commercial Airplane test would focus on the questions marked “ALL” and “AIR,” and a pilot preparing for the Commercial Helicopter test would focus on the questions marked “ALL” and “RTC.”

Prior to taking an FAA Airman Knowledge Test, all applicants must establish an FAA Tracking Number (FTN) by creating a profile in the Integrated Airman Certification and Rating Application (IACRA) system at **iacra.faa.gov**. Then visit **faa.psiexams.com/faa/login** to register for your exam and take FAA-created practice tests to become familiar with the computer testing platform.

It is important to answer every question assigned on your FAA Knowledge Test. If in their ongoing review, the FAA decides a question has no correct answer, is no longer applicable, or is otherwise defective, your answer will be marked correct no matter which one you chose. However, you will not be given the automatic credit if you have not marked an answer. Unlike some other exams you may have taken, there is no penalty for guessing in this instance.

The FAA exams are “closed tests” which means the exact database of questions is not available to the public. The question and answer choices in this book are based on our extensive history and experience with the FAA testing and airman certification process. You might see similarly worded questions on your official FAA exam, or answer stems might be rearranged from the order you see in this book. Therefore, be sure to fully understand the intent of each question and corresponding answer while studying, rather than memorizing the A, B, C answer. You may be asked a question that has unfamiliar wording; studying and understanding the information in this book and the associated references will give you the tools to answer question variations with confidence.

If your study leads you to question an answer choice, we recommend you seek the assistance of a local instructor. We welcome your questions, recommendations, and concerns—send them to:

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ASA Test Prep Layout

Sample FAA questions have been sorted into chapters according to subject matter. Within each chapter, similar questions are grouped together following introductory chapter text. Figures referenced in the chapter text are numbered with the appropriate chapter number, e.g., “Figure 1-1” is Chapter 1’s first chapter text figure.

Some sample FAA questions refer to Figures or Legends immediately following the question number, e.g., “5201. (Refer to Figure 14.)” These are FAA Figures and Legends which can be found in the separate booklet *Airman Knowledge Testing Supplement for Commercial Pilot* (CT-8080-1E). This supplement is bundled with this Test Prep and is the exact same material you will have access to when you take your FAA test. We provide it separately so you can become accustomed to referring to the FAA Figures and Legends as you would during the test.

Following each sample FAA test question is ASA’s explanation in italics. The last line of the explanation contains a Learning Statement Code (LSC), for those tests referencing an FAA Practical Test Standard (PTS), or Airman Certification Standards (ACS) code, for those tests with an ACS, as well as a reference for further study. Some questions include an explanation for the incorrect answers for added clarity. When you encounter a difficult question, find the LSC or ACS code in Cross-Reference B, and then look for material relating to the subject description within the given reference(s). Refer to Cross-Reference B for more information on how to use LSCs or ACS codes for effective studying.

Answers to each question are found at the bottom of each page.

EXAMPLE:

Chapter text

Four aerodynamic forces are considered to be basic because they act upon an aircraft during all flight maneuvers. There is the downward-acting force called WEIGHT which must be overcome by the upward-acting force called LIFT, and there is the rearward-acting force called DRAG, which must be overcome by the forward-acting force called THRUST.

Category rating. This question may be found on tests for these ratings.*

ALL, AIR, RTC, GLI, LTA, MIL

5201. (Refer to Figure 14.) The four forces acting on an airplane in flight are

See separate book *Airman Knowledge Testing Supplement* (CT-8080-XX)

A— lift, weight, thrust, and drag.

B— lift, weight, gravity, and thrust.

C— lift, gravity, power, and friction.

Question and answer choices

Lift, weight, thrust, and drag are the four basic aerodynamic forces acting on an aircraft in flight.

Explanation

(PLT235, IR.IV.A.K1) — FAA-H-8083-25

Answer (B) is incorrect because the force of gravity is always the same number and reacts with the airplane’s mass to produce a different weight for almost every airplane. Answer (C) is incorrect because weight is the final product of gravity, thrust is the final product of power, and drag is the final product of friction. Power, gravity, and friction are only parts of the aerodynamic forces of flight.

Code line. FAA LSC and ACS codes in parentheses, followed by references for further study.

Incorrect answer explanation. Reasons why answer choices are *incorrect* explained here.

* **Note:** The FAA does *not* identify which questions are on the different ratings’ tests. Unless the wording of a question is pertinent to only one rating category, it may be found on *any* of the tests.

ALL = All aircraft AIR = Airplane GLI = Glider LTA = Lighter-than-air (applies to hot air balloon, gas balloon and airship)
RTC = Rotorcraft (applies to both helicopter and gyroplane) MIL = Military Competency

Chapter 2

Aircraft Systems

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Ignition System

Most reciprocating engines used to power small aircraft incorporate two separate magneto ignition systems. The primary advantages of the dual ignition system are increased safety and improved engine performance.

A magneto (“mag”) is a self-contained source of electrical energy, so even if an aircraft loses total electric power, the engine will continue to run. For electrical energy, magnetos depend upon a rotating magnet and a coil.

When checking for magneto operation prior to flight, the engine should run smoothly when operating with the magneto selector set on BOTH, and should experience a slight drop in revolutions per minute (RPM) when running on only one or the other magneto. The drop in RPM is caused by reduced efficiency of a single spark plug, as opposed to two.

If the ground wire between the magneto and the ignition switch becomes disconnected or broken, the engine cannot be shut down by turning off the ignition switch.

AIR, RTC

5169. Before shutdown, while at idle, the ignition key is momentarily turned OFF. The engine continues to run with no interruption; this

- A—is normal because the engine is usually stopped by moving the mixture to idle cut-off.
- B—should not normally happen. Indicates a magneto not grounding in OFF position.
- C—is an undesirable practice, but indicates that nothing is wrong.

If the magneto switch ground wire is disconnected, the magneto is ON even though the ignition switch is in the OFF position. The engine could fire if the propeller is moved from outside the airplane. (PLT478, CA.I.G.R1) — FAA-H-8083-25

Answer (A) is incorrect because the engine should stop when the ignition key is turned to the OFF position. Answer (C) is incorrect because this indicates there is a faulty ground wire.

AIR, RTC

5171. 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.

If the magneto switch ground wire is disconnected, the magneto is ON even though the ignition switch is in the OFF position. The engine could fire if the propeller is moved from outside the airplane. (PLT343, CA.I.G.R1) — FAA-H-8083-25

Answer (B) is incorrect because it is not necessary to add full power when performing the check. Answer (C) is incorrect because the way to detect a broken magneto ground wire is to turn the ignition to the OFF position; if the engine continues to run, the problem is confirmed.

AIR, RTC

5173. 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.

If the magneto switch ground wire is disconnected, the magneto is ON even though the ignition switch is in the OFF position. The engine could fire if the propeller is moved from outside the airplane. (PLT343, CA.I.G.R1) — FAA-H-8083-25

Answer (A) is incorrect because glowing carbon deposits is a result of preignition. Answer (B) is incorrect because a magneto ground wire should be in contact with the engine casing to provide grounding.

Answers

5169 [B]

5171 [A]

5173 [C]

AIR, RTC

5174. 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.

If the magneto switch ground wire is disconnected, the magneto is ON even though the ignition switch is in the OFF position. The engine could fire if the propeller is moved from outside the airplane. (PLT343, CA.I.G.R1) — FAA-H-8083-25

Answer (A) is incorrect because both magnetos remain on when the ground wire is disconnected. Answer (B) is incorrect because the engine can still be started, and the magnetos cannot be turned off.

Air/Fuel Mixture

Carburetors are normally set to deliver the correct air/fuel mixture (air/fuel ratio) at sea level. This air/fuel ratio is the ratio of the weight of fuel to the weight of air entering the cylinder. This ratio is determined by the setting of the mixture control in both fuel injection and carburetor-equipped engines.

When climbing, the mixture control allows the pilot to decrease the fuel flow as altitude increases (air density decreases), thus maintaining the correct mixture (air/fuel ratio). If the fuel flow is allowed to remain constant by not leaning the mixture, the fuel/air ratio becomes too rich, as the density (weight per unit volume) of air decreases with increased altitude, resulting in a loss of efficiency. Operating with an excessively rich mixture may cause fouling of spark plugs.

When descending, air density increases. Unless fuel flow is increased, the mixture may become excessively lean; i.e., the weight of fuel is too low for the weight of air reaching the cylinders. This may result in the creation of high temperatures and pressures.

The best power mixture is the air/fuel ratio from which the most power can be obtained for any given throttle setting.

AIR, RTC, LTA

5172. 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.

If the fuel/air mixture is too rich, excessive fuel consumption, rough engine operation, and appreciable loss of power will occur. Because of excessive fuel, a cooling effect takes place which causes below normal temperatures in the combustion chambers. This cooling results in spark plug fouling. Unless the mixture is leaned with a gain in altitude, the mixture becomes excessively rich. (PLT343, CA.I.G.R1) — FAA-H-8083-25

Answer (B) is incorrect because descending without a mixture adjustment (operating with an excessively lean mixture) would result in overheating, rough engine operation, a loss of power, and detonation. Answer (C) is incorrect because advancing the throttle abruptly may cause the engine to hesitate or stop.

AIR, RTC, LTA

5176. The pilot controls the air/fuel ratio with the

- A—throttle
- B—manifold pressure
- C—mixture control

The fuel/air ratio of the combustible mixture delivered to the engine is controlled by the mixture control. (PLT249, CA.I.G.K1e) — FAA-H-8083-25

Answer (A) is incorrect because the throttle regulates the total volume of fuel and air entering the combustion chamber. Answer (B) is incorrect because the manifold pressure indicates the engine's power output.

Answers

5174 [C]

5172 [A]

5176 [C]

AIR, RTC, LTA

5187. 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 is used to change the fuel to air mixture entering the combustion chamber (cylinder). Fuel-to-air ratio is the weight of fuel to a given weight of air. (PLT249, CA.I.G.K1e) — FAA-H-8083-25

Answer (A) is incorrect because, as altitude increases, the amount of air in a fixed volume decreases. Answer (C) is incorrect because the carburetor is where the fuel/air ratio is established prior to entering the cylinders.

AIR, RTC, LTA

5188. 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.

As the aircraft climbs, the fuel/air mixture becomes richer and the excessive fuel causes the engine to lose power and to run rougher. The mixture control provides a means for the pilot to decrease fuel to compensate for this imbalance in mixture as altitude increases. (PLT343, CA.I.G.R1) — FAA-H-8083-25

Answer (B) is incorrect because the throttle regulates the airflow through the carburetor's venturi. Answer (C) is incorrect because the fuel/air ratio becomes richer as the aircraft climbs.

AIR, RTC, LTA

5298. 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.

The throttle setting determines the amount of air flowing into the engine. The mixture control is then adjusted to get the best fuel/air ratio, resulting in the best power the engine can develop at this particular throttle setting. (PLT249, CA.I.G.K1c) — FAA-H-8083-25

Answer (A) is incorrect because the cylinder heads will be the coolest when mixture is richest. Answer (C) is incorrect because this describes the highest power setting.

AIR, RTC, LTA

5608. 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.

Fuel flow remains constant if no adjustments are made. The same volume of air goes into the carburetor, but the weight and density of the air is less, causing an excessively rich mixture, which causes spark plug fouling and decreased power. (PLT249, CA.I.G.K1c) — FAA-H-8083-25

AIR, RTC, LTA

5609. 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.

Fuel flow remains constant if no adjustments are made. The same volume of air goes into the carburetor, but the weight and density of the air is less, causing an excessively rich mixture, which causes spark plug fouling and decreased power. (PLT249, CA.I.G.K1c) — FAA-H-8083-25

AIR, RTC, LTA

5610. 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.

Fuel flow remains constant if no adjustments are made. The same volume of air goes into the carburetor, but the weight and density of the air is less, causing an excessively rich mixture, which causes spark plug fouling and decreased power. (PLT249, CA.I.G.K1c) — FAA-H-8083-25

Answers

5187 [B]

5188 [A]

5298 [B]

5608 [C]

5609 [C]

5610 [A]

AIR, RTC, LTA

5611. 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.

Fuel flow remains constant if no adjustments are made. The same volume of air goes into the carburetor, but the weight and density of the air is less, causing an excessively rich mixture, which causes spark plug fouling and decreased power. (PLT343, CA.I.G.K1c) — FAA-H-8083-25

Answer (A) is incorrect because a lean mixture will cause the engine to overheat. Answer (C) is incorrect because an engine runs smoother when the mixture is adjusted for the altitude.

Carburetor Ice

As air flows through a carburetor, it expands rapidly. At the same time, fuel entering the airstream is vaporized. Expansion of the air and vaporization of the fuel causes a sudden cooling of the mixture which may cause ice to form inside the carburetor. The possibility of icing should always be considered when operating in conditions where the outside air temperature is between 20°F and 70°F and the relative humidity is high.

Carburetor heat preheats the air before it enters the carburetor and either prevents carburetor ice from forming or melts any ice which may have formed. When carburetor heat is applied, the heated air that enters the carburetor is less dense. This causes the air/fuel mixture to become enriched, and this in turn decreases engine output (less engine horsepower) and increases engine operating temperatures.

During engine run-up, prior to departure from a high-altitude airport, the pilot may notice a slight engine roughness which is not affected by the magneto check but grows worse during the carburetor heat check. In this case the air/fuel mixture may be too rich due to the lower air density at the high altitude, and applying carburetor heat decreases the air density even more. A leaner setting of the mixture control may correct this problem.

In an airplane with a fixed-pitch propeller, the first indication of carburetor ice will likely be a decrease in RPM as the air supply is choked off. Application of carburetor heat will decrease air density, causing the RPM to drop even lower. Then, as the carburetor ice melts, the RPM will rise gradually.

Fuel injection systems, which do not utilize a carburetor, are generally considered to be less susceptible to icing than carburetor systems are.

AIR, RTC, LTA

5170. 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.

Use of carburetor heat enriches the mixture, which tends to reduce the output of the engine and also increases the operating temperature. Therefore, the heat should not be used when full power is required (such as during takeoff) or during normal engine operations except to check for the presence of, or removal of carburetor ice. A decrease in engine output will increase distance required to reach lift off speed. Therefore, it will increase ground roll. (PLT189, CA.I.G.K1e) — FAA-H-8083-25

AIR, RTC, LTA

5189. 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.

Use of carburetor heat enriches the mixture which tends to reduce the output of the engine and also increases the operating temperature. (PLT189, CA.I.G.K1e) — FAA-H-8083-25

Answers

5611 [B]

5170 [C]

5189 [A]

AIR, RTC, LTA

5606. Applying carburetor heat will

- A—not affect the mixture.
- B—lean the fuel/air mixture.
- C—enrich the fuel/air mixture.

Use of carburetor heat enriches the mixture which tends to reduce the output of the engine and also increases the operating temperature. (PLT343, CA.I.G.K1e) — FAA-H-8083-25

Aviation Fuel

Fuel does two things for the engine; it acts both as an agent for combustion and as an agent for cooling (based on the mixture setting of the engine).

Aviation fuel is available in several grades. The proper grade for a specific engine will be listed in the aircraft flight manual. If the proper grade of fuel is not available, it is possible to use the next higher grade. A lower grade of fuel should never be used.

The use of low-grade fuel or a too lean air/fuel mixture may cause detonation, which is the uncontrolled spontaneous explosion of the mixture in the cylinder, instead of burning progressively and evenly. Detonation produces extreme heat.

Preignition is the premature uncontrolled firing of the fuel/air mixture. It is caused by an incandescent area (such as a carbon or lead deposit heated to a red hot glow) serving as an ignitor in advance of normal ignition.

Fuel can be contaminated by water and/or dirt. The air inside the aircraft fuel tanks can cool at night, which allows formation of water droplets (through condensation) on the insides of the fuel tanks. These droplets then fall into the fuel. To avoid this problem, always fill the tanks completely when parking overnight.

Thoroughly drain all of the aircraft's sumps, drains, and strainers before a flight to get rid of any water that may have collected.

Dirt can get into the fuel if refueling equipment is poorly maintained or if the refueling operation is sloppy. Use care when refueling an aircraft.

On aircraft equipped with fuel pumps, the practice of running a fuel tank dry before switching tanks is considered unwise because the engine-driven fuel pump or electric fuel boost pump may draw air into the fuel system and cause vapor lock.

AIR, RTC, LTA

5185-1. 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.

Detonation or knock is a sudden explosion or shock to a small area of the piston top, rather than the normal smooth burn in the combustion chamber. (PLT115, CA.I.G.K1e) — FAA-H-8083-25

Answer (B) is incorrect because detonation may occur with an excessively lean fuel mixture and a loss in power. Answer (C) is incorrect because this describes preignition.

Answers

5606 [C]

5185-1 [A]

AIR, RTC, LTA

5186. 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.

When the cylinder head gets too hot, it can ignite the fuel/air mixture before the spark. This condition is called preignition. (PLT115, CA.I.G.K1e) — FAA-H-8083-25

Answers (A) and (B) are incorrect because detonation is an instantaneous combustion of the fuel/air mixture, which is caused by using too lean a mixture, using too low a grade of fuel, or operating with temperatures that are too high.

AIR, RTC, LTA

5190. 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 fuel/air charge in the cylinders is subjected to instantaneous combustion.

Detonation is a sudden explosion, or instantaneous combustion, of the fuel/air mixture in the cylinders, producing extreme heat and severe structural stresses on the engine. (PLT115, CA.I.G.K1c) — FAA-H-8083-25

Answer (A) is incorrect because detonation is caused by too lean a mixture. Answer (B) is incorrect because detonation does not have anything to do with the wiring.

AIR, RTC, LTA

5299. Consider a reciprocating engine. Detonation can be caused by

- A—a “rich” mixture.
- B—low engine temperatures.
- C—using a lower grade fuel than recommended.

Detonation is a sudden explosion or shock to a small area of the piston top, rather than the normal smooth burn in the combustion chamber. It can be caused by low grade fuel or a lean mixture. (PLT251, CA.I.G.K1c) — FAA-H-8083-25

Engine Temperatures

Most light aircraft engines are cooled externally by air. For internal cooling and lubrication, an engine depends on circulating oil. Engine lubricating oil not only prevents direct metal-to-metal contact of moving parts, it also absorbs and dissipates part of the engine heat produced by internal combustion. If the engine oil level is too low, an abnormally high engine oil temperature indication may result.

On the ground or in the air, excessively high engine temperatures can cause excessive oil consumption, loss of power, and possible permanent internal engine damage.

If the engine oil temperature and cylinder head temperature gauges have exceeded their normal operating range, or if the pilot suspects that the engine (with a fixed-pitch propeller) is detonating during climb-out, the pilot may have been operating with either too much power and the mixture set too lean, using fuel of too low a grade, or operating the engine with not enough oil in it. Reducing the rate of climb and increasing airspeed, enriching the fuel mixture, or retarding the throttle will help cool an overheating engine. Also, rapid throttle operation can induce detonation, which may detune the crankshaft.

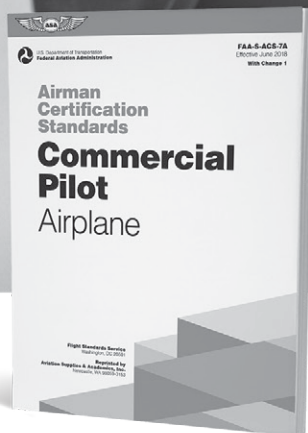
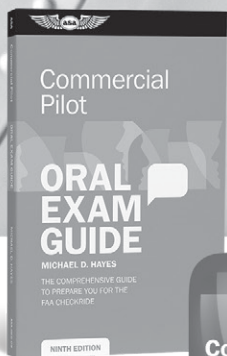
The most important rule to remember in the event of a power failure after becoming airborne is to maintain safe airspeed.

Answers

5186 [C]

5190 [C]

5299 [C]



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