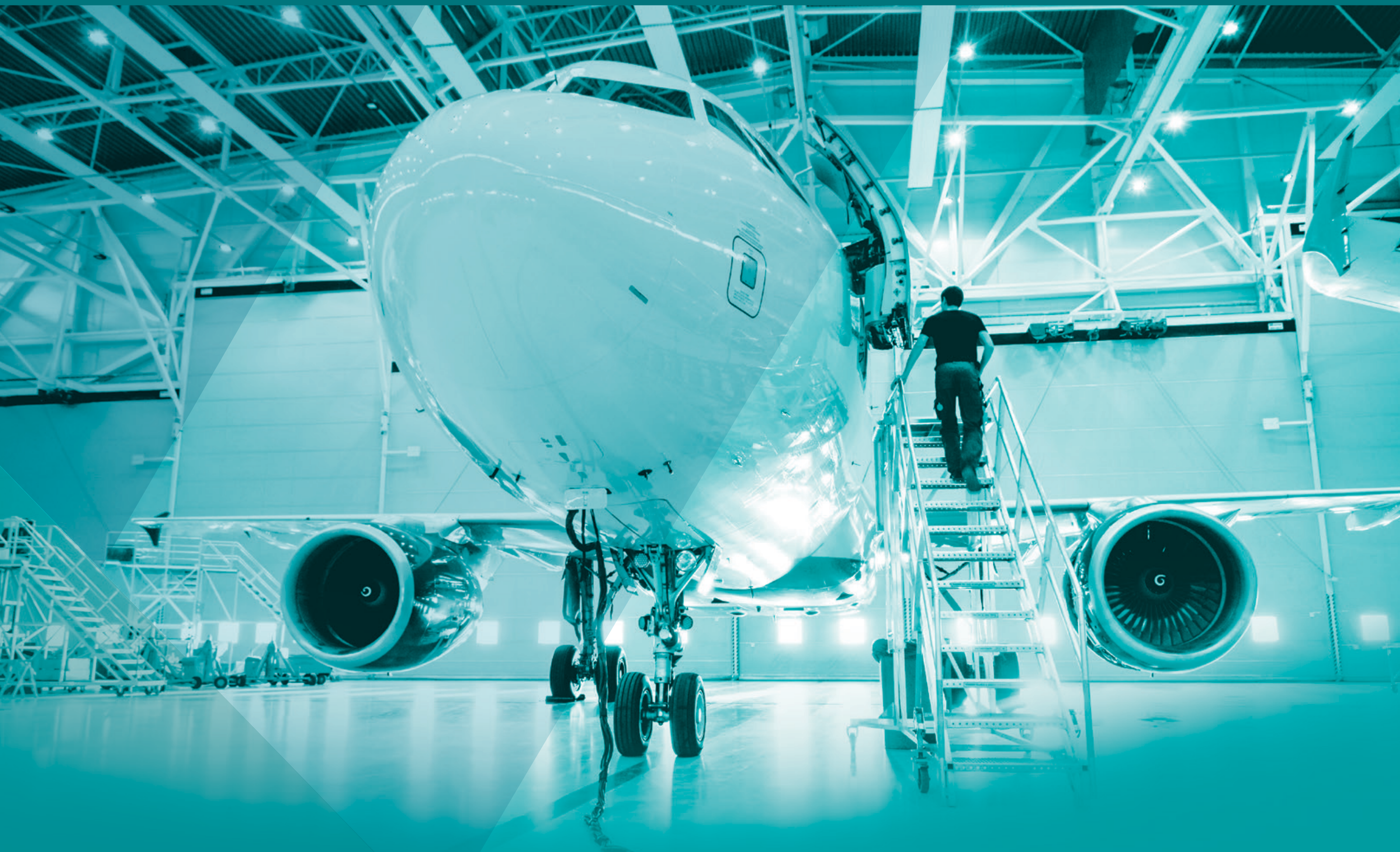

POWERPLANT

2022 TEST GUIDE

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Contents

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Introduction

Welcome to the Aviation Supplies & Academics, Inc., (ASA) Test Guide Series, based on the original Fast-Track series written by Dale Crane. This series has been helping aviation mechanics prepare for FAA Knowledge Exams with great success for more than 60 years. We are confident that with the proper use of this book you will score very well on your FAA Knowledge Exam. Additionally, the ASA Test Guides include typical oral test questions and practical projects to help you prepare for the final step in the Aviation Mechanic certification process.

Begin your studies with an instructor-led or home-study ground school course, which will involve reading a comprehensive AMT textbook. Once complete, visit the dedicated Reader Resource webpage for this Test Guide (**asa2fly.com/reader/AMP**) and become familiar with the FAA guidance material available for this certification exam. Then use this Test Guide to prepare for your exam: Read the question, select your choice for the correct answer, and then read the explanation. Use the references that accompany the correct answer at the bottom of each page to identify additional resources for further study. Upon completion of your studies, take practice tests at **prepware.com** (*see* inside the front cover for your five free practice tests).

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** to register for your exam and take FAA-created practice tests to become familiar with the computer testing platform.

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 process as well as the FAA's publicly available information. You might see similarly worded questions on your official FAA exam and answer stems may be rearranged from the A, B, C 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 letter associated with the correct response. 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 or concerns—send them to:

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Powerplant Test Questions, Explanations, Answers, and References

Answers are printed at the bottom of the page, with other coded items as explained below:

This is the question number.

The brackets enclose the letter answer selected by ASA's researchers. (For those questions for which none of the answer choices provide an accurate response, we have noted [X] as the Answer.)

8002 [C] (056) AMT-P Ch 2

The parentheses enclose the appropriate Learning Statement Code (LSC)—refer to Pages ix–x. FAA Learning Statement Codes have letter-identifying prefixes, but for reference purposes in this book the letter prefix ("AMP") is omitted and only the number-identifying portion of the code is shown in parentheses.

The reference following the Learning Statement Code is the source from which the answer was derived. The meanings of these abbreviations are found on Page xi. The number following the abbreviations is the specific chapter within that source to study for more information about the derived answer.

Reciprocating Engines

8001. Which statement is true regarding bearings used in high-powered reciprocating aircraft engines?

A—The outer race of a single-row, self-aligning ball bearing will always have a radius equal to the radius of the balls.
B—There is less rolling friction when ball bearings are used than when roller bearings are employed.
C—Crankshaft bearings are generally of the ball-type due to their ability to withstand extreme loads without overheating.

The smaller contact area of a ball bearing causes it to produce less rolling friction than a roller bearing.

Ball bearings are used in high-powered reciprocating engines, where keeping friction to a minimum is important.

Ball bearings can be designed and installed in such a way that they reduce friction in axial loads as well as in radial loads.

8002. A condition that can occur in radial engines but is unlikely to occur in horizontally opposed engines is

A—oil-fouled spark plug.
B—valve overlap.
C—hydraulic lock.

Radial and inverted engines have some cylinders below the crankcase, and when the engine is idle, oil will leak from the crankcase, past the piston rings, and fill the combustion chamber. This condition is called a hydraulic lock.

If this oil is not removed before the engine is started, the piston will move against the noncompressible oil and cause serious damage.

8003. Which condition would be the least likely to be caused by failed or failing engine bearings?

A—Excessive oil consumption.
B—High oil temperatures.
C—Low oil temperatures.

All of the alternatives except low oil temperature would likely be caused by failed or failing engine bearings in a reciprocating engine.

Low oil temperature would be the least likely of these alternatives.

8004. What is the principal advantage of using propeller reduction gears?

A—To enable the propeller RPM to be increased without an accompanying increase in engine RPM.
B—To enable the engine RPM to be increased with an accompanying increase in power and allow the propeller to remain at a lower, more efficient RPM.
C—To enable the engine RPM to be increased with an accompanying increase in propeller RPM.

The horsepower produced by a reciprocating engine is determined by its RPM. The higher the RPM, the greater the power. But the efficiency of a propeller decreases as the blade tip speed approaches the speed of sound.

In order to get the best of both conditions, many of the more powerful aircraft engines drive the propeller through a set of reduction gears.

Reduction gears allow the engine to turn fast enough to develop the required power. At the same time, the propeller tip speed is kept low enough that the tips do not approach the speed of sound.

8005. Which of the following will decrease volumetric efficiency in a reciprocating engine?

A—Full throttle operations, low cylinder head temperatures, and high carburetor air temperatures.
B—Low cylinder head temperatures, improper valve timing, and sharp bends in the induction system.
C—Improper valve timing, sharp bends in the induction system, and high carburetor air temperatures.

The volumetric efficiency of a reciprocating engine is the ratio of the weight of the fuel/air charge taken into the cylinder, to the weight of a charge that would completely fill the entire volume of the cylinder at the same pressure.

Anything that decreases the weight of the air entering the cylinder decreases the volumetric efficiency. Improper valve timing, sharp bends in the induction system, and high carburetor air temperature will all decrease the volumetric efficiency.

8006. Which of the following is a characteristic of a thrust bearing used in most radial engines?

A—Tapered roller.
B—Double-row ball.
C—Deep-groove ball.

Deep-groove ball bearings are used as the thrust bearing in most radial engines. This type of bearing is the best of those listed for reducing friction while carrying both thrust and radial loads.

Answers *Note: All Learning Statement Codes (in parentheses) are preceded by "AMP." See explanation on Page 1.*

8001 [B] (056) AMT-P
8002 [C] (054) AMT-P Ch 2
8003 [C] (056) AMT-P
8004 [B] (053) AMT-P Ch 2
8005 [C] (056) AMT-P Ch 2
8006 [C] (056) AMT-P Ch 2

8007. Which bearing is least likely to be a roller or ball bearing?

A—Rocker arm bearing (overhead valve engine).
B—Master rod bearing (radial engine).
C—Crankshaft main bearing (radial engine).

The master rod bearing in a radial engine is always a plain bearing.

Rocker arm bearings may be either ball, roller, or plain type and the crankshaft main bearings for radial engines are usually ball bearings.

8008. The operating temperature valve clearance of a radial engine as compared to cold valve clearance is

A—greater.
B—less.
C—the same.

When a radial engine is operating, the cast aluminum alloy cylinder head expands far more than the steel push rod. As the cylinder head expands, the rocker arm moves away from the cam ring and the hot, or running, valve clearance becomes much greater than the cold clearance.

8009. A nine-cylinder engine with a bore of 5.5 inches and a stroke of 6 inches will have a total piston displacement of

A—740 cubic inches.
B—1,425 cubic inches.
C—1,283 cubic inches.

The piston displacement of a reciprocating engine is the total volume swept by the pistons in one revolution of the crankshaft.

Find the piston displacement of one cylinder by multiplying the area of the piston in square inches by the stroke, which is measured in inches.

The total piston displacement is the volume of one cylinder, measured in cubic inches, multiplied by the number of cylinders.

Area = 0.7854 × bore^2
= 0.7854 × 30.25
= 23.75 square inches

Volume = piston area × stroke
= 23.75 × 6
= 142.55 cubic inches

Piston displacement = volume × number of cylinders
= 142.55 × 9
= 1,282.95 cubic inches

8010. The five events of a four-stroke cycle engine in the order of their occurrence are

A—intake, ignition, compression, power, and exhaust.
B—intake, compression, power, ignition, and exhaust.
C—intake, compression, ignition, power, and exhaust.

The five events that take place in a reciprocating engine during each cycle of its operation are:

Intake—The fuel/air mixture is taken into the cylinder.

Compression—The fuel/air mixture is compressed as the piston moves upward (outward) in the cylinder.

Ignition—As the piston nears the top of its stroke, an electrical spark ignites the mixture so it burns and releases its energy.

Power—As the fuel/air mixture burns, it forces the piston downward. This movement of the piston rotates the crankshaft and performs useful work.

Exhaust—After the piston has reached the bottom of its stroke and done the most of its useful work, the piston pushes upward, forcing the burned gases out of the cylinder.

8011. The primary concern in establishing the firing order for an opposed engine is to

A—provide for balance and eliminate vibration to the greatest extent possible.
B—keep power impulses on adjacent cylinders as far apart as possible in order to obtain the greatest mechanical efficiency.
C—keep the power impulses on adjacent cylinders as close as possible in order to obtain the greatest mechanical efficiency.

The firing order of an opposed engine is designed to provide for balance and to eliminate vibration as much as possible.

Answers

8007 [B] (054) AMT-P	8008 [A] (054) AMT-P Ch 2	8009 [C] (056) AMT-P Ch 2	8010 [C] (056) AMT-P Ch 2
8011 [A] (056) AMT-P Ch 2			

8012. If fuel/air ratio is proper and ignition timing is correct, the combustion process should be completed

A—20 to 30° before top center at the end of the compression stroke.
B—when the exhaust valve opens at the end of the power stroke.
C—just after top center at the beginning of the power stroke.

The ignition of the fuel/air mixture in the cylinder of a reciprocating engine is timed so it occurs when the piston is about 20 to 30 degrees of crankshaft rotation before reaching top center on the compression stroke.

If the mixture ratio and ignition timing are both correct, the fuel/air mixture will be all burned shortly after the piston passes over top center. The expanding gases caused by absorbing heat from the burning mixture will exert the maximum amount of push on the descending piston during the power stroke.

8013. Grinding the valves of a reciprocating engine to a feather edge is likely to result in

A—normal operation and long life.
B—excessive valve clearance.
C—preignition and burned valves.

If a valve is ground with a feather edge (a thin edge) the heat in the cylinder will cause the thin area to glow red hot and this will ignite the fuel/air mixture before the correct time for ignition. This will result in preignition and burned valves.

8014. Which statement is correct regarding engine crankshafts?

A—Moveable counterweights serve to reduce the dynamic vibrations in an aircraft reciprocating engine.
B—Moveable counterweights serve to reduce the torsional vibrations in an aircraft reciprocating engine.
C—Moveable counterweights are designed to resonate at the natural frequency of the crankshaft.

Torsional vibration caused by firing impulses of the engine are minimized by the installation of moveable counterweights suspended from certain crank cheeks. These moveable counterweights, called dynamic dampers, rock back and forth and act as pendulums, changing the resonant frequency of the rotating elements, thus reducing the torsional vibration.

8015. On which strokes are both valves on a four-stroke cycle reciprocating aircraft engine open?

A—Power and exhaust.
B—Intake and compression.
C—Exhaust and intake.

Both the intake and exhaust valve are open at the same time only during the period of valve overlap.

Valve overlap occurs at the end of the exhaust stroke and the beginning of the intake stroke. The intake valve opens a few degrees of crankshaft rotation before the piston reaches the top of the exhaust stroke. The exhaust valve remains open until the piston has moved down a few degrees of crankshaft rotation on the intake stroke.

8016. Which type of bearings are generally used for connecting rods and cam shafts?

A—Plain.
B—Roller.
C—Ball.

Master rods used in radial engines have plain bearings in both their big end that fits around the throw of the crankshaft and the small end that fits around the wrist pin in the piston.

8017. The actual power delivered to the propeller of an aircraft engine is called

A—friction horsepower.
B—brake horsepower.
C—indicated horsepower.

The actual horsepower delivered to the propeller of an aircraft engine is called brake horsepower. This name is used because brake horsepower was originally measured with a prony brake loading the engine with mechanical friction.

Modern measurements of brake horsepower are made with a dynamometer which loads the engine with electrical or fluid flow opposition.

Answers

8012 [C] (056) AMT-P Ch 2	8013 [C] (056) AMT-P Ch 2	8014 [B] (008) AMT-P Ch 2	8015 [C] (056) AMT-P Ch 2
8016 [A] (056) AMT-P Ch 2	8017 [B] (056) AMT-P Ch 2		

8018. Cam-ground pistons are installed in some aircraft engines to

A—provide a better fit at operating temperatures.
B—act as a compensating feature so that a compensated magneto is not required.
C—equalize the wear on all pistons.

A cam-ground piston is one whose diameter is a few thousandths of an inch greater in a plane perpendicular to the wrist pin boss than it is parallel to the boss.

When the piston reaches its operating temperature, the large mass of metal in the piston pin boss expands enough that the piston becomes round.

Since the piston is round at its operating temperature, it provides a better seal than it would if it were round while cold and expanded to an out-of-round condition when hot.

8019. Using the following information, determine how many degrees the crankshaft will rotate with both the intake and exhaust valves seated.

Intake opens 15° BTDC.
Exhaust opens 70° BBDC.
Intake closes 45° ABDC.
Exhaust closes 10° ATDC.

A—290°.
B—245°.
C—25°.

The intake valve closes 45° of crankshaft rotation after the piston passes bottom dead center, moving upward on the compression stroke.

Both valves are closed at this point, and they both remain closed until the piston passes over top center and comes down to 70° before bottom dead center on the power stroke. At this time the exhaust valve opens.

Both valves are on their seats for 45° + 180° + 20°, or 245°.

8020. Some aircraft engine manufacturers equip their product with choked or taper-ground cylinders in order to

A—provide a straight cylinder bore at operating temperatures.
B—flex the rings slightly during operation and reduce the possibility of the rings sticking in the grooves.
C—increase the compression pressure for starting purposes.

Some aircraft engine cylinders are ground with the diameter at the top of the barrel, where it screws into the head, slightly smaller than the diameter in the center of the barrel. This is called choke grinding.

The large mass of the cylinder head expands more when heated than the smaller mass of the cylinder barrel, so the diameter of a choke-ground cylinder becomes uniform when the engine is at its operating temperature.

8021. An aircraft reciprocating engine using hydraulic valve lifters is observed to have no clearance in its valve-operating mechanism after the minimum inlet oil and cylinder head temperatures for takeoff have been reached. When can this condition be expected?

A—During normal operation.
B—When the lifters become deflated.
C—As a result of carbon and sludge becoming trapped in the lifter and restricting its motion.

There is no clearance in the valve operating mechanism when an engine equipped with hydraulic valve lifters is operating normally and the minimum oil and cylinder-head temperatures for takeoff have been reached.

Hydraulic valve lifters are used because they remove all of the clearance between the rocker arm and the tip of the valve stem.

By keeping all of this clearance removed, the valves operate with less noise and less wear.

8022. What tool is generally used to measure the crankshaft rotation in degrees?

A—Dial indicator.
B—Timing disk.
C—Prop Protractor.

A top dead center indicator is used to show when the piston in cylinder number one is on top dead center.

A timing disk is clamped to the propeller shaft and positioned so the pointer, which is held straight up by a weight on one end, points to zero degrees.

As the crankshaft is rotated, the pointer indicates on the scale of the timing disk the number of degrees the crankshaft has rotated.

8023. If an engine with a stroke of 6 inches is operated at 2,000 RPM, the piston movement within the cylinder will be

A—at maximum velocity around TDC.
B—constant during the entire 360° of crankshaft travel.
C—at maximum velocity 90° after TDC.

The piston in a reciprocating engine is not moving when it is at the top and bottom of its stroke.

As it leaves top dead center, it accelerates from zero velocity to a maximum velocity, which is reached when it is 90° beyond top dead center. It then decelerates to zero velocity at bottom dead center.

Answers

8018 [A]	(056)	AMT-P Ch 2	8019 [B]	(057)	AMT-P Ch 2	8020 [A]	(056)	AMT-P Ch 2	8021 [A]	(057)	AMT-P Ch 2
8022 [B]	(057)	AMT-P	8023 [C]	(056)	AMT-P Ch 2						

8024. If the intake valve is opened too early in the cycle of operation of a four-stroke cycle engine, it may result in

A—improper scavenging of exhaust gases.
B—engine kickback.
C—backfiring into the induction system.

The intake valve opens when the piston is moving upward at the end of the exhaust stroke. Opening at this point allows the low pressure caused by the inertia of the exiting exhaust gases to assist in starting the fuel/air mixture flowing into the cylinder.

If the intake valve opens too early, some of the burning exhaust gases could flow into the intake manifold and ignite the mixture. This would cause a backfire in the induction system.

8025. Some cylinder barrels are hardened by

A—nitriding.
B—honing.
C—quenching.

The walls of an aircraft engine cylinder are subjected to a great deal of wear as the iron piston rings rub against them.

The walls of some cylinders are treated to increase their hardness and resistance to wear. There are two methods of hardening these surfaces: hard chrome plating and nitriding.

Nitriding is a process in which the surface of the steel cylinder wall is changed into a hard nitride by an infusion of nitrogen from the ammonia gas used in the nitriding heat treatment process.

8026. Which statement is correct regarding a four-stroke cycle aircraft engine?

A—The intake valve closes on the compression stroke.
B—The exhaust valve opens on the exhaust stroke.
C—The intake valve closes on the intake stroke.

The intake valve in a four-stroke cycle aircraft engine closes somewhere around 60° after bottom center on the compression stroke.

The exhaust valve opens about 70° before bottom center on the power stroke.

The intake valve opens about 20° before top center on the exhaust stroke.

The exhaust valve closes about 15° after top center on the intake stroke.

8027. On which part of the cylinder walls of a normally operating engine will the greatest amount of wear occur?

A—Near the center of the cylinder where piston velocity is greatest.
B—Near the top of the cylinder.
C—Wear is normally evenly distributed.

In normal operation, an aircraft engine cylinder wears more at the top than in the center or at the bottom. This greater wear is caused by the heat of combustion decreasing the efficiency of the lubrication at the top of the cylinder.

8028. During overhaul, reciprocating engine exhaust valves are checked for stretch

A—with a suitable inside spring caliper.
B—with a contour or radius gauge.
C—by placing the valve on a surface plate and measuring its length with a vernier height gauge.

One recommended way of checking exhaust valves for stretch is by measuring the diameter of the valve stem with a vernier outside micrometer caliper at a point specified by the engine manufacturer. If the valve has stretched, the stem diameter will be smaller than it should be.

Another way of determining if a valve has been stretched is by using a valve radius gauge to see if the radius between the valve stem and head is the same radius the valve had when it was manufactured.

8029. When is the fuel/air mixture ignited in a conventional reciprocating engine?

A—When the piston has reached top dead center of the intake stroke.
B—Shortly before the piston reaches the top of the compression stroke.
C—When the piston reaches top dead center on the compression stroke.

Ignition occurs in a reciprocating engine somewhere around 30° of crankshaft rotation before the piston reaches top center on the compression stroke.

By timing the ignition to occur when the piston is in this position, the maximum pressure inside the cylinder is reached just after the piston passes over top center and starts down on the power stroke.

Answers

8024 [C] (056) AMT-P Ch 2
8025 [A] (056) AMT-P Ch 2
8026 [A] (056) AMT-P Ch 2
8027 [B] (056) AMT-P Ch 2
8028 [B] (057) AMT-P Ch 2
8029 [B] (056) AMT-P Ch 2

8030. Ignition occurs at 28° BTDC on a certain four-stroke cycle engine, and the intake valve opens at 15° BTDC. How many degrees of crankshaft travel after ignition does the intake valve open? (Consider one cylinder only.)

A—707°.
B—373°.
C—347°.

The crankshaft rotates 28° on the compression stroke after the ignition occurs.

The crankshaft rotates 180° on the power stroke.

The crankshaft rotates 165° on the exhaust stroke before the intake valve opens.

The total crankshaft rotation between the time ignition occurs and the time the intake valve opens is:

28° + 180° + 165° = 373°.

8031. What is the purpose of the safety circlet installed on some valve stems?

A—To hold the valve guide in position.
B—To hold the valve spring retaining washer in position.
C—To prevent valves from falling into the combustion chamber.

Some aircraft engine poppet valves have a groove cut in their stem that is fitted with a safety circlet, a small snap ring that grips the valve stem in this groove.

If the tip of the valve stem should ever break off in operation, this safety circlet will contact the top of the valve guide and prevent the valve from dropping into the cylinder.

8032. Valve overlap is defined as the number of degrees of crankshaft travel

A—during which both valves are off their seats.
B—between the closing of the intake valve and the opening of the exhaust valve.
C—during which both valves are on their seats.

Valve overlap is the number of degrees of crankshaft rotation that both the intake and exhaust valves are off their seat at the end of the exhaust stroke and the beginning of the intake stroke.

Valve overlap allows a greater charge of fuel/air mixture to be inducted into the cylinder.

8033. The valve clearance of an engine using hydraulic lifters, when the lifters are completely flat, or empty, should not exceed

A—0.00 inch.
B—a specified amount above zero.
C—a specified amount below zero.

Hydraulic valve lifters are used to keep all of the clearance out of the valve system when the engine is operating and the lifters are pumped up.

When the lifters are completely flat, there will be clearance in the system of a specified amount above zero.

8034. If the exhaust valve of a four-stroke cycle engine is closed and the intake valve is just closed, the piston is on the

A—intake stroke.
B—power stroke.
C—compression stroke.

The intake valve closes when the piston is moving upward on the compression stroke. At this time, the exhaust valve is already closed.

8035. Which of the following are factors in establishing the maximum compression ratio limitations of an aircraft engine?

A—Design limitations of the engine, the degree of supercharging, and spark plug reach.
B—Detonation characteristics of the fuel, design limitations of the engine, and spark plug reach.
C—Detonation characteristics of the fuel, design limitations of the engine, and the degree of supercharging.

The maximum compression ratio of an engine is limited by the ability of the engine to withstand detonation in its cylinders.

The detonation characteristics of the fuel used is a limiting factor. Fuels having a low critical pressure and temperature must not be used with high compression engines.

The design limitations of the engine are important, because engines that are not designed strong enough to withstand high cylinder pressures must not have a high compression ratio.

The degree of supercharging is extremely important, because the cylinder pressures are a function of both the initial pressure in the cylinder (the pressure caused by the supercharger) and the compression ratio.

The only alternative that does not limit the compression ratio is the spark plug reach.

Answers

8030 [B] (056) AMT-P Ch 2	8031 [C] (056) AMT-P Ch 2	8032 [A] (008) AMT-P Ch 2	8033 [B] (008) AMT-P Ch 2
8034 [C] (056) AMT-P Ch 2	8035 [C] (008) AMT-P Ch 2		

Powerplant Oral & Practical Study Guide

The Oral and Practical Tests

Prerequisites

All applicants must have met the prescribed experience requirements as stated in 14 CFR §65.77. In addition, all applicants must provide:

1. Proof of having unexpired passing credit for the Aviation Mechanic General (AMG) knowledge test by presenting an Airman Computer Test Report (except when properly authorized under the provisions of 14 CFR §65.80 to take the practical tests before the airman knowledge tests).
2. Identification with a photograph and signature.

Test Standards

The examiner will download an oral and practical examination that is generated at random for each applicant that reflects all the knowledge and skill "Areas of Operation."

"Areas of Operation" are subject areas in which aviation mechanic applicants must have knowledge or demonstrate skill.

"Tasks" are the items that should be performed according to standards acceptable to the examiner.

"Reference" identifies the publication(s) that describe the task. Information contained in manufacturer and/or FAA approved data always takes precedence over textbook referenced data.

The objective of each Task lists the elements that must be satisfactorily performed to demon-strate competency in the Task.

The objective includes:

1. Specifically what the applicant will be able to do.
2. Conditions under which the Task is to be performed.
3. Acceptable standards of performance.

These terms apply to each Task:

- "Inspect" means to examine by sight and touch.
- "Check" means to verify proper operation.
- "Troubleshoot" means to analyze and identify malfunctions.
- "Service" means to perform functions that ensure continued operation.
- "Repair" means to correct a defective condition.
- "Overhaul" means to disassemble, inspect, repair as necessary, and check.

The applicant should be well prepared in all knowledge and skill areas included in the standards.

Satisfactory performance to meet the requirements for certification is based on the applicant's ability to:

1. Show basic knowledge.
2. Demonstrate basic mechanic skills.
3. Perform the Tasks within the standards of the reference materials.

The practical test is passed if, in the judgment of the examiner, the applicant demonstrates the prescribed level of proficiency on the assigned Tasks in each Area of Operation. Each practical examination item must be performed, at a minimum, to the performance level in the practical test standards. For mechanic testing, there are three practical performance levels:

- Level 1: You must know basic facts and principles and be able to locate information and reference materials. You do not have to interpret information or demonstrate a physical skill.
- Level 2: Know and understand principles, theories, operations, and concepts. You must be able to find, interpret, and apply maintenance data and information. You must be able to select and utilize the appropriate tools and equipment. While you need to demonstrate adequate performance skills, you do not need to demonstrate skill at a high or return-to-service quality level.
- Level 3: Know and understand principles, theories, operations, and concepts. You must be able to find, interpret, and apply maintenance data and information, select and utilize the appropriate tools and equipment to the overall operation and maintenance of an aircraft. You must be able to demonstrate the ability to work independently and make accurate judgments of airworthiness. You must demonstrate skills at a high level which includes the ability to perform return-to-service levels of work.

If, in the judgment of the examiner, the applicant does not meet the standards of any Task performed, the associated Area of Operation is failed and therefore, the practical test is failed.

Typical areas of unsatisfactory performance and grounds for disqualification are:

1. Any action or lack of action by the applicant that requires corrective intervention by the examiner for reasons of safety.
2. Failure to follow recommended maintenance practices and/or reference material while performing projects.
3. Exceeding tolerances stated in the reference material.
4. Failure to recognize improper procedures.
5. The inability to perform to a return-to-service standard, where applicable.
6. Inadequate knowledge in any of the subject areas.

When an applicant fails a test the examiner will record the applicant's unsatisfactory performance and Tasks not completed in terms of Areas of Operation appropriate to the practical test conducted.

Reciprocating Engines

Study Materials

Aviation Maintenance Technician Series Powerplant textbook .... ASA .... Chapter 1
Aviation Maintenance Technician Powerplant Handbook FAA-H-8083-32 Vol. 1 ..... FAA .... Chapter 1

Typical Oral Questions

1. What is the main advantage of a horizontally opposed engine over a radial engine for powering modern aircraft?

   The horizontally opposed engine has a much smaller frontal area and is easier to streamline than a radial engine.

2. How many throws are there in the crankshaft of a six-cylinder horizontally opposed engine?

   Six.

3. What kind of connecting rod arrangement is used in a radial engine?

   A master rod connects the single throw of the crankshaft with a piston. All of the other pistons are connected to the master rod with link rods.

4. Of what material are most piston rings made?

   Gray cast iron.

5. What is the reason for using hydraulic valve lifters in an aircraft engine?

   Hydraulic valve lifters keep all of the clearance out of the valve operating mechanism. This decreases the wear of the valve train components.

6. At what speed does the camshaft turn, relative to the crankshaft speed in a horizontally opposed engine?

   The camshaft turns at one half of the crankshaft speed.

7. What kind of main bearings are used in a horizontally opposed engine?

   Steel-backed, lead-alloy bearing inserts.

8. On what stroke is the piston of a reciprocating engine when the intake valve begins to open?

   On the exhaust stroke.

9. On what stroke is the piston of a reciprocating engine when the exhaust valve begins to open?

   On the power stroke.

10. Why are both the hot and cold valve clearances given for most radial engines?

    The hot clearance is given for valve timing purposes. The timing is adjusted with the valves in cylinder number one, set with the hot clearance. When the timing is set, all of the valves are adjusted to their cold clearance.

11. What is meant by a cam-ground piston?

    A piston that is not perfectly round. Its dimension parallel with the wrist pin is several thousandths of an inch less than its dimension perpendicular to the wrist pin. When the piston reaches operating temperature, the metal in the piston pin boss expands enough that the piston becomes perfectly round.

12. Where is the piston in a reciprocating engine when the ignition spark occurs?

    About 30 degrees of crankshaft rotation before the piston reaches top center on the compression stroke.

13. What is meant by a full-floating wrist pin?

    A wrist pin that is not clamped in either the piston or the connecting rod. Full-floating wrist pins are kept from scoring the cylinder walls by soft metal plugs in their ends.

14. Why do most aircraft reciprocating engines use more than one spring on each valve?

    By using more than one spring and having the wire diameter and pitch of the springs different, valve float is minimized. The springs have different resonant frequencies, so at least one spring will always be exerting a force on the valve.

15. Would excessive valve clearance cause the valves to open early or late?

    Excessive clearance will cause the valve to open late and close early.

16. What is the purpose of valve overlap in a reciprocating engine?

    Valve overlap allows the inertia of the exhaust gases leaving the cylinder to help the fresh induction charge start flowing into the cylinder.

17. What type of piston rings are installed on the pistons of an aircraft reciprocating engine?

    Compression rings, oil control rings, and oil wiper rings.

18. Why are some exhaust valves partially filled with metallic sodium?

    The metallic sodium melts at engine operating temperature and sloshes back and forth inside the hollow valve. It picks up heat from the valve head and transfers it into the valve stem, so it can be transferred to the cylinder head through the valve guide.

19. What causes detonation in an aircraft engine?

    Excessive heat and pressure in the engine cylinder causes the fuel/air mixture to reach its critical pressure and temperature. Under these conditions, the mixture explodes rather than burns. This explosion is called detonation.

20. Why is a compression check important for determining the condition of an aircraft reciprocating engine?

    A compression check can determine the condition of the seal between the piston rings and the cylinder walls, and the seal between the intake and exhaust valves and their seats.

21. What is meant by the compression ratio of a reciprocating engine?

    The ratio of the volume of the cylinder with the piston at the bottom of its stroke to the volume with the piston at the top of its stroke.

Typical Practical Projects

1. Correctly remove a cylinder and its piston from an engine specified by the examiner.
2. Examine the rings installed on a piston for the correct tension, end gap, and side clearance.
3. Dimensionally inspect an aircraft engine cylinder for bore diameter, out-of-round, and taper.
4. Inspect the valves from an aircraft engine cylinder for stretch and for their fit in the valve guides.
5. Inspect valve springs for their specified compression strength.
6. Grind a valve seat in an engine cylinder, using the correct stones for grinding and for narrowing the seat.
7. Reface an aircraft valve to the recommended angle, and check its fit and seal in the valve seat.
8. Explain to the examiner the correct way to adjust the oil pressure in an aircraft reciprocating engine.
9. Using the correct measuring instruments, measure the diameter of journals of a crankshaft and determine whether or not they are within the tolerances allowed by the engine manufacturer.
10. Examine the bearings in a crankcase specified by the examiner and determine their physical condition and whether or not they are within dimensional tolerance.
11. Examine a rocker arm of an aircraft engine by the magnetic particle inspection method.
12. Examine a cast aluminum or magnesium engine component by the dye penetrant inspection method.
13. Demonstrate to the examiner the correct way to start an aircraft reciprocating engine.
14. Demonstrate to the examiner the proper way to make an engine run-up check to determine the condition of the engine.
15. Identify the sludge plugs in the crankshaft of an aircraft engine and explain their purpose.
16. Explain to the examiner the things that should be checked about engine shock mounts.
17. Perform a crankshaft runout inspection on an engine specified by the examiner.
18. Demonstrate to the examiner the correct way to find the top dead center position of the piston in the cylinder.

POWERPLANT

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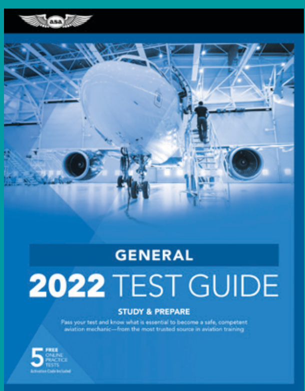

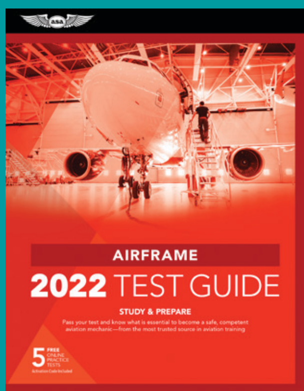

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