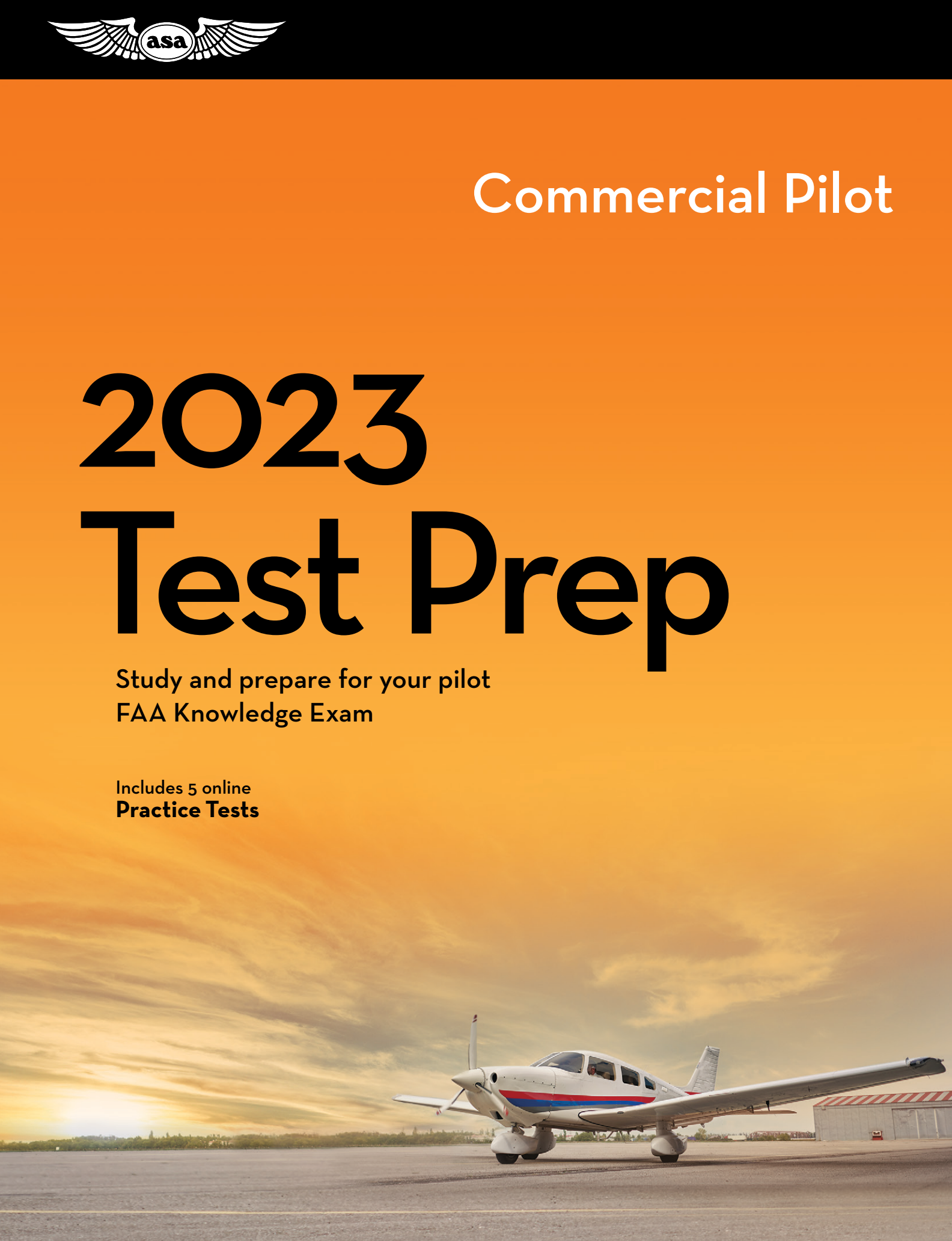
Commercial Pilot

2023 Test Prep

Study and prepare for your pilot FAA Knowledge Exam

Includes 5 online **Practice Tests**



Commercial Pilot

2023 Test Prep

Study and prepare for your pilot FAA Knowledge Exam

SAMPLE

AVIATION SUPPLIES & ACADEMICS, INC.
NEWCASTLE, WASHINGTON

The FAA Knowledge Exam questions can change throughout the year. Stay current with test changes; sign up for ASA's free email update service at **asa2fly.com/testupdate**

Commercial Pilot Test Prep
2023 Edition

Aviation Supplies & Academics, Inc.
7005 132nd Place SE
Newcastle, Washington 98059
asa@asa2fly.com | 425.235.1500 | asa2fly.com

© 2022 Aviation Supplies & Academics, Inc.

Visit **asa2fly.com/TPC** for additional information and resources related to this book.

Sample Federal Aviation Administration (FAA) questions herein contain information as of: September 2022. Stay informed of changes since the book was printed: **asa2fly.com/testupdate**

None of the material in this publication supersedes any documents, procedures or regulations issued by the Federal Aviation Administration.

Aviation Supplies & Academics, Inc. (ASA), assumes no responsibility for any errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

Cover photo: Aleksandr Lupin/Shutterstock.com

ASA-TP-C-23
ISBN 978-1-64425-241-3

Additional format available:
eBook PDF ISBN 978-1-64425-242-0

Also sold as *Commercial Pilot Test Prep Plus*, which includes this book plus Prepware software.
ASA-TPP-C-23, ISBN 978-1-64425-255-0

Printed in the United States of America

2023 2022 5 4 3 2 1

About the Contributors

Jackie Spanitz
General Manager
Aviation Supplies & Academics, Inc.

As ASA General Manager, Jackie Spanitz oversees maintenance and development of more than 1,000 titles and pilot supplies in the ASA product line. Ms. Spanitz has worked with airman training and testing for more than 25 years, including participation in the Airman Certification Standards (ACS) development committees. Jackie holds a Bachelor of Science in Aviation Technology from Western Michigan University, a Master of Science from Embry-Riddle Aeronautical University, and Instructor and Commercial Pilot certificates. She is the author of *Guide to the Flight Review*, and the technical editor for ASA's Test Prep and FAR/AIM series.

Aviation Supplies & Academics, Inc. (ASA) is an industry leader in the development and sale of aviation supplies and publications for pilots, flight instructors, aviation maintenance technicians, aircraft dispatchers, air traffic controllers, flight attendants, and drone operators. We manufacture and publish more than 1,000 products and have been providing trusted and reliable training materials to the aviation industry for over 80 years. Visit **asa2fly.com** to learn more.

SAMPLE

Stay informed with ASA online resources.

Website
asa2fly.com

Updates
asa2fly.com/testupdate

Follow, like, share.
twitter.com/asa2fly
instagram.com/asa2fly
facebook.com/asa2fly
youtube.com/asa2fly
linkedin.com/company/asa2fly

Contents

Instructions

Updates and Practice Tests v
Introduction vi
Description of the Tests vii
Knowledge Test Registration vii
Knowledge Test Eligibility viii
Acceptable Materials ix
Testing Procedures for Applicants Requesting Special Accommodations ix
Test Reports x
Retesting Procedures x
Cheating or Other Unauthorized Conduct x
Test-Taking Tips xii
Commercial Pilot Certificate Eligibility Requirements xiii
Knowledge Exam References xiv
Acronyms xv
ASA Test Prep Layout xvii

Chapter 1 **Basic Aerodynamics**

Aerodynamic Terms 1–3
Axes of Rotation and the Four Forces Acting in Flight 1–5
Lift 1–6
Weight 1–7
Thrust 1–7
Drag 1–7
Lift/Drag Ratios 1–11
The V_G Diagram 1–13
Stability 1–14
Turns, Loads, and Load Factors 1–16
Stalls and Spins 1–23
Flaps 1–24
Wing Shapes 1–25
Torque 1–26
Ground Effect 1–27
Wake Turbulence 1–28
Glider Aerodynamics 1–30

Chapter 2 **Aircraft Systems**

Ignition System 2–3
Fuel/Air Mixture 2–4
Carburetor Ice 2–6
Aviation Fuel 2–7
Engine Temperatures 2–8
Propellers 2–9
Cold Weather Operations 2–12
Rotorcraft Systems 2–13
Glider Systems 2–29
Balloon Operations 2–37
Airship Operations 2–43
Airship IFR Operations 2–45

Chapter 3 **Flight Instruments**

Airspeed Indicator 3–3
Altitudes 3–6
Magnetic Compass 3–7
Gyroscopic Instruments and Systems 3–8
Attitude Instrument Flying 3–9
Electronic Flight Instruments 3–10

Chapter 4 **Regulations**

Pilot Certificate Types and Privileges 4–3
Medical Certificates 4–6
Pilot Logbooks 4–7
High-Performance, Complex, and Tailwheel Airplanes 4–8
Recent Flight Experience: Pilot-In-Command 4–10
Change of Address 4–11
Towing 4–12
Responsibility and Authority of the Pilot-In-Command 4–13
Preflight Action 4–15
Seatbelts 4–17
Portable Electronic Devices 4–19
Fuel Requirements 4–20
Transponder and ADS-B Requirements 4–20
Supplemental Oxygen 4–22
Instrument and Equipment Requirements 4–23
Restricted, Limited, and Experimental Aircraft: Operating Limitations 4–24
Emergency Locator Transmitter (ELT) 4–25
Truth in Leasing 4–25
Operating Near Other Aircraft and Right-of-Way Rules 4–26
Speed Limits 4–29
Aircraft Lights 4–30
Minimum Altitudes 4–31
Maintenance Responsibility 4–32
Aircraft Inspections 4–33

SAMPLE

Maintenance Records 4–35
Maintenance, Preventative Maintenance, Rebuilding, and Alteration 4–36
NTSB Part 830 4–38
IFR Operations 4–41
Rotorcraft Regulations 4–42
Glider Regulations 4–43
Lighter-Than-Air Regulations 4–43
LTA Fundamentals of Instructing 4–46

Chapter 5 **Procedures and Airport Operations**

Airspace 5–3
Basic VFR Weather Minimums 5–14
Operations on Wet or Slippery Runways 5–15
Land and Hold Short Operations (LAHSO) 5–16
Airport Marking Aids and Signs 5–17
VFR Cruising Altitudes 5–22
Collision Avoidance 5–22
Fitness Physiology 5–25
Aeronautical Decision Making (ADM) 5–29

Chapter 6 **Weather**

The Earth's Atmosphere 6–3
Temperature 6–6
Wind 6–7
Moisture 6–9
Stable and Unstable Air 6–10
Clouds 6–11
Air Masses and Fronts 6–16
Turbulence 6–17
Icing 6–19
Thunderstorms 6–21
Fog 6–24
Wind Shear 6–26
Soaring Weather 6–29

Chapter 7 **Weather Services**

Aviation Routine Weather Report (METAR) 7–3
Pilot Report (UA) 7–5
Terminal Aerodrome Forecast (TAF) 7–8
Graphical Forecasts for Aviation (GFA) 7–9
Winds and Temperatures Aloft Forecast (FB) 7–10
Inflight Weather Advisories (WA, WS, WST) 7–10
Surface Analysis Chart 7–12
Constant Pressure Chart 7–13
Tropopause Height/Vertical Wind Shear Prognostic Chart 7–14
Significant Weather Prognostics 7–14
Lifted Index Chart 7–16

Chapter 8 **Aircraft Performance**

Weight and Balance 8–3
Computing Weight and Balance 8–4
Graph Weight and Balance Problems 8–4
Weight Change 8–5
Weight Shift 8–6
Rotorcraft Weight and Balance 8–12
Glider Weight and Balance 8–15
Headwind and Crosswind Components 8–17
Density Altitude 8–19
Takeoff and Landing Considerations 8–20
Takeoff and Landing Distance 8–22
Fuel Consumption vs. Brake Horsepower 8–26
Time, Fuel, and Distance to Climb 8–28
Table Method 8–28
Graph Method 8–29
Cruise Performance Table 8–33
Cruise and Range Performance Table 8–35
Maximum Rate of Climb 8–36
Glide Distance 8–37
Rotorcraft Performance 8–38
Glider Performance 8–40
Balloon Performance 8–43

Chapter 9 **Navigation**

The Flight Computer 9–3
Finding True Course, Time, Rate, Distance, and Fuel 9–3
Finding Density Altitude 9–10
Finding Wind Direction and Velocity 9–12
VHF Omni-Directional Range (VOR) 9–14
Horizontal Situation Indicator (HSI) 9–18

Cross References

A: Question Number and Page Number A–1
B: Airman Knowledge Test Report Codes and Question Numbers B–1

FAA Figures

Airman Knowledge Testing Supplement for Commercial Pilot (FAA-CT-8080-1E)

SAMPLE

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.

We Invite Your Feedback

After you take your FAA exam, let us know how you did. Were you prepared? Did ASA's products meet your needs and exceed your expectations? We want to continue to improve these products to ensure applicants are prepared and become safe aviators. Send your feedback to: **cfi@asa2fly.com**.

prepware.com

See inside front cover for FREE account!

Helping you practice for written exams.

As the experts in FAA Knowledge Exam preparation, we want you to have the confidence needed before heading to the testing center, and help eliminate the hassle and expense of retaking exams.

> **Realistic Test Simulation**
Test questions and time allowed replicate the official FAA exam

> **Performance Graphs**
Review how you did, track your performance and review explanations for the questions you missed

> **Gain Confidence**
Go into your exam fully prepared after practicing up to 5 simulated tests

> **Succeed**
Pass your exam, achieve your goals, and set new ones

Remote Pilot • Sport Pilot • Private Pilot • Instrument Rating • Commercial Pilot • Flight Instructor • Ground Instructor
Fundamentals of Instructing • Flight Engineer • Airline Transport Pilot • Aviation Mechanic General • Airframe • Powerplant

Practice tests are also available as an app! **asa2fly.com/apps**

SAMPLE

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 Reader Resources for this Test Prep (**asa2fly.com/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 activation code).

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** 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 letter associated with the correct response. 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:

Aviation Supplies & Academics, Inc.
7005 132nd Place SE
Newcastle, WA 98059-3153
Voice: 425.235.1500 Fax: 425.235.0128
Email: cfi@asa2fly.com Website: asa2fly.com

The FAA appreciates testing experience feedback. You can contact them at:

Federal Aviation Administration
AFS-630, Airman Testing Standards Branch
PO Box 25082
Oklahoma City, OK 73125
Email: afs630comments@faa.gov

SAMPLE

Description of the Tests

The FAA Knowledge Exam is an objective, multiple choice test. Each question can be answered by one of the three choices. Each test question is independent of the others—a correct response to one question does not depend on the correct response to another. You must score at least 70 percent to pass the test.

As stated in 14 CFR §61.63, an applicant need not take an additional knowledge test provided the applicant holds an airplane, rotorcraft, powered-lift, or airship rating at that pilot certificate level. For example, an applicant transitioning from gliders to airplanes will need to take the 100-question test. But an applicant transitioning from airplanes to gliders, or airplanes to helicopters, will *not* be required to take the Knowledge Exam.

Military applicants should refer to the *Commercial Pilot – Military Competence Airman Certification Standards* (FAA-S-ACS-12) for information on the expected knowledge in preparation for the Military Competence Knowledge Exam. Additionally, applicants should review §61.73. Military pilots or former military pilots: Special rules, which provides information to military pilots who are interested in acquiring their civilian pilot certificate.

The table below lists the number of questions and the allotted time for each test. Each question in this book is preceded by a category. Use these categories to study the content that may appear on your test. Study all the questions first, then refer to the following table, placing emphasis on those questions most likely to be included on your test (identified by the test prep category above each question number).

Test Code	Test Name	Test Prep Study	Number of Questions	Min. Age	Allotted Time (hrs)
CAX	Commercial Pilot—Airplane	ALL, AIR	100	16	3.0
CRH	Commercial Pilot—Helicopter	ALL, RTC	100	16	3.0
CRG	Commercial Pilot—Gyroplane	ALL, RTC	100	16	3.0
CGX	Commercial Pilot—Glider	ALL, GLI	100	16	3.0
CBH	Commercial Pilot—Balloon–Hot Air	ALL, LTA	100	16	3.0
CLA	Commercial Pilot—Airship	ALL, LTA	100	16	3.0
CBG	Commercial Pilot—Balloon–Gas	ALL, LTA	60	16	2.5
MCN	Military Competency—Non-Category	MIL	50	18	2.0
CCP	Commercial Pilot—Airplane Canadian Conversion*	ALL, AIR	40	18	2.0
CCH	Commercial Pilot—Helicopter Canadian Conversion*	ALL, RTC	40	18	2.0

* This test focuses on U.S. regulations, procedures, and operations.

Knowledge Test Registration

The FAA testing providier authorizes hundreds of test center locations that offer a full range of airman knowledge tests. For information on authorized testing centers and to register for the knowledge test, visit **faa.psiexams.com**.

When you contact a knowledge testing center, be prepared to select a test date and make payment. You may register for test(s) several weeks in advance online or by phone, and you may cancel in accordance with the testing center's cancellation policy.

SAMPLE

Regardless of your registration method, you will need an FAA Tracking Number (FTN) prior to registering for the FAA Airman Knowledge Test. This FTN will follow you throughout your aviation career. You will obtain your FTN as part of the test registration process, by creating a profile in the Integrated Airman Certificate and Rating Application (IACRA) system at iacra.faa.gov/IACRA. This FTN will be printed on your Airman Knowledge Test Report (AKTR).

The test registration process includes collection of this information: name, FTN, physical address, date of birth, email address, photo identification, phone number, test authorization (credentials of the individual such as an instructor endorsement), and previous number of test attempts.

Step 1: Create a profile using the IACRA system and login to obtain your FTN.
Step 2: Register for your knowledge test with PSI by phone or online.

For more information, contact:
PSI Services LLC
844-704-1487 or examschedule@psionline.com
faa.psiexams.com

Knowledge Test Eligibility

All Commercial Pilot Tests

You will be required to show proper identification and the following:

1. Certificate of graduation or a statement of accomplishment certifying the satisfactory completion of the ground school portion of a course for the certificate or rating sought. The certificate or statement may be issued by a Federal Aviation Administration certified pilot school or an agency such as a high school, college, adult education program, Civil Air Patrol, or Reserve Officers Training Corp (ROTC) flight training school.
2. Written statement or logbook endorsement from an authorized ground or flight instructor certifying that the applicant completed an applicable ground training or home study course and is prepared for the knowledge test.

Ground schools will issue an endorsement when you complete their course. If you choose to home-study, you can either get an endorsement from your instructor or submit your home-study materials to an FAA Office for review and approval prior to taking the test.

Complete two Prepware practice tests with scores of 80% or higher to get your knowledge test endorsement for any pilot rating directly from ASA. Visit **asa2fly.com/prepware** or **prepware.com** for more details.

If a flight or ground instructor is providing your endorsement, you may use the following template:

Commercial Pilot Endorsement

I certify that *(First name, MI, Last name)* _____ has received the required training of 14 CFR §61.125. I have determined he/she is prepared for the *(Test name; e.g., Commercial Pilot – Airplane)* _____ knowledge test.

Signed _____ Date _____

CFI Number _____ Expires _____

Military Competency Tests

Requires *no* instructor endorsements or other form of written authorization.

SAMPLE

Acceptable Materials

The applicant may use test aids and materials within the guidelines listed below during the test, if actual test questions or answers are not revealed.

Acceptable Materials	Unacceptable Materials	Notes
Supplement book provided by proctor.	Written materials that are handwritten, printed, or electronic.	Testing centers may provide calculators and/or deny the use of personal calculators.
All models of aviation-oriented calculators or small electronic calculators that perform only arithmetic functions.	Electronic calculators incorporating permanent or continuous type memory circuits without erasure capability.	Test proctor may prohibit the use of your calculator if he or she is unable to determine the calculator's erasure capability.
Calculators with simple programmable memories, which allow addition to, subtraction from, or retrieval of one number from the memory; or simple functions, such as square root and percentages.	Magnetic cards, magnetic tapes, modules, computer chips, or any other device upon which pre-written programs or information related to the test can be stored and retrieved.	Printouts of data must be surrendered at the completion of the test if the calculator incorporates this design feature.
Scales, straight-edges, protractors, plotters, navigation computers, blank log sheets, holding pattern entry aids, and electronic or mechanical calculators that are directly related to the test.	Dictionaries.	Before, and upon completion of the test, while in the presence of the test proctor, actuate the ON/OFF switch or RESET button, and perform any other function that ensures erasure of any data stored in memory circuits.
Manufacturer's permanently inscribed instructions on the front and back of such aids, such as formulas, conversions, regulations, signals, weather data, holding pattern diagrams, frequencies, weight and balance formulas, and ATC procedures.	Any booklet or manual containing instructions related to use of test aids.	Test proctor makes the final determination regarding aids, reference materials, and test materials.

Testing Procedures for Applicants Requesting Special Accommodations

If you are an applicant with a learning or reading disability, you may request approval from the local FAA office to take an airman knowledge test, using the special accommodations procedures outlined in the most current version of FAA Order 8080.6 Conduct of Airman Knowledge Tests.

Prior to approval of any option, the FAA Aviation Safety Inspector must advise you of the regulatory certification requirement of being able to read, write, speak, and understand the English language.

SAMPLE

Test Reports

Your test will be graded immediately upon completion and your score will display on the computer screen. You will receive your Airman Knowledge Test Report (AKTR), which will state your score. See sample AKTR on the next page.

Visit **faa.psiexams.com** to request a duplicate or replacement AKTR due to loss or destruction.

Airman Knowledge Test Reports are valid for 24 calendar months preceding the month you complete the practical test. If the AKTR expires before completion of the practical test, you must retake the knowledge test.

The AKTR lists the Airman Certification Standard (ACS) code (if an Airman Certification Standard is available for the certificate and rating specific to the test) or Learning Statement Code (LSC) (if a Practical Test Standard is in effect for the certificate and rating specific to the test) for questions answered incorrectly. The total number of ASCs/LSCs shown on the AKTR is not necessarily an indication of the total number of questions answered incorrectly. Study these knowledge areas to improve your understanding of the subject matter. See Cross-Reference B in the back of this book for a listing of ASCs/LSCs and their associated questions.

Your instructor is required to provide instruction on each of the knowledge areas listed on your AKTR and to complete an endorsement of this instruction. You must present this to the examiner prior to taking the practical test. During the oral portion of the practical test, the examiner is required to evaluate the noted areas of deficiency.

Retesting Procedures

Applicants retesting ***after failure*** are required to submit the applicable AKTR indicating failure, along with an endorsement (on the test report) from an authorized instructor, who gave the applicant the additional training, certifying the applicant is competent to pass the test. The original failed AKTR and retest endorsement presented as authorization shall be retained by the proctor and attached to the applicable sign-in/out log. The latest test taken will reflect the official score.

Applicants retesting ***in an attempt to achieve a higher passing score*** may retake the same test for a better grade after 30 days. The latest test taken will reflect the official score. Applicants are required to submit the original applicable AKTR indicating previous passing score to the testing center prior to testing. Testing center personnel must collect and destroy this report prior to issuing the new test report.

Cheating or Other Unauthorized Conduct

Computer testing centers must follow strict security procedures to avoid test compromise. These procedures are established by the FAA and are covered in FAA Order 8080.6 Conduct of Airman Knowledge Tests. The FAA has directed testing centers to terminate a test at any time a test proctor suspects a cheating incident has occurred. An FAA investigation will then be conducted. If the investigation determines that cheating or unauthorized conduct has occurred, then any airman certificate or rating that you hold may be revoked, and you will be prohibited for one year from applying for or taking any test for a certificate or rating under 14 CFR Part 61.

SAMPLE

U.S. DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Airman Knowledge Test Report

NAME: TAYLOR SMITH

FAA TRACKING NUMBER (FTN): C1234567 **EXAM ID:** 98765432109876543

EXAM: Commercial Pilot – Airplane (CAX)

EXAM DATE: 09/15/2022 **EXAM SITE:** ABC12345

SCORE: 88% **GRADE:** Pass **TAKE:** 1

The Airman Certification Standards (ACS) codes listed below represent incorrectly answered questions. These ACS codes and their associated Areas of Operation/Tasks/Elements may be found in the appropriate ACS document at http://www.faa.gov/training_testing/testing/acs.

A single code may represent more than one incorrect response.

CA.I.F.K3 CA.I.G.R1 CA.III.A.K8 CA.IV.A.R2d CA.V.A.K2e CA.VII.B.K1 CA.IX.D.K3c

EXPIRATION DATE: 09/30/2024

DO NOT LOSE THIS REPORT

AUTHORIZED INSTRUCTOR'S STATEMENT: (if applicable)

On _____ (date) I gave the above named applicant _____ hours of additional instruction, covering each subject area shown to be deficient, and consider the applicant competent to pass the knowledge test.

Name _____

Cert. No. _____ *(print clearly)*

Type of instructor certificate _____

Signature _____

FRAUDULENT ALTERATION OF THIS FORM BY ANY PERSON IS A BASIS FOR SUSPENSION OR REVOCATION OF ANY CERTIFICATES OR RATINGS HELD BY THAT PERSON.
ISSUED BY: PSI Services LLC
FEDERAL AVIATION ADMINISTRATION

THIS INFORMATION IS PROTECTED BY THE PRIVACY ACT. FOR OFFICIAL USE ONLY.

SAMPLE

Sample Airman Knowledge Test Report

Test-Taking Tips

Prior to launching the actual test, the test proctor's testing software will provide you with an opportunity to practice navigating through the test. This practice (or tutorial) session may include a "sample" question(s). These sample questions have no relation to the content of the test, but are meant to familiarize you with the look and feel of the system screens, including selecting an answer, marking a question for later review, time remaining for the test, and other features of the testing software.

Follow these time-proven tips, which will help you develop a skillful, smooth approach to test-taking:

- Visit **faa.psiexams.com** to take a small sample test to become familiar with the latest PSI exam interface you will see on your actual FAA knowledge test.
- Be careful to fully understand the intent of each question and corresponding answer while studying, rather than memorize the A, B, C answer choice—answer stems may appear in a different order than you studied and have some wording differences.
- Take with you to the testing center a sign-off from an instructor (except for military competency test candidates), photo I.D., the testing fee, calculator, flight computer (ASA's E6-B or CX-3 Flight Computer), plotter, magnifying glass, and a sharp pointer, such as a safety pin.
- Your first action when you sit down should be to write on the scratch paper the weight and balance and any other formulas and information you can remember from your study. Remember, some of the formulas may be on your E6-B.
- Answer each question in accordance with the latest regulations and guidance publications.
- Read each question carefully before looking at the possible answers. You should clearly understand the problem before attempting to solve it.
- After formulating an answer, determine which answer choice corresponds the closest with your answer. The answer chosen should completely resolve the problem.
- From the answer choices given, it may appear that there is more than one possible answer. However, there is only one answer that is correct and complete. The other answers are either incomplete, erroneous, or represent popular misconceptions.
- Answer each question in accordance with the latest regulations and guidance publications.
- If a certain question is difficult for you, it is best to mark it for REVIEW and proceed to the other questions. After you answer the less difficult questions, return to those which you marked for review and answer them. The review marking procedure will be explained to you prior to starting the test. Although the computer should alert you to unanswered questions, make sure every question has an answer recorded. This procedure will enable you to use the available time to the maximum advantage.
- Perform each math calculation twice to confirm your answer. If adding or subtracting a column of numbers, reverse your direction the second time to reduce the possibility of error.
- When solving a calculation problem, select the answer nearest to your solution. The problem has been checked with various types of calculators; therefore, if you have solved it correctly, your answer will be closer to the correct answer than any of the other choices.
- Remember that information is provided in the Legends and Figures contained within the Airman Knowledge Testing Supplement (FAA-CT-8080 document) you'll be using during the test.
- Remember to answer every question, even the ones with no completely correct answer, to ensure the FAA gives you credit for a bad question.
- Take your time and be thorough but relaxed. Take a minute off every half-hour or so to relax the brain and the body. Get a drink of water halfway through the test.
- Your test will be graded immediately upon completion.

SAMPLE

Commercial Pilot Certificate Eligibility Requirements

The general prerequisites for a Commercial Pilot Certificate require that the applicant have a combination of experience, knowledge, risk management, and skill. For specific information pertaining to certification, an applicant should carefully review the appropriate sections of Part 61 for Commercial Pilot Certification, including 14 CFR §61.23 "Medical Certificates: Requirement and Duration," and §61.35, "Knowledge Test: Prerequisites and Passing Grades."

Additionally, to be eligible for a Commercial Pilot Certificate, applicants must:

- Be at least 18 years of age (16 to take the knowledge test).
- Be able to read, speak, write, and understand English or have a limitation placed on the certificate.
- Hold a current medical certificate issued under Part 67. No medical certificate is required for a glider or balloon rating.
- Pass a knowledge test appropriate to the aircraft rating sought on the subjects in which ground instruction is required. Applicants for a knowledge test must show evidence of completing ground training or a home study course and be prepared for the knowledge test.
- Pass an oral and flight test appropriate to the rating they seek, covering items selected by the inspector or examiner from those on which training is required.
- Hold at least a Private Pilot Certificate.
- Comply with the provisions of Part 61 which apply to the rating they seek.

SAMPLE

Knowledge Exam References

The FAA references the following documents to write the FAA Knowledge Exam questions. You should be familiar with all of these as part of your ground school studies, which you should complete before starting test preparation.

FAA-H-8083-1 *Aircraft Weight and Balance Handbook*

FAA-H-8083-3 *Airplane Flying Handbook*

FAA-H-8083-13 *Glider Flying Handbook*

FAA-H-8083-21 *Helicopter Flying Handbook*

FAA-H-8083-25 *Pilot's Handbook of Aeronautical Knowledge*

FAA-H-8083-15 *Instrument Flying Handbook*

FAA-H-8083-11 *Balloon Flying Handbook*

(Note: LTA applicants should also review FAA-H-8083-9 *Aviation Instructor's Handbook, How to Fly a Balloon, Balloon Digest, Balloon Ground School, Powerline Excerpts*, and *Goodyear Airship Operations Manual*)

FAA-S-ACS-7 *Commercial Pilot Airplane Airman Certification Standards*

FAA-S-ACS-12 *Commercial Pilot Military Competence Airman Certification Standards*

FAA-S-8081-16 *Commercial Pilot Helicopter Practical Test Standards*

AC 00-6 *Aviation Weather*

AC 00-30 *Atmospheric Turbulence Avoidance*

AC 00-45 *Aviation Weather Services*

AC 60-22 *Aeronautical Decision Making*

AC 90-48 *Pilot's Role in Collision Avoidance*

AC 91-13 *Cold Weather Operation of Aircraft*

AC 91-51 *Effect of Icing on Aircraft Control and Airplane Deice and Anti-Ice Systems*

Chart Supplement U.S.

Sectional Aeronautical Chart (SAC)

U.S. Terminal Procedures

Aeronautical Information Manual (AIM)

14 CFR Part 1, 23, 29, 39, 43, 61, 68, 71, 73, 91, 117, 119

49 CFR Part 830 (NTSB)

Visit **asa2fly.com** for these and many more titles and pilot supplies for your aviation endeavors.
Visit **asa2fly.com/TPC** for reader resources useful to commercial pilots.

SAMPLE

Acronyms

For reference, acronyms appearing in this book are defined below.

AC	Convective Outlook
AD	Airworthiness Directive
ADC	air data computer
ADM	aeronautical decision making
ADS-B	Automatic Dependent Surveillance–Broadcast
AGL	above ground level
AGL	above ground level
AIRMET	airman's meteorological information
AME	aviation medical examiner
ARTCC	air traffic control center
ATC	air traffic control
ATIS	Automatic Terminal Information Service
AWC	aviation weather center
AWOS	Automated Surface Weather Observing System
AWW	Severe Weather Forecast Alert
BHP	brake horsepower
BTU	British thermal unit
CAMI	Civil Aeromedical Institute
CAT	clear air turbulence
CDI	course deviation indicator
CG	center of gravity
CL	center of lift
CONUS	continental/contiguous United States
CWA	Center Weather Advisory
ELT	emergency locator transmitter
FA	area forecast
FAR	Federal Aviation Regulation
FB	winds and temperatures aloft forecast
FL	flight level
FSDO	Flight Standards District Office
FSS	Flight Service Station
GFA	Graphical Forecasts for Aviation
GMT	Greenwich Mean Time
GPH	gallons per hour
GPS	Global Positioning System
HIS	horizontal situation indicator
IFR	instrument flight rules
IR	Instrument Route (MTR)
KIAS	knots indicated airspeed
L/D	lift-to-drag ratio
LAHSO	land and hold short operation
LLWAS	Low-Level Wind Shear Alert System
LOA	Letter of Agreement
LOC	localizer (ILS)
LTA	lighter than air
LTE	loss of tail rotor effectiveness
MAP	manifold pressure
MEF	maximum elevation figure
METAR	aviation routine weather report
MOA	Memorandum of Agreement
MOA	Military Operation Area
MSL	mean sea level
MTR	Military Training Route
NM	nautical mile
NMAC	near midair collision
NOTAM	Notice to Air Missions
NTSB	National Transportation Safety Board
OAT	outside air temperature
OBS	omni bearing selector
PA	pressure altitude
PATWAS	pilots' automatic telephone weather answering service
PFD	primary flight display
PIC	pilot-in-command
PIREP	pilot report
PT	procedure turn
RAIM	receiver autonomous integrity monitoring
SIC	second-in-command
SIGMET	significant meteorological information
SM	statute mile
TAF	terminal aerodrome forecast
TAS	true airspeed
TC	true course
TH	true heading

SAMPLE

TI	thermal index
TIBS	Telephone Information Briefing Service
TIS-B	Traffic Information Service–Broadcast
UAT	Universal Access Transceiver
VFR	visual flight rules
VOR	VHF Omnidirectional Range
VOT	VOR Test Facility
VR	Visual Route (MTR)
WCA	wind correction angle
WSFO	Weather Service Forecast Office

SAMPLE

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 from the Airman Knowledge Testing Supplement (FAA-CT-8080-1E) that can be found at the back of this book. This supplement will be provided to you as a separate booklet when you take your FAA 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 the Airman Knowledge Testing Supplement at the back of the book.

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

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

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.

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

SAMPLE

Chapter 2
Aircraft Systems

Ignition System ***2–3***

Fuel/Air Mixture ***2–4***

Carburetor Ice ***2–6***

Aviation Fuel ***2–7***

Engine Temperatures ***2–8***

Propellers ***2–9***

Cold Weather Operations ***2–12***

Rotorcraft Systems ***2–13***

Glider Systems ***2–29***

Balloon Operations ***2–37***

Airship Operations ***2–43***

Airship IFR Operations ***2–45***

SAMPLE

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.

Fuel/Air Mixture

Carburetors are normally set to deliver the correct fuel/air mixture (fuel/air ratio) at sea level. This fuel/air ratio is the ratio of the weight of fuel to the weight of air entering the cylinder. The 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 fuel flow as altitude increases (air density decreases), thus maintaining the correct fuel/air ratio. If fuel flow is allowed to remain constant by not leaning the mixture, the fuel/air ratio will become too rich as the density 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 will be too low for the weight of air reaching the cylinders. This may result in the creation of high engine temperatures and pressures.

The best power mixture is the fuel/air 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]

SAMPLE

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]

SAMPLE

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]

SAMPLE

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]

SAMPLE

2023 Test Prep

Commercial Pilot

Study and prepare for your pilot FAA knowledge exam

Pass your test and know what is essential to to become a safe, competent pilot—from the most trusted source in aviation training.

Rely on the time-proven and dependable ASA *Commercial Pilot Test Prep* to prepare for your FAA Knowledge Exam. Test material is expertly organized into chapters based on subject matter and includes introductory text and illustrations, questions, answer choices, answers, explanations (for correct and incorrect answers), and references for further study. This topical study promotes understanding and aids recall to provide an efficient study guide. When you're done studying, take practice tests and receive your test authorization (endorsement) with ASA's online simulated testing program at no additional cost!

The ASA Test Prep includes the figures, legends, and full-color charts from the FAA Airman Knowledge Testing Supplement so you'll be familiar with the information you'll be issued at the testing center. You can count on ASA to provide you with the latest changes in the FAA Knowledge Exams through a free email subscription service and updates. ASA's *Commercial Pilot Test Prep* is the pilot's best resource for successful test-taking.

- **Questions for all Commercial Pilot and Military Competency FAA Knowledge Exams: airplane, rotorcraft, glider, and lighter-than-air**
- **Explanations for correct and incorrect answers, FAA references for further study, and airman test report codes for remedial study**
- **Figures from the FAA Airman Knowledge Testing Supplement**
- **Organization by subject with introductory text for efficient and logical study**
- **Commercial Pilot Certificate requirements**
- **5 free online practice tests and test authorization**
- **Test-taking tips and quick cross-references for easy question-finding**
- **Free online updates and subscription service to stay informed of test changes**

TRANSPORTATION USD $39.95
ISBN 978-1-64425-241-3
53995 >
9 781644 252413

Explore more ways to study

SOFTWARE | APP | EBOOK
Available on demand from ASA
asa2fly.com/testprep

Aviation Supplies & Academics, Inc.
7005 132nd Place SE
Newcastle, Washington 98059
425-235-1500 | asa2fly.com
ASA-TP-C-23