



CIVIL AVIATION AUTHORITY
OF THE PHILIPPINES

ADVISORY CIRCULAR ***AC 02-018***

SKILL TEST STANDARDS: AIRCRAFT MAINTENANCE TECHNICIAN

SECTION 1 GENERAL

1.1 PURPOSE

This Advisory Circular (AC) provides guidance to individuals, organizations and examiners regarding the determination that an individual's skill level is adequate for the—

- Original issuance of an Aircraft Maintenance Technician License (AMT)
- Add an Airframe Rating to the AMT license; or
- Add a Powerplant Rating to the AMT license.

1.2 STATUS OF THIS ADVISORY CIRCULAR

This is an original issuance of this AC.

1.3 BACKGROUND

- A. ICAO Standards in Annex 1, Personnel Licensing, require that, before issuing an Aircraft Maintenance Technician License, the State must assess the knowledge and skill of the individual to perform such operations.
- B. PCAR Part 2 establishes the specific requirements for AMT testing that parallel the ICAO Standards.
- C. This AC provides amplified standards for a AMT applicant and the person assigned to conduct the skill test for license

1.4 APPLICABILITY

- A. These Skill Test Standards are for use by examiners for determination of an individual's fitness to be issued and continue to hold AMT privileges.
- B. Aircraft Maintenance Technician instructors are expected to use these standards when preparing applicants for their AMT skill tests.
- C. Applicants should be familiar with these skill test standards and refer to them during their training.

1.5 RELATED REGULATIONS

The following regulations are directly applicable to the guidance contained in this advisory circular—

- Advisory Circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.
- Where a regulation contains the words "prescribed by the Authority," the AC may be considered to "prescribe" a viable method of compliance, but status of that "prescription" is always "guidance" (never regulation).

- PCAR Part 2, Personnel Licensing
- PCAR Part 5, Airworthiness
- PCAR Part 6, Approved Maintenance Organizations
- PCAR Part 7, Instruments & Equipment
- PCAR Part 8, Operations of Aircraft

1.6 RELATED PUBLICATIONS & REFERENCES

For further information on this topic, individuals, instructors and examiners are invited to consult the following publications—

1) Civil Aviation Authority of the Philippines

Copies may be obtained from the CAAP Flight Standards Inspectorate Service.

- ◆ AC 05-002: Application & Process: Special Certificates of Airworthiness.
- ◆ AC 05-003: Disposition of Unsalvageable Parts & Materials
- ◆ AC 05-004: Eligibility & Traceability of Replacement Parts
- ◆ AC 05-005: Handling of Suspected Unapproved Aircraft Parts
- ◆ AC 08-015: Development of Acceptable Minimum Equipment Lists
- ◆ AC 08-016: Acceptable Aircraft Mass & Balance Control
- ◆ AC 08-018: Acceptable Required Flight Preparation Documents

2) United States Federal Aviation Administration (FAA)

● Copies are normally available through training schools and instructors.
● Contact the Flight Standards Inspectorate Service if unable to find copies.

- ◆ AC 65-9, Airframe and Powerplant Mechanics General Handbook
- ◆ AC 65-15, Airframe and Powerplant Mechanics Airframe Handbook
- ◆ FAA-H-8083-1: Aircraft Weight and Balance Handbook

3) International Civil Aviation Organization (ICAO)

Copies may be obtained from Document Sales Unit, ICAO, 999 University Street, Montreal, Quebec, Canada H3C 5H7.

- ◆ Annex 1, Personnel Licensing
- ◆ Annex 8, Airworthiness of Aircraft
- ◆ Document 9051, Airworthiness Technical Manual
- ◆ Document 9760, Airworthiness Manual
- ◆ Document 9824, Human Factors for Aircraft Maintenance Manuals
- ◆ Circular 251, Human Factors in Aircraft Maintenance and Inspection

4) Recommended Commercial Publications

- ◆ ABS: Aircraft Basic Science, Glencoe-Macmillan/McGraw-Hill Publishing Co.
- ◆ AEE: Aircraft Electricity and Electronics, Glencoe-Macmillan/McGraw-Hill Publishing Co.
- ◆ AMR: Aircraft Maintenance and Repair, Glencoe—Macmillan/McGraw-Hill Publishing Co.
- ◆ AMT-G: Aviation Maintenance Technician Series—General, Aviation Supplies and Academics (ASA), Inc.
- ◆ JSAT: A & P Technician Airframe Textbook—Jeppesen-Sandersen, Inc.

◆ JSGT: A & P Technician General Textbook—Jeppesen-Sandersen, Inc.

1.7 DEFINITIONS & ACRONYMS

The following definitions are used in this advisory circular—

- 1) **Examiner.** As used in this document, this word denotes either the CAAP Inspector or CAAP Designated Examiner who conducts the Skill Test.
- 2) **Objective.** Listing of the competency elements relating to a defined Subject Area to define knowledge and tasks that an applicant must be able to demonstrate satisfactorily.
- 3) **Categories.** The groupings of knowledge and skill Subject Areas for the purposes of skill tests for AMT ratings.
- 4) **Subject Areas.** The groupings of competency elements pertaining to specific knowledge and skills.

1.7.1 ACRONYMS & ABBREVIATIONS

The following acronyms and abbreviations are used in this advisory circular—

- 1) **AC** – Alternating Current
- 2) **CAAP** – Civil Aviation Authority of the Philippines
- 3) **CG** – Center of Gravity
- 4) **DC** – Direct Current
- 5) **FSIS** – Flight Standards Inspectorate Service
- 6) **AMT** – Aircraft Maintenance Technician License
- 7) **CAAP** – Civil Aviation Authority of the Philippines
- 8) **MAC** – Mean Aerodynamic Chord
- 9) **PCARs** – Philippine Civil Aviation Regulations
- 10) **PEL** – Personnel Licensing
- 11) **TCDS** – Type Certificate Data Sheet

SECTION 2 INTRODUCTORY INFORMATION

2.1 AIRCRAFT MAINTENANCE TECHNICIAN SKILL TEST PREREQUISITES

An applicant for the Aircraft Maintenance Technician Skill Test is required to—

- 1) Be at least 21 years of age;
 - 2) Be able to read, speak, write, and understand the English language.
 - 3) Have passed the appropriate aircraft maintenance technician rating since the beginning of the 24th month before the month in which he or she takes the skill test;
 - 4) Have satisfactorily accomplished the required training and/or obtained the aeronautical experience prescribed;
 - 5) Have an endorsement from an authorized instructor certifying that the applicant—
 - (a) Has received and logged training time within 60 days preceding the date of application in preparation for the skill test, and
 - (b) Is prepared for the skill test; and
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- 6) Also have an endorsement certifying that the applicant has demonstrated satisfactory knowledge of the subject areas in which the applicant was deficient on the knowledge test.

2.2 APPLICANT SKILL TEST PREPARATION CHECKLIST

The following guidance is provided to ensure that the applicant arrives at the appointment with all equipment and documents necessary for the administration of the skill test, including—

2.2.1 APPOINTMENT WITH EXAMINER

- A. Contact the CAAP-FSIS to be assigned an examiner for the purpose of the skill test.
- B. Contact the examiner to arrange a suitable location, date and time.
- C. Plan to arrive at the designated location before the actual time of the appointment.

2.2.2 TOOLS & EQUIPMENT

- A. The examiner will must provide the tools, equipment, forms, supplies and technical data necessary to conduct the appropriate skill test.
- B. The applicant may bring personal tools to the skill tests, if permitted by the examiner.

2.2.3 PERSONAL RECORDS

The applicant must provide the following personal records before the skill test can be administered—

- 1) Identification-photo/signature ID
- 2) PEL license (if applicable)
- 3) Completed FSIS Form 542, Other PEL Rating Application, with Instructor's Signature (If applicable)
- 4) Aeronautical knowledge test report
- 5) Pilot Logbook with appropriate instructor endorsements
- 6) FSIS-Form 555, Notice of Disapproval (if applicable)
- 7) Graduation certificate from an Approved Training Organization (if applicable)
- 8) Examiner's fee

2.3 A PRETEST INTERVIEW WILL BE CONDUCTED

2.3.1 CONTENTS OF INTERVIEW

- A. The examiner will accomplish the pretest interview face to face, by telephone/fax, through e-mail, or other methods to—
 - 1) Discuss fees, testing procedures, projects, and type of equipment to be used and what the applicant should expect if they pass, fail, or do not complete the test.
 - 2) Advise the applicant when the day's activities terminate, and when testing resumes if more than 1 day is needed.
 - 3) Ensure the applicant's eligibility.
 - (a) Review the application for completeness and correctness.
 - (b) The examiner will have the applicant correct any errors.

All applicants must have met the prescribed experience requirements as stated in PCAR Part 2.

- (c) This may require the applicant to return to CAAP where authorization was obtained.
 - (d) Review the applicant's current written test results that are applicable to the rating(s) sought.
- B. Advise applicant of retesting after failure provisions and restrictions.

2.3.2 REASONABLE FEE MAY BE CHARGED

- A. The examiner may charge a reasonable fee to each applicant for—
- 1) Handling the forms and reports incident to the issuance of an aircraft maintenance technician license, and
 - 2) Use of the examiner's facilities, equipment, and materials, service in administering the oral and practical tests.
- B. The examiner and the applicant should reach a mutual understanding and agreement of the total fee for the examiner's services before beginning the tests.
- An agreement in writing may be to the advantage of both the examiner and the applicant.

SECTION 3 GUIDELINES FOR SKILL TESTING

- A. The Aircraft Maintenance Technician Skill Test Standards include the Testing Categories with Subject Areas of knowledge and skill for the original issuance of an aircraft maintenance technician license and/or the addition of a rating.
- The subject areas include the competency elements in which aircraft maintenance technician applicants must have knowledge and/or demonstrate skill.
- B. Detailed descriptions relating to the subject areas are not included in the Skill Test Standards, because this information can be found in references listed and/or in manufacturer or CAAP-approved or acceptable data related to each subject area.
- C. Each subject area has an objective. The objective lists the important knowledge and skill competency elements that must be utilized by the--
- 1) Examiner in planning and administering aircraft maintenance technician tests; and
 - 2) Applicant to be prepared to satisfactorily perform.

3.1 USE OF THE SKILL TEST STANDARDS

- A. The CAAP requires that all Skill Tests be conducted in accordance with the appropriate Skill Test Standards. When using these Skill Test Standards contained in this document, the examiner must evaluate the applicant's knowledge and skill in sufficient depth to determine that the objective for each subject area element selected is met.
- B. An applicant is not permitted to know before testing begins which competency elements in each subject area will to be included in his/her test (except the core competency elements, which all applicants are required to perform). Therefore, an applicant should be well prepared in *all* oral and skill areas included in the Skill Test standard.

Those skill elements identified as "Core Competency Elements" will required for all applicants.

3.2 COMPETENCY TERMS

The following terms may be reviewed with the applicant prior to, or during, element assignment--

- 1) "Inspect" means to examine by sight and/or touch (with or without inspection enhancing tools/equipment).
- 2) "Check" means to verify proper operation.

- 3) "Troubleshoot" means to analyze and identify malfunctions.
- 4) "Service" means to perform functions that assure continued operation.
- 5) "Repair" means to correct a defective condition.

3.3 PERFORMANCE LEVELS

The following is a detailed description of the meaning of each level—

3.3.1 LEVEL 1

- Know basic facts and principles.
- Be able to find information and follow directions and written instructions.
- Locate methods, procedures, instructions, and reference material.
- Interpretation of information not required.
- No skill demonstration is required.

3.3.2 LEVEL 2

- Know and understand principles, theories, and concepts.
- Be able to find and interpret maintenance data and information, and perform basic operations using the appropriate data, tools, and equipment.
- A high level of skill is not required.

3.3.3 LEVEL 3

- Know, understand, and apply facts, principles, theories, and concepts.
- Understand how they relate to the total operation and maintenance of aircraft.
- Be able to make independent and accurate airworthiness judgments.
- Perform all skill operations to a return-to-service standard using appropriate data, tools, and equipment. Inspections are performed in accordance with acceptable or approved data.
- A fairly high skill level is required.

3.4 SELECTING COMPETENCY ELEMENTS FOR TESTING

- A. The knowledge (oral) and skill (practical) competency elements listed in the STS will be used by the examiner to administer the skill test.
- Examiners will be working from a plan of action that has been approved by the CAAP to ensure that the testing uses standardized methodology.
- B. Applicants should be aware that all knowledge questions and skill element test projects used by the examiner to test the competency elements have been reviewed and approved by the CAAP prior to their use in the testing process.
- C. The examiner will use the the follow method to select competency elements for testing in each Subject Area of each Testing Category required for the rating sought—
- 1) One-third of the competency elements must be Level 1 competency or higher;
 - 2) Additionally one-third of the elements must be Level 2 or higher; and
 - 3) Finally one-third of the competency elements selected must be Level 3, even though the applicant may not
- The examiner will not test every element listed in each Task.
- An applicant must be able to demonstrate satisfactory knowledge and skill in the assigned elements in each Task to the required standard.
- If a competency element in a Subject Area is listed as a "Core Competency Element," that element must be included in the test.

have used some of the skills in past or present jobs.

3.5 PRESCRIBED LENGTH OF TIME

- A. There is no standard length of time prescribed for the knowledge and skill test.
- B. The testing period will be long enough to make a valid determination in each Subject Area for the rating sought.
- C. The examiner will take appropriate time to ensure that all required knowledge element questions and skill element practical projects have been completed for the rating sought.
- D. Although it may be necessary to continue a test for more than 1 day, tests must not be allowed to continue for long periods.
- Progressive testing is defined as testing which continues for more than four sessions in a 4-day period.

Both the applicant and the examiner should plan the testing times so the applicant completes most of the test once it commences.

Suspending the test to allow the applicant further study is not allowed.

3.5.1 TESTING CATEGORIES

- A. There are 5 testing categories included in these Skill Test Standards—
- 1) General
 - 2) Airframe Structures
 - 3) Aircraft Systems and Components
 - 4) Powerplant Theory and Maintenance
 - 5) Powerplant Systems and Components
- B. The examiner should begin the test with the intent to complete the testing for the rating sought.
- Applicants for an airframe rating must complete Testing Categories 1, 2 and 3.
 - Applicants for a powerplant rating must complete Testing Categories 1, 4 and 5.

The examiner should not begin a test with the intent of testing the General competency elements only.

3.5.2 CONDUCTING THE ORAL PORTIONS OF THE TEST

- A. Oral questioning may be used at any time during the practical test.
- At least four questions will be asked in each Subject Area.
 - These questions should be from more than one element listed under Objective 1 in the STS for that Subject Area.
 - The applicant must be able to answer successfully 70 percent of the oral questions asked in each Subject Area.
 - Each Subject Area must be passed in order to pass a Testing Category.
 - No more than 10 questions will be used by the examiner to evaluate a Subject Area.
- B. An applicant's answers to oral questions must show an understanding of the subject and ability to apply knowledge.

- The applicant's skill of oral expression or ability to memorize details will not be allowed to affect oral test evaluation.
 - The examiner may ask additional exploratory questions to verify the applicant's understanding of the subject area, but this will not be considered as part of the test.
- C. The knowledge questions will be—
- 1) Clear.
 - 2) Grammatically correct.
 - 3) Concise.
 - 4) Pertinent to the skill element when combining knowledge (oral) and skill elements.
 - 5) Have only one correct answer.
- D. The questions will not—
- 1) Be open-ended or multiple-choice questions.
 - 2) Require any further information or clarification.
 - 3) Be manufacturer-specific.
 - 4) Contain double negatives.
 - 5) Have two parts.
 - 6) Contain clues to the answer.
- E. Knowledge questions should be limited only to who, what, when, where, how, or why, not a combination.
- F. Answers to the knowledge questions must be found within CAAP-approved or accepted information sources, including—
- 1) Recommended references
 - 2) Advisory circulars (AC)
 - 3) PCARs.
- G. The examiner is looking evaluate the applicant's basic knowledge. To determine if the oral questions are answered correctly, the examiner must be able to reference information (e.g., manufacturer's data, ACs, PCARs). The examiner must be objective in making the determination.
- The applicant must be able to answer successfully all oral questions without the use of any reference materials.
 - While the answers to the oral questions should be available in the PCARs, manufacturer's maintenance data, or other aviation related data, the use of any reference materials will not be allowed.

● Applicants shall not be expected to memorize all mathematical formulas that may be required in the performance of various elements in this Skill Test standard.

● However, where relevant, applicants must be able to locate and apply necessary formulas to obtain correct solutions.

Content should establish the conditions or significant circumstances so the examiner and the applicant will have the same mental picture.

Long questions can be complex and ambiguous.

3.6 CONDUCTING THE PRACTICAL PORTIONS OF THE TEST

3.6.1 SUBJECT AREA

- A. All Subject areas required for the rating sought must be tested; however, the examiner is not required to test every element in each Subject area.

- B. In Subject Areas where a core competency element is identified, the examiner must test the applicant on the core competency element and at least one other skill element selected from the Subject Area.
- C. The applicant must pass each Subject Area to pass a Testing Category.
 - The examiner may combine two or more Subject Areas within a practical project as needed to facilitate testing.
 - However, the examiner must be able to make an objective determination of an applicant's performance in each Subject Area tested.

3.6.2 SKILL (PRACTICAL) ELEMENT PROJECTS

- A. The objective of this portion of the skill testing is to measure an applicant's basic skills in a Competency Elements/Task.
- B. The examiner has designed the projects directly relational to its assigned level and to the accuracy of this measurement.

Several Subject Areas may be evaluated during an assigned practical project.
- C. The following basic guidelines were used to develop the skill projects.
 - 1) The givens (e.g., specific tools, equipment, mock ups, technical data) that will be required for the project will be provided;
 - 2) The level should be clearly identified, clear and concise with the level; and
 - 3) The standard(s) by which the project will be graded will be presented. The examiner has a develop a performance standard for each project which include:
 - (a) What the applicant must do. As an example: (for mechanic applicants) install an assigned control surface; (for parachute rigger applicants) inspect a pilot chute.
 - (b) How it must be done. As an example: use of proper information (e.g., manufacturer's data, Type Certificate Data Sheet (TCDS)) proper tooling, and observance of all applicable safety precautions.

3.6.3 EVALUATION OF THE PRACTICAL PROJECTS

- A. The examiner must determine if the applicant's project is acceptable.
 - The examiner must personally observe all practical projects performed by the applicant.
 - Be objective in making this determination. The applicant must be able to demonstrate satisfactory proficiency and competency using basic aircraft mechanic skills.
- B. The applicant must demonstrate an approval for return to service standard, where applicable, and demonstrate the ability to locate and apply the required reference materials, where applicable.
- C. For instances where an approval for return to service standard cannot be achieved, the applicant must be able to explain why the return to service standard cannot be met (e.g., when tolerances are outside of a product's limitations).

3.6.4 TOOLS, EQUIPMENT & REFERENCE MATERIALS

- A. The examiner will provide all tools, equipment, and reference materials for the Subject Area elements selected. These materials must include, but are not limited to—
 - PCARs
 - TCDS
 - Airworthiness Directives
 - Advisory circulars

- Manufacturer's technical and parts manuals, service information, and any other instructions and/or reference materials that are necessary for the objective accomplishment of the assigned Subject Area element(s).
- B. All reference material must be unmarked and in good condition.
- The applicant's use of other reference material, not provided by the examiner, is prohibited.
- C. Applicants may use personal tools and equipment at the discretion of the examiner.
- Use of non-programmable calculators is permitted where appropriate.
- D. Publications other than those listed may be used as references if their content conveys substantially the same information as the referenced publications.
- Document references listed in this document are NOT meant to supersede or otherwise replace manufacturer or other CAAP-approved or acceptable data.
 - They serve as general information and study material sources..
- E. Information contained in manufacturer and/or CAAP approved/acceptable data always takes precedence over advisory or textbook referenced data.

3.7 EVALUATION OF PERFORMANCE

- A. The examiner who conducts the Skill Test is responsible for determining that the applicant meets acceptable standards of knowledge and skill in the STS subject areas for the rating sought.
- Since there is no formal division between the knowledge and skill portions of the Skill Test, this becomes an ongoing process throughout the test.
- B. An applicant is not expected to be competent in all phases of overhaul, maintenance, alteration, and repair, or be highly skillful in performing complex manipulative operations.
- But applicants are expected to have developed basic skills and be able to demonstrate them during the practical test.
- C. The examiners will inform the applicant of the level of performance expected before beginning each project.
- Applicants can find the required performance levels in the STS.

3.7.1 SATISFACTORY PERFORMANCE

- A. The Skill Test is passed if the applicant demonstrates the prescribed proficiency in the assigned elements (core competency and other selected elements) in each subject area to the required standard.
- B. The following standards will be used by the examiner for evaluating applicant performance—
- 1) Approach to the project; proper information and tools; preparation of the equipment; and observation of safety precautions;
 - 2) Cleaning, preparing, and protecting parts; skill in handling tools; thoroughness and cleanliness;
 - 3) The functions of the units or systems of the assigned project; use of current maintenance and/or overhaul procedures;
 - 4) Final inspection for safety and operation;
 - 5) Completion of required forms and records;
 - 6) Application of appropriate rules; and
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- 7) Attitude toward safety, manufacturer's recommendations, and acceptable industry practices.

3.7.2 UNSATISFACTORY PERFORMANCE

- A. If the applicant does not meet the standards of any of the elements performed (knowledge, core competency, or other skill elements), the associated subject area is failed, and thus the Skill Test is failed.
- B. Typical areas of unsatisfactory performance and grounds for disqualification include the following—
- 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 acceptable or approved maintenance procedures while performing skill (practical) projects.
 - 3) Exceeding tolerances stated in the maintenance instructions.
 - 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.

3.7.3 FAILURE TO PERFORM AT AN ACCEPTABLE LEVEL

3.7.3.1 Testing Category

- A. When it becomes obvious during the test that an applicant cannot perform at an acceptable level and has already failed several Subject Areas in a Testing Category, the examiner may discontinue testing in that category and go on to the next category.
- B. In some cases, however, it may be advantageous to continue to the end of the category so the applicant will know his/her strengths and weaknesses when preparing for retest.

3.7.3.2 Subject Area

- A. When it becomes obvious during the test that an applicant cannot perform at an acceptable level and has failed a Subject Area, the examiner may discontinue testing in that Subject Area and go on to the next Subject Area.
- B. The examiner or the applicant may discontinue the testing any time after the failure of a Subject Area.

The applicant is entitled to credit for only those Subject Areas satisfactorily completed.

3.7.3.3 Disapproval or Discontinuance

- A. If, in the judgment of the examiner, the applicant does not meet the standards of performance of any task performed, the associated area of operation is failed and; therefore, the skill test performance will be unsatisfactory.
- The examiner or applicant may discontinue the test at any time when the failure of an area of operation makes the applicant ineligible for the license sought.
 - If the test is discontinued, the applicant is entitled to credit for only those areas of operation and their associated tasks satisfactorily performed.
- B. When a Notice of Disapproval is issued, the examiner shall record the—

The test may be continued only with the consent of the applicant.

During the re-test and at the discretion of the examiner, any TASK may be re-evaluated, including those previously passed.

- 1) Applicant's unsatisfactory performance in terms of the area of operation and specific task(s) not meeting the standard appropriate to skill test conducted;
- 2) The area(s) of operation/task(s) not tested; and
- 3) Number of skill test failures shall also be recorded.

3.7.3.4 Letter of Discontinuance

- A. When a skill test is discontinued for reasons other than unsatisfactory performance (i.e., equipment failure or illness), the examiner at that time shall prepare, sign and issue a Letter of Discontinuance to the applicant.
- The Letter of Discontinuance should identify the Elements and the Core Competency tasks of the skill test that were successfully completed.
- B. The following documents will be returned to the applicant—
- 1) The license application form; and
 - 2) The Aircraft Maintenance Technician knowledge test results
- C. The applicant shall be advised that the Letter of Discontinuance shall be presented to the examiner when the skill test is resumed, and made part of the certification file.

3.7.4 INCOMPLETE TEST

- A. Should the test not be completed in the allotted time frame, the examiner will forward this incomplete test file to the CAAP office within 7 calendar-days.
- B. When practical, schedule a retest for the areas not completed at the time the test is discontinued.
- Treat this retest as if the applicant had failed those portions not tested.

3.7.5 RE-TEST IN ALL REQUIRED AREAS

- A. Applicants for a re-test in all areas of the oral and/or practical tests in the Testing Category(s) or Area(s) of Operation listed as failed, that was/were not taken, or that has/have expired.
- 1) Applicants who apply for retesting within 60 calendar-days to the same examiner who gave the failed test may, at the option of the examiner, be tested in only the Subject Areas failed on the previous test (provided applicant has successfully passed all other Subject Areas within that Testing Category).
 - 2) Practical projects will be re-tested at the same level as failed.
- New questions and practical projects may be included in the retest.

SECTION 4 GENERAL SUBJECTS

4.1 SUBJECT AREA: BASIC ELECTRICITY

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Sources and/or effects of capacitance in a circuit.
 - (b) Uses of capacitance in a circuit.
 - (c) Sources and/or effects of inductance in a circuit.
 - (d) Uses of inductance in a circuit.

The applicant must satisfactorily complete the Subject Areas in this Testing Category for the Airframe or Powerplant ratings.

- (e) Operation of basic AC and/or DC electrical circuits.
 - (f) Ohm's law.
 - (g) Kirchoff's law(s).
 - (h) Procedures used in the measurement of voltage, current, and/or resistance.
 - (i) Determining power used in simple circuits.
 - (j) Troubleshooting, and/or repair or alteration using electrical circuit diagrams.
 - (k) Common types of defects that may occur in an installed battery system.
 - (l) Aircraft battery theory/operation.
 - (m) Servicing aircraft batteries.
- 2) Demonstrates the ability to perform both of the following—
- Core Competency Element
- (a) Use measuring equipment to measure in a circuit or circuit components), at least one of the following: voltage, current, resistance, or continuity. (Level 3)
 - (b) Determine the appropriateness of measurements) according to instructions/ specifications. (Level 2)
- 3) Demonstrates the ability to perform at least one of the following—
- (a) Read and interpret one or more electrical circuit diagrams. (Level 2)
 - (b) Troubleshoot an electrical circuit. (Level 3)
 - (c) Calculate voltage, current, and resistance using Ohm's Law. (Level 2)
 - (d) Inspect a battery and installed battery system. (Level 3)
 - (e) Accomplish a battery state-of-charge (hydrometer) and/or electrical leak (cell imbalance) test. (Level 3)
 - (f) Accomplish removal and/or installation of a battery in an aircraft. (Level 3)
 - (g) Set-up and connect a charger to one or more batteries for constant current and/or constant voltage charging. (Level 3)

4.2 SUBJECT AREA: AIRCRAFT DRAWINGS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Characteristics and/or uses of any of the various types of drawings/blueprints and/or system schematics.
 - (b) The meaning of any of the lines and symbols commonly used in aircraft sketches/ drawings/blueprints.
 - (c) Using charts or graphs.
 - (d) Troubleshooting an aircraft system or component(s) using drawings/blueprints and/ or system schematics.
 - (e) Inspection of an aircraft system or component(s) using drawings/blueprints and/ or system schematics.
 - (f) Repair or alteration of an aircraft system or component(s) using drawings/blueprints and/or schematics.
 - (g) Use of drawings/blueprints in component fabrication.

- (h) Terms used in conjunction with aircraft drawings/blueprints and/or system schematics.
- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Maintenance and/or inspection using drawings/blueprints and/or system schematics. (Level 3)
 - (b) Preventive maintenance using drawings/blueprints and/or schematics. (Level 3)
 - (c) Troubleshooting using drawings/blueprints and/or schematics. (Level 3)
 - (d) Use a control cable tension chart. (Level 3)
 - (e) Use a servicing, limitation, or calculation chart or graph. (Level 3)
 - (f) Draw a sketch of an alteration or repair. (Level 2)
 - (g) Draw a diagram of an electrical circuit or other system, or portion thereof, and explain the drawing. (Level 2)

4.3 SUBJECT AREA: WEIGHT & BALANCE

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) The purpose(s) of weighing or reweighing.
 - (b) General preparations for weighing, with emphasis on aircraft preparation and/or weighing area considerations.
 - (c) The general location of airplane center of gravity (CG) in relation to the center of lift for most fixed main airfoils.
 - (d) Definitions of any of the following: datum, arm, moment (positive or negative), or moment index.
 - (e) The meaning and/or application of any terms/nomenclature associated with weight and balance other than those mentioned in element “d” above, including but not limited to any of the following: tare, ballast, and residual fuel/oil.
 - (f) Procedures for finding any of the following: datum, arm, moment (positive or negative), or moment index.
 - (g) Purpose and/or application of mean aerodynamic chord (MAC).
 - (h) Adverse loading considerations.
 - 2) Demonstrates the ability to calculate weight and balance CG and complete aircraft weight and balance documentation. (Level 3) ● Core Competency Element
 - 3) Demonstrates the ability to perform at least one of the following—
 - (a) Weighing equipment preparation and setup according to manufacturer’s instructions. (Level 3)
 - (b) Locate procedures for leveling and the leveling points for an aircraft. (Level 2)
 - (c) Locate weigh points, procedures for determining CG, and determine the weigh point arms for an aircraft. (Level 2)
 - (d) Identify tare items for a specific aircraft and weighing procedure. (Level 2)
 - (e) Find the datum for at least two different aircraft. (Level 2)
 - (f) Determine the weight and location of required ballast after an (actual or hypothetical) equipment change. (Level 2)
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4.4 SUBJECT AREA: FLUID LINES & FITTINGS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Tubing materials.
 - (b) Tubing materials application.
 - (c) Tubing sizes.
 - (d) Flexible hose material.
 - (e) Flexible hose materials application.
 - (f) Flexible hose sizes.
 - (g) Flexible hose identification.
 - (h) AN, MS, and/or AC plumbing fittings.
 - (i) Rigid line fabrication techniques/practices.
 - (j) Rigid line installation techniques/practices.
 - (k) Flexible hose fabrication techniques/practices.
 - (l) Flexible hose installation techniques/practices.
- 2) Demonstrates the ability to perform at least one of the following—

● Core Competency Element

 - (a) Rigid line fabrication to include tube fittings, bending, and tube flaring. (Level 3)
 - (b) Flexible line fabrication using replaceable fittings on at least one end. (Level 3)
- 3) Demonstrates the ability to perform at least one of the following—
 - (a) Inspect for and identify defects in rigid and/or flexible lines. (Level 3)
 - (b) Install and remove a rigid and/or flexible line. (Level 3)
 - (c) Identify correct and/or incorrect rigid line installations. (Level 2)
 - (d) Identify correct and/or incorrect flexible line installations. (Level 2)
 - (e) Form a bead on tubing. (Level 3)
 - (f) Select components and assemble a flareless fitting tube connection. (Level 3)
 - (g) Repair a damaged rigid line. (Level 3)
 - (h) Identify various sizes and types of aircraft fittings. (Level 2)
 - (i) Secure a rigid line with clamps. (Level 3)
 - (j) Identify fluid and/or air lines that may be installed on an aircraft. (Level 2)

4.5 SUBJECT AREA: MATERIALS & PROCESSES

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Any of the metals commonly used in aircraft and their general application.
 - (b) Composites and other nonmetallic components and their general application.
 - (c) Heat-treated parts precautions, using DD or "icebox" rivets.
 - (d) Typical wood materials and fabric coverings.
 - (e) Visible characteristics of acceptable and/or unacceptable welds.

- (f) Precision measurement and precision measurement tools.
 - (g) Using inspection techniques/methods, including any of the following: visual, metallic ring test, dye/fluorescent penetrant, magnetic particle, and/or eddy current.
 - (h) Identification, selection, installation, and/or use of aircraft hardware.
 - (i) Safetying of components and/or hardware.
 - (j) Finding information about material types for specific application(s).
- 2) Demonstrates the ability to torque to specification(s), and safety-wire aircraft component(s)/hardware. (Level 3) ● Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—
- (a) Select and install standard aircraft hardware, to include one or more self-locking nuts. (Level 3)
 - (b) Select, install, and secure a clevis bolt and associated hardware. (Level 3)
 - (c) Select and install one or more appropriate screws/bolts, nuts, cotter pins, and washers. (Level 3)
 - (d) Inspect hardware for defects, proper installation. (Level 3)
 - (e) Safety a turnbuckle. (Level 3)
 - (f) Perform a dye or fluorescent penetrant inspection. (Level 3)
 - (g) Find a (not visible) defect using eddy current or ultrasonic inspection equipment. (Level 2)
 - (h) Perform, read, and record a precision measurement using a dial indicator, or micrometer, or vernier caliper. (Level 2)
 - (i) Visually inspect welds and determine acceptability. (Level 3)
 - (j) Identify rivets by physical characteristics. (Level 2)

4.6 SUBJECT AREA: GROUND OPERATION & SERVICING

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) General procedures for towing aircraft.
 - (b) Air Traffic Control (ATC) considerations/requirements for towing aircraft on or across active runways.
 - (c) General procedures for starting, ground operating, and/or taxiing a piston engine powered aircraft.
 - (d) General procedures for starting, ground operating, and/or taxiing a turbine engine powered aircraft.
 - (e) The hazards associated with starting, ground operating, and/or taxiing aircraft and procedures for preventing, minimizing or otherwise managing any of them.
 - (f) Procedures for refueling and/or defueling aircraft.
 - (g) Oxygen system safety practices/precautions.
 - (h) Characteristics of aviation gasoline and/or turbine fuels, including basic types and means of identification.
 - (i) Fuel contamination hazards.
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- (j) Fuel additives commonly used in the field.
 - (k) Use of automobile fuel in aircraft engines.
 - (l) Types/classes of fires, using proper fire extinguishers/methods.
- 2) Demonstrates the ability to perform at least one of the following—
- (a) Service an aircraft with compressed air or nitrogen. (Level 3)
 - (b) Set-up an aircraft and cockpit controls for engine start. (Level 2)
 - (c) Start and ground operate an aircraft engine* (taxiing optional), and use or respond to standard hand or light wand signals. (Level 3)
- This should be accomplished with an operable engine.
- (d) Determine the engine oil for a specific engine. (Level 2)
 - (e) Secure an aircraft for outside storage. (Level 3)
 - (f) Fuel and/or defuel an aircraft (may be simulated). (Level 3)
 - (g) Sample fuel and inspect for proper fuel and contaminants. (Level 3)
 - (h) Set-up and connect an aircraft to an external power source. (Level 2)
 - (i) Connect a tow bar to an aircraft and prepare for towing. (Level 3)
 - (j) Direct the movement (may be simulated) of aircraft. (Level 3)
 - (k) Locate and clear a liquid lock (actual or simulated) in an aircraft engine. (Level 3)
 - (l) Identify the types/classes of fires that local shop and/or flight line fire extinguishers may be used on. (Level 2)

4.7 SUBJECT AREA: CLEANING & CORROSION CONTROL

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Aircraft preparation for washing, general aircraft cleaning (washing) procedures.
 - (b) Post cleaning (washing) procedures.
 - (c) Corrosion theory.
 - (d) Types/effects of corrosion.
 - (e) Conditions that cause corrosion.
 - (f) Corrosion prone areas in aircraft.
 - (g) Corrosion preventive maintenance procedures.
 - (h) Inspection for and identification of corrosion in any of its various forms.
 - (i) Corrosion removal and treatment procedures.
 - (j) Use of Material Safety Data Sheets (MSDS).
 - 2) Demonstrates the ability to inspect for and identify two or more of the various forms of corrosion that affect aircraft. (Level 3)
- Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—
 - (a) Identify and select materials used to clean interior and/or exterior surfaces according to aircraft manufacturer's instructions. (Level 2)

- (b) Corrosion removal from any of the metals commonly used in aircraft. (Level 3)
- (c) Preventive corrosion treatment on any of the metals commonly used in aircraft. (Level 3)
- (d) Identify and select appropriate corrosion preventive methods and materials for a specific aircraft application. (Level 2)

4.8 SUBJECT AREA: MATHEMATICS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Areas of various geometrical shapes.
 - (b) Volumes of various geometrical shapes.
 - (c) Definitions/descriptions of geometrical terms, including but not limited to any of the following: polygon, pi, diameter, radius, and hypotenuse.
 - (d) Ratio problems, including one or more examples of where or how they may be used in relation to aircraft maintenance or system(s) operation.
 - (e) Proportion problems, including one or more examples of where or how they may be used in relation to aircraft maintenance or system(s) operation.
 - (f) Percentage problems, including one or more examples of where or how they may be used in relation to aircraft maintenance or system(s) operation.
 - (g) Algebraic operations, including one or more examples of where or how they may be used in relation to aircraft maintenance.
 - (h) Conditions or areas where metric conversion may be necessary.
- 2) Demonstrates the ability to perform at least one of the following, using appropriate formulas—
 - (a) Calculate the area of a polygon and/or circle. (Level 2)
 - (b) Calculate the volume of a sphere, cube, or cylinder. (Level 2)
 - (c) Algebraic operations involving addition, subtraction, multiplication, and/or division of positive and negative numbers. (Level 2)
 - (d) Locate mathematical formulas used to assist in the maintenance, preventive maintenance, or alteration of aircraft. (Level 1)

The practical portion of the Mathematics subject area may be tested simultaneously when performing calculation(s) in subject areas Basic Electricity and/or Weight and Balance.

4.9 SUBJECT AREA: MAINTENANCE FORMS & RECORDS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Writing descriptions of work performed and approval for return to service after minor repairs or minor alterations.
 - (b) The content, form and disposition of aircraft maintenance records reflecting approval for return to service after a 100-hour inspection.
 - (c) The content, form and disposition of aircraft maintenance records reflecting disapproval for return to service after a 100-hour inspection.
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- (d) The recording content, form and disposition requirements for licensed aircraft maintenance technicians (without an Inspection Authorization) who perform major repairs and/or major alterations.
 - (e) The inoperative instruments or equipment provisions of PCAR Part 8.
 - (f) The definition/explanation of any of the terms used in relation to aircraft maintenance, such as overhaul(ed), rebuilt, time in service, maintenance, preventive maintenance, inspection, major alteration, major repair, minor alteration, and minor repair.
- 2) Demonstrates the ability to write appropriate entries on CAAP Form 523, Major Repair and Major Alteration, indicating performance of a major repair, and make appropriate corresponding aircraft maintenance record entry. (Level 3)
- 3) Demonstrates the ability to write entries for at least one of the following—
- (a) Performance of minor repair or minor alteration. (Level 3)
 - (b) Performance of preventive maintenance. (Level 3)
 - (c) Compliance with an airworthiness directive. (Level 3)
 - (d) Performance of a 100-hour inspection with approval for return to service, including a list of some allowable inoperative instruments or equipment in accordance with the provision of PCAR Part 8. (Level 3)
 - (e) Performance of a 100-hour inspection with disapproval for return to service because of needed maintenance, or noncompliance with applicable specifications or airworthiness directive(s). (Level 3)
 - (f) CAAP Form 523, Major Repair and Major Alteration, for additional equipment installation or an alteration in accordance with a supplemental type certificate (STC) and make appropriate maintenance record entry. (Level 3)
 - (g) CAAP Form 524, Malfunction or Defect Report. (Level 3)

● Core Competency Element

4.10 SUBJECT AREA: BASIC PHYSICS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Any of the simple machines, how they function, and/or how mechanical advantage is applied in one or more specific examples.
 - (b) Sound resonance, how it can be a hazard to aircraft, and how sound may be used to aid in inspecting aircraft.
 - (c) The relationship between fluid density and specific gravity.
 - (d) The characteristic of specific gravity of fluids and how it may be applied to aircraft maintenance.
 - (e) The general effects of pressure and temperature on gases and liquids and how the qualities of compressibility and/or incompressibility of gases and liquids are generally applied to aircraft systems.
 - (f) Density altitude and the effects of temperature, and/or pressure, and/or humidity on aircraft and/or engine performance.
 - (g) Heat, how it is manifested in matter, and how heat transfer is accomplished through conduction, and/or convection, and/or radiation.
 - (h) Coefficient of linear (thermal) expansion as related to aircraft materials.

- (i) Aircraft structures and theory of flight/physics of lift.
 - (j) The operation of aerodynamic factors in the flight of airplanes and/or helicopters.
 - (k) The relationship between force, area, and pressure.
 - (l) The five forces or stresses affecting aircraft structures.
 - (m) The two forms of energy and how they apply to aircraft and/or aircraft systems.
- 2) Demonstrates the ability to perform at least one of the following—
- (a) Identify any parts or systems of an aircraft and/or engine where Bernoulli's principle and/or Newtonian law is applied. (Level 2)
 - (b) Identify parts or systems of an aircraft where Boyle's, Charles', and/or Pascal's Laws apply. (Level 2)
 - (c) Calculate force, area, or pressure in a specific application. (Level 3)
 - (d) Identify one or more methods of heat transfer in aircraft systems and where and how heat damage may occur when performing aircraft maintenance. (Level 2)
 - (e) Identify any of the following and describe how they function aerodynamically: stall strips, wing fences, vortex generators, flaps, slats, spoilers, ailerons, stabilators, elevators, rudders, or trim tabs. (Level 2)
 - (f) Determine which of the five forces/stresses are acting on an aircraft or aircraft parts at specific points under given conditions. (Level 2)
 - (g) Design a simple machine (on paper) that uses one or more methods of mechanical advantage. (Level 2)

4.11 SUBJECT AREA: MAINTENANCE PUBLICATIONS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) How a mechanic makes use of Type Certificate Data Sheets (TCDSs) and/or Aircraft Specifications in conducting maintenance or inspections.
 - (b) Aircraft maintenance manuals and associated publications including any of the following types of publications and how they are used: service bulletin, maintenance manual, overhaul manual, structural repair manual, or instructions for continued airworthiness.
 - (c) The requirements of PCAR Part 5 in the performance of maintenance.
 - (d) Airworthiness Directives (AD), including purpose and/or AD categories and/or ADs issued to other than aircraft.
 - (e) In what form individuals may receive CAAP published AD summaries and/or how they may be obtained.
 - (f) The AD identification numbering system.
 - (g) CAAP Advisory Circulars (ACs) including any of the following: significance of the AC numbering system, one or more examples of ACs issued to provide information in designated subject areas, one or more examples of ACs issued to show a method acceptable to the CAAP complying with the PCARs.
 - (h) The intent or function of the Aviation Maintenance Alerts.
 - (i) The Air Transport Association (ATA) Specification 100.
- 2) Demonstrates the ability to perform both of the following—

● Core Competency Element

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- (a) Read, comprehend, and apply information contained in a manufacturer's maintenance manual or illustrated parts manual. (Level 3)
 - (b) Locate and list all applicable ADs for at least one particular make, model, and serial number of an aircraft, engine, propeller, or appliance. (Level 2)
 - 3) Demonstrates the ability to read, comprehend, and apply the information contained in at least one of the following—
 - (a) Service bulletin. (Level 3)
 - (b) Overhaul manual. (Level 3)
 - (c) Structural repair manual. (Level 3)
 - (d) Instructions for continued airworthiness. (Level 3)
 - (e) At least one maintenance related section, or appendix, or portion(s) thereof, of the PCARs. (Level 3)
 - (f) An AD. (Level 3)
 - (g) Aircraft Specifications or TCDS to specific maintenance or inspection operations, or portions thereof. (Level 3)

4.12 AIRCRAFT MAINTENANCE TECHNICIAN PRIVILEGES & LIMITATIONS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of mechanic privileges and limitations and exercise thereof, including at least two of the following—
 - (a) Required evidence of eligibility experience satisfactory to the Administrator.
 - (b) Length of experience required for eligibility.
 - (c) Practical experience required for eligibility.
 - (d) The privileges of a mechanic in relation to 100-hour and annual inspections.
 - (e) Change of address reporting requirements.
 - (f) Minimum age requirements.
 - (g) Recent experience requirements to exercise privileges of a certificate.
 - (h) Who is authorized to perform maintenance/inspection, preventive maintenance, rebuilding, or alteration and/or approve for return to service afterwards.
 - (i) Causes for revocation or suspension.
 - (j) Criteria for determining major and minor repair or alteration.
 - 2) When given a copy of PCAR Part 2, demonstrates the ability to understand mechanic privileges and limitations by finding and interpreting/explaining essential information contained in at least two of the following—
 - (a) Offenses involving alcohol or drugs. (Level 2)
 - (b) Written tests: Cheating or other unauthorized conduct. (Level 2)
 - (c) Applications, certificates, logbooks, reports, and records: Falsification, reproduction, or alteration. (Level 2)
 - (d) Refusal to submit to a drug or alcohol test. (Level 2)
 - (e) General privileges and limitations. (Level 2)
 - (f) Recent experience requirements. (Level 2)
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- (g) Airframe rating; additional privileges and/or Powerplant rating; additional privileges. (Level 2)
- (h) Display of certificate (Level 2)

SECTION 5 AIRFRAME STRUCTURES

The applicant must satisfactorily complete the Subject Areas in this Testing Category for the Airframe rating.

5.1 SUBJECT AREA: WOOD STRUCTURES

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Inspection tools for wood structures.
 - (b) Inspection techniques and practices for wood structures.
 - (c) Effects of moisture/humidity on wood.
 - (d) Types and/or general characteristics of wood used in aircraft structures.
 - (e) Permissible substitutes and/or other materials used in the construction and repair of wood structures.
 - (f) Acceptable wood defects.
 - (g) Non-acceptable wood defects.
 - (h) Wood repair techniques and practices.
- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Inspect aircraft wood structure or wood sample. (Level 3)
 - (b) Inspect a wood repair for airworthiness. (Level 3)
 - (c) Identify and select aircraft quality/acceptable wood. (Level 2)
 - (d) Determine acceptable repairs or limits for one or more specific defects. (Level 2)
 - (e) Locate data for allowable substitute wood material. (Level 1)
 - (f) Determine the allowable species of wood that can be used as a substitute for spruce, and what, if any, dimensional changes are necessary. (Level 2)
 - (g) Locate wood spar and/or rib structure repair procedures. (Level 1)

5.2 SUBJECT AREA: AIRCRAFT COVERING

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Factors used in determining the proper type covering material.
 - (b) Types of approved aircraft covering material.
 - (c) Seams commonly used.
 - (d) Covering textile terms.
 - (e) Structure surface preparation.
 - (f) Covering methods commonly used.
 - (g) Covering means of attachment.
 - (h) Areas on aircraft covering most susceptible to deterioration.
 - (i) Aircraft covering preservation/restoration.
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- (j) Inspection of aircraft covering.
 - (k) Covering repair techniques and practices.
- 2) Demonstrates the ability to perform at least one of the following—
- (a) Inspect the repair of a damaged covering for airworthiness. (Level 3)
 - (b) Test a finished covering sample to determine acceptability of strength. (Level 3)
 - (c) Determine the minimum fabric strength covering requirements for a specific aircraft. (Level 2)
 - (d) Determine if a covering sample has appropriate identification markings. (Level 2)
 - (e) Determine acceptable repairs for a specific defect. (Level 2)
 - (f) Determine the classification (major or minor) of a specific repair to a fabric-covered surface. (Level 2)
 - (g) Locate the requirements for repair of a specific fabric covering defect. (Level 1)

5.3 SUBJECT AREA: AIRCRAFT FINISHES

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
- (a) Protection of airframe structures.
 - (b) Primer materials.
 - (c) Topcoat materials.
 - (d) Surface preparation for a desired finishing material.
 - (e) Effects of ambient conditions on finishing materials.
 - (f) Effects of improper surface preparation on finishing materials.
 - (g) Regulatory requirements for registration markings.
 - (h) Inspection of aircraft finishes.
 - (i) Safety practices/precautions when using finishing materials.
 - (j) Fungicidal, butyrate, and/or nitrate dopes.
 - (k) Finishing materials application techniques and practices.
 - (l) Where necessary, balance considerations after refinishing.
- 2) Demonstrates the ability to perform at least one of the following—
- (a) Select appropriate finishing materials for a specific application. (Level 2)
 - (b) Determine preparation necessary for application of finishing materials to a particular surface. (Level 2)
 - (c) Prepare a surface for application of finishing materials. (Level 3)
 - (d) Apply primer and/or topcoat materials. (Level 3)
 - (e) Inspect one or more finished surfaces. (Level 3)
 - (f) Locate appropriate data to use for a specific finishing task. (Level 1)
 - (g) Determine the allowable location and size of registration numbers for a fixed-wing and/or rotorcraft aircraft. (Level 2)

5.4 SUBJECT AREA: SHEET METAL & NON-METALLIC STRUCTURES

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Inspection/testing of sheet metal structures.
 - (b) Types of sheet metal defects.
 - (c) Selection of sheet metal.
 - (d) Layout, and/or forming of sheet metal.
 - (e) Selection of rivets.
 - (f) Rivet layout.
 - (g) Rivet installation.
 - (h) Inspection/testing of composite structures.
 - (i) Types of composite structure defects.
 - (j) Composite structure fiber, core, and/or matrix materials.
 - (k) Composite materials storage practices and shelf life.
 - (l) Composite structure repair methods, techniques, and practices.
 - (m) Window inspection/types of defects.
 - (n) Window material storage and handling.
 - (o) Window installation procedures.
 - (p) Care and maintenance of windows.
 - (q) Window temporary and/or permanent repairs.
 - (r) Maintenance safety practices/precautions for sheet metal, and/or composite materials/structures, and/or windows.
 - 2) Demonstrates the ability to install and remove at least two each, of two or more types of rivets. (Level 3) ● Core Competency Element
 - 3) Demonstrates the ability to perform at least one of the following—
 - (a) Lay out and form sheet metal to given dimensions; include at least one bend. (Level 3)
 - (b) Determine a rivet lay out pattern. (Level 2)
 - (c) Visually inspect an unpainted composite surface. (Level 3)
 - (d) Inspect a composite structure using a non-destructive testing method (in addition to visual). (Level 3)
 - (e) Select materials and clean a transparent surface. (Level 3)
 - (f) Inspect a window or windscreen. (Level 3)
 - (g) Remove one or more minor scratches from a transparent surface. (Level 3)
 - (h) Determine hole size to use in a sheet metal repair. (Level 2)
 - (i) Inspect a sheet metal assembly or repair for airworthiness. (Level 3)
 - (j) Drill and countersink and/or dimple sheet metal. (Level 3)
 - (k) Identify the fiber-reinforcing materials in at least three laminated composite structure samples. (Level 2)
 - (l) Locate data for composite structure damage assessment. (Level 1)
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5.5 SUBJECT AREA: WELDING

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Flame welding gasses.
 - (b) Storage/handling of welding gasses.
 - (c) Flame welding practices and techniques.
 - (d) Inert-gas welding practices and techniques.
 - (e) Purpose and types of shielding gasses.
 - (f) Characteristics of acceptable welds.
 - (g) Characteristics of unacceptable welds.
 - (h) Types of steel tubing welding repairs.
 - (i) Procedures for weld repairs.
 - (j) Soldering preparation, types of solder, and/or flux usage.
 - (k) Welding and/or soldering safety practices/precautions.
- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Ignite a torch, set one or more specified flame patterns, and accomplish proper torch shutdown. (Level 2)
 - (b) Solder a joint or connection. (Level 2)
 - (c) Using aircraft quality materials, weld or braze a joint. (Level 2)
 - (d) Determine the appropriate method/material(s) to use for a specific welding, soldering, or brazing task. (Level 2)
 - (e) Determine the appropriate data to use for a specific welding, soldering, or brazing task. (Level 1)

5.6 SUBJECT AREA: ASSEMBLY & RIGGING

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Control cable.
 - (b) Control cable maintenance.
 - (c) Cable connectors.
 - (d) Cable guides.
 - (e) Control stops.
 - (f) Push pull tubes.
 - (g) Torque tubes.
 - (h) Bell cranks.
 - (i) Flutter and flight control balance.
 - (j) Rigging of airplane or rotorcraft flight controls.
 - (k) Airplane or rotorcraft flight controls and/or stabilizer systems.
 - (l) Types of rotorcraft rotor systems.
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- (m) Rotor vibrations.
 - (n) Rotor blade tracking.
 - (o) Aircraft jacking procedures.
 - (p) Jacking safety practices/precautions.
- 2) Demonstrates the ability to check and/or set control surface cable tension. (Level 3) ● Core Competency Element
 - 3) Demonstrates the ability to perform at least one of the following—
 - (a) Install a control surface. (Level 3)
 - (b) Check the static balance of a control surface. (Level 3)
 - (c) Locate the procedures for rigging a helicopter. (Level 1)
 - (d) Locate helicopter rotor blade tracking procedures. (Level 1)
 - (e) Identify fixed-wing aircraft rigging adjustment locations. (Level 2)
 - (f) Locate leveling methods and procedures for a specific aircraft. (Level 1)
 - (g) Inspect a flight control system for travel and security. (Level 3)
 - (h) Inspect a primary flight control cable. (Level 3)
 - (i) Install one or more swaged cable terminals and check with appropriate gage. (Level 3)
 - (j) Install one or more Nicopress sleeves and check with appropriate gage. (Level 3)
 - (k) Check and adjust as necessary a push-pull flight control system. (Level 3)
 - (l) Locate jacking points and leveling locations for a specific aircraft. (Level 2)
 - (m) Determine the jacking requirements for a particular aircraft. (Level 2)
 - (n) Jack an aircraft or portion thereof (e.g., as appropriate for tire/wheel change, or gear retraction). (Level 3)

5.7 SUBJECT AREA: AIRFRAME INSPECTION

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) One or more required inspections under PCAR Part 5 and 8.
 - (b) Maintenance requirements under PCAR Part 5.
 - (c) Inspection requirements under PCAR Part 5.
 - (d) Requirements for complying with airworthiness directives.
 - (e) Compliance with service letters, instructions for continued airworthiness, and/or bulletins.
 - (f) Maintenance record requirements under PCAR Part 5.
 - (g) Maintenance record requirements under PCAR Part 8.
- 2) Demonstrates the ability to examine an aircraft maintenance record, and determine if inspection and/or maintenance is due. (Level 3) ● Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—

- (a) Accomplish a PCAR Part 8 required inspection on an airframe portion or component thereof. (Level 3)
- (b) Inspect an aircraft or portion thereof after maintenance or preventive maintenance. (Level 3)
- (c) Determine placarding requirements for a specific aircraft and condition. (Level 2)
- (d) Determine if all required instruments and equipment for specific operating conditions under PCAR Part 8 are installed in a particular aircraft. (Level 2)
- (e) Accomplish a conformity inspection on an airframe portion or component thereof and record results. (Level 3)
- (f) Generate a checklist for conducting a 100-hour airframe inspection on a specific aircraft. (Level 2)

SECTION 6 AIRFRAME SYSTEMS & COMPONENTS PHASE

6.1 SUBJECT AREA: AIRCRAFT LANDING GEAR SYSTEMS

The applicant must satisfactorily complete Subject Areas in this Testing Category for the Airframe rating.

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Landing gear strut servicing/lubrication.
 - (b) Landing gear steering systems.
 - (c) Landing gear retraction/extension systems.
 - (d) Landing gear inspection.
 - (e) Brake assembly inspection.
 - (f) Wheel and tire construction
 - (g) Tire mounting.
 - (h) Wheel and tire inspection.
 - (i) Wheel bearing inspection.
 - (j) Tire storage, care, and/or servicing.
 - (k) Landing gear and/or tire and wheel safety practices/precautions.
- 2) Demonstrates the ability to perform inspection of an installed brake for serviceability. (Level 3)
 - Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—
 - (a) Determine the proper lubricant(s) for a landing gear. (Level 1)
 - (b) Inspect a landing gear or landing gear component(s). (Level 3)
 - (c) Service an oleo strut. (Level 3)
 - (d) Install a brake lining or brake assembly. (Level 3)
 - (e) Clean and inspect wheel bearings. (Level 3)
 - (f) Disassemble, clean as necessary, and inspect a wheel. (Level 3)
 - (g) Select lubricant, and lubricate wheel bearings. (Level 3)
 - (h) Remove and replace/install a wheel and tire assembly on a landing gear. (Level 3)

- (i) Inspect a wheel and tire assembly, check tire pressure, and service as necessary. (Level 3)
- (j) Service a nosewheel shimmy damper. (Level 3)
- (k) Accomplish a landing gear retraction/extension check. (Level 3)
- (l) Replace a tire or tube valve core and check for leaks. (Level 3)

6.2 SUBJECT AREA: HYDRAULIC & PNEUMATIC POWER SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Hydraulic and/or pneumatic system, and/or system component(s) function/operation.
 - (b) Servicing, function, and/or operation of accumulators.
 - (c) Types of hydraulic/pneumatic seals and/or fluid/seal compatibility.
 - (d) Hydraulic/pneumatic seal maintenance procedures.
 - (e) Types of hydraulic/pneumatic filters and/or filter operation.
 - (f) Filter maintenance procedures.
 - (g) Pressure and/or vacuum pneumatic systems.
 - (h) Pressure regulators and valves.
 - (i) Servicing hydraulic and/or pneumatic systems.
 - (j) Types/identification and/or characteristics of various hydraulics fluids used in aircraft.
 - (k) Hydraulic/pneumatic system safety practices/precautions.
- 2) Demonstrates the ability to select and install a hydraulic seal. (Level 3) ● Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—
 - (a) Service a pneumatic or hydraulic system filter. (Level 3)
 - (b) Inspect components or portions of a hydraulic or pneumatic system. (Level 3)
 - (c) Locate fluid servicing instructions and identify/select fluid for a particular aircraft. (Level 2)
 - (d) Service a hydraulic reservoir. (Level 3)
 - (e) Troubleshoot a hydraulic or pneumatic system. (Level 3)
 - (f) Repair a hydraulic or pneumatic system defect. (Level 3)
 - (g) Remove and install hydraulic or pneumatic system component(s) and check operation. (Level 3)
 - (h) Service a hydraulic system accumulator. (Level 3)

6.3 SUBJECT AREA: CABIN ATMOSPHERE CONTROL SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Exhaust heat exchanger and/or system component(s) function, operation, and/or inspection procedures.
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- (b) Combustion heater and/or system component(s) function, operation, and/or inspection procedures.
 - (c) Vapor-cycle system and/or system component(s) operation, servicing and/or inspection procedures.
 - (d) Air-cycle system and/or system component(s) operation and/or inspection procedures.
 - (e) Cabin pressurization and/or system component(s) operation and/or inspection procedures.
 - (f) Types of oxygen systems and/or oxygen system component(s) operation.
 - (g) Oxygen system maintenance procedures.
- 2) Demonstrates the ability to perform at least one of the following—
- (a) Inspect and/or troubleshoot an exhaust heat exchanger cabin heat system or system component(s). (Level 3)
 - (b) Inspect and/or troubleshoot a combustion air heater system and/or system component(s). (Level 3)
 - (c) Select proper solution and leak test oxygen system component(s). (Level 3)
 - (d) Inspect and/or troubleshoot an oxygen system and/or system component(s). (Level 3)
 - (e) Check the operation of an oxygen system. (Level 3)
 - (f) Service an oxygen system. (Level 3)
 - (g) Purge an oxygen system. (Level 3)
 - (h) Inspect and/or troubleshoot a vapor cycle cooling system and/or system component(s). (Level 3)
 - (i) Inspect and/or troubleshoot a cabin pressurization system and/or system component(s). (Level 3)
 - (j) Inspect and/or troubleshoot an air cycle machine system and/or system component(s). (Level 3)
 - (k) Locate procedures for protecting a vapor-cycle system from contamination during component replacement. (Level 1)
 - (l) Locate procedures for servicing a vapor-cycle cooling system. (Level 1)
 - (m) Locate procedures for inspecting a cabin outflow valve. (Level 1)

6.4 SUBJECT AREA: AIRCRAFT INSTRUMENT SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Magnetic compass operation.
 - (b) Magnetic compass swinging procedures.
 - (c) Gyroscopic instrument(s) purpose and operation.
 - (d) Vacuum/pressure and/or electrically operated instrument system operation.
 - (e) Pitot and/or static instruments and function.
 - (f) Pitot and/or static instrument system operation.
 - (g) PCAR Parts 5 and/or 8 requirements for static system checks.

- (h) Aircraft instrument range markings.
- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Remove and install an aircraft instrument. (Level 3)
 - (b) Accomplish a magnetic compass swing. (Level 3)
 - (c) Determine range/limit markings for one or more instruments. (Level 2)
 - (d) Remove, inspect, and install one or more vacuum or pressure system filters. (Level 3)
 - (e) Determine the proper setting of a vacuum and/or pressure system for a particular aircraft. (Level 2)
 - (f) Inspect and/or troubleshoot portions of a vacuum and/or pressure and/or electrically operated instrument power system. (Level 3)
 - (g) Inspect portions of a pitot-static system. (Level 3)
 - (h) Find barometric pressure using an altimeter. (Level 2)

6.5 SUBJECT AREA: COMMUNICATION & NAVIGATION SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) PCAR Part 7 emergency locator transmitter (ELT) maintenance requirements.
 - (b) PCAR Part 7 ELT record keeping requirements.
 - (c) Checking/inspecting coaxial cable.
 - (d) Coaxial cable installation and/or routing requirements.
 - (e) Communication and/or navigation systems commonly used.
 - (f) Proper installation of a com/nav radio in an existing radio rack.
 - (g) Means of identification of commonly used communication and/or navigation antennas.
 - (h) Autopilot system basic components and/or sensing elements.
 - (i) Static discharger function and operation.
 - (j) Static discharger maintenance procedures.
 - 2) Demonstrates the ability to perform at least one of the following—
 - (a) Identify and inspect com/nav cable and connectors. (Level 3)
 - (b) Inspect an ELT and/or ELT installation. (Level 3)
 - (c) Determine ELT battery serviceability/status. (Level 2)
 - (d) Inspect one or more antenna installations. (Level 3)
 - (e) Inspect a coaxial cable installation. (Level 3)
 - (f) Inspect a com/nav radio installation. (Level 3)
 - (g) Inspect a shock mount base. (Level 3)
 - (h) Locate and identify various antennas installed on a particular aircraft. (Level 2)
 - (i) Inspect one or more static dischargers for security, resistance. (Level 3)
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6.6 SUBJECT AREA: AIRCRAFT FUEL SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Fuel system strainer servicing.
 - (b) Construction characteristics of one or more types of fuel tanks.
 - (c) Fuel tank maintenance procedures.
 - (d) Fuel line routing/installation requirements.
 - (e) Hazards associated with fuel system maintenance.
 - (f) Types, characteristics, and/or operation of fuel systems and/or components thereof.
 - (g) Characteristics, and/or operation of fuel jettison systems and/or components thereof.
- 2) Demonstrates the ability to service a fuel system strainer. (Level 3) ● Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—
 - (a) Install a fuel quantity transmitter and/or accomplish an operational check. (Level 3)
 - (b) Install a fuel valve and/or accomplish an operational check. (Level 3)
 - (c) Install a fuel pump and/or accomplish an operational check. (Level 3)
 - (d) Troubleshoot a fuel system. (Level 3)
 - (e) Determine the airworthiness of a specified size fuel system leak/seep. (Level 2)
 - (f) Inspect a fuel system and/or fuel system component(s). (Level 3)
 - (g) Check the operation of one or more fuel system components. (Level 3)
 - (h) Inspect a metal fuel tank. (Level 3)
 - (i) Inspect a bladder fuel tank. (Level 3)
 - (j) Locate fuel system operating instructions. (Level 1)
 - (k) Locate fuel system inspection procedures. (Level 1)

6.7 SUBJECT AREA: AIRCRAFT ELECTRICAL SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Factors to consider when selecting wire size for an aircraft circuit.
 - (b) Routing and/or installation of electric wire or wire bundles.
 - (c) Wire splicing.
 - (d) Use of derating factors in switch selection.
 - (e) Requirements for circuit protection devices.
 - (f) Voltage regulator: purpose and operating characteristics.
 - (g) Lighting and/or lighting system components.
 - (h) Electric motor operation and/or motor components.
 - (i) Constant speed drive (CSD) and/or integrated drive generator (IDG) systems and/or system components.
 - (j) Airframe electrical system components.

- (k) Wiring defects and/or inspection.
- 2) Demonstrates the ability to troubleshoot an electrical system or portion thereof, using appropriate tools and/or test equipment. (Level 3) ● Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—
 - (a) Select a circuit switch or circuit protection device for a specific aircraft and application. (Level 2)
 - (b) Install a circuit switch or circuit protection device. (Level 3)
 - (c) Select materials and tools and accomplish a wire splice. (Level 3)
 - (d) Adjust one or more voltage regulators. (Level 3)
 - (e) Select and install one or more wires and pins and/or sockets in a connector. (Level 3)
 - (f) Select materials and fabricate a bonding wire. (Level 3)
 - (g) Install a bonding wire and accomplish a resistance check. (Level 3)
 - (h) Check the operation of one or more airframe electrical system circuits and/or system components. (Level 3)
 - (i) Inspect and check a landing light. (Level 3)
 - (j) Inspect and check anti-collision and position lights. (Level 3)
 - (k) Inspect generator brushes and determine serviceability. (Level 3)

6.8 SUBJECT AREA: POSITION & WARNING SYSTEM

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Anti-skid system basic components.
 - (b) Anti-skid system operating characteristics.
 - (c) Takeoff warning system basic components.
 - (d) Takeoff warning system function and operation.
 - (e) Control-surface trim indicating system basic components and/or operating characteristics.
 - (f) Landing gear position indicators.
 - (g) Flap position indicators.
 - (h) Landing gear warning system basic components and/or operating characteristics.
 - (i) Checking and/or repairing a landing gear warning system.
 - (j) Types of stall warning/lift detector systems and/or operating characteristics.
 - (k) Common annunciator system indications.
 - (l) Mach warning system indicator(s) and/or operating characteristics.
- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Inspect and/or adjust a landing gear position switch. (Level 3)
 - (b) Accomplish an operational check of a landing gear position indicating and/or warning system. (Level 3)

- (c) Inspect and/or adjust a flap position indicating system. (Level 3)
- (d) Check the operation of a flap position indicating and/or warning system. (Level 3)
- (e) Troubleshoot a landing gear warning system. (Level 3)
- (f) Check the operation of an annunciator system. (Level 3)
- (g) Check the operation of an anti-skid warning system. (Level 3)
- (h) Identify landing gear position/warning system components. (Level 2)
- (i) Locate troubleshooting procedures for an anti-skid system. (Level 1)
- (j) Locate troubleshooting procedures for a landing gear warning system. (Level 1)

6.9 SUBJECT AREA: ICE & RAIN CONTROL SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Aircraft icing causes/effects.
 - (b) Ice detection systems.
 - (c) Anti-ice and/or deice areas.
 - (d) Anti-ice and/or deice methods commonly used.
 - (e) Checking and/or troubleshooting a pitot-static anti-ice system.
 - (f) Anti-icing and/or de-icing system components/operation.
 - (g) Anti-icing and/or de-icing system maintenance.
 - (h) Types of rain removal systems and/or operating characteristics.
- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Troubleshoot a pitot anti-ice system. (Level 3)
 - (b) Check the operation of a pitot-static anti-ice system. (Level 3)
 - (c) Inspect a deicer boot. (Level 3)
 - (d) Check deicer boot operation. (Level 3)
 - (e) Inspect windshield wiper blade(s) and check blade tension. (Level 3)
 - (f) Adjust a windshield wiper blade tension to specification. (Level 3)
 - (g) Inspect an electrically-heated windshield. (Level 3)
 - (h) Check an electrically-heated windshield operation. (Level 3)
 - (i) Troubleshoot a pneumatic deicer boot system. (Level 3)
 - (j) Service or repair on a pneumatic deicer boot. (Level 3)

6.10 SUBJECT AREA: FIRE PROTECTION SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Fire and/or smoke detection system(s) or system components.
 - (b) Fire extinguishing system(s) and/or system components.
 - (c) Fire and/or smoke detection system operating characteristics.
 - (d) Fire extinguishing system operating characteristics.

- (e) Determining proper container pressure for an installed fire extinguisher system.
 - (f) Maintenance procedures for fire detection and/or extinguishing system(s) and/or system component(s).
 - (g) Inspecting and/or checking a fire detection/overheat system.
 - (h) Inspecting and/or checking a smoke and/or toxic gas detection system.
 - (i) Troubleshooting a fire detection and/or extinguishing system.
- 2) Demonstrates the ability to perform at least one of the following—
- (a) Inspect a fire extinguisher container and determine if the pressure is within limits. (Level 3)
 - (b) Determine the hydrostatic test date of a fire extinguisher container. (Level 2)
 - (c) Troubleshoot a fire detection system. (Level 3)
 - (d) Install/replace one or more smoke and/or fire detection and/or extinguishing system components. (Level 3)
 - (e) Inspect a smoke and/or fire detection and/or extinguishing system, or system component(s). (Level 3)
 - (f) Locate inspection procedures for carbon monoxide detectors. (Level 1)
 - (g) Locate procedures for checking a smoke detection system. (Level 1)

SECTION 7 POWERPLANT THEORY & MAINTENANCE

7.1 SUBJECT AREA: PISTON ENGINES

The applicant must satisfactorily complete the Subject Areas in this Testing Category for the Powerplant rating.

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Piston engine theory of operation.
 - (b) Basic radial engine design, components, and/or operation.
 - (c) Firing order of a piston engine.
 - (d) Probable cause and removal of a hydraulic lock.
 - (e) Valve adjustment on a radial engine.
 - (f) Purpose of master and/or articulating rods.
 - (g) Checks necessary to verify proper operation of a piston engine.
 - (h) Induction system leak indications.
 - (i) Procedures for inspecting various engine components during an overhaul.
 - (j) Correct installation of piston rings and results of incorrectly installed or worn rings.
 - (k) Purpose/function/operation of various piston engine components, including, but not limited to, any of the following: crankshaft dynamic dampers, multiple springs for valves, piston rings, and reduction gearing.
 - 2) Demonstrates the ability to perform at least one of the following—
 - (a) Measure the valve clearance on a piston aircraft engine when the lifters are deflated. (Level 2)
 - (b) Accomplish a compression test, and note all findings. (Level 3)
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- (c) Inspect engine control cables and/ or push-pull tubes for proper rigging. (Level 3)
- (d) Inspect ring gap, install piston rings on a piston, and install an aircraft engine cylinder. (Level 3)
- (e) Dimensionally inspect an aircraft engine component. (Level 3)
- (f) Replace/install one or more aircraft engine components. (Level 3)

7.2 SUBJECT AREA: TURBINE ENGINES

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Turbine engine theory of operation.
 - (b) Checks necessary to verify proper operation.
 - (c) Turbine engine troubleshooting procedures.
 - (d) Procedures required after the installation of a turbine engine.
 - (e) Causes for turbine engine performance loss.
 - (f) Purpose/function/operation of various turbine engine components.
 - (g) Turbine engine maintenance procedures.
- 2) Demonstrates the ability to perform at least one of the following:
 - (a) Repair a turbine engine compressor blade by blending. (Level 3)
 - (b) Remove and/or install a turbine engine component. (Level 3)
 - (c) Determine cycle life remaining between overhaul of a turbine engine life limited component. (Level 2)
 - (d) Check rigging of a turbine engine inlet guide vane system. (Level 3)
 - (e) Measure compressor or turbine blade clearance. (Level 3)
 - (f) Troubleshoot a turbine engine. (Level 3)
 - (g) Locate and identify turbine engine components. (Level 2)
 - (h) Inspect turbine engine components. (Level 3)

● This Subject Area may be tested at the same time as the Subject Area, Auxiliary Power Units.

7.3 SUBJECT AREA: ENGINE INSPECTION

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) The use of a type certificate data sheet (TCDS) to identify engine accessories.
 - (b) Requirements for the installation or modification in accordance with a supplemental type certificate (STC).
 - (c) Procedures for accomplishing a 100-hour inspection in accordance with the manufacturer's instruction.
 - (d) Compliance with airworthiness directives.
 - (e) Changes to an inspection program due to a change or modification required by airworthiness directive or service bulletin.
 - (f) Determination of life limited parts.

- (g) Inspection required after a potentially damaging event, including but not limited to any of the following: sudden stoppage, overspeed, or overtemperature.
- 2) Demonstrates the ability to perform inspection of a piston and/or turbine engine installation in accordance with the manufacturer's instructions. (Level 3) ● Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—
- (a) Inspect a turbine engine using a bore scope. (Level 3)
 - (b) Determine proper crankshaft flange run-out. (Level 3)
 - (c) Inspect an engine in accordance with applicable airworthiness directive. (Level 2)
 - (d) Inspect a turbine engine compressor section. (Level 3)
 - (e) Inspect a crankcase for cracks. (Level 3)
 - (f) Inspect a crankshaft oil seal for leaks. (Level 3)
 - (g) Engine conformity inspection. (Level 3)
 - (h) Engine airworthiness inspection. (Level 3)

SECTION 8 POWERPLANT SYSTEMS & COMPONENTS

8.1 SUBJECT AREA: ENGINE INSTRUMENT SYSTEMS

The applicant must satisfactorily complete the Subject Areas in this Testing Category for the Powerplant rating.

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Troubleshoot a fuel flow and/or low fuel pressure indicating system.
 - (b) The operation of a fuel flow indicating system and where it is connected to the engine.
 - (c) The operation of a temperature indicating system.
 - (d) The operation of a pressure indicating system.
 - (e) The operation of an RPM indicating system.
 - (f) Required checks to verify proper operation of a temperature indicating system.
 - (g) Required checks to verify proper operation of a pressure indicating system.
 - (h) Required checks to verify proper operation of an RPM indicating system.
 - (i) The operation of a manifold pressure gage and where it actually connects to an engine.
- 2) Demonstrates the ability to perform inspection of engine electrical and/or mechanical instrument systems to include at least one of the following (Level 3)— ● Core Competency Element
 - (a) Temperature.
 - (b) Pressure.
 - (c) RPM.
 - (d) Rate of flow.
- 3) Demonstrates the ability to perform at least one of the following—

- (a) Verify proper operation and marking of an indicating system. (Level 2)
- (b) Replace a temperature sending unit. (Level 3)
- (c) Remove, inspect, and install fuel flow transmitter. (Level 3)
- (d) Troubleshoot an oil pressure indicating system. (Level 3)
- (e) Locate and inspect fuel flow components on an engine. (Level 2)
- (f) Replace an exhaust gas temperature (EGT) indication probe. (Level 3)
- (g) Troubleshoot a manifold pressure gage that is slow to indicate the correct reading. (Level 2)

8.2 SUBJECT AREA: ENGINE FIRE PROTECTION SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Checks to verify proper operation of an engine fire detection and/or extinguishing system.
 - (b) Troubleshoots an engine fire detection and/or extinguishing system.
 - (c) Inspection requirements for an engine fire extinguisher squib and safety practices/precautions.
 - (d) Components and/or operation of an engine fire detection and/or extinguishing system.
 - (e) Engine fire detection and/or extinguishing system maintenance procedures.
- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Check an engine fire detection and/or extinguishing system for proper operation. (Level 2)
 - (b) Accomplish weight and pressure inspection of an engine fire bottle, and verify hydrostatic inspection date. (Level 2)
 - (c) Repair an engine fire detector heat sensing loop malfunction. (Level 3)
 - (d) Check operation of firewall shut-off valve after a fire handle is pulled. (Level 2)
 - (e) Troubleshoot an engine fire detection or extinguishing system. (Level 2)
 - (f) Inspect an engine fire detection or extinguishing system. (Level 2)

8.3 SUBJECT AREA: ENGINE ELECTRICAL SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Generator rating and performance data location.
 - (b) Operation of a turbine engine starter-generator.
 - (c) The procedure for locating the correct electrical cable/wire size needed to fabricate a replacement cable/wire.
 - (d) Installation practices for wires running close to exhaust stacks or heating ducts.
 - (e) Operation of engine electrical system components.
 - (f) Types of and/or components of D.C. motors.
 - (g) Inspection and/or replacement of starter-generator brushes.

- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Flash a generator field. (Level 3)
 - (b) Install an engine driven generator or alternator. (Level 3)
 - (c) Use of an engine electrical wiring schematic. (Level 2)
 - (d) Accomplish the installation of a tach generator. (Level 3)
 - (e) Fabricate an electrical system cable. (Level 3)
 - (f) Repair a damaged engine electrical system wire. (Level 3)
 - (g) Replace and check a current limiter. (Level 3)
 - (h) Check/service/adjust one or more engine electrical system components. (Level 3)
 - (i) Troubleshoot an engine electrical system component. (Level 3)

8.4 SUBJECT AREA: LUBRICATION SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Differences between straight mineral oil, ashless dispersant oil, and synthetic oil.
 - (b) Types of oil used for different climates.
 - (c) Functions of an engine oil.
 - (d) Identification and selection of proper lubricants.
 - (e) Servicing of the lubrication system.
 - (f) The reasons for changing engine lubricating oil at specified intervals.
 - (g) The purpose and operation of an oil/air separator.
 - (h) Reasons for excessive oil consumption without evidence of oil leaks in a piston and/or turbine aircraft engine.
- 2) Demonstrates the ability to perform at least one of the following—
 - (a) Inspect an engine lubrication system to ensure continued operation. (Level 3)
 - (b) Inspect oil lines and filter/screen for leaks. (Level 3)
 - (c) Replace a defective oil cooler or oil cooler component. (Level 3)
 - (d) Replace a gasket or seal in the oil system, and accomplish a leak check. (Level 3)
 - (e) Adjust oil pressure. (Level 3)
 - (f) Change engine oil, inspect screen(s) and/or filter, and leak check the engine. (Level 3)
 - (g) Pre-oil an engine. (Level 2)

8.5 SUBJECT AREA: IGNITION & STARTING SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Troubleshooting a piston and/or turbine engine ignition system.
 - (b) Replacement of an exciter box and safety concerns if the box is damaged.
 - (c) Troubleshooting a starter system.
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- (d) Checking a starter system for proper operation.
 - (e) The operation of a pneumatic starting system.
 - (f) Reasons for the starter dropout function of a starter generator or pneumatic starter.
 - (g) The purpose of a shear section in a starter output shaft.
 - (h) Purpose of checking a p-lead for proper ground.
 - (i) Inspection and servicing of an igniter and/or spark plug.
 - (j) Magneto systems, components, and operation.
 - (k) Function/operation of a magneto switch and p-lead circuit.
 - (l) High and low tension ignition systems.
- 2) Demonstrates the ability to perform at least one of the following (Level 3)—
- Core Competency Element
- (a) Check engine timing.
 - (b) Check a magneto switch for proper operation.
 - (c) Inspect a turbine engine ignition system for proper installation.
 - (d) Inspect a starter/generator for proper installation.
 - (e) Inspect magneto points.
- 3) Demonstrates the ability to perform at least one of the following—
- (a) Install a magneto, and set timing on an aircraft engine. (Level 3)
 - (b) Repair an engine ignition and/or starter system. (Level 3)
 - (c) Remove, inspect, and install turbine engine igniter plugs, and perform a functional check of the igniter system. (Level 3)
 - (d) Inspect generator or starter-generator brushes. (Level 3)
 - (e) Install brushes in a starter or starter-generator. (Level 3)
 - (f) Install breaker points in a magneto and internally time the magneto. (Level 3)
 - (g) Repair an engine direct drive electric starter. (Level 3)
 - (h) Inspect and test an ignition harness with a high tension lead tester. (Level 3)
 - (i) Inspect and/or service and install aircraft spark plugs. (Level 3)
 - (j) Bench test an ignition system component. (Level 2)

8.6 SUBJECT AREA: FUEL METERING SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Troubleshooting an engine that indicates high exhaust gas temperature (EGT) for a particular engine pressure ratio (EPR).
 - (b) Purpose of an acceleration check after a trim check.
 - (c) Reasons an engine would require a trim check.
 - (d) Purpose of the part power stop on some engines when accomplishing engine trim procedure.
 - (e) Procedure required to adjust (trim) a fuel control unit (FCU).
 - (f) Possible reasons for fuel running out of a carburetor throttle body.

- (g) Indications that would result if the mixture is improperly adjusted.
 - (h) Procedure for checking idle mixture on a piston engine.
 - (i) Possible causes for poor engine acceleration, engine backfiring or missing when the throttle is advanced.
 - (j) Types and operation of various fuel metering systems.
 - (k) Fuel metering system components.
- 2) Demonstrates the ability to perform at least one of the following—
- (a) Remove and install the accelerating pump in a float-type carburetor. (Level 3)
 - (b) Check and adjust the float level of a float-type carburetor. (Level 3)
 - (c) Check the needle and seat in a float-type carburetor for proper operation. (Level 2)
 - (d) Check a fuel injection nozzle for proper spray pattern, and install a fuel injector nozzle. (Level 2)
 - (e) Check and adjust idle mixture. (Level 3)
 - (f) Install a turbine engine fuel nozzle. (Level 3)
 - (g) Locate and identify various fuel metering system components. (Level 2)
 - (h) Service a carburetor fuel screen. (Level 3)

8.7 SUBJECT AREA: ENGINE FUEL SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Inspection requirements for an engine fuel system.
 - (b) Checks of fuel systems to verify proper operation.
 - (c) Troubleshooting an engine fuel system.
 - (d) Procedure for inspection of an engine driven fuel pump for leaks and security.
 - (e) Function and/or operation of one or more types of fuel pumps.
 - (f) Function and/or operation of one or more types of fuel valves.
 - (g) Function and/or operation of engine fuel filters.
- 2) Demonstrates the ability to perform at least one of the following (Level 3)—
 - (a) Check a fuel selector valve for proper operation.
 - (b) Inspect an engine fuel filter assembly for leaks.
 - (c) Inspect a repair to an engine fuel system.
- 3) Demonstrates the ability to perform at least one of the following—
 - (a) Check a fuel boost pump for proper operation. (Level 3)
 - (b) Repair fuel selector valve. (Level 3)
 - (c) Inspect a main fuel filter assembly for leaks. (Level 3)
 - (d) Check the operation of a remotely located fuel valve. (Level 3)
 - (e) Locate and identify a turbine engine fuel heater. (Level 2)
 - (f) Service an engine fuel strainer. (Level 3)

● Core Competency Element

- (g) Inspect an engine driven fuel pump for leaks and security, and perform an engine fuel pressure check. (Level 3)
- (h) Repair an engine fuel system or system component. (Level 3)
- (i) Troubleshoot a fuel pressure system. (Level 3)

8.8 SUBJECT AREA: INDUCTION & ENGINE AIRFLOW SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Inspection procedures for engine ice control systems and/or carburetor air intake and induction manifolds.
 - (b) Operation of an alternate air valve, both automatic and manual heat systems.
 - (c) Troubleshooting ice control systems.
 - (d) Explain how a carburetor heat system operates and the procedure to verify proper operation.
 - (e) Effect(s) on an aircraft engine if the carburetor heat control is improperly adjusted.
 - (f) Causes and effects of induction system ice.
 - (g) Function and operation of one or more types of supercharging systems and components.
- 2) Demonstrates the ability to perform inspection of engine induction or airflow system to include at least one of the following (Level 3)—

● Core Competency Element

 - (a) Engine ice control system.
 - (b) Induction manifolds.
- 3) Demonstrates the ability to perform at least one of the following—
 - (a) Repair a defective condition in a carburetor heat box. (Level 3)
 - (b) Check proper operation of an engine anti-ice system. (Level 3)
 - (c) Rig a carburetor heat box. (Level 3)
 - (d) Inspect an induction system. (Level 3)
 - (e) Replace an induction system manifold gasket and/or induction tube. (Level 3)
 - (f) Service an induction system air filter. (Level 3)
 - (g) Trouble shoot an engine malfunction resulting from a defective induction or supercharging system. (Level 3)

8.9 SUBJECT AREA: ENGINE COOLING SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
 - (a) Required inspection on an engine cooling system.
 - (b) Operation of cowl flaps, and how cooling is accomplished.
 - (c) How turbine engine cooling is accomplished.
 - (d) Cooling of engine bearings and other parts on turbine engines.
 - (e) The importance of proper engine baffle and seal installation.

- (f) The operation of a heat exchanger.
 - (g) The function and operation of an augmentor cooling system.
 - (h) Rotorcraft engine cooling systems.
- 2) Demonstrate the ability to perform at least one of the following—
- (a) Inspect an engine cooling system. (Level 3)
 - (b) Check cowl flap operation and inspect rigging. (Level 3)
 - (c) Repair one or more cylinder cooling fins. (Level 3)
 - (d) Repair an engine pressure baffle plate. (Level 3)
 - (e) Inspect a heat exchanger. (Level 3)
 - (f) Troubleshoot an engine cooling system. (Level 3)
 - (g) Locate and identify rotorcraft cooling system components. (Level 2)

8.10 SUBJECT AREA: ENGINE EXHAUST & REVERSER SYSTEMS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
- (a) Exhaust leak indications and/or methods of detection.
 - (b) Thrust reverser system operation and components.
 - (c) Differences between a cascade and a mechanical blockage door thrust reverser.
 - (d) Hazards of exhaust system failure.
 - (e) Effects of using improper materials to mark on exhaust system components.
 - (f) Function and operation of various exhaust system components.
- 2) Demonstrates the ability to perform inspection of engine exhaust system and/or turbocharger system. (Level 3) ● Core Competency Element
- 3) Demonstrates the ability to perform at least one of the following—
- (a) Determine if components of an exhaust system are serviceable. (Level 2)
 - (b) Show the procedures to accomplish a pressurization check of an exhaust system. (Level 2)
 - (c) Repair one or more exhaust system components. (Level 3)
 - (d) Check engine exhaust system for proper operation. (Level 3)
 - (e) Replace one or more exhaust gaskets. (Level 3)
 - (f) Install an engine exhaust system. (Level 3)
 - (g) Check a turbocharger and waste gate system for proper operation. (Level 3)
 - (h) Troubleshoot and/or repair a turbine engine thrust reverser system and/or system component(s). (Level 3)

8.11 SUBJECT AREA: PROPELLERS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
- (a) Propeller theory of operation.
 - (b) Checks necessary to verify proper operation of propeller systems.
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- (c) Procedures for proper application of propeller lubricants.
 - (d) Installation or removal of a propeller.
 - (e) Measurement of blade angle with a propeller protractor.
 - (f) Repairs classified as major repairs on an aluminum propeller.
 - (g) Reference data for reducing the diameter of a type certificated propeller.
 - (h) Operation of propeller system component(s).
 - (i) Propeller governor components and operation.
 - (j) Theory and operation of various types of constant speed propellers.
 - (k) Function and operation of propeller synchronizing systems.
 - (l) Function and operation of propeller ice control systems.
- 2) Demonstrates the ability to perform both of the following—
- Core Competency Element
- (a) Inspection of a propeller installation, and make a minor repair on an aluminum propeller. (Level 3)
 - (b) Determine what minor propeller alterations are acceptable using the appropriate type certificate data sheet. (Level 2)
- 3) Demonstrates the ability to perform at least one of the following—
- (a) Service a constant speed propeller with lubricant. (Level 2)
 - (b) Use a propeller protractor to determine correct blade angle. (Level 3)
 - (c) Leak check a constant speed propeller installation. (Level 3)
 - (d) Install a fixed pitch propeller and check the tip tracking. (Level 3)
 - (e) Inspect a spinner/ bulkhead for defects and proper alignment and installation. (Level 3)
 - (f) Dye-penetrant inspection to determine the amount of propeller damage. (Level 2)
 - (g) Inspect and/or adjust a propeller governor. (Level 3)
 - (h) Inspect a wood propeller. (Level 3)
 - (i) Troubleshoot a propeller system. (Level 3)

8.12 SUBJECT AREA: TURBINE POWERED AUXILIARY POWER UNITS

Objective. To determine that the applicant—

- 1) Exhibits knowledge of at least two of the following—
- (a) Inspection to ensure proper operation of turbine driven auxiliary power unit.
 - (b) Replacement procedure for an igniter plug.
 - (c) Servicing an auxiliary power unit.
 - (d) Troubleshooting an auxiliary power unit.
 - (e) Function and operation of auxiliary power unit(s).

The competency elements in this Subject Area may be tested at the same time as the Subject Area, Turbine Engines.

End of Advisory Circular



RAMON S. GUTIERREZ

Director General

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