



Advisory Circular NCAA-AC-PEL 025

SUBJECT: AIRCRAFT MAINTENANCE ENGINEER (AIRFRAME) SKILL TEST STANDARDS

ADVISORY CIRCULAR NCAA-AC-PEL026

DATE: 02ND JUNE 2010

0.0 FOREWORD

0.1 The Nigerian Civil Aviation Authority (NCAA) has developed skill test standards for airmen licences and ratings and these are published as Advisory Circulars (ACs). This AC establishes the standards for the Aircraft Maintenance Engineer (Airframe) skill test. Nigerian inspectors and designated aircraft maintenance engineer examiners shall conduct skill tests in compliance with these standards. Aircraft maintenance engineer instructors and applicants should find these standards helpful in skill test preparation. Other ACs have been developed for other airmen licences and can be obtained from the NCAA website: <http://www.ncaa.gov.ng>.

0.2 Information considered directive in nature is described in this skill test AC in terms such as “shall” and “must”, indicating the actions are mandatory. Guidance information is described in terms such as “should” and “may” indicating the actions are desirable or permissive, but not mandatory.

0.3 The Nigerian Civil Aviation Regulations (Nig. CARs) can be obtained from the NCAA at the address given below. Nig. CARs Part 2 cover the requirements for personnel licensing.

0.4 This Skill Test Standard may be downloaded from the NCAA website at <http://www.ncaa.gov.ng>.

. Subsequent changes to the Skill Test Standard will also be available on the NCAA web site.

0.5 Comments regarding this publication should be sent to:

Nigerian Civil Aviation Authority
Aviation House
Murtala Muhammed Airport
Ikeja

Dr. H. O. Demuren
Director General, Civil Aviation Authority

[This page intentionally left blank.]

SKILL TEST STANDARDS
Contents

0.0 FOREWORD

1.0 SECTION ONE

1.1 Purpose.....	6
1.2 General Information.....	6
1.3 Skill Test Standard Concept.....	6
1.4 Skill Test Description.....	6
1.5 Use of the Skill Test Standards.....	9
1.6 Skill Test Prerequisites.....	9
1.7 Examiner Responsibility.....	9
1.8 Performance Levels.....	9
1.9 Satisfactory Performance.....	10
1.10 Unsatisfactory Performance.....	11

2.0 SECTION TWO – Skill Test Standards – Airframe Structures

2.1 Areas of Operation.....	13
-----------------------------	----

2.0 SECTION THREE – Skill Test Standards – Airframe Systems and Components

3.1 Areas of Operation.....	19
-----------------------------	----

[This page intentionally left blank]

SECTION ONE

PURPOSE

1.1 The purpose of this AC is to prescribe the standards that shall be used by NCAA inspectors and designated aircraft maintenance engineer examiners when conducting Aircraft Maintenance Engineer Airframe skill tests. Aircraft Maintenance Engineer Instructors are expected to use this document when preparing applicants for skill tests. Applicants should be familiar with this document and refer to these standards during their training.

GENERAL

1.2 The NCAA has developed this skill test AC as the standard that shall be used by NCAA inspectors and designated aircraft maintenance engineer examiners when conducting Aircraft Maintenance Engineer Airframe skill tests. Aircraft Maintenance Engineer Instructors are expected to use this book when preparing applicants for skill tests. Applicants should be familiar with this book and refer to these standards during their training.

SKILL TEST STANDARD CONCEPT

1.3 (1) The Nig. CARs specify the areas in which knowledge and skill must be demonstrated by the applicant before the issuance of a licence or rating. The Nig. CARs provide the flexibility to permit the NCAA to publish Skill Test Standards (STS) containing the AREAS OF OPERATION and specific TASKS in which competency shall be demonstrated.

"Knowledge" (oral) elements are indicated by use of the words *"Exhibits knowledge of...."*

"Skill" (practical) elements are indicated by the use of the words *"Demonstrates the ability to...."*

(2) The NCAA will revise this STS whenever it is determined that changes are needed in the interest of safety. Adherence to the provisions of the regulations and the STS is mandatory for evaluation of Aircraft Maintenance Engineer applicants.

SKILL TEST DESCRIPTION

1.4 (1) The Aircraft Maintenance Engineer Airframe Skill Test Standards include the subject areas of knowledge and skill for the issuance of an Aircraft Maintenance Engineer licence and/or the addition of a rating. The subject areas are the topics in which Aircraft Maintenance Engineer applicants must have knowledge and/or demonstrate skill.

(2) The REFERENCE identifies the publication(s) that describe(s) the subject area. Descriptions of the subject area are not included in the skill test standards, because this information can be found in references listed and/or in manufacturer or NCAA-approved or acceptable data related to each subject area. Publications other than those listed may be used as references if their content conveys substantially the same information as the referenced publications. Except where appropriate, (e.g., pertinent Nig. CARs) references listed in this document are NOT meant to supersede or otherwise replace manufacturer or other NCAA-approved or acceptable data, but to serve as general information and study material sources. **Information contained in manufacturer and/ or NCAA-approved/acceptable data always takes precedence over advisory or textbook referenced data.** Written instructions given to

applicants for the completion of assigned skill portions of the skill test standard may include service bulletins; airworthiness directives or other CFRs; type certificate data sheets or specifications; manufacturer maintenance manuals or other similar approved/acceptable data necessary for accomplishment of objective testing.

:

Reference List

NIG. CARS Part 4	Aircraft Registration and Marking
NIG. CARS Part 8	Operations
RESERVED	
RESERVED	
RESERVED	
RESERVED	
RESERVED	
RESERVED	
RESERVED	
RESERVED	
RESERVED	
RESERVED	
RESERVED	
RESERVED	

(3) Each subject area has an objective. The objective lists the important knowledge and skill elements that must be utilized by the examiner in planning and administering Aircraft Maintenance Engineer tests, and that applicants must be prepared to satisfactorily perform.

(4) EXAMINER is used in this standard to denote either the NCAA Inspector or NCAA Designated Aircraft Maintenance Engineer Examiner (DAME) who conducts the skill test.

(5) The following abbreviations have the meanings shown

ADF	Automatic Direction Finder
ADM	Aeronautical Decision Making
AIRMETS	Airman's Meteorological Information
APV	Approach with Vertical Guidance
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATS	Air Traffic Service
NIG. CARS	Civil Aviation Regulations
CDI	Course Deviation Indicator
CFIT	Controlled Flight into Terrain
CRM	Crew Resource Management
DA	Decision Altitude
DH	Decision Height
DME	Distance Measuring Equipment
DP	Departure Procedure

NCAA	Nigerian Civil Aviation Authority
FDC	Flight Data Center
FMS	Flight Management System
FSTD	Flight Simulation Training Device
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
IAP	Instrument Approach Procedure
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IPC	Instrument Proficiency Check
LAHSO	Land and Hold Short Operations
LCD	Liquid Crystal Display
LDA	Localizer-type Directional Aid
LED	Light Emitting Diode
LOC	ILS Localizer
LORAN	Long Range Navigation
MAP	Missed Approach Point
ACA	Minimum Descent Attitude
METAR	Aviation Routine Weather Report
MLS	Microwave Landing System
NAVAID	Navigational Aid
NDB	Non-Directional Beacon
NOTAM	Notice to Airmen
NPA	Nonprecision Approach
PA	Precision Approach
RAIM	Receiver Autonomous Integrity Monitoring
RMI	Radio Magnetic Indicator
RNAV	Area navigation
SAS	Stability Augmentation System
SDF	Simplified Directional Facility
SIGMETS	Significant Meteorological Advisory
SRM	Single Pilot Resource Management
STAR	Standard Terminal Arrival
STS	Skill Test Standards
TCAS	Traffic Alert and Collision Avoidance System
VDP	Visual Descent Point
VHF	Very High Frequency
VNAV	Vertical Navigation
VOR	Very High Frequency Ominidirectional Range

1.5 USE OF THE SKILL TEST STANDARDS

(1) The NCAA requires that all skill tests be conducted in accordance with the appropriate Aircraft Maintenance Engineer Skill Test Standards. When using the skill test, 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.

(2) An applicant is not permitted to know before testing begins which selections in each subject area are 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.

1.6. SKILL TEST PREREQUISITES

An applicant for an Aircraft Maintenance Engineer skill test is required to meet the applicable experience requirements in Nig. CARs Part 2 for an Aircraft Maintenance Engineer license.

1.7 EXAMINER RESPONSIBILITY

The examiner who conducts the skill test is responsible for determining that the applicant meets acceptable standards of knowledge and skill in the assigned subject areas within the appropriate skill test standard. Since there is no formal division between the knowledge and skill portions of the skill test, this becomes an ongoing process throughout the test.

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.

1.8 PERFORMANCE LEVELS

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

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.

Example:

Z3b. Locate specified nondestructive testing methods. (Level 1)

Performance Standard: The applicant will locate information for nondestructive testing.

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.

Example:

Z3c. Detect electrical leakage in electrical connections, terminal strips, and cable harness (at least ten will have leakage faults). (Level 2)

Performance Standard: Using appropriate maintenance data and a multimeter, the applicant will identify items with leakage faults.

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.

Example:

Z3e. Check control surface travel. (Level 3)

Performance Standard: Using type certificate data sheets and the manufacturer's service manual, the applicant will measure the control surface travel, compare the travel to the maintenance data, and determine if the travel is within limits.

1.9 SATISFACTORY PERFORMANCE

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. 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.

1.10 UNSATISFACTORY PERFORMANCE

(1) 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. The examiner or the applicant may discontinue testing any time after the failure of a subject area. In any case, the applicant is entitled to credit for only those subject areas satisfactorily completed

(2) 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.

SECTION TWO

SECTION II—AIRFRAME STRUCTURES

A. 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)

B. 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.
 - 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)

C. 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)

D. SHEET METAL AND NON-METALLIC STRUCTURES

*Core competency element.

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)
 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)

E. 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)

F. ASSEMBLY AND RIGGING

*Core competency element.

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.
 - 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)
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)

G. AIRFRAME INSPECTION

*Core competency element.

Objective. To determine that the applicant:

1. Exhibits knowledge of at least two of the following—
 - a. one or more required inspections under relevant parts of the Regulations.
 - b. maintenance requirements under relevant parts of the Regulations
 - c. inspection requirements under relevant parts of the Regulations.
 - d. requirements for complying with airworthiness directives.
 - e. compliance with service letters, instructions for continued airworthiness, and/or bulletins.
 - f. maintenance record requirements under relevant parts of the Regulations
 - g. maintenance record requirements under relevant parts of the Regulations.
2. *Demonstrates the ability to examine an aircraft maintenance record, and determine if inspection and/or maintenance is due. (Level 3)
3. Demonstrates the ability to perform at least one of the following—
 - a. accomplish a Regulation tasks 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 relevant parts of the Regulations 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)

H. Reserved

I. Reserved

J. Reserved

SECTION THREE

SECTION III—AIRFRAME SYSTEMS AND COMPONENTS

K. AIRCRAFT LANDING GEAR SYSTEMS

*Core competency element.

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)
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)

L. HYDRAULIC AND PNEUMATIC POWER SYSTEMS

*Core competency element.

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 regulators and valves.
 - h. servicing hydraulic and/or pneumatic systems.

- i. types/identification and/or characteristics of various hydraulics fluids used in aircraft.
 - j. hydraulic/pneumatic system safety practices/precautions.
2. *Demonstrates the ability to select and install a hydraulic seal. (Level 3)
 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)

M. 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.
 - 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)

N. 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. vacuum/pressure and/or electricity operated instrument system maintenance procedures.
 - f. pitot and/or static instruments purpose and operation.
 - g. pitot and/or static system operation.
 - h. relevant parts of the Regulations requirements for static system checks.
 - i. 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)

O. COMMUNICATION AND NAVIGATION SYSTEMS

REFERENCES: Nig. CARs Part 8.

Objective. To determine that the applicant:

1. Exhibits knowledge of at least two of the following—
 - a. Relevant parts of the Regulations locator transmitter (ELT) maintenance requirements.
 - b. Relevant parts of the Regulations 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)

P. AIRCRAFT FUEL SYSTEMS

*Core competency element.

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)
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)

Q. AIRCRAFT ELECTRICAL SYSTEMS

*Core competency element.

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)
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)

R. POSITION AND 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)

S. ICE AND 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)

T. 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)