higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N3

9 APRIL 2018

This marking guideline consists of 8 pages.

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QUESTION 1

1.1 B
1.2 A
1.3 A
1.4 C
1.5 A
1.6 B

(6 × 1) **[6]**

QUESTION 2

2.1 To ensure:

- The safety of the system
- Full and free movement
- No binding
- Correct routing
- Correct travel up and down
- Correct synchronisation of stick and control surfaces
- All safety devices are in safety
- Correct alignment (Any 6 × 1) (6)

2.2 When an aircraft makes a landing which can be described as an excessive descent tempo causing severe impact, it is called a <u>hard landing</u>. The landing causes a shock effect on the structure.

A heavy/<u>overweight/overmass landing</u> is when an aircraft makes a landing where the laid-down maximum landing weight/mass is exceeded. It has a pressure effect on the structure. (4)

2.3

- Shake the can of penetrant and spray a thin film of penetrant on the surface of the component to be tested and leave it to act for about 10 minutes.
- Respray the area and allow the film to act for a further 20 minutes (1 hour in cold conditions).
- Wipe any excess penetrant from the surface with a clean cloth.
- Spray the penetrant remover preferably on a clean cloth and wipe the area. It can also be sprayed directly onto the area and then wiped off with a clean cloth.
- Repeat the cleaning process until all visible traces of the penetrant on the surface are gone.
- Dry the area completely with a clean cloth.
- Shake the can of developer thoroughly to mix the contents.
- Allow the treated area to stand for about 10 minutes.
- As the developer dries a smooth white coating forms where the developer has been sprayed on the surface.
- Inspect the area for cracks that will show up as red lines in the white powder. (10)

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2.4
- Heat the metal to 400 °C for 20 minutes. (Soaking times in the furnace will be different for different alloys and thicknesses of metal.)
- Remove from furnace and allow to air-cool. (2)

2.5 To make the metal malleable, soft and workable. (1)
[23]

QUESTION 3

3.1 Galvanic corrosion occurs when two dissimilar metals are joined together, or are in contact with one another. The metals may differ entirely such as aluminum and steel, or they may differ only as far as their stages of heat treatment is concerned, such as aluminum which is annealed in contact with aluminum which is normalised. When these dissimilar metals are in contact and a conductor such as moisture is present, electrolyte action will take place where the insulation between the two metals has broken down. This electrolyte action causes galvanic corrosion. (5)

3.2 Inspect brazed joints for:
- Voids or porosity – an incomplete flow of brazing filler metal which can decrease joint strength and allow leakage – often caused by improper cleaning, incorrect joint clearance, insufficient filler metal, entrapped gas or thermal expansion.
- Flux entrapment – resulting from insufficient vents in the joint design – preventing the flow of filler metal and reducing joint strength as well as service life.
- Discontinuous fillets – areas on the joint surface where the fillet is interrupted – usually discovered by visual inspection.
- Base metal erosion (or alloying) – when the filler metal alloys with the base metal during brazing – movement of the alloy away from the fillet may cause erosion and reduce joint strength.
- Unsatisfactory surface condition or appearance – excessive filler metal or rough surfaces – may act as corrosion sites and stress concentrators, also interfering with further testing.
- Cracks - reducing strength and service life of the joint – may also be caused by liquid metal embrittlement. (Any 5 × 1) (5)

3.3 The two checks differ in terms of the two different angles and tools that are required. The <u>incidence check</u> is to check the incidence angle and is done using an incidence board.

The <u>dihedral check</u> is to check the dihedral angle and is done using a dihedral board. (2 × 2) (4)

3.4 These are checks that are carried out to ensure the proper alignment of an aircraft's structural components about the aircraft's centre line. (2)

3.5 Primary purpose
The primary purpose of aircraft weight and balance control is safety.
Secondary purpose
A secondary purpose is to achieve the utmost in efficiency during flight. (4)
[20]

QUESTION 4

4.1
- Pitot head
- Static vent (2)

4.2 The compass should be 'swung':
- When it is new
- When any electrical or magnetic influence in its vicinity has been altered
- After a considerable change in magnetic latitude (i.e. if the aircraft has been flown several thousand miles or kilometres north or south)
- After passing through a severe magnetic storm
- After major and minor inspections
- Whenever there is an installation or removal of any radio equipment or any other equipment which could have an effect on the compass
- At least once a year at the annual inspection
- Whenever the pilot has grounds for suspecting the accuracy of the compasss (Any 6 × 1) (6)

4.3 Inspect the entire wiring bundle for:
- Security of attachment (tightness)
- Excessive play
- Adequate support throughout its length
- Correct routing
- Damaged insulation
- Twisting
- Excessive bending
- Loose cable ties, lacing and clamps
- Chafing (where grommets are missing)
- Overheated wiring and connections
- Loose connections and terminals
- Broken wires
- Fluid contamination (Any 6 × 1) (6)

4.4
- Sharp edges
- Seized bearings
- Cable tension marks
- Foreign objects that are embedded in the pulley
- Excessive wear in one sector (Any 4 × 1) (4)

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4.5
- When repairs have been done on the fuel system.
- When modifications have been done on the fuel system.
- When parts have been replaced on the fuel system.
- When specified in the maintenance manual. (Any 3 × 1) (3)

4.6 Tolerance can be defined as:
the gap left between two moving components for the purpose of lubrication and expansion (due to friction and heat).

OR

an allowable amount of variation of a specified quantity, especially in the dimensions of a machine or part. (2)

4.7
- Dispose of all safety devices as they are removed.
- All loose studs and loose or damaged fittings should be carefully tagged to prevent their being overlooked during inspection.
- Always use the proper tool for the job and the one that fits.
- Use sockets and box end wrenches wherever possible.
- If special tools are required, use them rather than improvising.
- Drain the entire oil sump into a suitable container, straining it through a clean cloth.
- Check the oil and the cloth for metal particles and then remove the oil filter. (Any 6 × 1) (6)

[29]

QUESTION 5

5.1 Inspect for:
- Leakage
- Security of mounting
- Correct mounting of controls
- Corrosion
- Cracks (Any 2 × 1) (2)

5.2 Inspect for:
- Leakage
- Blockage of tubes (air and oil)
- Deformed tubes
- That valve functions are bypassed correctly (Any 2 × 1) (2)

5.3 Inspect:

- The spark plugs for damaged hexagons
- The threads on both the body and the screen for:
  - corrosion
  - erosion
  - cross threading
  - stripping
- The central and earth electrodes for:
  - erosion
  - cleanliness
  - cracks
- The ceramic centres for:
  - the condition of the glazing - it must not be removed by sandblasting
  - cracks
  - erosion
- The insulation of the plug screen and centre assembly by subjecting the spark plug to an insulation test
- For leakage by applying the plug to a gas leakage test with the pressure being raised to the maximum that will be experienced in the engine

(Any 4 × 1) (4)

5.4

- Wear
- Cracks
- Corrosion
- Burrs
- Overheating
- Nicks
- Scratches
- Distortion (Any 2 × 1) (2)

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5.5
- To load the parts of the engine to allow them to settle down to normal running conditions. If new seals and bearings are fitted, this run would give the seals and bearings a chance to run in first and seal properly before being subjected to sudden changes in engine operation.
- To expose any defects in material or workmanship that are not visible during assembly inspection. If the engine fails in the test cell it is not as dangerous as when it is fitted to the aircraft.
- To provide a check for the satisfactory functioning of the engine.
- The thrust or torque of the engine can be measured and will give an indication of the power output of the engine.
- The fuel and oil consumption can be determined by taking the amount of oil or fuel and measuring the drop in quantity.
- It allows for checks for unsatisfactory engine operations such as:
  - vibration
  - leaks
  - rough running
  - slow acceleration
- It allows for adjustments to be made to the engine or systems.
- It allows for fault finding and rectifications to be made.
- It reduces aircraft downtime.
- It provides more accurate measurements of engine performances.

(Any 6 × 1) (6)

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5.6

PISTON ENGINE

CAUSE	RECTIFICATION
-Mixture too rich	-Re-adjust as laid down
-Unmetered fuel too high	-Adjust as laid down
-Turbocharger waste gate not closing properly	-Remove and repair if possible as laid down
-Incorrect throttle cable tension	-Re-adjust as laid down
-Leak in turbocharger discharge pressure	-Repair or replace as necessary
-Slow-running cut-off valve sticking	-Repair faulty valve
-Obstruction in slow-running jets	-Remove obstruction
-Defective magnetos or earthing switches	-Repair or replace magneto or earthing switches
-Accelerator pump defective	-Repair or replace defective pump
-Sticking pressure-regulating valve	-Clean, repair or replace valve
-Sticking delivery nozzle	-Clean, repair or replace nozzle
-Restriction in fuel filters	-Clear or replace the filters
-Restriction in jets	-Clear or replace the jets
-Partial failure of aneroid capsules (Any 3)	-Replace aneroid capsules (Any 3)

OR

GAS TURBINE ENGINE

CAUSE	RECTIFICATION
-Defective fuel-control unit	-Clean and repair or replace fuel-control unit
-Air bleeds not operating on schedule	-Adjust air bleeds as laid down
-Insufficient fuel supply to control unit	-Check fuel system to ensure all valves are open and pumps are operative
-Fuel control main metering valve sticking	-Flush system; replace control
-Fuel control bypass valve sticking open	-Flush system; replace control
-Drain valve stuck in open position	-Replace drain valve
-Starting fuel enrichment pressure switch setting too high (Any 3)	-Replace pressure switch (Any 3)

(3 × 2) (6)
[22]

TOTAL: 100

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