higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N3

25 November 2022

This marking guideline consists of 7 pages.

Copyright reserved

QUESTION 1

1.1 1.1.1

- Place AC in rigging position. ✓
- Suspend plumb bobs on the various points under the fuselage and wings as specified in the manual. ✓
- Make markings on the level floor directly below the specified points. ✓
- Lower the aircraft and remove the jacks. ✓
- Move the aircraft out of the way so that the measurement of the markings can be done. ✓
- Make chalk lines between the points to simplify the measuring of the distances. ✓
- Measurements are then done with a steel tape or theodolite. ✓
- Compare the measurements with the specifications in the maintenance manual. ✓
- Remove all equipment and tools and store them in their right places. ✓ (Any 7 × 1) (7)

1.1.2

- Prepare the aircraft for weighing. ✓
- Determine the distances (arm) to each weighing point from the datum line. ✓
- Take the readings at each weighing point (scale). ✓
- Determine the moment of each object by multiplying the weight with the arm for each. ✓
- Add all the weights. ✓
- Add all the moments. ✓
- Divide the total moment by the total weight to find the centre of gravity. ✓
- This indicates the distance of the centre of gravity from the datum. ✓
- Enter the centre of gravity, arm and moments in the weight and balance records. ✓ (Any 7 × 1) (7)

1.2 Inspect the tail plane mounting points for:

- Cracks ✓
- Paint flaking ✓
- Loose or popped rivets ✓
- Distortion ✓
- Bending ✓
- Twisting ✓
- Broken bolts or screws ✓
- Security of attachment ✓
- Wrinkling ✓ (Any 4 × 1) (4)

Copyright reserved

1.3
- Corrosion ✓
- Chafe marks ✓
- Cracks ✓
- Bending ✓
- Distortion ✓
- Fatigue ✓
- Security of attachment ✓
- Insufficient tolerances between the turnbuckle and pulley ✓
- Loose, unsafe or missing safety devices (locking wire/clips) ✓
- Insufficient visible threads on rod end ✓
- Covering of the inspection hole (witness hole) on the barrel/rod ends ✓

(Any 5 × 1) (5)
[23]

QUESTION 2

2.1 Instrument check:
- Pointers, for excessive errors (Some indicators should show existing atmospheric pressure, existing temperatures, etc. Others should indicate zero.) ✓
- For loose or cracked cover glass faces (Replace pitot-static instruments if damaged.)
- Lights, for proper operation ✓
- Caging and setting knobs, for freedom of movement and correct operation ✓
- Any irregularity (on instruments) in the pilot reports ✓

(Any 4 × 1) (4)

2.2 Inspect brake casing/housing/calliper for:
- Misalignment ✓
- Leakage ✓
- Signs of overheating ✓
- Distortion ✓
- Cracks ✓
- Wear ✓
- Chafing ✓
- Loose bolts and nuts ✓

(Any 6 × 1) (6)

2.3 Inspect filter element for foreign material contaminants like:
- Carbon ✓
- Silica ✓
- Dust particles ✓
- Shavings ✓
- Flakes ✓
- Pieces of packing or seals ✓
- Shiny or reflective metal particles ✓
- Damaged threads – could also be damaged on the engine ✓
- Water ✓
- Sludge ✓

(Any 5 × 1) (5)

Copyright reserved

2.4
- Patch-plate repair of damage at a station. ✓
- Obtain a sheet of metal similar in thickness and properties to that of the original structure, cut out a section to cover the size of the damage. ✓
- Manufacture a reinforcing plate and trim it so that the fingers will extend over all the tubes of the station to a minimum of 1,5 times the size of the respective tube diameter. ✓
- Remove the paint from the damaged tubes. ✓
- Tack-weld the reinforcing plate on to the damaged section of the tubes. ✓
- Heat the reinforcing plate and shape it around the joint so as not to leave a gap of more than 1,5 mm. ✓
- Weld all the other reinforcing plates' edges to the cluster joint. ✓
- If required by the manufacturer, heat treatment must be applied on completion of the repair according to manufacturer's specifications. ✓ (8)

[23]

QUESTION 3

3.1
- Label each fuel injector and fuel line according to cylinder number. ✓
- Disconnect the fuel line from the injection nozzle. ✓
- Remove the injection nozzle from the engine cylinder. ✓
- Connect the fuel lines to the injection nozzles according to cylinder number. ✓
- Put the injection nozzles into four to six clear containers of equal size on a flat surface. ✓
- Turn the boost pump on, move the throttle and mixture control fully forward. ✓
- Let the prescribed amount of fuel flow into each container. ✓
- Close the throttle and mixture control, turn off the boost pump. ✓
- Measure the level of the fuel. ✓
- All containers must have the same amount of fuel. ✓
- A container with less fuel is an indication of a fuel-flow restriction. ✓
- Examine the fuel flow from each injection nozzle to make sure the fuel stream is not scattered which is an indication of blockage in the injection nozzle. ✓
- If the fuel flow is incorrect, disconnect the injection nozzle, and clean the nozzles according to the injection nozzle cleaning procedure. ✓
- Repeat the fuel-flow check. ✓
- If cleaning does not correct the scattered stream, replace the injection nozzle (fuel injection nozzles are not repairable). ✓
- Disconnect the fuel lines from the injection nozzles. ✓
- Install the injection nozzles in the cylinders and connect the fuel lines. ✓

(Concentrating on the test) (Any 8 × 1) (8)

3.2 Inspect the impulse coupling shell for:

- Cracks✓
- Rust✓
- Signs of corrosion✓

Inspect impulse coupling spring for:

- Breaks✓
- Cracks✓
- Rust✓
- Pitting✓

Inspect the impulse coupling hub for:

- Cracks✓
- Rust✓
- Signs of corrosion✓

Inspect the hub shaft and keyway for:

- Deformation✓
- Cracks✓
- Wear✓
- Signs of corrosion✓

Inspect the latching end that contacts the stop pin for a frame that is:

- Rounded✓
- Peened✓
- Not excessively worn✓

Inspect pawl-retaining rivets for:

- Security of attachment✓
- Indications of movement✓

Inspect the outer edge of the pawl for:

- Deformation✓
- Wear✓
- Correct movement✓
- Correct clearance✓ (Any 5 × 1) (5)

3.3 Inspect the:

- Header plate flanges for condition and proper attachment ✓
- Water inlet and outlet for condition and proper attachment ✓
- Radiator supports for condition and proper attachment ✓
- Header plate gasket for correct fitment ✓
- Drain and vent plug's thread for condition and proper attachment ✓
- Shell barrel and shell ends around inlet and outlet ports for condition and proper attachment ✓
- Condition of the welding between the radiator body and end shells using magnetic particle crack test ✓
- Condition and clearing of the drain hole ✓
- Condition of all tie rod threads ✓ (Any 6 × 1) (6)

[19]

Copyright reserved

QUESTION 4

4.1
- Attach an air regulator into the inlet port of the waste gate. ✓
- Cap the outlet port. ✓
- Increase the pressure. ✓
- Check that the butterfly starts to close at the required pressure and is fully closed at the maximum required pressure. ✓
- Decrease the pressure. ✓
- Check that the butterfly starts to open again at the required pressure and is fully open at the minimum required pressure. ✓
- If the butterfly chatters when actuated, it indicates that it is binding when hot and is probably defective. ✓
- Backflush it with a cleaning solvent to remove any foreign material that may be under the poppet valve seat, or replace the defective component.✓
- Repeat the test. ✓ (Any 8 × 1) (8)

4.2 Inspect the conduit or casing (rigid or flexible) for:
- Dents ✓
- Distortion ✓
- Corrosion ✓
- Proper lubrication ✓
- Sharp bending ✓
- Kinks ✓
- Chafing/Rubbing ✓
- Wear ✓ (Any 4 × 1) (4)

4.3 Procedure:
- Engines should be turned by hand through six revolutions or for a few minutes with a mechanical rig. ✓
- With pistons at top dead centre, remove surplus oil and moisture from the combustion chamber with a syringe. ✓

The following parts must be sprayed with a prescribed preservative:
- Valve springs ✓
- Valve stems ✓
- Valves ✓
- Turn the engine through six revolutions to ensure even spreading of the fluid. ✓
- Spray the interior of the cylinder through the spark-plug adapter with a corrosion inhibitor starting with No 1 cylinder, followed by the rest in firing order and the pistons at bottom dead centre. ✓
- Fill the fuel pump with preservation oil. ✓
- Remove, clean and refit or replace the fuel filters, and lock it with wire. ✓

Copyright reserved

Fit blank-off devices on all:

- Port openings. ✓
- Breathers. ✓
- Pipes. ✓
- Smear all blanking-off plates with thick grease to make them airtight. ✓
- Blank-off all air intakes and exhaust pipes. ✓ (Any 10 × 1) (10)

[22]

QUESTION 5

5.1

- Loosen the serrated throttle-control arm at the carburettor and back off the throttle stop until the throttle valve is in the 'fully closed' position. ✓
- Lock the cable drum into position with the locking pin. ✓
- Adjust the control rod to the length specified in the manual. ✓
- Attach one end of the control rod to the locked cable drum. Re-install the throttle-control arm on the carburettor in the serrations that will allow the other end of the control rod to be attached to it, connecting the control arm to the cable drum. ✓
- Loosen the cable turnbuckles until the throttle control can be locked at the quadrant with the locking pin. ✓
- With both locking pins in place, adjust the cables to the correct tension as measured with a tensiometer. ✓
- Remove the locking pins from the cable drum and quadrant. ✓
- Adjust the throttle control so that it will have a slight cushion action at two positions on the throttle quadrant – one when the carburettor throttle valve is in the 'fully open' position, and the other when it is closed to the 'idle' position. ✓
- Adjust the cushion by turning the cable turnbuckles equally in opposite directions until the throttle-control cushion is correct at the 'fully open' position of the throttle valve. ✓
- Make the turnbuckles and castle nuts safe and ensure that the jam nuts on all control rods are tightened. ✓ (Any 8 × 1) (8)

5.2

- Use of full throttle for lengthy periods ✓
- Faulty cooler-shutter operation ✓
- Incorrect use of warm air intake shutter ✓
- Defective warm air intake shutter ✓
- Weak mixture, incorrect ignition on timing ✓
- Missing baffles ✓ (Any 5 × 1) (5)

[13]

TOTAL: 100

Copyright reserved