higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N3

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This marking guideline consists of 9 pages.

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QUESTION 1

1.1
- Turn propeller so that Number 1 blade points straight down.
- Position a smooth board below the blade tip.
- Block up the board firmly in place just clear of the blade tip.
- Place a pencil mark approximately 25 mm long on the board at the midpoint of the outer edge of Number 1 blade tip.
- Turn the propeller so next blade is straight down.
- Place a thin 25 mm line on the board at the midpoint of the outer edge of the second blade tip.
- Carefully turn propeller, and repeat tracking measurement for each blade.
- Each time a line is added, measure the horizontal difference between the lines farthest apart.
- If blade track difference exceeds the allowable limits, remove the propeller and have the propeller face alignment checked and corrected.

(Any 6 × 1) or similar explanation (6)

1.2
- Weigh the aircraft inside a closed building to avoid errors that may be caused by wind.
- Wash the aircraft to get rid of all excessive dirt, grease, moisture, or any other extraneous material before weighing.
- Verify that all required equipment is installed in accordance with aircraft equipment records.
- Open fuel tank sump drain fitting and fuel isolator drain valve to flush system except the unusable fuel.
- Close all fuel drains.
- Drain the oil system and leave all the drain cocks open or service engine oil to maximum mark on the dip stick as required in the Aircraft Specification.
- Service the hydraulic brake fluid to top of clamp holding brake reservoir. Inflate tyres to the recommended operating pressures and align nose wheel with aircraft centreline.
- Place all control surfaces in neutral position, with flaps fully retracted (0°).
- Verify that there is no baggage within baggage bay and seat back.
- Check the fire extinguisher is current and full and mounted in its carrier.
- Check for the safety hammer and micro-fine cleaning cloths are in their proper place and secure.
- Check that all interior cushions and carpets are installed.
- Check foot wells, seats, baggage bay, carpets and cushions are clean, and in good condition.
- Install and secure all cowls (upper engine cowl, lower engine cowl, and belly panel).
- Ensure that all removable inspection panels are installed, access and other doors are closed.
- Rotate the propeller until it is parallel to horizontal and close doors.
- Establish the accuracy of the scales. (Any 8 × 1) (8)

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1.3 Inspect the rudder and elevator for:

Hinges for:
- Cracks
- Distortion
- Bending
- Twisting
- Broken bolts or screws
- Security of attachment

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

1.4 Inspect the sprocket for:
- Misalignment
- Security of attachment
- Corrosion
- Free movement
- Cleanliness
- Adequate lubrication
- Distortion
- Fatigue
- Teeth damage
- Chafing of guard
- Stretching
- Correct chain tension (Any 6 × 1) (6)

[24]

QUESTION 2

2.1
- Check the caging knob and make sure the instrument is uncaged.
- Check to see if the air filter is clean, clean it or replace it if necessary.
- Check the vacuum lines with a suction gage.
- Check that the suction regulator is properly adjusted.
- Check or adjust gauge calibration.
- Check to see if the pump or venturi is in operating order.
- Check the vacuum line for kinks or similar obstructions. (Any 4 × 1) (4)

2.2 Operational check of electrically driven equipment include:
- Motors
- Inverters
- Generators
- Alternators (4)

2.3 The part must be replaced. (1)

2.4
- An electrical landing gear retraction system utilizes an electrically driven motor for gear operation.
- When a switch in the cockpit is moved to the UP position, the electric motor operates.
- Through a system of shafts, gears, adapters, an actuator screw, and a torque tube, a force is transmitted to the drag strut linkages.
- The gear retracts and locks.
- The struts that open and close the gear doors are also activated.
- If the switch is moved to the DOWN position, the motor reverses and the gear moves down and locks
- Once activated the gear motor will continue to operate until an up or down limit switch on the motor's gearbox is tripped. (Any 5 × 1 or Similar) (5)

2.5
- The area should be cleaned thoroughly, and the damaged laminated plies sanded out.
- The area should be sanded to a circular or oval shape, and then tapered uniformly down to the deepest penetration of the damage.
- The diameter of the scarfed (tapered) area should be at least 100 times the depth of the penetration.
- Care should be exercised when using a mechanical sander - excess pressure on the sander can cause the sandpaper to grab, resulting in the delamination of undamaged plies.
- Next, the area should be cleaned thoroughly, the sanded area brush-coated with one coat of room-temperature catalysed resin, and the contoured pieces of resin-impregnated cloth should be applied.
- A sheet of cellophane should be taped over the built-up repair and excess resin and air bubbles worked out.
- The repair should be cured in accordance with the resin manufacturer's instructions, and the surface then sanded down (if necessary) to the original surface of the facing.
- Components whose frontal areas are exposed to high speeds are frequently coated with a rain erosion coating. (Any 8 × 1 or similar) (8)

[22]

QUESTION 3

3.1 3.1.1 Inspect all fuel lines for:

- Proper support
- Leakage
- Tightness of hose clamps
- Dents
- Kinks
- Scratches
- Corrosion
- Chafing
- Pits
- Nicks
- Stains caused by fuel leakage
- Cracks (Any 5 × 1) (5)

3.1.2

- Adequate support throughout its length
- Fluid contamination
- Condition of cable insulation (where possible)
- Damaged insulation
- Excessive play
- Correct routing
- Excessive bending
- Loose clamps
- Corrosion of the conduit or metal braid
- Loose cable and sleeve at the spark plug and distributor block ends
- Cracked cigarette ends
- Twisting
- Overheating
- Chafing
- Perishing
- Abrasions (Any 6 × 1) (6)

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3.2 3.2.1 Inspect for:

- Air or fuel leakage possibilities
- Security and condition of mounting/attachment
- Wear of shafts and bushings
- Correct mounting of controls
- Corrosion
- Cracks
- Nicks
- Burrs
- Dents
- Signs of overheating
- Distortion
- Grooves or scratches of the needle valve and seat (float type carburettors)
- Erosion
- Damaged threads
- Damaged seal or o-ring grooves (Any 6 × 1) (6)

3.2.2

- After cleaning and inspection, with end covers off, blank off oil inlet and outlet connections.
- Fill shell assembly with water through pipe plug connection.
- Apply appropriate air pressure and check for tube sheet bulging, damage and cracked tubes.
- Note location of tube leaks.
- Cores exceeding allowable repair limits shall be replaced.

OR

- Blank off the oil outlet opening.
- Apply appropriate air pressure to oil inlet while the cooler is immersed in water for 10 minutes.
- Alternatively, apply 100 KPa water pressure through the cooler for 10 minutes then 350 KPa water pressure for 10 minutes.
- Observe for leaks.
- Cores exceeding allowable repair limits shall be replaced. (5)

[22]

QUESTION 4

4.1 It is the result from the following processes:

- Creeping
- Overheating and melting
- Low-cycle and high-cycle fatigue due to thermal and thermo-mechanical factors
- Corrosion and fatigue cracking
- Chemical and Intercrystalline corrosion
- Erosion

Other factors of less importance:
- Rupture
- Creep deflection
- High-cycle fatigue
- Corrosion
- Oxidation
- Erosion
- Rubs/Wear
- Foreign object damage
- Cyclic duty application
- Thermal mechanical fatigue (Any 4 × 1) (4)

4.2
- Remove the upper spark plug from each cylinder.
- Move the piston to bottom dead centre on the power stroke.
- Insert the borescope through the upper vacant spark plug hole on the engine cylinder and examine the combustion chamber, the top of the piston, the internal surfaces of each cylinder, including the exhaust valve and exhaust valve seat.
- Move the piston to bottom dead centre at the end of the intake stroke.
- Insert the borescope probe through the upper spark plug hole and examine the intake valve and intake valve seat.
- Record all results and corrective action in the 100-Hour Inspection checklist and include it in the engine logbook.

Check for:
- Scoring, pitting, erosion, burning or damage valve seat inserts.
- Protrusion into combustion chamber of the spark plug heli-coils.
- Carbon deposits and excess oil.
- Discolouration on the circumference of the intake and exhaust valve faces.
- Cracks and erosion on the intake and exhaust valve faces.
- Cylinder bore for scoring or rubbing.
- Cylinder bore for corrosion.
- Excessive oil in the cylinder.
- Piston crown for erosion.
- Piston crown for damage. (Procedure × 3, Check's × 3) (6)

4.3 Inspect the cable for:
- Corrosion
- Wear
- Fraying
- Correct travel
- Backlash
- Kinks
- Damaged end fittings
- Free movement
- Sufficient lubrication of pivot points and sliding parts

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Inspect the conduit or casing (rigid or flexible) for:

- Dents
- Distortion
- Corrosion
- Kinks
- Tight or sharp bending (Any 6 × 1) (6)

4.4
- Connect the pressure gauge to the fuel inlet of the carburettor, fuel injector or fuel injection pump.
- A fuel flow meter that is calibrated in litres/hour is tapped into the fuel supply line.
- During the running of the engine readings should be taken and recorded as laid down, e.g. every 15 minutes.
- The fuel consumption calculation is made at the end of the required time.

(Any 3 × 1) (3)

[19]

QUESTION 5

5.1
- Certain materials and new spare parts should be kept available such as gaskets, seals, and packing's (make sure the new parts are not brittle, torn, cut, or cracked and do not have flashings, deterioration/wear or deformities.)
- Before installing a part, complete a check of its shelf-life.
- Any parts that were found damaged and cannot be repaired.
- New locking wire (safety wire), lock washers, lock nuts, tab locks, tab washers, and cotter pins were used. (Any other relevant) (4)

5.2
- Start and the engine as per instructions in the manual.
- Adjust the throttle for the engine to run-up to 2 000 r/min.
- Record the oil pressure reading.
- Determine the extent oil pressure is out of tolerance, turn off the engine.
- To increase oil pressure, use a screwdriver in the screw slot to turn the oil pressure adjustment screw on the oil pressure relief valve clockwise.
- To decrease oil pressure, use a screwdriver in the screw slot to turn the oil pressure adjustment screw on the oil pressure relief valve counter-clockwise.
- Start the engine and repeat the previous steps until the oil pressure is within specified limits. (Any 5 × 1) (5)

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5.3
- Improper start technique being used.
- No fuel is reaching the engine.
- Excessive air in fuel system.
- No ignition - gives wet stacks.
- Fuel manifold adapters improperly installed.
- Fuel pump failure
- Contaminated fuel system.
- Fuel control unit bypass valve is stuck in open position.
- Start control defective.
- Flow divider and dump valve stuck. (Any relevant 4 × 1) (4)

[13]

TOTAL: 100

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