higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T20**(E)**(A9)T

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N3

(11041113)

9 April 2019 (X-Paper)
09:00–12:00

This question paper consists of 8 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
AIRCRAFT MAINTENANCE THEORY N3
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Sketches must be large, neat and fully labelled.
5. Keep questions and sub-sections of questions together.
6. Write neatly and legibly.

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SECTION A: GENERAL

QUESTION 1

Various options are given as answers possible to the following questions. Choose the answer and write only the letter (A–C) next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 When using the Ardrox 996 dye penetrant crack detection method there are three cans of fluids which are called the ...

A penetrant, cleaner and visualiser.
B penetrant, penetrant remover and developer.
C dye, cleaner and developer.

1.2 When carrying out air frame rigging checks the following has to be taken into consideration:

A Lock all the control surfaces and the cockpit controls in the neutral position.
B Wash the aircraft of all extraneous dirt.
C Place the aircraft in rigging position.

1.3 The following are gyroscopic instruments:

A Turn and bank indicator and the artificial horizon
B Artificial horizon and the altimeter
C Directional indicator and the altimeter

1.4 When doing an overhaul on an aircraft engine its components are cleaned only after a preliminary inspection because ...

A a failure may often be detected from the residual deposits of metal particles.
B the cleaning solvents will cause defects to become invisible after cleaning.
C it is just an unwritten convenient rule.

1.5 A propeller blade is visually inspected for condition during routine maintenance. This involves checks for:

A Bending, distortion, carbonising and chips
B Chord wise cracks, burrs, nicks and dents
C Corrosion, scratches, distortion and gummy deposits

(5 × 1) **[5]**

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QUESTION 2

2.1 On the bulkheads of an aircraft, fairleads are found that is used to guide the cables and prevent them from making contact with the metal structure.

During a flying control system inspection, what would these fairleads be inspected for? (3)

2.2 When a hard landing has been carried out with an aircraft the whole aircraft structure, engines and landing gear has to be inspected.

What would the engine mounting structure be inspected for during this inspection. (3)

2.3 Name TWO common arrangements for the instruments to receive pressure from the pitot-static system. (2)

2.4 Many pitot-static systems are fitted with drains at the low points in the system to remove any moisture during maintenance. However there are systems that are not equipped with drains and this is especially a problem if the water freezes during flight. Therefore these systems have to be manually cleaned out during maintenance. Dry compressed air or nitrogen may be blown through the lines of the system.

State TWO precautions to be followed to ensure that the instruments are not damaged during the procedure. (2)

2.5 When inspecting an electrical system a bonding jumper (wire) is found that is broken and needs replacement.

What precautions must be kept in mind when replacing the bonding jumpers? (2)

2.6 A leak on the landing gear circuit is suspected when a pool of hydraulic fluid is found under an aircraft that has been parked for a while. Many of the leaks are found at system fittings.

How can this leak on the system fitting be fixed? (2)

2.7 A hydraulically operated flap system is inspected during routine overhaul. After the inspection the flaps system is functionally tested for correct operation.

Explain the procedure to follow during the functional test of the flap system. (4)

[18]

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QUESTION 3

3.1 A piston engine has been overhauled, reassembled, tested, and installed on the air frame mounting structure. The next step is to carry out a ground run but before that a final inspection of the engine installation is completed.

What does this inspection entail? (4)

3.2 During a piston engines after installation inspection, the controls will be checked for correct installation and functioning.

Name THREE controls that are involved that must be checked. (3)

3.3 Engine ground run testing is done for a variety of reasons.

When would it be necessary to carry out these test runs? (3)

3.4 During a ground run test of a gas turbine engine equipped with a pneumatic starter, the engine experiences a low engine rotational speed during starting.

What could be the cause of the problem? (3)

3.5 During routine maintenance of a piston engine the oil will be drained and the filter element will be either cleaned or replaced depending on the type of filter used. After draining the oil it is inspected for contamination.

What are the contaminants that may be found in the oil after draining it into a clean container? (2)

3.6 Explain how the inspection of spark plugs is done before new or reconditioned spark plugs are installed on a piston engine to ensure that they will function correctly. (4)

3.7 The metering jets fitted to the carburettor have to be checked for condition during an inspection.

Describe what you would look for to determine the condition of the jets. (4)

[23]

TOTAL SECTION A: 46

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SECTION B: AIR FRAMES

QUESTION 4

4.1 A crack is found on bulkhead on a light aircraft and needs to be repaired. FIGURE 1 shows the portion of the bulkhead that is cracked.

Explain how this kind of repair can be done.

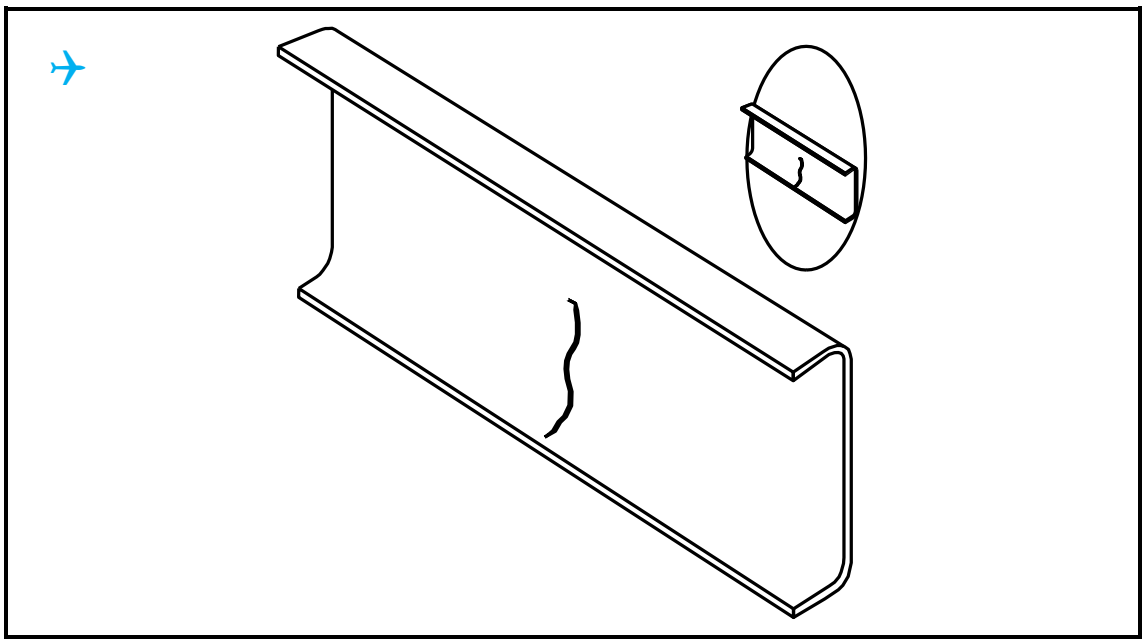


FIGURE 1 (5)

4.2 Before metal was used for construction of air frames on aircraft, they were normally covered with fabric on a truss type construction. Some newer aircraft are made in the same way.

Name the TWO methods that can be used when the air frame is covered during replacement of the fabric after severe damage. (2)

4.3 Refer to FIGURE 2 and answer the questions.

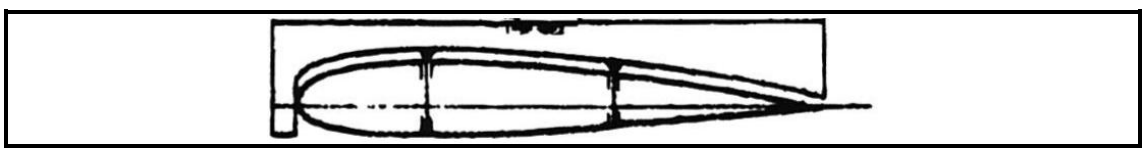


FIGURE 2

4.3.1 Name the instrument illustrated in FIGURE 2.

4.3.2 What is the instrument used for?

(2 × 1) (2)

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4.4 A gas turbine engine oil cooler is overhauled in the workshop during engine overhaul. One of the processes that the oil cooler will undergo is flushing to remove all foreign matter from the cooler.

Summarize this flushing process. (4)

4.5 In the landing gear workshop an oleo leg is disassembled, cleaned, inspected, necessary repairs completed, reassembled, tested functionally, filled with fluid, bled and inflated.

Explain the inspection of the oleo leg during this process. (4)

4.6 An aircraft wing is replaced after extensive damage was caused due to the aircraft flying through a flock of birds. After replacement an inspection and functional test of the control system is required to ensure correct installation and operation.

What would appear on the checklist? (4)

4.7 The artificial horizon, directional indicator and turn and bank indicator of the older type are fitted with gyros for operation. These gyros are normally powered by vacuum, pressure, or electric motors.

How can we ensure that vacuum and pressure powered gyroscopic instruments operate correctly? (2)

4.8 At regular intervals aircraft are weighed and its centre of gravity is determined.

Give a brief summary of how the centre of gravity is determined. (4)

[27]

TOTAL SECTION B: 27

SECTION C: ENGINES

QUESTION 5

5.1 Engine and air frame components has to be inspected during overhauls and invisible defects must be found to avoid breakdown of these components.

Summarise the procedure to be followed when applying the Eddy Current crack detection process. (8)

5.2 When an aircraft engine is overhauled it will go through various workshop processes for cleaning, inspection, crack detection, dimensional checking etc. after removal from the air frame.

Name THREE of these processes that the engine will go through. (3)

5.3 During the installation of the engine the engine controls will be connected to the engine. However, it is necessary to give it an inspection to ensure that they are serviceable before attachment.

What would this inspection entail? (2)

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5.4 When a piston type aircraft engine is tested in the test cell after an overhaul the fuel and oil consumption is checked.

How is the fuel consumption checked in the test cell and what equipment is required to do so? (4)

5.5 After installation of an overhauled variable pitch propeller on an aircraft engine it is important to check its functioning.

Describe the testing of the propeller during a ground run to verify that it's functioning correctly. (Any type - piston **or** turboprop but name the type.) (6)

5.6 The testing of superchargers and boost control systems will normally be done after replacement and repairs. The test would include doing an engine run testing the system and thereafter an inspection of the system to check its serviceability. There are several precautions that need to be taken during this ground run test.

Give FOUR precautions to be taken during the ground run. (4)
[27]

TOTAL SECTION C: 27
GRAND TOTAL: 100

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