SEMAE3174

Overhauling components of aircraft navigational and computing equipment

Overview

This standard identifies the competences you need to carry out overhauling activities on components of aircraft navigational and computing equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar.

It covers equipment used in both fixed wing and rotary winged aircraft, and covers a range of equipment such as distance measuring equipment (DME), very high frequency omnidirectional range (VOR), instrument landing system (ILS), auto direction finder (ADF), global positioning system (GPS), Doppler, tactical air navigation (TACAN), homing, inertial navigation system, Decca and compass, as applicable to the aircraft types. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all `lifed' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Your responsibilities will require you to comply with organisational policy and procedures for the overhauling activities undertaken and to report any problems with the overhauling activities, or with the tools and equipment used that you cannot personally resolve or that is outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area and that all necessary job/task documentation is completed accurately and legibly. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach to applying overhauling procedures to aircraft navigational and computing equipment. You will understand the dismantling and reassembly methods and procedures used, and their application. You will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

You will understand the safety precautions required when carrying out the overhauling

activities. You will be required to demonstrate safe working practices throughout and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the relevant overhauling schedules to carry out the required work
3. establish the components to be removed and where appropriate, mark/label components to aid re-assembly
4. carry out the overhaul to the agreed level, using the correct tools and techniques
5. ensure that all removed components are correctly identified and stored in the correct location
6. replace/refit components using appropriate methods and techniques
7. carry out checks on the overhauled equipment using correct procedures
8. report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule
9. complete the relevant documentation, in accordance with organisational requirements
10. dispose of unwanted components, waste materials and substances, in accordance with safe working practices and approved procedures
11. deal promptly and effectively with problems within your control and report those that cannot be solved
12. leave the equipment in a safe and appropriate condition, free from foreign object debris

Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures and the specific safety precautions to be taken when overhauling aircraft navigational equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft navigational equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines)
2. the hazards associated with overhauling aircraft navigational equipment, and with the tools and equipment used, and how to minimise them and reduce any risks
3. the requirements and importance of understanding and applying human factors as defined by the regulatory requirements and the potential impact if these are not adhered to
4. the protective equipment that you need to use for both personal protection (PPE) and protection of the navigational equipment
5. what constitutes a hazardous voltage and how to recognise victims of electric shock
6. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
7. how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft navigational systems and other documents needed in the overhauling process
8. how to carry out currency/issue checks on the specifications you are working with
9. terminology used in aircraft navigational equipment, and the use of system diagrams and associated symbols
10. the principles of operation of the aircraft navigational equipment being overhauled, and the performance characteristics and function of the components within the equipment
11. the techniques used to remove components from aircraft navigational equipment, without damage to the components or surrounding structure (such as

de-soldering components, applying electrostatic discharge (ESD) protection procedures)
12. the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections
13. the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices)
14. the importance of using the specified fasteners for the particular installation and why you must not substitute others
15. why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
16. the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved
17. the need to correctly label and store components, and to check that replaced components have the correct part/identification markings
18. the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul
19. the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure
20. the quality control procedures to be followed during the overhauling operations
21. procedures for ensuring that you have the correct tools, equipment, components and fasteners for the activities
22. methods of lifting, handling and supporting the components/equipment during the removal and replacement activities
23. the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken
24. why electrical bonding is critical and why it must be both mechanically and electrically secure
25. how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul
26. the tools and equipment used in the overhauling activities and their calibration/care and control procedures
27. why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities
28. the problems that can occur with the overhauling operations and how these can be overcome
29. how to recognise defects (such as poor seals, misalignment, incorrectly seated

plugs and sockets, ineffective fasteners, foreign object damage or contamination)
30. the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation
31. the procedure for the safe disposal of waste materials and scrap components
32. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

Scope/range related to performance criteria

1.

Carry out all of the following during the overhaul:

1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
1.2 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
1.3 provide and maintain safe access and working arrangements for the overhauling area
1.4 obtain the correct tools and equipment for the activity and check that they are in a safe, tested and usable condition and within current certification/calibration date
1.5 where appropriate, apply electrostatic discharge (ESD) protection procedures
1.6 carry out the overhauling activities, using approved techniques and procedures at all times
1.7 ensure that the equipment is maintained free from damage and foreign objects
1.8 return all tools and equipment to the correct location on completion of the activities

2.

Carry out the overhauling activities to unit level on three of the following types of aircraft navigational equipment:

2.1 distance measuring equipment (DME)
2.2 re-transmission systems
2.3 very high frequency omnidirectional range (VOR)
2.4 Doppler
2.5 instrument landing system (ILS)
2.6 homing
2.7 auto direction finder (ADF)
2.8 gyro
2.9 global positioning system (GPS)
2.10 Decca
2.11 tactical air navigation (TACAN)
2.12 compass
2.13 inertial navigation system
2.14 computing sub-systems
2.15 microwave landing system (MLS)

3.

Carry out all of the following activities, as applicable to the equipment being

overhauled:

3.1 cleaning parts prior to dismantling
3.2 checking components for serviceability
3.3 pre-disassembly checks and tests
3.4 replacing all `lifed' items (seals, dust caps)
3.5 disconnecting and de-soldering electrical connections
3.6 replacing all damaged or defective components
3.7 reassembling equipment
3.8 removal of earth bonding
3.9 setting and adjusting/calibrating replaced components (such as power output, voltage)
3.10 removal of conformal coating
3.11 removing cable securing devices
3.12 making mechanical connections
3.13 removing bolt securing devices and mechanical fasteners
3.14 soldering electrical connections
3.15 carrying out earth bonding
3.16 dismantling equipment to unit/sub-assembly level
3.17 installing cable securing devices
3.18 dismantling units to component level
3.19 tightening fastenings to the required torque
3.20 marking/labelling of components to aid reassembly
3.21 re-instating conformal coating
3.22 securing components using mechanical fasteners and threaded devices
3.23 applying locking and retaining devices (such as circlips, pins, wire locking)

4.

Carry out overhauling activities to component level on three of the following navigational equipment components:

4.1 aerials
4.2 satellite beacons
4.3 control units
4.4 transmitter units
4.5 transponders
4.6 navigation display units(including `head-up')
4.7 receiver units
4.8 analogue/digital converters (A- D/D-A)
4.9 power supply units
4.10 computers
4.11 microwave/acoustic generators
4.12 compensation units
4.13 interface units
4.14 processors
4.15 transducers
4.16 amplifiers
4.17 other specific component

5.

Replace a range of navigational equipment components, to include eight of the following:

- 5.1 switches
- 5.2 plugs/sockets/terminations
- 5.3 armatures
- 5.4 relays
- 5.5 batteries
- 5.6 wires/cables
- 5.7 gaskets
- 5.8 fuses
- 5.9 wiring harness (complete)
- 5.10 breakers/contacts
- 5.11 desiccant
- 5.12 fairings/panels
- 5.13 printed circuit boards
- 5.14 filament lamps/light emitting diodes
- 5.15 chassis components
- 5.16 electronic components (such as resistors, capacitors)
- 5.17 transparencies/lenses
- 5.18 transformers
- 5.19 screws/bolts/washers
- 5.20 other specific component

6.

Carry out checks and tests on the overhauled equipment, to include three of the following:

- 6.1 visual inspection for completeness and freedom
- 6.2 signal injection tests from damage or foreign objects
- 6.3 power output
- 6.4 soak test
- 6.5 continuity checks
- 6.6 bonding tests
- 6.7 standard serviceability test
- 6.8 voltage standing wave ratio (VSWR) checks
- 6.9 'special-to-type' tests

7.

Overhaul aircraft navigational equipment in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 7.2 Ministry of Defence (MoD)
- 7.3 Military Aviation Authority (MAA)
- 7.4 Aerospace Quality Management Standards (AS)
- 7.5 Federal Aviation Authority (FAA)
- 7.6 BS, ISO or BSEN standards and procedures
- 7.7 customer standards and requirements
- 7.8 company standards and procedures
- 7.9 aircraft manufacturer's requirements

8.

Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

8.1 job cards
8.2 computer records
8.3 aircraft service/flight log
8.4 aircraft log book
8.5 permit to work/formal risk assessment

Behaviours

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

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