SEMAE3319

Maintaining oxygen systems on aircraft

Overview

This standard identifies the competences you need to carry out maintenance activities on aircraft oxygen systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which store, regulate and deliver oxygen to the passengers and/or crew, including bottles, relief valves, shut-off valves, outlets, regulators, masks and walk-around bottles. The maintenance activities will include the removal, fitting and testing of a range of oxygen components. You will be expected to use the approved procedure for correctly isolating the system before breaking into the system circuit. You will remove the required components and fit approved replacements, as appropriate. You will then need to recharge the system, and test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Your responsibilities will require you to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft oxygen systems. You will understand the removal, fitting and testing methods and procedures, and their application, along with the oxygen system maintenance requirements. You will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

You will understand the safety precautions required when working on aircraft oxygen systems, especially those for ensuring system cleanliness and the avoidance of hydrocarbon contamination. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 35 Oxygen.
2. To display competence in this standard, it is necessary to both remove and fit aircraft oxygen system components. You must remove components; however, you may fit a replacement component where the original was previously removed by another person. You should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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 maintenance schedules to carry out the required work
3. carry out the maintenance activities within the limits of your personal authority
4. carry out the maintenance activities, and replace components in the specified sequence and in an agreed timescale
5. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
6. complete relevant documentation in accordance with organisational requirements
7. dispose of waste materials in accordance with safe working practices and approved procedures
8. leave the aircraft and system in a safe and appropriate condition, free from foreign object debris on completion of the activities

Knowledge and understanding

You need to know and understand:

1. the specific safety practices and procedures that you need to observe when working on aircraft oxygen systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
3. the importance of maintenance on aircraft oxygen systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
4. 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
5. the hazards associated with carrying out maintenance activities on aircraft oxygen systems, and with the tools and equipment used, and how to minimise them and reduce any risk
6. the protective equipment that you need to use for both personal protection (PPE) and protection of the aircraft
7. what constitutes a hazardous voltage and how to recognise victims of electric shock
8. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
9. the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of FOD to the safety of the aircraft
10. how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft oxygen systems, and other documents needed in the maintenance activities
11. how to carry out currency/issue checks on the specifications you are working with

12. terminology used in aircraft oxygen systems and the use of system diagrams and associated symbols
13. the various types of pipe and component that make up the aircraft oxygen system (such as rigid pipes; air hoses; pipe connectors; pipe sealing and supporting devices; valves used for pressure relief, flow and directional control; pumps; mechanical and electrical control devices)
14. why electrical bonding is critical, and why it must be both mechanically and electrically secure
15. the principles of operation of the oxygen system being worked on (such as system layout, sources of oxygen (such as bottles, chemical generators, ground supply); oxygen control and distribution; oxygen indication and warning)
16. the techniques used to remove components from aircraft oxygen systems without damage to the components or surrounding structure (such as removal of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
17. the various mechanical fasteners that will need to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
18. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
19. the importance of ensuring that any components or pipe ends are correctly covered/protected
20. recognition of contaminants and the problems they can create; the effects and likely symptoms of contamination in the system (especially hydrocarbons in oxygen systems)
21. the need to label and store correctly components that require repair or overhaul and to check that replacement components have the correct part/identification markings and accompanying release documentation
22. how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring the correct tightness of pipe fittings and connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking security of joints and that the system is safe to re-charge)
23. how to make adjustments to components/assemblies to ensure that they function correctly (such as pressure deployment settings and their effect on the system, travel and working clearance)
24. why securing devices need to be tightened to the correct torque, locked and

labelled, and the methods to be used
25. the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
26. why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
27. how to carry out routine checks and servicing of the aircraft oxygen system (including checking for leaks, checking and changing filters, changing masks and adjusting or replacing regulator)
28. the types of test to be carried out on the aircraft oxygen system and the test equipment to be used
29. the methods and procedures to be used to carry out the various tests on the oxygen system
30. the need to apply test pressures in incremental stages, and to check all readings and pressures at each stage
31. how to record the results of each individual test and the documentation that must be used
32. how to analyse the test results and make valid decisions about the acceptability of the aircraft oxygen system
33. the procedures to be followed if the equipment or system fails to meet the test specification
34. 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
35. the procedure for the safe disposal of waste materials and scrap components
36. the extent of your own authority 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 maintenance of the aircraft oxygen system:

1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
1.4 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
1.5 ensure the safe isolation of the oxygen equipment before breaking into the system
1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
1.7 use approved removal, fitting and testing techniques and procedures at all times
1.8 return tools and equipment to the correct storage location on completion of the activities
1.9 ensure that work carried out is correctly documented and recorded
1.10 ensure that any outstanding tests are correctly documented

2.

Carry out maintenance on two of the following parts of the aircraft oxygen system:

2.1 oxygen supply
2.2 portable liquid oxygen (LOX) equipment
2.3 crew supply
2.4 indicating
2.5 passenger supply
2.6 emergency supply

3.

Remove and fit four different aircraft oxygen system components (at least one must be from group A):

Group A

1. oxygen generator
2. oxygen regulator
3. portable LOX equipment
4. LOX converter/pack
5. concentrator
6. manifold
7. oxygen cylinder

8. oxygen candle
9. fill, build-up and vent valve

Group B

10. therapeutic masks
11. pipes and hoses
12. face mask and allied equipment
13. walk around set
14. filter
15. sensors/transmitters
16. control valves
17. gauges/wiring/switches/plugs
18. check valve
19. ground connector
20. other specific components

1.

Carry out fifteen of the following maintenance activities:

1.1 removing access panels and covers to expose components to be removed
1.2 carrying out fault diagnosis and system checks
1.3 preparing the system for maintenance (such as isolating, de-pressurising)
1.4 inspecting on board oxygen equipment
1.5 refitting components in the correct position, orientation and alignment
1.6 disconnecting electrical connections
1.7 removal of bonding
1.8 setting and adjusting replaced components
1.9 disconnecting/removing hoses and pipes (such as travel, working clearance)
1.10 removing securing devices and mechanical fasteners
1.11 making mechanical connections
1.12 supporting equipment to be removed
1.13 making electrical connections
1.14 dismantling equipment to an appropriate level
1.15 carrying out bonding
1.16 covering (protecting) exposed components, wires,
1.17 torque loading pipework or vents
1.18 purging and recharging oxygen system
1.19 checking components for serviceability
1.20 carrying out system functional checks
1.21 replacing damaged/defective components
1.22 replacing single use items such as seals, filters, gaskets
1.23 ensuring that replacement components have the correct part numbers

1.24 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
1.25 applying bolt locking methods (such as split pins, wire locking, lock nuts)

2.

Service/check the aircraft oxygen system, to include carrying out all of the following:

2.1 checking the system for leaks
2.2 replacing filters
2.3 testing the crew oxygen system
2.4 performing auto oxygen system deployment check
2.5 testing the passenger oxygen system (as applicable)
2.6 checking the indicating systems (such as pressure drop, temperature warning)

3.

Carry out three of the following tests on the aircraft oxygen system:

3.1 leak test
3.2 reduced system test
3.3 pressure test
3.4 built in test equipment (BITE) test
3.5 system charging
3.6 'special-to-type' tests

Using one of the following:

7. aircraft power source/system
8. ground test rig

1.

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

1.1 job cards/work sheets
1.2 computer records
1.3 aircraft technical log
1.4 aircraft cabin log
1.5 aircraft log book

2.

Carry out maintenance on aircraft oxygen system components in compliance with one of the following:

2.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
2.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)Ministry of Defence (MoD)
2.3 Military Aviation Authority (MAA)
2.4 Aerospace Quality Management Standards (AS)
2.5 Federal Aviation Authority (FAA)
2.6 aircraft maintenance manual/approved change documentation (service

bulletin)
2.7 manufacturers standards and procedures

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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