SEMAE3145

Removing and replacing components of aircraft fuel and lubrication systems

Overview

This standard identifies the competences you need to carry out the removal and replacement of components of aircraft fuel and lubrication systems, in accordance with approved procedures. It covers both fixed wing and rotary winged aircraft and includes a range of fuel and lubrication equipment associated with propulsion units/power plant, auxiliary engines and transmission systems, main and auxiliary fuel tanks and in-flight refuelling equipment, as applicable to the aircraft type.

You will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the components to be removed. The removal and replacement activities will include taking all necessary safeguards to isolate the system, drain fluids, support and lift removed and replaced parts, and will also include replacing faulty equipment at component or unit level, replenishing fluids, setting and adjusting replaced components, and leaving the system in a safe condition and ready for testing.

Your responsibilities will require you to comply with organisational policy and procedures for the removal and replacement 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, 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 removal and replacement techniques and procedures to aircraft fuel and lubrication equipment and systems. You will understand the removal and replacement methods and procedures, and their application, along with the systems maintenance requirements. You will know how the fuel and lubrication systems and 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 removal and replacement activities, and for ensuring that the equipment is replaced to the required standard. In addition, you will have sufficient knowledge of these components to ensure that they are fit for

purpose and meet the specifications, thus providing a sound basis for carrying out the replacement.

You will understand the safety precautions required when working on the aircraft fuel and lubrication system, especially those relating to the risk of spillage, fire and explosion. 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 To display competence in this standard, it is necessary to both remove and replace components from aircraft fuel and lubrication systems. You must remove components; however, you may fit a replacement component where the original was previously removed by another person.

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 aircraft manuals and publications to carry out the required work
3. establish and where appropriate, mark component orientation for re-assembly
4. ensure that any stored energy or substances are released safely and correctly
5. carry out the removal and replacement activities, within the limits of your personal authority
6. remove and replace the required components, using approved tools and techniques
7. take suitable precautions to prevent damage to components and the surrounding structure
8. complete the relevant documentation, in accordance with organisational requirements
9. label and store (in an appropriate location) components that require repair or overhaul
10. dispose of waste materials and scrap components, in accordance with safe working practices and approved procedures
11. leave the aircraft and the fuel and lubrication system in a safe and appropriate condition, free from foreign object debris and in a condition ready for testing

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 fuel and lubrication systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the importance of maintenance on, and impact upon (extended twin operations procedures) ETOpS systems, legislation and local procedures
3. the safety procedures that must be carried out before work is started on removing the fuel system components (such as displaying warning notices, ensuring adequate fire fighting equipment)
4. the hazards associated with removing aircraft fuel and lubrication system components, and with the tools and equipment used (such as handling fluids, flammable fluids, fire and explosion, misuse of tools) and how to minimise them and reduce any risks
5. 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
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. how to extract and use information from aircraft manuals, history/maintenance reports, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft fuel and lubrication systems, and other documents needed in the removal and replacement process
10. how to carry out currency/issue checks on the specifications you are working with
11. terminology used in aircraft fuel and lubrication systems, and the use of diagrams and associated symbols

12. the various types of pipes and components that make up the aircraft fuel and lubrication system (such as rigid pipes, flexible hoses, pipe connectors, pipe sealing and supporting devices, valves used for flow and change over, fuel and lubrication pumps, pressure intensifiers, mechanical and electrical control devices)
13. the principles of operation of the aircraft fuel or lubrication system being worked on, and the performance characteristics and function of the components within the circuit
14. the techniques used to remove components from aircraft fuel and lubrication systems, without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, proof marking, extraction of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
15. the importance of applying electrostatic discharge (ESD) procedures when working on sensitive equipment or devices
16. the various mechanical fasteners that will need to be removed and replaced and their method of removal and replacement (such as threaded fasteners, special securing devices)
17. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking in of the connections
18. methods of lifting and supporting the components/equipment during the removal and replacement activities
19. the importance of ensuring that the work area is free from dirt, swarf and foreign object damage and of ensuring that any exposed 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 fuel or lubrication system
21. the need to correctly label and store components that require repair or overhaul and to check that replacement components have the correct part/identification markings
22. how to re-connect components into the system (such as the use of gaskets/seals and jointing/sealing compounds; ensuring the correct tightness of pipe fittings and valve connections; eliminating stress on pipework/connections; ensuring that pipework is supported at suitable intervals; carrying out visual checks of all components; checking the security of joints and that the system is safe to re-fill/pressurise)
23. how to make adjustments to components/assemblies to ensure that they function correctly (such as flow and pressure settings and their effect on the

system, travel and working clearance)
24. why electrical bonding is critical and why it must be both mechanically and electrically secure
25. why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
26. the tools and equipment used in the removal and replacement activities and their calibration/care and control procedures
27. the need to control and account for all tools and equipment used during the removal and replacement activity and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
28. the problems that can occur with the removal/replacing operations and how these can be overcome
29.
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
30.
the procedure for the safe disposal of waste materials, scrap components, oils and fluids
31. the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

Scope/range related to performance criteria

1.

Carry out all of the following during the removal and replacement activity:

1.1 obtain clearance to work on the aircraft and observe all relevant safety procedures
1.2 obtain and use the appropriate documentation (such as job instructions, aircraft manuals, technical instructions, and other relevant maintenance documentation)
1.3 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
1.4 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 ensure the safe isolation and depressurisation of the fuel and lubrication system before breaking into the system
1.6 ensure that all relevant safety devices and mechanical/physical locks are in place (where appropriate)
1.7 where appropriate, apply electrostatic discharge (ESD) protection procedures
1.8 use approved removal and replacement techniques and procedures at all times
1.9 ensure that components and surrounding structures are maintained free from spillages, damage and foreign objects
1.10 return all tools and equipment to the correct location on completion of the activities

2.

Remove components from three of the following aircraft fuel and lubrication systems, and replace components from three of the following aircraft fuel and lubrication systems:

2.1 propulsion/power plant fuel system
2.2 in-flight refuelling equipment
2.3 auxiliary engine fuel system
2.4 auxiliary fuel tank
2.5 propulsion/power plant lubrication system
2.6 external/drop down fuel tanks
2.7 auxiliary engine lubrication system
2.8 main fuel tanks
2.9 oil storage system
2.10 fuel drain and jettison system
2.11 transmission system
2.12 other specific system

3.

During the activities identified in scope 2 above, you must cover the removal and replacement of the following:

Major fuel or lubrication components: Remove and replace three of the following:

1. pumps
2. fuel manifold
3. control valves (drain, bleed, change-over valves, dump)
4. reservoirs/supply tanks
5. pressure intensifiers
6. fuel/oil cooling units
7. cylinders
8. electrical controls (solenoids, motors, pressure switches)
9. compressor
10. actuating mechanisms
11. fuel and de-fuel connections
12. carburettors
13. injectors
14. safety devices
15. fuel flow regulators
16. other specific components

Other fuel and lubrication components: Remove and replace four of the following:

17. fuel filters
18. fuel injectors
19. gaskets and seals
20. gauges
21. oil filters
22. rigid pipework
23. sensors
24. magnetic chips
25. strainers
26. hoses
27. dip sticks, drip sticks, drop sticks
28. other specific components

1.

Carry out all of the following removal and replacement activities:

1.1 releasing stored pressure (where appropriate)
1.2 replacing all 'lifed' items (seals, filters, gaskets)
1.3 draining and removing fluids (where appropriate)
1.4 positioning and aligning replaced components
1.5 disconnecting electrical connections

1.6 making mechanical connections
1.7 disconnecting/removing hoses and pipes
1.8 making electrical connections
1.9 ensuring that any part dismantled components are secure/supported
1.10 tightening fastenings to the required torque
1.11 replacing fluids and bleeding the system
1.12 applying and removing covering/protection to exposed components, wires, pipework or vents
1.13 making `off-load' checks before re-pressurising
1.14 re-pressurising the system (where applicable)
1.15 checking components for serviceability
1.16 use of ground support equipment
1.17 replacing damaged/defective components
1.18 labelling (and storing in the correct location) components that require repair or overhaul
1.19 setting, and adjusting replaced components (such as travel, working clearance)
1.20 applying bolt locking methods (such as split pins, wire locking, lock nuts)
1.21 fitting blanks to open systems to prevent entry of contaminating debris
1.22 securing components by using mechanical fasteners and threaded devices

2.

Remove and replace aircraft fuel and lubrication components in compliance with one of the following:

2.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
2.2 extended twin operations procedures (ETOpS) (where appropriate
2.3 Ministry of Defence (MoD)
2.4 Military Aviation Authority (MAA)
2.5 Aerospace Quality Management Standards (AS)
2.6 Federal Aviation Authority (FAA)
2.7 BS, ISO or BSEN standards and procedures
2.8 customer standards and requirements
2.9 company standards and procedures
2.10 aircraft manufacturer's requirements

3.

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

3.1 job cards
3.2 computer records
3.3 aircraft service/flight log
3.4 aircraft log book
3.5 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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Developed by	Enginuity
Version Number	3
Date Approved	30 Mar 2021
Indicative Review Date	01 Mar 2024
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMAE3145
Relevant Occupations	Engineer, Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
Suite	Aeronautical Engineering Suite 3
Keywords	Aeronautical; engineering; aircraft fuel and lubrication; propulsion; units/power plant