SEMAE3312

Maintaining fuel systems on aircraft

Overview

This standard identifies the competences you need to carry out maintenance activities on aircraft fuel systems, in accordance with the approved 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 and deliver fuel to the engine. It includes engine driven fuel pumps for reciprocating engines, tanks (bladder), tanks (integral), tanks auxiliary, valves, boost pumps, fuel dump systems, fuel tank leak detection components, fuel draining, fuel tank capacitance units, float switches, float valves, temperature sensing, refuel diffuser systems, dip sticks, magnetic level indicators, fuel tank baffling, flame arrester components and tank venting systems. The maintenance activities will include the removal, fitting and testing of a range of fuel system 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 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 requirements 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 fuel systems. You will understand the removal, fitting and testing methods and procedures, and their application, along with the fuel 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 need to understand the impact of the SFAR88 legislation and its impact, as well as the impact of CDCCL (Critical Design Configuration Control Limitations) requirements. You will need to be aware of the regulations appertaining to

working in confined spaces and for working with flammable liquids and gases.

You will understand the safety precautions required when working on aircraft fuel systems, especially those for ensuring system cleanliness and the avoidance 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:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 28 Fuel. It does not include fuel flow rate sensing and transmitting or engine fuel flow or pressure which is covered in Chapter 73 Engine Fuel and Control.
2. To display competence in this standard, it is necessary to both remove and fit aircraft fuel 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 carrying out maintenance activities on aircraft fuel systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the importance of maintenance on aircraft fuel systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), 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 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 removing aircraft fuel 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 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 fuel systems, and other documents needed in the maintenance process
11. how to carry out currency/issue checks on the specifications you are working with

12. terminology used in aircraft fuel systems, and the use of system diagrams and associated symbols
13. the various types of pipe and component that make up the aircraft fuel system (such as rigid pipes; flexible hoses; pipe connectors; pipe sealing and supporting devices; valves used for flow, change over, fuel dumping; fuel pumps; mechanical and electrical control devices)
14. the principles of operation of the aircraft fuel system being worked on, and the function of the various units/components within the system
15. the techniques used to remove components from aircraft fuel 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)
16. the various mechanical fasteners 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 maintenance activities
19. the importance of ensuring that the work area is free from dirt, debris and foreign objects, 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 system
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 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 refill)
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 tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
26. why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
27. how to carry out routine checks and servicing of the aircraft fuel system (including checking for leaks, checking and changing filters, checking calibration of fuel quantity gauges)
28. the types of test to be carried out on the aircraft fuel system and the test equipment to be used
29. the methods and procedures to be used to carry out the various tests on the fuel system
30. the importance of carrying out the tests in the specified sequence, checking readings/movements 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 how to make valid decisions about the acceptability of the aircraft fuel 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, scrap components and waste fuel
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 fuel 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, breathing apparatus and other relevant safety regulations and procedures to realise a safe system of work
1.5 ensure the safe isolation and ventilation of the fuel equipment before breaking into the system, and check that the aircraft and ground equipment to be used is electrically bonded
1.6 ensure that the relevant safety devices, mechanical/physical locks and external signage 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 fuel system:

2.1 fuel storage
2.2 fuel drain
2.3 fuel indicating
2.4 distribution
2.5 in-flight refuelling
2.6 fuel jettison/dump

3.

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

Group A

1. control valves (such as drain, bleed, change over, fire wall, dump)
2. main fuel tanks/cells/bladders
3. refuel and de-fuel connections
4. fuel flow regulators
5. auxiliary fuel tank
6. fuel selector

7. motors
8. external/drop down fuel tanks
9. high/low level shutoff
10. solenoids
11. pumps
12. jet pumps
13. cell and tank inter-connectors
14. densitometer
15. float switch
16. sender unit
17. fuel cooling units
18. float valve
19. fuel manifold

Group B

20. pipes/hoses
21. fuel filters
22. ventilating components
23. over wing filler necks and caps
24. safety devices
25. sensors
26. pressure switches
27. strainers
28. gaskets and seals
29. bleed valve
30. 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, draining and removing fuel)
1.4 disconnecting electrical connections
1.5 replacing single use items such as seals, filters, gaskets
1.6 removal of bonding
1.7 disconnecting/removing hoses and pipes
1.8 refitting components in the correct position,
1.9 removing securing devices and mechanical fasteners orientation and alignment
1.10 supporting equipment to be removed
1.11 making mechanical connections
1.12 dismantling equipment to an appropriate level
1.13 making electrical connections

1.14 covering (protecting) exposed components, wires, pipework or vents
1.15 carrying out bonding
1.16 torque loading as required
1.17 checking components for serviceability
1.18 charging and bleeding the system
1.19 replacing damaged/defective components
1.20 carrying out a systems functional checks
1.21 ensuring that replacement components have the correct part numbers
1.22 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
1.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
1.24 carrying out area inspections prior to task close up

2.

Service/check the aircraft fuel system, to include carrying out three of the following:

2.1 checking the system and tanks for leaks
2.2 checking and cleaning/replacing filters
2.3 checking calibration of fuel quantity gauges (labelling or other methods)
2.4 checking operation of feed/selectors
2.5 checking indicating systems (such as pressure drop, temperature warning, valve position and status)

3.

Carry out four of the following tests on the aircraft fuel system:

3.1 leak test
3.2 fuel level/contents check
3.3 pressure test
3.4 fuel capacity tests
3.5 full system fuel flow
3.6 fuel sampling/heck/fuel system icing inhibitor/water
3.7 reduced system fuel flow results
3.8 system flush
3.9 built in test equipment (BITE) test
3.10 system fuel flow functional test
3.11 `special-to-type' tests
3.12 fuel transfer tests

Using one of the following:

13. fuel sampling devices
14. aircraft power source/system
15. ground test rig
16. `special to type' test equipment

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 aircraft cabin log
1.3 computer records
1.4 aircraft log book
1.5 aircraft technical log

2.

Carry out maintenance on aircraft fuel systems 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)
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 aircraft maintenance manual/approved change documentation (service bulletin)
2.8 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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Developed by	Enginuity
Version Number	3
Date Approved	30 Mar 2021
Indicative Review Date	01 Mar 2024
Validity	Current
Status	Original
Originating Organisation	Enginuity
Original URN	SEMAE3312
Relevant Occupations	Engineer, Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
Suite	Aeronautical Engineering Suite 3
Keywords	engineering; aeronautical; maintenance activities; aircraft fuel systems; maintenance manual; service bulletin; fuel pumps; tanks auxiliary; valves; boost pumps; fuel dump systems; fuel tank leak detection components; fuel draining; fuel tank capacitance