SEMAE3339

Maintaining engine fuel and control systems on aircraft

Overview

This standard identifies the competences you need to carry out maintenance activities on aircraft engine fuel and control systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers fixed wing and rotary winged aircraft, and includes both turbine and reciprocating engines. For turbine engines, it covers those units and components and associated mechanical systems or electrical circuits which deliver or control fuel to the engine beyond the main fuel quick disconnect. This includes engine driven fuel pumps and filter assembly, main and thrust augmentation fuel controls, electronic temperature datum control, temperature datum valve, fuel manifold, fuel nozzles, fuel enrichment system, speed sensitivity switch, relay box assembly and solenoid drip valves. For reciprocating engines, it covers those units and components which deliver metered fuel and air to the engine, and includes the carburettor master control from the inlet side to the discharge nozzles, injection pumps, carburettor, injection nozzles and fuel primer. The air portion includes units and components from the scoop inlet to the vapour return and impeller chamber. The maintenance activities will include the removal, fitting and testing of a range of engine fuel system components. You will be expected to use the approved procedure for correctly isolating the fuel supply and 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 engine fuel and control systems. You will understand the removal, fitting and testing methods and procedures, and their application, along with the engine fuel and control 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 engine fuel and control systems, especially those for ensuring the 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 73 Engine Fuel and Control
2. To display competence in this standard, it is necessary to both remove and fit aircraft engine fuel and control 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 engine fuel and control systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the importance of maintenance on aircraft engine fuel and control 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 engine fuel and control 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 engine fuel and control 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 engine fuel and control 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 engine fuel and control systems

13. the various types of pipe and component that make up the aircraft engine fuel and control system (such as rigid pipes; flexible hoses; valves, pumps, injector nozzles, governor, fuel heater, fuel and oil cooler, mechanical and electrical control and indicating devices)
14.
the principles of operation of the aircraft engine fuel and control system being worked on, and the function of the various units/components within the system
15.
the techniques used to remove components from aircraft engine fuel and control systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, proof marking, and the protecting circuit integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
16. the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
17. the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
18. 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
19. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
20. methods of lifting and supporting the components/equipment during the maintenance activities
21. recognition of contaminants, and the problems they can create; the effects and likely symptoms of contamination in the engine fuel system
22. 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
23. how to fit components into the circuit (such as the use of gaskets/seals; ensuring the correct tightness of pipe fittings and connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking the security of joints and that the system is safe to refuel)
24. how to make adjustments to components/assemblies to ensure that they function correctly (such as flow and pressure settings and their effect on the engine fuel system)
25. why electrical bonding is critical and why it must be both mechanically and

electrically secure
26. why securing devices need to be correctly torque loaded, locked and labelled, and the different methods used
27. how to carry out routine checks and servicing of the aircraft engine fuel and control system (including checking for leaks, checking and changing filters, checking and cleaning injectors and fuel nozzles)
28. the types of test to be carried out on the aircraft engine 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 engine fuel and control system
30. the importance of carrying out tests in the specified sequence and checking/recording the results 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 engine fuel and control 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 engine fuel and control 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
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 engine fuel and control system:

2.1 distribution
2.2 controlling and governing
2.3 indicating

3.

Remove and fit six different aircraft engine fuel and control system components (at least two must be from group A):

Group A

3.1 control valves (such as fuel return, temperature datum, solenoid drip, burner staging)
3.2 engine driven pump
3.3 rotor alternator
3.4 hydro-mechanical units
3.5 fuel nozzles
3.6 fuel manifold
3.7 servo fuel heater

3.8 injector nozzles
3.9 fuel primer
3.10 relay box assembly
3.11 turbine governor
3.12 carburettor
3.13 valves
3.14 fuel flow divider
3.15 injector pump
3.16 solenoids
3.17 stator alternator
3.18 engine fuel/oil cooler
3.19 electronic control unit
3.20 engine control unit
3.21 engine interface unit

Group B

22. pipes/hose assemblies
23. fuel pressure indicating devices
24. levers and linkages
25. differential fuel switch
26. cables and pulleys
27. fuel flow indicating devices
28. actuators
29. safety devices
30. fuel filters
31. fuel flow sensor/transmitter
32. temperature regulator
33. gaskets and seals
34. 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 disconnecting/removing hoses and pipes
1.7 removing securing devices and mechanical fasteners
1.8 refitting components in the correct position, orientation and alignment
1.9 supporting equipment to be removed
1.10 dismantling equipment to an appropriate level
1.11 making mechanical connections

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

2.

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

2.1 checking the system for leaks
2.2 checking and cleaning/replacing filters
2.3 cleaning injector nozzles
2.4 checking carburettor float setting
2.5 checking fuel/meter control unit (FCU/FMU)
2.6 adjust/rigging throttle box
2.7 cleaning/testing fuel nozzles
2.8 adjusting automatic mixture control (AMC)
2.9 adjusting ABC
2.10 checking indicating systems (such as fuel flow, fuel pressure and temperature warning)

3.

Carry out two of the following tests on the aircraft engine fuel and control system:

3.1 leak test
3.2 built in test equipment (BITE) test
3.3 fuel pressure test
3.4 `special-to-type' tests
3.5 fuel flow test
3.6 engine run

Using one of the following:

7. aircraft power source/system
8. ground test rig
9. '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 engine fuel and control 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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