

Overview

This standard identifies the competences you need to carry out maintenance activities on aircraft hydraulic 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 supply the hydraulic fluid under pressure (includes tanks, pumps, accumulators, valves, pipes) to a common point (manifold) for redistribution to other defined systems. The maintenance activities will include the removal, fitting and testing of a range of hydraulic components. You will be expected to use the approved procedure for correctly isolating and de-pressurising the system, breaking into the system circuit and catching/containing any spilled fluids. 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 hydraulic systems. You will understand the removal, fitting and testing methods and procedures, and their application, along with the hydraulic systems 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 hydraulic systems, especially those for handling hydraulic fluids, isolating and depressurising the equipment. 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 29 Hydraulic Power.
2. To display competence in this standard, it is necessary to both remove and fit aircraft hydraulic 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 hydraulic systems and when using synthetic oils (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 hydraulic 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 hydraulic systems, and with the tools and equipment used (such as the safe release of pressurised systems, handling hydraulic fluids, traps from moving parts, 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 hydraulic 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 hydraulic systems, and the use of fluid power diagrams and associated symbols
13. the various types of pipe and component that make up the aircraft hydraulic system (such as rigid pipes; hydraulic hoses; pipe connectors; pipe sealing and supporting devices; valves used for pressure relief, flow and directional control; pumps; pressure intensifiers, mechanical and electrical control devices)
14. the principles of operation of the hydraulic system being worked on (such as system layout, hydraulic fluids, the use of reservoirs and accumulators, pressure generation, pressure control and distribution, pressure indication and warning)
15. the types and use of hydraulic fluids, and their interaction and effect on the integrity of other parts of the aircraft
16. the techniques used to remove components from aircraft hydraulic systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, removal of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
17. the various mechanical fasteners 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 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 hydraulic 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 pump 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-pressurise)
23. how to make adjustments to components/assemblies to ensure that they function correctly (such as 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 different methods that are used
27. how to carry out routine checks and servicing of the aircraft hydraulic system (including replenishing hydraulic fluid and accumulator charging)
28. the types of test to be carried out on the aircraft hydraulic system, and the test equipment to be used
29. the methods and procedures to be used to carry out the various tests on the hydraulic systems
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 how to make valid decisions about the acceptability of the aircraft
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 hydraulic fluids
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 hydraulic 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 and depressurisation of the hydraulic 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 hydraulic system:

- 2.1 hydraulic power supply
- 2.2 emergency/auxiliary system
- 2.3 main hydraulic system
- 2.4 indicating system

3.

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

Group A

1. engine driven pump
2. standby pump
3. accumulator
4. heat exchanger
5. hand pump
6. manifold
7. electric motor driven pump

Maintaining hydraulic systems on aircraft

8. reservoirs/tanks
9. auxiliary servo equipment
10. gearbox driven pump
11. primary servo jack/actuator
12. ram air turbine

Group B

13. control valves
14. pipes and hoses
15. chip detectors
16. check valve
17. filters
18. gauges/wiring/switches/plugs
19. automatic cut-out valve
20. sensors/transmitters
21. in-flight refuelling components
22. ground connector
23. hydraulic fuses
24. 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, draining fluids)
- 1.4 disconnecting electrical connections
- 1.5 refitting components in the correct position, orientation and alignment
- 1.6 disconnect/removing hoses and pipes
- 1.7 removing securing devices and mechanical fasteners
- 1.8 setting and adjusting replaced components (such as travel, working clearance)
- 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 and reconnecting bonding leads
- 1.15 torque loading as required
- 1.16 checking components for serviceability
- 1.17 replacing fluids and bleeding the system
- 1.18 replacing damaged/defective components
- 1.19 re-pressurising the system

Maintaining hydraulic systems on aircraft

- 1.20 replacing single use items such as seals, filters, gaskets
- 1.21 carrying out system functional checks
- 1.22 ensuring that replacement components have the correct part numbers
- 1.23 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 1.24 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 1.25 carrying out area inspections prior to task close down

2.

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

- 2.1 visually checking the system for leaks
- 2.2 checking for correct operation of valves
- 2.3 checking filters
- 2.4 checking the fluid content of reservoirs
- 2.5 replenishing the hydraulic system
- 2.6 charging the nitrogen accumulator
- 2.7 checking accumulator gas/nitrogen pressure
- 2.8 checking indicating systems

3.

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

- 3.1 leak test
- 3.2 built in test equipment (BITE) test
- 3.3 pressure test
- 3.4 'special-to-type' tests
- 3.5 fluid sampling test

Using one of the following:

- 6. aircraft power source/pumps
- 7. 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 hydraulic 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)

Maintaining hydraulic systems on aircraft

- 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

Maintaining hydraulic systems on aircraft

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 SEMAE3313

Relevant Occupations Engineer, Engineering, Engineering and Manufacturing Technologies, Engineering Technicians

Suite Aeronautical Engineering Suite 3

Keywords engineering; aeronautical; aircraft hydraulic systems; maintenance manual; service bulletin; airworthiness requirements; tanks; pumps; accumulators; valves; pipes; hydraulic fluids
