SEMAE3335

Maintaining flight control systems on rotorcraft

Overview

This standard identifies the competences you need to carry out maintenance activities on rotorcraft flight control systems, in accordance with the approved rotorcraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It includes units and components which manually control the flight attitude and characteristics of the rotorcraft. The maintenance activities will include the removal, fitting and testing of a range of rotorcraft flight control components. You will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed, fitted and tested. The rotorcraft flight control components will include items such as control linkage and control cables for collective pitch, cyclic pitch, directional control, servo controls and corresponding systems. 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 rotorcraft 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 rotorcraft 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 rotorcraft flight control systems. You will understand the removal, fitting and testing methods and procedures, and their application, along with the rotorcraft flight control system maintenance requirements. You will know how the rotorcraft flight controls 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 rotorcraft flight control systems, especially those for isolating the equipment, lifting and handling control components. 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 67 Rotors Flight Controls.
2. To display competence in this standard, it is necessary to both remove and fit rotorcraft flight 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 working on rotorcraft flight control systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the importance of maintenance on rotorcraft flight control systems, and impact upon legislation and local procedures
3. hazards associated with removing, fitting and testing rotorcraft flight control system components, and with the tools and equipment used, and how to minimise them and reduce any risk
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 protective equipment that you need to use for both personal protection (PPE) and protection of the rotorcraft
6. what constitutes a hazardous voltage and how to recognise victims of electric shock
7. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
8. 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
9. how to extract and use information from rotorcraft maintenance manuals, log books, flight logs, and other documents needed in the maintenance process
10. how to carry out currency/issue checks on the specifications you are working with
11. terminology used in rotorcraft flight control systems, and the use of system diagrams and associated symbols
12. the principles of operation of the rotorcraft flight control system being worked on, and the function of the various units/components within the system
13. the techniques used to remove components from rotorcraft flight control

systems without damage to the components or surrounding structure (such as release of pressures/force, proof marking, extraction of components, and the need to protect the system integrity by fitting blanking plugs and ensuring that exposed components are correctly covered/protected)

14. the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)

15. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections

16. the importance of applying electrostatic discharge (ESD) avoidance procedures when working on sensitive equipment or devices

17. methods of lifting, handling and supporting the components/equipment during the maintenance activities

18. methods of checking that components are fit for purpose, and how to identify defects and wear characteristics

19. 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

20. how to replace and reconnect components into the system (such as ensuring the correct orientation, position and alignment; tightening securing devices to the required torque; replacing locking and securing devices; eliminating stress on pipework/connections; ensuring that pipework and cables are correctly supported at suitable intervals; carrying out visual checks of all components)

21. how to make adjustments to components/assemblies to ensure that they function correctly

22. why electrical bonding is critical, and why it must be both mechanically and electrically secure

23. the purpose of symmetry and rigging checks; how they are carried out; how to locate the rigging points and faces; and the use of incidence boards

24. how to carry out routine checks and servicing of the rotorcraft flight control system

25. 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)

26. the types of test to be carried out on the rotorcraft flight control system, and the test equipment to be used

27. the methods and procedures to be used to carry out the various tests on the

rotorcraft flight control system

28. the importance of carrying out the tests in the specified sequence, checking all readings and movements at each stage

29. how to record the results of each individual test, and the documentation that must be used

30. how to analyse the test results and make valid decisions about the acceptability of the flight control systems

31. the procedures to be followed if the equipment or system fails to meet the test specification

32. 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

33. the problems that can occur with the flight control system maintenance operations and how these can be overcome

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 rotorcraft flight control system:

1.1 ensure that appropriate authorisation to work on the rotorcraft is obtained, and observe all relevant isolation and safety procedures
1.2 obtain and use the correct documentation (such as job instructions, technical instructions, rotorcraft 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 that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
1.6 ensure the safe isolation of the control system before commencing work on the equipment
1.7 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
1.8 use approved removal, fitting and testing techniques and procedures at all times
1.9 return tools and equipment to the correct storage location on completion of the activities
1.10 ensure that work carried out is correctly documented and recorded
1.11 ensure that any outstanding tests are correctly documented

2.

Carry out maintenance on two of the following rotorcraft flight control systems:

2.1 main rotor control
2.2 tilt rotor flight control
2.3 servo control
2.4 tail rotor control
2.5 anti-torque rotor control (yaw control)
2.6 rotor flight control system wiring

3.

Remove and fit four different rotorcraft flight control system components (at least three must be from group A):

Group A

1. collective pitch lever
2. actuators
3. gradient boxes

4. cyclic pitch stick
5. blade pitch change rods
6. auxiliary servo equipment (ASE)
7. rudder pedals
8. mixer box/units
9. primary servo jack
10. swash plate
11. artificial feel units
12. primary flight computers
13. torque tubes
14. elevator
15. stability augmentation system (SAS)
16. magnetic brakes

Group B

17. cables and pulleys
18. levers and linkages
19. turnbuckles
20. position transmitters
21. control rods
22. actuators/motors/servos
23. locks and stops
24. return springs
25. position transmitters
26. bell cranks/quadrants
27. sensors
28. 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, releasing stored pressure)
1.4 disconnecting electrical connections
1.5 refitting components in the correct position, orientation and alignment
1.6 removing securing devices and mechanical fasteners
1.7 supporting equipment to be removed
1.8 setting and adjusting replaced components
1.9 dismantling equipment to an appropriate level
1.10 making mechanical connections
1.11 covering (protecting) exposed components, wires, pipework or vents
1.12 making electrical connections
1.13 torque loading as required

1.14 checking components for serviceability
1.15 carrying out functional checks of the system
1.16 replacing damaged/defective components
1.17 ensuring that replacement components have the correct part numbers
1.18 labelling (and storing in the correct location) components that require repair or overhaul
1.19 applying bolt locking methods (such as split pins, wire locking, lock nuts)
1.20 carrying out area inspections prior to task close down

2.

Carry out five of the following types of test/check on the rotorcraft flight control systems:

2.1 check collective system rigging
2.2 built in test equipment (BITE) test
2.3 pre flight tests
2.4 check cyclic system rigging
2.5 check controls for operation and sense
2.6 check anti-torque system rigging
2.7 timings
2.8 static friction check
2.9 cable tension check
2.10 leak test
2.11 adjust blade trim tab
2.12 safety interlock test
2.13 `special-to-type' tests
2.14 check blade track/balance
2.15 adjust pitch links

Using two of the following:

16. built in test equipment (BITE)
17. ground support equipment
18. 'special-to-type' test equipment
19. aircraft power supply/displays and gauges
20. use of safety locks
21. measuring 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 computer records
1.3 aircraft technical log
1.4 aircraft cabin log
1.5 aircraft log book

2.

Carry out maintenance on rotorcraft flight control systems in compliance with one of the following:

2.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
2.2 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 rotorcraft 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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