SEMAE3331

Maintaining propeller/propulsor systems on aircraft

Overview

This standard identifies the competences you need to carry out maintenance activities on aircraft propeller/propulsor systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed and variable pitch mechanical or electrical propellers, pumps, motors, governor, alternators, and those units and components external to or integral with the engine that are used to control the propeller blade angle. It includes propeller spinner synchronizers. It also covers propulsor duct assemblies, including aerodynamic fairing of mechanical components, stators and vectoring systems. The maintenance activities will include the removal, fitting and testing of a range of propeller/propulsor system components. 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 propeller/propulsor systems. You will understand the component removal, fitting and testing methods and procedures, and their application, along with the propeller/propulsor 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 propeller/propulsor system is maintained to the required standard.

You will understand the safety precautions required when working on the propeller/propulsor system, especially those for ensuring that the power system, and its fuel supply, is safely and correctly isolated. 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 61 Propellers/Propulsors.
2. To display competence in this standard, it is necessary to both remove and fit propeller/propulsor 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 propeller/propulsor systems (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 propeller 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 propeller/propulsor systems, and with the tools and equipment used (such as handling oils, greases, traps from moving parts, hot parts of engines, 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, system and physical layouts, specifications, symbols used in aircraft propeller/propulsor 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 propeller/propulsor systems, and the use of system diagrams and associated symbols
13. the principles of operation of the propeller/propulsor system being worked on, and the function of the units that make up the system (such as propeller assembly, blade, de-ice boot, spinner, hub, synchronizer section, braking and feathering, and propeller control and indicating)
14. the techniques used to remove components from aircraft propeller/propulsor system 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 system integrity by fitting blanking plugs and ensuring that exposed components are correctly covered/protected)
15. the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
16. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
17. the importance of ensuring that any exposed components or pipe ends are correctly covered/protected
18. 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
19. how to fit propeller/propulsor components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
20. how to make adjustments to components/assemblies to ensure that they function correctly (such as travel and working clearance)
21. why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
22. why electrical bonding is critical, and why it must be both mechanically and electrically secure
23. the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
24. 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

25. how to carry out routine checks and servicing of the aircraft propeller/propulsor system
26. the types of test to be carried out on the aircraft propeller/propulsor system, and the test equipment to be used
27. the methods and procedures to be used to carry out the various tests on the propeller/propulsor 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 propeller/propulsor system
31. the procedures to be followed if the equipment or system fails to meet the test specification
32. 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
33. the procedure for the safe disposal of waste materials, scrap components and fuel/fluids
34. 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 propeller/propulsor 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 that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
1.6 use approved removal, fitting and testing techniques and procedures at all times
1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and foreign object debris
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 three of the following parts of the aircraft propeller/propulsor system:

2.1 propeller assembly
2.2 controls
2.3 feathering/reversing
2.4 braking
2.5 indicating
2.6 propulsor duct

3.

Remove and fit six different propeller/propulsor system components (at least two must be from group A):

Group A

1. propeller/blades
2. spinner/governor synchronizers
3. gearboxes

4. dome
5. drive shafts
6. brake mechanisms
7. hub
8. synchronizing shafts
9. brush block assembly
10. spinner
11. pumps
12. counter weights
13. slip ring
14. motors
15. propulsor duct assemblies
16. de-icer devices
17. governor
18. vector drive attachments
19. distributor valve
20. alternators
21. stators

Group B

22. levers/linkages
23. fairings
24. cables/harness/wiring
25. pulleys
26. covers
27. switches/plugs
28. bearings
29. prop pitch control
30. indicators and warning devices
31. seals/gaskets
32. anti-ice heater mats
33. pipes and hoses
34. de-ice tank
35. other specific components

1.

Carry out fifteen of the following maintenance activities:

1.1 removing 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 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/reconnecting bonding leads
1.15 torque loading as required
1.16 checking components for serviceability
1.17 replenishing fluid systems
1.18 replacing damaged/defective components
1.19 carrying out rigging checks
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 aircraft propeller/propulsor systems, to include carrying out five of the following:

2.1 visually checking the system for damage and leaks
2.2 checking and adjusting dome and unfeathering accumulators
2.3 lubricating the propeller
2.4 adjusting the governor
2.5 checking propeller pitch control mechanisms and adjusting to establish blade angles
2.6 performing static function checks
2.7 checking the track
2.8 checking propeller hub for cracks and/or debonding of blade leading edge cap
2.9 performing a propeller runout check
2.10 examining the propeller for damage and corrosion
2.11 dynamically balancing the propeller
2.12 dressing out blade damage
2.13 checking indicating and warning systems
2.14
examining the brush block assembly
2.15
checking attachment of propeller and spinner for security
2.16 measuring and adjusting synchro-phaser magnetic pickup gap

3.

Carry out three of the following tests on the aircraft propeller/propulsor system:

3.1 checking that ground start mechanisms operate correctly
3.2 checking accuracy of propeller RPM
3.3 verifying that low/high RPM is achieved
3.4 verifying take-off RPM
3.5 testing electric anti-icing system
3.6 built in test equipment (BITE) test
3.7 `special-to-type' tests

Using two of the following:

8. stroboscope
9. ground test rig
10. `special-to-type' test equipment
11. tachometer
12. built in test equipment (BITE)

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

2.

Carry out maintenance on aircraft propeller/propulsor 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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