SEMAE3330

Maintaining wings on aircraft

Overview

This standard identifies the competences you need to carry out maintenance activities on aircraft wings, in accordance with the approved aircraft maintenance manual, structural repair manual, approved change documentation (service bulletin) and airworthiness requirements. The maintenance activities will include the removal, fitting and testing of a range of aircraft wing components, and making repairs to primary and secondary airframe/wing structures, as appropriate to the aircraft type.

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 aircraft wing components will include items such as centre wing and outer wing structural units and associated components and members that support the aircraft in flight, and covers flaps, slats, ailerons or elevons, tabs, spoilers and wing folding systems. You will remove the required wing 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, structural repair 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 wings. You will understand the removal, fitting and testing methods and procedures, and their application, along with the aircraft wing maintenance requirements. You will know how the aircraft wing 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 wing is maintained to the required standard.

You will understand the safety precautions required when working on aircraft wings, especially those for isolating the equipment, lifting and handling wing 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 57 Wings.
2. To display competence in this standard, it is necessary to both remove and fit aircraft wing 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 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 wings (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the requirements for working on wing fuel tanks (such as fuel tank training), and the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV)) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition
3. the importance of maintenance on aircraft wings, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, 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. hazards associated with removing, fitting and testing aircraft wing components, and with the tools and equipment used, 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 maintenance manuals, log books, flight logs, 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 wings, and the use of system diagrams and associated symbols
13. the principles of operation of the aircraft wing components being worked on, and the function of the various units/components
14. preparations to be undertaken on the wing structure, prior to repair
15. the repair methods and procedures to be used, and the importance of adhering to these procedures
16. the application of sealants and adhesives within the repair activities, and the precautions that must be taken when working with them
17. how to conduct any necessary checks to ensure the accuracy and quality of the repair
18. how to recognising defects (such as skin blemishes, poor skin lines, ineffective fasteners, foreign object damage)
19. the techniques used to remove components from aircraft wings 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 exposed components are correctly covered/protected)
20. the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
21. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
22. methods of lifting, handling and supporting the components/equipment during the removal and fitting activities
23. methods of checking that components are fit for purpose, and how to identify defects and wear characteristics
24. the need to replace items such as seals and gaskets
25. 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
26. how to replace and reconnect components onto the wing (such as ensuring 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)

27. how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel)
28. why electrical bonding is critical, and why it must be both mechanically and electrically secure
29. 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
30. how to carry out routine checks and servicing of the aircraft wings
31. the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before removing wing components
32. the types of test to be carried out on the aircraft wing and the test equipment to be used
33. the methods and procedures to be used to carry out the various tests
34. the importance of carrying out the tests in the specified sequence, checking all readings/movements at each stage
35. how to record the results of each individual test, and the documentation that must be used
36. how to analyse the test results and make valid decisions about the acceptability of the wing components
37. the procedures to be followed if the equipment or system fails to meet the test specification
38. 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
39. the problems that can occur with the aircraft wing maintenance operations and how these can be overcome
40. 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
41. the procedure for the safe disposal of waste materials and scrap components
42. 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 wings:

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 ensure the safe isolation of the control system before commencing work on the equipment
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/repairs on two of the following parts of the aircraft wing:

2.1 centre section
2.2 leading edge and leading edge devices
2.3 wing folding system
2.4 outer section
2.5 trailing edge and trailing edge devices
2.6 elevons
2.7 wing tip/winglets
2.8 inboard and outboard ailerons
2.9 spoilers
2.10 flaps
2.11 Krueger flaps
2.12 slats
2.13 spars
2.14 ailerons
2.15 tabs
2.16 integral fuel tanks
2.17 spoilers
2.18 lift dumpers

3.

Undertake three of the following structural repair activities:

3.1 insertion repair
3.2 overlay patch repair
3.3 primary structure repair
3.4 composite repair
3.5 secondary structure repair
3.6 blend repair
3.7 tertiary structure repair
3.8 reworking of aluminium structures and limitations forming
3.9 damage assessment and evaluation
3.10 NDT inspection requirements (post damage removal)

4.

Use six of the following during the structural repair activities:

4.1 marking out airframe materials
4.2 profiling
4.3 securing and locking components
4.4 making holes in airframe materials
4.5 countersinking
4.6 using adhesives and sealants
4.7 cutting/shaping airframe materials
4.8 deburring
4.9 anti-corrosive treatment
4.10 bending and forming materials
4.11 riveting
4.12 blending out permissible damage to structural components
4.13 drilling the extremities of cracks

5.

Remove and fit four different aircraft wing components (at least two must be from group A):

Group A

1. wing tip/winglets
2. spoilers
3. Krueger flaps
4. wing rib
5. slats
6. lift dumpers
7. wing skin repair
8. variable camber flaps
9. airbrakes
10. ailerons
11. flaps (fore, mid, aft)
12. swing wing
13. spoilers
14. leading edge and leading edge devices
15. tabs

16. wing folding system
17. trailing edge and trailing edge devices
18. lift dumpers
19. elevons
20. inboard and outboard ailerons

Group B

21. wing attachment fittings
22. wing plates
23. nacelles/pylon attachment fittings
24. seals
25. landing gear attachment fittings
26. indicating/warning devices
27. actuators
28. locks
29. static dischargers
30. lever/linkage assemblies
31. flap track assembly
32. closure panels
33. spring assemblies
34. gearboxes
35. access panels
36. carriage assembly
37. 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, fitting physical locks, stress jacking, releasing stored pressure)
1.4 disconnecting electrical connections
1.5 refitting components in the correct position, orientation and alignment
1.6 removal of bonding
1.7 removing securing devices and mechanical fasteners
1.8 setting and adjusting replaced components
1.9 supporting equipment to be removed (such as freedom of movement, travel)
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 carrying out bonding
1.15 checking components for serviceability
1.16 torque loading as required
1.17 replacing damaged/defective components
1.18 carrying out metal repairs
1.19 replacing items such as seals, gaskets, sealant
1.20 carrying out composite repairs
1.21 ensuring that replacement components have the correct part numbers
1.22 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 down

2.

Carry out three of the following types of test/check on the aircraft wings:

2.1 checking incidence rig
2.2 inspecting primary structure/spar
2.3 inspecting integral fuel tank
2.4 checking skins for cracking and distortion
2.5 checking control surface for range and freedom of movement
2.6 primary structural element (PSE) fastener inspection and replacement
2.7 checking wing skins for dents and scratches against manufacturer's tolerances
2.8 checking surface protection (such as paint finish, polish)
2.9 checking critical fastenings for security
2.10 checking for lightning strikes
2.11 heavy landing check
2.12 stress jacking
2.13 checking for dents
2.14 carrying out `special-to-type' tests

Using two of the following:

15. mechanical measuring equipment
16. ground support equipment
17. `special-to-type' test equipment
18. electrical measuring equipment
19. use of safety locks
20. incidence boards

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 wings 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)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 aircraft maintenance manual/structural repair 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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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	SEMAE3330
Relevant Occupations	Engineer, Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
Suite	Aeronautical Engineering Suite 3
Keywords	engineering; aeronautical; aircraft wings; airframe/wing structures; covers flaps; slats; ailerons or elevons; tabs; spoilers; wing folding systems