
Overview

This standard identifies the competences you need to carry out the removal and replacement of components of aircraft control systems, in accordance with approved procedures. It covers both fixed wing and rotary winged aircraft and includes equipment and components associated with flying controls and powerplant.

The removal and replacement activities will include taking all necessary safeguards to isolate the system, supporting and lifting removed and replaced parts, replacing faulty equipment at component or unit level, setting and adjusting replaced components and leaving the control system in a safe condition and ready for testing.

Your responsibilities will require you to comply with organisational policy and procedures for the removal and replacement activities undertaken and to report any problems with these activities 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, 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 removal and replacement techniques and procedures to aircraft control system components. You will understand the removal and replacement methods and procedures, and their application, along with the aircraft control system maintenance requirements. You will know how the aircraft controls function, 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 removal and replacement activities and for ensuring that the equipment is replaced to the required standard. In addition, you will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out the replacement.

You will understand the safety precautions required when working on aircraft controls, 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.

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Notes To display competence in this standard it is necessary to both remove and replace components from aircraft controls. You must remove components; however, you may fit a replacement component where the original was previously removed by another person.

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 aircraft manuals and publications to carry out the required work
3. establish and where appropriate, mark component orientation for re-assembly
4. ensure that any stored energy or substances are released safely and correctly
5. carry out the removal and replacement activities, within the limits of your personal authority
6. remove and replace the required components, using approved tools and techniques
7. take suitable precautions to prevent damage to components and the surrounding structure
8. complete the relevant documentation, in accordance with organisational requirements
9. label and store (in an appropriate location) components that require repair or overhaul
10. dispose of waste materials and scrap components in accordance with safe working practices and approved procedures
11. leave the aircraft and the control system in a safe and appropriate condition, free from foreign object debris and in a condition ready for testing

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 control systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the importance of maintenance on, and impact upon (extended twin operations procedures) ETOpS systems, legislation and local procedures
3. hazards associated with removing and replacing aircraft control components, and with the tools and equipment used (such as handling oils, greases, stored pressure/force, lifting and moving components, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) and how to minimise them and reduce any risks
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 aircraft
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. how to extract and use information from aircraft maintenance manuals, history/maintenance reports, flight logs and other documents needed in the removal and replacement process
9. how to carry out currency/issue checks on the specifications you are working with
10. terminology used in aircraft control systems
11. the principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact
12. the techniques used to remove components from aircraft controls 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
13. the various mechanical fasteners to be removed and replaced and their method of removal and replacement (such as threaded fasteners, special securing devices)

14. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking in of the connections
15. the importance of applying electrostatic discharge (ESD) procedures when working on sensitive equipment or devices
16. methods of lifting, handling and supporting the components/equipment during the removal and replacement activities
17. methods of checking that components are fit for purpose and how to identify defects and wear characteristics
18. the uses of measuring equipment (such as micrometers, Verniers, expansion indicators and other measuring devices)
19. the need to replace 'lified' items (such as seals and gaskets)
20. the need to correctly label and store components that require repair or overhaul and to check that replacement components have the correct part/identification markings
21. how to replace and re-connect components into the system (such as the use of gaskets/seals and jointing/sealing compounds; 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)
22. how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, pre-loading bearings)
23. why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
24. why electrical bonding is critical and why it must be both mechanically and electrically secure
25. 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
26. how to check that tools and equipment are free from damage or defect, are in a safe, tested and usable condition and are configured correctly for the intended purpose
27. 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
28. how to use lifting and handling equipment in the maintenance activity
29. 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
30. the procedure for the safe disposal of waste materials, scrap components, oils and fluids
31. the problems associated with removing and replacing control

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- system components and how they can be overcome
32. the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

Scope/range related to performance criteria

1. Carry out all of the following during the removal and replacement activity:
 1. obtain clearance to work on the aircraft and observe all relevant safety procedures
 2. obtain and use the appropriate documentation (such as job instructions, aircraft manuals, technical instructions and other relevant maintenance documentation)
 3. 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
 4. ensure the safe isolation of the control system before carrying out work on the equipment
 5. ensure that all relevant safety devices and mechanical/physical locks are in place (where appropriate)
 6. obtain the correct tools and equipment for the activity and check that they are in a safe, tested and usable condition and within current certification/calibration date
 7. use approved removal and replacement techniques and procedures at all times
 8. ensure that components and surrounding structures are maintained free from spillages, damage and foreign objects
 9. return all tools and equipment to the correct location on completion of the activities
2. Remove components from three of the following aircraft control systems, and replace components from three of the following aircraft control systems:
 1. air brakes
 2. flaperons
 3. elevators
 4. main rotor blades
 5. spoilers/speed brakes
 6. cyclic
 7. trim tabs
 8. horizontal stabilisers
 9. flaps/slats
 10. reaction control
 11. powerplant
 12. tail rotor blades/yaw
 13. tailplane
 14. wing sweep

15. collective
16. power augmentation
17. propeller
18. auxiliary transmission
19. auxiliary power
20. vectored thrust
21. rudders/yaw
22. canards
23. thrust reverse
24. nose wheel steering
25. ailerons/tailerons
26. main gear steering
27. other specific control system

3. During the activities identified in scope 2 above, you must cover the removal and replacement of the following:

Major control components: Remove and replace three of the following:

1. pedals
2. powered flying control units
3. control surfaces
4. flap selectors
5. fuel control units
6. gradient boxes
7. control columns/sticks
8. auto pilot system components
9. AFCS series and parallel actuators
10. air/speed brake selectors
11. auxiliary controls
12. mixer units
13. trim wheels
14. throttle boxes
15. artificial feel units
16. reaction control nozzles
17. torque tubes
18. primary flight computers (including actuator control electronic (ACE))
19. full authority digital engine control and full authority fuel control units (FADEC and FAFC)
20. other specific major component

Other control components: Remove and replace four of the following:

21. turnbuckles
22. levers and linkages
23. pedal shakers
24. cables and pulleys
25. sensors
26. locks and stops
27. connecting rods
28. actuators/motors

- 29. bell cranks
- 30. position transmitters/desyns
- 31. reaction control ducting
- 32. other specific components

4. Carry out all of the following removal and replacement activities:

- 1. releasing stored pressure (where appropriate)
- 2. positioning and aligning replaced components
- 3. disconnecting electrical connections
- 4. removing mechanical fasteners and securing devices
- 5. setting and adjusting replaced components
- 6. supporting equipment to be removed
- 7. making mechanical connections
- 8. dismantling equipment to an appropriate level
- 9. making electrical connections
- 10. proof marking components to aid reassembly
- 11. tightening fastenings to the required torque
- 12. applying and removing covering/protection to exposed components, wires, pipework or vents
- 13. using lifting operations (manual or automated)
- 14. checking components for serviceability
- 15. replacing all damaged/defective components
- 16. replacing all 'lived' items (such as seals, bearings, gaskets)
- 17. securing components using mechanical fasteners and threaded devices
- 18. applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 19. labelling (and storing in the correct location) components that require repair or overhaul
- 20. protecting and preparing removed components for transportation for overhaul

5. Remove and replace aircraft control components in compliance with one of the following:

- 1. Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
extended twin operations procedures (ETOpS) (where appropriate)
- 2. Ministry of Defence (MoD)
- 3. Military Aviation Authority (MAA)
- 4. Aerospace Quality Management Standards (AS)
- 5. Federal Aviation Authority (FAA)
- 6. BS, ISO or BSEN standards and procedures
- 7. customer standards and requirements
- 8. company standards and procedures
- 9. aircraft manufacturer's requirements

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6. Complete the relevant paperwork, including one from the following and pass it to the appropriate people:
 1. job cards
 2. computer records
 3. aircraft service/flight log
 4. aircraft log book
 5. permit to work/formal risk assessment

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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Removing and replacing components of aircraft control systems



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