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## Overview

This standard identifies the competences you need to carry out the removal and replacement of avionic indication and gauging components in aircraft systems, in accordance with approved procedures. It covers both fixed wing and rotary winged aircraft and includes units and components associated with power plant and auxiliary power, engine fuel and lubrication, flying controls, fluid power, wheels, brakes and steering, transmission systems, aircraft fuel systems, environmental control systems, ice and rain protection and airframe systems and components, as applicable to the aircraft type.

You will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The aircraft components will include items such as gauges, actuators and motors, indicating devices, position transmitters and selectors. The removal and replacement activities will include making all necessary checks to ensure that the components are safely and correctly removed and replaced and that the component is left 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 for the indication and gauging components in the relevant aircraft systems. You will understand the removal and replacement methods and procedures and their application, along with the 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 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 to the required specification.

You will understand the safety precautions required when working on the various aircraft systems and when using the associated tools and equipment. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace.

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

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## 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. carry out the removal and replacement activities, within the limits of your personal authority
5. remove and replace the required components, using approved tools and techniques
6. take suitable precautions to prevent damage to components and the surrounding structure
7. complete the relevant documentation, in accordance with organisational requirements
8. label and store (in an appropriate location) components that require repair
9. dispose of waste materials and scrap components, in accordance with approved procedures
10. leave the aircraft and the avionic 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 with aircraft control, indication and gauging systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the importance of maintenance on and impact upon ETOpS (extended twin operations procedures) systems, legislation and local procedures
3. the hazards associated with removing and replacing aircraft control, indication and gauging system components and with the tools and equipment used 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. how to extract and use information from aircraft manuals, history/maintenance reports, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft control, indication and gauging systems, and other documents needed in the maintenance process
7. how to carry out currency/issue checks on the specifications you are working with
8. terminology used in aircraft control, indication and gauging systems and the use of system diagrams and associated symbols
9. the principles of operation of the control, indication and gauging system being worked on, and the performance characteristics and function of the components within the system
10. the importance of applying electrostatic discharge (ESD) procedures when working on sensitive equipment or devices
11. what constitutes a hazardous voltage and how to recognise victims of electric shock
12. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
13. the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices)
14. the importance of using the specified fasteners for the installation and why you must not substitute others
15. why securing devices need to be locked and labelled, and the different methods that are used to remove and install them

16. the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved
17. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
18. the techniques used to remove components from aircraft control, indication and gauging systems, without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, proof marking, the need to protect the circuit integrity by covering and labelling exposed circuits)
19. the need to correctly label and store components that require repair or overhaul and to check that replaced components have the correct part/identification markings
20. the techniques used to position, align, adjust and secure the replaced components to the aircraft, without damage to the components or surrounding structure
21. the quality control procedures to be followed during the removal and replacement operations
22. procedures for ensuring that you have the correct tools, equipment, components and fasteners for the activities
23. methods of lifting, handling and supporting the components/equipment during the removal and replacement activities
24. the use of seals, sealant, adhesives and anti-electrolysis barriers and the precautions to be taken
25. why electrical bonding is critical and why it must be both mechanically and electrically secure
26. how to conduct any necessary checks to ensure the system integrity and the accuracy and quality of the removal and replacement
27. the tools and equipment used in the removal and replacement activities and their calibration/care and control procedures
28. 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
29. the problems that can occur with the removal and replacement operations and how these can be overcome
30. how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
31. 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
32. the procedure for the safe disposal of waste materials and scrap components
33. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

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## 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 isolation and 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 that all relevant safety devices and mechanical/physical locks are in place (where appropriate)
  5. 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
  6. use approved removal and replacement techniques and procedures at all times
  7. where appropriate, apply electrostatic discharge (ESD) protection procedures
  8. ensure that components and surrounding structures are maintained free from damage and foreign objects
  9. return all tools and equipment to the correct location on completion of the activities
  10. leave the aircraft and the system in a condition ready for testing
  
2. Remove avionic indication and gauging components from three of the following aircraft systems and replace avionic indication and gauging components in three of the following aircraft systems:
  1. power plant (such as main engine power, auxiliary power, thrust reverse, propeller, starting, monitoring, fire)
  2. engine fuel, lubrication, air, cooling and control systems
  3. fluid power (such as hydraulic power generation, undercarriage, pneumatic or vacuum pressure)
  4. flying controls (such as flaps, elevators, ailerons/ailerons, spoilers, wing sweep, reaction controls, rudder, rotor)
  5. wheels, brakes and steering
  6. transmission systems (such as main and auxiliary gearboxes)
  7. aircraft fuel systems (such as supply, contents, transfer, venting system, fuel jettison, refuelling and defuelling)
  8. environmental control systems (such as pressure control,

- heating and ventilation equipment, air conditioning)
- 9. ice and rain protection systems (such as windshield, engine protection, pitot static protection, ice accretion)
- 10. fuselage (such as access panels, cargo doors, boundary layer and suction doors)

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

Major Avionic components: Remove and replace two of the following:

1. transmitters (such as position, flow, pressure, level)
2. generators (such as pulse, speed/taco)
3. actuators
4. computers
5. capacitance units
6. motors
7. gauges/indicators
8. displays

other system components: Remove and replace two of the following:

9. switches (such as micro, proximity)
10. circuit breakers
11. wires/cables
12. relays
13. input and follow-up potentiometers
14. plugs/sockets
15. transducers/sensors
16. other specific system component

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

1. disconnecting electrical connections
2. positioning and aligning replaced components
3. removal of earth bonding
4. making mechanical connections
5. removing cable securing devices
6. making electrical connections
7. removing bolt securing devices and mechanical fasteners
8. carrying out earth bonding
9. installing cable securing devices
10. applying and removing covering/protection to exposed components, wires, pipe work or vents
11. tightening fastenings to the required torque
12. making 'off-load' checks before re-connecting power
13. checking components for serviceability
14. replacing all 'lifer' items (seals, filters, gaskets)
15. labelling (and storing in the correct location) components that

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- require repair or overhaul
  - 16. setting, and adjusting replaced components (such as zero, range, travel, clearance)
  - 17. applying bolt locking methods (such as split pins, wire locking, lock nuts)
5. Remove and replace aircraft avionic indication and gauging system components, in accordance with **one** of the following:
- 1. Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
  - 2. extended twin operations procedures (ETOpS) (where appropriate)
  - 3. Ministry of Defence (MoD)
  - 4. Military Aviation Authority (MAA)
  - 5. Aerospace Quality Management Standards (AS)
  - 6. Federal Aviation Authority (FAA)
  - 7. BS, ISO or BSEN standards and procedures
  - 8. customer standards and requirements
  - 9. company standards and procedures
  - 10. aircraft manufacturer's requirements
6. Complete the relevant paperwork, to include 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
  - 5. permit to work/formal risk assessment

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## 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 avionic indication and gauging components in aircraft systems



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