SEMAE3128

# Removing and replacing components of aircraft radar systems

## Overview

This standard identifies the competences you need to carry out the removal and replacement of components in aircraft radar systems, in accordance with approved procedures. It covers both fixed wing and rotary winged aircraft and includes units and components associated with surveillance radar (including supplementary surveillance radar), weather radar, and obstacle warning systems (such as enhanced ground proximity warning systems - EGPWS), traffic collision and avoidance systems (TCAS), towed radar decoys, radar (radio) altimeter, tactical air navigation (TACAN), identification friend or foe (IFF), Doppler and radar jamming devices, 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 scanners, aerials, transponders, transmitters, receiver units, microwave generators, processors, power supply units, wave guides, intermediate frequency units, indicator units, radar displays, winches, coolant units and control units. 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 equipment 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 to aircraft radar components, in the relevant aircraft systems. You will understand the removal and replacement methods and procedures and their application, along with the 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 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 aircraft radar systems and when using the associated tools and equipment. 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** To display competence in this standard, it is necessary to both remove and replace aircraft radar system components. 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. 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 radar 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 radar 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 Range Twin-Engine Operations Procedures) ETOPS systems, legislation and local procedures
3. the hazards associated with removing and replacing aircraft radar 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 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 manuals, history/maintenance reports, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft radar systems and other documents needed in the maintenance process
9. how to carry out currency/issue checks on the specifications you are working with
10. terminology used in aircraft radar systems and the use of system diagrams and associated symbols
11. the principles of operation of the radar system being worked on and the performance characteristics and function of the components within the system
12. the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices)
13. the importance of using the specified fasteners for the installation and why you

must not substitute others
14. why securing devices need to be locked and labelled and the different methods that are used to remove and install them
15.
the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
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 techniques used to remove components from aircraft radar systems, without damage to the components or surrounding structure (such as proof marking, the need to protect the circuit integrity by covering and labelling exposed circuits)
18. the importance of applying electrostatic discharge (ESD) procedures when working on sensitive equipment or devices
19. the need to label and store correctly 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 and 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, 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 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 removal and replacement activity:

1.1 obtain clearance to work on the aircraft and observe all relevant isolation and safety procedures
1.2 obtain and use the appropriate documentation (such as job instructions, aircraft manuals, technical instructions and other relevant maintenance documentation)
1.3 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
1.4 ensure that all relevant safety devices and mechanical/physical locks are in place (where appropriate)
1.5 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
1.6 use approved removal and replacement techniques and procedures at all times
1.7 where appropriate, apply electrostatic discharge (ESD) protection procedures
1.8 ensure that components and surrounding structures are maintained free from damage and foreign objects
1.9 return all tools and equipment to the correct location on completion of the activities
1.10 leave the aircraft and the radar system in a safe and appropriate condition, ready for testing

2.

Remove components from the following aircraft radar systems, and replace components of the following aircraft radar systems: Either one of the following:

2.1 surveillance radar
2.2 radar jamming

OR three of the following:

3. towed radar decoys
4. obstacle warning systems
5. radar (radio) altimeter
6. identification friend or foe (IFF)
7. Doppler
8. tactical air navigation (TACAN)
9. enhanced ground proximity warning system (EGPWS)

10. weather radar/predictive wind shear
11. supplementary surveillance radar
12. traffic collision avoidance system (TCAS)

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

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

1. scanners
2. radar displays
3. power supply units (PSU)
4. aerials
5. receiver units
6. winches
7. transformers
8. processors
9. waveguides
10. transmitter units
11. control units
12. radar packs
13. computers
14. microwave generators
15. coolant units
16. transponders
17. intermediate frequency unit (IFU)

Other radar system components: Remove and replace four of the following:

18. batteries
19. circuit breakers instruments/gauges
20. wires/cables
21. switches
22. plugs/sockets
23. relays
24. desiccant units
25. coolant
26. other specific component

1.

Carry out all of the following removal and replacement activities:

1.1 disconnecting electrical connections
1.2 replacing all `lifed' items (such as seals, filters, gaskets)
1.3 removal of earth bonding
1.4 positioning and aligning replaced components

1.5 removing cable securing devices
1.6 making mechanical connections
1.7 removing bolt securing devices and mechanical
1.8 making electrical connections fasteners
1.9 carrying out earth bonding
1.10 applying and removing covering/protection to
1.11 installing cable securing devices exposed components, wires, pipework or vents
1.12 tightening fastenings to the required torque
1.13 checking components for serviceability
1.14 pressurising systems (waveguide, coolant)
1.15 labelling (and storing in the correct location) components that require repair or overhaul
1.16 setting, and adjusting/tuning replaced components (such as power output, voltage)
1.17 applying bolt locking methods (such as split pins, wire locking, lock nuts)

2.

Remove and replace aircraft radar system components, 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 BS, ISO or BSEN standards and procedures
2.8 customer standards and requirements
2.9 company standards and procedures
2.10 aircraft manufacturer's requirements

3.

Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

3.1 job cards
3.2 computer records
3.3 aircraft service/flight log
3.4 aircraft log
3.5 permit to work/formal risk assessment computer records

## 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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