SEMAE3069

Installing aircraft navigational systems

Overview

This standard identifies the competences you need to install aircraft navigational systems, in accordance with approved procedures. It covers both fixed wing and rotary winged aircraft. You will be required to use appropriate installation drawings, specifications and documentation to install the various items of equipment. You will be expected to position, align and secure equipment in its correct locations, using specified/appropriate techniques and fastening devices. The aircraft equipment will include items such as central air data computers, pitot/static systems, distance measuring equipment (DME), very high frequency omnidirectional range (VOR), instrument landing system (ILS), auto direction finder (ADF), Global Positioning System (GPS), Doppler, long range navigation (LORAN), homing, inertial navigation system, Decca, compasses and other devices as applicable to the aircraft type.

Your responsibilities will require you to comply with organisational policy and procedures for the installation activities undertaken and to report any problems with the activities, components or equipment that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. 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 installation techniques and procedures. You will understand the aircraft navigational systems being installed, and their application, and will know about the installation techniques, tools and methods, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the installation operations. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace.

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 all relevant drawings and specifications for the installation being carried out
3. use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition
4. install, position and secure the equipment and components in accordance with the specification
5. ensure that all necessary connections to the equipment are complete
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. check that the installation is complete and that all components are free from damage
8. complete the relevant documentation, in accordance with organisational requirements
9. leave the aircraft and the work area 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 navigational systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the health and safety requirements of the work area where you are carrying out the activities and the responsibility these requirements place on you
3. the hazards associated with installing aircraft navigational systems and with the tools and equipment used and how to minimise them and reduce any risks
4. the protective equipment that you need to use for both personal protection (PPE) and protection of the aircraft
5. the precautions to be taken to prevent electrostatic discharge (ESD) damage to circuits and sensitive components (such as use of earthed wrist straps)
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. the interpretation of drawings, standards, quality control procedures and specifications used for the installation (including BS, ISO or BSEN schematics, symbols and terminology)
9. how to carry out currency/issue checks on the specifications you are working with
10. the components to be installed and their function within the particular navigational systems
11. the various mechanical fasteners that will be used and their method of installation (such as open and blind rivets, threaded fasteners, special securing devices)
12. the importance of using the specified fasteners for the particular installation and why you must not substitute others
13. why securing devices need to be locked and labelled, and the different methods

that are used
14. the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved
15. the quality control procedures to be followed during the installation operations
16. procedures for ensuring that you have the correct tools, equipment, components and fasteners for the activities
17.
the techniques used to position, align, adjust and secure the components to the aircraft without damage
18.
methods of lifting, handling and supporting the components/equipment during the installation activities
19. the use of seals, sealant, adhesives and anti-electrolysis barriers and the precautions to be taken
20. why electrical bonding is critical and why it must be both mechanically and electrically secure
21. the procedure for the safe disposal of waste materials
22. how to conduct any necessary checks to ensure the system integrity, functionality, accuracy and quality of the installation
23. how to recognise installation defects (such as poor seals, misalignment, ineffective fasteners, foreign object damage or contamination)
24. the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected
25. the tools and equipment used in the installation activities and their calibration/care and control procedures
26. 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
27. the problems that can occur with the installation operations and how these can be overcome
28. 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
29. the extent of your own responsibility 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 installation activities:

1.1 obtain and use the appropriate documentation (such as job instructions, installation drawings, planning and quality control documentation, aircraft standards and specifications)
1.2 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
1.3 provide and maintain a safe working environment for the installation activities
1.4 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 date
1.5 obtain clearance to work on the aircraft and observe all relevant isolation and safety procedures
1.6 follow safe practice/approved installation techniques and procedures at all times
1.7 return all tools and equipment to the correct location on completion of the installation activities
1.8 dispose of waste materials in accordance with approved procedures

2.

Install four of the following aircraft navigational systems:

2.1 distance measuring equipment (DME)
2.2 re-transmission systems
2.3 very high frequency omni directional range (VOR)
2.4 Doppler
2.5 instrument landing system (ILS)
2.6 homing
2.7 auto direction finder (ADF)
2.8 gyro
2.9 global positioning system (GPS)
2.10 Decca
2.11 long range navigation (LORAN)
2.12 compass
2.13 inertial navigation system
2.14 weather radar
2.15 microwave landing system (MLS)
2.16 enhanced ground proximity warning system (EGPWS)
2.17 traffic collision avoidance system (TCAS)
2.18 flight management computing (such as course computers, flight management, performance data computers)
2.19 flight environment data (such as central air data computers, pitot/static, rate-of-climb, air speed, high speed warning, altitude, altitude reporting,

altimeter correction, air disturbance detection, air temperature)
2.20 attitude and direction (such as magnetic compasses, vertical and directional references, magnetic heading systems, attitude director systems, symbol generators, turn and bank, rate of turn)
2.21 other specific system

3.

Install eight of the following aircraft navigational system components:

3.1 airspeed indicator
3.2 air data computer
3.3 analogue/digital converters (A-D/D-A)
3.4 altimeter
3.5 VOR unit
3.6 navigation display units (including head-up)
3.7 satellite beacons
3.8 HIS unit
3.9 computers
3.10 transponders
3.11 transmitter units
3.12 compass
3.13 compensation units
3.14 control units
3.15 gyro
3.16 receiver units
3.17 aerials
3.18 interface units
3.19 transformers
3.20 other specific system components

4.

Use all of the following installation methods and techniques:

4.1 levelling and aligning
4.2 earth bonding
4.3 taking electrostatic discharge (ESD) precautions
4.4 securing and locking

5.

Make three of the following types of mechanical securing connection:

5.1 threaded fasteners
5.2 locking devices
5.3 screws
5.4 torque load bolts
5.5 quick-release fasteners

6.

Make five of the following types of electrical connection:

6.1 co-axial
6.2 overall screened
6.3 terminal blocks

6.4 tray-mounted sockets
6.5 tri-axial
6.6 module blocks
6.7 free plugs and sockets
6.8 earth bonding points

7.

Carry out installations in compliance with one of the following standards:

7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
7.2 Ministry of Defence (MoD)
7.3 Military Aviation Authority (MAA)
7.4 Aerospace Quality Management Standards (AS)
7.5 customer standards and requirements
7.6 Federal Aviation Authority (FAA)
7.7 company standards and procedures
7.8 BS, ISO or BSEN standards and procedures
7.9 manufacturers standards and procedures

8.

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

8.1 build records
8.2 log cards
8.3 aircraft flight log
8.4 job cards
8.5 other specific recording method

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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