

Level 3 Diploma in Aviation Maintenance (Military Development Competence) (4608-60) - Avionic Component Overhaul

Version 2 (July 2019)

Unit Pack

Qualification at a glance

Subject area	Mechanical
City & Guilds number	4608
Age group approved	16-19, 19+
Entry requirements	None
Assessment types	Portfolio
Approvals	Automatic approval
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	GLH	TQT	City & Guilds qualification number	Ofqual accreditation number
Level 3 Diploma in Aviation Maintenance (Military Development Competence) - Avionic Component Overhaul	446	446	4608-60	603/2068/0

This unit pack must be read in conjunction with the main qualification handbook.

Version and date	Change detail	Section
Version 2.0 July 2019	Unit 418 formatted. Footer corrected.	Unit Footer

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1 Introduction

Level 3 Diploma in Aviation Maintenance (Military Development Competence) - Avionic Component Overhaul

Structure

Learners must complete 301,302, 304 & 455 plus one of 413 - 422

City & Guilds unit number	Unit title	GLH
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Mandatory

301	Complying with statutory regulations and organisational safety requirements	35
302	Using and interpreting engineering data and documentation	25
304	Reinstating the work area on completion of activities	25
455	Working efficiently and effectively in engineering	25

Optional

413	Overhauling components of aircraft navigational and computing equipment	336
414	Overhauling components of aircraft communication equipment	336
415	Overhauling components of aircraft radar equipment	336
416	Overhauling components of aircraft indication and gauging equipment	336
417	Overhauling components of aircraft electrical equipment	336
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419	Overhauling components of aircraft passive warning and optical/surveillance systems	336
420	Overhauling components of aircraft flight guidance and control equipment	336
421	Overhauling components of aircraft internal and external lighting equipment	336
422	Overhauling components of aircraft avionic equipment	336

2 Units

Structure of the units

These units each have the following:

- City & Guilds reference number
- Title
- Guided learning hours (GLH)
- Learning outcomes, which are comprised of a number of assessment criteria

Centres must deliver the full breadth of the range. Specialist equipment or commodities may not be available to all centres, so centres should ensure that their delivery covers their use. This may be covered by a practical demonstration (e.g. video). For the practical assessments for this qualification, centres should ensure that there are sufficient resources to complete the task but are not required to use all the equipment or commodities in the range.

Please refer to the main qualification handbook for full information on the qualification and the shared mandatory units.

GLH: 336**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft navigational and computing equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft, and covers a range of equipment such as distance measuring equipment (DME), very high frequency omnidirectional range (VOR), instrument landing system (ILS), auto direction finder (ADF), global positioning system (GPS), Doppler, tactical air navigation (TACAN), homing, inertial navigation system and compass, as applicable to the aircraft types. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying overhauling procedures to aircraft navigational and computing equipment. They will understand the dismantling and reassembly methods and procedures used, and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe working

practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation, in accordance with organisational requirements
- P9 dispose of unwanted components, waste materials and substances, in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhaul:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
 - 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 safe access and working arrangements for the overhauling area
 - 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 certification/calibration date
 - 1.5 where appropriate, apply electrostatic discharge (ESD) protection procedures
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area and the navigational and computing equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of aircraft navigational equipment:
 - 2.1 Distance Measuring Equipment (DME)
 - 2.2 re-transmission systems
 - 2.3 very high frequency omnidirectional 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 Tactical Air Navigation (TACAN)
 - 2.11 compass
 - 2.12 inertial navigation system
 - 2.13 computing sub-systems
 - 2.14 Microwave Landing System (MLS).

Learning outcome

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
- 3.1 cleaning parts prior to dismantling
 - 3.2 checking components for serviceability
 - 3.3 pre-disassembly checks and tests
 - 3.4 replacing all `lived' items (seals, dust caps)
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 replacing all damaged or defective components
 - 3.7 reassembling equipment
 - 3.8 removal of earth bonding
 - 3.9 setting and adjusting/calibrating replaced components (such as power output, voltage)
 - 3.10 removal of conformal coating
 - 3.11 removing cable securing devices
 - 3.12 making mechanical connections
 - 3.13 removing bolt securing devices and mechanical fasteners
 - 3.14 soldering electrical connections
 - 3.15 carrying out earth bonding
 - 3.16 dismantling equipment to unit/sub-assembly level
 - 3.17 installing cable securing devices
 - 3.18 dismantling units to component level
 - 3.19 tightening fastenings to the required torque
 - 3.20 marking/labelling of components to aid reassembly
 - 3.21 re-instating conformal coating
 - 3.22 securing components using mechanical fasteners and threaded devices
 - 3.23 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following navigational equipment components:
- 4.1 aerials
 - 4.2 satellite beacons
 - 4.3 control units
 - 4.4 transmitter units
 - 4.5 transponders
 - 4.6 navigation display units (including `head-up')
 - 4.7 receiver units
 - 4.8 analogue/digital converters (A- D/D-A)
 - 4.9 power supply units
 - 4.10 computers

- 4.11 microwave/acoustic generators
 - 4.12 compensation units
 - 4.13 interface units
 - 4.14 processors
 - 4.15 transducers
 - 4.16 amplifiers.
-

Learning outcome

The learner will:

5 replace a range of navigational equipment components, to include **eight** of the following:

- 5.1 switches
- 5.2 plugs/sockets/terminations
- 5.3 armatures
- 5.4 relays
- 5.5 batteries
- 5.6 wires/cables
- 5.7 gaskets
- 5.8 fuses
- 5.9 wiring harness (complete)
- 5.10 breakers/contacts
- 5.11 desiccant
- 5.12 fairings/panels
- 5.13 printed circuit boards
- 5.14 filament lamps/light emitting diodes
- 5.15 chassis components
- 5.16 electronic components (such as resistors, capacitors)
- 5.17 transparencies/lenses
- 5.18 transformers
- 5.19 screws/bolts/washers
- 5.20 other specific component.

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment, to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom
 - 6.2 signal injection tests from damage or foreign objects
 - 6.3 power output
 - 6.4 soak test
 - 6.5 continuity checks
 - 6.6 bonding tests
 - 6.7 standard serviceability test
 - 6.8 voltage standing wave ratio (VSWR) checks
 - 6.9 'special-to-type' tests.
-

Learning outcome

The learner will:

- 7 overhaul aircraft navigational equipment in compliance with **one** of the following:
 - 7.1 Military Aviation Authority (MAA)
 - 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.3 BS, ISO or BSEN standards and procedures
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 specific system requirements
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 organisation standards and procedures
 - 7.8 manufacturers' standards and procedures.
-

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method.
-

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling aircraft navigational equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft navigational equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling aircraft navigational equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the navigational equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock.
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft navigational systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft navigational equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft navigational equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft navigational equipment, without damage to the components or surrounding structure (such as de-soldering components, applying electrostatic discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled, and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.

- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components.
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 413

Overhauling components of aircraft navigational and computing equipment

Supporting Information

Unit guidance

Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

GLH: 336**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft communication equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft, and covers a range of equipment such as intercom (clear), intercom (secure), all radios, cockpit voice recorder, crash position indicators, digital data links, secure radio links, flight entertainment systems, Satellite Communications (SATCOM), and Selective Calling (SELCAL), as applicable to the aircraft type. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken, and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying appropriate overhauling procedures to aircraft communication equipment. They will understand the dismantling and reassembly methods and procedures used, and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhaul activities. They will be required to demonstrate safe working

practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements.
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
 - 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 safe access and working arrangements for the overhauling area
 - 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 certification/calibration date
 - 1.5 where appropriate, apply electrostatic discharge (ESD) protection procedures
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area and the communication equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of aircraft communication equipment:
 - 2.1 VHF radio
 - 2.2 cockpit voice recorder
 - 2.3 intercom (clear)
 - 2.4 SATCOM
 - 2.5 intercom (secure speech)
 - 2.6 digital data links
 - 2.7 secure radio links
 - 2.8 flight entertainment systems
 - 2.9 HF radio
 - 2.10 SELCAL
 - 2.11 UHF radio
 - 2.12 crash position indicators
 - 2.13 aircraft communication address reporting system (ACARS)
 - 2.14 telecommunications.

Learning outcome

The learner will:

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
 - 3.1 cleaning parts prior to dismantling
 - 3.2 checking components for serviceability
 - 3.3 pre-disassembly checks and tests
 - 3.4 replacing all 'lifer' items (such as seals, dust caps)
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 replacing all damaged or defective components
 - 3.7 reassembling equipment
 - 3.8 removal of earth bonding
 - 3.9 setting and adjusting/calibrating replaced components (such as power output, voltage)
 - 3.10 removal of conformal coating
 - 3.11 removing cable securing devices
 - 3.12 making mechanical connections
 - 3.13 removing bolt securing devices and mechanical fasteners
 - 3.14 soldering electrical connections
 - 3.15 carrying out earth bonding
 - 3.16 dismantling equipment to unit/sub-assembly level
 - 3.17 installing cable securing devices
 - 3.18 dismantling units to component level
 - 3.19 tightening fastenings to the required torque
 - 3.20 marking/labelling of components to aid reassembly
 - 3.21 re-instating conformal coating
 - 3.22 securing components using mechanical fasteners and threaded devices
 - 3.23 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following communication equipment components:
 - 4.1 power supply units
 - 4.2 tuning units
 - 4.3 aerials
 - 4.4 transmitter units
 - 4.5 receiver units
 - 4.6 transformers
 - 4.7 satellite beacons
 - 4.8 control units
 - 4.9 transponders
 - 4.10 intercom station boxes
 - 4.11 antenna switching units.

Learning outcome

The learner will:

- 5 replace a range of communication equipment components, to include **eight** of the following:
 - 5.1 batteries
 - 5.2 transformers
 - 5.3 plugs/sockets/terminations
 - 5.4 switches
 - 5.5 unit trays
 - 5.6 speakers
 - 5.7 fuses
 - 5.8 headsets
 - 5.9 microphone units
 - 5.10 relays
 - 5.11 instruments/gauges/ indicators
 - 5.12 chassis components
 - 5.13 circuit breakers
 - 5.14 gaskets/seals
 - 5.15 printed circuit boards
 - 5.16 filament lamps/light emitting diodes
 - 5.17 screws/bolts/washers
 - 5.18 electronic components (such as resistors, capacitors)
 - 5.19 wires/cables
 - 5.20 other specific components.

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment, to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom from damage or foreign objects
 - 6.2 signal injection tests
 - 6.3 power output
 - 6.4 soak test
 - 6.5 continuity checks
 - 6.6 bonding tests
 - 6.6. standard serviceability test
 - 6.8 voltage standing wave ratio (VSWR) checks
 - 6.9 `special-to-type' tests.

Learning outcome

The learner will:

- 7 overhaul aircraft communication equipment in compliance with one of the following:
 - 7.1 Military Aviation Authority (MAA)
 - 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.3 BS, ISO or BSEN standards and procedures
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 specific system requirements
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 organisation standards and procedures
 - 7.8 manufacturers' standards and procedures.

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method.

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling aircraft communication equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft communication equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling aircraft communication equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the communication equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft communication systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft communication equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft communication equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft communication equipment, without damage to the components or surrounding structure (such as de-soldering components, applying electrostatic discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.

- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components.
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 414

Overhauling components of aircraft communication equipment

Supporting Information

Unit guidance

Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

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GLH: 336**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft radar equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft and covers a range of equipment such as surveillance radar, weather radar, and obstacle warning systems, 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 types. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require you to comply with organisational policy and procedures for the overhauling activities undertaken and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside of their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying appropriate overhauling procedures to aircraft radar equipment. They will understand the dismantling and reassembly methods and procedures used and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and for ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe working

practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements.
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
 - 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 safe access and working arrangements for the overhauling area
 - 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 certification/calibration date
 - 1.5 where appropriate, apply electrostatic discharge (ESD) protection procedures
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area and the radar equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.
-

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on the following types of aircraft radar equipment:

Either **one** of the following:

- 2.1 surveillance radar
- 2.2 radar jamming

or

three of the following:

- 2.3 towed radar decoys
 - 2.4 obstacle warning systems
 - 2.5 radar (radio) altimeter
 - 2.6 identification friend or foe (IFF)
 - 2.7 Doppler
 - 2.8 tactical air navigation (TACAN)
 - 2.9 enhanced ground proximity warning system (EGPWS)
 - 2.10 weather radar/predictive wind shear
 - 2.11 supplementary surveillance radar
 - 2.12 traffic collision avoidance system (TCAS).
-

Learning outcome

The learner will:

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
 - 3.1 cleaning parts prior to dismantling
 - 3.2 checking components for serviceability
 - 3.3 pre-disassembly checks and tests
 - 3.4 replacing all 'lived' items (such as seals, dust caps)
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 replacing all damaged or defective components
 - 3.7 reassembling equipment
 - 3.8 removal of earth bonding
 - 3.9 setting and adjusting/calibrating replaced components (such as power output, voltage)
 - 3.10 removal of conformal coating
 - 3.11 removing cable securing devices
 - 3.12 making mechanical connections
 - 3.13 removing bolt securing devices and mechanical fasteners
 - 3.14 soldering electrical connections
 - 3.15 carrying out earth bonding
 - 3.16 dismantling equipment to unit/sub-assembly level
 - 3.17 installing cable securing devices
 - 3.18 dismantling units to component level
 - 3.19 tightening fastenings to the required torque
 - 3.20 marking/labelling of components to aid reassembly
 - 3.21 re-instating conformal coating
 - 3.22 securing components using mechanical fasteners and threaded devices
 - 3.23 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following radar equipment components:
 - 4.1 scanners
 - 4.2 control units
 - 4.3 aerials
 - 4.4 microwave generators
 - 4.5 transformers
 - 4.6 intermediate frequency unit (IFU)
 - 4.7 transmitter units
 - 4.8 power supply units (PSU)

- 4.9 computers
 - 4.10 winches
 - 4.11 transponders
 - 4.12 waveguides
 - 4.13 radar displays
 - 4.14 radar packs
 - 4.15 receiver units
 - 4.16 coolant units
 - 4.17 processors.
-

Learning outcome

The learner will:

5 replace a range of radar equipment components, to include **eight** of the following:

- 5.1 batteries
- 5.2 instruments/gauges/indicators
- 5.3 switches
- 5.4 desiccant units
- 5.5 fuses
- 5.6 filament lamps/light emitting diodes
- 5.7 relays
- 5.8 wires/cables
- 5.9 transformers
- 5.10 plugs/sockets/terminations
- 5.11 circuit breakers
- 5.12 chassis components
- 5.13 printed circuit boards
- 5.14 screws/bolts/washers
- 5.15 electronic components (such as resistors, capacitors)
- 5.16 coolants
- 5.17 gaskets and seals
- 5.18 other specific components.

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment, to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom from damage or foreign objects
 - 6.2 signal injection tests
 - 6.3 power output
 - 6.4 soak test
 - 6.5 continuity checks
 - 6.6 bonding tests
 - 6.7 standard serviceability test
 - 6.8 voltage standing wave ratio (VSWR) checks
 - 6.9 pressure/leak test
 - 6.10 `special-to-type' tests.

Learning outcome

The learner will:

- 7 overhaul aircraft radar equipment in compliance with **one** of the following:
 - 7.1 Military Aviation Authority (MAA)
 - 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.3 BS, ISO or BSEN standards and procedures
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 specific system requirements
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 organisation standards and procedures
 - 7.8 manufacturers' standards and procedures.

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling radar equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft radar equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling aircraft radar equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the radar equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock.
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft radar systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft radar equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft radar equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft radar equipment, without damage to the components or surrounding structure (such as de-soldering components, applying electrostatic discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled, and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.

- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 415

Overhauling components of aircraft radar equipment

Supporting Information

Unit guidance

Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

GLH: 336**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft indication and gauging equipment in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft and covers a range of indication and gauging equipment associated with powerplant and auxiliary power; engine fuel and lubrication; flying controls; fluid power; wheels, brakes and steering; transmission systems; environmental control systems; ice and rain protection and airframe systems and components, as applicable to the aircraft type. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken, and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area, and that all necessary job/task documentation is completed accurately and legibly.

They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying appropriate overhauling procedures to aircraft indication and gauging equipment. They will understand the dismantling and reassembly methods and procedures used, and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe working practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
 - 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 safe access and working arrangements for the overhauling area
 - 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 certification/calibration date
 - 1.5 where appropriate, apply electrostatic discharge (ESD) protection procedures
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area and the indication and gauging equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.
-

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of indication and gauging equipment:
 - 2.1 power plant (such as main engine power, auxiliary power, thrust reverse, propeller, starting, monitoring, fire)
 - 2.2 engine fuel, lubrication, air, cooling, control systems
 - 2.3 fluid power (such as hydraulic power generation, undercarriage, pneumatic or vacuum pressure)
 - 2.4 flying controls (such as flaps/slats, elevators, ailerons/ailerons, horizontal stabiliser, spoilers/speed brakes, wing sweep, reaction controls, rudder, rotor)
 - 2.5 wheels, brakes, steering
 - 2.6 transmission systems (such as main and auxiliary gear boxes)
 - 2.7 aircraft fuel systems (such as supply, contents, transfer, venting system, fuel jettison, refuelling and defuelling)
 - 2.8 environmental control systems (such as pressure control, heating and ventilation, equipment air conditioning)
 - 2.9 ice and rain protection systems (such as windshield, engine protection, pitot static protection, ice accretion)
 - 2.10 fuselage (such as access panels, cargo doors, boundary layer and suction doors).
-

Learning outcome

The learner will:

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
 - 3.1 cleaning parts prior to dismantling
 - 3.2 replacing all 'lived' items (seals, dust caps)
 - 3.3 pre-disassembly checks and tests
 - 3.4 replacing all damaged/defective components
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 reassembling equipment
 - 3.7 removal of earth bonding
 - 3.8 setting and adjusting/calibrating replaced components (such as power output, voltage)
 - 3.9 removing cable securing devices
 - 3.10 removing bolt securing devices and mechanical fasteners
 - 3.11 making mechanical connections
 - 3.12 dismantling equipment to unit/sub-assembly level
 - 3.13 soldering electrical connections
 - 3.14 dismantling units to component level
 - 3.15 carrying out earth bonding
 - 3.16 marking/labelling of components to aid reassembly
 - 3.17 installing cable securing devices
 - 3.18 checking components for serviceability
 - 3.19 tightening fastenings to the required torque
 - 3.20 securing components using mechanical fasteners and threaded devices
 - 3.21 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following indication and gauging equipment components:
 - 4.1 transmitters (such as position, flow, pressure, level)
 - 4.2 displays
 - 4.3 actuators
 - 4.4 generators (such as pulse, speed/tacho)
 - 4.5 motors
 - 4.6 computers
 - 4.7 capacitance units
 - 4.8 gauges/indicators.

Learning outcome

The learner will:

- 5 replace a range of indication and gauging equipment components, to include **eight** of the following:
 - 5.1 switches (such as micro, proximity)
 - 5.2 plugs/sockets/terminations
 - 5.3 fuses
 - 5.4 circuit breakers
 - 5.5 relays
 - 5.6 input and follow-up potentiometers
 - 5.7 transformers
 - 5.8 batteries
 - 5.9 printed circuit boards
 - 5.10 desiccant units
 - 5.11 electronic components (such as resistors, capacitors)
 - 5.12 filament lamps/light emitting diodes
 - 5.13 screws/bolts/washers
 - 5.14 transducers/sensors
 - 5.15 wires/cables
 - 5.16 gaskets and seals
 - 5.17 chassis components
 - 5.18 other specific components.

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom from damage or foreign objects
 - 6.2 comparison check
 - 6.3 continuity checks
 - 6.4 soak test
 - 6.5 standard serviceability test
 - 6.6 bonding tests
 - 6.7 'special-to-type' tests
 - 6.8 signal injection tests.

Learning outcome

The learner will:

- 7 overhaul aircraft indication and gauging equipment in compliance with **one** of the following:
 - 7.1 Military Aviation Authority (MAA)
 - 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.3 BS, ISO or BSEN standards and procedures
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 specific system requirements
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 organisation standards and procedures
 - 7.8 manufacturers' standards and procedures.
-

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method.
-

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling indication and gauging equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft indication and gauging equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
 - K2 the hazards associated with overhauling aircraft indication and gauging equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
 - K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
-

- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the indication and gauging equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock.
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft indication and gauging systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft indication and gauging equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft indication and gauging equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft indication and gauging equipment, without damage to the components or surrounding structure (such as desoldering components, applying electrostatic discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled, and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.
- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.

- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components.
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 416

Overhauling components of aircraft indication and gauging equipment

Supporting Information

Unit guidance

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This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

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This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft electrical equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft and covers a range of equipment associated with power generation, emergency power backup equipment, power distribution, flying controls, environmental control systems (ECS), fuel systems, undercarriage, pitot/static, lighting, weapons, engine control and countermeasures, as applicable to the aircraft type. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that are outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area and that all necessary job/task documentation is completed accurately and legibly.

They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying appropriate overhauling procedures to aircraft electrical equipment. They will understand the dismantling and reassembly methods and procedures used, and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe working practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements.
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 Carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation).
 - 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 safe access and working arrangements for the overhauling area.
 - 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 certification/calibration date.
 - 1.5 where appropriate, apply electrostatic discharge (ESD) protection procedures.
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times.
 - 1.7 return all tools and equipment to the correct location on completion of the activities.
 - 1.8 leave the work area and the electrical equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.
-

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of electrical equipment:
 - 2.1 fuel systems
 - 2.2 lighting
 - 2.3 pitot/static
 - 2.4 environmental control systems
 - 2.5 undercarriage
 - 2.6 engine control
 - 2.7 weapons
 - 2.8 countermeasures
 - 2.9 flying controls
 - 2.10 AC main power generation equipment
 - 2.11 DC power generation equipment
 - 2.12 emergency power backup equipment
 - 2.13 secondary/standby power generation equipment
 - 2.14 power distribution equipment.

Learning outcome

The learner will:

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
 - 3.1 cleaning parts prior to dismantling
 - 3.2 replacing all 'lived' items (seals, dust caps)
 - 3.3 pre-disassembly checks and tests
 - 3.4 replacing all damaged/defective components
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 reassembling equipment
 - 3.7 removal of earth bonding
 - 3.8 setting and adjusting/calibrating replaced components (such as power output, voltage)
 - 3.9 removal of conformal coating
 - 3.10 removing cable securing devices
 - 3.11 making mechanical connections
 - 3.12 removing bolt securing devices and mechanical fasteners
 - 3.13 soldering electrical connections
 - 3.14 dismantling equipment to unit/sub-assembly level
 - 3.15 carrying out earth bonding
 - 3.16 dismantling units to component level
 - 3.17 installing cable securing devices
 - 3.18 marking/labelling of components to aid reassembly
 - 3.19 tightening fastenings to the required torque
 - 3.20 checking components for serviceability
 - 3.21 reinstating conformal coating
 - 3.22 securing components using mechanical fasteners and threaded devices
 - 3.23 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following electrical equipment components:
 - 4.1 generators
 - 4.2 rectifier units
 - 4.3 regulators
 - 4.4 main contactors
 - 4.5 alternators
 - 4.6 actuator motors
 - 4.7 transformer
 - 4.8 air conditioning equipment

- 4.9 inverters
 - 4.10 controllers
 - 4.11 changeover relays
 - 4.12 other specific equipment components.
-

Learning outcome

The learner will:

- 5 replace a range of electrical equipment components, to include **eight** of the following:
 - 5.1 switches
 - 5.2 electronic components (such as resistors, capacitors)
 - 5.3 fuses
 - 5.4 batteries (such as one shot or flight control DC batteries)
 - 5.5 batteries (other types)
 - 5.6 relays
 - 5.7 transformers
 - 5.8 circuit breakers
 - 5.9 transducers/sensors
 - 5.10 wires/cables
 - 5.11 under-voltage phase sequence units
 - 5.12 plugs/sockets/terminations
 - 5.13 printed circuit boards
 - 5.14 screws/bolts/washers
 - 5.15 gaskets and seals
 - 5.16 chassis components
 - 5.17 other specific electrical components.
-

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom
 - 6.2 signal injection tests from damage or foreign objects
 - 6.3 comparison check
 - 6.4 soak test
 - 6.5 continuity checks
 - 6.6 bonding tests
 - 6.7 standard serviceability test
 - 6.8 voltage checks
 - 6.9 'special-to-type' tests.
-

Learning outcome

The learner will:

7 overhaul aircraft indication and gauging equipment in compliance with **one** of the following:

- 7.1 Military Aviation Authority (MAA)
- 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 7.3 BS, ISO or BSEN standards and procedures
- 7.4 Aerospace Quality Management Standards (AS)
- 7.5 specific system requirements
- 7.6 Federal Aviation Authority (FAA)
- 7.7 organisation standards and procedures
- 7.8 manufacturers' standards and procedures.

Learning outcome

The learner will:

8 complete the relevant documentation to include **one** from the following and pass it to the appropriate people:

- 8.1 computer records
- 8.2 record/history cards
- 8.3 job cards
- 8.4 aircraft service/flight log
- 8.5 other specific recording method.

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling electrical equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft electrical equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling aircraft electrical equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the electrical equipment
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock.
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft electrical systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft electrical equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft electrical equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft electrical equipment, without damage to the components or surrounding structure (such as de-soldering components, applying electrostatic discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled, and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.

- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components.
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 417

Overhauling components of aircraft electrical equipment

Supporting Information

Unit guidance

Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

GLH: 336**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft pitot static equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft, and covers a range of equipment associated with height, speed, rate of climb, navigation, auto-pilot, flying control surfaces, ice and rain protection, as applicable to the aircraft type. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken, and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area, and that all necessary job/task documentation is completed accurately and legibly.

They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying appropriate overhauling procedures to aircraft pitot static equipment. They will understand the dismantling and reassembly methods and procedures used, and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe

working practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements.
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
 - 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 safe access and working arrangements for the overhauling area
 - 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 certification/calibration date
 - 1.5 where appropriate, apply electrostatic discharge (ESD) protection procedures
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area and the pitot static equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.
-

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of pitot static equipment:
 - 2.1 rate of climb
 - 2.2 aircraft height indication
 - 2.3 auto-pilot
 - 2.4 air speed indication
 - 2.5 navigation
 - 2.6 oxygen drop-out
 - 2.7 flying controls (such as flaps, elevators, ailerons/ailerons, spoilers, wing sweep, reaction controls, rudder, rotor, airbrakes, horizontal stabiliser, artificial feel, gust alleviation, modal suppression)
 - 2.8 engine control systems (such as FADEC, FAFC, EEC)
 - 2.9 environmental control systems (such as pressure control)
 - 2.10 ice and rain protection systems (such as pitot static protection, ice accretion).

Learning outcome

The learner will:

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
 - 3.1 cleaning parts prior to dismantling
 - 3.2 replacing all damaged/defective components
 - 3.3 pre-disassembly checks and tests
 - 3.4 reassembling equipment
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 setting and adjusting/calibrating replaced components (such as pressure, flow, voltage)
 - 3.7 removal of earth bonding
 - 3.8 removing cable securing devices
 - 3.9 removing bolt securing devices and mechanical fasteners
 - 3.10 making mechanical connections
 - 3.11 dismantling equipment to unit/sub-assembly level
 - 3.12 soldering electrical connections
 - 3.13 dismantling units to component level
 - 3.14 carrying out earth bonding
 - 3.15 marking/labelling of components to aid reassembly
 - 3.16 installing cable securing devices
 - 3.17 checking components for serviceability
 - 3.18 tightening fastenings to the required torque
 - 3.19 replacing all 'lived' items (such as seals, dust caps)
 - 3.20 securing components using mechanical fasteners and threaded devices
 - 3.21 applying locking and retaining devices (such as circlips, pins, wire locking).
-

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following pitot static equipment components:
 - 4.1 airspeed indicators
 - 4.2 heaters
 - 4.3 analogue/digital converters
 - 4.4 altitude indicators
 - 4.5 static ports
 - 4.6 pitot probes/pressure heads
 - 4.7 rate of climb indicators
 - 4.8 transducer units
 - 4.9 air data computers/modules
 - 4.10 cabin altitude alerter

- 4.11 digital displays
 - 4.12 mach meters.
-

Learning outcome

The learner will:

- 5 replace a range of pitot static equipment components to include **eight** of the following:
 - 5.1 switches (such as micro, proximity)
 - 5.2 plugs/sockets/terminations
 - 5.3 fuses
 - 5.4 circuit breakers
 - 5.5 relays
 - 5.6 moisture drains/traps
 - 5.7 printed circuit boards
 - 5.8 rigid pipes
 - 5.9 electronic components (such as resistors, capacitors)
 - 5.10 flexi-pipes/hoses
 - 5.11 batteries
 - 5.12 transformers
 - 5.13 desiccant units
 - 5.14 transducers/sensors
 - 5.15 screws/bolts/washers
 - 5.16 filament lamps/light emitting diodes
 - 5.17 wires/cables
 - 5.18 gaskets and seals
 - 5.19 other specific components.
-

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom
 - 6.2 signal injection tests from damage or foreign objects
 - 6.3 comparison check
 - 6.4 soak test
 - 6.5 continuity checks
 - 6.6 bonding tests
 - 6.7 standard serviceability test
 - 6.8 sense and leak tests
 - 6.9 'special-to-type' tests.
-

Learning outcome

The learner will:

- 7 overhaul aircraft indication and gauging equipment in compliance with **one** of the following:
 - 7.1 Military Aviation Authority (MAA)
 - 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.3 BS, ISO or BSEN standards and procedures
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 specific system requirements
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 organisation standards and procedures
 - 7.8 manufacturers' standards and procedures.

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method.

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling pitot static equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft pitot static equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling aircraft pitot static equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the pitot static equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock.
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft pitot static systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft pitot static equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft pitot static equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft pitot static equipment, without damage to the components or surrounding structure (such as de-soldering components, applying electrostatic discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled, and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.

- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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..
- K32 the procedure for the safe disposal of waste materials and scrap components
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 418

Overhauling components of aircraft pitot static equipment

Supporting Information

Unit guidance

Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

GLH: 336**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft passive warning and optical surveillance equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft and covers a range of equipment associated with acoustics, SONAR, radar homing & warning receivers (RHWR), collision and ground avoidance, wet, digital, video and infra-red cameras, recording and LASER systems, as applicable to the aircraft types. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying overhauling procedures on aircraft passive warning and optical surveillance equipment. They will understand the dismantling and reassembly methods and procedures used, and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe working

practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements.
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
 - 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 safe access and working arrangements for the overhauling area
 - 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 certification/calibration date
 - 1.5 where appropriate, apply Electrostatic Discharge (ESD) protection procedures
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area and the passive warning and optical surveillance equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of passive warning and optical surveillance equipment:
 - 2.1 acoustics
 - 2.2 collision avoidance (radar)
 - 2.3 video recording systems
 - 2.4 air data recording
 - 2.5 ground avoidance (radio altimeter)
 - 2.6 LASER systems
 - 2.7 Sound Navigation and Ranging (SONAR)
 - 2.8 camera systems (wet film, digital or infra-red)
 - 2.9 Radar Homing and Warning Receivers (RHWR).

Learning outcome

The learner will:

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
 - 3.1 cleaning parts prior to dismantling
 - 3.2 checking components for serviceability
 - 3.3 pre-disassembly checks and tests
 - 3.4 replacing all 'lived' items (seals, dust caps)
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 replacing all damaged or defective components
 - 3.7 reassembling equipment
 - 3.8 removal of earth bonding
 - 3.9 setting and adjusting/calibrating replaced components (such as power output, voltage)
 - 3.10 removal of conformal coating
 - 3.11 removing cable securing devices
 - 3.12 making mechanical connections
 - 3.13 removing bolt securing devices and mechanical fasteners
 - 3.14 soldering electrical connections
 - 3.15 carrying out earth bonding
 - 3.16 dismantling equipment to unit/sub-assembly level
 - 3.17 installing cable securing devices
 - 3.18 dismantling units to component level
 - 3.19 tightening fastenings to the required torque
 - 3.20 marking/labelling of components to aid reassembly
 - 3.21 re-instating conformal coating
 - 3.22 securing components using mechanical fasteners and threaded devices
 - 3.23 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following passive warning and optical surveillance equipment components:
 - 4.1 buoys
 - 4.2 recording devices (cockpit, video, air data)
 - 4.3 cameras
 - 4.4 aerials
 - 4.5 Power Supply Unit (PSU)
 - 4.6 satellite beacons
 - 4.7 receiver units
 - 4.8 interface units

- 4.9 transponders
 - 4.10 transmitter units
 - 4.11 control units
 - 4.12 display units
 - 4.13 processors
 - 4.14 transformers
 - 4.15 other specific components.
-

Learning outcome

5 replace a range of passive warning and optical surveillance equipment components, to include **eight** of the following:

- 5.1 switches
- 5.2 plugs/sockets/terminations
- 5.3 wires/cables
- 5.4 relays
- 5.5 batteries
- 5.6 wiring harness (complete)
- 5.7 gaskets
- 5.8 fuses
- 5.9 instruments/gauges/indicators
- 5.10 filament lamps/light emitting diodes
- 5.11 desiccant
- 5.12 fairings/panels
- 5.13 printed circuit boards
- 5.14 breakers/contacts
- 5.15 chassis components
- 5.16 electronic components (such as resistors, capacitors)
- 5.17 transformers
- 5.18 film or digital modules
- 5.19 armatures
- 5.20 screws/bolts/washers
- 5.21 other specific components.

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment, to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom from damage or foreign objects
 - 6.2 signal injection tests
 - 6.3 continuity checks
 - 6.4 soak test
 - 6.5 standard serviceability test
 - 6.6 bonding tests
 - 6.7 'special-to-type' tests
 - 6.8 Voltage Standing Wave Ratio (VSWR) checks.
-

Learning outcome

The learner will:

- 7 overhaul aircraft indication and gauging equipment in compliance with **one** of the following:
 - 7.1 Military Aviation Authority (MAA)
 - 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.3 BS, ISO or BSEN standards and procedures
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 specific system requirements
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 organisation standards and procedures
 - 7.8 manufacturers' standards and procedures.
-

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method.

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling passive warning and optical/surveillance equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft passive warning and optical/surveillance equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling aircraft passive warning and optical/surveillance equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the passive warning and optical/surveillance equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock.
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft passive warning and optical/surveillance systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft passive warning and optical/surveillance equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft passive warning and optical/surveillance equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft passive warning and optical/surveillance equipment, without damage to the components or surrounding structure (such as de-soldering components, applying Electrostatic Discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.

- K16 why securing devices need to be locked and labelled and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.
- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components.
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 419

Overhauling components of aircraft passive warning and optical/surveillance systems

Supporting Information

Unit guidance

Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

GLH: 336**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft flight guidance and control equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft, and covers a range of equipment associated with fly by wire, gyros, autopilot, flight director, angle of attack, turn and slip, and AFCS (Automatic Flying Control System), as applicable to the aircraft types. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area, and that all necessary job/task documentation is completed accurately and legibly.

They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying overhauling procedures to aircraft flight guidance and control equipment. They will understand the dismantling and reassembly methods and procedures used, and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe working

practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements.
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
 - 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 safe access and working arrangements for the overhauling area
 - 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 certification/calibration date
 - 1.5 where appropriate, apply Electrostatic Discharge (ESD) protection procedures
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area and the guidance and control equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities
-

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of aircraft flight guidance and control equipment:
 - 2.1 fly by wire
 - 2.2 Automatic Flying Control System (AFCS)
 - 2.3 autopilot
 - 2.4 angle of attack/stall warning
 - 2.5 flight director
 - 2.6 nose wheel steering
 - 2.7 turn and slip indication
 - 2.8 main gear steering
 - 2.9 gyros

Learning outcome

3 carry out **all** of the following activities, as applicable to the equipment being overhauled:

- 3.1 cleaning parts prior to dismantling
- 3.2 checking components for serviceability
- 3.3 pre-disassembly checks and tests
- 3.4 replacing all 'lived' items (seals, dust caps)
- 3.5 disconnecting and de-soldering electrical connections
- 3.6 replacing all damaged or defective components
- 3.7 reassembling equipment
- 3.8 removal of earth bonding
- 3.9 setting and adjusting/calibrating replaced components (such as power output, voltage)
- 3.10 removal of conformal coating
- 3.11 removing cable securing devices
- 3.12 making mechanical connections
- 3.13 removing bolt securing devices and mechanical fasteners
- 3.14 soldering electrical connections
- 3.15 carrying out earth bonding
- 3.16 dismantling equipment to unit/sub-assembly level
- 3.17 installing cable securing devices
- 3.18 dismantling units to component level
- 3.19 tightening fastenings to the required torque
- 3.20 marking/labelling of components to aid reassembly
- 3.21 re-instating conformal coating
- 3.22 securing components using mechanical fasteners and threaded devices
- 3.23 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

4 carry out overhauling activities to component level on **three** of the following passive flight guidance and control equipment components:

- 4.1 computers
- 4.2 actuators
- 4.3 controllers
- 4.4 transformers
- 4.5 air data units
- 4.6 stick position cancellers
- 4.7 detectors/position sensors
- 4.8 Attitude Heading and Reference System (AHRS)
- 4.9 receiver units

- 4.10 Inertial Reference Unit (IRUs)
 - 4.11 gyros (rate and vertical)
 - 4.12 primary or secondary embedded GPS and INS (EGI)
 - 4.13 trim units.
-

Learning outcome

The learner will:

- 5 replace a range of flight guidance and control equipment components, to include eight of the following:
 - 5.1 switches
 - 5.2 instruments/gauges/indicators
 - 5.3 armatures
 - 5.4 relays
 - 5.5 plugs/sockets/terminations
 - 5.6 wires/cables
 - 5.7 gaskets
 - 5.8 batteries
 - 5.9 wiring harness (complete)
 - 5.10 breakers/contacts
 - 5.11 fuses
 - 5.12 fairings/panels
 - 5.13 filament lamps/light emitting diodes
 - 5.14 desiccant
 - 5.15 chassis components
 - 5.16 electronic components (such as resistors, capacitors)
 - 5.17 printed circuit boards
 - 5.18 aerials
 - 5.19 transformers
 - 5.20 screws/bolts/washers
 - 5.21 other specific components.

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment, to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom from damage or foreign objects
 - 6.2 power output from damage or foreign objects
 - 6.3 continuity checks
 - 6.4 soak test
 - 6.5 standard serviceability test
 - 6.6 bonding tests
 - 6.7 'special-to-type' tests
 - 6.8 signal injection tests

Learning outcome

7 overhaul aircraft flight guidance and control equipment in compliance with **one** of the following:

- 7.1 Military Aviation Authority (MAA)
- 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 7.3 BS, ISO or BSEN standards and procedures
- 7.4 Aerospace Quality Management Standards (AS)
- 7.5 specific system requirements
- 7.6 Federal Aviation Authority (FAA)
- 7.7 organisation standards and procedures
- 7.8 manufacturers' standards and procedures

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling flight guidance and control equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft flight guidance and control equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling flight guidance and control equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the flight guidance and control equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock.
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft flight guidance and control systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft flight guidance and control equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft flight guidance and control equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft flight guidance and control equipment, without damage to the components or surrounding structure (such as desoldering components, applying Electrostatic Discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled and the different methods that are used to remove and install them.

- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.
- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve..

Unit 420

Overhauling components of aircraft flight guidance and control equipment

Supporting Information

Unit guidance

Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

GLH: 336**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft internal and external lighting equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft, and covers a range of equipment associated with Electro-Luminescence (EL), emergency lighting, Night Vision (NVG), utility lighting, spot/search lighting, anti-dazzle lighting, external lighting systems, flood lighting and cabin lighting, as applicable to the aircraft type. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area and that all necessary job/task documentation is completed accurately and legibly.

They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work and will provide an informed approach to applying appropriate overhauling procedures to aircraft lighting equipment. They will understand the dismantling and reassembly methods and procedures used and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe working

practices throughout and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation)
 - 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 safe access and working arrangements for the overhauling area
 - 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 certification/calibration date
 - 1.5 where appropriate, apply Electrostatic Discharge (ESD) protection procedures
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area and the lighting equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of aircraft lighting equipment:
 - 2.1 Electro-Luminescence (EL)
 - 2.2 spot/search lighting
 - 2.3 flood lighting
 - 2.4 emergency lighting
 - 2.5 anti-dazzle lighting
 - 2.6 cabin lighting
 - 2.7 Night Vision Goggles (NVG)
 - 2.8 external lighting systems
 - 2.9 utility lighting.

Learning outcome

The learner will:

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
 - 3.1 cleaning parts prior to dismantling
 - 3.2 replacing all damaged/defective components
 - 3.3 pre-disassembly checks and tests
 - 3.4 reassembling equipment
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 setting and adjusting/calibrating replaced components (such as power output, voltage)
 - 3.7 removal of earth bonding
 - 3.8 removal of conformal coating
 - 3.9 making mechanical connections
 - 3.10 removing cable securing devices
 - 3.11 soldering electrical connections
 - 3.12 removing bolt securing devices and mechanical fasteners
 - 3.13 carrying out earth bonding
 - 3.14 dismantling equipment to unit/sub-assembly level
 - 3.15 installing cable securing devices
 - 3.16 dismantling units to component level
 - 3.17 tightening fastenings to the required torque
 - 3.18 marking/labelling of components to aid reassembly
 - 3.19 weather sealing lighting unit assemblies
 - 3.20 checking components for serviceability
 - 3.21 re-instating conformal coating
 - 3.22 replacing all 'lived' items (seals, dust caps)
 - 3.23 securing components using mechanical fasteners and threaded devices
 - 3.24 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following lighting equipment components:
 - 4.1 spot/search light (complete unit)
 - 4.2 power supplies
 - 4.3 rheostats
 - 4.4 inverters
 - 4.5 taxi/landing lamp (complete unit)
 - 4.6 junction box
 - 4.7 utility light
 - 4.8 control units
 - 4.9 strobe light/beacon light
 - 4.10 transformer
 - 4.11 rectifier units
 - 4.12 navigation light.

Learning outcome

The learner will:

- 5 replace a range of lighting equipment components, to include **eight** of the following:
 - 5.1 switches
 - 5.2 printed circuit boards
 - 5.3 plugs/sockets/terminations
 - 5.4 fuses
 - 5.5 terminal blocks
 - 5.6 filament lamps
 - 5.7 relays
 - 5.8 batteries (such as one shot or flight control DC batteries)
 - 5.9 batteries (other types)
 - 5.10 light emitting diodes
 - 5.11 transformers
 - 5.12 circuit breakers
 - 5.13 strip lights
 - 5.14 transducers/sensors
 - 5.16 wires/cables
 - 5.16 screws/bolts/washers
 - 5.17 electronic components (such as resistors, capacitors)
 - 5.18 under-voltage phase sequence units
 - 5.19 other specific components.

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment, to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom from damage or foreign objects
 - 6.2 comparison check
 - 6.3 continuity checks
 - 6.4 soak test
 - 6.5 standard serviceability test
 - 6.6 bonding tests
 - 6.7 'special-to-type' tests
 - 6.8 voltage checks.

Learning outcome

The learner will:

- 7 overhaul aircraft lighting equipment in compliance with **one** of the following:
 - 7.1 Military Aviation Authority (MAA)
 - 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.3 BS, ISO or BSEN standards and procedures
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 specific system requirements
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 organisation standards and procedures
 - 7.8 manufacturers' standards and procedures.

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method.

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling lighting equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft lighting equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling lighting equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the lighting equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft lighting systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft lighting equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft lighting equipment being overhauled, and the performance characteristics and function of the components within the equipment.
- K12 the techniques used to remove components from aircraft lighting equipment, without damage to the components or surrounding structure (such as de-soldering components, applying Electrostatic Discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved

- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components.
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 421

Overhauling components of aircraft internal and external lighting equipment

Supporting Information

Unit guidance

Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

GLH: 336**Unit aim:**

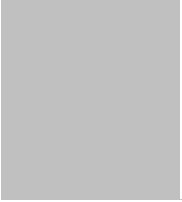
This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief.

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to carry out overhauling activities on components of aircraft avionic equipment, in accordance with approved procedures. The equipment to be overhauled will have been removed from the aircraft and the overhauling activities may take place in a workshop or hangar. It covers equipment used in both fixed wing and rotary winged aircraft, and includes a range of equipment such as communication, radar, electrical, pitot static, passive warning and optical surveillance, flight guidance and control, navigation and computing and lighting systems as applicable to the aircraft type. The overhauling activities will include carrying out all necessary safety checks, dismantling the equipment to unit or component level, inspecting and checking all components for damage and wear, replacing all 'lived' items and worn/faulty components or units, reassembling the equipment and carrying out all necessary tests/checks.

Their responsibilities will require them to comply with organisational policy and procedures for the overhauling activities undertaken, and to report any problems with the overhauling activities, or with the tools and equipment used that they cannot personally resolve or that is outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will provide a good understanding of their work, and will provide an informed approach to applying appropriate overhauling procedures to aircraft avionic equipment. They will understand the dismantling and reassembly methods and procedures used, and their application. They will know how the equipment functions, the common faults encountered, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities and for ensuring that the overhauled equipment meets the required specification.

They will understand the safety precautions required when carrying out the overhauling activities. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.



They will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall objectives of the organisation, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Learning outcome

Performance Requirements

Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines.
- P2 demonstrate the required behaviours in line with the job role and organisational objectives.
- P3 follow the relevant overhauling schedules to carry out the required work.
- P4 establish the components to be removed and where appropriate, mark/label components to aid re-assembly.
- P5 carry out the overhaul to the agreed level, using the correct tools and techniques.
- P6 ensure that all removed components are correctly identified and stored in the correct location.
- P7 report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule.
- P8 complete the relevant documentation in accordance with organisational requirements.
- P9 dispose of unwanted components, waste materials and substances in accordance with safe working practices and approved procedures.
- P10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

- 1 carry out **all** of the following during the overhauling activities:
 - 1.1 obtain and use the appropriate documentation (such as job instructions, aircraft manuals and overhauling documentation, technical instructions and other relevant maintenance documentation).
 - 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 safe access and working arrangements for the overhauling area.
 - 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 certification/calibration date.
 - 1.5 where appropriate, apply Electrostatic Discharge (ESD) protection procedures.
 - 1.6 carry out the overhauling activities, using approved techniques and procedures at all times.
 - 1.7 return all tools and equipment to the correct location on completion of the activities.
 - 1.8 leave the work area and the avionic equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities.
-

Learning outcome

The learner will:

- 2 carry out the overhauling activities to unit level on **three** of the following types of aircraft avionic equipment:
 - 2.1 communication
 - 2.2 passive warning and optical/surveillance
 - 2.3 radar
 - 2.4 flight guidance and control
 - 2.5 electrical
 - 2.6 navigation and computing
 - 2.7 pitot static
 - 2.8 internal and external lighting

Learning outcome

The learner will:

- 3 carry out **all** of the following activities, as applicable to the equipment being overhauled:
- 3.1 cleaning parts prior to dismantling
 - 3.2 replacing all damaged/defective components
 - 3.3 pre-disassembly checks and tests
 - 3.4 reassembling equipment
 - 3.5 disconnecting and de-soldering electrical connections
 - 3.6 setting and adjusting/calibrating replaced components (such as power output, voltage)
 - 3.7 removal of earth bonding
 - 3.8 removal of conformal coating
 - 3.9 making mechanical connections
 - 3.10 removing cable securing devices
 - 3.11 soldering electrical connections
 - 3.12 removing bolt securing devices and mechanical fasteners
 - 3.13 carrying out earth bonding
 - 3.14 dismantling equipment to unit/sub-assembly level
 - 3.15 installing cable securing devices
 - 3.16 dismantling units to component level
 - 3.17 tightening fastenings to the required torque
 - 3.18 marking/labelling of components to aid reassembly
 - 3.19 checking components for serviceability
 - 3.20 re-instating conformal coating
 - 3.21 replacing all 'lived' items (seals, dust caps)
 - 3.22 securing components using mechanical fasteners and threaded devices
 - 3.23 applying locking and retaining devices (such as circlips, pins, wire locking).

Learning outcome

The learner will:

- 4 carry out overhauling activities to component level on **three** of the following avionic equipment components:
- 4.1 transmitter/receiver
 - 4.2 transducer
 - 4.3 computer
 - 4.4 lighting unit
 - 4.5 recorder/camera
 - 4.6 transformer
 - 4.7 scanner

- 4.8 rectifier
 - 4.9 aerial
 - 4.10 inverters
 - 4.11 displays/indicators
 - 4.12 amplifier
 - 4.13 control unit
 - 4.14 inertial navigation/gyros
 - 4.15 signal generator
 - 4.16 actuators
 - 4.17 interface unit
 - 4.18 generator/alternator
 - 4.19 power supply
 - 4.20 contactor
 - 4.21 switching unit
 - 4.22 tuning unit
 - 4.23 other specific avionic component.
-

Learning outcome

The learner will:

- 5 replace a range of avionic equipment components, to include **eight** of the following:
 - 5.1 batteries
 - 5.2 desiccant units
 - 5.3 switches
 - 5.4 filament lamps/light emitting diodes
 - 5.5 breakers/contacts
 - 5.6 wires/cables
 - 5.7 fuses
 - 5.8 plugs/sockets/terminations
 - 5.9 relays
 - 5.10 speakers
 - 5.11 transformers
 - 5.12 microphone units
 - 5.13 circuit breakers
 - 5.14 chassis components
 - 5.15 printed circuit boards
 - 5.16 screws/bolts/washers
 - 5.17 electronic components (such as resistors, capacitors)
 - 5.18 coolants
 - 5.19 unit trays
 - 5.20 gaskets/seals
 - 5.21 instruments/gauges/indicators
 - 5.22 headsets

- 5.23 transducers/sensors
 - 5.24 pipes/hoses
 - 5.25 moisture drains/traps
 - 5.26 film/digital modules
 - 5.27 aerials
 - 5.28 transparencies/lenses
 - 5.29 terminal blocks
 - 5.30 other specific components.
-

Learning outcome

The learner will:

- 6 carry out checks and tests on the overhauled equipment, to include **three** of the following:
 - 6.1 visual inspection for completeness and freedom from damage or foreign objects
 - 6.2 signal injection tests
 - 6.3 power output
 - 6.4 soak test
 - 6.5 continuity checks
 - 6.6 bonding tests
 - 6.7 standard serviceability test
 - 6.8 Voltage Standing Wave Ratio (VSWR) checks
 - 6.9 `special-to-type' tests
 - 6.10 pressure/leak test
 - 6.11 voltage checks
 - 6.12 comparison check
 - 6.13 other specific checks.
-

Learning outcome

The learner will:

- 7 overhaul aircraft avionic equipment in compliance with **one** of the following:
 - 7.1 Military Aviation Authority (MAA)
 - 7.2 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.3 BS, ISO or BSEN standards and procedures
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 specific system requirements
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 organisation standards and procedures
 - 7.8 manufacturers' standards and procedures.
-

Learning outcome

The learner will:

- 8 complete the relevant documentation, to include **one** from the following and pass it to the appropriate people:
 - 8.1 computer records
 - 8.2 record/history cards
 - 8.3 job cards
 - 8.4 aircraft service/flight log
 - 8.5 other specific recording method.

Learning outcome

Knowledge and understanding

Assessment criteria

The learner must know and understand:

- K1 the safe working practices and procedures and the specific safety precautions to be taken when overhauling avionic equipment (to include wearing protective clothing and equipment; lifting and handling techniques; safe working practices and procedures with regard to working on aircraft avionic equipment; procedures and guidelines which satisfy current regulations such as HASAWA, COSHH and other work related legislation and guidelines).
- K2 the hazards associated with overhauling avionic equipment, and with the tools and equipment used, and how to minimise them and reduce any risks.
- K3 The importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the organisation if these are not adhered to.
- K4 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.
- K5 the protective equipment that they need to use for both personal protection (PPE) and protection of the avionic equipment.
- K6 what constitutes a hazardous voltage and how to recognise victims of electric shock.
- K7 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers).
- K8 how to extract and use information from equipment manuals, history/maintenance reports, charts, circuit and physical layouts, specifications, symbols used in aircraft avionic systems and other documents needed in the overhauling process.
- K9 how to carry out currency/issue checks on the specifications they are working with.
- K10 terminology used in aircraft avionic equipment, and the use of system diagrams and associated symbols.
- K11 the basic principles of operation of the aircraft avionic equipment being overhauled, and the performance characteristics and function of the components within the equipment.

- K12 the techniques used to remove components from aircraft avionic equipment, without damage to the components or surrounding structure (such as de-soldering components, applying electrostatic discharge (ESD) protection procedures).
- K13 the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections.
- K14 the various mechanical fasteners that are used and their method of removal and replacement (such as threaded fasteners, special securing devices).
- K15 the importance of using the specified fasteners for the particular installation and why they must not substitute others.
- K16 why securing devices need to be locked and labelled, and the different methods that are used to remove and install them.
- K17 the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved.
- K18 the need to correctly label and store components, and to check that replaced components have the correct part/identification markings.
- K19 the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul.
- K20 the techniques used to position, align, adjust and secure the replaced components to the equipment, without damage to the components or surrounding structure.
- K21 the quality control procedures to be followed during the overhauling operations.
- K22 procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.
- K23 methods of lifting, handling and supporting the components/equipment during the removal and replacement activities.
- K24 the use of seals, sealant and adhesives and anti-electrolysis barriers and the precautions to be taken.
- K25 why electrical bonding is critical and why it must be both mechanically and electrically secure.
- K26 how to conduct any necessary checks and adjustments to ensure the system integrity, accuracy and quality of the overhaul.
- K27 the tools and equipment used in the overhauling activities and their calibration/care and control procedures.
- K28 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the overhauling activities.
- K29 the problems that can occur with the overhauling operations and how these can be overcome.
- K30 how to recognise defects (such as poor seals, misalignment, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination).
- K31 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.
- K32 the procedure for the safe disposal of waste materials and scrap components.
- K33 the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve.

Unit 422

Overhauling components of aircraft avionic equipment

Supporting Information

Unit guidance

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Appendix 1 Useful contacts

UK learners

General qualification information

E: learnersupport@cityandguilds.com

International learners

General qualification information

F: +44 (0)20 7294 2413

E: intcg@cityandguilds.com

Centres

Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results

F: +44 (0)20 7294 2413

E: centresupport@cityandguilds.com

Single subject qualifications

Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change

F: +44 (0)20 7294 2413

F: +44 (0)20 7294 2404 (BB forms)

E: singlesubjects@cityandguilds.com

International awards

Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports

F: +44 (0)20 7294 2413

E: intops@cityandguilds.com

Walled Garden

Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems

F: +44 (0)20 7294 2413

E: walledgarden@cityandguilds.com

Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

T: +44 (0)121 503 8993

E: business@cityandguilds.com

Publications

Logbooks, Centre documents, Forms, Free literature

F: +44 (0)20 7294 2413

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