

Level 3 Diploma in Aviation Maintenance (Development Competence) (4608-30)

Version 1-5 (June 2024)

Qualification Handbook

Qualification at a glance

Subject area	Mechanical
City & Guilds number	4608
Age group approved	16-18, 19+
Entry requirements	None
Assessment types	Portfolio
Approvals	Fast track approval
Support materials	Fast track approval forms
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Accreditation number
Level 3 Diploma in Aviation Maintenance (Development Competence)	4608-30	601/9036/X

Version and date	Change detail	Section
1.2 October 2017	Outcome S6 amended	Unit 309
1.3 October 2018	Unit 341 content S2-S8 and Knowledge and understanding corrected	Unit 341
1.4 November 2018	Amendment to unit 315 S2	Unit 315
1.5 June 2024	Change to wording for 3.1 and 3.2	Unit 302 S3

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Unit 318	Maintaining ice and rain protection systems on aircraft ATA 30	161
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Unit 320	Maintaining landing gear on aircraft ATA 32	181
Unit 321	Maintaining lighting systems on aircraft ATA 33	191
Unit 322	Maintaining navigation systems on aircraft ATA 34	200
Unit 323	Maintaining oxygen systems on aircraft ATA 35	211
Unit 324	Maintaining pneumatic systems on aircraft ATA 36	220
Unit 325	Maintaining vacuum systems on aircraft ATA 37	230
Unit 326	Maintaining water and waste systems on aircraft ATA 38	239
Unit 327	Maintaining cabin systems on aircraft ATA 44	248
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Unit 332	Maintaining stabilisers on aircraft ATA 55	298
Unit 333	Maintaining windows on aircraft ATA 56	308
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Unit 338	Maintaining rotor blade and tail pylon folding systems on rotorcraft ATA 66	359
Unit 339	Maintaining flight control systems on rotorcraft ATA 67	368
Unit 340	Maintaining power plant on aircraft ATA 71	378
Unit 341	Maintaining turbine engines on aircraft ATA 72	388
Unit 342	Maintaining reciprocating engines on aircraft ATA 72	398
Unit 343	Maintaining engine fuel and control systems on aircraft ATA 73	407
Unit 344	Maintaining ignition systems on aircraft ATA 74	417
Unit 345	Maintaining bleed air systems on aircraft ATA 75	426

Unit 346	Maintaining engine controls on aircraft ATA 76	435
Unit 347	Maintaining engine indicating systems on aircraft ATA 77	444
Unit 348	Maintaining engine exhaust systems on aircraft ATA 78	454
Unit 349	Maintaining lubricating oil systems on aircraft ATA 79	463
Unit 350	Maintaining engine starting systems on aircraft ATA 80	473
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1 Introduction

This document tells you what you need to do to deliver the qualification:

Area	Description
Who is the qualification for?	<p>It is aimed at anyone over the age of 16 who has an interest in working and progressing in the Aerospace and Aviation sector.</p> <p>It offers progression from Level 2 Diploma in Aviation and Aerospace Engineering (Foundation Competence)</p> <p>It is designed to train and qualify the next generation of Aviation maintenance technicians to meet an identified gap in the market and minimise the potential loss of skills and knowledge over the next 5-10 years.</p>
What does the qualification cover?	<p>This qualification allows candidates to learn, develop and practise the skills required for employment and/or career progression in the Aviation Advanced Maintenance and Engineering sector in general.</p>
What opportunities for progression are there?	<p>This qualification will allow candidates to access employment as Aircraft Maintenance Fitters/Technicians and provides a pathway into Higher Education.</p>
Who did we develop the qualification with?	<p>The Aerospace and Aviation Employer apprenticeship group which consists of the following organisations:</p> <ul style="list-style-type: none"> • BAE Systems • Airbus • Gama Aviation • Harrods Aviation • Marshall ADG • Inflight MRO Services • Virgin • Rizon Jet UK • MOD <p>Professional Engineering Institutions, SEMTA</p>
Is it part of an apprenticeship framework or initiative?	Yes

Structure

Learners must achieve all four units from Mandatory Group A (301 - 304), plus one unit from Optional Group A (305 - 308) and a minimum of six units from Optional Group B (309 - 353)

City & Guilds component number	Title
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Mandatory Group A

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

Optional Group A

305	Lifting and trestling/shoring aircraft for maintenance/repair operations
306	Levelling and weighing aircraft
307	Towing, marshalling and parking aircraft
308	Carrying out flight servicing and routine maintenance of aircraft

Optional Group B

309	Maintaining air conditioning systems on aircraft ATA 21
310	Maintaining auto flight systems on aircraft ATA 22
311	Maintaining communication systems on aircraft ATA 23
312	Maintaining electrical power systems on aircraft ATA24
313	Maintaining equipment and furnishings on aircraft ATA 25
314	Maintaining fire protection systems on aircraft ATA 26
315	Maintaining flight control systems on aircraft ATA 27
316	Maintaining fuel systems on aircraft ATA 28
317	Maintaining hydraulic systems on aircraft ATA 29
318	Maintaining ice and rain protection systems on aircraft ATA 30
319	Maintaining indicating and recording systems on aircraft ATA 31
320	Maintaining landing gear on aircraft ATA 32
321	Maintaining lighting systems on aircraft ATA 33

Optional Group B

322	Maintaining navigation systems on aircraft ATA 34
323	Maintaining oxygen systems on aircraft ATA 35
324	Maintaining pneumatic systems on aircraft ATA 36
325	Maintaining vacuum systems on aircraft ATA 37
326	Maintaining water and waste systems on aircraft ATA 38
327	Maintaining cabin systems on aircraft ATA 44
328	Maintaining airborne auxiliary power systems on aircraft ATA 49
329	Maintaining cargo and accessory compartments on aircraft ATA 50
330	Maintaining doors on aircraft ATA 52
331	Maintaining fuselage, nacelles and pylons on aircraft ATA 53 and ATA 54
332	Maintaining stabilisers on aircraft ATA 55
333	Maintaining windows on aircraft ATA 56
334	Maintaining wings on aircraft ATA 57
335	Maintaining propeller/propulsor systems on aircraft ATA 61
336	Maintaining rotor systems on rotorcraft ATA 62 and ATA 64
337	Maintaining rotor drive systems on rotorcraft ATA 63 and ATA 65
338	Maintaining rotor blade and tail pylon folding systems on rotorcraft ATA 66
339	Maintaining flight control systems on rotorcraft ATA 67
340	Maintaining power plant on aircraft ATA 71
341	Maintaining turbine engines on aircraft ATA 72
342	Maintaining reciprocating engines on aircraft ATA 72
343	Maintaining engine fuel and control systems on aircraft ATA 73
344	Maintaining ignition systems on aircraft ATA 74
345	Maintaining bleed air systems on aircraft ATA 75
346	Maintaining engine controls on aircraft ATA 76
347	Maintaining engine indicating systems on aircraft ATA 77
348	Maintaining engine exhaust systems on aircraft ATA 78
349	Maintaining lubricating oil systems on aircraft ATA 79
350	Maintaining engine starting systems on aircraft ATA 80
351	Maintaining reciprocating engine turbo-supercharging systems on aircraft ATA 81

Optional Group B

352	Maintaining engine water injection systems on aircraft ATA 82
353	Maintaining radar systems on aircraft ATA 34

Total Qualification Time

Total Qualification Time (TQT) is the number of notional hours which represents an estimate of the total amount of time that could reasonably be expected for a learner to achieve and demonstrate the achievement of the level of attainment necessary for the award of a qualification.

TQT is comprised of the following two elements:

- 1) The number of hours which an awarding organisation has assigned to a qualification for Guided Learning, and
- 2) an estimate of the number of hours a Learner will reasonably be likely to spend in preparation, study or any other form of participation in education or training, including assessment, which takes place as directed by - but, unlike Guided Learning, not under the Immediate Guidance or Supervision of - a lecturer, supervisor, tutor or other, appropriate provider of education or training.

Title and level	GLH	TQT
Level 3 Diploma in Aviation Maintenance (Development Competence)	1034	1700

2 Centre requirements

Approval

If your Centre is approved to offer the qualification Level 3 NVQ Diploma in Aeronautical Engineering then you can apply for the new Level 3 Diploma in Aviation Maintenance (Development Competence) approval using the fast track approval form, available from the City & Guilds website.

Centres should use the fast track form if:

- there have been no changes to the way the qualifications are delivered, and
- they meet all of the approval criteria in the fast track form guidance notes.

Fast track approval is available for 12 months from the launch of the qualification. After 12 months, the Centre will have to go through the standard Qualification Approval Process. The centre is responsible for checking that fast track approval is still current at the time of application.

To offer these qualifications, new centres will need to gain both centre and qualification approval. Please refer to the Centre Manual - Supporting Customer Excellence for further information.

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualifications before designing a course programme.

Resource requirements

Centre staffing

Staff delivering these qualifications must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the area[s] for which they are delivering training and/or have experience of providing training. This knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.
- assessors must be able to demonstrate that they are able to make valid assessment decisions. This could be through an accredited qualification such as the Award in Understanding the Principles and Practice of Assessment (TAQA) or through a structured training programme covering assessment practices.

See also page 13 for details from the assessment strategy on the role of supervisors and managers in the assessment process.

Centre staff may undertake more than one role, eg tutor and assessor or internal verifier, but cannot internally verify their own assessments.

Learner entry requirements

Individual employers will set the criteria, but most candidates will have four GCSEs C grade (or equivalent) or above on entry (including English, Maths & Science). Employers who recruit candidates

without English, Maths and Science at Grade C or above must ensure that the candidate achieves this requirement, or an equivalent at Level 2, prior to completion of the Apprenticeship.

This qualification is a mandatory component of the Development Phase of the following Apprenticeship Standards:

- Aircraft Maintenance Fitter/Technician (Fixed and Rotary Wing)
The Standards have been designed by Employers. Centres should make themselves familiar with the Standards, Assessment Plan and Employer Occupational Brief requirements, details of which can be found at:

<https://www.gov.uk/government/collections/apprenticeship-standards>

Age restrictions

City & Guilds cannot accept any registrations for learners under 16 as these qualifications are not approved for learners under 16.

3 Delivering the qualification

Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs
- support and guidance they may need when working towards their qualifications
- any units they have already completed, or credit they have accumulated which is relevant to the qualifications
- the appropriate type and level of qualification.

Support materials

The following resources are available for these qualifications:

Description	How to access
Fast track approval forms	www.cityandguilds.com

Recording documents

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, Learning Assistant, an easy-to-use and secure online tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: www.cityandguilds.com/eportfolios.

City & Guilds has developed a set of Recording forms including examples of completed forms, for new and existing centres to use as appropriate. Recording forms are available on the City & Guilds website.

Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre. Amendable (MS Word) versions of the forms are available on the City & Guilds website.

4 Assessment

Summary of assessment methods

Candidates must: have a completed portfolio of evidence covering mandatory and chosen units.

- 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 business 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.

Assessment strategy

Access to assessment

There are no entry requirements required for the Units of Competence unless this is a legal requirement of the process or the environment in which the Apprentice is working in. Assessment is open to any Apprentice who has the potential to reach the assessment requirements set out in the relevant units.

Aids or appliances, which are designed to alleviate disability, may be used during assessment, providing they do not compromise the standard required.

Carrying out assessments

The Units of Competence have been specifically developed to cover a wide range of activities. The evidence produced for the units will, therefore, depend on the skills and knowledge required by employer and specified in the Apprentice's Training Plan. The Skills section of the Units of Competence makes reference to a number of optional items listed (for example 'any three from five'). This is the minimum standard set by employers.

Where the unit requirements gives a choice of optional areas, Assessors should note that Apprentices do not need to provide evidence of the other areas to complete the unit, unless specified by the employer (in this example above, two items) particularly where these additional items may relate to other activities or methods that are not part of the Apprentice's normal workplace activities or required by the employer.

Performance evidence requirements

Performance evidence must be the main form of evidence gathered. In order to demonstrate consistent competent performance for a unit, a minimum of three different examples of performance of the unit activity will be required. Items of performance evidence often contain features that apply to more than one unit, and can be used as evidence in any unit where they are suitable.

Performance evidence must be:

- products of the Apprentice's work, such as items that have been produced or worked on, plans, charts, reports, standard operating procedures, documents produced as part of a work activity, records or photographs of the completed activity

together with:

- evidence of the way the Apprentice carried out the activities, such as witness testimonies, assessor observations or authenticated Apprentice reports of the activity undertaken.

Competent performance is more than just carrying out a series of individual set tasks. Many of the units in the Development Phase contain statements that require the Apprentice to provide evidence that proves they are capable of combining various features and techniques. Where this is the case, separate fragments of evidence would not provide this combination of features and techniques and, therefore, will not be acceptable as demonstrating competent performance.

If there is any doubt as to what constitutes suitable evidence the Internal/External Quality Assurer should be consulted.

Assessing knowledge and understanding requirements

Knowledge and understanding are key components of competent performance, but it is unlikely that performance evidence alone will provide enough evidence in this area. Where the Apprentice's knowledge and understanding is not apparent from performance evidence, it must be assessed by other means and be supported by suitable evidence.

Knowledge and understanding can be demonstrated in a number of different ways. It is recommended that oral questioning and practical demonstrations are used perhaps whilst observing the apprentice undertake specific tasks, as these are considered the most appropriate for these units. Assessors should ask enough questions to make sure that the Apprentice has an appropriate level of knowledge and understanding, as required by the unit.

Evidence of knowledge and understanding will **not** be required for those items in the skills section of the Units of Competence that have not been selected by the employer.

Where oral questioning is used the assessor must retain a record of the questions asked, together with the Apprentice's answers.

Witness testimony

Where observation is used to obtain performance evidence, this must be carried out against the unit assessment criteria. Best practice would require that such observation is carried out by a qualified assessor. If this is not practicable, then alternative sources of evidence may be used.

For example, the observation may be carried out against the assessment criteria by someone else that is in close contact with the Apprentice. This could be a team leader, supervisor, mentor or line manager who may be regarded as a suitable witness to the Apprentice's competency. However, the witness must be technically competent in the process or skills that they are providing testimony for, to at least the same level of expertise as that required of the Apprentice. It will be the responsibility of the assessor to make sure that any witness testimonies accepted as evidence of the Apprentice's competency are reliable, auditable and technically valid.

Maximising opportunities to use assessment evidence

One of the critical factors required in order to make this Assessment Strategy as efficient and effective as possible and to ease the burden of assessment, is the Assessor's ability and expertise to work in partnership with the apprentice and their employer to provide advice and guidance on how to maximise opportunities to cross reference performance and knowledge evidence to all relevant Units of Competence. For example if a knowledge statement is repeated in a number of separate Units of Competence and the expected evidence/response to that statement is the same including the context, then the same piece of evidence should be cross referenced to the appropriate units.

Recognition of prior learning (RPL)

Recognition of prior learning means using a person's previous experience, or qualifications which have already been achieved, to contribute to a new qualification.

For this qualification, RPL is allowed and is not sector specific.

<http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/quality-assurance-documents>

5 Units

Structure of the units

Availability of units

Below is a list of the learning outcomes for all the units. If you want to download a complete set of units, go to www.cityandguilds.com

Structure of units

These units each have the following:

- City & Guilds reference number
- Unit accreditation number (UAN)
- title
- level
- unit aim
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

Unit 301

Complying with statutory regulations and organisational safety requirements

RQF Reference:	L/508/6383
Unit level:	Level 3
GLH:	35

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Advanced Manufacturing and Engineering 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 Deal with statutory regulations and organisational safety requirements, in accordance with approved procedures. They will be required to comply with all relevant regulations that apply to their area of work as well as their general responsibilities as defined in the Health and Safety at Work Act.

They must also be able to identify the relevant qualified first aiders or appointed person, and know the location of the first aid facilities. They will have an understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. They will also need to be fully conversant with the organisation's procedures for fire alerts and the evacuation of premises.

They will be required to identify the hazards and risks that are associated with their job. Typically, these will focus on their working environment, the tools and equipment that they use, materials and substances that they use, working practices that do not follow laid down procedures, and manual lifting and carrying techniques.

Their responsibilities will require them to comply with organisational policy and procedures for the statutory regulations and organisational safety activities undertaken, and to report any problems with the safety activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to work with minimal supervision, taking personal responsibility for their own actions, and for the way in which they carry out the required manufacturing/engineering activities.

Their underpinning knowledge will provide a good understanding of their work, and will provide an informed approach to applying statutory regulations and organisational safety requirements and procedures. They will understand the safety requirements and their application, and will know about the safety requirements in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

They will be able to apply the occupational behaviours required in the workplace to meet the job profile and overall company objectives, including being able to demonstrate; personal

responsibility and resilience, working effectively in teams, effective communication and interpersonal skills, focus on quality and problem solving and continuous development

Outcome

P Performance requirements

The learner must be able to:

- P1 comply with their duties and obligations as defined in the Health and Safety at Work Act
 - P2 demonstrate the required occupational behaviours in line with the job role and company objectives
 - P3 present themselves in the workplace suitably prepared for the activities to be undertaken
 - P4 follow organisational accident and emergency procedures
 - P5 recognise and control hazards in the workplace
 - P6 use correct manual lifting and carrying techniques
 - P7 apply safe working practices and procedures
-

Outcome

S Skills requirements

The learner must be able to:

- S1 Demonstrate their understanding of their duties and obligations to health and safety by carrying out all of the following:
 - 1.1 apply in principle their duties and responsibilities as an individual under the Health and Safety at Work Act and relevant current legislation
 - 1.2 identifying within their organisation, appropriate sources of information and guidance on health and safety issues, to include:
 - 1.3 identifying the warning signs and labels of the main groups of hazardous or dangerous substances
 - 1.4 complying with the appropriate statutory regulations at all times
-

Outcome

S2 Comply with all emergency requirements, to include:

- 2.1 identifying the appropriate qualified first aiders or appointed person and the location of first aid facilities
 - 2.2 identifying the procedures to be followed in the event of injury to self or others
 - 2.3 following organisational procedures in the event of fire and the evacuation of premises
 - 2.4 Identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions
-

Outcome

S3 Comply with all emergency requirements, to include:

- 3.1 their working environment
 - 3.2 the tools and equipment that they use
 - 3.3 materials and substances that they use
 - 3.4 using working practices that do not follow laid down procedures
-

Outcome

S4 Demonstrate two of the following methods of manual lifting and carrying techniques:

- 4.1 lifting alone
 - 4.2 with assistance of others
 - 4.3 with mechanical assistance
-

Outcome

S5 Apply safe working practices in an industrial environment, to include all of the following:

- 5.1 maintaining a tidy workplace with exits and gangways free from obstructions
 - 5.2 using tools and equipment safely and only for the purpose intended
 - 5.3 observing organisational safety rules, signs and hazard warnings
 - 5.4 taking measures to protect others from harm by any work they are carrying out
-

Outcome

K Knowledge and understanding.

The learner must be able to:

- K1 describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act 1974 and current legislation (such as The Management of Health and Safety at Work Regulations; Workplace Health and Safety and Welfare Regulations; Personal Protective Equipment at Work Regulations 1992; Manual Handling Operations Regulations; Provision and Use of Work Equipment Regulations; Display Screen at Work Regulations; The Electricity at Work Regulations)
 - K2 describe the specific regulations and safe working practices and procedures that apply to their work activities
 - K3 describe the warning signs for the nine main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances Regulations
 - K4 explain how to locate relevant health and safety information for their tasks and the sources of expert assistance when help is needed
 - K5 explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile or toxic materials, unshielded processes)
-

- K6 describe their responsibilities for dealing with hazards and reducing risks in the workplace (such as hazard spotting and safety inspections; the use of hazard check lists, carrying out risk assessments, COSHH assessments and safe systems of working)
- K7 describe the risks associated with their working environment, the tools, materials and equipment that they use, spillages of oil and chemicals, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures
- K8 describe the importance of applying the appropriate occupational behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K9 describe first aid facilities that exist within their work area and within the organisation in general and the procedures to be followed in the case of accidents involving injury
- K10 explain what constitutes dangerous occurrences and hazardous malfunctions, and why these must be reported even when no one was injured
- K11 describe the procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used and the need to report their presence at the appropriate assembly point
- K12 describe the organisational policy with regard to firefighting procedures, the common causes of fire and what they can do to help prevent them
- K13 describe the protective clothing and equipment that is available for their areas of activity
- K14 explain how to lift and carry loads safely, and the manual and mechanical aids available
- K15 explain how to prepare and maintain safe working areas, standards and procedures to ensure good housekeeping
- K16 describe the importance of safe storage of tools, equipment, materials and products
- K17 describe the extent of their own authority and to whom they should report in the event of problems that they cannot resolve

Unit 301

Complying with statutory regulations and organisational safety requirements

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 302

Using and interpreting engineering data and documentation

RQF Reference:	R/508/6384
Unit level:	Level 3
GLH:	25

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Advanced Manufacturing and Engineering 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 make effective use of text, numeric and graphical information by interpreting and using technical information extracted from engineering drawings, technical manuals, reference tables, specifications and charts, in accordance with approved procedures. They will be required to extract the necessary information from the various drawings and related documents in order to establish and carry out the maintenance requirements and to make valid decisions about the quality and accuracy of the equipment being maintained.

Their responsibilities will require them to comply with organisational policy and procedures for obtaining and using the drawings and related specifications. They will be expected to report any problems with the use and interpretation of the drawings and specifications that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to work with minimal 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 the types of drawings and documents used within a maintenance environment, and will provide an informed approach to applying instructions and procedures. They will be able to read and interpret the drawings and documents used and will know about the conventions, symbols and abbreviations, in adequate depth to provide a sound basis for carrying out the maintenance activities to the required specification.

They will be able to apply the occupational behaviours required in the workplace to meet the job profile and overall company objectives, including being able to demonstrate; personal responsibility and resilience, working effectively in teams, effective communication and interpersonal skills, focus on quality and problem solving and continuous development

Outcome

P Performance requirements

The learner must be able to:

P1 use the approved source to obtain the required data, documentation or specifications

- P2 demonstrate the required occupational behaviours in line with the job role and company objectives
 - P3 extract and interpret the required information from the data, documentation or specifications
 - P4 use the information obtained to establish work requirements
 - P5 deal promptly and effectively with any problems within their control and report those which cannot be solved
 - P6 record and/or communicate technical data and information using approved methods
 - P7 report any inaccuracies or discrepancies in drawings and specifications
 - P8 use the approved source to obtain the required data, documentation or specifications
-

Outcome

S Skills requirements

The learner must be able to:

- S1 Use approved sources to obtain the necessary drawings and related specifications, and carry out all of the following:
 - 1.1 check the currency and validity of the documentation used
 - 1.2 exercise care and control over the documentation at all times
 - 1.3 correctly extract all necessary data in order to carry out the required tasks
 - 1.4 seek out additional information where there are gaps or deficiencies in the information obtained
 - 1.5 deal with and/or report any problems found with the data and documentation
 - 1.6 make valid decisions based on the evaluation of the information extracted from the documentation
 - 1.7 return all documentation to the approved location on completion of the work
 - 1.8 complete all necessary work related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation
-

Outcome

- S2 Use information extracted from engineering drawings and related documentation, to include two of the following:
 - 2.1 drawings (such as component drawings, general assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings)
 - 2.2 diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit, layout diagrams)
 - 2.3 manufacturers manuals/drawings
 - 2.4 approved sketches
 - 2.5 technical illustrations
 - 2.6 photographic images/representations
 - 2.7 visual display screen information
 - 2.8 technical sales/marketing documentation
 - 2.9 contractual documentation
 - 2.10 other specific drawings/documents
-

Outcome

The learner will:

S3 use information extracted from related documentation.

Must include **both** of the following:

- 3.1 standard operating procedures
- 3.2 instructions (such as job instructions, drawing instructions, manufacturers' instructions)

Plus, any **one** of the following:

- 3.3 specifications (such as material, finish, process, contractual, calibration)
- 3.4 reference materials (such as manuals, tables, charts, fault diagnosis guides)
- 3.5 schedules
- 3.6 operation sheets
- 3.7 maintenance log reports
- 3.8 service/test information/schedules/results
- 3.9 planning documentation
- 3.10 quality control documents
- 3.11 company specific technical instructions
- 3.12 national, international and organisational standards
- 3.13 health and safety standards relating to the activity (such as COSHH)
- 3.14 environmental requirements/information
- 3.15 other specific related documentation

Outcome

S4 Extract information that includes three of the following:

- 4.1 materials or components required
- 4.2 dimensions
- 4.3 tolerances
- 4.4 quality requirements
- 4.5 installation requirements
- 4.6 customer requirements
- 4.7 time scales
- 4.8 financial information
- 4.9 operating parameters
- 4.10 surface texture requirements
- 4.11 location/orientation of parts
- 4.12 process or treatments required
- 4.13 dismantling/assembly sequence
- 4.14 inspection/testing requirements
- 4.15 number/volumes required
- 4.16 repair/service methods
- 4.17 method of manufacture
- 4.18 weld type and size

- 4.19 operations required
 - 4.20 connections to be made
 - 4.21 surface finish required
 - 4.22 shape or profiles
 - 4.23 fault finding procedures
 - 4.24 test points
 - 4.25 safety/risk factors
 - 4.26 environmental controls
 - 4.27 technical data (such as component data, maintenance data, electrical data, fluid data)
 - 4.28 resources (such as tools, equipment, personnel)
 - 4.29 utility supply details (such as electricity, water, gas, air)
 - 4.30 location of services, including standby and emergency backup systems
 - 4.31 circuit characteristics (such as pressure, flow, current, voltage, speed)
 - 4.32 protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment)
 - 4.33 other specific related information (such as financial delivery or contractual data)
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain what information sources are used for the documentation and specifications that they use in their work activities
 - K2 explain how the required documentation is obtained, and how to check that it is current and valid
 - K3 explain the importance of applying the appropriate occupational behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K4 explain how to use other sources of information to support the activity (such as manuals, tables, charts, planning and quality documentation, national and international standards)
 - K5 describe the procedure for reporting discrepancies, lost or damaged documentation
 - K6 explain the care and control procedures for the documentation, and the importance of returning them to the designated location on completion of the work activities
 - K7 explain what basic drawing conventions are used, and why there needs to be different types of drawings
 - K8 explain what types of drawings/diagrams used, and how they interrelate (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)
 - K9 explain why technical information is presented in different forms
 - K10 explain the meaning of common symbols and abbreviations used within the working environment/work area
 - K11 explain the imperial and metric systems of measurement, tolerancing and fixed reference points
 - K12 describe the meaning of the different symbols and abbreviations found on the documentation that they use (such as wiring and component symbols, surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics)
 - K13 describe the extent of their own responsibility, when to act on their own initiative to find, clarify and evaluate information, and to whom they should report if they have problems that they cannot resolve
-

Unit 302

Using and interpreting engineering data and documentation

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 303

Working efficiently and effectively in advanced manufacturing and engineering

RQF Reference:	Y/508/6385
Unit level:	Level 3
GLH:	25

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Advanced Manufacturing and Engineering Sector and is part of an overall development programme designed to meet the requirements of the Sector, the 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:

Work efficiently and effectively in the workplace, in accordance with approved procedures and practices. Prior to undertaking the manufacturing/engineering activity, they will be required to carry out all necessary preparations within the scope of their responsibility. This may include preparing the work area and ensuring that it is in a safe condition to carry out the intended activities, ensuring they have the appropriate job specifications and instructions and that any tools, equipment, materials and other resources required are available and in a safe and usable condition.

On completion of the manufacturing/engineering activity, they will be required to return their immediate work area to an acceptable condition before recommencing further work requirements. This may involve placing completed work in the correct location, returning and/or storing any tools and equipment in the correct area, identifying any waste and/or scrapped materials and arranging for their disposal, and reporting any defects or damage to tools and equipment used.

Their responsibilities will require them to comply with organisational policy and procedures for the manufacturing/engineering activities undertaken, and to report any problems with the activities, tools or equipment that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to take personal responsibility for their own actions, and for the quality and accuracy of the work that they carry out and to identify and make recommendations where improvements could be made in their working area.

Their underpinning knowledge will provide a good understanding of their work, and will provide an informed approach to working efficiently and effectively in a manufacturing/engineering environment. They will understand the need to work efficiently and effectively, and will know about the things they need to consider when preparing and tidying up the work area, how to contribute to improvements, deal with problems, maintain effective working relationships, and agree their development objectives and targets, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.



They will understand the safety precautions required when carrying out manufacturing/engineering activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Outcome

P Performance requirements

The learner must be able to:

- P1 work safely at all times, complying with health and safety and environmental legislation, regulations and other relevant guidelines
 - P2 demonstrate the required occupational behaviours in line with the job role and company objectives/values
 - P3 plan the manufacturing/engineering activities before they start them
 - P4 prepare the work area for carrying out the manufacturing/engineering activity
 - P5 obtain all necessary consumables, tools and equipment and check that they are in a safe and usable condition
 - P6 deal promptly and effectively with any manufacturing/engineering problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve
 - P7 contribute to the business by identifying possible opportunities for improving working practices, processes and/or procedures
 - P8 maintain effective working relationships with colleagues and supervisors
 - P9 review personal training and development, as appropriate to the job role
 - P10 clean, tidy up and restore the work area on completion of the manufacturing/engineering activity
-

Outcome

S Skills requirements

The learner must be able to:

- S1 Ensure that they apply all the following checks and practices at all times
 - 1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
 - 1.2 wear the appropriate personal protective equipment for the work area and specific activity being carried out
 - 1.3 use all tools and equipment safely and correctly, and only for their intended purpose including adherence to the Control of Vibration at Work Regulations (Hand and Arm)
 - 1.4 ensure that the work area is maintained and left in a safe and tidy condition
-

Outcome

S2 Demonstrate and apply all the following occupational behaviours

- 2.1 Personal responsibility and resilience:
 - a. comply with health and safety guidance and procedures,
 - b. be disciplined and have a responsible approach to risk
 - c. work diligently regardless of how much they are being supervised
 - d. accept responsibility for managing time and workload
 - e. stay motivated and committed when facing challenges
 - 2.2 Working effectively in teams
 - a. make an effort to integrate with the team
 - b. support other people
 - c. consider implications of their own actions on other people and activities
 - d. work effectively to get the task completed
 - 2.3 Effective communication and interpersonal skills
 - a. is an open and honest communicator
 - b. communicate clearly using appropriate methods
 - c. listen well to others
 - d. have a positive and respectful attitude
 - 2.4 Focus on quality and problem solving
 - a. follow instructions and guidance
 - b. demonstrates attention to detail
 - c. follow a logical approach to problem solving
 - d. seek opportunities to improve quality, speed and efficiency
 - 2.5 Continuous development
 - a. reflect on skills, knowledge and behaviours and seeks opportunities to develop
 - b. adapt to different situations, environments or technologies
 - c. has a positive attitude to feedback and advice
-

Outcome

S3 Prepare to carry out the manufacturing/engineering activity, ensuring all the following as applicable to the activity to be undertaken

- 3.1 the work area is free from hazards and is suitably prepared for the activities to be undertaken
 - 3.2 any required safety procedures are implemented
 - 3.3 any necessary personal protection equipment is obtained, and is in a usable condition
 - 3.4 all necessary drawings, specifications and associated documents are obtained
 - 3.5 job instructions are obtained and understood
 - 3.6 tools and equipment required are obtained and checked that they are in a safe and useable condition
 - 3.7 the correct materials or components are obtained
 - 3.8 appropriate authorisation to carry out the work is obtained
-

Outcome

S4 Complete the work activities to include all of the following

- 4.1 returning tools and equipment to the designated location
-

- 4.2 returning drawings and work instructions
 - 4.3 disposing of waste materials, in line with organisational and environmental requirements
 - 4.4 completing all necessary documentation accurately and legibly
 - 4.5 identifying, where appropriate, any damaged or unusable tools or equipment
-

Outcome

- S5 Recognise and deal with problems affecting the manufacturing/engineering activity to include four of the following

- 5.1 materials
 - 5.2 job specification
 - 5.3 timescales
 - 5.4 tools and equipment
 - 5.5 quality
 - 5.6 safety
 - 5.7 drawings
 - 5.8 people
 - 5.9 work activities or procedures
 - 5.10 other
-

Outcome

- S6 Contribute to the business by identifying possible opportunities for improving working practices and/or processes that will impact on one of the following

- 6.1 standard operating procedures
 - 6.2 quality
 - 6.3 cost
 - 6.4 time such as lead or processing time
 - 6.5 waste
 - 6.6 energy utilisation
 - 6.7 equipment performance or condition
 - 6.8 resource
 - 6.9 engineering designs
 - 6 Plus one from the following:
 - 6.10 health and safety
 - 6.11 customer service
 - 6.12 training and development
 - 6.13 regulatory compliance
 - 6.14 supplier relationships
 - 6.15 communication (internal and/or external)
 - 6.16 team working
 - 6.17 other improvement to be specified by the employer
-

Outcome

S7 Contribute to developing their own Continuous Development Plan (CPD) relevant to their career aspirations to include all the following

- 7.1 describing the levels of skill, knowledge and understanding needed for competence in the areas of work expected of them
 - 7.2 describing their development objectives/program, and how these were identified
 - 7.3 providing information on their expectations and progress towards their identified objectives
 - 7.4 using feedback and advice to improve their personal development and performance objectives
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 describe the safe working practices and procedures to be followed whilst preparing and tidying up your work area
 - K2 explain the importance of applying the appropriate occupational behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K3 describe how to present themselves in the workplace suitably dressed for the activities to be undertaken (such as being neat, clean and dressed in clothes appropriate to the area of activity)
 - K4 explain the importance of reporting to work on time and returning from breaks on time and the potential consequences if this is not adhered to
 - K5 describe the types of attitudes and behaviours that are likely to create conflict or negative responses
 - K6 explain the benefits of team working and understanding of team objectives
 - K7 describe the roles of individual team members and the strengths they bring to the team
 - K8 explain the importance of clear communication both oral and written, using appropriate language and format
 - K9 explain the need to change communication styles to meet the needs of the target audience
 - K10 explain the need to adhere to timescales set for work, whilst maintaining appropriate quality standards and the implications if these are not adhered to
 - K11 explain the importance of seeking additional support and guidance when required
 - K12 explain why it is important to be open and honest and admit to any errors and/or mistakes
 - K13 describe the need to be flexible in their approach to work, responding positively to changes or amendments required by the business
 - K14 explain the importance of taking an active and positive part in the implementation of any amendments or changes to work requirements
 - K15 describe their individual responsibility to work in an ethical manner and the organisations policies relating to ethical working and behaviours
 - K16 explain the importance of respecting others, including an awareness of diversity and inclusion
 - K17 explain what Personal Protective Equipment (PPE) needs to be worn for the manufacturing/engineering activities undertaken (such as correctly fitting overalls, safety shoes, eye protection, ear protection)
 - K18 describe the correct use of any equipment used to protect the health and safety of themselves and their colleagues
-

- K19 describe the necessary planning and preparing to carry out the manufacturing/engineering activity (such as obtaining the appropriate drawings/documentation to be used, determining the materials required, determining the tools and equipment required, determining a suitable sequence of operations, determining the quality checks to be made and equipment to be used)
- K20 describe the procedure for ensuring that all documentation relating to the work being carried out is available, prior to starting the activity
- K21 describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity
- K22 describe the checks to be carried out to ensure that tools and equipment are in full working order, prior to undertaking the activity
- K23 describe the checks to be carried out to ensure that all materials required are correct and complete, prior to undertaking the activity
- K24 describe how to deal effectively with problems that could arise with areas such as quality, safety, people, drawings and other documentation, tools and equipment or if material are incomplete or do not meet the requirements of the activity and the action that should be taken
- K25 describe the process and procedure used for making suggestions for improving the business
- K26 describe the importance of taking responsibility for identifying and making suggestions for making business improvements
- K27 explain their role in helping to develop their own skills and knowledge (such as checking with their supervisor about the work they are expected to carry out and the standard required to achieve; the safety points to be aware of and the skills and knowledge you will need to develop)
- K28 describe the benefits of continuous personal development, and the training opportunities that are available in the workplace
- K29 describe the importance of reviewing their training and development with trainers and supervisors, of comparing the skills, setting objectives to overcome any shortfall or address any development needs
- K30 explain their responsibilities for providing evidence of their performance and progress (such as submitting work for assessment or the completion of assignments or tests)
- K31 describe the importance of maintaining effective working relationships within the workplace (such as listening attentively to instructions from their supervisor, making sure they ask for help and advice in a polite and courteous manner, responding positively to requests for help from others)
- K32 explain the reason for informing others of their activities which may have impact on their work (such as the need to temporarily disconnect a shared resource like electricity or compressed air supply; making undue noise or creating sparks, fumes or arc flashes from welding)
- K33 describe how to deal with disagreements with others in ways which will help to resolve difficulties and maintain long term relationships
- K34 describe the organisational procedures to deal with and report any problems that can affect working relationships
- K35 describe the difficulties that can occur in working relationships, and how to resolve them
- K36 describe the current legislation covering discrimination in the workplace on the ground of race, religion sex, age and disability
- K37 explain the need to dispose of waste materials and consumables (such as oils and chemicals) in a safe and environmentally friendly way
- K38 explain where tools and equipment should be stored and located, and the importance of returning all tools and documentation to their designated area on completion of your work activities
- K39 describe when to act on their own initiative and when to seek help and advice from others

K40 explain the importance of leaving the work area in a safe condition on completion of your activities (such as equipment correctly isolated, cleaning the work area and removing and disposing of waste)

Unit 303

Working efficiently and effectively in advanced manufacturing and engineering

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

The Automotive Trailblazer Employer Group have published a separate Behavioural Framework and Assessment recording document that should be used alongside this unit and the technical units selected from the qualification pathway for the following Apprenticeship Standards

- Mechatronics Maintenance Technician Level 3
- Product Design and Development Technician Level 3
- Electrical/Electronic Support Engineer Level 6
- Control/Technical Support Engineer Level 6
- Manufacturing Engineer Level 6
- Product Design and Development Engineer Level 6

Unit 304

Reinstating the work area on completion of activities

RQF Reference:	D/508/6386
Unit level:	Level 3
GLH:	25

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 reinstate the work area, in accordance with approved procedures. They will be required to follow the correct procedures for the safe storage of finished products and surplus materials and to correctly identify and separate all waste materials and ensure that they are removed to their designated locations. They will also need to ensure that all tools, equipment and documents used are accounted for and returned to the appropriate places. Tidying of the work area will be of prime importance and includes office and clean working area environments, workshops, staging and platforms, internal areas of aircraft such as wings, tanks and fuselage sections and areas that are airside.

Their responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the reinstatement activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality of the work they carry out.

Their underpinning knowledge will provide a good understanding of their work and provide an informed approach to applying the required procedures. They will understand the need for reinstating the work areas and will know about the storage requirements of the products, equipment, materials, documentation and consumables, in adequate depth to provide a sound basis for carrying out the activities to the required standard and ensuring that the work area is reinstated satisfactorily.

They will understand the safety precautions required when reinstating the work area. They will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to 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 company objectives, such as strong work ethic, positive attitude, team player, dependability, responsibility, honesty, integrity, motivation and commitment.

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
 - P3 separate equipment, components and materials for re-use from waste items and materials
 - P4 store reusable materials and equipment in an appropriate location
 - P5 dispose of waste materials in line with organisational and environmental safe procedures
 - P6 restore the work areas to a safe condition in accordance with agreed requirements and schedules
 - P7 deal promptly and effectively with problems within their control and report those that cannot be solved
-

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following activities during reinstatement of the work area
 - 1.1 work to current schedules
 - 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 report any loss or damage to equipment (where applicable)
 - 1.4 report any identified hazards within the work area (where applicable)
 - 1.5 return all consumables and materials to their correct location
 - 1.6 complete any documentation as required
-

Outcome

S2 Carry out reinstatement activities on two work areas from

- 2.1 workshops/hangers
 - 2.2 airside
 - 2.3 areas at height (such as platforms, staging, lifts)
 - 2.4 internal areas of aircraft (such as wings, tanks, fuselage sections)
 - 2.5 office environment
 - 2.6 Computer Aided Design (CAD) environment
 - 2.7 technical/clean room environment
 - 2.8 other specific environment
-

Outcome

S3 Correctly label and store four the following resources:

- 3.1 finished products/components
 - 3.2 scrap components
 - 3.3 components requiring overhaul/repair
 - 3.4 measuring and test instruments
 - 3.5 surplus materials/components
 - 3.6 finished drawings
 - 3.7 tooling, jigs, fixtures or other equipment used
 - 3.8 finished documentation
 - 3.9 drawings requiring actioning/adjusting
 - 3.10 documentation requiring actioning/adjusting
-

Outcome

- S4 Deal with waste materials, in line with company and environmental regulations, to include two of the following:

- 4.1 correctly segregating waste materials
 - 4.2 correctly dispose of waste materials
 - 4.3 disposing of joining compounds, sealants and adhesives
 - 4.4 disposing of other chemical products
 - 4.5 removing non-hazardous materials
 - 4.6 disposing of fluid waste (such as oil, hydraulic fluids, fuel)
-

Outcome

- K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when reinstating the work area (such as any specific legislation, regulations/codes of practice for the activities, equipment or materials) and the responsibility these requirements place on them
 - K2 describe the hazards associated with reinstating the work area and how to minimise them and reduce any risks
 - K3 explain the safe working practices and procedures to be followed when carrying out the various activities (such as lifting and handling techniques)
 - K4 explain what Personal Protective Clothing and Equipment (PPE) needs to be worn and where this can be obtained
 - K5 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K6 explain why work areas need to be restored to a set standard and what these requirements are
 - K7 describe the types of work area that will need to be restored (such as office environments, Computer Aided Design (CAD) environment, technical/clean room environment, workshops, test areas, stages and platforms and aircraft areas such as wing, tank, fuselage, airside section areas)
 - K8 explain the importance of tool and equipment control and why this is critical within the aerospace industry
 - K9 explain the meaning of 'Foreign Object Debris' (FOD) and why it is vital to ensure that this does not occur or is removed
-

- K10 describe the stores procedures for tools and equipment, documentation and surplus or waste materials
- K11 explain what materials will need to be stored and disposed of and why they need to be segregated, correctly identified and labelled
- K12 explain how the various disposal bins can be identified (such as colour coded, labelled)
- K13 explain the procedures for disposing of hazardous materials (such as chemicals, adhesives, oil, hydraulic fluids, fuel)
- K14 explain what documentation to be used on completion of reinstatement
- K15 describe the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve

Unit 304

Reinstating the work area on completion of activities

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 305

Lifting and trestling/shoring aircraft for maintenance/repair operations

RQF Reference:	H/508/6387
Unit level:	Level 3
GLH:	56

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 lift and where appropriate, trestle/shore commercial, military or light aircraft, both fixed wing and rotary aircraft, for maintenance operations (such as routine maintenance, repair, refurbishment or recovery), in accordance with the aircraft maintenance manual or approved change documentation (service bulletin) requirements. They will be required to use correctly specified items of lifting and supporting equipment, which will include hand and/or power operated lifting and jacking equipment, and associated lifting accessories. They must check that the lifting equipment is within current authorisation dates, is undamaged and within the permitted safe working load (SWL) or working load limit (WLL). They will be expected to establish the weight of the aircraft to be lifted, and to attach the appropriate lifting equipment/slings to the designated lifting points on the aircraft, in order to achieve a safe and balanced lift.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual or change/service bulletin documentation for the aircraft lifting and shoring activities undertaken, and to report any problems with the lifting and trestling/shoring activities or with the equipment used, that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to work with a minimum of supervision and, as part of a team, they must demonstrate a significant personal contribution during the team activities, in order to satisfy the requirements of this standard, and competence in all the areas required by the standard must be demonstrated. They will be expected to take personal responsibility for their own actions, for their contribution to the team, and for the safety 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 the correct aircraft lifting and trestling/shoring techniques and procedures. They will understand the lifting and trestling/shoring techniques used, and their application, and will know about the lifting equipment and accessories for lifting, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

They will understand the safety precautions required when carrying out the lifting and trestling/shoring, and the safeguards that are

necessary for undertaking these activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

Notes: This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 07 Lifting and Shoring.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 position the lifting equipment so that the weight of the load is evenly distributed
- P4 attach the appropriate lifting equipment securely to the load, using approved methods to eliminate slippage
- P5 confirm that the load is secure before moving
- P6 lift the load using approved techniques and procedures
- P7 position and release the load safely in its intended location

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the aircraft lifting and trestling/shoring activities
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the appropriate documentation (such as job instructions, technical instructions, aircraft manuals and lifting/shoring maintenance documentation)
 - 1.3 check that the work area is free from hazards and suitably prepared for the activities to be undertaken
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved lifting and trestling/shoring techniques and procedures at all times

- 1.7 return tools and equipment to the correct storage location on completion of the activities
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that the work carried out is correctly documented and recorded
-

Outcome

S2 Ensure that the lifting and trestling/shoring equipment to be used is correct for the aircraft being lifted and is in a safe and usable condition, by establishing all of the following

- 2.1 the lifting equipment selected is as specified for the aircraft being lifted (such as type, lifting capacity)
 - 2.2 the lifting equipment is certified and is compliant, within current test dates (such as LOLER regulations and health and safety requirements)
 - 2.3 all lifting equipment documents/registers are up to date
 - 2.4 where appropriate, all slings and ancillary equipment are free from obvious defects
 - 2.5 all trestles and shoring equipment are in a safe and usable condition
-

Outcome

S3 Use two of the following lifting methods and technique

- 3.1 bellyband suspension
 - 3.2 tail wheel jacking
 - 3.3 rotor head suspension
 - 3.4 nose wheel jacking
 - 3.5 complete aircraft jacking
 - 3.6 hard point attachment slings
 - 3.7 main undercarriage jacking
 - 3.8 stress jacking
 - 3.9 other specific technique
-

Outcome

S4 Carry out jacking and trestling/shoring of an aircraft, to include carrying out all of the following

- 4.1 establishing the weight of the aircraft to be lifted, including fuel on board
 - 4.2 determining the correct lifting/jacking points on the aircraft
 - 4.3 removing access panels to expose the jacking/lifting points
 - 4.4 positioning the lifting/jacking equipment correctly on the aircraft
 - 4.5 attaching any required balance weights (ballast) to the aircraft (where appropriate)
 - 4.6 carrying out the lifting/jacking using the approved techniques and procedures for the aircraft type
-

- 4.7 positioning the supporting equipment (such as contoured/cushioned supports, trestles, tail supports) and ensuring that it is installed at the appropriate/defined positions on the aircraft (where appropriate)
 - 4.8 lowering the aircraft onto the supporting equipment without causing damage to the aircraft structure (where appropriate)
 - 4.9 checking that the aircraft is correctly and safely balanced and held
-

Outcome

S5 Jack and trestle/shore an aircraft for one of the following conditions

- 5.1 routine maintenance
 - 5.2 modifications
 - 5.3 repair work
 - 5.4 refurbishment
 - 5.5 recovery
-

Outcome

S6 Carry out aircraft lifting and trestling/shoring operations in compliance with one of the following

- 6.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 6.2 Ministry of Defence (MoD)
 - 6.3 Military Aviation Authority (MAA)
 - 6.4 Aerospace Quality Management Standards (AS)
 - 6.5 Federal Aviation Authority (FAA)
 - 6.6 aircraft maintenance manual/approved change documentation (service bulletin)
 - 6.7 aircraft manufacturer's requirements
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety precautions to be taken when lifting and trestling/shoring aircraft, and the need for ensuring aircraft security (such as general workshop and site safety, appropriate personal protective equipment (PPE), protecting other workers during the lifting operations, accident procedures, statutory regulations, risk assessment procedures and COSHH regulations)
 - K2 describe the hazards associated with lifting and trestling/shoring aircraft, and how to minimise them and reduce any risk
 - K3 explain the Approved Code of Practice (ACOP) for safe use of lifting equipment, and Lifting Operation and Lifting Equipment Regulations (LOLER)
 - K4 describe the requirements and explain the importance of understanding and applying human factors as defined by the regulatory requirements and the potential impact if these are not adhered to
-

- K5 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K6 explain the specific requirements for the marking of lifting equipment and the specific method used in the organisation in which they are working
- K7 describe the range of equipment that is to be used for the lifting operations (such as hydraulic jacks, power operated cranes, winches, pulling equipment)
- K8 describe the lifting equipment accessories that are to be used (such as slings, eye bolts)
- K9 explain what checks should be made on the lifting equipment prior to use and the problems that they should look for
- K10 explain how to carry out visual in-service inspections of the equipment and what to do should any defective equipment be identified
- K11 describe the factors which affect the selection of the lifting equipment and lifting accessories (such as weight, type of load, operating environment)
- K12 explain how to check that the lifting equipment is capable of lifting the load to be moved
- K13 explain the signalling techniques used to communicate with crane drivers (to include both hand signals and verbal commands)
- K14 explain how to identify the lifting and trestling/shoring points on the aircraft and why they must not use any other
- K15 explain why balance/ballast weights are sometimes required during the lifting operations
- K16 explain how to determine the type of ballast/balance weight material (such as water, sand, newspaper bulk) with regard to suspension points and floorboard loading limits
- K17 describe the various trestling/shoring methods that may be used, and the types of trestling/shoring material, contour dimensions and trestling/shoring locations on the aircraft
- K18 explain the need to carry out the lifting and trestling/shoring operations without causing damage or undue stress to the airframe and its components
- K19 explain how lifting and trestling/shoring equipment should be stored and handled
- K20 describe the problems that can occur during the lifting, trestling or shoring of the aircraft and how these problems can be rectified
- K21 describe the extent of their own authority, and to whom they should report if they have problems that they cannot resolve

Unit 305

Lifting and trestling/shoring aircraft for maintenance/repair operations

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 306

Levelling and weighing aircraft

RQF Reference:	K/508/6388
Unit level:	Level 3
GLH:	56

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 prepare for levelling and weighing commercial, military or light aircraft; both fixed wing and rotary aircraft, in accordance with the aircraft maintenance manual and approved change documentation (service bulletin) requirements.

They will be required to prepare the aircraft ready for levelling and weighing, which will include carrying out activities such as defueling, replenishing oil and other liquids/gaseous substances, removing foreign objects (such as tools, luggage) and cleaning the aircraft interior and exterior. They will be expected to obtain the correct equipment to use, as specified in the aircraft maintenance manual and weighing procedures, and to check that the equipment is within current certification requirements and is in a safe and usable condition. In carrying out the levelling and weighing activities, they will be expected to determine/locate the correct levelling points on the aircraft, to level the aircraft using appropriate techniques, to weigh the aircraft, to determine the weigh point arms and to determine the centre of gravity for the aircraft.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual or change/service bulletin documentation for levelling and weighing the aircraft, and to complete the necessary documentation. They will be required to report any problems with the levelling and weighing activities that they cannot personally resolve, or which are outside their defined authority, to the relevant people. They will be expected to work with a minimum of supervision and as part of a team, communicating (where appropriate) using hand signals and other communication devices. They must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and competence in all the areas required by the standard must be demonstrated. They will be expected to take personal responsibility for their own actions, for their contribution to the team, and for the safety 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 the levelling and weighing of aircraft. They will understand the levelling and weighing process, and its application, and will know about the levelling and weighing requirements and equipment to be used, in

sufficient depth to provide a sound basis for carrying out the activities to the required standards.

They will understand the safety precautions required when carrying out the levelling and weighing operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Notes: This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 08 Levelling and Weighing.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 obtain all the required equipment and ensure that it is in safe and usable condition
- P4 carry out the necessary preparations to the equipment, in line with work requirements
- P5 level and weigh the aircraft, using the approved techniques and procedures
- P6 use the information gained to determine the weight and centre of gravity of the aircraft
- P7 record the information accurately and legibly in the appropriate documentation
- P8 deal promptly and effectively with problems within their control and report those that cannot be solved

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the aircraft levelling and weighing activities
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, aircraft configurations, technical instructions, aircraft manuals and levelling and weighing documentation)
 - 1.3 check that the work area is free from hazards and is suitably prepared for the activities to be undertaken

- 1.4 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
 - 1.5 obtain the correct tools and equipment for the levelling and weighing activity, and check that they are in a safe, tested and usable condition and within current calibration date(s)
 - 1.6 use the approved levelling and weighing techniques and procedures at all times
 - 1.7 return tools and equipment to the correct storage location on completion of the activities
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 ensure that work carried out is correctly documented and recorded
-

Outcome

S2 Prepare the aircraft for the levelling and weighing operations, to include carrying out all of the following

- 2.1 de-fuel the aircraft to the unusable fuel level
 - 2.2 empty all waste tanks
 - 2.3 replenish oil, hydraulic fluid, cooling and anti-icing fluids, liquid oxygen and other gaseous substances to the appropriate level
 - 2.4 remove any items surplus to requirements (such as tools, cabin equipment or luggage)
 - 2.5 clean and dry the aircraft
 - 2.6 move the aircraft to a suitable environment, away from elements effecting the aircraft
 - 2.7 obtain or construct an inventory of equipment actually installed on the aircraft
 - 2.8 correct the basic weight and balance record, based upon the inventory
-

Outcome

S3 Level the aircraft, to include carrying out three of the following

- 3.1 setting and adjusting hydraulic jacks at the appropriate points (such as wing and nose)
 - 3.2 determining/locating the correct levelling points on the aircraft
 - 3.3 placing levelling bars across the levelling lugs
 - 3.4 creating a straight line on the floor from which measurements can be taken, or exposing the levelling plate on the aircraft floor
 - 3.5 using suitable equipment to check the level of the aircraft (such as spirit level, clinometers, plumb bob, steel tape, chalk line, laser levelling equipment)
 - 3.6 making adjustments to level the aircraft until the plumb bob tip or clinometers are at the required attitude
-

Outcome

S4 Use one of the following types of equipment for weighing the aircraft

- 4.1 stationary platform/pit weighing
 - 4.2 mobile electronic weighing system
 - 4.3 shear-beam load cells
-

- 4.4 heavy duty portable scales
 - 4.5 self-levelling pressure transducer
 - 4.6 on-board weight and balance equipment
 - 4.7 hydrostats
-

Outcome

S5 Weigh the aircraft, to include carrying out five of the following

- 5.1 obtaining the appropriate type and number of scales/load cells to use
 - 5.2 checking that all the equipment to be used is within current calibration dates
 - 5.3 placing portable weighing equipment in the appropriate positions on a level surface
 - 5.4 setting and levelling the equipment where required
 - 5.5 positioning the aircraft on the scales, or jacking the aircraft at the appropriate points using load cell jacks
 - 5.6 allowing electronic equipment to warm up before taking readings
 - 5.7 taking and recording all the load readings
-

Outcome

S6 Use the information gained to determine four of the following

- 6.1 weigh point arms
 - 6.2 empty weight of the aircraft
 - 6.3 centre of gravity/balance point of the aircraft
 - 6.4 basic weight of the aircraft
 - 6.5 most forward centre of gravity
 - 6.6 gross weight of the aircraft
 - 6.7 most rearward centre of gravity
 - 6.8 weight and location of any required ballast
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft log book
 - 7.5 other specific recording method
-

Outcome

S8 Carry out aircraft levelling and weighing in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 extended range Twin Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual or approved change documentation (service bulletin) requirements
 - 8.8 aircraft manufacturer's requirements
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety precautions to be taken when levelling and weighing aircraft, and the need for ensuring aircraft security (such as general airside and site safety, appropriate personal protective equipment, protecting other workers during the levelling and weighing operations, accident procedures, statutory regulations, risk assessment procedures and COSHH regulations)
 - K2 describe the hazards associated with levelling and weighing aircraft, and how to minimise them and reduce any risk
 - K3 explain why it is necessary to check periodically the weight of the aircraft (such as mandatory requirements and changes in weight due to maintenance, added or changed equipment)
 - 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 importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K6 explain how a change in the aircraft weight will affect its handling characteristics
 - K7 explain what manuals and documentation they will require for the levelling and weighing activities and how to obtain and complete them
 - K8 explain what information they will need to extract from the manuals and documentation in order to carry out the activities correctly
 - K9 explain the reasons for completing inventories of the actual equipment installed in the aircraft; the need to compare this with the aircraft basic weight and balance record and to update this as required
 - K10 explain the need to carry out the levelling and weighing activities in a controlled environment (such as a closed hangar or building) with no blowers or ventilating system blowing air onto the aircraft
 - K11 explain what preparations and checks that must be made on the aircraft and its systems prior to weighing (such as cleaning, emptying all waste and fuel tanks, replenishing oil, liquid and gaseous systems to the appropriate level)
 - K12 describe the range of levelling and weighing equipment that is to be used during the process (such as portable scales, load cells, hydraulic jacks, levels, clinometers and plumb bobs)
-

- K13 explain the purpose and use of the respective pieces of equipment and the limitations (particularly with regard to Safe Working Limit (SWL) or Working Load Limit (WLL))
- K14 explain what checks need to be made on the equipment to ensure that it is safe to use, correctly calibrated and configured for the intended purpose
- K15 describe the various methods that may be used to level aircraft, depending on their type and size (such as chalk lines on the floor, levelling plates in the aircraft floor)
- K16 describe the various methods that may be used to weigh aircraft, depending on their type and size (such as stationary platform/pit scales, mobile electronic weighing systems, load cells on hydraulic jacks)
- K17 explain the information to be calculated from the loadings gathered (such as empty, basic and gross weight of the aircraft, the centre of gravity of the aircraft, weight and location of any required ballast)
- K18 describe the disposal methods for waste oil, fuel and other liquids and waste
- K19 describe the problems with the weighing and levelling procedures and explain the importance of informing appropriate people of defects
- K20 explain what recording documentation needs to be completed for the activities undertaken and how to fully complete it
- K21 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 306

Levelling and weighing aircraft

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 307

Towing, marshalling and parking aircraft

RQF Reference:	M/508/6389
Unit level:	Level 3
GLH:	56

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 aircraft handling operations on commercial, military or light aircraft, both fixed wing and rotary, in accordance with approved procedures. They will be required to select the correct tools and equipment to use, based on the handling activities to be carried out, and to check that they are in a safe and serviceable condition. They will be required to assist in manoeuvring the aircraft to the appropriate location, and to prepare the aircraft for flight operations or post-flight recovery. The handling activities will involve assisting in aircraft towing, preparation for flight, starter crew, aircraft marshalling, recovery from flight, marshalling and parking.

Their responsibilities will require them to comply with organisational policy and procedures for the aircraft handling activities undertaken, and to report any problems with these activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to work with a minimum of supervision and as part of a team, communicating (where appropriate) using hand signals and other communication devices. They must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and competence in all the areas required by the standard must be demonstrated. They will be expected to take personal responsibility for their own actions, for their contribution to the team, and for the quality and accuracy of the work that they carry out.

Their underpinning knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying aircraft handling techniques and procedures. They will have an understanding of the preparations to be carried out on the aircraft prior to moving it, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

They will understand the safety precautions required when carrying out the aircraft handling operations, especially those for jet intakes and exhaust dangers. 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.

Notes:

This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 09

Towing and Taxiing and Chapter 10 Parking, Mooring, Storage and Return to Service

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 prepare the aircraft and work area for the handling activities to be undertaken
- P4 carry out the activities within the limits of their personal authority
- P5 carry out the activities in the specified sequence and in an agreed timescale
- P6 report any instances where the activities cannot be fully met or where defects are identified
- P7 ensure that the aircraft and work area are left in a safe and secure condition on completion of the activities

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the aircraft handling activities
 - 1.1 ensure that airport procedures applicable to movement in restricted (such as airside) areas, including necessary security procedures, are understood and carried out
 - 1.2 ensure that appropriate authorisation to move the aircraft is obtained and that authorisations relevant to operating towing vehicles are held and valid
 - 1.3 check that the work area is free from hazards and suitably prepared for the aircraft to be moved
 - 1.4 adhere to procedures or systems in place for risk assessment, COSHH, and other relevant safety regulations and procedures to realise a safe system of work
 - 1.5 ensure that the relevant required safety procedures are implemented
 - 1.6 obtain appropriate personal protection equipment and emergency equipment, and check that it is in a usable condition
 - 1.7 obtain any required support equipment, and check that it is in a safe and useable condition
 - 1.8 use approved aircraft handling and moving techniques at all times
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 leave the work area and the aircraft in a safe and secure condition

Outcome

S2 Prepare the aircraft for towing, by carrying out five of the following:

- 2.1 ensure that the aircraft is in safe condition to move, by checking aircraft documentation
 - 2.2 check/set brake pressure
 - 2.3 make cockpit checks and apply internal power, as required
 - 2.4 check/fit required safety locks/pins (such as landing gear, nose steering, control surface)
 - 2.5 fit the towing arm
 - 2.6 check/remove electrical earthing and chocks (where appropriate)
 - 2.7 obtain clearance for movement
 - 2.8 ensure that the aircraft is prepared in accordance with local regulations
-

Outcome

S3 Assist in three of the following aircraft handling activities:

- 3.1 towing
 - 3.2 marshalling
 - 3.3 parking/storing
 - 3.4 mooring
 - 3.5 picketing
-

Outcome

S4 Undertake three of the following roles when moving aircraft:

- 4.1 brake man
 - 4.2 wing tip man
 - 4.3 tractor/steering operator
 - 4.4 blade man
 - 4.5 tail safety man
 - 4.6 towing supervisor
 - 4.7 safety chock man
-

Outcome

S5 Assist in carrying out all of the following during the preparation for flight operations:

- 5.1 removing any fitted blanks, bungs and covers
 - 5.2 removing any locking/safety devices (such as undercarriage, nose steering, control surface)
 - 5.3 carrying out cockpit checks and applying ground power
 - 5.4 carrying out engine starter crew activities (using headset operations and/or hand signals)
 - 5.5 carrying out pre-flight checks
 - 5.6 marshalling
-

Outcome

S6 Carry out all of the following during recovery from flight operations:

- 6.1 marshalling (where applicable)
- 6.2 fitting any blanks, bungs and covers that may be required
- 6.3 fitting any required locking/safety devices (such as undercarriage, nose steering, control surface)
- 6.4 parking of the aircraft (to include the use of wheel chocks, mooring blocks and where appropriate, earthing)

Outcome

S7 Carry out aircraft handling operations in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 7.2 Extended Range Twin Engined Operations Procedures (ETOPS) (where appropriate)
- 7.3 Federal Aviation Authority (FAA)
- 7.4 Ministry of Defence (MoD)
- 7.5 Military Aviation Authority (MAA)
- 7.6 Aerospace Quality Management Standards (AS)
- 7.7 specific organisation standards and procedures
- 7.8 aircraft manufacturer's requirements

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety precautions and procedures to be observed whilst carrying out the aircraft handling operations (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
- K2 explain the health and safety requirements of the work area in which they are carrying out the activities, and the responsibility these requirements place on them
- K3 explain the authorisation they require to commence work on the aircraft
- K4 describe the requirements and explain the importance of understanding and applying human factors as defined by the regulatory requirements and the potential impact if these are not adhered to
- K5 describe the hazards associated with towing, marshalling, parking and securing the aircraft (including airfield hazards and procedures), and explain how to minimise them and reduce any risk
- K6 describe the hazards associated with engine start and running and how they can be minimised
- K7 the importance of aircraft husbandry and of ensuring that, throughout the activity, the aircraft and area are free from foreign objects; the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K8 explain what protective equipment they need to use for both personal protection and protection of the aircraft

- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain what specifications are used during aircraft handling and the importance of following the procedures listed in these documents
- K11 explain the process and procedures for preparing an aircraft for flight operations (including engine start and 'see off')
- K12 explain the process and procedures for recovering an aircraft from flight operations ('see in')
- K13 describe the standard signals used when marshalling and handling aircraft
- K14 explain how to attach the towing devices to the aircraft and how to identify the appropriate attachment points
- K15 explain what equipment is to be used to tow the aircraft (such as towing vehicles, tow bars, towing cables) and how to check that they are in a safe and usable condition
- K16 explain their understanding of the minimum turning radius for the particular aircraft being handled and the ground turning techniques to be used
- K17 explain the methods used to communicate with the handling team and/or flight crew using both headsets and hand signals
- K18 explain the importance of correctly securing of the aircraft (using such items as wheel chocks, mooring blocks and mooring cables)
- K19 explain the need to fit blanking plugs, covers, locking/safety devices and where appropriate, cocooning materials
- K20 explain the importance of correct static grounding of the aircraft
- K21 explain the importance of tool control and company tool control procedures
- K22 explain what methods and equipment are to be used to manoeuvre the aircraft and how to check that the equipment is in a usable condition
- K23 explain how to deal with problems with aircraft handling processes or procedures, and the importance of informing appropriate people of any defects
- K24 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 307

Towing, marshalling and parking aircraft

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 308

Carrying out flight servicing and routine maintenance of aircraft

RQF Reference:	H/508/6390
Unit level:	Level 3
GLH:	105

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 flight servicing and routine maintenance activities on commercial, military or light aircraft, both fixed wing and rotary, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. They will be required to select the correct tools and equipment to use for the servicing activities to be carried out in accordance with the aircraft maintenance manual, and to check that they are in a safe and serviceable condition. They will be required to manoeuvre the aircraft to the appropriate location and to prepare the aircraft for the work. The servicing activities will involve defueling and refuelling, replenishing oxygen systems, replenishing oil systems, checking undercarriages, wheels and brakes, and completing the servicing records.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the servicing/maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate aircraft servicing and maintenance techniques and procedures. They will understand the type of aircraft being serviced, the common problems that can occur, and will know about the replenishment equipment and fastening devices, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

They will understand the safety precautions required when working on the aircraft, especially those for ensuring system cleanliness and the avoidance of contamination. 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.

Notes:

This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 12

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the servicing or maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the servicing and routine maintenance activities
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the appropriate documentation (such as job instructions, servicing/routine maintenance documentation, technical instructions, aircraft manuals)
 - 1.3 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
 - 1.4 ensure that relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.5 ensure that the aircraft is correctly earthed and follow approved safe procedures for connecting ground power
 - 1.6 use approved servicing and maintenance techniques at all times
 - 1.7 return tools and equipment to the correct storage location on completion of the activities
 - 1.8 ensure that work carried out is correctly documented and recorded

- 1.9 leave the aircraft in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
-

Outcome

S2 Carry out one of the following:

- 2.1 refuelling
 - 2.2 defueling
-

Outcome

S3 Carry out three of the following flight inspections, in accordance with the approved servicing schedule:

- 3.1 daily
- 3.2 before flight
- 3.3 transit
- 3.4 turnaround
- 3.5 after flight
- 3.6 Extended Range Twin-Engine Operations Procedures (ETOPS)

To include replenishment and servicing of all of the following:

- 3.7 gas systems
 - 3.8 aircraft lights
 - 3.9 structure examination
 - 3.10 oil systems
 - 3.11 cabin/flight deck inspections
 - 3.12 landing gear examination and tyre pressure checks
 - 3.13 hydraulic systems
 - 3.14 engines
 - 3.15 water/toilet systems (as appropriate)
 - 3.16 Liquid Oxygen (LOX) system (as appropriate)
-

Outcome

S4 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 4.1 job cards/work sheets
 - 4.2 aircraft technical log
 - 4.3 aircraft log book
 - 4.4 computer records
 - 4.5 aircraft cabin log
-

Outcome

S5 Carry out servicing work in compliance with one of the following:

- 5.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 5.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 5.3 Ministry of Defence (MoD)
 - 5.4 Military Aviation Authority (MAA)
 - 5.5 Aerospace Quality Management Standards (AS)
 - 5.6 Federal Aviation Authority (FAA)
 - 5.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 5.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety precautions and procedures to be observed whilst carrying out the aircraft servicing (including any specific legislation, approvals, regulations or codes of practice relating to the activities, equipment or materials)
 - K2 explain the importance of maintenance on, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, legislation and local procedures
 - K3 explain the health and safety requirements of the work area in which they are carrying out the aircraft servicing/maintenance activities, and the responsibility these requirements place on them
 - K4 describe the requirements and explain the importance of understanding and applying human factors as defined by the regulatory requirements and the potential impact if these are not adhered to
 - K5 explain the authorisation they require to commence work on the aircraft
 - K6 describe the hazards associated with carrying out flight servicing of the aircraft, and how to minimise them and reduce any risk
 - K7 describe the hazards associated with working on and replenishing aircraft systems (such as fuel, gaseous systems and oils), and how they can be minimised
 - K8 explain what protective equipment needs to be used for both personal protection and protection of the aircraft
 - K9 explain the importance of aircraft husbandry and of ensuring that, throughout the servicing activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K11 explain the maintenance schedules and servicing specifications that are used during servicing and maintenance, and the importance of following the procedures listed in these documents
 - K12 explain what replenishments need to be made and the method of replenishment to be used
 - K13 explain the electrical bonding specifications and their importance
 - K14 explain how to identify the fuels, lubricants and gases to be used, and how to ensure that systems are not contaminated
-

- K15 explain the procedures for checking undercarriages, wheels and brakes, and what to look for (such as tyre damage, tyre creep, tyre pressure, hydraulic leaks, shock absorber/oleo extension, security of fastenings and brake wear)
- K16 describe the quality control procedures to be followed during the servicing procedures
- K17 explain how to conduct any necessary checks to ensure the system integrity and functionality
- K18 describe the problems that can occur with the servicing and maintenance activities, and how these can be overcome
- K19 explain the importance of the correct securing and locking of connections
- K20 explain the importance of personal tool control, and the organisational tool control procedures
- K21 explain how replenishment equipment is cared for, connected, operated and controlled
- K22 explain the methods and equipment used to replenish aircraft systems and how to check that the equipment is within its current certification dates
- K23 describe the tools and equipment used in the servicing activities and their calibration/care and control procedures
- K24 describe the disposal methods for waste oil, fuel and other liquids and waste
- K25 describe the problems with the servicing procedures and explain the importance of informing appropriate people of any defects
- K26 explain what recording documentation needs 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
- K27 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 308

Carrying out flight servicing and routine maintenance of aircraft

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 309

Maintaining air conditioning systems on aircraft ATA 21

RQF Reference:	K/508/6391
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft air conditioning systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which provide a means of pressurising, heating, cooling, moisture controlling, filtering and treating air used to ventilate the areas of the fuselage within the pressure zone, as applicable to the aircraft type. The maintenance activities will include the removal, fitting and testing of a range of air conditioning system components. They will be expected to use the approved procedure for correctly isolating the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft air conditioning systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the air conditioning system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft air conditioning systems, especially those for isolating the system, ensuring system cleanliness and the avoidance of contamination. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 21 Air Conditioning.
2. To display competence in this standard it is necessary to both remove and fit aircraft air conditioning system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft air conditioning system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation of the air conditioning equipment before breaking into the system
 - 1.6 ensure that relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that the work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance activities on three of the following parts of an aircraft air conditioning system

- 2.1 compression
- 2.2 heating
- 2.3 temperature control
- 2.4 distribution
- 2.5 cooling
- 2.6 air contaminant control
- 2.7 pressurisation control
- 2.8 filtration control
- 2.9 humidity control

Outcome

S3 Remove and fit four different aircraft air conditioning system components, at least one must be from group A

Group A:

- 3.1 reservoirs/supply tanks
- 3.2 pressure intensifiers
- 3.3 valves (such as by-pass, shut-off, check, pressure relief, temperature control, outflow, anti-g)
- 3.4 air receivers
- 3.5 diffusers
- 3.6 compressor
- 3.7 cooling units
- 3.8 regulators
- 3.9 heat exchanger
- 3.10 safety devices
- 3.11 pumps
- 3.12 cabin blowers
- 3.13 air-conditioning packs
- 3.14 air cycle unit
- 3.15 vapour cycle unit
- 3.16 pressure/pressurisation controller

Group B:

- 3.17 filters
- 3.18 hoses
- 3.19 gauges
- 3.20 strainers including water separator
- 3.21 gaskets and seals
- 3.22 sensors
- 3.23 earthing straps/jumper braids
- 3.24 unions and couplings
- 3.25 electrical controls (solenoids, motors, switches)
- 3.26 rigid pipework
- 3.27 ducting
- 3.28 actuating mechanisms
- 3.29 scoops
- 3.30 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, de-pressurising, draining fluids)
- 4.4 disconnecting electrical connections
- 4.5 replacing single use items (such as seals, filters, gaskets)
- 4.6 disconnecting/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners
- 4.8 refitting components in the correct position, orientation and alignment
- 4.9 dismantling equipment to an appropriate level
- 4.10 setting, and adjusting replaced components (such as travel, working clearance)
- 4.11 ensuring that any part-dismantled components are secure/supported
- 4.12 making mechanical connections
- 4.13 covering (protecting) exposed components,

- 4.14 making electrical connections wires, pipework or vents
 - 4.15 torque loading as required
 - 4.16 checking components for serviceability
 - 4.17 re-pressurising the system
 - 4.18 replacing damaged/defective components
 - 4.19 carrying out a system functional check
 - 4.20 ensuring that replacement components have the correct part numbers
 - 4.21 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.23 carrying out area inspections prior to task close-up
-

Outcome

- S5 Service/check the aircraft air conditioning system, to include carrying out five of the following

- 5.1 checking filters
 - 5.2 cleaning outflow valves
 - 5.3 checking fluid content of reservoirs (such as deodorisers, insecticides)
 - 5.4 checking operation of air conditioning/heating system
 - 5.5 checking operation of pressurisation system
 - 5.6 checking indicating systems
 - 5.7 replenishing vapour system
 - 5.8 checking safety devices
-

Outcome

- S6 Carry out three of the following during the maintenance of the aircraft air conditioning system:

- 6.1 cabin pressure test
- 6.2 airline vapour tests
- 6.3 pressure balancing
- 6.4 reduced system test
- 6.5 bulkhead and dome pressure tests
- 6.6 equipment functional test
- 6.7 air flow tests
- 6.8 visual inspection
- 6.9 leak test
- 6.10 Built in Test Equipment (BITE) test
- 6.11 air temperature tests
- 6.12 'special-to-type' tests
- 6.13 safety interlock test
- 6.14 aircraft self-test printout

Using one of the following:

- 6.15 aircraft power source/system
 - 6.16 ground test rig
-

Outcome

- S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 aircraft cabin log
 - 7.3 computer records
 - 7.4 aircraft log book
 - 7.5 aircraft technical log
-

Outcome

- S8 Carry out maintenance on aircraft air conditioning systems in compliance with one of the following

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

- K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft air conditioning systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain importance of maintenance on air conditioning systems, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K3 describe the hazards associated with carrying out maintenance activities on aircraft air conditioning systems, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K4 describe 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 explain what protective equipment needs to be used for both personal protection and protection of the aircraft
 - K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
-

- K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K9 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft air conditioning systems, and other documents in the maintenance activities
- K10 explain how to carry out currency/issue checks on the specifications they are working with
- K11 explain the terminology used in aircraft air conditioning systems, and the use of system diagrams and associated symbols
- K12 describe the basic principles of operation of the aircraft air conditioning system being worked on (such as system layout, compression, distribution, pressurisation control, heating, cooling, temperature control and air contaminant control; indication and warning), along with corresponding safety devices
- K13 describe the various types of pipe and component that make up the aircraft air conditioning system (such as rigid and flexible pipes; ducting; supporting devices; valves used for pressure, flow and directional control; pumps; heaters; cooling units; air cycle units; cabin blowers; mechanical and electrical control devices)
- K14 explain the techniques used to remove components from aircraft air conditioning systems without damage to the components or surrounding structure (such as removal of components, and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
- K15 describe the various mechanical fasteners that will need to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K16 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K17 explain the methods of lifting, handling and supporting components/equipment during the maintenance activities
- K18 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and that any exposed components or pipe ends are correctly covered/protected, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K19 explain how to recognise contaminants, and the problems they can create: the effects and likely symptoms of contamination in the system
- K20 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K21 explain how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring the correct tightness of pipe fittings and connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking the security of joints and that the system is safe to re-charge)
- K22 explain how to make adjustments to components/assemblies to ensure that they function correctly
- K23 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K24 explain how to carry out routine servicing of the aircraft air conditioning system (including checking for leaks, checking and changing filters, cleaning outflow valves)
- K25 explain what types of test need to be carried out on the aircraft air conditioning system (such as functional checks, pressure tests, pressure balancing, air temperature tests, safety interlock tests, leak checks)

- K26 describe the methods and procedures to be used to carry out the various tests on the air conditioning system
- K27 explain the need to apply test pressures in incremental stages, and to check all readings and pressures at each stage
- K28 explain how to record the results of each individual test and the documentation that must be used
- K29 explain how to analyse the test results and how to make valid decisions about the acceptability of the aircraft air conditioning system
- K30 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K31 explain what recording documentation needs 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 describe the procedure for the safe disposal of waste materials and scrap components
- K33 describe the extent of their own authority and explain to whom they should report if they have problems that they cannot resolve

Unit 309

Maintaining air conditioning systems on aircraft ATA 21

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 310

Maintaining auto flight systems on aircraft ATA 22

RQF Reference:	M/508/6392
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft auto flight systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes units and components which provide a means of automatically controlling the flight of the aircraft, including direction, heading, altitude and speed, as applicable to the aircraft type. The maintenance activities will include the removal, fitting and testing of a range of auto flight components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The aircraft components will include items such as computers, controllers, air data units, and detectors, gyros (rate and vertical); trim units, actuators, stick position cancellers and angle of attack and stall warning components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft auto flight systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the auto flight system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated

defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft auto flight system, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 22 Auto Flight.
2. To display competence in this standard it is necessary to both remove and fit aircraft auto flight system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft auto flight system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply Electrostatic Discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft auto flight system:

- 2.1 autopilot
- 2.2 auto pilot system monitoring
- 2.3 Mach trim
- 2.4 integrated flight director system
- 2.5 auto throttle
- 2.6 aerodynamic load alleviating
- 2.7 auto land systems
- 2.8 command stability and augmentation system

Outcome

- S3 Remove and fit three different aircraft auto flight system components (at least one must be from group A):

Group A

- 3.1 computers
- 3.2 trim units
- 3.3 controllers
- 3.4 actuators
- 3.5 amplifier
- 3.6 transformers
- 3.7 detectors/position sensors
- 3.8 stick position cancellers
- 3.9 receiver units
- 3.10 embedded GPS and INS (EGI)
- 3.11 gyros (rate and vertical)

Group B

- 3.12 batteries
- 3.13 servos
- 3.14 wires/cables
- 3.15 switches
- 3.16 aerials
- 3.17 plugs/sockets
- 3.18 relays
- 3.19 instruments/gauges/indicators
- 3.20 other specific components

Outcome

- S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removal of bonding
- 4.7 removing cable securing devices
- 4.8 setting and adjusting/tuning replaced components (such as power output, voltage)
- 4.9 removing securing devices and mechanical fasteners
- 4.10 making mechanical connections
- 4.11 supporting equipment to be removed
- 4.12 making electrical connections
- 4.13 dismantling equipment to an appropriate level

- 4.14 carrying out bonding
 - 4.15 covering (protecting) exposed components, wires, pipework or vents
 - 4.16 installing cable securing devices
 - 4.17 torque loading as required
 - 4.18 checking components for serviceability
 - 4.19 carrying out functional checks of systems
 - 4.20 replacing damaged/defective components
 - 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
-

Outcome

S5 Service/check aircraft auto flight systems, to include carrying out four of the following:

- 5.1 check operation of autopilot
 - 5.2 perform autopilot gain adjustments
 - 5.3 check operation of auto throttle
 - 5.4 perform Mach trim functional check
 - 5.5 check operation of yaw damper
 - 5.6 check autoland system
 - 5.7 check and adjust servo clutch
 - 5.8 check stability augmentation system
 - 5.9 other specific aircraft auto flight checks
-

Outcome

S6 Carry out five of the following types of test/check on aircraft auto flight systems:

- 6.1 functional check
- 6.2 continuity checks
- 6.3 audio warning
- 6.4 bonding tests
- 6.5 signal injection tests
- 6.6 visual warning
- 6.7 BITE test
- 6.8 rate/range/sense of movement
- 6.9 'special-to-type' tests
- 6.10 voltage checks

Using four of the following:

- 6.11 simulators
 - 6.12 external power source (electrical/hydraulic)
 - 6.13 oscilloscope
 - 6.14 clinometers
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- 6.15 aircraft power source (electrical/hydraulic)
 - 6.16 reference gyros
 - 6.17 air data test sets
 - 6.18 bonding tester
 - 6.19 tilt tables
 - 6.20 'special to type' test equipment
 - 6.21 multimeter
 - 6.22 internal aircraft equipment
-

Outcome

- S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

- S8 Carry out maintenance on aircraft auto flight systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

- K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working with aircraft auto flight systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on auto flight systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, RVSM operations, Electrical Wiring Interconnect Systems (EWIS), Autoland system status and legislation and local procedures
-

- K3 describe the hazards associated with removing, fitting and testing aircraft flight control system components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection and protection of the aircraft
- K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft flight control systems, other documents needed in the maintenance process
- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 explain the terminology used in aircraft flight control systems, and the use of system diagrams and associated symbols
- K13 describe the basic principles of operation of the auto flight system being worked on, and the function of the various units within the system
- K14 describe the various mechanical fasteners that are used, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K15 explain the importance of using the specified fasteners for the installation and why they must not substitute others
- K16 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K17 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the techniques used to remove components from aircraft auto flight systems without damage to the components or surrounding structure (such as proof marking, the need to protect the circuit integrity by covering and labelling exposed circuits)
- K20 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K21 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K22 explain the techniques used to position, align, adjust and secure the replaced components to the aircraft without damage to the components or surrounding structure
- K23 explain the methods of lifting, handling and supporting the components/equipment during the removal and fitting activities
- K24 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K25 describe the tools and equipment used in the maintenance activities, and explain their calibration/care and control procedures

- K26 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K27 explain how to recognise defects (such as incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K28 explain how to carry out routine servicing of the aircraft auto flight system
- K29 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K30 explain what types of test that need to be carried out on the aircraft auto flight system, and the test equipment to be used
- K31 explain the methods and procedures to be used to carry out the various tests on the auto flight system
- K32 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K33 explain how to record the results of each individual test and the documentation that must be used
- K34 explain how to analyse the test results and make valid decisions about the acceptability of the aircraft auto flight systems
- K35 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K36 describe the problems that can occur with the auto flight system maintenance operations, and how these can be overcome
- K37 explain what recording documentation needs 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
- K38 describe the procedure for the safe disposal of waste materials and scrap components
- K39 describe the extent of their own authority, and to whom they should report if they have problems that they cannot resolve

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 311

Maintaining communication systems on aircraft ATA 23

RQF Reference:	T/508/6409
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft communication systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes units and components which provide a means of communicating from one part of the aircraft to another, between aircraft and aircraft to ground stations. The maintenance activities will include the removal, fitting and testing of a range of communication system components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The communication system will include units and components associated with speech and satellite communication, data transmission, automatic calling, passenger address, interphone, audio integrating, static discharging, integrated automatic tuning, audio and video monitoring, as applicable to the aircraft type. They will remove the required components and to fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual or change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft communication systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the system maintenance requirements. They will know how the equipment functions, the common problems that can occur,

the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft communication systems, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 23 Communications.
2. To display competence in this standard, it is necessary to both remove and fit aircraft communication system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directive and guidelines
- P2 demonstrate the required behaviours in line with the job role and company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements:

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft communication system equipment
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply Electrostatic Discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on three of the following aircraft communication systems:

- 2.1 speech communication (such as HF radio, VHF radio, UHF radio, intercom (clear), intercom (secure speech))
- 2.2 satellite communications (such as SATCOM, GPS systems, crash position indicators)
- 2.3 data transmission and automatic calling (such as telecommunications/teleprinter, Selcal, Calsel, ACARS)
- 2.4 passenger address
- 2.5 Interphone
- 2.6 audio integrating (such as microphones, headphones, cockpit loudspeakers)
- 2.7 static discharging
- 2.8 integrated automatic tuning (such as digital data links)
- 2.9 audio and video monitoring (such as voice recorders, passenger conversation/movement, external cameras)

Outcome

- S3 Remove and fit four different communication system components (at least two must be from group A):

Group A

- 3.1 aerials/antennas
- 3.2 voice recorder
- 3.3 amplifiers
- 3.4 intercom station boxes
- 3.5 receiver units
- 3.6 antenna switching units
- 3.7 cameras
- 3.8 monitors
- 3.9 satellite beacons
- 3.10 tuning units
- 3.11 transformers
- 3.12 display panels
- 3.13 transponders
- 3.14 transmitter units
- 3.15 control units

Group B

- 3.16 switches
- 3.17 static discharge wicks
- 3.18 speakers
- 3.19 instruments/gauges/indicators
- 3.20 relays
- 3.21 headsets
- 3.22 wires/cables
- 3.23 microphone units
- 3.24 unit trays
- 3.25 handsets
- 3.26 plugs/sockets
- 3.27 other specific components

Outcome

- S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 replacing damaged/defective components
- 4.6 removal of bonding

- 4.7 refitting components in the correct position, orientation and alignment
 - 4.8 removing cable securing devices
 - 4.9 removing securing devices and mechanical fasteners
 - 4.10 making mechanical connections
 - 4.11 supporting equipment to be removed
 - 4.12 making electrical connections
 - 4.13 dismantling equipment to an appropriate level
 - 4.14 carrying out bonding
 - 4.15 covering (protecting) exposed components, wires, pipework or vents
 - 4.16 installing cable securing devices
 - 4.17 torque loading as required
 - 4.18 checking components for serviceability
 - 4.19 carrying out functional checks of the system
 - 4.20 ensuring that replacement components have the correct part numbers
 - 4.21 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.22 setting, and adjusting/tuning replaced components (such as power output, voltage, frequency presets)
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task closedown
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Outcome

S5 Service/check aircraft communication systems, to include carrying out five of the following:

- 5.1 checking operation of speech communication system
 - 5.2 checking operation of satellite communications
 - 5.3 checking operation of data transmission and automatic calling system
 - 5.4 checking operation of passenger address, entertainment and comfort system
 - 5.5 replacing static discharge wicks
 - 5.6 checking operation of interphone system
 - 5.7 checking operation of audio integrating system
 - 5.8 checking operation of integrated automatic tuning system
 - 5.9 checking operation of audio and video monitoring system
-

Outcome

S6 Carry out three of the following types of test/check on aircraft communication systems:

- 6.1 continuity check
 - 6.2 Built in Test Equipment (BITE) test
 - 6.3 'special-to-type' tests
 - 6.4 bonding tests
 - 6.5 distortion checks
 - 6.6 power output
 - 6.7 Voltage Standing Wave Ratio (VSWR) checks
-

Using five of the following:

- 6.8 'special to type' test equipment
 - 6.9 oscilloscope
 - 6.10 multimeter
 - 6.11 modulation analyser
 - 6.12 Time Domain Reflectometer (TDR) equipment
 - 6.13 RF signal generator
 - 6.14 bonding tester
 - 6.15 Voltage Standing Wave Ratio (VSWR) equipment
 - 6.16 headset
 - 6.17 aircraft power source
 - 6.18 wattmeter
 - 6.19 external power source
 - 6.20 insulation resistance (Megger) tester
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Outcome

- S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 aircraft cabin log
 - 7.3 computer records
 - 7.4 aircraft log book
 - 7.5 aircraft technical log
-

Outcome

- S8 Carry out maintenance on aircraft communication systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 8.3 Ministry of Defence (MoD)
- 8.4 Military Aviation Authority (MAA)
- 8.5 Aerospace Quality Management Standards (AS)
- 8.6 Federal Aviation Authority (FAA)
- 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
- 8.8 manufacturers standards and procedures

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working with aircraft communication systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the importance of maintenance on aircraft communication systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K3 describe the hazards associated with removing, fitting and testing aircraft communication system components, and with the tools and equipment used, and explain how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection and protection of the aircraft
- K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft communication systems, and other documents in the maintenance process
- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 explain the terminology used in aircraft communication systems, and the use of system diagrams and associated symbols
- K13 describe the basic principles of operation of the communication system being worked on, and the function of the various units that make up the system
- K14 describe the various mechanical fasteners that are used and explain their method of removal and replacement (such as threaded fasteners, special securing devices)
- K15 explain the importance of using the specified fasteners for the installation and why they must not substitute others
- K16 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K17 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the techniques used to remove components from aircraft communication systems without damage to the components or surrounding structure (such as the need to protect the circuit integrity by covering and labelling exposed circuits)
- K20 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices

- K21 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K22 explain the techniques used to position, align, adjust and secure the replaced components to the aircraft without damage to the components or surrounding structure
- K23 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K24 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K25 describe the tools and equipment used in the maintenance activities and their calibration/care and control procedures
- K26 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K27 explain how to recognise defects (such as incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K28 explain how to carry out routine checks and servicing of the aircraft communication system (including performing antenna VSWR checks, checking function of radios and passenger address system)
- K29 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K30 explain what types of test need to be carried out on the aircraft communication system and the test equipment to be used
- K31 explain the methods and procedures to be used to carry out the various tests on the communication system
- K32 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K33 explain how to record the results of each individual test and the documentation that must be used
- K34 explain how to analyse the test results, and make valid decisions about the acceptability of the communication system
- K35 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K36 explain what recording documentation needs 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
- K37 describe the procedure for the safe disposal of waste materials and scrap components
- K38 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 311

Maintaining communication systems on aircraft ATA 23

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 312

Maintaining electrical power systems on aircraft ATA24

RQF Reference:	K/508/6410
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft equipment and furnishings, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes those removable items of equipment and furnishings externally mounted on the aircraft or contained in the flight, passenger, cargo and accessory compartments. The maintenance activities will include the removal, fitting and, where appropriate, testing of a range of equipment and furnishings. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the equipment to be removed or fitted. The aircraft equipment and furnishings will include galley and toilet equipment, flight crew seats, tables, food containers, wardrobes, curtains, wall coverings, carpets, overhead storage compartments, movable partitions, mirrors and other similar equipment. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft equipment and furnishings. They will understand the removal, fitting and testing/checking methods and procedures, and their application, along with the equipment maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components

and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft equipment and furnishings, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 25 Equipment and Furnishings.
2. To display competence in this standard, it is necessary to both remove and fit aircraft equipment and furnishings. They must remove equipment and furnishings; however, they may fit replacement equipment and furnishings where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft electrical power system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
-

Outcome

S2 Carry out maintenance on three of the following aircraft electrical power systems:

- 2.1 generator drive system
 - 2.2 DC power generation equipment
 - 2.3 AC power generation equipment
 - 2.4 AC electrical load distribution
 - 2.5 external power equipment
 - 2.6 DC electrical load distribution
 - 2.7 emergency power backup equipment
 - 2.8 secondary/standby power generation equipment
-

Outcome

S3 Remove and fit six different electrical power system components (at least three must be from group A):

Group A

- 3.1 starter/generators
-

- 3.2 regulators
- 3.3 transformer/rectifier units
- 3.4 alternators
- 3.5 invertors
- 3.6 main contactors
- 3.7 integrated drive generator
- 3.8 circuit breakers
- 3.9 generator control panels/units
- 3.10 main batteries
- 3.11 voltage regulators
- 3.12 ram air turbine
- 3.13 under-voltage phase sequence units
- 3.14 power system control units

Group B

- 3.15 switches
- 3.16 batteries (such as emergency lighting)
- 3.17 wires/cables
- 3.18 relays
- 3.19 connectors
- 3.20 plugs/sockets
- 3.21 transducers/sensors
- 3.22 warning lights
- 3.23 transformer
- 3.24 indicators (such as volts/frequency)
- 3.25 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removal of bonding
- 4.7 removing cable securing devices
- 4.8 making mechanical connections
- 4.9 removing securing devices and mechanical fasteners
- 4.10 making electrical connections
- 4.11 supporting equipment to be removed
- 4.12 carrying out bonding
- 4.13 dismantling equipment to an appropriate level
- 4.14 installing cable securing devices
- 4.15 covering (protecting) exposed components, wires, pipework or vents
- 4.16 torque loading as required

- 4.17 setting and adjusting replaced components (such as voltage regulation, power output)
 - 4.18 checking components for serviceability
 - 4.19 replacing damaged/defective components
 - 4.20 carrying out functional checks of the system
 - 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
-

Outcome

S5 Carry out four of the following types of test/check on aircraft electrical power systems:

- 5.1 functional check
- 5.2 insulation test
- 5.3 comparison check
- 5.4 continuity check
- 5.5 built in test equipment BITE test
- 5.6 'special-to-type' tests
- 5.7 voltage check
- 5.8 standby power failure checks

Using two of the following:

- 5.9 external power source
 - 5.10 aircraft power source/system
 - 5.11 'special-to-type' test sets
 - 5.12 measuring equipment (such as multimeters, insulation testers)
-

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
-

Outcome

S7 Carry out maintenance on aircraft electrical power systems in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 7.3 Ministry of Defence (MoD)
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- 7.4 Military Aviation Authority (MAA)
 - 7.5 Aerospace Quality Management Standards (AS)
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working with aircraft electrical power systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the importance of maintenance on aircraft electrical power systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K3 describe the hazards associated with removing, fitting and testing aircraft electrical power system components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection and protection of the aircraft
- K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications and other documents needed in the maintenance process
- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 explain the terminology used in aircraft electrical power systems, and the use of system diagrams and associated symbols
- K13 describe the basic principles of operation of the electrical power system being worked on; AC and DC power supplies and the function of the various units within the system
- K14 describe the various mechanical fasteners that are used, and their method of removal and replacement (such as threaded fasteners, special securing devices)
- K15 explain the importance of using the specified fasteners for the installation and why they must not substitute others
- K16 explain why securing devices need to be locked and labelled, and the methods that are used to remove and install them
- K17 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections

- K19 explain the techniques used to remove components from aircraft electrical power systems without damage to the components or surrounding structure (such as proof marking, the need to protect the circuit integrity by covering and labelling exposed circuits)
- K20 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K21 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K22 explain the techniques used to position, align, adjust and secure the replaced components to the aircraft without damage to the components or surrounding structure
- K23 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities
- K24 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K25 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K26 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K27 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K28 describe the problems that can occur with the maintenance operations, and how these can be overcome
- K29 explain how to recognise defects (such as incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K30 explain how to carry out routine checks and servicing of the aircraft electrical power system (including adjusting voltage regulators, checking battery capacity and charging batteries)
- K31 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K32 explain what types of test need to be carried out on the aircraft electrical power system, and the test equipment used
- K33 explain what methods and procedures are to be used to carry out the various tests on the electrical power system
- K34 explain how to record the results of each individual test and the documentation that must be used
- K35 explain how to analyse the test results and make valid decisions about the acceptability of the electrical power system
- K36 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K37 explain what recording documentation needs 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
- K38 describe the procedure for the safe disposal of waste materials and scrap components
- K39 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 312

Maintaining electrical power systems on aircraft ATA24

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 313

Maintaining equipment and furnishings on aircraft ATA 25

RQF Reference:	M/508/6411
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft equipment and furnishings, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes those removable items of equipment and furnishings externally mounted on the aircraft or contained in the flight, passenger, cargo and accessory compartments. The maintenance activities will include the removal, fitting and, where appropriate, testing of a range of equipment and furnishings. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the equipment to be removed or fitted. The aircraft equipment and furnishings will include galley and toilet equipment, flight crew seats, tables, food containers, wardrobes, curtains, wall coverings, carpets, overhead storage compartments, movable partitions, mirrors and other similar equipment. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft equipment and furnishings. They will understand the removal, fitting and testing/checking methods and procedures, and their application, along with the equipment maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components

and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft equipment and furnishings, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 25 Equipment and Furnishings.
2. To display competence in this standard, it is necessary to both remove and fit aircraft equipment and furnishings. They must remove equipment and furnishings; however, they may fit replacement equipment and furnishings where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft equipment and furnishings
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on equipment and furnishings from two of the following areas of the aircraft:

- 2.1 flight compartment
 - 2.2 buffet/galley
 - 2.3 emergency kit
 - 2.4 passenger compartment
 - 2.5 toilet/dressing rooms
 - 2.6 insulation
 - 2.7 cargo compartments
 - 2.8 accessory compartments
-

Outcome

S3 Remove and fit six different aircraft equipment and furnishing components (at least two must be from group A):

Group A

- 3.1 flight crew seats
 - 3.2 movable partitions
-

- 3.3 cargo rollers/drive equipment
- 3.4 passenger seats
- 3.5 removable and fixed cabinets
- 3.6 cargo restraint equipment
- 3.7 berths
- 3.8 ovens
- 3.9 evacuation equipment
- 3.10 wardrobes
- 3.11 refrigerators
- 3.12 drag parachutes
- 3.13 overhead storage compartments
- 3.14 garbage containers/compactor
- 3.15 Kevlar/armour plating
- 3.16 inertia reels
- 3.17 coffee maker and dispenser

Group B

- 3.18 carpets
- 3.19 mirrors
- 3.20 life rafts
- 3.21 sound proofing
- 3.22 curtains
- 3.23 cargo restraint nets
- 3.24 life jackets
- 3.25 signal flares
- 3.26 wall coverings
- 3.27 emergency locator transmitters (ELT)
- 3.28 first aid kit
- 3.29 spare bulbs/fuses
- 3.30 insulation blankets
- 3.31 seat belts
- 3.32 batteries
- 3.33 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components/fastenings to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the equipment for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 replacing damaged/defective components
- 4.6 removing securing devices and mechanical fasteners
- 4.7 refitting components in the correct position, orientation and alignment
- 4.8 supporting components to be removed

- 4.9 removal of bonding
 - 4.10 positioning and aligning replaced equipment
 - 4.11 supporting equipment to be removed
 - 4.12 making mechanical connections
 - 4.13 dismantling equipment to an appropriate level
 - 4.14 making electrical connections
 - 4.15 covering (protecting) exposed components, wires, pipework or vents
 - 4.16 carrying out bonding
 - 4.17 torque loading as required
 - 4.18 checking components for serviceability
 - 4.19 carrying out equipment functional checks
 - 4.20 ensuring that replacement equipment is of the correct type (have the correct part numbers)
 - 4.21 labelling (and storing in the correct location) equipment that requires repair or overhaul
 - 4.22 setting, and adjusting replaced components (such as seats)
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
-

Outcome

- S5 Service/check aircraft equipment and furnishings, to include carrying out four of the following:

- 5.1 checking inertia reels for correct operation
 - 5.2 checking seat belts for damage and security
 - 5.3 checking that emergency equipment is all present and in a serviceable condition
 - 5.4 checking emergency locator transmitters (ELT) for compliance with regulations
 - 5.5 changing cabin configuration
 - 5.6 repairing upholstery
 - 5.7 checking seat structure, recline and table mechanisms
 - 5.8 checking contents of first aid kit
 - 5.9 checking operation of emergency megaphone
 - 5.10 checking operation of galley compartment door primary and secondary latches
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Outcome

- S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
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Outcome

S7 Carry out maintenance on aircraft equipment and furnishings in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 7.3 Ministry of Defence (MoD)
 - 7.4 Military Aviation Authority (MAA)
 - 7.5 Aerospace Quality Management Standards (AS)
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when carrying out maintenance activities on aircraft equipment and furnishings (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft equipment and furnishings, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, legislation and local procedures
 - K3 describe the hazards associated with removing and fitting aircraft equipment and furnishings, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K10 explain how to extract and use information from aircraft manuals, log books, flight logs, and other documents needed in the maintenance process
 - K11 explain how to carry out currency/issue checks on the specifications they are working with
 - K12 describe the range of equipment and furnishings that may need to be maintained/replaced
 - K13 describe the various mechanical fasteners that are used to hold the equipment in place, and their method of removal and replacement (such as threaded fasteners, special securing devices)
 - K14 explain the importance of using the specified fasteners for the installation and why they must not substitute others
-

- K15 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K16 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K18 explain the need to take care when removing equipment and furnishings so as not to cause damage to the equipment or surrounding structure
- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K20 explain the need to correctly position, align, adjust and secure the replaced equipment in the aircraft without damage to the components or surrounding structure
- K21 explain the methods of lifting, handling and supporting the components/equipment during the removal and fitting activities
- K22 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K23 explain how to carry out routine checks of the aircraft equipment and furnishings (such as checking contents of emergency and first aid equipment, checking condition and security of seat belts)
- K24 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K25 describe the problems that can occur with the maintenance operations and how these can be overcome
- K26 explain what recording documentation needs 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
- K27 describe the procedure for the safe disposal of waste materials and scrap components
- K28 describe the extent of their own authority and explain to whom they should report if they have problems that they cannot resolve

Unit 313

Maintaining equipment and furnishings on aircraft ATA 25

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 314

Maintaining fire protection systems on aircraft ATA 26

RQF Reference:	T/508/6412
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft fire protection systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers both fixed and portable units and components which detect and indicate fire or smoke, and which store and distribute fire extinguishing agents to all protected areas of the aircraft. The maintenance activities will include the removal, fitting and testing of a range of fire protection system components. They will be expected to use the approved procedure for correctly isolating the system or fitting extinguishing trip defeat mechanisms before testing/trouble shooting the protection system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft fire protection systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the fire protection systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft fire protection systems. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 26 Fire Protection.
2. To display competence in this standard, it is necessary to both remove and fit aircraft fire protection system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft fire protection system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation of the fire protection equipment before breaking into the system circuit
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.8 use approved removal, fitting and testing techniques and procedures at all times
 - 1.9 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.10 return tools and equipment to the correct storage location on completion of the activities
 - 1.11 ensure that work carried out is correctly documented and recorded
 - 1.12 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following parts of an aircraft fire protection system:

- 2.1 detection
- 2.2 indicating
- 2.3 extinguishing
- 2.4 explosion suppression

Outcome

S3 Carry out maintenance on fire protection systems operated by two of the following:

- 3.1 thermal switch
- 3.2 thermocouple
- 3.3 continuous loop
- 3.4 continuous element

Outcome

- S4 Remove and fit four different aircraft fire protection system components (at least two must be from group A):

Group A

- 4.1 smoke detectors (optical)
- 4.2 overheat detectors
- 4.3 thermal switches
- 4.4 rate-of-temperature-rise detectors
- 4.5 fibre-optic detectors
- 4.6 control valves
- 4.7 radiation sensing detectors
- 4.8 sprays/nozzles
- 4.9 fire wire
- 4.10 carbon monoxide detectors
- 4.11 fire bottles
- 4.12 combustible mixture detectors
- 4.13 pumps

Group B

- 4.14 pipes and hoses
- 4.15 sensors/transmitters
- 4.16 gauges
- 4.17 pyrotechnic cartridges
- 4.18 wiring/switches/plugs
- 4.19 foam suppressant
- 4.20 nitrogen equipment
- 4.21 other specific components

Outcome

- S5 Carry out fifteen of the following maintenance activities:

- 5.1 removing access panels and covers to expose components to be removed
- 5.2 carrying out fault diagnosis and system checks
- 5.3 preparing the system for maintenance (such as isolating, fitting trip defeat mechanisms)
- 5.4 inspecting on board fire protection equipment
- 5.5 refitting components in the correct position, orientation and alignment
- 5.6 disconnecting electrical connections
- 5.7 removal of bonding
- 5.8 setting and adjusting replaced components (such as travel, working clearance)
- 5.9 disconnect/removing hoses and pipes
- 5.10 removing securing devices and mechanical fasteners
- 5.11 making mechanical connections
- 5.12 supporting equipment to be removed

- 5.13 making electrical connections
 - 5.14 dismantling equipment to an appropriate level
 - 5.15 carrying out bonding
 - 5.16 covering (protecting) exposed components, wires, pipework or vents
 - 5.17 torque loading as required
 - 5.18 purging and replenishing extinguishing agent
 - 5.19 checking components for serviceability
 - 5.20 carrying out a system functional check
 - 5.21 replacing damaged/defective components
 - 5.22 replacing single use items such as seals, filters, gaskets
 - 5.23 ensuring that replacement components have the correct part numbers
 - 5.24 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 5.25 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 5.26 carrying out area inspections prior to task close down
-

Outcome

- S6 Service/check the aircraft fire protection system, to include carrying out three of the following:

- 6.1 checking fire bottle contents
 - 6.2 checking operation of fire warning system
 - 6.3 checking cabin fire extinguisher contents
 - 6.4 checking cargo bays fire extinguishing system
 - 6.5 checking toilet smoke detector system
 - 6.6 inspecting engine fire wire detection system
 - 6.7 checking auto-shutdown function if installed (such as APU)
 - 6.8 function testing of fire bottle activation circuits
-

Outcome

- S7 Carry out one of the following tests on the aircraft fire protection system:

- 7.1 smoke test
 - 7.2 built in test equipment (BITE) test
 - 7.3 heat test
 - 7.4 'special-to-type' tests
 - 7.5 'no volts' test
-

Outcome

- S8 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 8.1 job cards/work sheets
 - 8.2 computer records
-

- 8.3 aircraft technical log
 - 8.4 aircraft cabin log
 - 8.5 aircraft log book
-

Outcome

- S9 Carry out maintenance on aircraft fire protection systems in compliance with one of the following:

- 9.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 9.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 9.3 Ministry of Defence (MoD)
 - 9.4 Military Aviation Authority (MAA)
 - 9.5 Aerospace Quality Management Standards (AS)
 - 9.6 Federal Aviation Authority (FAA)
 - 9.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 9.8 manufacturers standards and procedures
-

Outcome

- K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft fire protection systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft fire protection systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K3 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K4 describe the requirements and explain importance of understanding and applying human factors as defined by the regulatory requirements and the potential impact if these are not adhered to
 - K5 describe the requirements and explain the importance of understanding and applying human factors as defined by the regulatory requirements and the potential impact if these are not adhered to
 - K6 describe the hazards associated with carrying out maintenance activities on aircraft fire protection systems, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K7 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K8 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K9 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K10 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
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- K11 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K12 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft fire protection systems, and other documents in the maintenance activities
- K13 explain how to carry out currency/issue checks on the specifications they are working with
- K14 explain the terminology used in aircraft fire protection systems, and the use of system diagrams and associated symbols
- K15 describe the various types of pipe and component that make up the aircraft fire protection system (such as rigid pipes; hoses; pipe connectors; pipe sealing and supporting devices; valves; pumps; mechanical and electrical control devices)
- K16 describe the basic principles of operation of the aircraft fire protection system being worked on (such as thermal switch, thermocouple, continuous loop, continuous element; fire detection, and warning; sources and types of extinguishing agent; extinguishing agent control and distribution)
- K17 explain the techniques used to remove components from aircraft fire protection systems without damage to the components or surrounding structure
- K18 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K19 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K20 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K21 explain the importance of ensuring that any exposed components, wires or pipe ends are correctly covered/protected
- K22 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K23 describe how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring the correct tightness of pipe fittings and connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
- K24 explain how to make adjustments to components/assemblies to ensure that they function correctly
- K25 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K26 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K27 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K28 explain how to carry out routine checks and servicing of the aircraft fire detection system (including checking content of fire bottles and extinguishers, replacing fire bottle squib, checking operation of warning system, checking operation of smoke detectors)
- K29 explain what types of test need to be carried out on the aircraft fire protection system, and describe the test equipment to be used
- K30 explain the methods and procedures to be used to carry out the various tests on the fire protection system
- K31 explain the importance of carrying out tests in the specified sequence, checking readings and movements at each stage

- K32 explain how to record the results of each individual test, and the documentation that must be used
- K33 explain how to analyse the test results, and how to make valid decisions about the acceptability of the aircraft indicating and recording systems
- K34 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K35 describe the procedure for the safe disposal of waste materials and scrap components
- K36 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 314

Maintaining fire protection systems on aircraft ATA 26

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 315

Maintaining flight control systems on aircraft ATA 27

RQF Reference:	A/508/6413
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft flight control systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It includes units and components which manually control the flight, attitude and characteristics of the aircraft. The maintenance activities will include the removal, fitting and testing of a range of flight control components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed, fitted and tested. The aircraft components will include items such as ailerons and tabs, horizontal stabilizer, elevator, rudder, flaps, spoilers/drag devices, gust locks and dampers, lift augmenting system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft flight control systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the aircraft flight control system maintenance requirements. They will know how the aircraft flight controls function, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft flight control systems, especially those for isolating the equipment, and lifting and handling control components. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 27 Flight Controls.
2. To display competence in this standard, it is necessary to both remove and fit aircraft flight control system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft flight control system
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 ensure the safe isolation of the control system before commencing work on the equipment
 - 1.7 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.8 use approved removal, fitting and testing techniques and procedures at all times
 - 1.9 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.10 return tools and equipment to the correct storage location on completion of the activities
 - 1.11 ensure that work carried out is correctly documented and recorded
 - 1.12 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following aircraft flight control systems:

- 2.1 spoiler, drag devices and variable aerodynamic fairings (such as air brakes, speed brakes)
- 2.2 ailerons/ailerons and tab
- 2.3 elevators and trim tabs
- 2.4 gust lock and damper
- 2.5 flaps/slats/flaperons
- 2.6 rudder/yaw/ruddervator and tab
- 2.7 throttles
- 2.8 lift augmenting devices
- 2.9 horizontal stabilisers/stabilator/canards
- 2.10 thrust reverser
- 2.11 nose and body steering
- 2.12 spoilers, air brakes, lift dumpers
- 2.13 propeller controls
- 2.14 other specific flight control system

Outcome

- S3 Remove and fit six different aircraft flight control system components (at least three must be from group A):

Group A

- 3.1 horizontal stabiliser
- 3.2 trim wheels
- 3.3 spoilers
- 3.4 elevator
- 3.5 reaction control nozzles
- 3.6 drag devices
- 3.7 aileron
- 3.8 powered flying control units
- 3.9 gradient boxes
- 3.10 rudder
- 3.11 automatic stall recovery device
- 3.12 actuators
- 3.13 flaps rudder pedals
- 3.14 auxiliary controls
- 3.15 mixer units
- 3.16 flap selectors
- 3.17 torque tubes
- 3.18 artificial feel units
- 3.19 control columns
- 3.20 boosters
- 3.21 Auxiliary Servo Equipment (ASE)
- 3.22 stick shaker units
- 3.23 tab control wheel
- 3.24 primary servo jack
- 3.25 air/speed brake selectors
- 3.26 control surfaces
- 3.27 primary flight computers (including Actuator Control Electronic - ACE)
- 3.28 other specific component

Group B

- 3.29 cables and pulleys
- 3.30 levers and linkages
- 3.31 turnbuckles
- 3.32 locks and stops
- 3.33 connecting rods
- 3.34 pedal shakers
- 3.35 jack screws
- 3.36 bell cranks
- 3.37 position transmitters
- 3.38 actuators/motors/servos

- 3.39 sensors
 - 3.40 reaction control ducting
 - 3.41 other specific components
-

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
 - 4.2 carrying out fault diagnosis and system checks
 - 4.3 preparing the system for maintenance (such as isolating, releasing stored pressure)
 - 4.4 disconnecting electrical connections
 - 4.5 refitting components in the correct position, orientation and alignment
 - 4.6 removal of bonding
 - 4.7 removing securing devices and mechanical fasteners
 - 4.8 setting and adjusting replaced components (such as freedom of movement, cable tension)
 - 4.9 supporting equipment to be removed
 - 4.10 dismantling equipment to an appropriate level
 - 4.11 making mechanical connections
 - 4.12 covering (protecting) exposed components, wires, pipework or vents
 - 4.13 making electrical connections
 - 4.14 carrying out bonding
 - 4.15 checking components for serviceability
 - 4.16 torque loading as required
 - 4.17 replacing damaged/defective components
 - 4.18 carrying out functional checks of the system
 - 4.19 ensuring that replacement components have the correct part numbers
 - 4.20 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.22 carrying out area inspections prior to task close down
-

Outcome

S5 Carry out five of the following types of test/check on the aircraft flight control systems:

- 5.1 functional
 - 5.2 Built in Test Equipment (BITE)
 - 5.3 ground run tests
 - 5.4 rigging check
 - 5.5 timings
 - 5.6 range and freedom of movement
 - 5.7 static friction check
 - 5.8 cable tension check
 - 5.9 leak test
 - 5.10 'special-to-type' tests
 - 5.11 safety interlock test
-

Using two of the following:

- 5.12 Built in Test Equipment (BITE)
 - 5.13 ground support equipment
 - 5.14 'special-to-type' test equipment
 - 5.15 aircraft power source/displays and gauges
 - 5.16 use of safety locks
 - 5.17 measuring equipment
-

Outcome

- S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
-

Outcome

- S7 Carry out maintenance on aircraft flight control systems in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 7.3 Ministry of Defence (MoD)
 - 7.4 Military Aviation Authority (MAA)
 - 7.5 Aerospace Quality Management Standards (AS)
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 manufacturers standards and procedures
-

Outcome

- K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft flight control systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft flight control systems, and impact upon Extended Range Twin Engine Operations Procedures Systems (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K3 describe the hazards associated with removing, fitting and testing aircraft flight control system components, and with the tools and equipment used, and how to minimise them and reduce any risk
-

- K4 describe the requirements and explain the importance of understanding and applying human factors as defined by the regulatory requirements and the potential impact if these are not adhered to
- K5 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain how to extract and use information from aircraft maintenance manuals, log books, flight logs, and other documents needed in the removal and replacement process
- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 explain the terminology used in aircraft flight control systems, and the use of system diagrams and associated symbols
- K13 describe the basic principles of operation of the aircraft flight control system being worked on, and the function of the various units/components within the system
- K14 explain the techniques used to remove components from aircraft flight control systems without damage to the components or surrounding structure (such as release of pressures/force, proof marking, extraction of components), and the need to protect the system integrity (by fitting blanking plugs and ensuring that exposed components are correctly covered/protected)
- K15 describe the various mechanical fasteners to be removed and replaced (such as threaded fasteners, special securing devices), and their method of removal and replacement
- K16 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K17 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K18 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K19 explain the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics
- K20 explain the need to replace items such as seals and gaskets
- K21 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K22 explain how to replace and reconnect components into the system (such as ensuring correct orientation, position and alignment; tightening securing devices to the required torque; replacing locking and securing devices; eliminating stress on pipework/connections; ensuring that pipework and cables are correctly supported at suitable intervals; carrying out visual checks of all components)
- K23 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, preloading bearings)
- K24 explain why electrical bonding is critical and why it must be both mechanically and electrically secure
- K25 explain the purpose of symmetry and rigging checks; how they are carried out; how to locate the rigging points and faces; and the use of incidence boards

- K26 explain how to carry out routine checks and servicing of the aircraft flight control system
- K27 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K28 explain the types of test to be carried out on the aircraft flight control system and the test equipment to be used
- K29 explain the methods and procedures to be used to carry out the various tests on the flight control system
- K30 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K31 explain how to record the results of each individual test and the documentation that must be used
- K32 explain how to analyse the test results and make valid decisions about the acceptability of the flight control systems
- K33 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K34 why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K35 describe the problems that can occur with flight control system maintenance operations, and how these can be overcome
- K36 explain what recording documentation needs 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
- K37 describe the procedure for the safe disposal of waste materials and scrap components
- K38 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 315

Maintaining flight control systems on aircraft ATA 27

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 316

Maintaining fuel systems on aircraft ATA 28

RQF Reference:	F/508/6414
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft fuel systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which store and deliver fuel to the engine. It includes engine driven fuel pumps for reciprocating engines, tanks (bladder), tanks (integral), tanks auxiliary, valves, boost pumps, fuel dump systems, fuel tank leak detection components, fuel draining, fuel tank capacitance units, float switches, float valves, temperature sensing, refuel diffuser systems, dip sticks, magnetic level indicators, fuel tank baffling, flame arrester components and tank venting systems. The maintenance activities will include the removal, fitting and testing of a range of fuel system components. They will be expected to use the approved procedure for correctly isolating the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft fuel systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the fuel system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in

adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard. They will need to understand the impact of the SFAR88 legislation and its impact, as well as the impact of CDCCL (Critical Design Configuration Control Limitations) requirements. They will need to be aware of the regulations appertaining to working in confined spaces and for working with flammable liquids and gases.

They will understand the safety precautions required when working on aircraft fuel systems, especially those for ensuring system cleanliness and the avoidance of spillage, fire and explosion. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 28 Fuel. It does not include fuel flow rate sensing and transmitting or engine fuel flow or pressure which is covered in Chapter 73 Engine Fuel and Control.
2. To display competence in this standard, it is necessary to both remove and fit aircraft fuel system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule

- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures
-

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft fuel system:
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment, breathing apparatus and other relevant safety regulations and procedures to realise a safe system of work
 - 1.5 ensure the safe isolation and ventilation of the fuel equipment before breaking into the system, and check that the aircraft and ground equipment to be used is electrically bonded
 - 1.6 ensure that the relevant safety devices, mechanical/physical locks and external signage are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft fuel system:

- 2.1 fuel storage
- 2.2 fuel drain
- 2.3 fuel indicating
- 2.4 distribution
- 2.5 in-flight refuelling
- 2.6 fuel jettison/dump

Outcome

- S3 Remove and fit four different aircraft fuel system components (at least one must be from group A):

Group A

- 3.1 control valves (such as drain, bleed, change over, fire wall, dump)
- 3.2 main fuel tanks/cells/bladders
- 3.3 refuel and de-fuel connections
- 3.4 fuel flow regulators
- 3.5 auxiliary fuel tank
- 3.6 fuel selector
- 3.7 motors
- 3.8 external/drop down fuel tanks
- 3.9 high/low level shutoff
- 3.10 solenoids
- 3.11 pumps
- 3.12 jet pumps
- 3.13 cell and tank inter-connectors
- 3.14 densitometer
- 3.15 float switch
- 3.16 sender unit
- 3.17 fuel cooling units
- 3.18 float valve
- 3.19 fuel manifold

Group B

- 3.20 pipes/hoses
- 3.21 fuel filters
- 3.22 ventilating components
- 3.23 over wing filler necks and caps
- 3.24 safety devices
- 3.25 sensors
- 3.26 pressure switches
- 3.27 strainers
- 3.28 gaskets and seals
- 3.29 bleed valve
- 3.30 other specific components

Outcome

- S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining and removing fuel)
- 4.4 disconnecting electrical connections
- 4.5 replacing single use items such as seals, filters, gaskets
- 4.6 removal of bonding
- 4.7 disconnecting/removing hoses and pipes

- 4.8 refitting components in the correct position,
 - 4.9 removing securing devices and mechanical fasteners orientation and alignment
 - 4.10 supporting equipment to be removed
 - 4.11 making mechanical connections
 - 4.12 dismantling equipment to an appropriate level
 - 4.13 making electrical connections
 - 4.14 covering (protecting) exposed components, wires, pipework or vents
 - 4.15 carrying out bonding
 - 4.16 torque loading as required
 - 4.17 checking components for serviceability
 - 4.18 charging and bleeding the system
 - 4.19 replacing damaged/defective components
 - 4.20 carrying out a systems functional checks
 - 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close up
-

Outcome

S5 Service/check the aircraft fuel system, to include carrying out three of the following:

- 5.1 checking the system and tanks for leaks
 - 5.2 checking and cleaning/replacing filters
 - 5.3 checking calibration of fuel quantity gauges (labelling or other methods)
 - 5.4 checking operation of feed/selectors
 - 5.5 checking indicating systems (such as pressure drop, temperature warning, valve position and status)
-

Outcome

S6 Carry out four of the following tests on the aircraft fuel system:

- 6.1 leak test
 - 6.2 fuel level/contents check
 - 6.3 pressure test
 - 6.4 fuel capacity tests
 - 6.5 full system fuel flow
 - 6.6 fuel sampling/heck/fuel system icing inhibitor/water
 - 6.7 reduced system fuel flow results
 - 6.8 system flush
 - 6.9 built in test equipment (BITE) test
 - 6.10 system fuel flow functional test
 - 6.11 `special-to-type' tests
 - 6.12 fuel transfer tests
-

Using one of the following:

- 6.8 fuel sampling devices
 - 6.9 aircraft power source/system
 - 6.10 ground test rig
 - 6.11 'special to type' test equipment
-

Outcome

- S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 aircraft cabin log
 - 7.3 computer records
 - 7.4 aircraft log book
 - 7.5 aircraft technical log
-

Outcome

- S8 Carry out maintenance on aircraft fuel systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

- K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when carrying out maintenance activities on aircraft fuel systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft fuel systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K3 explain the safety procedures that must be carried out before work is started on removing the fuel system components (such as displaying warning notices, ensuring adequate firefighting equipment)
 - K4 describe 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 describe the hazards associated with removing aircraft fuel system components, and with the tools and equipment used, (such as handling fluids, flammable fluids, fire and explosion, misuse of tools), and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft fuel systems, and other documents needed in the maintenance process
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain terminology used in aircraft fuel systems, and the use of system diagrams and associated symbols
- K14 describe the various types of pipe and component that make up the aircraft fuel system (such as rigid pipes; flexible hoses; pipe connectors; pipe sealing and supporting devices; valves used for flow, change over, fuel dumping; fuel pumps; mechanical and electrical control devices)
- K15 describe the basic principles of operation of the aircraft fuel system being worked on, and the function of the various units/components within the system
- K16 explain the techniques used to remove components from aircraft fuel systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, proof marking, extraction of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
- K17 describe the various mechanical fasteners to be removed and replaced, and their method of removal and replacement (such as threaded fasteners, special securing devices)
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the methods of lifting, and supporting the components/equipment during the maintenance activities
- K20 explain the importance of ensuring that the work area is free from dirt, debris and foreign objects, and of ensuring that any exposed components or pipe ends are correctly covered/protected
- K21 explain the recognition of contaminants and the problems they can create; the effects and likely symptoms of contamination in the fuel system
- K22 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K23 explain how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring correct tightness of pipe fittings and connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking security of joints and that the system is safe to refill)
- K24 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as flow and pressure settings, and their effect on the system, travel and working clearance)

- K25 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K26 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K27 explain how to carry out routine checks and servicing of the aircraft fuel system (including checking for leaks, checking and changing filters, checking calibration of fuel quantity gauges)
- K28 explain the types of test to be carried out on the aircraft fuel system and the test equipment to be used
- K29 explain the methods and procedures to be used to carry out the various tests on the fuel system
- K30 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K31 explain how to record the results of each individual test and the documentation that must be used
- K32 explain how to analyse the test results and how to make valid decisions about the acceptability of the aircraft fuel system
- K33 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K34 explain what recording documentation needs 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
- K35 describe the procedure for the safe disposal of waste materials, scrap components and waste fuel

Unit 316

Maintaining fuel systems on aircraft ATA 28

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 317

Maintaining hydraulic systems on aircraft ATA 29

RQF Reference:	J/508/6415
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft hydraulic systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which supply the hydraulic fluid under pressure (includes tanks, pumps, accumulators, valves, pipes) to a common point (manifold) for redistribution to other defined systems. The maintenance activities will include the removal, fitting and testing of a range of hydraulic components. They will be expected to use the approved procedure for correctly isolating and de-pressurising the system, breaking into the system circuit and catching/containing any spilled fluids. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft hydraulic systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the hydraulic systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft hydraulic systems, especially those for handling hydraulic fluids, isolating and depressurising the equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 29 Hydraulic Power.
2. To display competence in this standard, it is necessary to both remove and fit aircraft hydraulic system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements:

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft hydraulic system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation and depressurisation of the hydraulic equipment before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft hydraulic system:

- 2.1 hydraulic power supply
- 2.2 emergency/auxiliary system
- 2.3 main hydraulic system
- 2.4 indicating system

Outcome

S3 Remove and fit four different aircraft hydraulic system components (at least one must be from group A):

Group A

- 3.1 engine driven pump
- 3.2 standby pump
- 3.3 accumulator
- 3.4 heat exchanger
- 3.5 hand pump

- 3.6 manifold
- 3.7 electric motor driven pump
- 3.8 reservoirs/tanks
- 3.9 auxiliary servo equipment
- 3.10 gearbox driven pump
- 3.11 primary servo jack/actuator
- 3.12 ram air turbine

Group B

- 3.13 control valves
- 3.14 pipes and hoses
- 3.15 chip detectors
- 3.16 check valve
- 3.17 filters
- 3.18 gauges/wiring/switches/plugs
- 3.19 automatic cut-out valve
- 3.20 sensors/transmitters
- 3.21 in-flight refuelling components
- 3.22 ground connector
- 3.23 hydraulic fuses
- 3.24 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, de-pressurising, draining fluids)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 disconnect/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 supporting equipment to be removed
- 4.10 dismantling equipment to an appropriate level
- 4.11 making mechanical connections
- 4.12 covering (protecting) exposed components, wires, pipework or vents
- 4.13 making electrical connections
- 4.14 torque loading as required
- 4.15 checking components for serviceability
- 4.16 replacing fluids and bleeding the system
- 4.17 replacing damaged/defective components
- 4.18 re-pressurising the system
- 4.19 replacing single use items such as seals, filters, gaskets
- 4.20 carrying out system functional checks

- 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
-

Outcome

S5 Service/check the aircraft hydraulic system, to include carrying out all of the following:

- 5.1 visually checking the system for leaks
 - 5.2 checking for correct operation of valves
 - 5.3 checking filters
 - 5.4 checking the fluid content of reservoirs
 - 5.5 replenishing the hydraulic system
 - 5.6 charging the nitrogen accumulator
 - 5.7 checking accumulator gas/nitrogen pressure
 - 5.8 checking indicating systems
-

Outcome

S6 Carry out three of the following tests on the aircraft hydraulic system:

- 6.1 leak test
- 6.2 built in test equipment (BITE) test
- 6.3 pressure test
- 6.4 'special-to-type' tests
- 6.5 fluid sampling test

Using one of the following:

- 6.6 aircraft power source/pumps
 - 6.7 ground test rig
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft hydraulic system components in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft hydraulic systems and when using synthetic oils (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K3 explain the importance of maintenance on aircraft hydraulic systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K4 explain 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 describe the hazards associated with carrying out maintenance activities on aircraft hydraulic systems, and with the tools and equipment used (such as the safe release of pressurised systems, handling hydraulic fluids, traps from moving parts, misuse of tools), and how to minimise them and reduce any risk
 - K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft hydraulic systems, and other documents needed in the maintenance activities
 - K12 explain how to carry out currency/issue checks on the specifications they are working with
-

- K13 explain the terminology used in aircraft hydraulic systems, and the use of fluid power diagrams and associated symbols
- K14 describe the various types of pipe and the components that make up the aircraft hydraulic system (such as rigid pipes; hydraulic hoses; pipe connectors; pipe sealing and supporting devices; valves used for pressure relief, flow and directional control; pumps; pressure intensifiers, mechanical and electrical control devices)
- K15 describe the basic principles of operation of the hydraulic system being worked on (such as system layout, hydraulic fluids, the use of reservoirs and accumulators, pressure generation, pressure control and distribution, pressure indication and warning)
- K16 describe the types and use of hydraulic fluids, and their interaction and effect on the integrity of other parts of the aircraft
- K17 explain the techniques used to remove components from aircraft hydraulic systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, removal of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
- K18 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K19 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K20 explain the importance of ensuring that any exposed components or pipe ends are correctly covered/protected
- K21 explain how to recognise contaminants, and the problems they can create; the effects and likely symptoms of contamination in the hydraulic system
- K22 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K23 explain how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring correct tightness of pipe fittings and pump connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking security of joints and that the system is safe to re-pressurise)
- K24 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as pressure settings, and their effect on the system, travel and working clearance)
- K25 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K26 explain how to carry out routine checks and servicing of the aircraft hydraulic system (including replenishing hydraulic fluid and accumulator charging)
- K27 explain the types of test to be carried out on the aircraft hydraulic system, and the test equipment to be used
- K28 explain the methods and procedures to be used to carry out the various tests on the hydraulic systems
- K29 explain the need to apply test pressures in incremental stages, and to check all readings and pressures at each stage
- K30 explain how to record the results of each individual test, and the documentation that must be used
- K31 explain how to analyse the test results, and how to make valid decisions about the acceptability of the aircraft
- K32 explain the procedures to be followed if the equipment or system fails to meet the test specification

- K33 explain what recording documentation needs 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
- K34 describe the procedure for the safe disposal of waste materials, scrap components and hydraulic fluids
- K35 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 318

Maintaining ice and rain protection systems on aircraft ATA 30

RQF Reference:	L/508/6416
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft ice and rain protection systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which provide a means of preventing or disposing of ice and rain on various parts of the aircraft. The maintenance activities will include the removal, fitting and testing of a range of ice and rain protection system components associated with airfoil surfaces, air intakes and cowls, pitot static, windows and doors, antennas and radomes, propellers and rotors, water supply and drain lines, and ice detection and indicating systems. They will be expected to use the approved procedure for correctly isolating the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft ice and rain protection systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the ice and rain protection system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual

components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft ice and rain protection systems, especially those involved with handling de-icing fluids. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 30 Ice and Rain Protection.
2. To display competence in this standard, it is necessary to both remove and fit aircraft ice and rain protection system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft ice and rain protection systems
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the system is safely isolated and where appropriate, drain off fluid before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft ice and rain protection systems:

- 2.1 aerofoil surfaces
- 2.2 propellers/rotors
- 2.3 antennae/radomes
- 2.4 air intakes/cowlings
- 2.5 windows/windshields
- 2.6 water supply and drain lines
- 2.7 pitot static
- 2.8 doors
- 2.9 ice detection and indicating

Outcome

S3 Carry out maintenance on ice and rain protection systems operated by two of the following:

- 3.1 mechanical/pneumatic actuation
 - 3.2 hot air
 - 3.3 alcohol spray
 - 3.4 electrically heated elements
-

Outcome

S4 Remove and fit four different aircraft ice and rain protection components (at least one must be from group A):

Group A

- 4.1 pump
- 4.2 solenoids
- 4.3 wiper motor
- 4.4 manifold
- 4.5 wing heaters
- 4.6 pitot probes/pressure heads
- 4.7 valves (such as check, de-icing, distributing)
- 4.8 heated windshields
- 4.9 pitot heaters
- 4.10 pressure regulator
- 4.11 nozzles (air or fluid)
- 4.12 scoop heaters
- 4.13 fluid reservoirs/tanks
- 4.14 water line heaters
- 4.15 ice detectors
- 4.16 rubber de-icer boots
- 4.17 electrical elements

Group B

- 4.18 windshield wipers
 - 4.19 pipes and hoses
 - 4.20 moisture drains/traps
 - 4.21 sensors/transmitters
 - 4.22 air filters
 - 4.23 wiring/switches/plugs
 - 4.24 timers
 - 4.25 gauges
 - 4.26 temperature probes
 - 4.27 electrical probes
 - 4.28 other specific components
-

Outcome

S5 Carry out fifteen of the following maintenance activities:

- 5.1 removing access panels and covers to expose components to be removed
- 5.2 carrying out fault diagnosis and system checks
- 5.3 preparing the system for maintenance (such as isolating, draining fluids)
- 5.4 disconnecting electrical connections
- 5.5 refitting components in the correct position, orientation and alignment
- 5.6 removal of bonding
- 5.7 disconnecting/removing hoses and pipes
- 5.8 setting and adjusting replaced components
- 5.9 removing mechanical fasteners and securing devices
- 5.10 making mechanical connections
- 5.11 supporting equipment to be removed
- 5.12 making electrical connections
- 5.13 dismantling equipment to an appropriate level
- 5.14 carrying out bonding
- 5.15 covering (protecting) exposed components, wires, pipework or vents
- 5.16 torque loading as required
- 5.17 replenishing fluids
- 5.18 checking components for serviceability
- 5.19 carrying out system functional checks
- 5.20 replacing damaged/defective components
- 5.21 replacing single use items such as seals, gaskets
- 5.22 ensuring that replacement components have the correct part numbers
- 5.23 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 5.24 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 5.25 carrying out area inspections prior to task close down

Outcome

S6 Service/check aircraft ice and rain protection systems, to include carrying out all of the following:

- 6.1 checking the system for leaks
- 6.2 replacing filters
- 6.3 replenishing fluids (such as de-icing, rain repellent)
- 6.4 checking and adjusting spray nozzles
- 6.5 checking the operation of pitot, static and stall detection heating elements
- 6.6 changing windshield wiper blades (as appropriate)
- 6.7 checking indicating systems

Outcome

S7 Carry out three of the following tests on the aircraft ice and rain protection systems:

- 7.1 leak test
- 7.2 reduced system test
- 7.3 pressure test
- 7.4 Built in Test Equipment (BITE) test
- 7.5 system charging
- 7.6 special-to-type tests

Using one of the following:

- 7.7 aircraft pumps
 - 7.8 ground test rig
 - 7.9 aircraft electrical power
-

Outcome

S8 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 8.1 job cards/work sheets
 - 8.2 computer records
 - 8.3 aircraft technical log
 - 8.4 aircraft cabin log
 - 8.5 aircraft log book
-

Outcome

S9 Carry out maintenance on aircraft ice and rain protection systems in compliance with one of the following:

- 9.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 9.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 9.3 Ministry of Defence (MoD)
- 9.4 Military Aviation Authority (MAA)
- 9.5 Aerospace Quality Management Standards (AS)
- 9.6 Federal Aviation Authority (FAA)
- 9.7 aircraft maintenance manual/approved change documentation (service bulletin)
- 9.8 manufacturers standards and procedures

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft ice and rain protection systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K3 explain the importance of maintenance on ice and rain protection systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft ice and rain protection systems, and with the tools and equipment used (such as the safe release of fluids, misuse of tools), and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft ice and rain protection systems, and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft ice and rain protection systems, and the use of system diagrams and associated symbols
- K14 explain the various types of pipe and component that make up the aircraft ice and rain protection system (such as rigid pipes; air hoses; rubber de-icing boots; heating elements; valves; pumps; mechanical and electrical control devices)
- K15 describe the basic principles of operation of the ice and rain protection system being worked on (such as hot air, electrically heated elements, mechanically/pneumatic operated rubber de-icing boots, alcohol spray and water repellent systems; ice indication and warning)
- K16 explain the techniques used to remove components from aircraft ice and rain protection systems without damage to the components or surrounding structure (such as release of fluids, removal of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
- K17 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections

- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K20 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K21 explain how to fit components into the circuit (such as ensuring the correct tightness of fastenings, fittings and pump connections; eliminating stress on pipework/connections; correctly making electrical connections; carrying out visual checks of all components)
- K22 explain how to fit components into the circuit (such as ensuring the correct tightness of fastenings, fittings and pump connections; eliminating stress on pipework/connections; correctly making electrical connections; carrying out visual checks of all components)
- K23 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as flow settings, travel and working clearance)
- K24 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K25 explain how to carry out routine checks and servicing of the aircraft ice and rain protection system (including checking for leaks, checking and changing filters, replenishing fluids, changing windshield wiper blades)
- K26 explain the types of test to be carried out on the aircraft ice and rain protection system, and the test equipment to be used (such as testing operation of pitot, static and stall detectors)
- K27 explain the methods and procedures to be used to carry out the various tests on the ice and rain protection system
- K28 explain the importance of carrying out tests in the specified sequence, checking readings and movements at each stage
- K29 explain how to record the results of each individual test and the documentation that must be used
- K30 explain how to analyse the test results, and how to make valid decisions about the acceptability of the aircraft ice and rain protection system
- K31 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K32 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 318

Maintaining ice and rain protection systems on aircraft ATA 30

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 319

Maintaining indicating and recording systems on aircraft ATA 31

RQF Reference:	R/508/6417
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft indicating and recording systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes visual display units, instruments, instrument panels and control of those systems which give visual or aural warning of conditions in unrelated systems. It also covers units which record, store or compute data from unrelated systems, and includes systems/units which integrate indicating instruments into a central display system and instruments not related to any specific system. The maintenance activities will include the removal, fitting and testing of a range of aircraft indicating and recording system components. They will be expected to use the approved procedure for correctly isolating the circuit/system. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft indicating and recording systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the indicating and recording system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate

depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft indicating and recording systems. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 31 Indicating and Recording Systems.
2. To display competence in this standard, it is necessary to both remove and fit aircraft indicating and recording system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft indicating and recording systems
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation of the indicating and recording systems before breaking into the system circuit
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.8 use approved removal, fitting and testing techniques and procedures at all times
 - 1.9 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.10 return tools and equipment to the correct storage location on completion of the activities
 - 1.11 ensure that work carried out is correctly documented and recorded
 - 1.12 ensure that any outstanding tests are correctly documented

Outcome

- S2 Carry out maintenance on two of the following parts of aircraft indicating and recording systems:

- 2.1 Instrument and control panels (such as instruments, switches, circuit breakers)
- 2.2 independent instruments (such as clocks, inclinometers)
- 2.3 recorders (such as flight recorders, cockpit voice recorders, maintenance recorders)
- 2.4 central computers (such as Digital Core Avionic Systems (DCAS), stored checklists, integrated instrument systems)
- 2.5 central warning system (such as master warning or flight warning systems, central instrument warning, tone generators, annunciators)
- 2.6 central display systems (such as those that give visual display of conditions in unrelated systems)
- 2.7 automatic data reporting systems (such as ASDAR systems)

Outcome

- S3 Remove and fit four different indicating and recording system components (at least two must be from group A):

Group A

- 3.1 flight data recorder (FDR)
- 3.2 performance/maintenance recorders
- 3.3 display units
- 3.4 cockpit voice recorder
- 3.5 Digital Core Avionic Systems (DCAS)
- 3.6 inclinometer
- 3.7 master caution unit
- 3.8 generators (such as pulse, speed/taco, tone)
- 3.9 quick access recorder (QAR)
- 3.10 independent instruments (such as clocks)

Group B

- 3.11 transmitters (such as position, flow, pressure, level)
- 3.12 computers
- 3.13 gauges/indicators
- 3.14 switches (such as micro, proximity)
- 3.15 relays
- 3.16 capacitance units
- 3.17 input and follow-up potentiometers
- 3.18 transducers/sensors
- 3.19 wires/cables
- 3.20 actuators
- 3.21 circuit breakers
- 3.22 plugs/sockets
- 3.23 motors

Outcome

- S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removal of bonding
- 4.7 removing cable securing devices
- 4.8 setting and adjusting replaced components (such as zero, range, travel, clearance)
- 4.9 removing securing devices and mechanical fasteners
- 4.10 supporting equipment to be removed
- 4.11 making mechanical connections

- 4.12 dismantling equipment to an appropriate level
 - 4.13 making electrical connections
 - 4.14 covering (protecting) exposed components, wires, pipework or vents
 - 4.15 carrying out bonding
 - 4.16 torque loading
 - 4.17 checking components for serviceability
 - 4.19 replacing damaged/defective components
 - 4.20 carrying out functional checks of the system
 - 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
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Outcome

S5 Carry out two of the following tests on the aircraft indicating and recording systems:

- 5.1 continuity check
- 5.2 built in test equipment BITE test
- 5.3 voltage check
- 5.4 'special-to-type' tests
- 5.5 compass swing
- 5.6 check swing
- 5.7 comparison check

Using three of the following

- 5.8 measuring equipment
 - 5.9 'special-to-type' test sets
 - 5.10 external power source (such as electrical/hydraulic)
 - 5.11 aircraft power source (such as electrical/hydraulic)
 - 5.12 pitot/static pump/digital air data test equipment
-

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
-

Outcome

S7 Carry out maintenance on aircraft indicating and recording systems in compliance with one of the following:

- 7.1 Skills Requirement Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Skills Requirement Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 7.3 Skills Requirement Ministry of Defence (MoD)
 - 7.4 Skills Requirement Military Aviation Authority (MAA)
 - 7.5 Skills Requirement Aerospace Quality Management Standards (AS)
 - 7.6 Skills Requirement Federal Aviation Authority (FAA)
 - 7.7 Skills Requirement aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 Skills Requirement manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft indication and recording systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K3 explain the importance of maintenance on indicating and recording systems and the impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft indication and recording systems, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft indication and recording systems, and other documents needed in the maintenance activities
-

- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft indication and recording systems, and the use of system diagrams and associated symbols
- K14 describe the basic principles of operation of the indicating and recording system being worked on, and the function of the various units that make up the system
- K15 explain the techniques used to remove components from aircraft indicating and recording systems without damage to the components or surrounding structure (such as removal of components and the need to protect the circuit integrity by labelling and covering exposed circuits)
- K16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K18 explain the importance of applying electrostatic discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K20 explain how to fit equipment and components into the system (such as ensuring correct position and orientation; ensuring the correct tightness of fastenings; eliminating stress on cables; correctly making electrical connections; carrying out visual checks of all components)
- K21 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as zero, range, travel and working clearance)
- K22 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K23 explain the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K24 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K25 explain why electrical bonding is critical and why it must be both mechanically and electrically secure
- K26 explain how to carry out routine checks and servicing of the aircraft indicating and recording system (including checking for security of equipment, changing filters, inspecting for High Intensity Radiated Fields (HIRF) requirements)
- K27 explain the types of test to be carried out on the aircraft indicating and recording system, and the test equipment to be used (such as continuity, voltage and soak tests)
- K28 explain the methods and procedures to be used to carry out the various tests on the indicating and recording system
- K29 explain the importance of carrying out tests in the specified sequence, checking all readings and movements at each stage
- K30 explain how to record the results of each individual test and the documentation that must be used
- K31 explain how to analyse the test results, and how to make valid decisions about the acceptability of the aircraft indicating and recording systems
- K32 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K33 explain what recording documentation needs 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

- K34 describe the procedure for the safe disposal of waste materials and scrap components
- K35 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 319

Maintaining indicating and recording systems on aircraft ATA 31

Supporting Information

Unit guidance

Assessment Requirement:

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information:

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 that meets their own business 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

Unit 320

Maintaining landing gear on aircraft ATA 32

RQF Reference:	Y/508/6418
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft landing gear, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which provide a means of supporting and steering the aircraft on the ground or water, and which make it possible to retract and store the landing gear in flight (including main gear and nose wheel, tail skid assemblies, brakes, wheels, floats, skids, skis, doors, shock struts, tyres, linkages and indicating and warning systems). The maintenance activities will include the removal, fitting and testing of a range of landing gear components. They will be expected to use the approved procedure for correctly isolating and, where appropriate, de-pressurising the system, before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft landing gear. They will understand the removal, fitting and testing methods and procedures, and their application, along with the landing gear maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the

maintenance activities, correcting faults and for ensuring that the landing gear is maintained to the required standard.

They will understand the safety precautions required when working on aircraft landing gear, especially those for ensuring that the undercarriage locks are in place, and when isolating and depressurising the equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 32 Landing Gear.
2. To display competence in this standard, it is necessary to both remove and fit aircraft landing gear components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to

- S1 Carry out all of the following during the maintenance of the aircraft landing gear:
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation and depressurisation of the hydraulic lines before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on three of the following parts of aircraft landing gear:

- 2.1 main gear
- 2.2 extension and retraction system
- 2.3 wheels and brakes
- 2.4 nose gear
- 2.5 landing gear door mechanism
- 2.6 nose wheel steering
- 2.7 tail gear
- 2.8 supplementary gear (skis, floats)
- 2.9 gear position, warning and ground safety devices

Outcome

S3 Remove and fit four different aircraft landing gear components (at least two must be from group A):

3 Group A

- 3.1 shock struts
- 3.2 nose gear actuators
- 3.3 gear selector valve
- 3.4 bogie axles
- 3.5 main gear actuators
- 3.6 motors
- 3.7 drag struts
- 3.8 bogie trim
- 3.9 bearings
- 3.10 swivel glands
- 3.11 operating controls
- 3.12 anti-skid devices
- 3.13 brake master cylinder
- 3.14 de-boosters
- 3.15 skis/floats
- 3.16 brake units/components
- 3.17 shimmy damper
- 3.18 emergency landing devices
- 3.19 linkages
- 3.20 nose/main gear locking mechanisms

Group B

- 3.21 relays
- 3.22 attachment bolts
- 3.23 cables
- 3.24 solenoids
- 3.25 bungees
- 3.26 pipes and hoses
- 3.27 wiring/switches/plugs
- 3.28 tyres
- 3.29 pressure indicators
- 3.30 indicators and warning devices
- 3.31 seals
- 3.32 pressure switch
- 3.33 wheel well fire loops
- 3.34 sensors
- 3.35 brake control valve
- 3.36 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, de-pressurising, draining fluids)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removal of bonding
- 4.7 disconnecting/removing hoses and pipes
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 removing securing devices and mechanical fasteners
- 4.10 supporting equipment to be removed
- 4.11 making mechanical connections
- 4.12 dismantling equipment to an appropriate level
- 4.13 making electrical connections
- 4.14 covering (protecting) exposed components, wires, pipework or vents
- 4.15 carrying out bonding
- 4.16 torque loading as required
- 4.17 checking components for serviceability
- 4.18 replacing fluids and bleeding the system
- 4.19 replacing damaged/defective components
- 4.20 re-pressurising the system
- 4.21 replacing single use items (such as seals, filters, gaskets)
- 4.22 carrying out system functional checks
- 4.23 ensuring that replacement components have the correct part numbers
- 4.24 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 4.25 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.26 carrying out area inspections prior to task close down

Outcome

S5 Service/check aircraft landing gear, to include carrying out eight of the following:

- 5.1 visually checking the system for leaks
- 5.2 rigging the steering
- 5.3 inspecting tyres for wear, impact damage and creep
- 5.4 adjusting micro switches
- 5.5 charging struts
- 5.6 replacing wheels
- 5.7 checking the indicating and warning systems
- 5.8 checking and cleaning the braking system
- 5.9 charging the braking accumulator
- 5.10 replacing brake units/components

- 5.11 checking the oleo extension
 - 5.12 bleeding the braking system
-

Outcome

S6 Carry out three of the following tests on the aircraft landing gear:

- 6.1 leak test
- 6.2 built in test equipment (BITE) test
- 6.3 pressure test
- 6.4 'special-to-type' tests
- 6.5 functional
- 6.6 cable tension check
- 6.7 rigging check
- 6.8 safety interlock test
- 6.9 static friction check
- 6.10 freedom and range of movement
- 6.11 testing outbreak system
- 6.12 testing anti-skid unit
- 6.13 landing gear door functional testing

Using two of the following:

- 6.14 aircraft power source/pumps
 - 6.15 ground test rig
 - 6.16 measuring equipment
 - 6.17 built in test equipment (BITE)
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft landing gear components in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
-

- 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft landing gear systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K3 explain the importance of maintenance of aircraft landing gear, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft landing gear, and with the tools and equipment used (such as the safe release of pressurised systems, traps from moving parts, misuse of tools), and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft landing gear systems, and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft landing gear systems, and the use of system diagrams and associated symbols
- K14 describe the various types of pipe and component that make up the aircraft landing gear system (such as rigid pipes; hydraulic hoses; valves; struts, steering and braking mechanisms; extension and retraction mechanisms; mechanical and electrical control devices)
- K15 describe the basic principles of operation of the landing gear being worked on and the function of the units that make up the system
- K16 explain the techniques used to remove components from aircraft landing gear systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, removal of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)

- K17 describe the various mechanical fasteners that will need to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the importance of ensuring that the aircraft and work area is maintained free from dirt, debris and foreign objects, and of ensuring that any exposed components or pipe ends are correctly covered/protected
- K20 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K21 explain how to fit landing gear components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
- K22 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as travel and working clearance)
- K23 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K24 explain the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K25 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K26 explain how to carry out routine checks and servicing of the aircraft landing gear (including checking tyres and braking systems)
- K27 explain the types of test to be carried out on the aircraft landing gear and the test equipment to be used
- K28 explain the methods and procedures to be used to carry out the various tests on the landing gear
- K29 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K30 explain how to record the results of each individual test and the documentation that must be used
- K31 explain how to analyse the test results and how to make valid decisions about the acceptability of the aircraft landing gear
- K32 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K33 explain what recording documentation needs 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
- K34 describe the procedure for the safe disposal of waste materials, scrap components and fluids
- K35 describe the extent of their own authority, and to whom they should report if they have problems that they cannot resolve

Unit 320

Maintaining landing gear on aircraft ATA 32

Supporting Information

Unit guidance

Assessment Requirements:

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information:

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 that meets their own business 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

Unit 321

Maintaining lighting systems on aircraft ATA 33

RQF Reference:	D/508/6419
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft lighting systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes electrically powered units and components which provide for external and internal illumination, such as landing lights, taxi lights, position lights, rotating lights, ice lights, master warning lights, passenger reading and cabin dome lights, as applicable to the aircraft type. It does not include warning lights for individual systems or self-illuminating signs. The maintenance activities will include the removal, fitting and testing of a range of lighting system components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The aircraft lighting system components will include items such as light fixtures and fittings, rotating beacons, switches and wiring. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to the aircraft lighting systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the system maintenance requirements. They will know how the equipment functions, the common problems that can occur,

the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard
They will understand the safety precautions required when working on the aircraft lighting systems, and when using the associated tools and equipment.

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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 33 Lights.
2. To display competence in this standard, it is necessary to both remove and fit aircraft lighting system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirement

The learner must be able to

- S1 Carry out all of the following during the maintenance of the aircraft lighting system
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on three of the following parts of aircraft lighting systems

- 2.1 flight compartment and annunciator panel (such as direct and indirect illumination of work areas, panels and instruments)
- 2.2 passenger compartment (such as cabin dome lights, reading lights, toilet, galley, lounges and coat rooms)
- 2.3 cargo and service compartments
- 2.4 exterior lighting (such as landing, navigation, wing illumination, position indicating, rotating, taxi and courtesy)
- 2.5 additional lighting (such as search lights, spot lights, flood lights)
- 2.6 emergency lighting (such as low level, inertia flashlights, lanterns)

Outcome

S3 Remove and fit six different lighting system components (at least four must be from group A)

Group A

- 3.1 rotating beacon
- 3.2 courtesy lights
- 3.3 master warning lights/attention getters
- 3.4 strobe light
- 3.5 low level emergency lights
- 3.6 landing lights
- 3.7 portable emergency torches
- 3.8 cabin dome lights
- 3.9 wing illumination lights
- 3.10 ice lights
- 3.11 reading lights
- 3.12 position lights
- 3.13 strobe anti-collision lights and power/synchronising units
- 3.14 illuminated signs
- 3.15 navigation lights
- 3.16 taxi lights

Group B

- 3.17 switches
- 3.18 dimming equipment
- 3.19 relays
- 3.20 inertia flash lights
- 3.21 wires/cables
- 3.22 connectors/plugs/sockets
- 3.23 light fixtures
- 3.24 batteries
- 3.25 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removal of bonding
- 4.7 removing cable securing devices
- 4.8 setting and adjusting replaced components
- 4.9 removing securing devices and mechanical fasteners

- 4.10 making mechanical connections
 - 4.11 supporting equipment to be removed
 - 4.12 making electrical connections
 - 4.13 dismantling equipment to an appropriate level
 - 4.14 carrying out bonding
 - 4.15 covering (protecting) exposed components and wires
 - 4.16 installing cable securing devices
 - 4.17 checking components for serviceability
 - 4.18 torque loading as required
 - 4.19 replacing damaged/defective components
 - 4.20 carrying out functional checks of the system
 - 4.21 carrying out area inspections prior to task close down
-

Outcome

S5 Service/check aircraft lighting systems, to include carrying out two of the following

- 5.1 perform emergency lighting system check
 - 5.2 check all flight compartment and passenger compartment lights and replace any found defective
 - 5.3 check all cargo and service compartment lights and replace any found defective
 - 5.4 check all exterior lighting and replace any found defective
 - 5.5 check portable emergency torch lights
-

Outcome

S6 Carry out two of the following tests/checks on aircraft lighting systems

- 6.1 functional check
- 6.2 built in test equipment BITE test
- 6.3 emergency power failure checks
- 6.4 'special-to-type' tests

Using two of the following

- 6.5 external power source
 - 6.6 aircraft power source
 - 6.7 'special-to-type' test sets
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
-

Outcome

S8 Carry out maintenance on aircraft lighting systems in compliance with one of the following

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and Understanding

The learner must be able to:

- K.1 explain the specific safety practices and procedures that they need to observe when working with aircraft lighting systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K.2 explain the importance of maintenance on aircraft lighting systems, and impact upon Extended Range Twin-Engine Operations (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K.3 describe the hazards associated with removing, fitting and testing aircraft lighting system components, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K.4 describe 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
 - K.5 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K.6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K.7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K.8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K.9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K.10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft lighting systems, and other documents needed in the maintenance process
 - K.11 explain how to carry out currency/issue checks on the specifications they are working with
 - K.12 explain the terminology used in aircraft lighting systems, and the use of system diagrams and associated symbols
-

- K.13 describe the basic principles of operation of the lighting system being worked on, and the function of the various units within the system
- K.14 describe the various mechanical fasteners that are used, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.15 explain the importance of using the specified fasteners for the particular installation and why they must not substitute others
- K.16 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.17 explain the techniques used to remove components from aircraft lighting systems without damage to the components or surrounding structure
- K.18 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K.19 explain the techniques used to position, align, adjust and secure the replaced components to the aircraft without damage to the components or surrounding structure
- K.20 explain the need to check that replacement components have the correct part/identification markings and accompanying release documentation
- K.21 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities
- K.22 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K.23 describe the tools and equipment used in the maintenance activities and their calibration/care and control procedures
- K.24 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K.25 describe the problems that can occur with the maintenance operations and how these can be overcome
- K.26 explain how to recognise defects in the lighting systems (such as faulty switches, incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K.27 explain how to carry out routine checks and servicing of the aircraft lighting system (including emergency lighting checks)
- K.28 explain the need to check that cabin/cockpit switches and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K.29 explain the types of test to be carried out on the aircraft lighting system and the test equipment to be used
- K.30 explain the methods and procedures to be used to carry out the various tests on the lighting system
- K.31 explain how to record the results of each individual test and the documentation that must be used
- K.32 explain how to analyse the test results and how to make valid decisions about the acceptability of the lighting system
- K.33 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K.34 explain what recording documentation needs 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
- K.35 describe the procedure for the safe disposal of waste materials and scrap components
- K.36 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 321

Maintaining lighting systems on aircraft ATA 33

Supporting Information

Unit guidance

Assessment Requirements:

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information:

This will allow each organisation to develop their own specific and tailored apprentice training programme that meets their own business 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

Unit 322

Maintaining navigation systems on aircraft ATA 34

RQF Reference:	R/508/6420
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft navigation systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes units and components which provide aircraft navigational information, as applicable to the aircraft type. The maintenance activities will include the removal, fitting and testing of a range of navigational components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The aircraft system components will include items such as air data computers, pitot/static, distance measuring equipment (DME), very high frequency omnidirectional range (VOR), instrument landing (ILS), auto direction finder (ADF), global positioning (GPS), Doppler, long range navigation (LORAN), homing, inertial navigation system (INS), compasses and other devices, as applicable to the aircraft type. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft navigational systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the navigational system maintenance requirements. They will know how the equipment functions, the common problems that can

occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard. They will understand the safety precautions required when working on the aircraft navigational systems, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 34 Navigation.
2. To display competence in this standard, it is necessary to both remove and fit aircraft navigation system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- P.1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P.2 demonstrate the required behaviours in line with the job role and company objectives
- P.3 follow the relevant maintenance schedules to carry out the required work
- P.4 carry out the maintenance activities within the limits of their personal authority
- P.5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P.6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P.7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P.8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirement

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft navigation system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on three of the following parts of aircraft navigation systems:

- 2.1 flight environment data (such as central air data computers, pitot/static, rate-of-climb, air speed, high speed warning, altitude, altitude reporting, altimeter correction, air disturbance detection, air temperature)
- 2.2 attitude and direction (such as magnetic compasses, vertical and directional references, magnetic heading systems, attitude director systems, symbol generators, turn and bank, rate of turn)
- 2.3 landing and taxiing aids (such as localizer, glide slope, instrument landing systems (ILS), markers and paravisual director ground guidance systems, microwave landing systems (MLS), radio altimeter)
- 2.4 independent position determining (such as inertial guidance systems, weather radar, Doppler, enhanced ground proximity warning system (EGPWS), traffic collision avoidance system (TCAS))
- 2.5 dependant position determining (such as distant measuring equipment (DME), long range navigation (LORAN), very high frequency omnidirectional range (VOR), auto direction finder (ADF), global positioning system (GPS))
- 2.6 flight management computing (such as course computers, flight management, performance data computers)

Outcome

- S3 Remove and fit six different aircraft navigation system components (at least four must be from group A):

Group A

- 3.1 airspeed indicator
- 3.2 air data computer
- 3.3 analogue/digital converters (A-D/D-A)
- 3.4 altimeter
- 3.5 VHF nav receiver
- 3.6 navigation display units (including head-up)
- 3.7 vertical speed indicator
- 3.8 ADF receiver
- 3.9 horizontal situation indicator unit (HSI)
- 3.10 satellite beacons
- 3.11 transmitter units
- 3.12 computers (such as FMS, EGPWS,TCAS)
- 3.13 ATC and DME transponders
- 3.14 control units
- 3.15 heading and vertical reference gyro
- 3.16 compensation units
- 3.17 interface units
- 3.18 attitude/direction indicator (ADI)
- 3.19 compass flux valve
- 3.20 DME indicator
- 3.21 radio magnetic indicator
- 3.22 standby compass
- 3.23 receiver units
- 3.24 standby/artificial horizon
- 3.25 radio altimeter
- 3.26 aerials
- 3.27 weather radar Tx/Rx
- 3.28 pitot static probes/plates/sensors
- 3.29 weather radar antenna

Group B

- 3.30 batteries
- 3.31 unit trays
- 3.32 plugs/sockets
- 3.33 switches
- 3.34 instruments/gauges/indicators
- 3.35 transformers
- 3.36 relays
- 3.37 wires/cables/antenna
- 3.38 line replacement units (LRU)

- 3.39 circuit breakers
 - 3.40 feeder/waveguide
 - 3.41 other specific components
-

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
 - 4.2 carrying out fault diagnosis and system checks
 - 4.3 preparing the system for maintenance (such as isolating)
 - 4.4 disconnecting electrical connections
 - 4.5 refitting components in the correct position, orientation and alignment
 - 4.6 removal of bonding
 - 4.7 removing cable securing devices
 - 4.8 setting and adjusting/tuning replaced components (such as power output, voltage)
 - 4.9 removing securing devices and mechanical fasteners
 - 4.10 supporting equipment to be removed
 - 4.11 making mechanical connections
 - 4.12 dismantling equipment to an appropriate level
 - 4.13 making electrical connections
 - 4.14 covering (protecting) exposed components, wires,
 - 4.15 carrying out bonding of pipework or vents
 - 4.16 installing cable securing devices
 - 4.17 checking components for serviceability
 - 4.18 torque loading as required
 - 4.19 replacing damaged/defective components
 - 4.20 checking the function of equipment
 - 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
-

Outcome

S5 Service/check aircraft navigation systems, to include carrying out six of the following:

- 5.1 checking calibration of magnetic direction indicator
 - 5.2 functionally check weather radar
 - 5.3 checking pitot static system for leaks
 - 5.4 functional check Doppler
 - 5.5 checking of pitot static instruments
 - 5.6 functional check TCAS
 - 5.7 checking operation of directional directional/vertical reference gyros and indication systems
 - 5.8 functional check DME
 - 5.9 functional check of VOR
 - 5.10 checking calibration of pressure altitude reporting system
-

- 5.11 functional check ATC transponder
 - 5.12 checking instrument landing systems
 - 5.13 functional check stand-alone flight director system
 - 5.14 checking marker systems
 - 5.15 checking the satcom system
 - 5.16 functionally check inertial navigation/reference system
 - 5.17 checking GPS
 - 5.18 checking of radar altimeter
 - 5.19 carrying out FMS/ EGPWS database update
 - 5.20 functional check FMS
 - 5.21 functional check ADF
-

Outcome

S6 Carry out four of the following types of test/check on aircraft navigation systems:

- 6.1 functional check
 - 6.2 built in test equipment BITE test
 - 6.3 signal-to-noise checks
 - 6.4 bonding tests
 - 6.5 power output
 - 6.6 continuity checks
 - 6.7 standard serviceability checks
 - 6.8 compass swing
 - 6.9 'special-to-type' tests
 - 6.10 applying a dummy load
 - 6.11 distant object test
 - 6.12 time-domain reflectometer (TDR) checks
 - 6.13 voltage standing wave ratio (VSWR) checks
 - 6.14 signal injection tests
 - 6.15 receiver sensitivity
 - 6.16 distortion checks
- Using four of the following
- 6.17 multimeter
 - 6.18 headset
 - 6.19 bonding tester
 - 6.20 oscilloscope
 - 6.21 'special to type' test equipment
 - 6.22 reference gyros
 - 6.23 radio frequency (RF) signal generators
 - 6.24 delay lines
 - 6.25 external power source (electrical/hydraulic)
 - 6.26 time-domain reflectometer (TDR) equipment
 - 6.27 aircraft power source (electrical/hydraulic)
 - 6.28 voltage standing wave ratio (VSWR) equipment
 - 6.29 vacuum systems
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people

- 7.1 job cards/work sheets
- 7.2 aircraft cabin log
- 7.3 computer records
- 7.4 aircraft log book
- 7.5 aircraft technical log

Outcome

S8 Carry out maintenance on aircraft navigation systems in compliance with one of the following

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 8.3 Ministry of Defence (MoD)
- 8.4 Military Aviation Authority (MAA)
- 8.5 Aerospace Quality Management Standards (AS)
- 8.6 Federal Aviation Authority (FAA)
- 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
- 8.8 manufacturers standards and procedures

Outcome

K Knowledge and understanding

The learner must be able to:

- K.1 explain the specific safety practices and procedures that they need to observe when working with aircraft navigation systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K.2 explain the importance of maintenance on aircraft navigation systems and equipment, and the impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, RVSM requirements, Autoland systems/status requirements, Elementary and Enhanced Mode 'S' Surveillance, Electrical Wiring Interconnect Systems (EWIS), legislation and local/company/customer procedures
- K.3 describe the hazards associated with removing, fitting and testing aircraft navigation system components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K.4 describe 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
- K.5 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K.6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K.7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)

- K.8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K.9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K.10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications and other documents needed in the maintenance process
- K.11 explain how to carry out currency/issue checks on the specifications they are working with
- K.12 explain the terminology used in aircraft navigation systems, and the use of system diagrams and associated symbols
- K.13 describe the basic principles of operation of the aircraft navigation system being worked on, and the function of the various units within the system
- K.14 describe the various mechanical fasteners that are used, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.15 explain the importance of using the specified fasteners for the installation, and why they must not substitute others
- K.16 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K.17 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K.18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.19 explain the techniques used to remove components from aircraft navigation systems without damage to the components or surrounding structure (such as proof marking, the need to protect the circuit integrity by covering and labelling exposed circuits)
- K.20 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K.21 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K.22 explain the techniques used to position, align, adjust and secure the replaced components to the aircraft without damage to the components or surrounding structure
- K.23 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K.24 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K.25 explain the tools and equipment used in the maintenance activities and their calibration/care and control procedures
- K.26 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K.27 explain how to recognise defects (such as incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K.28 explain how to carry out routine checks and servicing of the aircraft navigation system
- K.29 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K.30 explain the types of test to be carried out on the aircraft navigation system and the test equipment to be used

- K.31 explain the methods and procedures to be used to carry out the various tests on the navigation system
- K.32 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K.33 explain how to record the results of each individual test and the documentation that must be used
- K.34 explain how to analyse the test results and make valid decisions about the acceptability of the aircraft navigation systems
- K.35 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K.36 describe the problems that can occur with the aircraft navigation system maintenance operations and how these can be overcome
- K.37 explain what recording documentation needs 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
- K.38 describe the procedure for the safe disposal of waste materials and scrap components
- K.39 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Supporting Information

Unit guidance

Assessment Requirements:

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information:

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 that meets their own business 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

Unit 323

Maintaining oxygen systems on aircraft ATA 35

RQF Reference:	Y/508/6421
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft oxygen systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which store, regulate and deliver oxygen to the passengers and/or crew, including bottles, relief valves, shut-off valves, outlets, regulators, masks and walk-around bottles. The maintenance activities will include the removal, fitting and testing of a range of oxygen components. They will be expected to use the approved procedure for correctly isolating the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to recharge the system, and test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft oxygen systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the oxygen system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the

maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft oxygen systems, especially those for ensuring system cleanliness and the avoidance of hydrocarbon contamination. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 35 Oxygen.
2. To display competence in this standard, it is necessary to both remove and fit aircraft oxygen system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

S1 Carry out all of the following during the maintenance of the aircraft oxygen system

- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
- 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
- 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
- 1.4 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
- 1.5 ensure the safe isolation of the oxygen equipment before breaking into the system
- 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
- 1.7 use approved removal, fitting and testing techniques and procedures at all times
- 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
- 1.9 return tools and equipment to the correct storage location on completion of the activities
- 1.10 ensure that work carried out is correctly documented and recorded
- 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft oxygen system:

- 2.1 oxygen supply
- 2.2 Portable Liquid Oxygen (LOX) equipment
- 2.3 crew supply
- 2.4 indicating
- 2.5 passenger supply
- 2.6 emergency supply

Outcome

S3 Remove and fit four different aircraft oxygen system components (at least one must be from group A):

Group A

- 3.1 oxygen generator
- 3.2 oxygen regulator
- 3.3 portable LOX equipment
- 3.4 LOX converter/pack

- 3.5 concentrator
- 3.6 manifold
- 3.7 oxygen cylinder
- 3.8 oxygen candle
- 3.9 fill, build-up and vent valve

Group B

- 3.10 therapeutic masks
- 3.11 pipes and hoses
- 3.12 face mask and allied equipment
- 3.13 walk around set
- 3.14 filter
- 3.15 sensors/transmitters
- 3.16 control valves
- 3.17 gauges/wiring/switches/plugs
- 3.18 check valve
- 3.19 ground connector
- 3.20 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, de-pressurising)
- 4.4 inspecting on board oxygen equipment
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 disconnecting electrical connections
- 4.7 removal of bonding
- 4.8 setting and adjusting replaced components
- 4.9 disconnecting/removing hoses and pipes (such as travel, working clearance)
- 4.10 removing securing devices and mechanical fasteners
- 4.11 making mechanical connections
- 4.12 supporting equipment to be removed
- 4.13 making electrical connections
- 4.14 dismantling equipment to an appropriate level
- 4.15 carrying out bonding
- 4.16 covering (protecting) exposed components, wires
- 4.17 torque loading pipework or vents
- 4.18 purging and recharging oxygen system
- 4.19 checking components for serviceability
- 4.20 carrying out system functional checks
- 4.21 replacing damaged/defective components
- 4.22 replacing single use items such as seals, filters, gaskets
- 4.23 ensuring that replacement components have the correct part numbers

- 4.24 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.25 applying bolt locking methods (such as split pins, wire locking, lock nuts)
-

Outcome

S5 Service/check the aircraft oxygen system, to include carrying out all of the following:

- 5.1 checking the system for leaks
 - 5.2 replacing filters
 - 5.3 testing the crew oxygen system
 - 5.4 performing auto oxygen system deployment check
 - 5.5 testing the passenger oxygen system (as applicable)
 - 5.6 checking the indicating systems (such as pressure drop, temperature warning)
-

Outcome

S6 Carry out three of the following tests on the aircraft oxygen system:

- 6.1 leak test
 - 6.2 reduced system test
 - 6.3 pressure test
 - 6.4 Built in Test Equipment (BITE) test
 - 6.5 system charging
 - 6.6 'special-to-type' tests
- Using one of the following:
- 6.7 aircraft power source/system
 - 6.8 ground test rig
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft oxygen system components in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate) Ministry of Defence (MoD)
-

- 8.3 Military Aviation Authority (MAA)
 - 8.4 Aerospace Quality Management Standards (AS)
 - 8.5 Federal Aviation Authority (FAA)
 - 8.6 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.7 manufacturers standards and procedures
-

Outcome

K Knowledge and Understanding:

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft oxygen systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K.2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K.3 explain the importance of maintenance on aircraft oxygen systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K.4 describe 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
- K.5 describe the hazards associated with carrying out maintenance activities on aircraft oxygen systems, and with the tools and equipment used, and how to minimise them and reduce any risk
- K.6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K.6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K.7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K.8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K.9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K.10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft oxygen systems, and other documents needed in the maintenance activities
- K.11 explain how to carry out currency/issue checks on the specifications they are working with
- K.12 explain the terminology used in aircraft oxygen systems and the use of system diagrams and associated symbols
- K.13 describe the various types of pipe and component that make up the aircraft oxygen system (such as rigid pipes; air hoses; pipe connectors; pipe sealing and supporting devices; valves used for pressure relief, flow and directional control; pumps; mechanical and electrical control devices)
- K.14 describe the basic principles of operation of the oxygen system being worked on (such as system layout, sources of oxygen (such as bottles, chemical generators, ground supply); oxygen control and distribution; oxygen indication and warning)

- K.15 explain the techniques used to remove components from aircraft oxygen systems without damage to the components or surrounding structure (such as removal of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
- K.16 describe the various mechanical fasteners that will need to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.17 explain the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.18 explain the importance of ensuring that any components or pipe ends are correctly covered/protected
- K.19 explain how to recognise contaminants and the problems they can create; the effects and likely symptoms of contamination in the system (especially hydrocarbons in oxygen systems)
- K.20 explain the need to label and store correctly components that require repair or overhaul and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K.21 explain how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring the correct tightness of pipe fittings and connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking security of joints and that the system is safe to re-charge)
- K.22 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as pressure deployment settings and their effect on the system, travel and working clearance)
- K.23 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K.24 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K.25 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K.26 explain how to carry out routine checks and servicing of the aircraft oxygen system (including checking for leaks, checking and changing filters, changing masks and adjusting or replacing regulator)
- K.27 explain the types of test to be carried out on the aircraft oxygen system and the test equipment to be used
- K.28 explain the methods and procedures to be used to carry out the various tests on the oxygen system
- K.29 explain the need to apply test pressures in incremental stages, and to check all readings and pressures at each stage
- K.30 explain how to record the results of each individual test and the documentation that must be used
- K.31 explain how to analyse the test results and make valid decisions about the acceptability of the aircraft oxygen system
- K.32 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K.33 explain what recording documentation needs 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
- K.34 describe the procedure for the safe disposal of waste materials and scrap components
- K.35 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 323

Maintaining oxygen systems on aircraft ATA 35

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 324

Maintaining pneumatic systems on aircraft ATA 36

RQF Reference:	H/508/6423
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft pneumatic systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which deliver large volumes of compressed air from a power source to connecting points for other systems, such as air conditioning, pressurization and de-icing. The maintenance activities will include the removal, fitting and testing of a range of pneumatic components. They will be expected to use the approved procedure for correctly isolating and de-pressurising the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to pressurise the system, and test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft pneumatic systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the pneumatic system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft pneumatic systems, especially those for isolating and depressurising the equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 36 Pneumatic.
2. To display competence in this standard, it is necessary to both remove and fit aircraft pneumatic system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft pneumatic system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation and depressurisation of the pneumatic equipment before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft pneumatic system:

- 2.1 pneumatic supply
 - 2.2 indicating
 - 2.3 distribution
 - 2.4 gauging
-

Outcome

S3 Remove and fit four different aircraft pneumatic system components (at least one must be from group A):

Group A

- 3.1 pump
 - 3.2 air reservoirs/tanks
 - 3.3 manifold
 - 3.4 compressors
 - 3.5 accumulator
-

- 3.6 desiccators
- 3.7 standby pump
- 3.8 oil and water trap
- 3.9 heat exchangers

Group B

- 3.10 control valves
- 3.11 pipes and hoses
- 3.12 wiring/switches/plugs
- 3.13 check valve
- 3.14 ducting
- 3.15 pressure regulating valve
- 3.16 ground connector
- 3.17 air filters
- 3.18 warning devices (temperature, pressure)
- 3.19 pressure relief valve
- 3.20 sensors/transmitters
- 3.21 actuators
- 3.22 gauges
- 3.23 control mechanisms
- 3.24 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, de-pressurising)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removal of bonding
- 4.7 disconnecting/removing hoses and pipes
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 removing securing devices and mechanical fasteners
- 4.10 supporting equipment to be removed
- 4.11 making mechanical connections
- 4.12 dismantling equipment to an appropriate level
- 4.13 making electrical connections
- 4.14 covering (protecting) exposed components, wires, pipework or vents
- 4.15 carrying out bonding
- 4.16 torque loading as required
- 4.17 checking components for serviceability
- 4.18 re-pressurising the system
- 4.19 replacing damaged/defective components
- 4.20 carrying out system functional checks

- 4.21 replacing single use items such as seals, filters, gaskets
 - 4.22 ensuring that replacement components have the correct part numbers
 - 4.23 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.24 applying bolt locking methods (such as split pins, wire locking, lock nuts)
-

Outcome

S5 Service/check the aircraft pneumatic system, to include carrying out four of the following:

- 5.1 checking the system for leaks
 - 5.2 replacing filters
 - 5.3 recharging desiccators
 - 5.4 checking and adjusting pressure regulator
 - 5.5 checking the indicating systems (such as pressure, temperature warning)
-

Outcome

S6 Carry out three of the following tests on the aircraft pneumatic system:

- 6.1 leak test
- 6.2 reduced system test
- 6.3 pressure test
- 6.4 movement tests (such as range, timing, sequencing)
- 6.5 system charging
- 6.6 built in test equipment (BITE) test
- 6.7 airline vapour tests
- 6.8 'special-to-type' tests

Using one of the following

- 6.9 aircraft power source/pumps
 - 6.10 ground test rig
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft pneumatic system components in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)Federal Aviation Authority (FAA)
 - 8.6 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.7 manufacturers standards and procedures
-

Outcome

K Knowledge and Understanding

The learner must be able to:

- K.1 explain the specific safety practices and procedures that they need to observe when working on aircraft pneumatic systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K.2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K.3 explain the importance of maintenance on aircraft pneumatic systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K.4 describe 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
 - K.5 describe the hazards associated with carrying out maintenance activities on aircraft pneumatic systems, and with the tools and equipment used (such as the safe release of pressurised systems, traps from moving parts, misuse of tools), and how to minimise them and reduce any risk
 - K.6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K.7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K.8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K.9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K.10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K.11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft pneumatic systems, and other documents in the maintenance activities
 - K.12 explain how to carry out currency/issue checks on the specifications they are working with
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- K.13 explain the terminology used in aircraft pneumatic systems, and the use of system diagrams and associated symbols
- K.14 describe the various types of pipe and component that make up the aircraft pneumatic system (such as rigid pipes; air hoses; pipe connectors; pipe sealing and supporting devices; valves used for pressure relief, flow and directional control; pumps; pressure intensifiers, mechanical and electrical control devices)
- K.15 describe the basic principles of operation of the pneumatic system being worked on (such as system layout, sources of air pressure (such as engine, compressor, ground supply); the use of air reservoirs/tanks; pressure control and distribution; pressure indication and warning)
- K.16 explain the techniques used to remove components from aircraft pneumatic systems without damage to the components or surrounding structure (such as release of pressures/force, removal of components and the need to protect the circuit integrity by ensuring that any exposed components or pipe ends are correctly covered/protected)
- K.17 describe the various mechanical fasteners that will need to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.19 explain how to recognise contaminants and the problems they can create; the effects and likely symptoms of contamination in the pneumatic system
- K.20 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K.21 explain how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring the correct tightness of pipe fittings and pump connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking the security of joints and that the system is safe to re-pressurise)
- K.22 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K.23 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K.24 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as pressure settings and their effect on the system, travel and working clearance)
- K.25 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K.26 explain how to carry out routine checks and servicing of the aircraft pneumatic system (including checking for leaks, checking and changing air filters, charging desiccators, checking and adjusting pressure regulator)
- K.27 explain the types of test to be carried out on the aircraft pneumatic system and the test equipment to be used
- K.28 explain the methods and procedures to be used to carry out the various tests on the pneumatic system
- K.29 explain the need to apply test pressures in incremental stages, and to check all readings and pressures at each stage
- K.30 explain how to record the results of each individual test, and the documentation that must be used
- K.31 explain how to analyse the test results, and make valid decisions about the acceptability of the aircraft pneumatic system
- K.32 explain the procedures to be followed if the equipment or system fails to meet the test specification

- K.33 explain what recording documentation needs 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
- K.34 describe the procedure for the safe disposal of waste materials and scrap components
- K.35 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 325

Maintaining vacuum systems on aircraft ATA 37

RQF Reference:	K/508/6424
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft vacuum systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components used to generate, deliver and regulate negative air pressure, including pumps, regulators and lines, through to and including the manifold. The maintenance activities will include the removal, fitting and testing of a range of vacuum components. They will be expected to use the approved procedure for correctly isolating and bringing the system to atmospheric pressure before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to pressurise the system and test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft vacuum systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the vacuum system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft vacuum systems, especially those for isolating and depressurising the equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 37 Vacuum.
2. To display competence in this standard, it is necessary to both remove and fit aircraft vacuum system components. they must remove components; however, they may fit a replacement component where the original was previously removed by another person. they should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

S1 Carry out all of the following during the maintenance of the aircraft vacuum system

- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
- 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
- 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
- 1.4 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
- 1.5 ensure the safe isolation and return to atmospheric pressure before breaking into the system
- 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
- 1.7 use approved removal, fitting and testing techniques and procedures at all times
- 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
- 1.9 return tools and equipment to the correct storage location on completion of the activities
- 1.10 ensure that work carried out is correctly documented and recorded
- 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft vacuum system:

- 2.1 vacuum generation
- 2.2 indicating
- 2.3 distribution
- 2.4 gauging

Outcome

S3 Remove and fit four different aircraft vacuum system components (at least one must be from group A)

Group A

- 3.1 vacuum pump
- 3.2 standby pump
- 3.3 regulator valve
- 3.4 manifold

Group B

- 3.5 control valves
 - 3.6 sensors/transmitters
 - 3.7 check valve
 - 3.8 Venturi
 - 3.9 ground connector
 - 3.10 gauges/wiring/switches/plugs
 - 3.11 reducing valve
 - 3.12 oil separator
 - 3.13 pipes and hoses
 - 3.14 suction relief valve
 - 3.15 air filters
 - 3.16 other specific components
-

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
 - 4.2 carrying out fault diagnosis and system checks
 - 4.3 preparing the system for maintenance (such as isolating, bringing to atmospheric pressure)
 - 4.4 disconnecting electrical connections
 - 4.5 refitting components in the correct position, orientation and alignment
 - 4.6 removal of bonding
 - 4.7 disconnecting/removing hoses and pipes
 - 4.8 setting and adjusting replaced components (such as travel, working clearance)
 - 4.9 removing securing devices and mechanical fasteners
 - 4.10 supporting equipment to be removed
 - 4.11 making mechanical connections
 - 4.12 dismantling equipment to an appropriate level
 - 4.13 making electrical connections
 - 4.14 covering (protecting) exposed components, wires, pipework or vents
 - 4.15 carrying out bonding
 - 4.16 torque loading as required
 - 4.17 checking components for serviceability
 - 4.18 re-pressurising the system
 - 4.19 replacing damaged/defective components
 - 4.20 carrying out system functional checks
 - 4.21 replacing single use items such as seals, filters, gaskets
 - 4.22 ensuring that replacement components have the correct part numbers
 - 4.23 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.24 applying bolt locking methods (such as split pins, wire locking, lock nuts)
-

Outcome

S5 Service/check the aircraft vacuum system, to include carrying out all of the following:

- 5.1 checking the system for leaks
 - 5.2 replacing filters
 - 5.3 recharging desiccators
 - 5.4 checking and adjusting the pressure regulator
 - 5.5 checking the indicating systems (such as pressure, temperature warning)
-

Outcome

S6 Carry out three of the following tests on the aircraft vacuum system:

- 6.1 leak test
 - 6.2 movement tests (such as range, timing, sequencing)
 - 6.3 vacuum pressure test
 - 6.4 built in test equipment (BITE) test
 - 6.5 vacuum line vapour tests
 - 6.6 'special-to-type' tests
 - 6.7 reduced system test
 - 6 Using one of the following:
 - 6.8 aircraft power source/pumps
 - 6.9 ground test rig
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft vacuum system components in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Aerospace Quality Management Standards (AS)
 - 8.5 Federal Aviation Authority (FAA)
 - 8.6 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.7 manufacturers standards and procedures
-

Outcome

K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft vacuum systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K3 explain the importance of maintenance on aircraft vacuum systems, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft vacuum systems, and with the tools and equipment used (such as safely bringing the system to atmospheric pressure, traps from moving parts, misuse of tools) and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft vacuum systems, and the use of system diagrams and associated symbols
- K14 describe the various types of pipe and components that make up the aircraft vacuum system (such as rigid pipes; hoses; pipe connectors; pipe sealing and supporting devices; valves used for pressure relief, flow and directional control; pumps; pressure intensifiers, mechanical and electrical control devices)
- K15 describe the basic principles of operation of the vacuum system being worked on (such as system layout, sources of vacuum pressure (such as engine, compressor, ground supply); the use of vacuum reservoirs/tanks; pressure control and distribution; pressure indication and warning)
- K16 explain the techniques used to remove components from aircraft vacuum systems without damage to the components or surrounding structure (such as bringing system up to atmospheric pressure; removal of components and the need to protect the circuit integrity by ensuring any exposed components or pipe ends are correctly covered/protected)

- K17 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain how to recognise contaminants and the problems they can create; the effects and likely symptoms of contamination in the vacuum system
- K20 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K21 explain how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring the correct tightness of pipe fittings and pump connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking security of joints and that the system is safe to re-pressurise)
- K22 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as pressure settings and their effect on the system, travel and working clearance)
- K23 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K24 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K25 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K26 explain how to carry out routine checks and servicing of the aircraft vacuum system (including checking for leaks, checking and changing air filters, charging desiccators, checking and adjusting pressure regulator)
- K27 Explain the types of test to be carried out on the aircraft vacuum system and the test equipment to be used
- K28 explain the methods and procedures to be used to carry out the various tests on the vacuum system
- K29 explain the need to apply test pressures in incremental stages, and to check all readings and pressures at each stage
- K30 explain how to record the results of each individual test and the documentation that must be used
- K31 explain how to analyse the test results and make valid decisions about the acceptability of the aircraft vacuum system
- K32 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K33 explain what recording documentation needs 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

Unit 325

Maintaining vacuum systems on aircraft ATA 37

Supporting Information

Unit guidance

Assessment Requirements:

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information:

This will allow each organisation to develop their own specific and tailored apprentice training programme that meets their own business 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

Unit 326

Maintaining water and waste systems on aircraft ATA 38

RQF Reference:	M/508/6425
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft water and waste systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which store and deliver for use, fresh water and those fixed components which store and provide a means of removing water and waste. The maintenance activities will include the removal, fitting and testing of a range of water and waste system components, such as wash basins, toilet assemblies, water and waste tanks, valves and pipes. They will be expected to use the approved procedure for correctly isolating the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft water and waste systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the water and waste systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft water and waste systems, especially those involved with working on pressurised systems. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 38 Water and Waste.
2. To display competence in this standard, it is necessary to both remove and fit aircraft water and waste system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft water and waste system:
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the system is safely isolated and depressurised and (where appropriate) drain off fluid before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft water and waste systems:

- 2.1 potable (drinking water)
 - 2.2 wash
 - 2.3 waste disposal
 - 2.4 air supply
-

Outcome

S3 Remove and fit four different aircraft water and waste system components (at least two must be from group A):

Group A:

- 3.1 water pump
 - 3.2 fresh water tanks
 - 3.3 water heaters
 - 3.4 toilet pump
-

- 3.5 waste water tanks
- 3.6 electrical elements
- 3.7 valves
- 3.8 toilet assemblies
- 3.9 taps
- 3.10 water pressure regulator
- 3.11 flushing systems
- 3.12 wash basins
- 3.13 solenoids

Group B

- 3.14 sensors/transmitters
- 3.15 water filters
- 3.16 temperature probes
- 3.17 drains/traps
- 3.18 water pipes and hoses
- 3.19 portable toilet
- 3.20 wiring/switches/plugs
- 3.21 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining)
- 4.4 disconnecting electrical connections
- 4.5 replacing single use items (such as seals, gaskets)
- 4.6 removal of bonding
- 4.7 refitting components in the correct position, orientation and alignment
- 4.8 disconnecting/removing hoses and pipes
- 4.9 removing mechanical fasteners and securing devices
- 4.10 setting and adjusting replaced components
- 4.11 making mechanical connections
- 4.12 supporting equipment to be removed
- 4.13 making electrical connections
- 4.14 dismantling equipment to an appropriate level
- 4.15 carrying out bonding
- 4.16 covering (protecting) exposed components, wires, pipework or vents
- 4.17 torque loading
- 4.18 carrying out system functional checks
- 4.19 checking components for serviceability
- 4.20 replacing damaged/defective components
- 4.21 ensuring that replacement components have the correct part numbers

- 4.22 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
-

Outcome

S5 Service/check aircraft water and waste systems, to include carrying out all of the following:

- 5.1 checking system for leaks
 - 5.2 replacing water filters
 - 5.3 checking and adjusting supply water pressure
 - 5.4 checking tank content indicating systems
-

Outcome

S6 Carry out three of the following tests on the aircraft water and waste systems:

- 6.1 leak test
- 6.2 reduced system test
- 6.3 pressure test
- 6.4 built in test equipment (BITE) test
- 6.5 system charging
- 6.6 'special-to-type' tests

Using one of the following

- 6.7 aircraft power source/pumps
 - 6.8 ground test rig
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft water and waste system components in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
-

- 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft water and waste systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the importance of maintenance on aircraft waste and water systems, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K3 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft water and waste systems, and with the tools and equipment used, and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft water and waste systems, and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft water and waste systems, and the use of system diagrams and associated symbols
- K14 describe the various types of pipe and component that make up the aircraft water and waste system (such as pipes; pumps; valves; water heaters; taps; toilet units; mechanical and electrical control devices)
- K15 describe the basic principles of operation of the water and waste system being worked on, and the function of the various units that make up the system
- K16 explain the techniques used to remove components from aircraft water and waste systems without damage to the components or surrounding structure (such as release of fluids, removal

of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)

- K17 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K20 explain how to fit components into the system (such as ensuring the correct tightness of fastenings, fittings and pump connections; eliminating stress on pipework/connections; correctly making electrical connections; carrying out visual checks of all components)
- K21 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as flow settings, travel and working clearance)
- K22 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K23 explain how to carry out routine checks and servicing of the aircraft water and waste system (including checking for leaks, checking and changing filters)
- K24 explain the types of test to be carried out on the aircraft water and waste system, and the test equipment to be used
- K25 explain the methods and procedures to be used to carry out the various tests on the water and waste system
- K26 explain the importance of carrying out the tests in the specified sequence, checking all readings and movements at each stage
- K27 explain how to record the results of each individual test and the documentation that must be used
- K28 explain how to analyse the test results and how to make valid decisions about the acceptability of the aircraft water and waste system
- K29 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K30 explain what recording documentation needs 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
- K31 describe the procedure for the safe disposal of waste materials and scrap components
- K32 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 326

Maintaining water and waste systems on aircraft ATA 38

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 327

Maintaining cabin systems on aircraft ATA 44

RQF Reference:	T/508/6426
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft cabin systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It includes units and components which provide a means of entertaining the passengers and providing communication within the aircraft. It also includes the means by which passengers and cabin crew can access communications equipment to exchange data and messages with other air or ground stations. It does not include the transmitting/receiving system itself such as SATCOM, HF, VHF and UHF which are covered in other standards/ATA chapters.

The maintenance activities will include the removal, fitting and testing of a range of cabin system components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The cabin system will include units and components associated with in-flight entertainment systems, active noise control, passenger address, interphone, audio and video security monitoring, as applicable to the aircraft type. They will remove the required components and fit approved replacements, as appropriate. They will then need to test the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft cabin systems. They will understand the removal, fitting and testing

methods and procedures, and their application, along with the system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft cabin systems and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 44 Cabin Systems.
2. To display competence in this standard, it is necessary to both remove and fit aircraft cabin system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

Skills Requirements:

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft cabin system equipment:
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration date
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on three of the following parts of the aircraft cabin systems:

- 2.1 cabin core system (such as active noise control)
 - 2.2 in-flight entertainment (such as audio, video, information, games)
 - 2.3 external communication (such as access to telecommunications, digital fax, Wi-Fi, mobile phones)
 - 2.4 passenger address and interphone (such as internal communications)
 - 2.5 cabin mass memory system (such as configuration data, multimedia programs)
 - 2.6 cabin monitoring (such as surveillance cameras, passenger conversation/movement)
-

Outcome

S3 Remove and fit four different cabin system components (at least two must be from group A):

Group A

- 3.1 control units
 - 3.2 video equipment
 - 3.3 keyboards
 - 3.4 cameras
-

- 3.5 cabin control panels
- 3.6 telephones
- 3.7 media drives
- 3.8 monitors
- 3.9 radio units
- 3.10 modems
- 3.11 printers
- 3.12 display panels
- 3.13 audio equipment

Group B

- 3.14 batteries
- 3.15 headsets
- 3.16 instruments/gauges/indicators
- 3.17 switches
- 3.18 handsets
- 3.19 wires/cables
- 3.20 relays
- 3.21 electronic signs
- 3.22 plugs/sockets
- 3.23 circuit breakers
- 3.24 loudspeakers
- 3.25 transformers
- 3.26 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 carrying out fault diagnosis and system checks
- 4.2 preparing the system for maintenance (such as isolating)
- 4.3 disconnecting electrical connections
- 4.4 replacing damaged/defective components
- 4.5 removal of bonding
- 4.6 refitting components in the correct position, orientation and alignment
- 4.7 removing cable securing devices
- 4.8 removing securing devices and mechanical fasteners
- 4.9 making mechanical connections
- 4.10 supporting equipment to be removed
- 4.11 making electrical connections
- 4.12 dismantling equipment to an appropriate level
- 4.13 carrying out bonding
- 4.14 covering (protecting) exposed components, wires, pipework or vents
- 4.15 installing cable securing devices
- 4.16 torque loading as required
- 4.17 checking components for serviceability

- 4.18 carrying out functional checks of the system
 - 4.19 ensuring that replacement components have the correct part numbers
 - 4.20 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.21 setting, and adjusting/tuning replaced components (such as power output)
 - 4.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.23 carrying out fault diagnosis and system checks
-

Outcome

S5 Service/check aircraft cabin systems, to include carrying out three of the following:

- 5.1 checking operation of interphone system
 - 5.2 checking operation of external communication system
 - 5.3 checking operation of passenger address system
 - 5.4 checking entertainment system
 - 5.5 checking active noise control system
 - 5.6 checking operation of audio and video monitoring system
-

Outcome

S6 Carry out three of the following types of test/check on aircraft cabin systems:

- 6.1 continuity check
- 6.2 built in test equipment BITE test
- 6.3 signal-to-noise checks
- 6.4 bonding tests
- 6.5 distortion checks
- 6.6 'special-to-type' tests
- 6.7 power output

Using one of the following

- 6.8 'special to type' test equipment
 - 6.9 headset
 - 6.10 multimeter
 - 6.11 aircraft power source
 - 6.12 bonding tester
 - 6.13 external power source
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 aircraft cabin log
 - 7.3 computer records
-

- 7.4 aircraft log book
 - 7.5 aircraft technical log
-

Outcome

S8 Carry out maintenance on aircraft cabin systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge Requirements

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working with aircraft cabin systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft cabin systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K3 describe the hazards associated with removing, fitting and testing aircraft cabin system components, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K4 describe 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 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft cabin systems, and other documents needed in the maintenance process
 - K11 explain how to carry out currency/issue checks on the specifications they are working with
 - K12 explain the terminology used in aircraft cabin systems, and the use of system diagrams and associated symbols
-

- K13 describe the basic principles of operation of the cabin system being worked on, and the function of the various units that make up the system
- K14 describe the various mechanical fasteners that are used, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K15 explain the importance of using the specified fasteners for the installation, and why they must not substitute others
- K16 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K17 explain the specific safety practices and procedures that they need to observe when working with aircraft cabin systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K18 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K19 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K20 explain the techniques used to remove components from aircraft cabin systems without damage to the components or surrounding structure (such as the need to protect the circuit integrity by covering and labelling exposed circuits)
- K21 explain the importance of applying electrostatic discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K22 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K22 explain the techniques used to position, align, adjust and secure the replaced components to the aircraft without damage to the components or surrounding structure
- K23 explain the specific safety practices and procedures that they need to observe when working with aircraft cabin systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K24 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K25 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K26 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K27 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K28 explain how to recognise defects (such as incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K29 explain how to carry out routine checks and servicing of the aircraft cabin system equipment (including checking function of radios and passenger address system)
- K30 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K31 explain the types of test to be carried out on the aircraft cabin systems and the test equipment to be used
- K32 explain the methods and procedures to be used to carry out the various tests on the cabin systems
- K33 explain how to record the results of each individual test and the documentation that must be used

- K34 explain how to analyse the test results and how to make valid decisions about the acceptability of the cabin systems
- K35 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K36 explain what recording documentation needs 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
- K37 describe the procedure for the safe disposal of waste materials and scrap components

Unit 327

Maintaining cabin systems on aircraft ATA 44

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information:

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 that meets their own business 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

Unit 328

Maintaining airborne auxiliary power systems on aircraft ATA 49

RQF Reference:	A/508/6427
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft auxiliary power systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components of airborne auxiliary power units (APU) which are installed on the aircraft for the purpose of supplying a single type or combination of auxiliary electric, hydraulic, pneumatic or other power. It includes the power and drive section, fuel, ignition and control systems, wiring, indicators, plumbing, valves and ducts up to the power unit. It does not include generators, alternators, hydraulic pumps or their connecting systems, which supply and deliver power to their respective aircraft systems, unless directly associated with the APU. The maintenance activities will include the removal, fitting and testing of a range of airborne auxiliary power system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft airborne auxiliary power systems. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the auxiliary power systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of

the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the airborne auxiliary power system is maintained to the required standard.

They will understand the safety precautions required when working on the airborne auxiliary power system, especially those for ensuring that the power system, and its fuel supply, is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 49 Airborne Auxiliary Power.
2. To display competence in this standard, it is necessary to both remove and fit airborne auxiliary power system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft airborne auxiliary power system:
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation and draining of fluid lines before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on three of the following parts of the aircraft auxiliary power system:

- 2.1 cowling/containment
- 2.2 starting and ignition
- 2.3 indicating
- 2.4 power plant
- 2.5 exhaust
- 2.6 bleed air system
- 2.7 engine
- 2.8 oil system
- 2.9 APU hydraulic system
- 2.10 fuel and control
- 2.11 engine controls
- 2.12 APU generating system and wiring
- 2.13 fire detection

Outcome

- S3 Remove and fit four different aircraft auxiliary power system components (at least two must be from group A):

Group A

- 3.1 air Intake
- 3.2 pumps (fuel, oil)
- 3.3 valves/valve mechanisms
- 3.4 exhaust unit
- 3.5 fuel manifolds
- 3.6 actuators
- 3.7 exciter ignition unit
- 3.8 fuel control unit
- 3.9 torque converters
- 3.10 coolers (air, oil, fuel)
- 3.11 fuel flow divider
- 3.12 thermocouple
- 3.13 starter motor
- 3.14 fuel metering units
- 3.15 tacho generator/speed sensor
- 3.16 engine control units
- 3.17 fuel nozzle
- 3.18 data modules
- 3.19 starter clutch assembly
- 3.20 ignition unit
- 3.21 electronic control boxes
- 3.22 cooling fan
- 3.23 hydraulic pump
- 3.24 fire seals and shrouds
- 3.25 heat exchangers (oil, fuel)
- 3.26 generator

Group B

- 3.27 cowling/containment covers
- 3.28 cable harness/wiring/switches/plugs
- 3.29 engine mounts
- 3.30 indicators and warning devices
- 3.31 vibration dampers
- 3.32 solenoids
- 3.33 battery
- 3.34 fire detection units
- 3.35 rod assemblies/levers and linkages
- 3.36 fire wire
- 3.37 damper/connector arm
- 3.38 transducers

- 3.39 tube assemblies
 - 3.40 fire bottle
 - 3.41 attachment bolts
 - 3.42 seals
 - 3.43 igniters
 - 3.44 filters (fuel, oil, air)
 - 3.45 sensors
 - 3.46 pressure switches
 - 3.47 magnetic chip detectors
 - 3.48 cables
 - 3.49 pipes and hoses
 - 3.50 thermostat
 - 3.51 relays
-

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing the cowling and containment covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining fluids)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removal of bonding
- 4.7 disconnecting/removing hoses and pipes
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 removing securing devices and mechanical fasteners
- 4.10 supporting equipment to be removed
- 4.11 making mechanical connections
- 4.12 dismantling equipment to an appropriate level
- 4.13 making electrical connections
- 4.14 covering (protecting) exposed components, wires, pipework or vents
- 4.15 carrying out bonding
- 4.16 torque loading as required
- 4.17 checking components for serviceability
- 4.18 replenishing fluid systems
- 4.19 replacing damaged/defective components
- 4.20 replacing single use items such as seals, filters, gaskets
- 4.21 ensuring that replacement components have the correct part numbers
- 4.22 carrying out system functional checks
- 4.23 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 4.24 applying bolt locking methods (such as split pins, wire locking, lock nuts)

Outcome

S5 Service/check aircraft airborne auxiliary power systems, to include carrying out five of the following:

- 5.1 visually checking the system for damage and leaks
- 5.2 visually inspect APU bay for condition and damage
- 5.3 inspecting hot section
- 5.4 checking exhaust components for security of attachment
- 5.5 inspecting magnetic chip indicators
- 5.6 changing filters (fuel, oil, air)
- 5.7 checking heat shields for damage and security
- 5.8 visually checking cable harnesses, pipe work and fittings for correct gaps/clearances and signs of chafing
- 5.9 checking indicating and warning systems
- 5.10 replacing the battery
- 5.11 servicing and replenishing the oil system
- 5.12 checking power take-off shaft(s) for correct connection and alignment
- 5.13 inspecting the intake door system

Outcome

S6 Carry out three of the following tests on the aircraft auxiliary power system:

- 6.1 checking that ground start mechanisms operate correctly
- 6.2 checking aux/APU battery condition prior to APU start up
- 6.3 checking that the APU cuts out at correct time (emergency shutdown)
- 6.4 fuel flow is operating correctly
- 6.5 engine pressure ratios are within specification
- 6.6 engine temperature is within specification
- 6.7 the bleed air system functions correctly
- 6.8 hydraulic pressures are attained
- 6.9 electrical generation equipment functions correctly
- 6.10 normal operating RPM is achieved and maintained under load
- 6.11 fire detection and protection equipment is functioning

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
- 7.2 aircraft cabin log
- 7.3 computer records
- 7.4 aircraft log book
- 7.5 aircraft technical log

Outcome

S8 Carry out maintenance on aircraft airborne auxiliary power systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft airborne auxiliary power systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K3 explain the importance of maintenance on aircraft auxiliary power systems, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft airborne auxiliary power systems, and with the tools and equipment used (such as handling oils, aviation fuel, the safe release of fuel and other fluids, traps from moving parts, hot parts of engines, misuse of tools), and how to minimise them and reduce any risk
 - K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in aircraft auxiliary power unit systems, and other documents needed in the maintenance activities
 - K12 explain how to carry out currency/issue checks on the specifications they are working with
-

- K13 explain the terminology used in aircraft airborne auxiliary power systems, and the use of system diagrams and associated symbols
- K14 describe the basic principles of operation of the airborne auxiliary power system being worked on, and the function of the units that make up the system (such as power plant, starting and ignition, fuel and control, oil, exhaust, engine control, indicating)
- K15 explain the techniques used to remove components from aircraft auxiliary power system without damage to the components or surrounding structure (such as release of pressures/force, draining of fuel/fluids, removal of components, and the need to protect the system integrity by fitting blanking plugs and ensuring exposed components are correctly covered/protected)
- K16 describe the various mechanical fasteners that will need to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K18 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K19 explain how to fit auxiliary power unit components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
- K20 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as travel and working clearance)
- K21 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K22 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K23 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K24 explain how to carry out routine checks and servicing of the aircraft auxiliary power system
- K25 explain the types of test to be carried out on the aircraft auxiliary power system, and the test equipment to be used
- K26 explain the methods and procedures to be used to carry out the various tests on the auxiliary power system
- K27 explain the importance of carrying out the tests in the specified sequence, checking all readings and movements at each stage
- K28 explain how to record the results of each individual test, and the documentation that must be used
- K29 explain how to analyse the test results, and how to make valid decisions about the acceptability of the aircraft auxiliary power system
- K30 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K31 explain what recording documentation needs 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 describe the procedure for the safe disposal of waste materials, scrap components and fuel/fluids
- K33 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 328

Maintaining airborne auxiliary power systems on aircraft ATA 49

Supporting Information

Unit Range Description

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit guidance

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft auxiliary power systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components of airborne auxiliary power units (APU) which are installed on the aircraft for the purpose of supplying a single type or combination of auxiliary electric, hydraulic, pneumatic or other power. It includes the power and drive section, fuel, ignition and control systems, wiring, indicators, plumbing, valves and ducts up to the power unit. It does not include generators, alternators, hydraulic pumps or their connecting systems, which supply and deliver power to their respective aircraft systems, unless directly associated with the APU. The maintenance activities will include the removal, fitting and testing of a range of airborne auxiliary power system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet

the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft airborne auxiliary power systems. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the auxiliary power systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the airborne auxiliary power system is maintained to the required standard.

They will understand the safety precautions required when working on the airborne auxiliary power system, especially those for ensuring that the power system, and its fuel supply, is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 49 Airborne Auxiliary Power.
2. To display competence in this standard, it is necessary to both remove and fit airborne auxiliary power system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Unit 329

Maintaining cargo and accessory compartments on aircraft ATA 50

RQF Reference:	J/508/6429
Unit level:	Level 3
GLH:	133

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft cargo and accessory compartments, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes equipment mounted on the aircraft and/or contained in the cargo and accessory compartments. The maintenance activities will include the removal, fitting and, where appropriate, testing of a range of equipment. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the equipment to be removed or fitted. The aircraft equipment will include cargo/baggage handling equipment, cargo restraints, sound and heat insulation, removable and fixed cabinets, fire suppressant equipment and other similar equipment. They will remove the required components and fit approved replacements, as appropriate. They will then need to check and adjust the equipment to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these activities 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft cargo and accessory compartments and equipment. They will understand the removal, fitting and testing/checking methods and procedures, and their application, along with the equipment's maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance

activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft cargo and accessory compartment equipment, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 50 Cargo and Accessory Compartments.
2. To display competence in this standard, it is necessary to both remove and fit aircraft cargo and accessory compartment equipment/components. They must remove equipment/components; however, they may fit replacement equipment/components where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements:

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to

- S1 Carry out all of the following during the maintenance of the aircraft cargo and accessory compartments
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and foreign object debris
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented

Outcome

- 2 Carry out maintenance on three of the following parts of aircraft cargo and accessory compartments:

- 2.1 cargo compartments
- 2.2 cargo loading system
- 2.3 insulation barriers
- 2.4 accessory compartments
- 2.5 cargo related systems

Outcome

- S3 Remove and fit four different aircraft cargo and accessory compartment equipment/components:

- 3.1 removable and fixed cabinets
- 3.2 panels and fairings
- 3.3 armour plating/Kevlar
- 3.4 cargo/baggage handling rollers/drive equipment
- 3.5 blow-out panels

- 3.6 fire equipment
 - 3.7 cargo restraint equipment
 - 3.8 cargo restraint nets
 - 3.9 galley equipment
 - 3.10 sound proofing
 - 3.11 insulation materials
 - 3.12 pallet locking system
 - 3.13 liner replacement
 - 3.14 other specific components
-

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components/fastenings to be removed
 - 4.2 carrying out fault diagnosis and system checks
 - 4.3 preparing the equipment for maintenance (such as isolating)
 - 4.4 disconnecting electrical connections
 - 4.5 replacing damaged/defective components
 - 4.6 removing securing devices and mechanical fasteners
 - 4.7 refitting components in the correct position, orientation and alignment
 - 4.8 removal of bonding
 - 4.9 supporting equipment to be removed
 - 4.10 positioning and aligning replaced equipment
 - 4.11 dismantling equipment to an appropriate level
 - 4.12 making mechanical connections
 - 4.13 covering (protecting) exposed components, wires, pipework or vents
 - 4.14 making electrical connections
 - 4.15 carrying out bonding
 - 4.16 checking components for serviceability
 - 4.17 torque loading as required
 - 4.18 carrying out any required structural repairs
 - 4.19 carrying out equipment functional checks
 - 4.20 ensuring that replacement equipment is of the correct type (have the correct part numbers)
 - 4.21 labelling (and storing in the correct location) equipment that requires repair or overhaul
 - 4.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
-

Outcome

S5 Service/check aircraft cargo and accessory compartments, to include carrying out four of the following:

- 5.1 checking the associated structure for integrity
 - 5.2 checking for evidence of leakage or spills
 - 5.3 function check of cargo loading/movement system (such as rollers/drive equipment, locking mechanisms)
-

- 5.4 function check of cargo restraint system (such as restraint nets, baggage restraints)
 - 5.5 examining panel systems for damage
 - 5.6 examining insulation systems for damage
 - 5.7 examining seating/stretcher equipment for security and damage
 - 5.8 checking emergency equipment (such as axe/cutters)
 - 5.9 security and condition of panels and fairings
 - 5.10 security and condition of galley equipment
 - 5.11 security and condition of fixed cabinets
 - 5.12 checking placard and marking load requirements
 - 5.13 checking lighting systems
 - 5.14 fire and smoke detection and extinguishing systems
 - 5.15 compartment sealing requirements to smother potential fire sources
-

Outcome

- S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
-

Outcome

- S7 Carry out maintenance on aircraft cargo and accessory compartments in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 7.3 Ministry of Defence (MoD)
 - 7.4 Military Aviation Authority (MAA)
 - 7.5 Aerospace Quality Management Standards (AS)
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 manufacturers standards and procedures
-

Outcome

- K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when carrying out maintenance activities on aircraft cargo and accessory compartments (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
-

- K2 explain the importance of maintenance on aircraft cargo and accessory compartments, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, legislation and local procedures
- K3 describe the hazards associated with removing and fitting aircraft cargo and accessory compartment equipment and components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K6 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K7 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K8 explain how to extract and use information from aircraft manuals, log books, flight logs, and other documents needed in the maintenance process
- K9 explain how to carry out currency/issue checks on the specifications they are working with
- K10 describe the range of cargo and accessory compartment equipment that may need to be maintained/replaced
- K11 describe the various mechanical fasteners that are used to hold the equipment in place, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K12 explain the importance of using the specified fasteners for the particular installation and why they must not substitute others
- K13 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K14 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K15 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K16 explain the need to take care when removing equipment so as not to cause damage to the equipment or surrounding structure
- K17 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K18 explain the need to position, align, adjust and secure correctly the replaced equipment in the aircraft, without damage to the components or surrounding structure
- K19 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K20 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K21 explain how to carry out routine checks of the aircraft cargo and accessory compartments (such as checking the condition and security of cargo restraint equipment)
- K22 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K23 describe the problems that can occur with the maintenance operations and how these can be overcome

- K24 explain what recording documentation needs 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
- K25 describe the procedure for the safe disposal of waste materials and scrap components
- K26 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 329

Maintaining cargo and accessory compartments on aircraft ATA 50

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 330

Maintaining doors on aircraft ATA 52

RQF Reference:	J/508/6432
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft doors, in accordance with the approved aircraft maintenance manual, structural repair manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes those removable units used for entrance or exit, and for enclosing other structure contained within the fuselage. The maintenance activities will include the removal, fitting and, where appropriate, testing of a range of doors/door equipment, and making repairs to primary and secondary airframe/door structures, as appropriate to the aircraft type.

They will be required to select the correct tools and equipment to use, based on the operations to be performed and the door equipment to be removed or fitted. The aircraft doors will include those used for entrance and exit of passenger and crew to and from the aircraft, emergency exits that are not normally used and are there to facilitate evacuation of the aircraft, exterior doors used to gain access to cargo compartments and for servicing of the aircraft, interior doors inside the fuselage installed in fixed partitions, stairs which operate with but are not an integral part of entrance doors. It also includes the electrical and hydraulic systems associated with door control and warning systems. They will remove the required door components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, structural repair manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, structural repair manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft doors and door equipment. They will understand the removal, fitting and testing/checking methods and procedures, and their application, along with the equipment maintenance requirements. They will know how the door equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the aircraft doors are maintained to the required standard.

They will understand the safety precautions required when working on the aircraft door equipment, and when using the associated tools and equipment. 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.

Notes:

This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 52 Doors.

To display competence in this standard, it is necessary to both remove and fit aircraft door equipment. They must remove the door components; however, they may fit replacement components where the original was previously removed by another person.

They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale

- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
 - P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
 - P8 dispose of waste materials in accordance with safe working practices and approved procedures
-

Outcome

S Skills Requirements:

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft doors
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on three of the following aircraft doors/door equipment:

- 2.1 passenger
 - 2.2 service
 - 2.3 door warning equipment
 - 2.4 crew
 - 2.5 galley
 - 2.6 door wiring
 - 2.7 cargo/baggage
 - 2.8 accessory compartment
 - 2.9 escape equipment
 - 2.10 emergency exit
 - 2.11 auxiliary power unit (APU) doors
 - 2.12 door arming equipment
-

- 2.13 tail cone
 - 2.14 entrance stairs
 - 2.15 power plant doors
 - 2.16 landing gear
 - 2.17 fixed interior doors
-

Outcome

S3 Undertake three of the following structural repair activities:

- 3.1 insertion repair
 - 3.2 overlay patch repair
 - 3.3 primary structure repair
 - 3.4 composite repair
 - 3.5 secondary structure repair
 - 3.6 blend repair
 - 3.7 tertiary structure repair
 - 3.8 reworking of aluminium structures and limitations forming
 - 3.9 damage assessment and evaluation
 - 3.10 NDT inspection requirements (post damage removal)
-

Outcome

S4 Use six of the following during the structural repair activities:

- 4.1 marking out airframe materials
 - 4.2 profiling
 - 4.3 securing and locking components
 - 4.4 making holes in airframe materials
 - 4.5 countersinking
 - 4.6 using adhesives and sealants
 - 4.7 cutting/shaping airframe materials
 - 4.8 deburring
 - 4.9 anti-corrosive treatment
 - 4.10 bending and forming materials
 - 4.11 riveting
 - 4.12 blending out permissible damage to structural components
 - 4.13 drilling extremities of cracks
-

Outcome

S5 Remove and fit six different aircraft door equipment components (at least three must be from group A):

Group A

- 5.1 escape slide
-

- 5.2 actuating mechanisms (such as linear, rotary)
- 5.3 door seals
- 5.4 door mounted life rafts
- 5.5 pneumatic cylinder
- 5.6 handle assembly
- 5.7 ramps
- 5.8 hydraulic cylinder
- 5.9 lock assembly
- 5.10 lining
- 5.11 latching mechanisms and interlocks
- 5.12 integral steps
- 5.13 cargo door jack
- 5.14 pressure relief doors and gates
- 5.15 gearbox
- 5.16 controls
- 5.17 torque tubes (aircraft and door)
- 5.18 damper
- 5.19 electric power lift unit
- 5.20 door abutments
- 5.21 counter balance
- Group B
- 5.22 insulation
- 5.23 door snubber/damper
- 5.24 attached fittings
- 5.25 trim
- 5.26 hand rails
- 5.27 security locking devices
- 5.28 handles
- 5.29 switches
- 5.30 warning devices (such as lights, bells horns)
- 5.31 brackets
- 5.32 sensors
- 5.33 cable harness/wiring/switches/plugs sensors
- 5.34 door hinges
- 5.35 interlock
- 5.36 viewing devices
- 5.37 levers/linkages
- 5.38 push rods
- 5.39 teleflex
- 5.40 other specific components

Outcome

S6 Carry out fifteen of the following maintenance activities:

- 6.1 removing/refitting linings and covers to expose components/fastenings to be removed

- 6.2 carrying out fault diagnosis and system checks
 - 6.3 carrying out safety checks and isolation on automatic systems prior to the commencement of maintenance activities
 - 6.4 preparing the equipment for maintenance (such as isolating, disarming escape systems, pressure relief and automatic systems disconnections)
 - 6.5 disconnecting electrical connections
 - 6.6 positioning and aligning replaced equipment
 - 6.7 removing securing devices and mechanical fasteners
 - 6.8 setting and adjusting replaced components
 - 6.9 removal of bonding
 - 6.10 replacing seals and sealants
 - 6.11 supporting equipment to be removed
 - 6.12 making mechanical connections
 - 6.13 dismantling equipment to an appropriate level
 - 6.14 making electrical connections
 - 6.15 covering (protecting) exposed components, wires, pipework or vents
 - 6.16 carrying out bonding
 - 6.17 torque loading as required
 - 6.18 checking components for serviceability
 - 6.19 re connecting/rearming escape systems
 - 6.20 replacing damaged/defective components
 - 6.21 carrying out equipment functional checks
 - 6.22 refitting components in the correct position, orientation and alignment
 - 6.23 removal and refitting of door dams (ditching requirements on some aircraft)
 - 6.24 ensuring that replacement equipment is of the correct type (has the correct part numbers)
 - 6.25 labelling (and storing in the correct location) equipment that requires repair or overhaul
 - 6.26 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 6.27 carrying out area inspections prior to task close down
-

Outcome

S7 Service/check aircraft doors to include carrying out four of the following:

- 7.1 checking door seals for damage
 - 7.2 checking handles for correct operation
 - 7.3 checking latching mechanisms for correct operation
 - 7.4 rigging/adjusting the locking mechanism
 - 7.5 adjusting air stair system
 - 7.6 checking operation of emergency exits
 - 7.7 checking door assemblies for deterioration, de-lamination, wear (mechanical or otherwise)
 - 7.8 checking critical fastenings for security
 - 7.9 lubricating door mechanisms
 - 7.10 checking and adjustment of door abutments
 - 7.11 checking of water drains
 - 7.12 testing door warning system
 - 7.13 check dents and scratches on door skin/structure against manufacturer's tolerances
-

Outcome

S8 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 8.1 job cards/work sheets
- 8.2 computer records
- 8.3 aircraft technical log
- 8.4 aircraft cabin log
- 8.5 aircraft log book

Outcome

S9 Carry out maintenance on aircraft doors in compliance with one of the following:

- 9.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 9.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 9.3 Ministry of Defence (MoD)
- 9.4 Military Aviation Authority (MAA)
- 9.5 Aerospace Quality Management Standards (AS)
- 9.6 Federal Aviation Authority (FAA)
- 9.7 aircraft maintenance manual/structural repair manual/approved change documentation (service bulletin)
- 9.8 manufacturers standards and procedures

Outcome

K Knowledge Requirements

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when carrying out maintenance activities on aircraft doors (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the importance of maintenance on aircraft doors, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, legislation and local procedures
- K3 describe the hazards associated with removing and fitting aircraft doors and door components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 explain how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft

- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain how to extract and use information from aircraft manuals, log books, flight logs, and other documents needed in the maintenance process
- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 describe the range of door equipment and components that may need to be maintained/replaced/repaired
- K13 explain what preparations to be undertaken on the door structure, prior to maintenance/repair (including disarming of escape slides and door rafts)
- K14 explain the interconnection between door systems and other emergency equipment (slides, rafts and door dams for ditching)
- K15 explain the repair methods and procedures to be used, and the importance of adhering to these procedures
- K16 explain the application of sealants and adhesives within the repair activities, and the precautions that must be taken when working with them
- K17 explain how to conduct any necessary checks to ensure the accuracy and quality of the repair
- K18 explain how to recognise defects (such as skin blemishes, poor skin lines, ineffective fasteners, foreign object damage)
- K19 describe the various mechanical fasteners that are used to hold the equipment in place, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K20 explain the importance of using the specified fasteners for the particular installation, and why they must not substitute others
- K21 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K22 explain the torque loading requirements on the fasteners, and what to do if these loadings are exceeded or not achieved
- K23 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K24 explain the need to take care when removing doors, door equipment and furnishings so as not to cause damage to the equipment or surrounding structure
- K25 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K26 explain the need to position, align, adjust and secure correctly the replaced door equipment on the aircraft, without damage to the components or surrounding structure
- K27 explain the methods of lifting, handling and supporting the components/equipment during the removal and fitting activities
- K28 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K29 explain how to carry out routine checks of the aircraft doors and door equipment (such as checking the condition of door seals, checking correct operation of air stairs and emergency exits, checking door warning devices)
- K30 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K31 describe the problems that can occur with the maintenance operations and how these can be overcome

- K32 explain what recording documentation needs 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
- K33 describe the procedure for the safe disposal of waste materials and scrap components
- K34 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 330

Maintaining doors on aircraft ATA 52

Supporting Information

Unit guidance

Assessment Requirements:

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 331

Maintaining fuselage, nacelles and pylons on aircraft ATA 53 and ATA 54

RQF Reference:	L/508/6433
Unit level:	Level 3
GLH:	147

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft fuselage, nacelles and pylons, in accordance with the approved aircraft maintenance manual, structural repair manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes structural units and associated components which make up the compartments for equipment, passengers, crew and cargo/baggage, and structural units and associated components which provide a means of mounting and housing the power plant or rotor assembly. The maintenance activities will include the removal, fitting and, where appropriate, testing of a range of fuselage components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or fitted. The fuselage maintenance activities will include removing the required components, fitting approved replacements, and making repairs to primary and secondary airframe structures, as appropriate to the aircraft type.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, structural repair manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to the aircraft fuselage, nacelles and pylons. They will understand the removal, refitting and repair methods and procedures, and their application, along with the fuselage maintenance requirements. They will know the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance

activities, correcting faults and for ensuring that the fuselage, nacelles and pylons are maintained to the required standard.

They will understand the safety precautions required when working on the aircraft fuselage, nacelles and pylons, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 53 Fuselage and Chapter 54 Nacelles/Pylons.
2. To display competence in this standard, it is necessary to both remove and fit fuselage and nacelles/pylon components. They must remove fuselage and/or nacelles/pylon components; however, they may fit replacement components where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft fuselage, nacelles and pylons
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and repair techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance/repairs on three of the following areas of the aircraft fuselage:

- 2.1 fuselage sections
- 2.2 fin
- 2.3 pressure dome
- 2.4 engine nacelle
- 2.5 skins
- 2.6 nose
- 2.7 scuppers
- 2.8 pylons
- 2.9 floor beams
- 2.10 tail
- 2.11 hatches
- 2.12 box sections
- 2.13 floor
- 2.14 tail cone
- 2.15 bulkheads
- 2.16 avionics cabinets
- 2.17 stringers

- 2.18 cockpit/cabin
 - 2.19 mission consoles
 - 2.20 drains
-

Outcome

S3 Undertake three of the following structural repair activities:

- 3.1 insertion repair
 - 3.2 overlay patch repair
 - 3.3 primary structure repair
 - 3.4 composite repair
 - 3.5 secondary structure repair
 - 3.6 blend repair
 - 3.7 tertiary structure repair
 - 3.8 reworking of aluminium structures and limitations forming
 - 3.9 damage assessment and evaluation
 - 3.10 NDT inspection requirements (post damage removal)
-

Outcome

S4 Use six of the following during the structural repair activities:

- 4.1 marking out airframe materials
 - 4.2 profiling
 - 4.3 securing and locking components
 - 4.4 making holes in airframe materials
 - 4.5 countersinking
 - 4.6 using adhesives and sealants
 - 4.7 cutting/shaping airframe materials
 - 4.8 deburring
 - 4.9 anti-corrosive treatment
 - 4.10 bending and forming materials
 - 4.11 riveting
 - 4.12 blending out permissible damage to structural components
 - 4.13 drilling the extremities of cracks
-

Outcome

S5 Carry out fifteen of the following maintenance activities:

- 5.1 removing access panels and covers to expose components/fastenings to be removed
 - 5.2 preparing the fuselage for the maintenance/repair activities (such as isolating, depressurising/draining systems that need disconnecting)
 - 5.3 disconnecting electrical connections
 - 5.4 ensuring the correct specification of replacement material
-

- 5.5 removal of bonding
 - 5.6 removing securing devices and mechanical fasteners
 - 5.7 refitting components in the correct position, orientation and alignment
 - 5.8 disconnecting/removing hoses and pipes
 - 5.9 supporting components to be removed
 - 5.10 positioning and aligning replaced equipment
 - 5.11 dismantling equipment to an appropriate level
 - 5.12 setting and adjusting replaced components
 - 5.13 covering (protecting) exposed components, wires, pipework or vents
 - 5.14 making mechanical connections
 - 5.15 making electrical connections
 - 5.16 checking components for serviceability
 - 5.17 carrying out bonding
 - 5.18 fitting securing devices and mechanical fasteners
 - 5.19 torque loading as required
 - 5.20 replacing damaged/defective components
 - 5.21 ensuring that replacement equipment is of the correct type (have the correct part numbers)
 - 5.22 labelling (and storing in the correct location) components that requires repair or overhaul
 - 5.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 5.24 carrying out area inspections prior to task close down
-

Outcome

S6 Check aircraft fuselage components, to include carrying out three of the following:

- 6.1 checking structural components for signs of corrosion
 - 6.2 checking components for fatigue cracks
 - 6.3 checking for lightning strike damage
 - 6.4 checking critical fastenings for security
 - 6.5 checking hoses and looms for security and chafing
 - 6.6 checking surface protection (such as paint finish, polish)
 - 6.7 checking for de-bonding of aircraft structure
 - 6.8 checking for oil canning
 - 6.9 checking dents, scratches/scoring on skin/structure against manufacturers tolerances
 - 6.10 checking aircraft structure for distortion (such as panting and quilting)
 - 6.11 checking components for wear (mechanical or otherwise) or damage
 - 6.12 checking for non-approved repairs
 - 6.13 carrying out symmetry and rigging checks
 - 6.14 other specific checks
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
-

- 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance/repairs on aircraft fuselage components in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/structural repair manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when carrying out maintenance activities on the aircraft fuselage and nacelles/pylons (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft fuselage systems, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, legislation and local procedures
 - K3 describe the hazards associated with repairing airframes, removing and fitting aircraft fuselage components, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K10 explain how to extract and use information from aircraft manuals, log books, flight logs, and other documents needed in the maintenance process
-

- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 explain what preparations to be undertaken on the fuselage or nacelles/pylons, prior to repair
- K13 explain the repair methods and procedures to be used, and the importance of adhering to these procedures
- K14 describe the various mechanical fasteners that are used to hold the equipment in place, and their methods of removal and replacement (such as threaded fasteners, open and blind rivets, special securing devices)
- K15 explain the application of sealants and adhesives within the repair activities, and the precautions that must be taken when working with them
- K16 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K17 explain the importance of using the specified fasteners for the particular repair, and why they must not substitute others
- K18 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K19 explain the torque loading requirements on the fasteners, and what to do if these loadings are exceeded or not achieved
- K20 explain the need to take care when removing fuselage components so as not to cause damage to the equipment or surrounding structure
- K21 explain the need to check that replaced components have the correct part/identification markings and accompanying release documentation
- K22 explain the need to position, align, adjust and secure correctly the replaced equipment in the aircraft, without damage to the components or surrounding structure
- K23 explain the methods of lifting, handling and supporting the components during the maintenance activities
- K24 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K25 explain how to carry out routine checks of the fuselage (such as checking for corrosion, stress/fatigue cracks, torque on critical fastenings)
- K26 explain how to conduct any necessary checks to ensure the accuracy and quality of the repair
- K27 explain how to recognise defects (such as skin blemishes, poor skin lines, ineffective fasteners, foreign object damage)
- K28 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K29 describe the problems that can occur with the maintenance/repair operations, and how these can be overcome
- K30 explain what recording documentation needs 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
- K31 describe the procedure for the safe disposal of waste materials and scrap components
- K32 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 331

Maintaining fuselage, nacelles and pylons on aircraft ATA 53 and ATA 54

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 332

Maintaining stabilisers on aircraft ATA 55

RQF Reference:	Y/508/6435
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft stabilisers, in accordance with the approved aircraft maintenance manual, structural repair manual, approved change documentation (service bulletin) and airworthiness requirements. The maintenance activities will include the removal, fitting and testing of a range of aircraft stabiliser components, and making repairs to primary and secondary airframe/stabiliser structures, as appropriate to the aircraft type.

They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed, fitted and tested. The aircraft stabiliser components will include items such as horizontal stabiliser/stabilator or canard/fore planes, vertical stabiliser, elevator/elevon, rudder/ruddevator, and associated components. They will remove the required stabiliser components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, structural repair manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft stabilisers. They will understand the removal, fitting and testing methods and procedures, and their application, along with the aircraft stabiliser maintenance requirements. They will know how the aircraft stabiliser functions, the common problems that can occur, the purpose of the individual components and associated

defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft stabiliser systems, especially those for isolating the equipment, lifting and handling stabiliser components. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 55 Stabilisers.
2. To display competence in this standard, it is necessary to both remove and fit aircraft stabiliser components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

S1 Skills Requirements: Carry out all of the following during the maintenance of the aircraft stabilisers:

- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
- 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
- 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
- 1.4 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
- 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
- 1.6 ensure the safe isolation of the control system before commencing work on the equipment
- 1.7 use approved removal, fitting and testing techniques and procedures at all times
- 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
- 1.9 return tools and equipment to the correct storage location on completion of the activities
- 1.10 ensure that work carried out is correctly documented and recorded
- 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following aircraft stabilisers:

- 2.1 horizontal stabilisers/stabilator/canards/fore planes
- 2.2 elevator/elevon
- 2.3 vertical stabiliser
- 2.4 rudder/yaw/ruddervator
- 2.5 trim tab
- 2.6 tailerons
- 2.7 other specific stabiliser

Outcome

S3 Undertake three of the following structural repair activities:

- 3.1 insertion repair
- 3.2 overlay patch repair
- 3.3 primary structure repair
- 3.4 composite repair
- 3.5 secondary structure repair
- 3.6 blend repair
- 3.7 tertiary structure repair
- 3.8 reworking of aluminium structures and limitations forming
- 3.9 damage assessment and evaluation
- 3.10 NDT inspection requirements (post damage removal)

Outcome

S4 Use six of the following during the structural repair activities:

- 4.1 marking out airframe materials
- 4.2 profiling
- 4.3 securing and locking components
- 4.4 making holes in airframe materials
- 4.5 countersinking
- 4.6 anti-corrosive treatment
- 4.7 deburring
- 4.8 using adhesives and sealants
- 4.9 cutting/shaping airframe materials
- 4.10 riveting
- 4.11 bending and forming materials
- 4.12 drilling the extremities of cracks
- 4.13 blending out permissible damage to structural components

Outcome

S5 Remove and fit four different aircraft stabiliser components (at least two must be from group A):

Group A

- 5.1 horizontal stabiliser
- 5.2 upper rudder
- 5.3 inboard elevator
- 5.4 vertical stabiliser
- 5.5 lower rudder
- 5.6 tailerons
- 5.7 stabiliser leading edge

- 5.8 splice ribs
- 5.9 outboard elevator
- 5.10 stabiliser tip
- 5.11 panel stiffeners
- 5.12 stabiliser screw jack
- 5.13 stabiliser seals
- 5.14 access doors/panels
- 5.15 attachment fittings

Group B

- 5.16 pivot hinge assembly
- 5.17 pivot pin assembly
- 5.18 anti-rotation plate
- 5.19 bonding jumpers
- 5.20 bearing assemblies
- 5.21 static wick discharger
- 5.22 other specific component

Outcome

S6 Carry out fifteen of the following maintenance activities:

- 6.1 removing access panels and covers to expose components to be removed
- 6.2 carrying out fault diagnosis and system checks
- 6.3 preparing the system for maintenance (such as isolating, releasing stored pressure)
- 6.4 disconnecting electrical connections
- 6.5 replacing items (such as seals, gaskets, sealants)
- 6.6 removal of bonding
- 6.7 removing securing devices and mechanical fasteners
- 6.8 setting and adjusting replaced components (such as freedom of movement, travel)
- 6.9 supporting equipment to be removed
- 6.10 dismantling equipment to an appropriate level
- 6.11 making mechanical connections
- 6.12 covering (protecting) exposed components, wires, pipework or vents
- 6.13 making electrical connections
- 6.14 carrying out bonding
- 6.15 checking components for serviceability
- 6.16 torque loading as required
- 6.17 replacing damaged/defective components
- 6.18 carrying out functional checks of the system
- 6.19 refitting components in the correct position, orientation and alignment
- 6.20 ensuring that replacement components have the correct part numbers
- 6.21 labelling (and storing in the correct location) components that require repair or overhaul
- 6.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 6.23 carrying out area inspections prior to task close down

Outcome

S7 Carry out three of the following types of test/check on the aircraft stabilisers:

- 7.1 checking bonding jumpers for tightness, corrosion, melted strands, electrical resistance
- 7.2 checking ground leads for security and electrical continuity
- 7.3 checking components for wear (mechanical or otherwise) damage
- 7.4 check stabiliser skins for dents and scratches against manufacturer's tolerances
- 7.5 checking structural components for signs of cracking, corrosion or de-bonding
- 7.6 checking stabilisers for range and freedom of movement
- 7.7 checking critical fastenings for security
- 7.8 checking surface protection (such as paint finish, polish)
- 7.9 carrying out 'special-to-type' tests
- 7.10 carrying out rigging checks

Using two of the following

- 7.11 mechanical measuring equipment
- 7.12 ground support equipment
- 7.13 'special-to-type' test equipment
- 7.14 electrical measuring equipment
- 7.15 use of safety locks

Outcome

S8 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 8.1 job cards/work sheets
- 8.2 aircraft technical log
- 8.3 aircraft log book
- 8.4 computer records
- 8.5 aircraft cabin log

Outcome

S9 Carry out maintenance on aircraft stabilisers in compliance with one of the following:

- 9.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 9.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 9.3 Ministry of Defence (MoD)
- 9.4 Military Aviation Authority (MAA)
- 9.5 Aerospace Quality Management Standards (AS)
- 9.6 Federal Aviation Authority (FAA)
- 9.7 aircraft maintenance manual/structural repair manual/approved change documentation (service bulletin)
- 9.8 manufacturers standards and procedures

Outcome

K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft stabilisers (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the importance of maintenance on, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, legislation and local procedures
- K3 describe the hazards associated with removing, fitting and testing aircraft stabiliser components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K6 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K7 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K8 explain how to extract and use information from aircraft maintenance manuals, log books, flight logs, and other documents needed in the maintenance process
- K9 explain how to carry out currency/issue checks on the specifications they are working with
- K10 explain the terminology used in aircraft stabiliser systems, and the use of system diagrams and associated symbols
- K11 describe the basic principles of operation of the aircraft stabiliser being worked on, and the function of the various units/components
- K12 Preparations to be undertaken on the aircraft stabilisers, prior to repair
- K13 explain the repair methods and procedures to be used, and the importance of adhering to these procedures
- K14 explain the application of sealants and adhesives within the repair activities, and the precautions that must be taken when working with them
- K15 explain how to conduct any necessary checks to ensure the accuracy and quality of the repair
- K16 explain how to recognise defects (such as skin blemishes, poor skin lines, ineffective fasteners, foreign object damage)
- K17 explain the techniques used to remove components from aircraft stabilisers without damage to the components or surrounding structure (such as release of pressures/force, proof marking, extraction of components, and the need to protect the system integrity by fitting blanking plugs and ensuring exposed components are correctly covered/protected)
- K18 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K19 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K20 explain the methods of lifting, handling and supporting the components/equipment during the removal and fitting activities
- K21 explain the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics

- K22 explain the need to replace items such as seals and gaskets
- K23 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K24 explain how to replace and reconnect components into the system (such as ensuring correct orientation, position and alignment; tightening securing devices to the required torque; replacing locking and securing devices; eliminating stress on pipework/connections; ensuring that pipework and cables are correctly supported at suitable intervals; carrying out visual checks of all components)
- K25 explain how to make adjustments to components/assemblies to ensure they function correctly (such as setting working clearance, setting travel)
- K26 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K27 explain the purpose of symmetry and rigging checks; how they are carried out; how to locate the rigging points and faces; and the use of incidence boards
- K28 explain how to carry out routine checks and servicing of the aircraft stabilisers
- K29 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before removing stabiliser components
- K30 explain the types of test to be carried out on the aircraft stabiliser and the test equipment to be used
- K31 explain the methods and procedures to be used to carry out the various tests
- K32 explain the importance of carrying out the tests in the specified sequence, checking all readings and movements at each stage
- K33 explain how to record the results of each individual test and the documentation that must be used
- K34 explain how to analyse the test results, and how to make valid decisions about the acceptability of the stabiliser system
- K35 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K36 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K37 describe the problems that can occur with the aircraft stabiliser maintenance operations and how these can be overcome
- K38 explain what recording documentation needs 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
- K39 describe the procedure for the safe disposal of waste materials and scrap components
- K40 describe the extent of their own authority, and to whom they should report if they have problems that they cannot resolve

Unit 332

Maintaining stabilisers on aircraft ATA 55

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 333

Maintaining windows on aircraft ATA 56

RQF Reference:	D/508/6436
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft windows, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes fuselage and crew compartment windows and windshields including windows installed in doors. The maintenance activities will include the removal, fitting and where appropriate testing of a range of windows. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the window equipment to be removed or fitted. The aircraft windows include items such as the transparent material and frame of sliding and fixed windows and windshields, frost shields, handles, latching mechanisms. They will remove the required window components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft windows. They will understand the removal, fitting and testing/checking methods and procedures, and their application, along with the window maintenance requirements. They will know how the window equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the aircraft windows are maintained to the required standard.

They will understand the safety precautions required when working on the aircraft windows, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 56 Windows.
2. To display competence in this standard, it is necessary to both remove and fit aircraft windows. They must remove windows; however, they may fit a replacement where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft windows:
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following aircraft windows:

- 2.1 flight compartment
 - 2.2 door
 - 2.3 window heating/wiring system
 - 2.4 passenger/cargo compartment
 - 2.5 inspection and observation
-

Outcome

S3 Remove and fit four different aircraft window components (at least two must be from group A):

Group A

- 3.1 windshield
 - 3.2 cabin window assembly
 - 3.3 canopy
 - 3.4 fixed windows
 - 3.5 rear window
-

- 3.6 window seals
- 3.7 sliding windows
- 3.8 ice inspection window
- 3.9 landing gear and cargo bay inspection windows

Group B

- 3.10 handle assembly
- 3.11 trim
- 3.12 warning devices (such as lights, bells horns)
- 3.13 lock assembly
- 3.14 window blind
- 3.15 cable harness/wiring/switches/plugs sensors
- 3.16 window latching mechanisms
- 3.17 lift block
- 3.18 windscreen wiper blades
- 3.19 window slide
- 3.20 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing linings and covers to expose components/fastenings to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the equipment for maintenance
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removing securing devices and mechanical fasteners
- 4.7 supporting components to be removed
- 4.8 positioning and aligning replaced equipment
- 4.9 setting and adjusting replaced components
- 4.10 dismantling equipment to an appropriate level
- 4.11 replacing seals, sealants and desiccant (as appropriate)
- 4.12 covering (protecting) exposed components, wires, pipework or vents
- 4.13 making mechanical connections
- 4.14 making electrical connections
- 4.15 checking components for serviceability
- 4.16 torque loading as required
- 4.17 replacing damaged/defective components
- 4.18 carrying out equipment functional checks
- 4.19 ensuring that replacement equipment is of the correct type (have the correct part numbers)
- 4.20 labelling (and storing in the correct location) equipment that requires repair or overhaul
- 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.22 carrying out area inspections prior to task close down

Outcome

S5 Service/check aircraft windows, to include carrying out three of the following:

- 5.1 checking window seals for damage
 - 5.2 checking cleanliness
 - 5.3 applying rain repellent
 - 5.4 checking window condition (such as delamination, cracking, crazing, chips)
 - 5.5 checking latching mechanisms for correct operation
 - 5.6 checking critical fastenings for security
 - 5.7 rigging/adjusting the latching mechanism
 - 5.8 testing window heating elements
-

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
-

Outcome

S7 Carry out maintenance on aircraft windows in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 7.3 Ministry of Defence (MoD)
 - 7.4 Military Aviation Authority (MAA)
 - 7.5 Aerospace Quality Management Standards (AS)
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 manufacturers standards and procedures
-

Outcome

K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when carrying out maintenance activities on aircraft windows (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft windows, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, legislation and local procedures
-

- K3 describe the hazards associated with removing and fitting aircraft windows, and with the tools and equipment used, and how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain how to extract and use information from aircraft manuals, log books, flight logs, and other documents needed in the maintenance process
- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 describe the range of windows and window components that may need to be maintained/replaced
- K13 describe the various mechanical fasteners that are used to hold the equipment in place, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K14 explain the importance of using the specified fasteners for the particular installation and why they must not substitute others
- K15 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K16 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K18 explain the need to take care when removing windows so as not to cause damage to the equipment or surrounding structure
- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K20 explain the need to position, align, adjust and secure correctly the replaced windows on the aircraft, without damage to the components or surrounding structure
- K21 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K22 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K23 explain how to carry out routine checks of the aircraft windows (such as checking condition of seals, checking correct operation of sliding windows and window locking mechanisms, checking window warning devices)
- K24 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K25 describe the problems that can occur with the maintenance operations and how these can be overcome

- K26 explain what recording documentation needs 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
- K27 describe the procedure for the safe disposal of waste materials and scrap components
- K28 explain the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 333

Maintaining windows on aircraft ATA 56

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 334

Maintaining wings on aircraft ATA 57

RQF Reference:	H/508/6437
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft wings, in accordance with the approved aircraft maintenance manual, structural repair manual, approved change documentation (service bulletin) and airworthiness requirements. The maintenance activities will include the removal, fitting and testing of a range of aircraft wing components, and making repairs to primary and secondary airframe/wing structures, as appropriate to the aircraft type.

They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed, fitted and tested. The aircraft wing components will include items such as centre wing and outer wing structural units and associated components and members that support the aircraft in flight, and covers flaps, slats, ailerons or elevons, tabs, spoilers and wing folding systems. They will remove the required wing components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, structural repair manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft wings. They will understand the removal, fitting and testing methods and procedures, and their application, along with the aircraft wing maintenance requirements. They will know how the aircraft wing functions, the common problems that can occur, the purpose of the individual components and associated defects, in

adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the wing is maintained to the required standard.

They will understand the safety precautions required when working on aircraft wings, especially those for isolating the equipment, lifting and handling wing components. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 57 Wings.
2. To display competence in this standard, it is necessary to both remove and fit aircraft wing components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements:

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft wings
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 ensure the safe isolation of the control system before commencing work on the equipment
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance/repairs on two of the following parts of the aircraft wing:

- 2.1 centre section
- 2.2 leading edge and leading edge devices
- 2.3 wing folding system
- 2.4 outer section
- 2.5 trailing edge and trailing edge devices
- 2.6 elevons
- 2.7 wing tip/winglets
- 2.8 inboard and outboard ailerons
- 2.9 spoilers
- 2.10 flaps
- 2.11 Krueger flaps
- 2.12 slats
- 2.13 spars
- 2.14 ailerons
- 2.15 tabs
- 2.16 integral fuel tanks

- 2.17 spoilers
 - 2.18 lift dumpers
-

Outcome

S3 Undertake three of the following structural repair activities:

- 3.1 insertion repair
 - 3.2 overlay patch repair
 - 3.3 primary structure repair
 - 3.4 composite repair
 - 3.5 secondary structure repair
 - 3.6 blend repair
 - 3.7 tertiary structure repair
 - 3.8 reworking of aluminium structures and limitations forming
 - 3.9 damage assessment and evaluation
 - 3.10 NDT inspection requirements (post damage removal)
-

Outcome

S4 Use six of the following during the structural repair activities:

- 4.1 marking out airframe materials
 - 4.2 profiling
 - 4.3 securing and locking components
 - 4.4 making holes in airframe materials
 - 4.5 countersinking
 - 4.6 using adhesives and sealants
 - 4.7 cutting/shaping airframe materials
 - 4.8 deburring
 - 4.9 anti-corrosive treatment
 - 4.10 bending and forming materials
 - 4.11 riveting
 - 4.12 blending out permissible damage to structural components
 - 4.13 drilling the extremities of cracks
-

Outcome

S5 Remove and fit four different aircraft wing components (at least two must be from group A):

Group A

- 5.1 wing tip/winglets
 - 5.2 spoilers
 - 5.3 Krueger flaps
 - 5.4 wing rib
 - 5.5 slats
-

- 5.6 lift dumpers
- 5.7 wing skin repair
- 5.8 variable camber flaps
- 5.9 airbrakes
- 5.10 ailerons
- 5.11 flaps (fore, mid, aft)
- 5.12 swing wing
- 5.13 spoilers
- 5.14 leading edge and leading edge devices
- 5.15 tabs
- 5.16 wing folding system
- 5.17 trailing edge and trailing edge devices
- 5.18 lift dumpers
- 5.19 elevons
- 5.20 inboard and outboard ailerons

Group B

- 5.21 wing attachment fittings
- 5.22 wing plates
- 5.23 nacelles/pylon attachment fittings
- 5.24 seals
- 5.25 landing gear attachment fittings
- 5.26 indicating/warning devices
- 5.27 actuators
- 5.28 locks
- 5.29 static dischargers
- 5.30 lever/linkage assemblies
- 5.31 flap track assembly
- 5.32 closure panels
- 5.33 spring assemblies
- 5.34 gearboxes
- 5.35 access panels
- 5.36 carriage assembly
- 5.37 other specific components

Outcome

S6 Carry out fifteen of the following maintenance activities:

- 6.1 removing access panels and covers to expose components to be removed
- 6.2 carrying out fault diagnosis and system checks
- 6.3 preparing the system for maintenance (such as isolating, fitting physical locks, stress jacking, releasing stored pressure)
- 6.4 disconnecting electrical connections
- 6.5 refitting components in the correct position, orientation and alignment
- 6.6 removal of bonding
- 6.7 removing securing devices and mechanical fasteners
- 6.8 setting and adjusting replaced components

- 6.9 supporting equipment to be removed (such as freedom of movement, travel)
 - 6.10 dismantling equipment to an appropriate level
 - 6.11 making mechanical connections
 - 6.12 covering (protecting) exposed components, wires, pipework or vents
 - 6.13 making electrical connections
 - 6.14 carrying out bonding
 - 6.15 checking components for serviceability
 - 6.16 torque loading as required
 - 6.17 replacing damaged/defective components
 - 6.18 carrying out metal repairs
 - 6.19 replacing items such as seals, gaskets, sealant
 - 6.20 carrying out composite repairs
 - 6.21 ensuring that replacement components have the correct part numbers
 - 6.22 labelling (and storing in the correct location) components that require repair or overhaul
 - 6.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 6.24 carrying out area inspections prior to task close down
-

Outcome

S7 Carry out three of the following types of test/check on the aircraft wings:

- 7.1 checking incidence rig
- 7.2 inspecting primary structure/spar
- 7.3 inspecting integral fuel tank
- 7.4 checking skins for cracking and distortion
- 7.5 checking control surface for range and freedom of movement
- 7.6 primary structural element (PSE) fastener inspection and replacement
- 7.7 checking wing skins for dents and scratches against manufacturer's tolerances
- 7.8 checking surface protection (such as paint finish, polish)
- 7.9 checking critical fastenings for security
- 7.10 checking for lightning strikes
- 7.11 heavy landing check
- 7.12 stress jacking
- 7.13 checking for dents
- 7.14 carrying out 'special-to-type' tests

Using two for the following

- 7.15 mechanical measuring equipment
- 7.16 ground support equipment
- 7.17 'special-to-type' test equipment
- 7.18 electrical measuring equipment
- 7.19 use of safety locks
- 7.20 incidence boards

Outcome

S8 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 8.1 job cards/work sheets
- 8.2 computer records
- 8.3 aircraft technical log
- 8.4 aircraft cabin log
- 8.5 aircraft log book

Outcome

S9 Carry out maintenance on aircraft wings in compliance with one of the following:

- 9.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 9.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate) Ministry of Defence (MoD)
- 9.3 Military Aviation Authority (MAA)
- 9.4 Aerospace Quality Management Standards (AS)
- 9.5 Federal Aviation Authority (FAA)
- 9.6 aircraft maintenance manual/structural repair manual/approved change documentation (service bulletin)
- 9.7 manufacturers standards and procedures

Outcome

K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft wings (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the requirements for working on wing fuel tanks (such as fuel tank safety training (FTS)), and the importance of emergency procedures and safe systems of work (including permits to work, Required Air Quantities (RAQS) and Local Exhaust Ventilation (LEV)) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition
- K3 explain the importance of maintenance on aircraft wings, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, legislation and local procedures
- K4 describe 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 describe the hazards associated with removing, fitting and testing aircraft wing components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 explain how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)

- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft maintenance manuals, log books, flight logs, and other documents needed in the maintenance process
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft wings, and the use of system diagrams and associated symbols
- K14 describe the basic principles of operation of the aircraft wing components being worked on, and the function of the various units/components
- K15 explain what preparations to be undertaken on the wing structure, prior to repair
- K16 explain the repair methods and procedures to be used, and the importance of adhering to these procedures
- K17 explain the application of sealants and adhesives within the repair activities, and the precautions that must be taken when working with them
- K18 explain how to conduct any necessary checks to ensure the accuracy and quality of the repair
- K19 explain how to recognising defects (such as skin blemishes, poor skin lines, ineffective fasteners, foreign object damage)
- K20 explain the techniques used to remove components from aircraft wings without damage to the components or surrounding structure (such as release of pressures/force, proof marking, extraction of components) and the need to protect the system integrity by fitting blanking plugs and ensuring exposed components are correctly covered/protected)
- K21 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K22 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K23 explain the methods of lifting, handling and supporting the components/equipment during the removal and fitting activities
- K24 explain the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics
- K25 explain the need to replace items such as seals and gaskets
- K26 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K27 explain how to replace and reconnect components onto the wing (such as ensuring correct orientation, position and alignment; tightening securing devices to the required torque; replacing locking and securing devices; eliminating stress on pipework/connections; ensuring that pipework and cables are correctly supported at suitable intervals; carrying out visual checks of all components)
- K28 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel)
- K29 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K30 explain the purpose of symmetry and rigging checks; how they are carried out; how to locate the rigging points and faces; and the use of incidence boards
- K31 explain how to carry out routine checks and servicing of the aircraft wings

- K32 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before removing wing components
- K33 explain the types of test to be carried out on the aircraft wing and the test equipment to be used
- K34 explain the methods and procedures to be used to carry out the various tests
- K35 explain the importance of carrying out the tests in the specified sequence, checking all readings/movements at each stage
- K36 explain how to record the results of each individual test, and the documentation that must be used
- K37 explain how to analyse the test results and make valid decisions about the acceptability of the wing components
- K38 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K39 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K40 describe the problems that can occur with the aircraft wing maintenance operations and how these can be overcome
- K41 explain what recording documentation needs 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
- K42 describe the procedure for the safe disposal of waste materials and scrap components
- K43 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 334

Maintaining wings on aircraft ATA 57

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 335

Maintaining propeller/propulsor systems on aircraft ATA 61

RQF Reference:	K/508/6438
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft propeller/propulsor systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed and variable pitch mechanical or electrical propellers, pumps, motors, governor, alternators, and those units and components external to or integral with the engine that are used to control the propeller blade angle. It includes propeller spinner synchronizers. It also covers propulsor duct assemblies, including aerodynamic fairing of mechanical components, stators and vectoring systems. The maintenance activities will include the removal, fitting and testing of a range of propeller/propulsor system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft propeller/propulsor systems. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the propeller/propulsor system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance

activities, correcting faults and for ensuring that the propeller/propulsor system is maintained to the required standard.

They will understand the safety precautions required when working on the propeller/propulsor system, especially those for ensuring that the power system, and its fuel supply, is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 61 Propellers/Propulsors.
2. To display competence in this standard, it is necessary to both remove and fit propeller/propulsor system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance Requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills Requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft propeller/propulsor system:
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented

Outcome

- S2 Carry out maintenance on three of the following parts of the aircraft propeller/propulsor system:

- 2.1 propeller assembly
- 2.2 controls
- 2.3 feathering/reversing
- 2.4 braking
- 2.5 indicating
- 2.6 propulsor duct

Outcome

- S3 Remove and fit six different propeller/propulsor system components (at least two must be from group A):

Group A

- 3.1 propeller/blades
- 3.2 spinner/governor synchronizers
- 3.3 gearboxes

- 3.4 dome
- 3.5 drive shafts
- 3.6 brake mechanisms
- 3.7 hub
- 3.8 synchronizing shafts
- 3.9 brush block assembly
- 3.10 spinner
- 3.11 pumps
- 3.12 counter weights
- 3.13 slip ring
- 3.14 motors
- 3.15 propulsor duct assemblies
- 3.16 de-icer devices
- 3.17 governor
- 3.18 vector drive attachments
- 3.19 distributor valve
- 3.20 alternators
- 3.21 stators

Group B

- 3.22 levers/linkages
- 3.23 fairings
- 3.24 cables/harness/wiring
- 3.25 pulleys
- 3.26 covers
- 3.27 switches/plugs
- 3.28 bearings
- 3.29 prop pitch control
- 3.30 indicators and warning devices
- 3.31 seals/gaskets
- 3.32 anti-ice heater mats
- 3.33 pipes and hoses
- 3.34 de-ice tank
- 3.35 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining fluids)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 disconnect/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners

- 4.8 setting and adjusting replaced components (such as travel, working clearance)
 - 4.9 supporting equipment to be removed
 - 4.10 dismantling equipment to an appropriate level
 - 4.11 making mechanical connections
 - 4.12 covering (protecting) exposed components, wires, pipework or vents
 - 4.13 making electrical connections
 - 4.14 torque loading as required
 - 4.15 checking components for serviceability
 - 4.16 replenishing fluid systems
 - 4.17 replacing damaged/defective components
 - 4.18 carrying out rigging checks
 - 4.19 replacing single use items such as seals, filters, gaskets
 - 4.20 carrying out system functional checks
 - 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
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Outcome

- S5 Service/check aircraft propeller/propulsor systems, to include carrying out five of the following:

- 5.1 visually checking the system for damage and leaks
 - 5.2 checking and adjusting dome and unfeathering accumulators
 - 5.3 lubricating the propeller
 - 5.4 adjusting the governor
 - 5.5 checking propeller pitch control mechanisms and adjusting to establish blade angles
 - 5.6 performing static function checks
 - 5.7 checking the track
 - 5.8 checking propeller hub for cracks and/or debonding of blade leading edge cap
 - 5.9 performing a propeller runout check
 - 5.10 examining the propeller for damage and corrosion
 - 5.11 dynamically balancing the propeller
 - 5.12 dressing out blade damage
 - 5.13 checking indicating and warning systems
 - 5.14 examining the brush block assembly
 - 5.15 checking attachment of propeller and spinner for security
 - 5.16 measuring and adjusting synchro-phaser magnetic pickup gap
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Outcome

- S6 Carry out three of the following tests on the aircraft propeller/propulsor system:

- 6.1 checking that ground start mechanisms operate correctly
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- 6.2 checking accuracy of propeller RPM
- 6.3 verifying that low/high RPM is achieved
- 6.4 verifying take-off RPM
- 6.5 testing electric anti-icing system
- 6.6 built in test equipment (BITE) test
- 6.7 `special-to-type' tests

Using two of the following:

- 6.8 stroboscope
- 6.9 ground test rig
- 6.10 `special-to-type' test equipment
- 6.11 tachometer
- 6.12 built in test equipment (BITE)

Outcome

- S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
- 7.2 aircraft technical log
- 7.3 aircraft log book
- 7.4 computer records
- 7.5 aircraft cabin log

Outcome

- S8 Carry out maintenance on aircraft propeller/propulsor systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 8.3 Ministry of Defence (MoD)
- 8.4 Military Aviation Authority (MAA)
- 8.5 Aerospace Quality Management Standards (AS)
- 8.6 Federal Aviation Authority (FAA)
- 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
- 8.8 manufacturers standards and procedures

Outcome

K Knowledge and Understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft propeller/propulsor systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K3 explain the importance of maintenance on aircraft propeller systems, and impact upon (Extended Range Twin-Engine Operations Procedures) ETOPS systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft propeller/propulsor systems, and with the tools and equipment used (such as handling oils, greases, traps from moving parts, hot parts of engines, misuse of tools), and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 explain how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in aircraft propeller/propulsor systems, and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft propeller/propulsor systems, and the use of system diagrams and associated symbols
- K14 describe the basic principles of operation of the propeller/propulsor system being worked on, and the function of the units that make up the system (such as propeller assembly, blade, de-ice boot, spinner, hub, synchronizer section, braking and feathering, and propeller control and indicating)
- K15 explain the techniques used to remove components from aircraft propeller/propulsor system without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, removal of components and the need to protect the system integrity by fitting blanking plugs and ensuring that exposed components are correctly covered/protected)
- K16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections

- K18 explain the importance of ensuring that any exposed components or pipe ends are correctly covered/protected
- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K20 explain how to fit propeller/propulsor components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
- K21 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as travel and working clearance)
- K22 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K23 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K24 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K25 explain how to carry out routine checks and servicing of the aircraft propeller/propulsor system
- K26 explain the types of test to be carried out on the aircraft propeller/propulsor system, and the test equipment to be used
- K27 explain the methods and procedures to be used to carry out the various tests on the propeller/propulsor system
- K28 explain the importance of carrying out the tests in the specified sequence, checking all readings and movements at each stage
- K29 explain how to record the results of each individual test, and the documentation that must be used
- K30 explain how to analyse the test results, and make valid decisions about the acceptability of the propeller/propulsor system
- K31 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K32 explain what recording documentation needs 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
- K33 describe the procedure for the safe disposal of waste materials, scrap components and fuel/fluids
- K34 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 335

Maintaining propeller/propulsor systems on aircraft ATA 61

Supporting Information

Unit guidance

Assessment Requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 336

Maintaining rotor systems on rotorcraft ATA 62 and ATA 64

RQF Reference:	M/508/6439
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on rotorcraft main and/or tail rotors, in accordance with the approved rotorcraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers the main and tail rotor head assembly, rotor blades and blade folding system, swashplate assemblies, and the rotor shaft units if not an integral part of the gearbox. It also includes indicating systems which show operation or activation of the rotor systems. The maintenance activities will include the removal, fitting and testing of a range of main and/or tail rotor system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the rotorcraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the rotorcraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to rotorcraft main and/or tail rotor systems. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the rotor system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the main and tail rotor system is maintained to the required standard.

They will understand the safety precautions required when working on the rotor system, especially those for ensuring that the power system is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 62 Main Rotors and ATA Chapter 64 Tail Rotor.
2. To display competence in this standard, it is necessary to both remove and fit rotor system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the rotorcraft main and/or tail rotor system
- 1.1 ensure that appropriate authorisation to work on the rotorcraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, rotorcraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the rotorcraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on three of the following parts of the rotorcraft rotor system:

- 2.1 main rotor blades
- 2.2 rotor servos
- 2.3 swash plate assembly
- 2.4 tail rotor blades
- 2.5 blade folding system
- 2.6 indicating system
- 2.7 rotor heads
- 2.8 rotor shafts
- 2.9 pivoting and swivelling actuators
- 2.10 trim actuators

Outcome

S3 Remove and fit six different rotor system components (at least two must be from group A):

Group A

- 3.1 rotor blades
- 3.2 azimuth star assembly (collective pitch)
- 3.3 wobble ring
- 3.4 mast assembly
- 3.5 blade governor synchronizes
- 3.6 pitch control beam
- 3.7 clutch assembly
- 3.8 pitch change linkage
- 3.9 brake mechanisms
- 3.10 bumper/damper
- 3.11 rotor/drive shafts
- 3.12 wear/grip pads
- 3.13 coupling
- 3.14 speed governor
- 3.15 cams
- 3.16 rotor/rudder hub assembly
- 3.17 rudder blade plate
- 3.18 housings
- 3.19 rotor head
- 3.20 trunnion
- 3.21 scupper assembly
- 3.22 swash plate
- 3.23 main drive actuator
- 3.24 lead/lag damper

Group B

- 3.25 levers/linkages
- 3.26 folding hinge pin
- 3.27 anti-ice heater mats
- 3.28 pulleys
- 3.29 blade lock pin
- 3.30 fairing assemblies
- 3.31 bearings
- 3.32 control lock pin
- 3.33 balance weights
- 3.34 seals/gaskets
- 3.35 springs
- 3.36 de-icer boot
- 3.37 bolt assemblies
- 3.38 pipes and hoses
- 3.39 cable harness/wiring/switches/plugs

- 3.40 support brackets
 - 3.41 rotor head fairings
 - 3.42 indicators and warning devices
 - 3.43 lubrication tank
 - 3.44 covers
 - 3.45 other specific components
-

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing fairings to expose components to be removed
 - 4.2 carrying out fault diagnosis and system checks
 - 4.3 preparing the system for maintenance (such as isolating, draining fluids)
 - 4.4 disconnecting electrical connections
 - 4.5 refitting components in the correct position, orientation and alignment
 - 4.6 disconnecting/removing hoses and pipes
 - 4.7 removing securing devices and mechanical fasteners
 - 4.8 setting and adjusting replaced components (such as travel, working clearance)
 - 4.9 supporting equipment to be removed
 - 4.10 dismantling equipment to an appropriate level
 - 4.11 making mechanical connections
 - 4.12 covering (protecting) exposed components, wires, pipework or vents
 - 4.13 making electrical connections
 - 4.14 torque loading as required
 - 4.15 checking components for serviceability
 - 4.16 replenishing fluid systems
 - 4.17 replacing damaged/defective components
 - 4.18 carrying out system functional checks
 - 4.19 replacing single use items such as seals, filters, gaskets
 - 4.20 ensuring that replacement components have the correct part numbers
 - 4.21 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.23 carrying out area inspections prior to task close down
-

Outcome

S5 Service/check rotorcraft main and tail rotor systems, to include carrying out five of the following:

- 5.1 visually checking the system for damage and leaks
 - 5.2 adjusting main rotor trim tab
 - 5.3 adjusting the governor
 - 5.4 adjusting main/tail rotor pitch change linkage
 - 5.5 performing static function checks
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- 5.6 fitting and removing rigging pins
 - 5.7 examining main and tail rotor blades for damage and corrosion
 - 5.8 checking and adjusting main rotor control rigging
 - 5.9 checking and adjusting tail rotor control rigging
 - 5.10 carrying out blend repair to rotor blades
 - 5.11 checking indicating and warning systems
 - 5.12 replacing main rotor blade erosion tape
 - 5.13 lubricating rotor mechanism
 - 5.14 performing main rotor blade disbonding check
 - 5.15 checking spar integrity system
 - 5.16 checking main/tail rotor pitch change mechanism
 - 5.17 servicing lead/lag damper
 - 5.18 tracking/balancing the main rotor
 - 5.19 examining flapping hinge and droop stop
-

Outcome

S6 Carry out two of the following tests on the rotorcraft rotor system:

- 6.1 checking that ground start mechanisms operate correctly
- 6.2 testing electric anti-icing system
- 6.3 testing rotor braking system
- 6.4 built in test equipment (BITE) test
- 6.5 'special-to-type' tests
- 6.6 blade tracking

Using two of the following:

- 6.7 stroboscope
 - 6.8 ground test rig
 - 6.9 'special-to-type' test equipment
 - 6.10 tachometer
 - 6.11 built in test equipment (BITE)
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to

- 7.1 job cards/work sheets
 - 7.2 rotorcraft cabin log
 - 7.3 computer records
 - 7.4 rotorcraft log book
 - 7.5 rotorcraft technical log
-

Outcome

S8 Carry out maintenance on rotorcraft main and tail rotor systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Ministry of Defence (MoD)
 - 8.3 Military Aviation Authority (MAA)
 - 8.4 Aerospace Quality Management Standards (AS)
 - 8.5 Federal Aviation Authority (FAA)
 - 8.6 rotorcraft maintenance manual/approved change documentation (service bulletin)
 - 8.7 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding:

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on rotorcraft main and tail rotor systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on rotorcraft rotor systems, and impact upon legislation and local procedures
 - K3 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K4 describe 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 describe the hazards associated with carrying out maintenance activities on rotorcraft main and tail rotor systems, and with the tools and equipment used (such as handling oils, greases, traps from moving parts, hot parts of engines, misuse of tools), and how to minimise them and reduce any risk
 - K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the rotorcraft
 - K7 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the rotorcraft
 - K8 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K9 explain how to extract and use information from rotorcraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in rotorcraft main and tail rotor systems, and other documents needed in the maintenance activities
 - K10 explain how to carry out currency/issue checks on the specifications they are working with
 - K11 explain the terminology used in rotorcraft main rotor systems, and the use of system diagrams and associated symbols
 - K12 describe the basic principles of operation of the main and/or tail rotor system being worked on, and the function of the units that make up the system (such as rotor blade, rotor heads, swash plate assemblies, blade folding mechanisms, de-ice boot, blade braking and blade control and indicating)
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- K13 explain the techniques used to remove components from rotorcraft main and/or tail rotor systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, removal of components and the need to protect the system integrity by fitting blanking plugs and ensuring that exposed components are correctly covered/protected)
- K14 describe the various mechanical fasteners that will need to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K15 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K16 explain the importance of ensuring that any exposed components or pipe ends are correctly covered/protected
- K17 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K18 explain how to fit main rotor components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
- K19 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as travel and working clearance)
- K20 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K21 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K22 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K23 explain how to carry out routine checks and servicing of the rotorcraft main and/or tail rotor system
- K24 explain the types of test to be carried out on the rotorcraft main and/or tail rotor system, and the test equipment to be used
- K25 explain the methods and procedures to be used to carry out the various tests on the rotor systems
- K26 explain the importance of carrying out the tests in the specified sequence, checking all readings and movements at each stage
- K27 explain how to record the results of each individual test, and the documentation that must be used
- K28 explain how to analyse the test results and how to make valid decisions about the acceptability of the rotor system
- K29 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K30 explain what recording documentation needs 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
- K31 describe the procedure for the safe disposal of waste materials, scrap components and fuel/fluids
- K32 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 336

Maintaining rotor systems on rotorcraft ATA 62 and ATA 64

Supporting Information

Unit guidance

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 337

Maintaining rotor drive systems on rotorcraft ATA 63 and ATA 65

RQF Reference:	H/508/6440
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on rotorcraft main and/or tail drive systems, in accordance with the approved rotorcraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers the main and tail rotor drive, and includes all components transmitting power to the rotors, such as engine coupling components, drive shafts and bearings, drive supports, clutch and freewheel units, gearboxes and their components, accelerometers, vibration monitoring equipment and indicating systems which show operation or activation of the rotor systems. The maintenance activities will include the removal, fitting and testing of a range of main and/or tail rotor drive system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the rotorcraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the rotorcraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to rotorcraft main and/or tail rotor drive systems. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the rotor drive systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the

main and tail rotor drive systems are maintained to the required standard.

They will understand the safety precautions required when working on the rotor drive systems, especially those for ensuring that the power system is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 63 Main Rotor Drives and ATA Chapter 65 Tail Rotor Drive.
2. To display competence in this standard, it is necessary to both remove and fit rotor drive system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
 - 1.1 demonstrate the required behaviours in line with the job role and company objectives
 - 1.2 follow the relevant maintenance schedules to carry out the required work
 - 1.3 carry out the maintenance activities within the limits of their personal authority
 - 1.4 carry out the maintenance activities in the specified sequence and in an agreed timescale
 - 1.5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
 - 1.6 complete the relevant maintenance records accurately and pass them on to the appropriate person
 - 1.7 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to

- S1 Carry out all of the following during the maintenance of the rotorcraft main and/or tail rotor drive system
- 1.1 ensure that appropriate authorisation to work on the rotorcraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, rotorcraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the rotorcraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on three of the following parts of the rotorcraft rotor drive system

- 2.1 main rotor gearbox/transmission
- 2.2 aft vertical shaft
- 2.3 rotor braking system
- 2.4 intermediate gearbox/transmission
- 2.5 drive shaft/high speed shaft
- 2.6 rotorcraft cooling fan
- 2.7 combining gearbox/transmission
- 2.8 engine/gearbox couplings
- 2.9 accelerometer
- 2.10 nose gearbox/transmission
- 2.11 clutch/freewheel units
- 2.12 indicating system
- 2.13 tail rotor gearbox
- 2.14 other specific gearbox/transmission in the drive train

Outcome

- S3 Remove and fit six different rotor drive system components (at least two must be from group A)

Group A

- 3.1 clutch assembly
- 3.2 bearings
- 3.3 control valves
- 3.4 freewheel units
- 3.5 dynamic seals
- 3.6 vibration bars
- 3.7 clutch operating mechanisms
- 3.8 housings
- 3.9 suspension units
- 3.10 flexible couplings
- 3.11 lubricating pumps
- 3.12 mounts/attachments
- 3.13 drive shaft support
- 3.14 brake mechanisms
- 3.15 accessory drive casing
- 3.16 drive shafts

Group B

- 3.17 levers/linkages
- 3.18 accelerometers
- 3.19 mechanical controls (plungers, springs, rollers)
- 3.20 static seals/gaskets
- 3.21 drive belts and pulleys
- 3.22 anti-ice heater mats
- 3.23 bolt assemblies
- 3.24 pipes and hoses
- 3.25 cable harness/wiring/switches/plugs
- 3.26 support brackets
- 3.27 rotor drive fairings
- 3.28 electrical controls (solenoids, motors, switches)
- 3.29 chip detectors
- 3.30 gearbox covers
- 3.31 indicators and warning devices
- 3.32 control units
- 3.33 locks and stops
- 3.34 sensors
- 3.35 other specific components

Outcome

S4 Skills requirements: Carry out fifteen of the following maintenance activities

- 4.1 removing fairings and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining fluids)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 disconnecting/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 supporting equipment to be removed
- 4.10 dismantling equipment to an appropriate level
- 4.11 making mechanical connections
- 4.12 covering (protecting) exposed components, wires, pipework or vents
- 4.13 making electrical connections
- 4.14 torque loading as required
- 4.15 checking components for serviceability
- 4.16 replenishing fluid systems
- 4.17 replacing damaged/defective components
- 4.18 carrying out system functional checks
- 4.19 replacing single use items such as seals, filters, gaskets
- 4.20 ensuring that replacement components have the correct part numbers
- 4.21 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 4.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.23 carrying out area inspections prior to task close down

Outcome

S5 Skills requirements: Service/check rotorcraft main and tail rotor drive systems, to include carrying out three of the following

- 5.1 visually checking gearboxes and drive system for damage and leaks
- 5.2 checking gearbox chip detectors
- 5.3 carrying out oil drain rotor tune adjustments
- 5.4 checking and adjusting clutch mechanisms
- 5.5 checking indicating and warning systems
- 5.6 checking and adjusting braking mechanisms

Outcome

S6 Carry out three of the following tests on the rotorcraft rotor drive system:

- 6.1 visual inspection
- 6.2 Built In Test Equipment (BITE) test
- 6.3 ground run tests
- 6.4 gearbox alignment (main, tail, intermediate)
- 6.5 timings
- 6.6 leak test
- 6.7 tension adjuster check
- 6.8 vibration analysis
- 6.9 drive shaft/high speed shaft alignment
- 6.10 freedom and range of movement
- 6.11 phasing check
- 6.12 'special-to-type' tests
- 6.13 safety interlock test
- 6.14 checking gearboxes and drive systems for correct oil levels
- 6.15 static or dynamic balancing of drive shafts

Using three of the following:

- 6.16 built in test equipment (BITE)
- 6.17 use of safety locks
- 6.18 'special-to-type' test equipment
- 6.19 dial test indicator
- 6.20 plumb and bob
- 6.21 optical sight instruments
- 6.22 laser alignment
- 6.23 feeler/slip gauges
- 6.24 jigs/fixture
- 6.25 clinometers
- 6.26 'go/no go' gauge
- 6.27 wrenches/'special-to-type' appliances
- 6.28 lay straight wires
- 6.29 vibration analysis equipment

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
- 7.2 rotorcraft cabin log
- 7.3 computer records
- 7.4 rotorcraft log book
- 7.5 rotorcraft technical log

Outcome

S8 Carry out maintenance on rotorcraft main and tail rotor systems in compliance with one of the following

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Ministry of Defence (MoD)
 - 8.3 Military Aviation Authority (MAA)
 - 8.4 Aerospace Quality Management Standards (AS)
 - 8.5 Federal Aviation Authority (FAA)
 - 8.6 rotorcraft maintenance manual/approved change documentation
 - 8.7 (service bulletin)
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K.1 explain the specific safety practices and procedures that they need to observe when working on rotorcraft main and tail rotor systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K.2 explain the importance of maintenance on rotorcraft rotor drive systems, and impact upon legislation and local procedures
 - K.3 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K.4 describe 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
 - K.5 describe the hazards associated with carrying out maintenance activities on rotorcraft main and tail rotor systems, and with the tools and equipment used (such as handling oils, greases, traps from moving parts, lifting and moving heavy and bulky components, hot parts of engines, misuse of tools), and how to minimise them and reduce any risk
 - K.6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the rotorcraft
 - K.7 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the rotorcraft
 - K.8 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K.9 explain how to extract and use information from rotorcraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in rotorcraft main and tail rotor systems, and other documents needed in the maintenance activities
 - K.10 explain how to carry out currency/issue checks on the specifications they are working with
 - K.11 explain the terminology used in rotorcraft power transmission systems, and the use of system diagrams and associated symbols
 - K.12 describe the basic principles of operation of the main and/or tail rotor drive system being worked on, and the function of the units that make up the system (such as main, intermediate, tail and nose gearboxes, clutch/freewheel mechanisms, braking equipment, couplings and drive shafts and indicating systems)
-

- K.13 explain the techniques used to remove components from rotorcraft main and/or tail rotor systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, removal of components and the need to protect the system integrity by fitting blanking plugs and ensuring that exposed components are correctly covered/protected)
- K.14 describe the various mechanical fasteners that will need to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.15 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.16 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K.17 explain the importance of ensuring that any exposed components or pipe ends are correctly covered/protected
- K.18 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K.19 explain how to replace and reconnect components into the rotor power transmission system (such as the use of gaskets/seals and jointing/sealing compounds; ensuring correct orientation, position and alignment; tightening securing devices to the required torque; replacing locking and securing devices; eliminating stress on pipework/connections; ensuring that pipework and cables are correctly supported at suitable intervals; carrying out visual checks of all components)
- K.20 explain how to make adjustments to components to ensure that they function correctly (such as travel, working clearance)
- K.21 explain why securing devices need to be correctly torque loaded, locked and labelled, and the different methods that are used
- K.22 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K.23 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K.24 explain how to carry out routine checks and servicing of the rotorcraft main and/or tail rotor system
- K.25 explain the tests to be carried out on the rotorcraft power transmission system, and the test equipment to be used
- K.26 explain the methods and procedures to be used to carry out the various tests on the rotor power transmission systems
- K.27 explain the importance of carrying out the tests in the specified sequence, checking all readings/movements at each stage
- K.28 explain how to record the results of each individual test and the documentation that must be used
- K.29 explain how to analyse the test results, and how to make valid decisions about the acceptability of the rotor power transmission system
- K.30 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K.31 explain what recording documentation needs 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
- K.32 describe the procedure for the safe disposal of waste materials, scrap components and fuel/fluids

K.33 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 337

Maintaining rotor drive systems on rotorcraft ATA 63 and ATA 65

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 338

Maintaining rotor blade and tail pylon folding systems on rotorcraft ATA 66

RQF Reference:	K/508/6441
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on rotor blade and tail pylon folding systems, in accordance with the approved rotorcraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers the whole of the system for ensuring automatic or manual folding and spreading of the rotor blades and/or tail pylon, and includes the mechanical, hydraulic, electrical and indicating equipment and systems permanently fitted to the rotorcraft. The maintenance activities will include the removal, fitting and testing of a range of rotor blade and tail pylon folding system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the rotorcraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the rotorcraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to rotor blade and tail pylon folding systems. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the rotor blade and tail pylon folding systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the rotor blade and tail pylon folding systems are maintained to the required standard.

They will understand the safety precautions required when working on the rotor blade and tail pylon folding systems, especially those for ensuring that the power system is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 66 Rotor Blade and Tail Pylon Folding Systems.
2. To display competence in this standard, it is necessary to both remove and fit rotor blade and tail pylon folding system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements:

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the rotor blade and tail pylon folding system
- 1.1 ensure that appropriate authorisation to work on the rotorcraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, rotorcraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the rotorcraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the rotorcraft rotor blade and tail pylon folding system:

- 2.1 rotor blades
 - 2.2 tail pylon
 - 2.3 controls and indicating
-

Outcome

S3 Remove and fit six different rotor blade and tail pylon folding system components from the following:

- 3.1 actuators
 - 3.2 mechanical controls (plungers, springs, rollers)
 - 3.3 sensors
 - 3.4 control valves
 - 3.5 electrical controls (solenoids, motors, switches)
 - 3.6 hinge mechanisms
 - 3.7 pipes and hoses
-

- 3.8 flexible couplings
 - 3.9 fairings
 - 3.10 indicators and warning devices
 - 3.11 levers/linkages
 - 3.12 bearings
 - 3.13 cable/harness/wiring
 - 3.14 bolt assemblies
 - 3.15 static seals/gaskets
 - 3.16 switches/plugs
 - 3.17 support brackets
 - 3.18 dynamic seals
 - 3.19 locks and stops
 - 3.20 control units
 - 3.21 other specific components
-

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing fairings and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, releasing pressure, draining fluids)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 disconnecting/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 supporting equipment to be removed
- 4.10 making mechanical connections
- 4.11 dismantling equipment to an appropriate level
- 4.12 making electrical connections
- 4.13 covering (protecting) exposed components, wires, pipework or vents
- 4.14 torque loading as required
- 4.15 replenishing fluid systems
- 4.16 checking components for serviceability
- 4.17 carrying out system functional checks
- 4.18 replacing all damaged/defective components
- 4.19 replacing single use items such as seals, filters, gaskets
- 4.20 ensuring that replacement components have the correct part numbers
- 4.21 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 4.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.23 carrying out area inspections prior to task close down

Outcome

S5 Service/check and test rotor blade and tail pylon folding systems, to include carrying out three of the following:

- 5.1 visually checking folding system for damage and leaks
- 5.2 checking tracking/balance
- 5.3 checking critical fastenings for security
- 5.4 carrying out a safety interlock test
- 5.5 checking for freedom and range of movement
- 5.6 checking indicating and warning systems
- 5.7 checking and adjusting folding mechanisms
- 5.8 Built In Test Equipment (BITE) test
- 5.9 checking and adjusting locking mechanisms
- 5.10 'special-to-type' test
- 5.11 checking for vibration

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
- 6.2 rotorcraft cabin log
- 6.3 computer records
- 6.4 rotorcraft log book
- 6.5 rotorcraft technical log

Outcome

S7 Carry out maintenance on rotorcraft rotor blade and tail pylon folding systems in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 7.2 Ministry of Defence (MoD)
- 7.3 Military Aviation Authority (MAA)
- 7.4 Aerospace Quality Management Standards (AS)
- 7.5 Federal Aviation Authority (FAA)
- 7.6 aircraft maintenance manual/approved change documentation (service bulletin)
- 7.7 manufacturers standards and procedures

Outcome

K Knowledge and understanding

The learner must be able to:

- K.1 explain the specific safety practices and procedures that they need to observe when working on rotorcraft rotor blade and tail pylon folding systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K.2 explain the importance of maintenance on rotorcraft rotor blade and tail pylon folding systems, and impact upon legislation and local procedures
- K.3 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic)
- K.4 describe 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
- K.5 describe the hazards associated with carrying out maintenance activities on rotorcraft rotor blade and tail pylon folding systems, and with the tools and equipment used (such as handling oils, greases, traps from moving parts, lifting and moving heavy and bulky components, hot parts of engines, misuse of tools), and how to minimise them and reduce any risk
- K.6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the rotorcraft
- K.7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K.8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K.9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K.10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K.11 explain how to extract and use information from rotorcraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in rotorcraft rotor blade and tail pylon folding systems, and other documents needed in the maintenance activities
- K.12 explain how to carry out currency/issue checks on the specifications they are working with
- K.13 explain the terminology used in rotorcraft rotor blade and tail pylon folding systems, and the use of system diagrams and associated symbols
- K.14 describe the basic principles of operation of the rotor blade and tail pylon folding system being worked on, and the function of the units that make up the system (such as mechanisms, hydraulic actuators, electrical equipment and indicating systems)
- K.15 explain the techniques used to remove components from rotor blade and tail pylon folding systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, removal of components and the need to protect the system integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
- K.16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.18 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities

- K.19 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K.20 explain how to replace and reconnect components into the rotor blade and tail pylon folding system (such as the use of gaskets/seals; ensuring the correct orientation, position and alignment; tightening securing devices to the required torque; replacing locking and securing devices; eliminating stress on pipework/connections; ensuring that pipework and cables are correctly supported at suitable intervals; carrying out visual checks of all components)
- K.21 explain how to make adjustments to components to ensure that they function correctly (such as travel, freedom of movement and working clearance)
- K.22 explain why securing devices need to be correctly torque loaded, locked and labelled, and the different methods that are used
- K.23 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K.24 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K.25 explain how to carry out routine checks and servicing of the rotorcraft rotor blade and tail pylon folding system
- K.26 explain the tests to be carried out on the rotor blade and tail pylon folding system, and the test equipment to be used
- K.27 explain the methods and procedures to be used to carry out the various tests on the rotor blade/tail pylon folding systems
- K.28 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K.29 explain how to record the results of each individual test and the documentation that must be used
- K.30 explain how to analyse the test results, and how to make valid decisions about the acceptability of the rotor blade and tail pylon folding system
- K.31 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K.32 explain what recording documentation needs 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
- K.33 describe the procedure for the safe disposal of waste materials, scrap components and fuel/fluids
- K.34 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 338

Maintaining rotor blade and tail pylon folding systems on rotorcraft ATA 66

Supporting Information

Unit Range Description

Assessments requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 339

Maintaining flight control systems on rotorcraft ATA 67

RQF Reference:	M/508/6442
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on rotorcraft flight control systems, in accordance with the approved rotorcraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It includes units and components which manually control the flight attitude and characteristics of the rotorcraft. The maintenance activities will include the removal, fitting and testing of a range of rotorcraft flight control components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed, fitted and tested. The rotorcraft flight control components will include items such as control linkage and control cables for collective pitch, cyclic pitch, directional control, servo controls and corresponding systems. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the rotorcraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the rotorcraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to rotorcraft flight control systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the rotorcraft flight control system maintenance requirements. They will know how the rotorcraft flight controls functions, the common problems that can occur, the purpose of

the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on rotorcraft flight control systems, especially those for isolating the equipment, lifting and handling control components. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 67 Rotors Flight Controls.
2. To display competence in this standard, it is necessary to both remove and fit rotorcraft flight control system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P1 demonstrate the required behaviours in line with the job role and company objectives
- P2 demonstrate the required behaviours in line with the job role and company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the rotorcraft flight control system
- 1.1 ensure that appropriate authorisation to work on the rotorcraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, rotorcraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 ensure the safe isolation of the control system before commencing work on the equipment
 - 1.7 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.8 use approved removal, fitting and testing techniques and procedures at all times
 - 1.9 leave the rotorcraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.10 return tools and equipment to the correct storage location on completion of the activities
 - 1.11 ensure that work carried out is correctly documented and recorded
 - 1.12 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following rotorcraft flight control systems:

- 2.1 main rotor control
- 2.2 tilt rotor flight control
- 2.3 servo control
- 2.4 tail rotor control
- 2.5 anti-torque rotor control (yaw control)
- 2.6 rotor flight control system wiring

Outcome

S3 Remove and fit four different rotorcraft flight control system components (at least three must be from group A):

Group A

- 3.1 collective pitch lever
- 3.2 actuators
- 3.3 gradient boxes

- 3.4 cyclic pitch stick
- 3.5 blade pitch change rods
- 3.6 Auxiliary Servo Equipment (ASE)
- 3.7 rudder pedals
- 3.8 mixer box/units
- 3.9 primary servo jack
- 3.10 swash plate
- 3.11 artificial feel units
- 3.12 primary flight computers
- 3.13 torque tubes
- 3.14 elevator
- 3.15 Stability Augmentation System (SAS)
- 3.16 magnetic brakes

Group B

- 3.17 cables and pulleys
- 3.18 levers and linkages
- 3.19 turnbuckles
- 3.20 position transmitters
- 3.21 control rods
- 3.22 actuators/motors/servos
- 3.23 locks and stops
- 3.24 return springs
- 3.25 position transmitters
- 3.26 bell cranks/quadrants
- 3.27 sensors
- 3.28 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, releasing stored pressure)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removing securing devices and mechanical fasteners
- 4.7 supporting equipment to be removed
- 4.8 setting and adjusting replaced components
- 4.9 dismantling equipment to an appropriate level
- 4.10 making mechanical connections
- 4.11 covering (protecting) exposed components, wires, pipework or vents
- 4.12 making electrical connections
- 4.13 torque loading as required
- 4.14 checking components for serviceability

- 4.15 carrying out functional checks of the system
 - 4.16 replacing damaged/defective components
 - 4.17 ensuring that replacement components have the correct part numbers
 - 4.18 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.19 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.20 carrying out area inspections prior to task close down
-

Outcome

S5 Carry out five of the following types of test/check on the rotorcraft flight control systems::

- 5.1 check collective system rigging
- 5.2 Built In Test Equipment (BITE) test
- 5.3 pre-flight tests
- 5.4 check cyclic system rigging
- 5.5 check controls for operation and sense
- 5.6 check anti-torque system rigging
- 5.7 timings
- 5.8 static friction check
- 5.9 cable tension check
- 5.10 leak test
- 5.11 adjust blade trim tab
- 5.12 safety interlock test
- 5.13 'special-to-type' tests
- 5.14 check blade track/balance
- 5.15 adjust pitch links

Using two of the following:

- 5.16 Built In Test Equipment (BITE)
 - 5.17 ground support equipment
 - 5.18 'special-to-type' test equipment
 - 5.19 aircraft power supply/displays and gauges
 - 5.20 use of safety locks
 - 5.21 measuring equipment
-

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
-

Outcome

S7 Carry out maintenance on rotorcraft flight control systems in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Ministry of Defence (MoD)
 - 7.3 Military Aviation Authority (MAA)
 - 7.4 Aerospace Quality Management Standards (AS)
 - 7.5 Federal Aviation Authority (FAA)
 - 7.6 rotorcraft maintenance manual/approved change documentation (service bulletin)
 - 7.7 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on rotorcraft flight control systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on rotorcraft flight control systems, and impact upon legislation and local procedures
 - K3 describe the hazards associated with removing, fitting and testing rotorcraft flight control system components, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the rotorcraft
 - K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K10 explain how to extract and use information from rotorcraft maintenance manuals, log books, flight logs, and other documents needed in the maintenance process
 - K11 explain how to carry out currency/issue checks on the specifications they are working with
 - K12 explain the terminology used in rotorcraft flight control systems, and the use of system diagrams and associated symbols
 - K13 describe the basic principles of operation of the rotorcraft flight control system being worked on, and the function of the various units/components within the system
 - K14 explain the techniques used to remove components from rotorcraft flight control systems without damage to the components or surrounding structure (such as release of pressures/force, proof marking, extraction of components, and the need to protect the system
-

- integrity by fitting blanking plugs and ensuring that exposed components are correctly covered/protected)
- K15 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
 - K16 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
 - K17 explain the importance of applying electrostatic discharge (ESD) avoidance procedures when working on sensitive equipment or devices
 - K8 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
 - K19 explain the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics
 - K20 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
 - K21 explain how to replace and reconnect components into the system (such as ensuring the correct orientation, position and alignment; tightening securing devices to the required torque; replacing locking and securing devices; eliminating stress on pipework/connections; ensuring that pipework and cables are correctly supported at suitable intervals; carrying out visual checks of all components)
 - K22 explain how to make adjustments to components/assemblies to ensure that they function correctly
 - K23 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
 - K24 explain the purpose of symmetry and rigging checks; how they are carried out; how to locate the rigging points and faces; and the use of incidence boards
 - K25 explain how to carry out routine checks and servicing of the rotorcraft flight control system
 - K26 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic)
 - K27 explain the types of test to be carried out on the rotorcraft flight control system, and the test equipment to be used
 - K28 explain the methods and procedures to be used to carry out the various tests on the rotorcraft flight control system
 - K29 explain the importance of carrying out the tests in the specified sequence, checking all readings and movements at each stage
 - K30 explain how to record the results of each individual test, and the documentation that must be used
 - K31 explain how to analyse the test results and make valid decisions about the acceptability of the flight control systems
 - K32 describe the procedures to be followed if the equipment or system fails to meet the test specification
 - K33 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
 - K34 describe the problems that can occur with the flight control system maintenance operations and how these can be overcome
 - K35 explain what recording documentation needs 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
 - K36 describe the procedure for the safe disposal of waste materials and scrap components

K37 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 339

Maintaining flight control systems on rotorcraft ATA 67

Supporting Information

Unit guidance

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 340

Maintaining power plant on aircraft ATA 71

RQF Reference:	R/508/6448
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft power plant, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the overall power package/engine dressing, inclusive of engine air intakes, engine mounts, cowling, scoops and cowl flaps. It does not cover engine strip down and maintenance activities, which are covered in other standards/ATA chapters. The maintenance activities will include carrying out a complete engine change, and the removal, fitting and testing of a range of power plant components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft power plant. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the power plant maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the aircraft power plant is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft power plant, especially those for ensuring that the power plant, and its fuel supply, is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 71 Aircraft Power Plant.

2. To display competence in this standard, it is necessary to both remove and fit aircraft power plant components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft power plant system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.1 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.2 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.3 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
 - 1.4 ensure the safe isolation and draining of fuel and oil pipes/lines before breaking into the system
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out both of the following activities:

- 2.1 contribute significantly to an engine removal
- 2.2 contribute significantly to an engine installation

Plus: Carry out maintenance on three of the following parts of the aircraft power plant:

- 2.3 cowling/containment
- 2.4 fireseals and shrouds
- 2.5 engine air intakes
- 2.6 engine mounts
- 2.7 electrical harness
- 2.8 engine drains
- 2.9 attached fittings
- 2.10 nozzles and jet pipes
- 2.11 reverse thrust
- 2.12 exhaust components

Outcome

- S3 Remove and fit four different aircraft power plant components (at least two must be from group A):

Group A

- 3.1 accessory section cowls
- 3.2 scoops
- 3.3 flame arrestors vents
- 3.4 nose ring cowls
- 3.5 actuators
- 3.6 fire wire
- 3.7 compressor fan cowls
- 3.8 engine mounts
- 3.9 fire detection units
- 3.10 buried engine ducts
- 3.11 vibration dampers
- 3.12 fire bottle
- 3.13 vortex generators
- 3.14 drain lines
- 3.15 electrical plugs/sockets
- 3.16 cowl flaps
- 3.17 manifolds
- 3.18 conduits
- 3.19 cowling supports
- 3.20 tanks
- 3.21 position indicators
- 3.22 hydraulic pump
- 3.23 Integrated Drive Generator (IDG)
- 3.24 starter
- 3.25 nozzle exhaust
- 3.26 Fuel Control/Metering Unit (FCU/FMU)
- 3.27 air intake
- 3.28 fan blades

Group B

- 3.29 attachment and locking mechanisms
- 3.30 fittings and brackets
- 3.31 cable harness/wiring/switches/plugs
- 3.32 cables
- 3.33 indicators and warning devices
- 3.34 rod assemblies/levers and linkages
- 3.35 engine mounting bolts
- 3.36 support links
- 3.37 seals
- 3.38 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing cowling and containment covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining fluids)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removal of bonding
- 4.7 disconnecting/removing hoses and pipes
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 removing securing devices and mechanical fasteners
- 4.10 supporting equipment to be removed
- 4.11 making mechanical connections
- 4.12 dismantling equipment to an appropriate level
- 4.13 making electrical connections
- 4.14 covering (protecting) exposed components, wires, pipework or vents
- 4.15 carrying out bonding
- 4.16 torque loading as required
- 4.17 checking components for serviceability
- 4.18 replenishing fluid systems
- 4.19 replacing damaged/defective components
- 4.20 carrying out system functional checks
- 4.21 replacing single use items such as seals, filters, gaskets
- 4.22 ensuring that replacement components have the correct part numbers
- 4.23 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 4.24 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.25 carrying out area inspections prior to task close down

Outcome

S5 Service/check aircraft power plant, to include carrying out five of the following:

- 5.1 visually checking power plant for damage and leaks
- 5.2 checking cowl flap rigging
- 5.3 checking fastenings/security of all power plant access panels/cowls
- 5.4 checking indicating and warning systems
- 5.5 carrying out nozzle rigging
- 5.6 examining engine mounting bolt assemblies
- 5.7 checking the starting system

Outcome

S6 Assist in carrying out an engine ground run test, to include carrying out all of the following:

- 6.1 checking that the aircraft is correctly parked in authorised position for a ground run
- 6.2 positioning all required safety equipment prior to ground run
- 6.3 carrying out prescribed pre-start and start procedures
- 6.4 ground running an engine in accordance with maintenance manual and local authority requirements/regulations
- 6.5 checking and recording all specified parameters
- 6.6 shutting down the engine in accordance with specified procedures

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
- 7.2 aircraft cabin log
- 7.3 computer records
- 7.4 aircraft log book
- 7.5 aircraft technical log

Outcome

S8 Carry out maintenance on aircraft power plant in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 8.3 Ministry of Defence (MoD)
- 8.4 Military Aviation Authority (MAA)
- 8.5 Aerospace Quality Management Standards (AS)
- 8.6 Federal Aviation Authority (FAA)
- 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
- 8.8 manufacturers standards and procedures

Outcome

K Knowledge and understanding

The learner must be able to:

- K.1 explain the specific safety practices and procedures that they need to observe when working on aircraft power plant (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K.2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)

- K.3 explain the importance of maintenance on aircraft power plant, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K.4 describe 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
- K.5 describe the hazards associated with carrying out maintenance activities on aircraft power plant, and with the tools and equipment used (such as handling oils, greases, aviation fuel, the safe release of fuel and other fluids, traps from moving parts, hot parts of engines, misuse of tools), and how to minimise them and reduce any risk
- K.6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K.7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K.8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K.9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K.10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K.11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in aircraft power plant, and other documents in the maintenance activities
- K.12 explain how to carry out currency/issue checks on the specifications they are working with
- K.13 explain the terminology used in aircraft power plant, and the use of system diagrams and associated symbols
- K.14 describe the basic principles of operation of the power plant being worked on, and the function of the units that make up the system
- K.15 explain the techniques used to remove power plant and power plant components without damage to the components or surrounding structure (such as release of pressures/force, draining of fuel/fluids, removal of components and the need to protect the system integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
- K.16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.18 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K.19 explain how to remove and refit aircraft power plant components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
- K.20 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as travel and working clearance)
- K.21 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K.22 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K.23 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities

- K.24 explain the routine checks and tests to be carried out on the aircraft power plant
- K.25 explain how to conduct engine ground runs and the engine data/parameters to be recorded
- K.26 explain the importance of carrying out the engine ground run in accordance with the aircraft manual and regulations
- K.27 explain how to record the results of the engine ground run and the documentation that must be used
- K.28 explain how to analyse the ground run results and how to make valid decisions about the acceptability of the aircraft power unit under test
- K.29 explain the procedures to be followed if the power plant fails to meet the ground run specification
- K.30 describe the procedure for the safe disposal of waste materials, scrap components and fuel/fluids
- K.31 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 340

Maintaining power plant on aircraft ATA 71

Supporting Information

Unit guidance

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional Information

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 that meets their own business 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

Unit 341

Maintaining turbine engines on aircraft ATA 72

RQF Reference:	Y/508/6449
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft turbine engines, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the general maintenance requirements. It does not cover complete engine overhaul, for which other standards are available. The maintenance activities will include carrying out the removal, fitting and testing of a range of turbine engine components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft turbine engines. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the turbine engine maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the aircraft turbine engine is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft turbine engines, especially those for ensuring that

the engine, and its fuel supply, is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 72 Aircraft Turbine Engines.
2. To display competence in this standard, it is necessary to both remove and fit aircraft turbine engine components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to

- S1 Carry out all of the following during the maintenance of the aircraft turbine engine
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation and draining of fluid lines before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on one of the following types of aircraft turbine engine:

- 2.1 turbo prop
- 2.2 un-ducted fan
- 2.3 turbo-shaft
- 2.4 ducted fan
- 2.5 turbo jet
- 2.6 turbo-fan

Outcome

S3 Carry out maintenance on two of the following parts of the aircraft turbine engine:

- 3.1 air intake section
- 3.2 turbine section
- 3.3 reverse thrust
- 3.4 air inlet section
- 3.5 fan section
- 3.6 propulsor section (rear mounted)

- 3.7 compressor section
 - 3.8 accessory drives
 - 3.9 nozzles and jet pipes
 - 3.10 combustion section
 - 3.11 by-pass section
 - 3.12 reduction gear and shaft section (turboprop or front-mounted driven propulsor)
-

Outcome

- S4 Remove and fit six different aircraft turbine engine components (at least two must be from Group A):

Group A

- 4.1 drive shafts
- 4.2 gearboxes/gearbox housing
- 4.3 annulus fillers/sealing strips
- 4.4 reduction gears
- 4.5 drive tubs/shafts
- 4.6 attrition linings
- 4.7 propulsor blades
- 4.8 oil pump assembly
- 4.9 compressor support structural fairings
- 4.10 guide vanes
- 4.11 compressor spinners
- 4.12 shrouds
- 4.13 curvic couplings
- 4.14 bearing housing end cover
- 4.15 rotor/stator fan blades
- 4.16 nose cone support rings
- 4.17 bearings
- 4.18 burner cans
- 4.19 front and rear blade root chocking pads
- 4.20 cooling air manifold
- 4.21 turbine nozzles
- 4.22 bearing support assembly
- 4.23 valves (such as oil tank check)
- 4.24 hydraulic pump
- 4.25 integrated drive generator (IDG)
- 4.26 starter
- 4.27 nozzle exhaust
- 4.28 fuel control/meter unit (FCU/FMU)
- 4.29 air intake

Group B

- 4.30 attachment and locking mechanisms
 - 4.31 fittings and brackets
 - 4.32 fairings
 - 4.33 rod assemblies/levers and linkages
-

- 4.34 cables
 - 4.35 cable harness/wiring/switches/plugs
 - 4.36 support links
 - 4.37 nose cowl
 - 4.38 indicators and warning devices
 - 4.39 mounting bolts
 - 4.40 seals
 - 4.41 other specific components
-

Outcome

S5 Carry out fifteen of the following maintenance activities

- 5.1 removing cowling and fairings to expose components to be removed
 - 5.2 carrying out inspections, fault diagnosis and system checks
 - 5.3 preparing the system for maintenance (such as isolating, draining fluids)
 - 5.4 disconnecting electrical connections
 - 5.5 refitting components in the correct position, orientation and alignment
 - 5.6 disconnecting/removing hoses and pipes
 - 5.7 removing securing devices and mechanical fasteners
 - 5.8 setting and adjusting replaced components
 - 5.9 supporting equipment to be removed
 - 5.10 making mechanical connections
 - 5.11 dismantling equipment to an appropriate level
 - 5.12 making electrical connections
 - 5.13 covering (protecting) exposed components, wires, pipework or vents
 - 5.14 torque loading as required
 - 5.15 replenishing fluid systems
 - 5.16 checking components for serviceability
 - 5.17 carrying out system functional checks
 - 5.18 replacing damaged/defective components
 - 5.19 replacing single use items such as seals, filters, gaskets
 - 5.20 ensuring that replacement components have the correct part numbers
 - 5.21 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 5.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 5.23 carrying out area inspections prior to task close down
-

Outcome

S6 Service/check aircraft turbine engines, to include carrying out four of the following:

- 6.1 visually checking the system for damage and leaks
 - 6.2 checking fastenings/security of all engine access panels/cowls
 - 6.3 checking and cleaning rotor and compressor blades (compressor washing)
 - 6.4 oil replenishment
-

- 6.5 carrying out vibration checks
 - 6.6 carrying out blade tip clearance checks
 - 6.7 carrying out transient acoustic propagation (TAP) test of rotor/compressor blades
-

Outcome

- S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people

- 7.1 job cards/work sheets
 - 7.2 aircraft cabin log
 - 7.3 computer records
 - 7.4 aircraft log book
 - 7.5 aircraft technical log
-

Outcome

- S8 Carry out maintenance on aircraft turbine engines in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

- K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft turbine engines (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K3 explain the importance of maintenance on aircraft turbine engines, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft turbine engines, and with the tools and equipment used (such as handling oils, greases, the safe release
-

- of fuel and other fluids, traps from moving parts, hot parts of engines, misuse of tools) and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Flying Object Debris (FOD) to the safety of the aircraft
 - K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in aircraft turbine engines, and other documents in the maintenance activities
 - K12 explain how to carry out currency/issue checks on the specifications they are working with
 - K13 explain the terminology used in aircraft turbine engines, and the use of system diagrams and associated symbols
 - K14 describe the basic principles of operation of the turbine engine being worked on, and the function of the units that make up the system
 - K15 explain the techniques used to remove turbine engine components without damage to the components or surrounding structure (such as release of pressures/force, draining of fuel/fluids, removal of components and the need to protect the system integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
 - K16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
 - K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
 - K18 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
 - K19 explain how to remove and refit aircraft turbine engine components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
 - K20 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as blade tip clearance)
 - K21 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
 - K22 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
 - K23 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
 - K24 explain the routine checks and tests to be carried out on the aircraft turbine engine
 - K25 explain how to record the results of the checks and tests, and the documentation that must be used
 - K26 explain how to analyse the checks and tests, and make valid decisions about the acceptability of the aircraft turbine engine
 - K27 describe the procedure for the safe disposal of waste materials, scrap components and fuel/fluids

K28 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 341

Maintaining turbine engines on aircraft ATA 72

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 342

Maintaining reciprocating engines on aircraft ATA 72

Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft reciprocating engines, both spark and compression ignition, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the general maintenance requirements. It does not cover complete engine overhaul, for which other standards are available. The maintenance activities will include carrying out the removal, fitting and testing of a range of reciprocating engine components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft reciprocating engines. They will understand the component removal, fitting and testing methods and procedures, and their application, along with the reciprocating engines maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the aircraft reciprocating engine is maintained to the required standard.

They will understand the safety precautions required when working on the aircraft reciprocating engines, especially those for ensuring that the engine, and its fuel supply, is safely and correctly isolated. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 72 Aircraft Reciprocating Engines.
2. To display competence in this standard, it is necessary to both remove and fit aircraft reciprocating engine components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements:

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft reciprocating engine
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation and draining of fluid lines before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from fluid spillages, damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on one of the following types of aircraft reciprocating engine:

- 2.1 in-line engine
- 2.2 vee engine
- 2.3 rotary engine
- 2.4 horizontally-opposed engine
- 2.5 in-line engine
- 2.6 vee engine

Outcome

S3 Carry out maintenance on three of the following parts of the aircraft reciprocating engine:

- 3.1 front section (drive)
- 3.2 cylinder section
- 3.3 lubrication system
- 3.4 power section
- 3.5 supercharger section
- 3.6 power recovery section

Outcome

- S4 Remove and fit six different aircraft reciprocating engine components (at least three must be from group A):

Group A

- 4.1 cylinder heads
- 4.2 oil pump assembly
- 4.3 pushrods
- 4.4 carburettor systems
- 4.5 cylinder liners
- 4.6 reduction gear
- 4.7 timing mechanisms
- 4.8 valve mechanisms
- 4.9 fly wheel
- 4.10 piston assemblies
- 4.11 shell bearings
- 4.12 bearing housing end cover
- 4.13 torque converter
- 4.14 camshaft assemblies
- 4.15 injector mechanisms
- 4.16 ball/roller bearings
- 4.17 gearbox
- 4.18 crank shafts
- 4.19 turbo/supercharger
- 4.20 manifolds

Group B

- 4.21 springs
- 4.22 pipes and unions
- 4.23 fittings and brackets
- 4.24 sump pans
- 4.25 filters/strainers
- 4.26 pulleys and sprockets
- 4.27 seals and gaskets
- 4.28 belts and chains
- 4.29 other specific components

Outcome

- S5 Carry out fifteen of the following maintenance activities:

- 5.1 removing cowling and fairings to expose components to be removed
- 5.2 carrying out inspections, fault diagnosis and system checks
- 5.3 preparing the system for maintenance (such as isolating, draining fluids)
- 5.4 disconnecting electrical connections
- 5.5 refitting components in the correct position, orientation and alignment

- 5.6 disconnecting/removing hoses and pipes
 - 5.7 removing securing devices and mechanical fasteners
 - 5.8 setting and adjusting replaced components (such as valve clearance, bearing end float)
 - 5.9 supporting equipment to be removed
 - 5.10 dismantling equipment to an appropriate level
 - 5.11 making mechanical connections
 - 5.12 covering (protecting) exposed components, wires, pipework or vents
 - 5.13 making electrical connections
 - 5.14 torque loading as required
 - 5.15 checking components for serviceability
 - 5.16 replenishing fluid systems
 - 5.17 replacing damaged/defective components
 - 5.18 carrying out system functional checks
 - 5.19 replacing single use items such as seals, filters, gaskets
 - 5.20 ensuring that replacement components have the correct part numbers
 - 5.21 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 5.22 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 5.23 carrying out area inspections prior to task close down
-

Outcome

S6 Service/check aircraft reciprocating engines, to include carrying out five of the following:

- 6.1 visually checking the system for damage and leaks
 - 6.2 checking fastenings/security of all engine access panels/cowls
 - 6.3 testing and, where appropriate, changing ignition plugs
 - 6.4 carrying out compression checks
 - 6.5 checking and adjusting fuel and ignition timing
 - 6.6 checking and adjusting valve clearance
 - 6.7 checking reference RPM
 - 6.8 checking magnetic chip detectors/filters, and examining foreign matter
 - 6.9 checking and, where appropriate, changing high tension leads
 - 6.10 checking and replenishing oil levels
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 aircraft cabin log
 - 7.3 computer records
 - 7.4 aircraft log book
 - 7.5 aircraft technical log
-

Outcome

S8 Carry out maintenance on aircraft reciprocating engines in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding:

The learner must be able to:

- K.1 explain the specific safety practices and procedures that they need to observe when working on aircraft reciprocating engines (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K.2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K.3 explain the importance of maintenance on aircraft reciprocating engines and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K.4 describe 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
 - K.5 describe the hazards associated with carrying out maintenance activities on aircraft reciprocating engines, and with the tools and equipment used (such as handling oils, greases, the safe release of fuel and other fluids, traps from moving parts, hot parts of engines, misuse of tools), and how to minimise them and reduce any risk
 - K.6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K.7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K.8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K.9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K.10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K.11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in aircraft reciprocating engines, and other documents needed in the maintenance activities
-

- K.12 explain how to carry out currency/issue checks on the specifications they are working with
- K.13 explain the terminology used in aircraft reciprocating engines, and the use of system diagrams and associated symbols
- K.14 describe the basic principles of operation of the reciprocating engine being worked on, and the function of the units that make up the system
- K.15 explain the techniques used to remove reciprocating engine components without damage to the components or surrounding structure (such as release of pressures/force, draining of fuel/fluids, removal of components and the need to protect the system integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
- K.16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.18 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K.19 explain how to remove and refit aircraft reciprocating engine components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
- K.20 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as valve clearance, ignition timing, belt/chain tension)
- K.21 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K.22 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K.23 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K.24 explain the routine checks and tests to be carried out on the aircraft reciprocating engine
- K.25 explain how to record the results of the checks and tests, and the documentation that must be used
- K.26 explain how to analyse the checks and tests, and how to make valid decisions about the acceptability of the aircraft reciprocating engine
- K.27 describe the procedure for the safe disposal of waste materials, scrap components and fuel/fluids
- K.28 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 342

Maintaining reciprocating engines on aircraft ATA 72

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 343

Maintaining engine fuel and control systems on aircraft ATA 73

Unit level:	Level 3
GLH:	133

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft engine fuel and control systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers fixed wing and rotary winged aircraft, and includes both turbine and reciprocating engines. For turbine engines, it covers those units and components and associated mechanical systems or electrical circuits which deliver or control fuel to the engine beyond the main fuel quick disconnect. This includes engine driven fuel pumps and filter assembly, main and thrust augmentation fuel controls, electronic temperature datum control, temperature datum valve, fuel manifold, fuel nozzles, fuel enrichment system, speed sensitivity switch, relay box assembly and solenoid drip valves. For reciprocating engines, it covers those units and components which deliver metered fuel and air to the engine, and includes the carburettor master control from the inlet side to the discharge nozzles, injection pumps, carburettor, injection nozzles and fuel primer. The air portion includes units and components from the scoop inlet to the vapour return and impeller chamber. The maintenance activities will include the removal, fitting and testing of a range of engine fuel system components. They will be expected to use the approved procedure for correctly isolating the fuel supply and the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft engine fuel and control systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the engine fuel and control system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft engine fuel and control systems, especially those for ensuring the system cleanliness and the avoidance of spillage, fire and explosion. 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.

Notes:

This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 73 Engine Fuel and Control

To display competence in this standard, it is necessary to both remove and fit aircraft engine fuel and control system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements:

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale

- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
 - P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
 - P8 dispose of waste materials in accordance with safe working practices and approved procedures
-

Outcome

S1 Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft engine fuel and control system
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment, breathing apparatus and other relevant safety regulations and procedures to realise a safe system of work
 - 1.5 ensure the safe isolation and ventilation of the fuel equipment before breaking into the system
 - 1.6 ensure that the relevant safety devices, mechanical/physical locks and external signage are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft engine fuel and control system:

- 2.1 distribution
 - 2.2 controlling and governing
 - 2.3 indicating
-

Outcome

- S3 Remove and fit six different aircraft engine fuel and control system components (at least two must be from group A)::

Group A

- 3.1 control valves (such as fuel return, temperature datum, solenoid drip, burner staging)
- 3.2 engine driven pump
- 3.3 rotor alternator
- 3.4 hydro-mechanical units
- 3.5 fuel nozzles
- 3.6 fuel manifold
- 3.7 servo fuel heater
- 3.8 injector nozzles
- 3.9 fuel primer
- 3.10 relay box assembly
- 3.11 turbine governor
- 3.12 carburettor
- 3.13 valves
- 3.14 fuel flow divider
- 3.15 injector pump
- 3.16 solenoids
- 3.17 stator alternator
- 3.18 engine fuel/oil cooler
- 3.19 electronic control unit
- 3.20 engine control unit
- 3.21 engine interface unit

Group B

- 3.22 pipes/hose assemblies
- 3.23 fuel pressure indicating devices
- 3.24 levers and linkages
- 3.25 differential fuel switch
- 3.26 cables and pulleys
- 3.27 fuel flow indicating devices
- 3.28 actuators
- 3.29 safety devices
- 3.30 fuel filters
- 3.31 fuel flow sensor/transmitter
- 3.32 temperature regulator
- 3.33 gaskets and seals

Outcome

S4 Carry out fifteen of the following maintenance activities::

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining and removing fuel)
- 4.4 disconnecting electrical connections
- 4.5 replacing single use items such as seals, filters, gaskets
- 4.6 disconnecting/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners
- 4.8 refitting components in the correct position, orientation and alignment
- 4.9 supporting equipment to be removed
- 4.10 dismantling equipment to an appropriate level
- 4.11 making mechanical connections
- 4.12 covering (protecting) exposed components, wires, pipework or vents
- 4.13 making electrical connections
- 4.14 torque loading as required
- 4.15 checking components for serviceability
- 4.16 charging and bleeding the fuel system
- 4.17 replacing damaged/defective components
- 4.18 carrying out system functional checks
- 4.19 ensuring that replacement components have the correct part numbers
- 4.20 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.22 carrying out area inspections prior to task close down

Outcome

S5 Service/check the aircraft engine fuel and control system, to include carrying out three of the following

- 5.1 checking the system for leaks
- 5.2 checking and cleaning/replacing filters
- 5.3 cleaning injector nozzles
- 5.4 checking carburettor float setting
- 5.5 checking fuel/meter control unit (FCU/FMU)
- 5.6 adjust/rigging throttle box
- 5.7 cleaning/testing fuel nozzles
- 5.8 adjusting automatic mixture control (AMC)
- 5.9 adjusting ABC
- 5.10 checking indicating systems (such as fuel flow, fuel pressure and temperature warning)

Outcome

S6 Carry out two of the following tests on the aircraft engine fuel and control system

- 6.1 leak test
- 6.2 built in test equipment (BITE) test
- 6.3 fuel pressure test
- 6.4 'special-to-type' tests
- 6.5 fuel flow test
- 6.6 engine run

Using one of the following:

- 6.7 aircraft power source/system
 - 6.8 ground test rig
 - 6.9 'special to type' test equipment
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people

- 7.1 job cards/work sheets
 - 7.2 aircraft cabin log
 - 7.3 computer records
 - 7.4 aircraft log book
 - 7.5 aircraft technical log
-

Outcome

S8 Carry out maintenance on aircraft engine fuel and control systems in compliance with one of the following

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding:

The learner must be able to:

- K.1 explain the specific safety practices and procedures that they need to observe when carrying out maintenance activities on aircraft engine fuel and control systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K.2 explain the importance of maintenance on aircraft engine fuel and control systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K.3 explain the safety procedures that must be carried out before work is started on removing the engine fuel and control system components (such as displaying warning notices, ensuring adequate firefighting equipment)
- K.4 describe 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
- K.5 describe the hazards associated with removing aircraft engine fuel and control system components, and with the tools and equipment used (such as handling fluids, flammable fluids, fire and explosion, misuse of tools) and how to minimise them and reduce any risk
- K.6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K.7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K.8 explain how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K.9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K.10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K.11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft engine fuel and control systems, and other documents needed in the maintenance process
- K.12 explain how to carry out currency/issue checks on the specifications they are working with
- K.13 explain the terminology used in aircraft engine fuel and control systems
- K.14 describe the various types of pipe and component that make up the aircraft engine fuel and control system (such as rigid pipes; flexible hoses; valves, pumps, injector nozzles, governor, fuel heater, fuel and oil cooler, mechanical and electrical control and indicating devices)
- K.15 describe the basic principles of operation of the aircraft engine fuel and control system being worked on, and the function of the various units/components within the system
- K.16 explain the techniques used to remove components from aircraft engine fuel and control systems without damage to the components or surrounding structure (such as release of pressures/force, draining of fluids, proof marking, and the protecting circuit integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
- K.17 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K.18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K.19 explain the methods of lifting and supporting the components/equipment during the maintenance activities

- K.20 explain how to recognise of contaminants, and the problems they can create; the effects and likely symptoms of contamination in the engine fuel system
- K.21 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K.22 explain how to fit components into the circuit (such as the use of gaskets/seals; ensuring the correct tightness of pipe fittings and connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking the security of joints and that the system is safe to refuel)
- K.23 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as flow and pressure settings and their effect on the engine fuel system)
- K.24 explain why electrical bonding is critical and why it must be both mechanically and electrically secure
- K.25 explain why securing devices need to be correctly torque loaded, locked and labelled, and the different methods used
- K.26 explain how to carry out routine checks and servicing of the aircraft engine fuel and control system (including checking for leaks, checking and changing filters, checking and cleaning injectors and fuel nozzles)
- K.27 explain the types of test to be carried out on the aircraft engine fuel system and the test equipment to be used
- K.28 explain the methods and procedures to be used to carry out the various tests on the engine fuel and control system
- K.29 explain the importance of carrying out tests in the specified sequence and checking/recording the results at each stage
- K.30 explain how to record the results of each individual test and the documentation that must be used
- K.31 explain how to analyse the test results, and how to make valid decisions about the acceptability of the aircraft engine fuel and control system
- K.32 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K.33 explain what recording documentation needs 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

Unit 343

Maintaining engine fuel and control systems on aircraft ATA 73

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Unit 344

Maintaining ignition systems on aircraft ATA 74

RQF Reference:	Y/508/6452
Unit level:	Level 3
GLH:	147

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft ignition systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes units and components which generate the electrical power, control and provide or distribute high and low voltage electrical current to ignite the fuel air mixture in the cylinders of reciprocating engines or in the combustion chambers or thrust augmentation of turbine engines. The maintenance activities will include the removal, fitting and testing of a range of ignition system components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The aircraft ignition components will include items such as induction vibrators, magnetos, distributors, excitors, booster coils, transformers, storage capacitors, spark plugs, igniters, ignition harness and other associated wiring and switches. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft ignition systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the

purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the ignition system is maintained to the required standard

They will understand the safety precautions required when working on the aircraft ignition systems, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 74 Ignition.
2. To display competence in this standard, it is necessary to both remove and fit aircraft ignition system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft ignition system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft ignition system:

- 2.1 generation of high and low voltage electrical power supply
 - 2.2 distribution of the power supply (ignition harness)
 - 2.3 ignition switching/isolation
-

Outcome

S3 Remove and fit six different ignition system components (at least two must be from group A):

Group A

- 3.1 magneto
 - 3.2 high energy ignition units
 - 3.3 exciters
 - 3.4 ignition switches
 - 3.5 distributor
 - 3.6 low tension coil
 - 3.7 transformers
-

- 3.8 capacitors
- 3.9 ignition/induction vibrator
- 3.10 ignition relays
- 3.11 ignition harness
- 3.12 booster coils

Group B

- 3.13 spark plugs
- 3.14 low tension leads
- 3.15 transducers/sensors
- 3.16 glow plugs
- 3.17 electrical plugs/sockets
- 3.18 wires/cables
- 3.19 high tension leads
- 3.20 igniters

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 making mechanical connections
- 4.6 removal of bonding
- 4.7 making electrical connections
- 4.8 removing cable securing devices
- 4.9 carrying out bonding
- 4.10 removing securing devices and mechanical fasteners
- 4.11 installing cable securing devices
- 4.12 supporting equipment to be removed
- 4.13 torque loading as required
- 4.14 dismantling equipment to an appropriate level
- 4.15 setting and adjusting replaced components (such as spark plug gap, distributor settings, ignition timing, igniter plug immersion depth)
- 4.16 covering (protecting) exposed components, wires, pipework or vents
- 4.17 checking components for serviceability
- 4.18 replacing all damaged/defective components
- 4.19 refitting components in the correct position, orientation and alignment
- 4.20 ensuring that replacement components have the correct part numbers
- 4.21 carrying out functional checks of the system
- 4.22 labelling (and storing in the correct location) components that require repair or overhaul
- 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.24 carrying out area inspections prior to task close down

Outcome

S5 Carry out two of the following types of check/test on the aircraft ignition system:

- 5.1 test spark plugs
- 5.2 check HT leads
- 5.3 built in test equipment BITE test
- 5.4 test glow plugs
- 5.5 ignition timing
- 5.6 'special-to-type' tests
- 5.7 check ignition unit
- 5.8 test igniters

Using one of the following:

- 5.9 stroboscope
- 5.10 aircraft power source
- 5.11 'special-to-type' test sets
- 5.12 measuring equipment (such as gap gauges)

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people

- 6.1 job cards/work sheets
- 6.2 computer records
- 6.3 aircraft technical log
- 6.4 aircraft cabin log
- 6.5 aircraft log book

Outcome

S7 Carry out maintenance on aircraft ignition systems in compliance with one of the following

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 7.3 Ministry of Defence (MoD)
- 7.4 Military Aviation Authority (MAA)
- 7.5 Aerospace Quality Management Standards (AS)
- 7.6 Federal Aviation Authority (FAA)
- 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
- 7.8 manufacturers standards and procedures

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working with aircraft ignition systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the importance of maintenance on aircraft ignition systems, and impact upon Extended Range Twin-Engine Operations explain the procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K3 describe the hazards associated with removing, fitting and testing aircraft ignition system components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft ignition systems, and other documents needed in the maintenance process
- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 explain the terminology used in aircraft ignition systems, and the use of system diagrams and associated symbols
- K13 describe the basic principles of operation of the ignition system being worked on, and the function of the various units within the system
- K14 describe the various mechanical fasteners that are used, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K15 explain the importance of using the specified fasteners for the installation and why they must not substitute others
- K16 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K17 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the techniques used to remove components from aircraft ignition systems without damage to the components or surrounding structure
- K20 explain the importance of applying electrostatic discharge (ESD) avoidance procedures when working on sensitive equipment or devices

- K21 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K22 explain the techniques used to position, align, adjust and secure the replaced components without damage to the components or surrounding structure
- K23 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities
- K24 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K25 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K26 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K27 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K28 describe the problems that can occur with the maintenance operations, and how these can be overcome
- K29 explain how to recognise defects (such as incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K30 explain how to carry out routine checks and servicing of the aircraft ignition system (including adjusting plug gaps and checking ignition timing)
- K31 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before working on the ignition system
- K32 explain the types of test to be carried out on the aircraft ignition system and the test equipment to be used
- K33 explain the methods and procedures to be used to carry out the various tests on the ignition system
- K34 explain how to record the results of each individual test and the documentation that must be used
- K35 explain how to analyse the test results and how to make valid decisions about the acceptability of the ignition system
- K36 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K37 explain what recording documentation needs 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
- K38 describe the procedure for the safe disposal of waste materials and scrap components
- K39 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 344

Maintaining ignition systems on aircraft ATA 74

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 345

Maintaining bleed air systems on aircraft ATA 75

RQF Reference:	D/508/6453
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft engine bleed air systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which go together to conduct air to the extension shaft and torque meter assembly. It includes compressor bleed systems used to control flow of air through the engine, cooling air systems and heated air systems for engine anti-icing. It does not include aircraft anti-icing, engine starting systems, or exhaust supplementary air systems, which are covered in other standards/ATA chapters. The maintenance activities will include the removal, fitting and testing of a range of engine bleed air system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft engine bleed air systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the bleed air systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft bleed air systems, especially those for isolating the equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 75 Bleed Air.
2. To display competence in this standard, it is necessary to both remove and fit aircraft engine bleed air system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to

- S1 Carry out all of the following during the maintenance of the aircraft engine bleed air system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft engine bleed air system:

- 2.1 engine anti-icing
 - 2.2 compressor bleed valve
 - 2.3 engine cooling
 - 2.4 bleed air indicating
 - 2.5 compressor bleed control
 - 2.6 bleed air system wiring
 - 2.7 compressor bleed governor
 - 2.8 nozzle control system
-

Outcome

S3 Remove and fit four different aircraft engine bleed air system components (at least one must be from group A):

Group A

- 3.1 jet pump
 - 3.2 valves
 - 3.3 vortex spoiler
-

- 3.4 compressor
- 3.5 actuators
- 3.6 Air Motor Servo Units (AMSU)
- 3.7 governor
- 3.8 regulator

Group B

- 3.9 levers and linkages
- 3.10 air filters
- 3.11 cables/harness/wiring
- 3.12 control mechanisms
- 3.13 sensors/transmitters
- 3.14 plugs/sockets/switches
- 3.15 ducting
- 3.16 warning devices (temperature, pressure)
- 3.17 pipes and hoses
- 3.18 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections (where applicable)
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 disconnect/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 supporting equipment to be removed
- 4.10 dismantling equipment to an appropriate level
- 4.11 making mechanical connections
- 4.12 covering (protecting) exposed components, wires, pipework or vents
- 4.13 making electrical connections
- 4.14 torque loading as required
- 4.15 checking components for serviceability
- 4.16 replacing all damaged/defective components
- 4.17 replacing single use items such as seals, filters, gaskets
- 4.18 carrying out system functional checks
- 4.19 ensuring that replacement components have the correct part numbers
- 4.20 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.22 carrying out area inspections prior to task close down

Outcome

S5 Service/check the aircraft bleed air system, to include carrying out four of the following:

- 5.1 inspecting engine anti-icing system
 - 5.2 inspecting variable stator blades
 - 5.3 checking and adjusting compressor bleed governor
 - 5.4 checking and adjusting pressure regulator
 - 5.5 checking bleed air indicating systems (such as pressure, temperature, control positions)
 - 5.6 checking Blow-Off Valve (BOV)
 - 5.7 checking compressor control bleed valves/mechanisms
-

Outcome

S6 Carry out two of the following tests on the aircraft bleed air system:

- 6.1 leak test
- 6.2 reduced system test
- 6.3 pressure test
- 6.4 movement tests (such as range, timing, sequencing)
- 6.5 'special-to-type' tests
- 6.6 built in test equipment (BITE) test

Using one of the following:

- 6.7 aircraft power source/system
 - 6.8 ground test rig
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft engine bleed air systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
-

- 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft bleed air systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K3 explain the importance of maintenance on aircraft bleed air systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft bleed air systems, and with the tools and equipment used (such as hot parts of engines, traps from moving parts, misuse of tools), and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft pneumatic systems, and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft bleed air systems, and the use of system diagrams and associated symbols
- K14 describe the basic principles of operation of the aircraft bleed air system being worked on (such as system layout, engine cooling, engine anti-icing, compressor control and indication and warning)
- K15 explain the techniques used to remove components from aircraft bleed air systems without damage to the components or surrounding structure (such as release of pressures/force, removal of components and the need to protect the circuit integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
- K16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, Special securing devices)

- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K18 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K19 explain how to fit components into the circuit (such as ensuring correct position and orientation; correct the tightness of fittings and connections; eliminating stress on pipework, cables and connections; carrying out visual checks of all components)
- K20 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K21 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K22 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K23 explain how to carry out routine checks and servicing of the aircraft bleed air system (including checking the engine anti-icing system, the compressor bleed governor and the variable stator blades)
- K24 explain the types of test to be carried out on the aircraft bleed air system and the test equipment to be used
- K25 explain the methods and procedures to be used to carry out the various tests on the bleed air system
- K26 explain how to record the results of the tests and the documentation that must be used
- K27 explain how to analyse the test results and how to make valid decisions about the acceptability of the aircraft bleed air system
- K28 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K29 explain what recording documentation needs 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
- K30 describe the procedure for the safe disposal of waste materials and scrap components
- K31 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 346

Maintaining engine controls on aircraft ATA 76

RQF Reference:	H/508/6454
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft engine control systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It includes units and components which govern operation of the engine, and includes units and components that are interconnected for emergency shutdown. The maintenance activities will include the removal, fitting and testing of a range of engine control components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed, fitted and tested. The aircraft engine control components will include items such as linkages, cables, levers, pulleys, switches and wiring. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft engine control systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the aircraft engine control system maintenance requirements. They will know how the aircraft engine controls function, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting

faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft engine control systems, especially those for isolating the equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 76 Engine Controls.
2. To display competence in this standard, it is necessary to both remove and fit aircraft engine control system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft engine control system
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 ensure the safe isolation of the engine control system before commencing work on the equipment
 - 1.7 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.8 use approved removal, fitting and testing techniques and procedures at all times
 - 1.9 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.10 return tools and equipment to the correct storage location on completion of the activities
 - 1.11 ensure that work carried out is correctly documented and recorded
 - 1.12 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft engine control systems:

- 2.1 engine synchronizing
- 2.2 emergency shutdown
- 2.3 mixture control
- 2.4 engine control system wiring
- 2.5 power control
- 2.6 variable air intake
- 2.7 throttles
- 2.8 nozzle control system
- 2.9 start system
- 2.10 fuel/air control
- 2.11 reverse thrust
- 2.12 engine bypass

Outcome

S3 Remove and fit four different aircraft engine control system components from the following:

- 3.1 cables and pulleys
- 3.2 levers and linkages
- 3.3 turnbuckles
- 3.4 sensors
- 3.5 connecting rods
- 3.6 actuators
- 3.7 jack screws
- 3.8 cables/harness/wiring
- 3.9 position transmitters
- 3.10 motors
- 3.11 locks and stops
- 3.12 plugs/sockets/switches
- 3.13 start valve
- 3.14 servos
- 3.15 bell cranks
- 3.16 Fuel Control/Meter Unit (FCU/FMU)
- 3.17 other specific components

Outcome

S4 Skills requirements: Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 removing securing devices and mechanical fasteners
- 4.7 supporting equipment to be removed
- 4.8 setting and adjusting replaced components (such as freedom of movement, cable tension)
- 4.9 dismantling equipment to an appropriate level
- 4.10 covering (protecting) exposed components, wires, pipework or vents
- 4.11 making mechanical connections
- 4.12 making electrical connections
- 4.13 checking components for serviceability
- 4.14 torque loading as required
- 4.15 replacing damaged/defective components
- 4.16 carrying out functional checks of the system
- 4.17 ensuring that replacement components have the correct part numbers
- 4.18 labelling (and storing in the correct location) components that require repair or overhaul
- 4.19 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.20 carrying out area inspections prior to task close down

Outcome

S5 Carry out three of the following types of test/check on the aircraft engine control systems:

- 5.1 rig thrust lever
- 5.2 rig/check reverse thrust
- 5.3 rig RPM control
- 5.4 rig/check bypass
- 5.5 rig mixture high pressure cock lever
- 5.6 check cable tension
- 5.7 rig power lever
- 5.8 adjust pedestal micro switches
- 5.9 check control synchronization (multi-engine)
- 5.10 check range and sense of operation of controls
- 5.11 engine run
- 5.12 'special-to-type' tests
- 5.13 rig/check variable intake
- 5.14 Built In Test Equipment (BITE) test

Using two of the following:

- 5.15 Built In Test Equipment (BITE)
- 5.16 ground support equipment
- 5.17 'special-to-type' test equipment
- 5.18 aircraft power supply/displays and gauges
- 5.19 use of safety locks
- 5.20 measuring equipment

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
- 6.2 computer records
- 6.3 aircraft technical log
- 6.4 aircraft cabin log
- 6.5 aircraft log book

Outcome

S7 Carry out maintenance on aircraft engine control systems in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
- 7.3 Ministry of Defence (MoD)

- 7.4 Military Aviation Authority (MAA)
 - 7.5 Aerospace Quality Management Standards (AS)
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft engine control systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft engine controls, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K3 describe the hazards associated with removing, fitting and testing aircraft engine control system components, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K10 explain how to extract and use information from aircraft maintenance manuals, log books, flight logs, and other documents needed in the maintenance process
 - K11 explain how to carry out currency/issue checks on the specifications they are working with
 - K12 explain the terminology used in aircraft engine control systems, and the use of system diagrams and associated symbols
 - K13 describe the basic principles of operation of the aircraft engine control system being worked on, and the function of the various units/components within the system
 - K14 explain the techniques used to remove components from aircraft engine control systems without damage to the components or surrounding structure (such as proof marking, extraction of components and the need to protect the system integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
 - K15 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
 - K16 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
 - K17 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices
-

- K18 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K19 explain the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics
- K20 explain the need to replace items such as seals and gaskets
- K21 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K22 explain how to replace and reconnect components into the system (such as ensuring the correct orientation, position and alignment; tightening securing devices to the required torque; replacing locking and securing devices; eliminating stress on pipework/connections; ensuring that pipework and cables are correctly supported at suitable intervals; carrying out visual checks of all components)
- K23 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel)
- K24 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K25 explain how to carry out routine checks and servicing of the aircraft engine control system
- K26 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K27 explain the types of test to be carried out on the aircraft engine control system, and the test equipment to be used
- K28 explain the methods and procedures to be used to carry out the various tests on the engine control system
- K29 explain the importance of carrying out the tests in the specified sequence, checking all readings and movements at each stage
- K30 explain how to record the results of the checks and tests, and the documentation that must be used
- K31 explain how to analyse the test results and make valid decisions about the acceptability of the engine control systems
- K32 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K33 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K34 describe the problems that can occur with the aircraft engine control system maintenance operations and how these can be overcome
- K35 explain what recording documentation needs 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
- K36 describe the procedure for the safe disposal of waste materials and scrap components
- K37 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 346

Maintaining engine controls on aircraft ATA 76

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 347

Maintaining engine indicating systems on aircraft ATA 77

RQF Reference:	K/508/6455
Unit level:	Level 3
GLH:	168

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft engine indicating systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes units, components and associated systems which indicate engine operation. The units and components will include indicators, transmitters, analyzers, phase detectors, instruments/gauges, amplifiers, generators, display units, transmitters, receivers and computers. The maintenance activities will include the removal, fitting and testing of a range of aircraft engine indicating system components. They will be expected to use the approved procedure for correctly isolating the circuit/system, and to remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft engine indicating systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the engine indicating systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft engine indicating systems. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 77 Engine Indicating Systems.
2. To display competence in this standard, it is necessary to both remove and fit aircraft engine indicating system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft engine indicating systems
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation of the engine indicating systems before breaking into the system circuit
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 where appropriate, apply Electrostatic Discharge (ESD) avoidance procedures
 - 1.8 use approved removal, fitting and testing techniques and procedures at all times
 - 1.9 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.10 return tools and equipment to the correct storage location on completion of the activities
 - 1.11 ensure that work carried out is correctly documented and recorded
 - 1.12 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on four of the following parts of the aircraft engine indicating systems

- 2.1 power indicating system
- 2.2 Engine Revs Per Minute (RPM)
- 2.3 inter turbine temperature
- 2.4 Engine Pressure Ratio (EPR)
- 2.5 cylinder head temperature
- 2.6 chip detection
- 2.7 engine brake mean effective pressure/torque
- 2.8 engine exhaust gas temperature
- 2.9 bleed air
- 2.10 turbine inlet temperature
- 2.11 ignition analyzer
- 2.12 Manifold Pressure (MP)
- 2.13 turbine blade temperature
- 2.14 vibration analyzer

- 2.15 oil pressure indication
 - 2.16 Nf tacho
 - 2.17 integrated instrument systems
 - 2.18 fuel flow indication
 - 2.19 Ng tacho
 - 2.20 engine temperature
 - 2.21 engine oil pressure/ temperature/quantity
 - 2.22 system wiring
-

Outcome

- S3 Remove and fit four different aircraft indicating/recording system components (at least two must be from group A)

Group A

- 3.1 display units
- 3.2 amplifiers
- 3.3 analysers
- 3.4 computers
- 3.5 generators (such as pulse, speed/tacho, tone)
- 3.6 phase detectors
- 3.7 instruments/gauges
- 3.8 thermocouples

Group B

- 3.9 transmitters (such as temperature, flow, pressure, vibration)
 - 3.10 relays
 - 3.11 wires/cables
 - 3.12 capacitance units
 - 3.13 plugs/sockets
 - 3.14 receivers
 - 3.15 transducers/sensors
 - 3.16 switches (such as micro, proximity)
 - 3.17 circuit breakers
 - 3.18 input and follow-up devices
 - 3.19 other specific components
-

Outcome

- S4 Carry out fifteen of the following maintenance activities

- 4.1 removing access panels and covers to expose components to be removed
 - 4.2 carrying out fault diagnosis and system checks
 - 4.3 preparing the system for maintenance (such as isolating)
 - 4.4 disconnecting electrical connections
 - 4.5 refitting components in the correct position, orientation and alignment
-

- 4.6 removal of bonding
 - 4.7 removing cable securing devices
 - 4.8 setting and adjusting replaced components (such as zero, range, travel, clearance)
 - 4.9 removing securing devices and mechanical fasteners
 - 4.10 supporting equipment to be removed
 - 4.11 making mechanical connections
 - 4.12 dismantling equipment to an appropriate level
 - 4.13 making electrical connections
 - 4.14 covering (protecting) exposed components, wires, pipework or vents
 - 4.15 carrying out bonding
 - 4.16 torque loading
 - 4.17 checking components for serviceability
 - 4.18 installing cable securing devices
 - 4.19 replacing damaged/defective components
 - 4.20 carrying out functional checks of the system
 - 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
-

Outcome

S5 Carry out two of the following tests on the aircraft engine indicating systems

- 5.1 continuity check
- 5.2 leak test
- 5.3 voltage check
- 5.4 engine run
- 5.5 comparison check
- 5.6 Built In Test Equipment BITE test
- 5.7 vibration analysis
- 5.8 'special-to-type' tests
- 5.9 functional test

Using two of the following:

- 5.10 measuring equipment
 - 5.11 'special-to-type' test sets
 - 5.12 external power source (such as electrical/hydraulic)
 - 5.13 aircraft power source (such as electrical/hydraulic)
 - 5.14 pitot/static pump/digital air data test equipment
-

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
-

Outcome

- S7 Carry out maintenance on aircraft engine indicating systems in compliance with one of the following

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 7.3 Ministry of Defence (MoD)
 - 7.4 Military Aviation Authority (MAA)
 - 7.5 Aerospace Quality Management Standards (AS)
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 manufacturers standards and procedures
-

Outcome

- K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft indication and recording systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K3 explain the importance of maintenance on aircraft engine indicating systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K4 describe 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 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K6 describe the hazards associated with carrying out maintenance activities on aircraft engine indication systems, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K7 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K8 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K9 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
-

- K10 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft indication and recording systems, and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft engine indication systems, and the use of system diagrams and associated symbols
- K14 describe the basic principles of operation of the engine indicating system being worked on, and the function of the various units that make up the system
- K15 explain the techniques used to remove components from the aircraft engine indicating systems without damage to the components or surrounding structure (such as removal of components and the need to protect the circuit integrity by labelling and covering exposed circuits)
- K16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K18 explain the importance of applying electrostatic discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K20 explain how to fit equipment and components into the system (such as ensuring the correct position and orientation; ensuring the correct tightness of fastenings; eliminating stress on cables; correctly making electrical connections; carrying out visual checks of all components)
- K21 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as zero, range, travel and working clearance)
- K22 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K23 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K24 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K25 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K26 explain how to carry out routine checks and servicing of the aircraft engine indicating system (including checking for security of equipment)
- K27 explain the types of test to be carried out on the aircraft engine indicating system (such as continuity, voltage) and the test equipment to be used
- K28 explain the methods and procedures to be used to carry out the various tests on the engine indicating system
- K29 explain how to record the results of each individual test and the documentation that must be used
- K30 explain how to analyse the test results and how to make valid decisions about the acceptability of the aircraft engine indicating systems
- K31 describe the procedures to be followed if the equipment or system fails to meet the test specification

- K32 explain what recording documentation needs 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
- K33 describe the procedure for the safe disposal of waste materials and scrap components
- K34 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 347

Maintaining engine indicating systems on aircraft ATA 77

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 348

Maintaining engine exhaust systems on aircraft ATA 78

RQF Reference:	M/508/6456
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft engine exhaust systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the portion of the system which directs the engine exhaust gases overboard. For turbine engines, it includes units external to the basic engine, such as thrust reverser and noise suppressor. For reciprocating engines, it includes augmentation, stacks and clamps. It does not include exhaust driven turbines which are covered in other standards/ATA chapters. The maintenance activities will include the removal, fitting and testing of a range of engine exhaust system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft engine exhaust systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the exhaust systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft engine exhaust systems, especially those for isolating the equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 78 Engine Exhaust.
2. To display competence in this standard, it is necessary to both remove and fit aircraft engine exhaust system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft engine exhaust system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft engine exhaust system

- 2.1 collector/tailpipe/nozzle
 - 2.2 supplementary air
 - 2.3 noise suppressor
 - 2.4 engine exhaust system wiring
 - 2.5 thrust reverser
-

Outcome

S3 Remove and fit four different aircraft engine exhaust system components (at least one must be from group A)

Group A

- 3.1 collector rings
 - 3.2 actuators
 - 3.3 jet pipe
 - 3.4 exhaust mixer ducts
 - 3.5 clamshells
 - 3.6 exhaust cone
-

- 3.7 thrust augmentation ducts
- 3.8 tertiary air doors
- 3.9 shroud assembly
- 3.10 variable nozzles
- 3.11 service panels/fairings
- 3.12 trimmers
- 3.13 integrated nozzle assembly

Group B

- 3.14 levers and linkages
- 3.15 pipes and hoses
- 3.16 cables/harness/wiring
- 3.17 control mechanisms
- 3.18 air filters
- 3.19 plugs/sockets/switches
- 3.20 ducting
- 3.21 springs
- 3.22 position indicators/warning devices
- 3.23 baffles
- 3.24 shields
- 3.25 seals
- 3.26 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections (where applicable)
- 4.5 refitting components in the correct position, orientation and alignment
- 4.6 disconnect/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners
- 4.8 setting and adjusting replaced components (such as travel, working clearance)
- 4.9 supporting equipment to be removed
- 4.10 dismantling equipment to an appropriate level
- 4.11 making mechanical connections
- 4.12 covering (protecting) exposed components, wires, pipework or vents
- 4.13 making electrical connections
- 4.14 torque loading as required
- 4.15 checking components for serviceability
- 4.16 carrying out system functional checks
- 4.17 replacing damaged/defective components
- 4.18 replacing single use items such as seals, filters, gaskets
- 4.19 ensuring that replacement components have the correct part numbers

- 4.20 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.22 carrying out area inspections prior to task close down
-

Outcome

S5 Service/check the aircraft engine exhaust system, to include carrying out three of the following:

- 5.1 inspecting the Integrated Nozzle Assembly (INA) (such as for cracks, distortion, dents/damage to acoustical lining)
 - 5.2 inspecting the collector nozzle system
 - 5.3 inspecting the exhaust cone (such as cracks, dents, nicks or scores, distortion)
 - 5.4 inspecting the exhaust gasket
 - 5.5 checking and adjusting trimmers
 - 5.6 carrying out a pressure check of the cabin heater muff
 - 5.7 checking exhaust indicating systems (such as control positions)
-

Outcome

S6 Carry out two of the following tests on the aircraft engine exhaust system:

- 6.1 leak test
- 6.2 movement tests (such as range, timing, sequencing)
- 6.3 pressure test
- 6.4 Built In Test Equipment (BITE) test
- 6.5 'special-to-type' tests

Using one of the following:

- 6.6 aircraft power supply/systems
 - 6.7 ground test rig
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft engine exhaust systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft engine exhaust systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K3 explain the importance of maintenance on aircraft engine exhaust systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft engine exhaust systems, and with the tools and equipment used (such as hot parts of engines, traps from moving parts, misuse of tools), and how to minimise them and reduce any risk
 - K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft engine exhaust systems, and other documents needed in the maintenance activities
 - K12 explain how to carry out currency/issue checks on the specifications they are working with
-

- K13 explain the terminology used in aircraft engine exhaust systems, and the use of system diagrams and associated symbols
- K14 describe the basic principles of operation of the aircraft engine exhaust system being worked on (such as system layout, noise suppression, thrust reverser, supplementary air control, and indication and warning)
- K15 explain the techniques used to remove components from aircraft engine exhaust systems without damage to the components or surrounding structure (such as release of pressures/force, removal of components and the need to protect the circuit integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
- K16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K18 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K19 explain how to fit components into the system (such as ensuring the correct position and orientation; correct tightness of fittings and connections; eliminating stress on pipework, cables and connections; carrying out visual checks of all components)
- K20 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K21 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K22 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting travel and freedom of movement)
- K23 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K24 explain how to carry out routine checks and servicing of the aircraft engine exhaust system (including checking the security of critical fasteners, checking the condition of the exhaust gasket, pressure checking the cabin heater muff)
- K25 explain the types of test to be carried out on the aircraft engine exhaust system, and the test equipment to be used
- K26 explain the methods and procedures to be used to carry out the various tests on the exhaust system
- K27 explain how to record the results of the tests, and the documentation that must be used
- K28 explain how to analyse the test results, and how to make valid decisions about the acceptability of the aircraft exhaust system
- K29 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K30 explain what recording documentation needs 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
- K31 describe the procedure for the safe disposal of waste materials and scrap components
- K32 describe the extent of their own authority, and to whom they should report if they have problems that they cannot resolve

Unit 348

Maintaining engine exhaust systems on aircraft ATA 78

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 349

Maintaining lubricating oil systems on aircraft ATA 79

RQF Reference:	T/508/6457
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft lubricating oil systems, in accordance with the aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components external to the engine, which store and deliver lubricating oil to and from the engine. It includes units and components from the lubricating oil engine outlet to the inlet, including the inlet and outlet fittings, tanks, radiators, valves, and the auxiliary oil systems. The maintenance activities will include the removal, fitting and testing of a range of lubricating oil system components. They will be expected to use the approved procedure for correctly isolating the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft lubricating oil systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the lubricating oil system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for

ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft lubricating oil systems, especially those for ensuring system cleanliness and the avoidance of oil spillage. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 79 Lubricating Oil.
2. To display competence in this standard, it is necessary to both remove and fit aircraft lubricating oil system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

1 Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft lubricating oil system
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure the safe isolation of the lubricating oil equipment before breaking into the system
 - 1.6 ensure that the relevant safety devices, mechanical/physical locks and external signage are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from oil spillage, damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

- S2 Carry out maintenance on two of the following parts of the aircraft lubricating oil system:

- 2.1 storage
 - 2.2 cooling
 - 2.3 indicating
 - 2.4 distribution
 - 2.5 pressure/regulation
 - 2.6 system wiring
-

Outcome

- S3 Remove and fit four different aircraft lubricating oil system components (at least one must be from group A):

Group A

- 3.1 control valves (such as drain, bleed, change over, fire wall, dump)
 - 3.2 main oil tanks
 - 3.3 scavenge pump
 - 3.4 regulators (temperature, flow)
 - 3.5 auxiliary oil tank
 - 3.6 oil cooling units
 - 3.7 tank interconnectors
-

- 3.8 primary or secondary pressure pump
- 3.9 radiator
- 3.10 oil transmitter units (such as pressure, temperature, quantity)
- 3.11 oil distribution block/manifold
- 3.12 valves (such as oil pressure relief, shut-off)
- 3.13 oil tubes and connectors

Group B

- 3.14 pipes/hoses
- 3.15 pressure switches
- 3.16 ventilating components
- 3.17 oil filler necks and caps
- 3.18 safety devices
- 3.19 sensors
- 3.20 magnetic chip detectors (MCD)
- 3.21 wires/cables
- 3.22 solenoids
- 3.23 gaskets and seals
- 3.24 plugs/sockets
- 3.25 oil filters
- 3.26 MCD housings
- 3.27 strainer (pressure pump)
- 3.28 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining and removing oil)
- 4.4 disconnecting electrical connections
- 4.5 replacing single use items such as seals, filters, gaskets
- 4.6 disconnecting/removing hoses and pipes
- 4.7 removing securing devices and mechanical fasteners
- 4.8 refitting components in the correct position, orientation and alignment
- 4.9 supporting equipment to be removed
- 4.10 dismantling equipment to an appropriate level
- 4.11 making mechanical connections
- 4.12 covering (protecting) exposed components, wires, pipework or vents
- 4.13 making electrical connections
- 4.14 torque loading as required
- 4.15 checking components for serviceability
- 4.16 charging and bleeding the system
- 4.17 replacing damaged/defective components
- 4.18 carrying out system functional checks

- 4.19 ensuring that replacement components have the correct part numbers
 - 4.20 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.22 carrying out area inspections prior to task close down
-

Outcome

S5 Service/check the aircraft lubricating oil system, to include carrying out three of the following:

- 5.1 checking the system for leaks
 - 5.2 checking and cleaning/replacing filters/strainers
 - 5.3 flushing out the oil system
 - 5.4 checking and replenishing the oil system
 - 5.5 examining engine oil tubes for damage or leaks
 - 5.6 checking calibration of oil quantity gauges (labelling or other methods)
 - 5.7 checking, and where applicable, adjusting pressure relief valve
 - 5.8 checking indicating systems (such as temperature warning, oil level, oil pressure)
-

Outcome

S6 Carry out three of the following tests on the aircraft lubricating oil system:

- 6.1 leak test
- 6.2 checking contents of magnetic chip indicators against specification
- 6.3 oil level/contents check
- 6.4 oil sampling/check
- 6.5 'special-to-type' tests
- 6.6 Built In Test Equipment (BITE) test

Using one of the following:

- 6.7 oil sampling devices
 - 6.8 MCD particle analysis equipment
 - 6.9 aircraft power source/system
 - 6.10 ground test rig (such as air flow)
 - 6.11 'special to type' test equipment
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 aircraft cabin log
 - 7.3 computer records
 - 7.4 aircraft log book
 - 7.5 aircraft technical log
-

Outcome

S8 Carry out maintenance on aircraft lubricating oil systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 8.3 Ministry of Defence (MoD)
 - 8.4 Military Aviation Authority (MAA)
 - 8.5 Aerospace Quality Management Standards (AS)
 - 8.6 Federal Aviation Authority (FAA)
 - 8.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when carrying out maintenance activities on aircraft lubricating oil systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft lubricating oil systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K3 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
 - K4 describe 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 describe the hazards associated with removing aircraft engine lubrication system components, and with the tools and equipment used (such as handling oils and fluids, misuse of tools), and how to minimise them and reduce any risk
 - K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft lubricating oil systems, and other documents in the maintenance process
 - K12 explain how to carry out currency/issue checks on the specifications they are working with
-

- K13 explain the terminology used in aircraft lubricating oil systems, and the use of system diagrams and associated symbols
- K14 describe the various types of pipe and component that make up the aircraft lubricating oil system (such as rigid pipes; flexible hoses; pipe connectors; pipe sealing and supporting devices; valves used for flow, pressure control and bypass; oil pumps (such as main pressure, secondary and scavenger); oil coolers and radiators; mechanical and electrical control devices)
- K15 describe the basic principles of operation of the aircraft lubricating oil system being worked on, and the function of the various units/components within the system
- K16 explain the techniques used to remove components from aircraft lubricating oil systems without damage to the components or surrounding structure (such as release of pressures, draining of fluids, proof marking, extraction of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)
- K17 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the methods of lifting, and supporting the components/equipment during the removal and replacement activities
- K20 explain how to recognise contaminants, and the problems they can create; the effects and likely symptoms of contamination in the lubricating oil system
- K21 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K22 explain how to fit components into the circuit (such as the use of gaskets/seals and jointing/sealing compounds; ensuring the correct tightness of pipe fittings and connections; eliminating stress on pipework/connections; carrying out visual checks of all components; checking the security of joints and that the system is safe to refill)
- K23 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as flow and pressure settings, and their effect on the system, travel and working clearance)
- K24 explain why bonding is critical, and why it must be both mechanically and electrically secure
- K25 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the methods to be used
- K26 explain how to carry out routine checks and servicing of the aircraft lubricating oil system (including checking for leaks, checking and changing filters, checking the calibration of oil quantity gauges)
- K27 explain the types of test to be carried out on the aircraft lubricating oil system, and the test equipment to be used
- K28 explain the methods and procedures to be used to carry out the various tests on the lubricating oil system
- K29 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K30 explain how to record the results of each individual test and the documentation that must be used
- K31 explain how to analyse the test results and how to make valid decisions about the acceptability of the aircraft lubricating oil system
- K32 explain the procedures to be followed if the equipment or system fails to meet the test specification

- K33 explain what recording documentation needs 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
- K34 describe the procedure for the safe disposal of waste materials, scrap components and waste oil
- K35 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 349

Maintaining lubricating oil systems on aircraft ATA 79

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 350

Maintaining engine starting systems on aircraft ATA 80

RQF Reference:	A/508/6458
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft engine starting systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers units and components used for starting the engine, including electrical, inertia air or other starter systems. It does not include ignition systems, which are covered in other standards/ATA chapters. The maintenance activities will include the removal, fitting and testing of a range of starter system components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The aircraft starting system components will include items such as starters, actuators, valves, solenoids, clutch assembly, ring gear, electrical modules and controls and other associated wiring and switches. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft starting systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in

adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the starting system is maintained to the required standard.

They will understand the safety precautions required when working on aircraft starting systems, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 80 Starting.
2. To display competence in this standard, it is necessary to both remove and fit aircraft starter system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft engine starting system.
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on three of the following parts of the aircraft starting system:

- 2.1 engine cranking
 - 2.2 engine starter
 - 2.3 start valves/controls
 - 2.4 starter system wiring
-

Outcome

S3 Remove and fit four different starter system components (at least two must be from group A):

Group A

- 3.1 starter
 - 3.2 actuator
 - 3.3 solenoid
 - 3.4 starter Quick Attach-detach Adapter (QAD)
 - 3.5 solenoid valve
 - 3.6 electrical/electronic modules
-

- 3.7 starter control valve
- 3.8 cluster gear assembly
- 3.9 air/hydraulic modules
- 3.10 butterfly valve
- 3.11 clutch mechanism
- 3.12 starter harness
- 3.13 pistons
- 3.14 ring gear
- 3.15 starter switch
- 3.16 cartridge start
- 3.17 starter relay

Group B

- 3.18 static or dynamic seals
- 3.19 springs
- 3.20 wires/cables
- 3.21 coupling clamps
- 3.22 start valve filter
- 3.23 electrical plugs/sockets
- 3.24 transducers/sensors
- 3.25 other specific components

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating)
- 4.4 disconnecting electrical connections
- 4.5 making mechanical connections
- 4.6 removal of bonding
- 4.7 making electrical connections
- 4.8 removing cable securing devices
- 4.9 carrying out bonding
- 4.10 removing securing devices and mechanical fasteners
- 4.11 installing cable securing devices
- 4.12 supporting equipment to be removed
- 4.13 torque loading as required
- 4.14 dismantling equipment to an appropriate level
- 4.15 setting and adjusting replaced components
- 4.16 covering (protecting) exposed components, wires, pipework or vents
- 4.17 checking components for serviceability
- 4.18 replacing all damaged/defective components
- 4.19 refitting components in the correct position, orientation and alignment
- 4.20 ensuring that replacement components have the correct part numbers

- 4.21 carrying out functional checks of the system
 - 4.22 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
-

Outcome

S5 Carry out three of the following types of check/test on the aircraft starter system:

- 5.1 visually check the starter system for leaks/damage
- 5.2 operational test of the starter
- 5.3 check cranking speed
- 5.4 check operation of starter indication
- 5.5 carry out built in test equipment BITE test
- 5.6 carry out 'special-to-type' tests

Using one of the following:

- 5.7 ground test rig
 - 5.8 aircraft power source/system
 - 5.9 'special-to-type' test sets
-

Outcome

S6 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 6.1 job cards/work sheets
 - 6.2 computer records
 - 6.3 aircraft technical log
 - 6.4 aircraft cabin log
 - 6.5 aircraft log book
-

Outcome

S7 Carry out maintenance on aircraft starting systems in compliance with one of the following:

- 7.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 7.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
 - 7.3 Ministry of Defence (MoD)
 - 7.4 Military Aviation Authority (MAA)
 - 7.5 Aerospace Quality Management Standards (AS)
 - 7.6 Federal Aviation Authority (FAA)
 - 7.7 aircraft maintenance manual/approved change documentation (service bulletin)
 - 7.8 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working with aircraft starting systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the importance of maintenance on aircraft engine starting systems, and impact upon Extended Range Twin-Engine Operations describe the procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K3 describe the hazards associated with removing, fitting and testing aircraft starting system components, and with the tools and equipment used, and how to minimise them and reduce any risk
- K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft starting systems, and other documents needed in the maintenance process
- K11 explain how to carry out currency/issue checks on the specifications they are working with
- K12 explain the terminology used in aircraft starting systems, and the use of system diagrams and associated symbols
- K13 describe the basic principles of operation of the starting system being worked on, and the function of the various units within the system
- K14 describe the various mechanical fasteners that are used, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K15 explain the importance of using the specified fasteners for the particular installation, and why they must not substitute others
- K16 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K17 explain the techniques used to remove components from aircraft starting systems without damage to the components or surrounding structure
- K18 explain the importance of applying Electrostatic Discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K20 explain the techniques used to position, align, adjust and secure the replaced components without damage to the components or surrounding structure

- K21 describe the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities
- K22 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K23 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K24 describe the tools and equipment used in the maintenance activities and their calibration/care and control procedures
- K25 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K26 describe the problems that can occur with the maintenance operations and how these can be overcome
- K27 explain how to recognise defects (such as incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K28 explain how to carry out routine checks and servicing of the aircraft starting system (including checking operation of the starters)
- K29 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before working on the starter system
- K30 explain the types of test to be carried out on the aircraft starter system and the test equipment to be used
- K31 explain the methods and procedures to be used to carry out the various tests on the starter system
- K32 explain how to record the results of each individual test and the documentation that must be used
- K33 explain how to analyse the test results and how to make valid decisions about the acceptability of the starter system
- K34 explain the procedures to be followed if the equipment or system fails to meet the test specification
- K35 explain what recording documentation needs 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
- K36 describe the procedure for the safe disposal of waste materials and scrap components
- K37 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 350

Maintaining engine starting systems on aircraft ATA 80

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 351

Maintaining reciprocating engine turbo-supercharging systems on aircraft ATA 81

RQF Reference:	F/508/6459
Unit level:	Level 3
GLH:	154a

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft reciprocating engine turbo-supercharging systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes power recovery turbine assemblies and turbo-supercharging units when external to the engine. The maintenance activities will include the removal, fitting and testing of a range of engine turbo-supercharging system components. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft engine turbo-supercharging systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the turbo- supercharging systems maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft engine turbo-supercharging systems, especially those

for isolating the equipment. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 81 Reciprocating Engine Turbines.
2. To display competence in this standard, it is necessary to both remove and fit aircraft engine turbo-supercharging system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft engine turbo-supercharging system:
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 use approved removal, fitting and testing techniques and procedures at all times
 - 1.7 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.8 return tools and equipment to the correct storage location on completion of the activities
 - 1.9 ensure that work carried out is correctly documented and recorded
 - 1.10 ensure that any outstanding tests are correctly documented

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft engine turbo-supercharging system:

- 2.1 power recovery turbine
- 2.2 supercharger
- 2.3 exhaust turbocharger
- 2.4 turbo-supercharger system wiring

Outcome

S3 Remove and fit four different aircraft engine turbo-supercharger system components (at least one must be from group A):

Group A

- 3.1 turbo blower
- 3.2 density controller
- 3.3 supercharger unit
- 3.4 actuators
- 3.5 waste gate

3.6 cables/harness/wiring

Group B

- 3.7 levers and linkages
 - 3.8 service panels/fairings
 - 3.9 plugs/sockets/switches
 - 3.10 control mechanisms
 - 3.11 air filters
 - 3.12 position indicators/warning devices
 - 3.13 seals
 - 3.14 springs
 - 3.15 pipes and hoses
 - 3.16 heat shields
 - 3.17 other specific components
-

Outcome

S4 Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
 - 4.2 carrying out fault diagnosis and system checks
 - 4.3 preparing the system for maintenance (such as isolating)
 - 4.4 disconnecting electrical connections (where applicable)
 - 4.5 refitting components in the correct position, orientation and alignment
 - 4.6 disconnect/removing hoses and pipes
 - 4.7 removing securing devices and mechanical fasteners
 - 4.8 setting and adjusting replaced components (such as travel, working clearance)
 - 4.9 supporting equipment to be removed
 - 4.10 dismantling equipment to an appropriate level
 - 4.11 making mechanical connections
 - 4.12 covering (protecting) exposed components, wires, pipework or vents
 - 4.13 making electrical connections
 - 4.14 torque loading as required
 - 4.15 checking components for serviceability
 - 4.16 carrying out system functional checks
 - 4.17 replacing damaged/defective components
 - 4.18 replacing single use items (such as seals, filters, gaskets)
 - 4.19 ensuring that replacement components have the correct part numbers
 - 4.20 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
 - 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.22 carrying out area inspections prior to task close down
-

Outcome

S5 Service/check the aircraft engine turbo-supercharging system, to include carrying out three of the following:

- 5.1 inspecting the turbo-supercharger units (such as for cracks, signs of leakage or damage)
 - 5.2 inspecting heat shields for damage/deterioration
 - 5.3 checking and adjusting density controller
 - 5.4 checking turbo-supercharging indicating systems
-

Outcome

S6 Carry out three of the following tests on the aircraft engine turbo-supercharging system:

- 6.1 leak test
- 6.2 movement tests (such as range, timing, sequencing)
- 6.3 pressure test
- 6.4 Built In Test Equipment (BITE) test
- 6.5 'special-to-type' tests

Using one of the following:

- 6.6 aircraft power source/systems
 - 6.7 ground test rig
-

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
 - 7.2 computer records
 - 7.3 aircraft technical log
 - 7.4 aircraft cabin log
 - 7.5 aircraft log book
-

Outcome

S8 Carry out maintenance on aircraft engine turbo-supercharging systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate) Ministry of Defence (MoD)
 - 8.3 Military Aviation Authority (MAA)
 - 8.4 Aerospace Quality Management Standards (AS)
 - 8.5 Federal Aviation Authority (FAA)
 - 8.6 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.7 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft engine turbo- supercharging systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K3 explain the importance of maintenance on aircraft engine turbo-supercharging systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft engine turbo-supercharging systems, and with the tools and equipment used (such as hot parts of engines, traps from moving parts, misuse of tools) and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft engine turbo-supercharging systems, and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft engine turbo-supercharging systems, and the use of system diagrams and associated symbols
- K14 describe the basic principles of operation of the aircraft engine turbo-supercharging system being worked on (such as system layout, and indication and warning)
- K15 explain the techniques used to remove components from aircraft engine turbo-supercharging systems without damage to the components or surrounding structure (such as release of pressures/force, removal of components and the need to protect the circuit integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
- K16 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K17 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K18 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K19 explain how to fit components into the system (such as ensuring the correct position and orientation; correct tightness of fittings and connections; eliminating stress on pipework, cables and connections; carrying out visual checks of all components)

- K20 describe the tools and equipment used in the maintenance activities and their calibration/care and control procedures
- K21 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K22 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as adjusting density controller)
- K23 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K24 explain how to carry out routine checks and servicing of the aircraft engine turbo-supercharging system (including checking the security of critical fasteners, checking condition of gaskets)
- K25 explain the types of test to be carried out on the aircraft engine turbo-supercharging system and the test equipment to be used
- K26 explain the methods and procedures to be used to carry out the various tests on the turbo-supercharging system
- K27 explain how to record the results of the tests and the documentation that must be used
- K28 explain how to analyse the test results, and how to make valid decisions about the acceptability of the aircraft turbo- supercharging system
- K29 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K30 explain what recording documentation needs 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
- K31 describe the procedure for the safe disposal of waste materials and scrap components
- K32 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 351

Maintaining reciprocating engine turbo-supercharging systems on aircraft ATA 81

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 352

Maintaining engine water injection systems on aircraft ATA 82

RQF Reference:	T/508/6460
Unit level:	Level 3
GLH:	154

Unit aim:

This Employer Unit of Competence (EUC) has been developed by employers in the Aerospace and Aviation Engineering 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 maintenance activities on aircraft engine water injection systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the units and components which provide, deliver and inject water or water mixtures into the induction system. The maintenance activities will include the removal, fitting and testing of a range of engine water injection system components, such as water tanks/bladder cells, interconnectors, pumps, valves, controls, pipes, transmitters and indicators. They will be expected to use the approved procedure for correctly isolating the system before breaking into the system circuit. They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft engine water injection systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the engine water injection system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting

faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft engine water injection systems, especially those involved with working on pressurised systems. 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.

Notes:

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 82 Water Injection.
2. To display competence in this standard, it is necessary to both remove and fit aircraft engine water injection system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority
- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
- P8 dispose of waste materials in accordance with safe working practices and approved procedures

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft engine water injection system:
- 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the system is safely isolated and depressurised and (where appropriate) drain off fluid before breaking into the system
 - 1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on two of the following parts of the aircraft engine water injection system:

- 2.1 water storage
 - 2.2 distribution
 - 2.3 dumping and purging
 - 2.4 indicating
-

Outcome

S3 Remove and fit four different engine water injection system components (at least two must be from group A):

Group A

- 3.1 water pump
 - 3.2 water tanks/bladder cells
 - 3.3 filling system components
-

- 3.4 valves
- 3.5 interconnectors
- 3.6 ventilating components
- 3.7 water pressure regulator
- 3.8 solenoids
- 3.9 control unit

Group B

- 3.10 sensors/transmitters
- 3.11 wiring/switches/plugs
- 3.12 temperature probes
- 3.13 water pipes and hoses
- 3.14 other specific components

Outcome

S4 Skills requirements: Carry out fifteen of the following maintenance activities:

- 4.1 removing access panels and covers to expose components to be removed
- 4.2 carrying out fault diagnosis and system checks
- 4.3 preparing the system for maintenance (such as isolating, draining)
- 4.4 disconnecting electrical connections
- 4.5 replacing single use items such as seals, gaskets
- 4.6 disconnect/removing hoses and pipes
- 4.7 removing mechanical fasteners and securing devices
- 4.8 refitting components in the correct position, orientation and alignment
- 4.9 supporting equipment to be removed
- 4.10 setting and adjusting replaced components
- 4.11 dismantling equipment to an appropriate level
- 4.12 making mechanical connections
- 4.13 covering (protecting) exposed components, wires, pipework or vents
- 4.14 making electrical connections
- 4.15 torque loading
- 4.16 checking components for serviceability
- 4.17 replacing damaged/defective components
- 4.18 ensuring that replacement components have the correct part numbers
- 4.19 carrying out system functional checks
- 4.20 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
- 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts)
- 4.22 carrying out area inspections prior to task close down

Outcome

S5 Service/check the aircraft engine water injection system, to include carrying out four of the following:

- 5.1 checking the system for leaks
- 5.2 checking and adjusting the water/methanol control unit
- 5.3 checking fluid for quality/correct mixture
- 5.4 checking tank content indicating systems
- 5.5 checking jettison systems

Outcome

S6 Carry out three of the following tests on the aircraft engine water injection system:

- 6.1 leak test
- 6.2 flow test
- 6.3 pressure test
- 6.4 Built In Test Equipment (BITE) test
- 6.5 system charging
- 6.6 'special-to-type' tests

Using one of the following:

- 6.7 aircraft power source/pumps
- 6.8 ground test rig

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
- 7.2 computer records
- 7.3 aircraft technical log
- 7.4 aircraft cabin log
- 7.5 aircraft log book

Outcome

S8 Carry out maintenance on aircraft engine water injection system components in compliance with one of the following

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- 8.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate) Ministry of Defence (MoD)
- 8.3 Military Aviation Authority (MAA)
- 8.4 Aerospace Quality Management Standards (AS)

- 8.5 Federal Aviation Authority (FAA)
 - 8.6 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.7 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working on aircraft engine water injection systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 explain the importance of maintenance on aircraft engine water injection systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
- K3 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K4 describe 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 describe the hazards associated with carrying out maintenance activities on aircraft engine water injection systems, and with the tools and equipment used, and how to minimise them and reduce any risk
- K6 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
- K7 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
- K8 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
- K10 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K11 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft engine water injection systems, and other documents needed in the maintenance activities
- K12 explain how to carry out currency/issue checks on the specifications they are working with
- K13 explain the terminology used in aircraft engine water injection systems, and the use of system diagrams and associated symbols
- K14 describe the various types of pipe and component that make up the aircraft engine water injection system (such as tanks/bladder cells; pipes; pumps; valves; mechanical and electrical control devices)
- K15 describe the basic principles of operation of the engine water injection system being worked on and the function of the various units that make up the system
- K16 explain the techniques used to remove components from aircraft engine water injection systems without damage to the components or surrounding structure (such as release of fluids, removal of components and the need to protect the circuit integrity by fitting blanking plugs and labelling exposed circuits)

- K17 describe the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
- K20 explain how to fit components into the system (such as ensuring the correct tightness of fastenings, fittings and pump connections; eliminating stress on pipework/connections; correctly making electrical connections; carrying out visual checks of all components)
- K21 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as flow settings, travel and working clearance)
- K22 explain why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
- K23 explain how to carry out routine checks and servicing of the aircraft engine water injection system (including checking for leaks, checking quality of water mixture)
- K24 explain the types of test to be carried out on the aircraft engine water injection system and the test equipment to be used
- K25 explain the methods and procedures to be used to carry out the various tests
- K26 explain how to record the results of each individual test and the documentation that must be used
- K27 explain how to analyse the test results and how to make valid decisions about the acceptability of the aircraft engine water injection system
- K28 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K29 explain what recording documentation needs 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
- K30 describe the procedure for the safe disposal of waste materials and scrap components
- K31 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 352

Maintaining engine water injection systems on aircraft ATA 82

Supporting Information

Unit guidance

Assessment requirements

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set out in the relevant Qualification Assessment Strategy available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Qualification Assessment Strategy and specify the title of the relevant Trailblazer Standard.

Additional information

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 that meets their own business 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.

Unit 353

Maintaining radar systems on aircraft ATA 34

RQF Reference:	A/508/6461
Unit level:	Level 3
GLH:	168

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 maintenance activities on aircraft radar systems, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and includes units and components associated with surveillance radar (including supplementary surveillance radar), weather radar, and obstacle warning systems (such as enhanced ground proximity warning systems - EGPWS), traffic collision and avoidance systems (TCAS), towed radar decoys, radar (radio) altimeter, tactical air navigation (TACAN), identification friend or foe (IFF), Doppler, and radar jamming devices, as applicable to the aircraft type. The maintenance activities will include the removal, fitting and testing of a range of radar components. They will be required to select the correct tools and equipment to use, based on the operations to be performed and the components to be removed or replaced. The aircraft radar components will include items such as scanners, aerials, transponders, transmitters, receiver units, microwave generators, processors, power supply units, waveguides, intermediate frequency units, indicator units, radar displays, coolant units and control units, and other devices, as applicable to the aircraft type.

They will remove the required components and fit approved replacements, as appropriate. They will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Their responsibilities will require them to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements 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 are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, 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 the appropriate maintenance techniques and procedures to aircraft radar systems. They will understand the removal, fitting and testing methods and procedures, and their application, along with the radar system maintenance requirements. They will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the equipment is maintained to the required standard.

They will understand the safety precautions required when working on aircraft radar systems, and when using the associated tools and equipment. 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.

Notes:

1. This standard is designed to cover the requirements of military aircraft radar systems and will cover some of the practical experience requirements of the Airline Transport Association (ATA) Chapter 34 Navigation
2. To display competence in this standard, it is necessary to both remove and fit aircraft radar system components. They must remove components; however, they may fit a replacement component where the original was previously removed by another person. They should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

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

Outcome

P Performance requirements

The learner must be able to:

- 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 company objectives
- P3 follow the relevant maintenance schedules to carry out the required work
- P4 carry out the maintenance activities within the limits of their personal authority

- P5 carry out the maintenance activities in the specified sequence and in an agreed timescale
 - P6 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
 - P7 complete the relevant maintenance records accurately and pass them on to the appropriate person
 - P8 dispose of waste materials in accordance with safe working practices and approved procedures
-

Outcome

S Skills requirements

The learner must be able to:

- S1 Carry out all of the following during the maintenance of the aircraft radar system
 - 1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
 - 1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
 - 1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
 - 1.4 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
 - 1.5 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
 - 1.6 where appropriate, apply electrostatic discharge (ESD) avoidance procedures
 - 1.7 use approved removal, fitting and testing techniques and procedures at all times
 - 1.8 leave the aircraft and equipment in a safe and appropriate condition, and ensure that components and surrounding structures are maintained free from damage and Foreign Object Debris (FOD)
 - 1.9 return tools and equipment to the correct storage location on completion of the activities
 - 1.10 ensure that work carried out is correctly documented and recorded
 - 1.11 ensure that any outstanding tests are correctly documented
-

Outcome

S2 Carry out maintenance on four of the following aircraft radar systems:

- 2.1 surveillance radar
 - 2.2 radar jamming
 - 2.3 towed radar decoys
 - 2.4 Doppler
 - 2.5 Identification Friend or Foe (IFF)
 - 2.6 radar (radio) altimeter
 - 2.7 obstacle warning systems
 - 2.8 Tactical Air Navigation (TACAN)
 - 2.9 supplementary surveillance radar
 - 2.10 weather radar/predictive wind shear
-

- 2.11 Traffic Collision Avoidance System (TCAS)
 - 2.12 Enhanced Ground Proximity Warning System (EGPWS)
-

Outcome

- S3 Remove and fit six different aircraft radar system components (at least three must be from group A):

Group A

- 3.1 scanners
- 3.2 radar displays
- 3.3 satellite beacons
- 3.4 aerials
- 3.5 receiver units
- 3.6 Power Supply Units (PSU)
- 3.7 transformers
- 3.8 processors
- 3.9 waveguides
- 3.10 transmitter units
- 3.11 control units
- 3.12 radar packs
- 3.13 computers
- 3.14 microwave generators
- 3.15 coolant units
- 3.16 transponders
- 3.17 Intermediate Frequency Unit (IFU)
- 3.18 interface units
- 3.19 Analogue/Digital Converters (A-D/D-A)
- 3.20 Line Replacement Units (LRU)

Group B

- 3.21 batteries
 - 3.22 instruments/gauges/indicators
 - 3.23 plugs/sockets
 - 3.24 switches
 - 3.25 desiccant units
 - 3.26 coolant
 - 3.27 relays
 - 3.28 unit trays
 - 3.29 circuit breakers
 - 3.30 wires/cables
 - 3.31 other specific components
-

Outcome

- S4 Carry out fifteen of the following maintenance activities:
-

- 4.1 removing access panels and covers to expose components to be removed
 - 4.2 carrying out fault diagnosis and system checks
 - 4.3 preparing the system for maintenance (such as isolating)
 - 4.4 disconnecting electrical connections
 - 4.5 refitting components in the correct position, orientation and alignment
 - 4.6 removal of bonding
 - 4.7 removing cable securing devices
 - 4.8 setting and adjusting/tuning replaced components (such as power output, voltage)
 - 4.9 removing securing devices and mechanical fasteners
 - 4.10 supporting equipment to be removed
 - 4.11 making mechanical connections
 - 4.12 dismantling equipment to an appropriate level
 - 4.13 making electrical connections
 - 4.14 covering (protecting) exposed components, wires, pipework or vents
 - 4.15 carrying out bonding
 - 4.16 installing cable securing devices
 - 4.17 checking components for serviceability
 - 4.18 torque loading as required
 - 4.19 replacing damaged/defective components
 - 4.20 pressurising systems (such as waveguide, coolant)
 - 4.21 ensuring that replacement components have the correct part numbers
 - 4.22 labelling (and storing in the correct location) components that require repair or overhaul
 - 4.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
 - 4.24 carrying out area inspections prior to task close down
-

Outcome

S5 Service/check the aircraft radar systems, to include carrying out three of the following:

- 5.1 functional check surveillance radar
- 5.2 functional check Doppler
- 5.3 functional check towed radar decoys
- 5.4 functional check radar jamming
- 5.5 functional check radar (radio) altimeter
- 5.6 functional check obstacle warning systems
- 5.7 functional check supplementary surveillance radar
- 5.8 functional check Identification Friend or Foe (IFF)
- 5.9 functional check Tactical Air Navigation (TACAN)
- 5.10 functional check weather radar/predictive wind shear
- 5.11 functional check Traffic Collision Avoidance System (TCAS)
- 5.12 functional check Enhanced Ground Proximity Warning System (EGPWS)

Outcome

S6 Skills requirements: Carry out four of the following types of test/check on aircraft radar systems:

- 6.1 standard serviceability checks of all equipment
- 6.2 distortion checks
- 6.3 receiver sensitivity
- 6.4 continuity check
- 6.5 voltage standing wave ratio (VSWR) checks
- 6.6 signal-to-noise checks
- 6.7 bonding tests
- 6.8 TDR checks
- 6.9 applying a dummy load
- 6.10 range checks
- 6.11 'special-to-type' tests
- 6.12 Built In Test Equipment BITE test
- 6.13 power output
- 6.14 signal injection tests
- 6.15 distant object test

Using four of the following:

- 6.16 multimeter
- 6.17 dummy load
- 6.18 bonding tester
- 6.19 modulation analyser
- 6.20 'special to type' test equipment
- 6.21 oscilloscope
- 6.22 Radio Frequency (RF) signal generators
- 6.23 delay lines
- 6.24 external power source (electrical/hydraulic)
- 6.25 Time-Domain Reflectometer (TDR) equipment
- 6.26 aircraft power source (electrical/hydraulic)
- 6.27 Voltage Standing Wave Ratio (VSWR) equipment
- 6.28 pressure tester (hydraulic, pneumatic, coolant)

Outcome

S7 Complete the relevant paperwork, to include one from the following and pass it to the appropriate people:

- 7.1 job cards/work sheets
- 7.2 aircraft technical log
- 7.3 aircraft log book
- 7.4 computer records
- 7.5 aircraft cabin log

Outcome

S8 Carry out maintenance on aircraft radar systems in compliance with one of the following:

- 8.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
 - 8.2 Ministry of Defence (MoD)
 - 8.3 Military Aviation Authority (MAA)
 - 8.4 Aerospace Quality Management Standards (AS)
 - 8.5 Federal Aviation Authority (FAA)
 - 8.6 aircraft maintenance manual/approved change documentation (service bulletin)
 - 8.7 manufacturers standards and procedures
-

Outcome

K Knowledge and understanding:

The learner must be able to:

- K1 explain the specific safety practices and procedures that they need to observe when working with aircraft radar systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
 - K2 explain the importance of maintenance on aircraft radar systems, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
 - K3 describe the hazards associated with removing, fitting and testing aircraft radar system components, and with the tools and equipment used, and how to minimise them and reduce any risk
 - K4 describe 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 explain what protective equipment needs to be used for both personal protection (PPE) and protection of the aircraft
 - K6 explain what constitutes a hazardous voltage and how to recognise victims of electric shock
 - K7 describe how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
 - K8 explain the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of Foreign Object Debris (FOD) to the safety of the aircraft
 - K9 explain the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
 - K10 explain how to extract and use information from aircraft manuals, log books, flight logs, charts, circuit and physical layouts, specifications, symbols used in aircraft radar systems, and other documents needed in the maintenance process
 - K11 explain how to carry out currency/issue checks on the specifications they are working with
 - K12 explain the terminology used in aircraft radar systems, and the use of system diagrams and associated symbols
 - K13 describe the basic principles of operation of the aircraft radar system being worked on, and the function of the various units within the system
 - K14 describe the various mechanical fasteners that are used, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
-

- K15 explain the importance of using the specified fasteners for the installation and why they must not substitute others
- K16 explain why securing devices need to be locked and labelled, and the different methods that are used to remove and install them
- K17 explain the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
- K19 explain the techniques used to remove components from aircraft radar systems without damage to the components or surrounding structure (such as proof marking, the need to protect the circuit integrity by covering and labelling exposed circuits)
- K20 explain the importance of applying electrostatic discharge (ESD) avoidance procedures when working on sensitive equipment or devices
- K21 explain the need to label and store correctly components that require repair or overhaul, and to check that replaced components have the correct part/identification markings and accompanying release documentation
- K22 explain the techniques used to position, align, adjust and secure the replaced components to the aircraft without damage to the components or surrounding structure
- K23 explain the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K24 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure
- K25 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
- K26 explain why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
- K27 explain how to recognise defects (such as incorrectly seated plugs and sockets, ineffective fasteners, foreign object damage or contamination)
- K28 explain how to carry out routine checks and servicing of the aircraft radar system
- K29 explain the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
- K30 explain the types of test to be carried out on the aircraft radar system and the test equipment to be used
- K31 explain the methods and procedures to be used to carry out the various tests on the radar system
- K32 explain the importance of carrying out the tests in the specified sequence, checking readings/movements at each stage
- K33 explain how to record the results of each individual test and the documentation that must be used
- K34 explain how to analyse the test results and make valid decisions about the acceptability of the aircraft radar systems
- K35 describe the procedures to be followed if the equipment or system fails to meet the test specification
- K36 describe the problems that can occur with the aircraft radar system maintenance operations and how these can be overcome
- K37 explain what recording documentation needs 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

- K38 describe the procedure for the safe disposal of waste materials and scrap components
- K39 describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve

Unit 353

Maintaining radar systems on aircraft ATA 34

Supporting Information

Unit guidance

Assessment requirements have been developed by employers for the occupational competency units and qualifications for Advanced Manufacturing and Engineering Sector. These assessment requirements are set down in the relevant Qualification Assessment Strategies available from Semta. Please contact Customer.Services@semta.org.uk quoting Advanced Manufacturing and Engineering Trailblazer Qualification Assessment Strategy and specifying the title of the relevant Trailblazer Standard

Additional information

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 that meets their own business 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

Appendix 1 Relationships to other qualifications

Links to other qualifications

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications.

Literacy, language, numeracy and ICT skills development

This [these] qualification[s] can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see www.cityandguilds.com/functionalskills
- Essential Skills (Northern Ireland) – see www.cityandguilds.com/essentialskillsni
- Essential Skills Wales – see www.cityandguilds.com/esw

Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the Centres and Training Providers homepage on www.cityandguilds.com.

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues.

Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents such as:

- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information on such things as:

- **Walled Garden:** how to register and certificate candidates on line
- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for e-assessments.

Centre Guide – Delivering International Qualifications contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification.

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- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

Appendix 3 Useful contacts

UK learners

General qualification information

E: learnersupport@cityandguilds.com

International learners

General qualification information

E: intcg@cityandguilds.com

Centres

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

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

E: singlesubjects@cityandguilds.com

International awards

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

E: intops@cityandguilds.com

Walled Garden

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

E: walledgarden@cityandguilds.com

Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

E: business@cityandguilds.com

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City & Guilds Group

The City & Guilds Group is a leader in global skills development. Our purpose is to help people and organisations to develop their skills for personal and economic growth. Made up of City & Guilds, City & Guilds Kineo, The Oxford Group and ILM, we work with education providers, businesses and governments in over 100 countries.

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