

# Specification

Edexcel NVQ/competence-  
based qualifications

## Edexcel Level 2 NVQ Diploma in Aeronautical Engineering (QCF)

For first registration December 2010

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Authorised by Roger Beard  
Prepared by Andres Vergara

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## Qualification title covered by this specification

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This specification gives you the information you need to offer the Edexcel Level 2 NVQ Diploma in Aeronautical Engineering (QCF):

<b>Qualification title</b>	<b>Qualification Accreditation Number (QAN)</b>	<b>Accreditation start date</b>
Edexcel Level 2 NVQ Diploma in Aeronautical Engineering (QCF)	501/2303/8	01/12/2010

This qualification has been accredited within the Qualifications and Credit Framework (QCF) and are eligible for public funding as determined by the Department for Education (DfE) under Sections 96 and 97 of the Learning and Skills Act 2000.

The qualification title listed above features in the funding lists published annually by the DfE and the regularly updated website. It will also appear on the Learning Aims Database (LAD), where relevant.

You should use the QCF Qualification Accreditation Number (QAN), when you wish to seek public funding for your learners. Each unit within a qualification will also have a unique QCF reference number, which is listed in this specification.

The QCF qualification title and unit reference numbers will appear on the learners' final certification document. Learners need to be made aware of this when they are recruited by the centre and registered with Edexcel.

# Key features of the Edexcel Level 2 NVQ Diploma in Aeronautical Engineering (QCF)

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This qualification:

- is nationally recognised
- is based on the Semta National Occupational Standards (NOS). The NOS, assessment strategy and qualification structure are owned by Semta.

The Edexcel Level 2 NVQ Diploma in Aeronautical Engineering (QCF) has been approved as a component for the Semta Apprenticeship framework.

## What is the purpose of this qualification?

This qualification is appropriate for employees in the engineering sector working across a broad range of areas. It is designed to assess occupational competence in the workplace where learners are required to demonstrate skills and knowledge to a level required in the engineering sector.

## Who is this qualification for?

This qualification is for all learners aged 16 and above who are capable of reaching the required standards.

Edexcel's policy is that the qualification should:

- be free from any barriers that restrict access and progression
- ensure equality of opportunity for all wishing to access the qualification.

## What are the benefits of this qualification to the learner and employer?

This qualification allows learners to demonstrate competence against National Occupational Standards which are based on the needs of the engineering sector as defined by Semta, the Sector Skills Council. As such it contributes to the development of skilled labour in the sector. The qualification may contribute towards the competence element of an Apprenticeship.

## What are the potential job roles for those working towards this qualification?

- Aerospace engineer
- Aerospace engineering technician.

**What progression opportunities are available to learners who achieve this qualification?**

This qualification allows learners to demonstrate competence in aeronautical engineering at a level required by the engineering industry. Learners can progress across the level and size of the engineering competence and knowledge qualifications and into other occupational areas such as team leading and management.

Further information is available in *Annexe A*.

# What is the qualification structure for the Edexcel Level 2 NVQ Diploma in Aeronautical Engineering (QCF)?

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Individual units can be found in the *Units* section. The QCF level and credit value are given on the first page of each unit.

## To achieve the **Edexcel Level 2 NVQ Diploma in Aeronautical Engineering (QCF)**

Learners must complete a minimum of 47 credits. Learners must complete all mandatory units in Group A (20 credits) and then choose one of the following pathways.

### **Edexcel Level 2 NVQ Diploma in Aeronautical Engineering – Aircraft Systems Maintenance (QCF)**

Learners must complete a minimum of one unit in Group B1 and all the units in Group B2 for a minimum total of 102 credits.

### **Edexcel Level 2 NVQ Diploma in Aeronautical Engineering – Survival Equipment Maintenance (QCF)**

Learners must complete a minimum of three units in Group C1 for a minimum total of 64 credits.

### **Edexcel Level 2 NVQ Diploma in Aeronautical Engineering – Aircraft Component Assembly (QCF)**

Learners must complete a minimum of two units in Group D1 for a minimum total of 68 credits.

### **Edexcel Level 2 NVQ Diploma in Aeronautical Engineering – Electrical and Electronic (QCF)**

Learners must complete a minimum of two units in Group E1 for a minimum total of 75 credits.

### **Edexcel Level 2 NVQ Diploma in Aeronautical Engineering – Composite Manufacture (QCF)**

Learners can choose to complete a minimum of one unit in Group F1 or complete a minimum of two units in Group F2 for a minimum total of 32 credits.

## **Edexcel Level 2 NVQ Diploma in Aeronautical Engineering – Lifting and Moving loads (QCF)**

Learners must complete a minimum of two units in Group G1 for a minimum total of 27 credits.

### **A – Mandatory units**

Learners must complete all the units in Group A.

Y/601/4242 – Reinstating the work area on completion of aircraft engineering activities

A/601/5013 – Complying with statutory regulations and organisational safety requirements

Y/601/5102 – Using and interpreting engineering data and documentation

Y/601/5052 – Working efficiently and effectively in engineering

### **P – Pathways**

Learners must choose one pathway.

### **B – Aircraft Systems Maintenance**

Credit value required: minimum 102.

#### **B1 – Optional units (Aircraft Systems Maintenance)**

Sub-components required: minimum 1.

R/601/4241 – Carrying out aircraft handling operations

H/601/4244 – Carrying out aircraft routine servicing

#### **B2 – Mandatory units (Aircraft Systems Maintenance)**

Learners must complete all the units in Group B2.

K/601/4245 – Carry out maintenance on aircraft mechanical systems by component replacement

M/601/4246 – Carrying out maintenance on aircraft electrical/electronic systems by component replacement

### **C – Survival Equipment Maintenance**

Credit value required: minimum 64.

## **C1 – Optional units (Survival Equipment Maintenance)**

Sub-components required: minimum 3.

R/601/4269 – Servicing aircrew protective helmets and electrical headsets

D/601/4274 – Servicing aircrew nuclear, biological and chemical (NBC) respirators and equipment

H/601/4275 – Servicing aircrew life preserver equipment

K/601/4293 – Servicing parachute assemblies

## **D – Aircraft Component Assembly**

Credit value required: minimum 68.

### **D1 – Optional units (Aircraft Component Assembly)**

Sub-components required: minimum 2.

L/601/4299 – Drilling and finishing holes in aircraft components

A/601/4301 – Installing aircraft mechanical fasteners

L/601/4304 – Assembling aircraft airframe ancillary components

## **E – Electrical and Electronic**

Credit value required: minimum 75.

### **E1 – Optional units (Electrical and Electronic)**

Sub-components required: minimum 2.

R/601/4305 – Producing aircraft cableforms and looms

Y/601/4306 – Assembling aircraft electrical components

D/601/4310 – Making modifications to aircraft cableforms and looms

## **F – Composite Manufacture**

Credit value required: minimum 32.

## **F1 – Optional units (Composite Manufacture)**

Sub-components required: minimum 1.

H/601/4311 – Producing aircraft components using wet lay-up techniques

K/601/4312 – Producing aircraft components using pre-preg laminating techniques

T/601/4314 – Producing aircraft components using resin infusion techniques

A/601/4315 – Producing aircraft components by acrylic moulding

J/601/4317 – Producing aircraft components by vacuum forming

R/601/4319 – Producing aircraft components by injection moulding

Y/601/4323 – Assembling aircraft composite components

## **F2 - Optional units (Composite Manufacture)**

Sub-components required: minimum 2.

D/601/4324 – Carrying out trimming operations on aircraft composite components

T/601/4328 – Carrying out bonding operations on aircraft composite components

A/601/4332 – Carrying out repairs to aircraft composite mouldings

F/601/4333 – Checking aircraft composite mouldings for defects

## **G – Lifting and Moving Loads**

Credit value required: minimum 27.

### **G1 – Optional units (Lifting and Moving Loads)**

Sub-components required: minimum 2.

F/601/4350 – Setting up and preparing loads for moving

J/601/4351 – Moving materials and components in an aircraft environment

L/601/4352 – Positioning and securing aircraft access structures

R/601/4353 – Dismantling and removing aircraft access structures

## How is the qualification graded and assessed?

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The overall grade for the qualification is a 'pass'. The learner must achieve all the required units within the specified qualification structure.

To pass a unit the learner must:

- achieve **all** the specified learning outcomes
- satisfy **all** the assessment criteria by providing sufficient and valid evidence for each criterion
- show that the evidence is their own.

The qualification is designed to be assessed:

- in the workplace or
- in conditions resembling the workplace, as specified in the assessment strategy for the sector, or
- as part of a training programme.

### Assessment strategy

The assessment strategy for this qualification has been included in *Annexe D*. It has been developed by Semta in partnership with employers, training providers, awarding organisations and the regulatory authorities. The Assessment strategy includes details on:

- criteria for defining realistic working environments
- roles and occupational competence of assessors, expert witnesses, internal verifiers and standards verifiers
- quality control of assessment
- evidence requirements.

Evidence of competence may come from:

- **current practice** where evidence is generated from a current job role
- a **programme of development** where evidence comes from assessment opportunities built into a learning/training programme whether at or away from the workplace
- the **Recognition of Prior Learning (RPL)** where a learner can demonstrate that they can meet the assessment criteria within a unit through knowledge, understanding or skills they already possess without undertaking a course of learning. They must submit sufficient, reliable and valid evidence for internal and standards verification purposes. RPL is acceptable for accrediting a unit, several units or a whole qualification
- a **combination** of these.

It is important that the evidence is:

<b>Valid</b>	relevant to the standards for which competence is claimed
<b>Authentic</b>	produced by the learner
<b>Current</b>	sufficiently recent to create confidence that the same skill, understanding or knowledge persist at the time of the claim
<b>Reliable</b>	indicates that the learner can consistently perform at this level
<b>Sufficient</b>	fully meets the requirements of the standards.

### **Types of evidence (to be read in conjunction with the assessment strategy in Annexe D)**

To successfully achieve a unit the learner must gather evidence which shows that they have met the required standard in the assessment criteria. Evidence can take a variety of different forms including the examples below. Centres should refer to the assessment strategy for information about which of the following are permissible.

- direct observation of the learner's performance by their assessor (O)
- outcomes from oral or written questioning (Q&A)
- products of the learner's work (P)
- personal statements and/or reflective accounts (RA)
- outcomes from simulation, where permitted by the assessment strategy (S)
- professional discussion (PD)
- assignment, project/case studies (A)
- authentic statements/witness testimony (WT)
- expert witness testimony (EPW)
- evidence of Recognition of Prior Learning (RPL).

The abbreviations may be used for cross-referencing purposes.

Learners can use one piece of evidence to prove their knowledge, skills and understanding across different assessment criteria and/or across different units. It is, therefore, not necessary for learners to have each assessment criterion assessed separately. Learners should be encouraged to reference the assessment criteria to which the evidence relates.

Evidence must be made available to the assessor, internal verifier and Edexcel standards verifier. A range of recording documents is available on the Edexcel website [www.edexcel.com](http://www.edexcel.com). Alternatively, centres may develop their own.

## **Additional requirements**

The Joint Awarding Body and the SSC Working Practices Group have identified additional requirements that are needed to assess and quality assure qualifications placed on the QCF that use NVQ within their title. These requirements are shown in *Annexe E: Additional requirement for qualifications that use the term 'NVQ' in a QCF qualification title.*

# Centre recognition and approval

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## Centre recognition

Centres that have not previously offered Edexcel qualifications need to apply for and be granted centre recognition as part of the process for approval to offer individual qualifications. New centres must complete both a centre recognition approval application and a qualification approval application.

Existing centres will be given 'automatic approval' for a new qualification if they are already approved for a qualification that is being replaced by the new qualification and the conditions for automatic approval are met. Centres already holding Edexcel approval are able to gain qualification approval for a different level or different sector via Edexcel online.

## Approvals agreement

All centres are required to enter into an approvals agreement which is a formal commitment by the head or principal of a centre to meet all the requirements of the specification and any linked codes or regulations. Edexcel will act to protect the integrity of the awarding of qualifications, if centres do not comply with the agreement. This could result in the suspension of certification or withdrawal of approval.

## Quality assurance

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Detailed information on Edexcel's quality assurance processes is given in *Annexe B*.

## What resources are required?

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Each qualification is designed to support learners working in the engineering sector. Physical resources need to support the delivery of the qualifications and the assessment of the learning outcomes and must be of industry standard. Centres must meet any specific resource requirements outlined in *Annexe D: Assessment strategy*. Staff assessing the learner must meet the requirements within the overarching assessment strategy for the sector.

# Unit format

Each unit in this specification contains the following sections.

<b>Unit 1:</b>				
The unit title is accredited on the QCF and this form of words will appear on the learner's Notification of Performance (NOP).				
<b>Unit reference number:</b>				
This code is a unique reference number for the unit.				
<b>QCF level:</b>				
All units and qualifications within the QCF have a level assigned to them, which represents the level of achievement. There are nine levels of achievement, from Entry level to level 8. The level of the unit has been informed by the QCF level descriptors and, where appropriate, the NOS and/or other sector/professional.				
<b>Credit value:</b>				
All units have a credit value. The minimum credit value is one, and credits can only be awarded in whole numbers. Learners will be awarded credits when they achieve the unit.				
<b>Guided learning hours:</b>				
A notional measure of the substance of a qualification. It includes an estimate of the time that might be allocated to direct teaching or instruction, together with other structured learning time, such as directed assignments, assessments on the job or supported individual study and practice. It excludes learner-initiated private study.				
<b>Unit summary:</b>				
This provides a summary of the purpose of the unit.				
<b>Assessment requirements/evidence requirements:</b>				
The assessment/evidence requirements are determined by the SSC. Learners must provide evidence for each of the requirements stated in this section.				
<b>Assessment recording:</b>				
This provides a summary of the assessment recording to be used for the unit.				
<b>Learning outcomes:</b>	<b>Assessment criteria:</b>	<b>Evidence type:</b>	<b>Portfolio reference:</b>	<b>Date:</b>
			The learner should use this box to indicate where the evidence can be obtained eg portfolio page number.	The learner should give the date when the evidence has been provided.
Learning outcomes state exactly what a learner should know, understand or be able to do as a result of completing a unit.		The assessment criteria of a unit specify the standard a learner is expected to meet to demonstrate that a learning outcome, or a set of learning outcomes, has been achieved.		Learners must reference the type of evidence they have and where it is available for quality assurance purposes. The learner can enter the relevant key and a reference. Alternatively, the learner and/or centre can devise their own referencing system.

# Units



**Unit 1:** **Reinstating the work area on completion of aircraft engineering activities**

**Unit reference number:** Y/601/4242

**QCF level:** 2

**Credit value:** 5

**Guided learning hours:** 25

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**Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to reinstate the work area, in accordance with approved procedures. The learner will be required to follow the correct procedures for the safe storage of finished products and surplus materials, and to correctly identify, separate and ensure that all waste materials are removed to their designated locations. The learner will also need to ensure that all tools, equipment and documents used are accounted for and returned to the appropriate places. Tidying up of the work area will be of prime importance, and this includes workshops, staging and platforms, internal areas of aircraft such as wings, tanks and fuselage sections, and areas that are airside.

**Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

**Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Reinstating the work area on completion of aircraft engineering activities</p>	<p>1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines</p> <p>1.2 carry out all of the following during the work area reinstatement activities:</p> <ul style="list-style-type: none"> <li>- work to current schedules</li> <li>- use copies of relevant COSHH sheets and risk assessment standards</li> <li>- report any loss or damage to equipment</li> <li>- report any identified hazards within the work area</li> <li>- return all consumables and materials to their correct location</li> <li>- complete any required documentation</li> </ul> <p>1.3 carry out reinstatement activities on two work areas from:</p> <ul style="list-style-type: none"> <li>- workshops</li> <li>- airside</li> <li>- areas at height (such as platforms, staging, lifts)</li> <li>- internal areas of aircraft (such as wings, tanks, fuselage sections)</li> <li>- other specific work area</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 separate equipment, components, and materials for reuse from waste items and materials 1.5 store reusable materials and equipment in an appropriate location.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Reinstating the work area on completion of aircraft engineering activities (continued)</p>	<p>1.6 correctly label and store four of the following:</p> <ul style="list-style-type: none"> <li>- removed/maintained components</li> <li>- surplus materials (such as consumables, locking devices, mechanical fasteners)</li> <li>- tooling</li> <li>- measuring and test instruments</li> <li>- drawings and documentation</li> </ul> <p>1.7 dispose of waste materials in line with organisational and environmental safe procedures</p> <p>1.8 deal with waste materials, in line with company and environmental regulations, to include all the following:</p> <ul style="list-style-type: none"> <li>- correctly segregating waste materials</li> <li>- disposing of hazardous materials</li> <li>- removing non-hazardous materials</li> </ul> <p>1.9 restore the work areas to a safe condition in accordance with agreed requirements and schedules</p> <p>1.10 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to reinstate the work area on completion of aircraft engineering activities</p>	<p>2.1 explain the specific safety practices and procedures that they need to observe when reinstating the work area (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area where they are carrying out the activities, and the responsibility these requirements place on them</p> <p>2.3 describe the hazards associated with reinstating the work area, and how they can be minimised</p> <p>2.4 explain the safe working practices and procedures to be followed when carrying out the various activities (such as lifting and handling techniques)</p> <p>2.5 describe the personal protective clothing and equipment to be worn, and where this can be obtained</p> <p>2.6 explain why work areas need to be restored to a set standard, and what these requirements are</p> <p>2.7 describe the types of work area that will need to be restored (such as workshops, test areas, stages and platforms, aircraft areas such as wing, tank, fuselage and airside section areas)</p> <p>2.8 explain the importance of tool control, and why this is critical within the aerospace industry.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to reinstate the work area on completion of aircraft engineering activities (continued)</p>	<p>2.9 explain the meaning of 'foreign object debris', and why it is vital to ensure that this does not occur or is removed</p> <p>2.10 explain the stores procedures for tools and equipment, documentation and surplus or waste materials</p> <p>2.11 describe the materials that will need to be stored and disposed of, and why they need to be segregated, correctly identified and labelled</p> <p>2.12 explain how the various disposal bins can be identified (such as colour coded, labelled)</p> <p>2.13 describe the procedures for disposing of hazardous materials (such as chemicals and adhesives)</p> <p>2.14 explain the documentation to be used on completion of the reinstatement activities</p> <p>2.15 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

Learner signature: \_\_\_\_\_ Date: \_\_\_\_\_

Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Internal verifier signature: \_\_\_\_\_ Date: \_\_\_\_\_  
(if sampled)

## **Unit 2: Complying with statutory regulations and organisational safety requirements**

**Unit reference number:** A/601/5013

**QCF level:** 2

**Credit value:** 5

**Guided learning hours:** 35

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements, it does, however, cover the more general health and safety requirements that apply to working in an industrial environment.

The learner will be expected 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 1974. The learner will need to be able to identify the relevant qualified first aiders and know the location of the first aid facilities. The learner will have a knowledge and 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. The learner will also need to be fully conversant with their organisation's procedures for fire alerts and the evacuation of premises.

The learner will also 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, the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

## **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1 Comply with statutory regulations and organisational safety requirements</p>	<p>1.1 comply with their duties and obligations as defined in the Health and Safety at Work Act 1974</p> <p>1.2 demonstrate their understanding of their duties and obligations to health and safety by:</p> <ul style="list-style-type: none"> <li>- applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act 1974</li> <li>- identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as: <ul style="list-style-type: none"> <li>- eye protection and personal protective equipment (PPE)</li> <li>- COSHH regulations</li> <li>- risk assessments</li> </ul> </li> <li>- identifying the warning signs and labels of the main groups of hazardous or dangerous substances</li> <li>- complying with the appropriate statutory regulations at all times</li> </ul> <p>1.3 present themselves in the workplace suitably prepared for the activities to be undertaken</p> <p>1.4 follow organisational accident and emergency procedures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.5 comply with emergency requirements, to include:</p> <ul style="list-style-type: none"> <li>- identifying the appropriate qualified first aiders and the location of first aid facilities</li> <li>- identifying the procedures to be followed in the event of injury to themselves or others</li> <li>- following organisational procedures in the event of fire and the evacuation of premises</li> <li>- identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment</li> </ul> <p>1.6 recognise and control hazards in the workplace</p> <p>1.7 identify the hazards and risks that are associated with the following:</p> <ul style="list-style-type: none"> <li>- their working environment</li> <li>- the equipment that they use</li> <li>- materials and substances (where appropriate) that they use</li> <li>- working practices that do not follow laid-down procedures</li> </ul> <p>1.8 use correct manual lifting and carrying techniques</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.9 demonstrate one of the following methods of manual lifting and carrying:</p> <ul style="list-style-type: none"> <li>- lifting alone</li> <li>- with assistance of others</li> <li>- with mechanical assistance</li> </ul> <p>1.10 apply safe working practices and procedures to include:</p> <ul style="list-style-type: none"> <li>- maintaining a tidy workplace, with exits and gangways free from obstruction</li> <li>- using equipment safely and only for the purpose intended</li> <li>- observing organisational safety rules, signs and hazard warnings</li> <li>- taking measures to protect others from any harm resulting from the work that they are carrying out.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2 Know how to comply with statutory regulations and organisational safety requirements</p>	<p>2.1 describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act 1974, and other 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, Manual Handling Operations Regulations, Provision and Use of Work Equipment Regulations, Display Screen at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations)</p> <p>2.2 describe the specific regulations and safe working practices and procedures that apply to their work activities</p> <p>2.3 describe the warning signs for the seven main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances Regulations</p> <p>2.4 explain how to locate relevant health and safety information for their tasks, and the sources of expert assistance when help is needed</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.5 explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, poorly placed equipment, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile, flammable or toxic materials, unshielded processes, working in confined spaces)</p> <p>2.6 describe their responsibilities for identifying and dealing with hazards and reducing risks in the workplace</p> <p>2.7 describe the risks associated with their working environment (such as the tools, materials and equipment that they use, spillages of oil, chemicals and other substances, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures)</p> <p>2.8 describe the processes and procedures that are used to identify and rate the level of risk (such as safety inspections, the use of hazard checklists, carrying out risk assessments, COSHH assessments)</p> <p>2.9 describe the first aid facilities that exist within their work area and within the organisation in general; the procedures to be followed in the case of accidents involving injury</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.10 explain what constitute dangerous occurrences and hazardous malfunctions, and why these must be reported even if no one is injured</p> <p>2.11 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</p> <p>2.12 describe the organisational policy with regard to fire fighting procedures; the common causes of fire and what they can do to help prevent them</p> <p>2.13 describe the protective clothing and equipment that is available for their areas of activity</p> <p>2.14 explain how to safely lift and carry loads, and the manual and mechanical aids available</p> <p>2.15 explain how to prepare and maintain safe working areas; the standards and procedures to ensure good housekeeping</p> <p>2.16 describe the importance of safe storage of tools, equipment, materials and products</p> <p>2.17 describe the extent of their own authority, and to whom they should report in the event of problems that they cannot resolve.</p>			

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## **Unit 3: Using and interpreting engineering data and documentation**

**Unit reference number:** Y/601/5102

**QCF level:** 2

**Credit value:** 5

**Guided learning hours:** 25

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to make effective use of text, numeric and graphical information, by interpreting and using technical information extracted from documents such as engineering drawings, technical manuals, reference tables, specifications, technical sales/marketing documentation, charts or electronic displays, in accordance with approved procedures. The learner will be required to extract the necessary information from the various documents, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1 Use and interpret engineering data and documentation</p>	<p>1.1 use the approved source to obtain the required data and documentation</p> <p>1.2 use the data and documentation and carry out all of the following:</p> <ul style="list-style-type: none"> <li>- check the currency and validity of the data and documentation used</li> <li>- exercise care and control over the documents at all times</li> <li>- correctly extract all necessary data in order to carry out the required tasks</li> <li>- seek out additional information where there are gaps or deficiencies in the information obtained</li> <li>- deal with or report any problems found with the data and documentation</li> <li>- make valid decisions based on the evaluation of the engineering information extracted from the documents</li> <li>- return all documents to the approved location on completion of the work</li> <li>- complete all necessary work-related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 correctly identify, interpret and extract the required information</p> <p>1.4 extract information that includes three of the following:</p> <ul style="list-style-type: none"> <li>- materials or components required</li> <li>- dimensions</li> <li>- tolerances</li> <li>- build quality</li> <li>- installation requirements</li> <li>- customer requirements</li> <li>- timescales</li> <li>- financial information</li> <li>- operating parameters</li> <li>- surface texture requirements</li> <li>- location/orientation of parts</li> <li>- process or treatments required</li> <li>- dismantling/assembly sequence</li> <li>- inspection/testing requirements</li> <li>- number/volumes required</li> <li>- repair/service methods</li> <li>- method of manufacture</li> <li>- weld type and size</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- operations required</li> <li>- connections to be made</li> <li>- surface finish required</li> <li>- shape or profiles</li> <li>- fault-finding procedures</li> <li>- safety/risk factors</li> <li>- environmental controls</li> <li>- specific data (such as component data, maintenance data, electrical data, fluid data)</li> <li>- resources (such as tools, equipment, personnel)</li> <li>- utility supply details (such as electricity, water, gas, air)</li> <li>- location of services, including standby and emergency backup systems</li> <li>- circuit characteristics (such as pressure, flow, current, voltage, speed)</li> <li>- protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment)</li> <li>- other specific related information</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.5 use the information obtained to ensure that work output meets the specification</p> <p>1.6 use information extracted from documents to include one from the following:</p> <ul style="list-style-type: none"> <li>- drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings)</li> <li>- diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams)</li> <li>- manufacturers manuals/drawings</li> <li>- approved sketches</li> <li>- technical illustrations</li> <li>- photographic representations</li> <li>- visual display screen information</li> <li>- technical sales/marketing documentation</li> <li>- contractual documentation</li> <li>- other specific drawings/documents</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 use information extracted from related documentation, to include two from the following:</p> <ul style="list-style-type: none"> <li>- instructions (such as job instructions, drawing instructions, manufacturers instructions)</li> <li>- specifications (such as material, finish, process, contractual, calibration)</li> <li>- reference materials (such as manuals, tables, charts, guides, notes)</li> <li>- schedules</li> <li>- operation sheets</li> <li>- service/test information</li> <li>- planning documentation</li> <li>- quality control documents</li> <li>- company specific technical instructions</li> <li>- national, international and organisational standards</li> <li>- health and safety standards relating to the activity (such as COSHH)</li> <li>- other specific related documentation</li> </ul> <p>1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved</p> <p>1.9 report any inaccuracies or discrepancies in documentation and specifications.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2 Know how to use and interpret engineering data and documentation</p>	<p>2.1 explain what information sources are used for the data and documentation that they use in their work activities</p> <p>2.2 explain how documents are obtained, and how to check that they are current and valid</p> <p>2.3 explain the basic principles of confidentiality (including what information should be available and to whom)</p> <p>2.4 describe the different ways/formats that data and documentation can be presented (such as such as drawings, job instructions, product data sheets, manufacturer's manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information)</p> <p>2.5 explain how to use other sources of information to support the data (such as electronic component pin configuration specifications, reference charts, standards, bend allowances required for material thickness, electrical conditions required for specific welding rods, mixing ratios for bonding and finishing materials, metal specifications and inspection requirements, health and safety documentation)</p> <p>2.6 describe the importance of differentiating fact from opinion when reviewing data and documentation</p> <p>2.7 describe the importance of analysing all available data and documentation before decisions are made</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 describe the different ways of storing and organising data and documentation to ensure easy access</p> <p>2.9 describe the procedures for reporting discrepancies in the data or documentation, and for reporting lost or damaged documents</p> <p>2.10 describe the importance of keeping all data and documentation up to date during the work activity, and the implications of this not being done</p> <p>2.11 explain the care and control procedures for the documents, and how damage or graffiti on documents can lead to scrapped work</p> <p>2.12 explain the importance of returning documents to the designated location on completion of the work activities</p> <p>2.13 explain what basic drawing conventions are used and why there needs to be different types of drawings (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)</p> <p>2.14 explain what types of documentation are used and how they interrelate (such as production drawings, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)</p> <p>2.15 explain the imperial and metric systems of measurement; tolerancing and fixed reference points</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.16 describe the meaning of the different symbols and abbreviations found on the documents that they use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics)</p> <p>2.17 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.</p>			

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## **Unit 4: Working efficiently and effectively in engineering**

**Unit reference number:** Y/601/5052

**QCF level:** 2

**Credit value:** 5

**Guided learning hours:** 25

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to work efficiently and effectively in the workplace, in accordance with approved procedures and practices. Prior to undertaking the engineering activity, the learner 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 ensuring that any tools, equipment, materials and other resources required are available and in a safe and usable condition.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1 Work efficiently and effectively in engineering</p>	<p>1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines</p> <p>1.2 prepare the work area to carry out the engineering activity</p> <p>1.3 prepare to carry out the engineering activity, taking into consideration all of the following, as applicable to the work to be undertaken:</p> <ul style="list-style-type: none"> <li>- the work area is free from hazards and suitably prepared for the activities to be undertaken</li> <li>- any required safety procedures are implemented</li> <li>- any necessary personal protection equipment is obtained and is in a usable condition</li> <li>- tools and equipment required are obtained and checked that they are in a safe and useable condition</li> <li>- all necessary drawings, specifications and associated documentation is obtained</li> <li>- job instructions are obtained and understood</li> <li>- the correct materials or components are obtained</li> <li>- storage arrangements for work are appropriate</li> <li>- appropriate authorisation to carry out the work is obtained</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.4 check that there are sufficient supplies of materials and/or consumables and that they meet work requirements</p> <p>1.5 ensure completed products or resources are stored in the appropriate location on completion of the activities</p> <p>1.6 complete work activities, to include all of the following:</p> <ul style="list-style-type: none"> <li>- returning tools and equipment</li> <li>- returning drawings and work instructions</li> <li>- completing all necessary documentation accurately and legibly</li> <li>- identifying, where appropriate, any unusable tools, equipment and components</li> <li>- arranging for the safe disposal of waste materials</li> </ul> <p>1.7 tidy up the work area on completion of the engineering activity</p> <p>1.8 deal promptly and effectively with problems within their control and report those that cannot be resolved</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.9 deal with problems affecting the engineering process, to include two of the following:</p> <ul style="list-style-type: none"> <li>- materials</li> <li>- tools and equipment</li> <li>- drawings</li> <li>- job specification</li> <li>- quality</li> <li>- people</li> <li>- timescales</li> <li>- safety</li> <li>- activities or procedures</li> </ul> <p>1.10 contribute to organisational procedures for identifying opportunities for improvement to one of the following:</p> <ul style="list-style-type: none"> <li>- working practices</li> <li>- working methods</li> <li>- quality</li> <li>- safety</li> <li>- tools and equipment</li> <li>- supplier relationships</li> <li>- internal communication</li> <li>- customer service</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- training and development</li> <li>- teamwork</li> <li>- other</li> </ul> <p>1.11 maintain effective working relationships with colleagues to include two of the following:</p> <ul style="list-style-type: none"> <li>- colleagues within their own working group</li> <li>- people outside their normal working group</li> <li>- line management</li> <li>- external contacts</li> </ul> <p>1.12 review personal training and development as appropriate to the job role</p> <p>1.13 review personal development objectives and targets to include one of the following:</p> <ul style="list-style-type: none"> <li>- dual or multi-skilling</li> <li>- training on new equipment/technology</li> <li>- increased responsibility</li> <li>- understanding of company working practices, procedures, plans and policies</li> <li>- other specific requirements.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2 Know how to work efficiently and effectively in engineering</p>	<p>2.1 describe the safe working practices and procedures to be followed whilst preparing and tidying up their work environment</p> <p>2.2 describe the correct use of any equipment to protect the health and safety of themselves and their colleagues</p> <p>2.3 describe the procedure for ensuring that all documentation relating to the work being carried out is available and current, prior to starting the activity</p> <p>2.4 describe the action that should be taken if documentation received is incomplete and/or incorrect</p> <p>2.5 describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity</p> <p>2.6 describe the checks to be carried out to ensure that tools and equipment are in full working order, prior to undertaking the activity</p> <p>2.7 describe the action that should be taken if tools and equipment are not in full working order</p> <p>2.8 describe the checks to be carried out to ensure that all required materials are correct and complete, prior to undertaking the activity</p> <p>2.9 describe the action that should be taken if materials do not meet the requirements of the activity</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.10 explain whom to inform when the work activity has been completed</p> <p>2.11 describe the information and/or documentation that others will require to confirm that the activity has been completed</p> <p>2.12 explain what materials, equipment and tools can be reused</p> <p>2.13 explain how any waste materials and/or products are transferred, stored and disposed of</p> <p>2.14 explain where tools and equipment should be stored and located</p> <p>2.15 describe the importance of maintaining effective working relationships within the workplace</p> <p>2.16 describe the procedures for dealing with and reporting any problems that can affect working relationships</p> <p>2.17 describe the importance of making a contribution to improving working practices</p> <p>2.18 describe the procedure and format for making suggestions for improvements</p> <p>2.19 describe the benefits for the work area if improvements can be identified</p> <p>2.20 describe the difficulties that can occur in working relationships</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.21 describe the regulations that affect how they should be treated at work (such as Equal Opportunities Act, Race and Sex Discrimination, Working Time Directive)</p> <p>2.22 describe the benefits of continuous personal development</p> <p>2.23 describe the training opportunities that are available in the workplace</p> <p>2.24 describe the importance of reviewing their training and development</p> <p>2.25 explain with whom to discuss training and development issues</p> <p>2.26 describe the extent of their own authority and to whom they should report if they have any problems that they cannot resolve.</p>			

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## **Unit 5: Carrying out aircraft handling operations**

**Unit reference number:** R/601/4241

**QCF level:** 2

**Credit value:** 12

**Guided learning hours:** 35

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out aircraft handling operations on commercial, military or light aircraft, both fixed wing and rotary, in accordance with approved procedures. The learner will be required to select the appropriate 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. The learner 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.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Carrying out aircraft handling operations</p>	<p>1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines</p> <p>1.2 carry out all of the following during the aircraft handling activities:</p> <ul style="list-style-type: none"> <li>- ensure that appropriate authorisation to carry out the work is obtained</li> <li>- check that the work area is free from hazards and suitably prepared for the activities to be undertaken</li> <li>- ensure that any required safety procedures are implemented</li> <li>- obtain appropriate personal protection equipment and emergency equipment, and check that it is in a usable condition</li> <li>- obtain any support equipment required, and check that it is in a safe and useable condition</li> <li>- return all tools and equipment to the correct storage location</li> <li>- leave the work area and the aircraft in a safe condition</li> </ul> <p>1.3 prepare the aircraft and work area for the handling activities to be undertaken</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.4 prepare the aircraft for towing, by carrying out four of the following:</p> <ul style="list-style-type: none"> <li>- ensure the aircraft is in safe condition to move, by checking aircraft documentation</li> <li>- check/set brake pressure</li> <li>- make cockpit checks and apply internal power, as required</li> <li>- check/fit required safety locks/pins</li> <li>- check/remove electrical bonding (where appropriate)</li> </ul> <p>1.5 assist in carrying out all of the following during the preparation for flight operations:</p> <ul style="list-style-type: none"> <li>- remove all blanks, bungs and locking/safety devices</li> <li>- carry out cockpit checks and apply ground power</li> <li>- carry out engine starter crew activities (using headset operations and/or hand signals)</li> <li>- carry out pre-flight checks</li> <li>- marshalling</li> </ul> <p>1.6 carry out the activities within the limits of your personal authority.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Carrying out aircraft handling operations (continued)</p>	<p>1.7 carry out the activities in the specified sequence and in an agreed timescale</p> <p>1.8 during aircraft towing, complete aircraft moves, including two of the following:</p> <ul style="list-style-type: none"> <li>- hangar to flight line/deck</li> <li>- to/from hardened aircraft shelter operations</li> <li>- to test/inspection area</li> </ul> <p>plus undertake three roles from the following:</p> <ul style="list-style-type: none"> <li>- brake man</li> <li>- blade man</li> <li>- safety chock man</li> <li>- wing tip man</li> <li>- tail safety man</li> <li>- tractor/steering operator</li> <li>- towing supervisor</li> </ul> <p>1.9 carry out all of the following during recovery from flight operations:</p> <ul style="list-style-type: none"> <li>- marshalling</li> <li>- parking of aircraft, to include chocking and where appropriate earthing</li> <li>- fitting blanks, bungs and locking/safety devices</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.10 carry out aircraft handling operations which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.11 report any instances where the activities cannot be fully met or where defects are identified</p> <p>1.12 check the aircraft and work area are left in a safe and secure condition on completion of the activities.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to carry out aircraft handling operations</p>	<p>2.1 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)</p> <p>2.2 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</p> <p>2.3 explain the authorisation they require to commence work on the aircraft</p> <p>2.4 describe the hazards associated with towing, marshalling, parking, securing the aircraft (including airfield hazards and procedures), and explain how they can be minimised</p> <p>2.5 describe the hazards associated with engine start and running, and explain how they can be minimised</p> <p>2.6 explain the importance of aircraft husbandry and of ensuring that, throughout the activity, the aircraft and area are free from foreign objects</p> <p>2.7 explain what protective equipment they need to use for both personal protection and protection of the aircraft</p> <p>2.8 describe the specifications used during aircraft handling, and the importance of following the procedures listed in these documents</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 explain the process and procedures for preparing an aircraft for flight operations (including engine start and 'see off')</p> <p>2.10 explain the process and procedures for recovering an aircraft from flight operations ('see in').</p>			
<p>2b Know how to carry out aircraft handling operations (continued)</p>	<p>2.11 describe the standard signals used when marshalling and handling aircraft</p> <p>2.12 explain the importance of correct electrical bonding specifications</p> <p>2.13 explain the quality standards that they must work to during the activities</p> <p>2.14 describe the problems that can occur with the aircraft handling activities, and explain how these can be overcome</p> <p>2.15 explain the importance of correct securing of the aircraft, and of fitting blanks, bungs and locking/safety devices</p> <p>2.16 explain the importance of tool control, and company tool control procedures</p> <p>2.17 explain what methods and equipment are used to manoeuvre aircraft, and how to check that the equipment is in a usable condition</p> <p>2.18 describe the tools and equipment used in the aircraft handling activities, and explain any calibration/care and control procedures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.19 describe how to deal with problems with aircraft handling processes or procedures, and explain the importance of informing appropriate people of defects</p> <p>2.20 describe the extent of their own responsibility, and explain to whom they should report to if they have problems that they cannot resolve.</p>			

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## **Unit 6: Carrying out aircraft routine servicing**

**Unit reference number:** H/601/4244

**QCF level:** 2

**Credit value:** 15

**Guided learning hours:** 49

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out routine servicing of commercial, military or light aircraft, both fixed wing and rotary, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the servicing activities to be carried out, and to check that they are in a safe and serviceable condition. The servicing activities will involve assisting in defuelling, refuelling and replenishing gaseous systems, replenishing oil systems, checking undercarriages and wheels/skids, and completing servicing records.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Carrying out aircraft routine servicing</p>	<p>1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines</p> <p>1.2 follow the relevant maintenance schedules to carry out the required work</p> <p>1.3 carry out all of the following during the aircraft servicing activities:</p> <ul style="list-style-type: none"> <li>- use the correct issue of the servicing or maintenance schedule</li> <li>- use copies of relevant COSHH sheets, risk assessment and aircraft standards</li> <li>- check the calibration dates of tools to be used</li> <li>- obtain clearance to work on the aircraft, and observe the power isolation and safety procedures</li> <li>- use appropriate and approved maintenance techniques at all times</li> <li>- return all tools and equipment to the correct location</li> <li>- leave the work area in a safe and tidy condition</li> </ul> <p>1.4 carry out the maintenance activities within the limits of your personal authority</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.5 assist in the refuelling or defuelling of the aircraft, to include carrying out three of the following:</p> <ul style="list-style-type: none"> <li>- remove and refit access panels and structures</li> <li>- check fuel filter indicators</li> <li>- clean/replace fuel filters</li> <li>- check the security and continuity of fuel equipment bonding</li> <li>- refuel or defuel to the correct fuel load and distribution</li> </ul> <p>1.6 carry out the maintenance activities in the specified sequence and in an agreed timescale</p> <p>1.7 carry out all of the following during replenishment of gaseous systems:</p> <ul style="list-style-type: none"> <li>- apply appropriate safety precautions to prevent oil or grease contamination</li> <li>- ensure the electrical earth bonding of gaseous supply equipment</li> <li>- monitor flow rates and storage pressures during the replenishment</li> </ul> <p>1.8 carry out both of the following during replenishment of oil/hydraulic systems:</p> <ul style="list-style-type: none"> <li>- check/replace filters</li> <li>- drain and replace oil, or top up oil reservoirs, as appropriate.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Carrying out aircraft routine servicing (continued)</p>	<p>1.9 visually inspect undercarriages and wheels/skids, by carrying out five of the following checks:</p> <ul style="list-style-type: none"> <li>- tyre impact damage</li> <li>- tyre inflation pressures</li> <li>- tyre creep</li> <li>- floatation gear security</li> <li>- corrosion</li> <li>- hydraulic leaks</li> <li>- shock absorber extension</li> <li>- fastener security</li> <li>- split-pin security</li> <li>- skid damage</li> </ul> <p>1.10 report any instances where the servicing or maintenance activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>1.11 complete relevant maintenance records accurately and pass them on to the appropriate person</p> <p>1.12 dispose of waste materials in accordance with safe working practices and approved procedures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 carry out servicing work which complies with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- manufacturer's specifications</li> <li>- ISO 9000 series procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- service schedule/log</li> <li>- job cards</li> <li>- aircraft service/flight log.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to carry out aircraft routine servicing</p>	<p>2.1 describe the specific safety precautions and procedures to be observed whilst carrying out the aircraft servicing (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 explain health and safety requirements of the work area in which they are carrying out the aircraft servicing activities, and the responsibility these requirements place on them</p> <p>2.3 explain the authorisation they require to commence work on the aircraft</p> <p>2.4 describe the hazards associated with servicing the aircraft, and how they can be minimised</p> <p>2.5 describe the hazards associated with working on and replenishing aircraft systems (such as fuel, gaseous systems and oils), and how they can be minimised</p> <p>2.6 explain the protective equipment that they need to use for both personal protection and protection of the aircraft</p> <p>2.7 describe the maintenance schedules and servicing specifications that are used during the servicing activities, and the importance of following the procedures listed in these documents</p> <p>2.8 explain the replenishments to be made, and the methods of replenishment</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 explain the electrical bonding specifications, and their importance</p> <p>2.10 describe how to identify the fuels, lubricants and gases to be used, and how to ensure that systems are not contaminated</p> <p>2.11 explain the procedures for checking undercarriages and wheels</p> <p>2.12 explain the quality control procedures to be followed during the servicing procedures.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to carry out aircraft routine servicing (continued)</p>	<p>2.13 describe how to conduct any necessary checks to ensure the system integrity and functionality</p> <p>2.14 describe the problems that can occur with the servicing and maintenance activities, and how these can be overcome</p> <p>2.15 explain the importance of correct securing and locking of connections</p> <p>2.16 explain the importance of tool control, and company tool control procedures</p> <p>2.17 describe how replenishment equipment is cared for, connected, operated and controlled</p> <p>2.18 describe the methods and equipment used to replenish aircraft systems, and how to check that the equipment is within its current certification dates</p> <p>2.19 explain the tools and equipment used in the servicing activities, and their calibration/care and control procedures</p> <p>2.20 explain the importance of ensuring that, when the servicing is completed, the aircraft is free from dirt, swarf and foreign objects</p> <p>2.21 explain the disposal methods for waste oil, fuel, other liquids and waste</p> <p>2.22 describe how to deal with problems with the servicing procedures, and the importance of informing appropriate people of defects</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.23 explain the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.24 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

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*(if sampled)*



## **Unit 7: Carry out maintenance on aircraft mechanical systems by component replacement**

**Unit reference number:** K/601/4245

**QCF level:** 2

**Credit value:** 45

**Guided learning hours:** 126

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out mechanical component replacement on commercial, military and light aircraft, both fixed wing and rotary, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the maintenance activities to be carried out, and to check that they are in a safe and serviceable condition. The learner will be required to prepare the aircraft for work, and this will involve obtaining permission to work on the aircraft, ensuring that all safety pins and warning notices are in place, and ensuring that the relevant systems are in a suitable condition for work to be undertaken. The maintenance activities to be carried out will involve the replacement of aircraft mechanical system components, which will include components from the following systems: undercarriage, brakes, hydraulics, pneumatics, fuel/oil, air/oxygen, environmental, de-icing, flying control and engine change units.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Sema Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Carry out maintenance on aircraft mechanical systems by component replacement</p>	<p>1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines</p> <p>1.2 carry out all of the following during the aircraft maintenance activities:</p> <ul style="list-style-type: none"> <li>- use the correct issue of the aircraft servicing or maintenance schedule</li> <li>- use copies of relevant COSHH sheets, risk assessment and aircraft standards</li> <li>- check the calibration dates of tools and equipment to be used</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe and tidy condition</li> </ul> <p>1.3 follow the relevant maintenance schedules to carry out the required work</p> <p>1.4 carry out the maintenance activities within the limits of your personal authority</p> <p>1.5 prepare the aircraft for work, by carrying out all of the following:</p> <ul style="list-style-type: none"> <li>- obtain clearance to work on the aircraft, and observe the power isolation and safety procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- identify defects for maintenance and ensure the aircraft is fit for maintenance from the aircraft documentation</li> <li>- ensure that relevant safety warnings are in place               <ul style="list-style-type: none"> <li>- ensure that appropriate safety locks/pins are in place</li> <li>- check that the relevant systems are in a condition for work and for component replacement to take place</li> </ul> </li> </ul> <p>1.6 carry out the maintenance activities in the specified sequence and in an agreed timescale</p> <p>1.7 carry out component replacements on three of the following aircraft systems:</p> <ul style="list-style-type: none"> <li>- engine change unit</li> <li>- oxygen supply</li> <li>- undercarriage</li> <li>- hydraulic</li> <li>- pneumatic</li> <li>- de-icing</li> <li>- fuel/oil</li> <li>- transmission</li> <li>- flying control surfaces</li> <li>- mechanical controls</li> <li>- environmental control.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Carry out maintenance on aircraft mechanical systems by component replacement (continued)</p>	<p>1.8 carry out ten of the following maintenance techniques, as applicable to the equipment being maintained:</p> <ul style="list-style-type: none"> <li>- removing excessive dirt and grime</li> <li>- isolating and/or depressurising system</li> <li>- draining system fluids</li> <li>- dismantling equipment to unit/sub-assembly level</li> <li>- dismantling units to component level</li> <li>- monitoring component condition/deterioration</li> <li>- proof-marking/labelling of components/units</li> <li>- replacing 'lived' items (such as seals, bearings, gaskets)</li> <li>- replacing all damaged or defective units/components</li> <li>- securing components using mechanical fasteners and threaded devices</li> <li>- applying bolt locking methods (such as split-pins, wire locking, lock nuts, stiff nuts, swage nuts)</li> <li>- making static, functional or operational checks of the completed system</li> <li>- reassembling the equipment/system</li> <li>- making all required pipe connections</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- carrying out leak checks on all connections</li> <li>- setting and adjusting replaced components</li> <li>- reconnecting electrical connections</li> <li>- tightening fastenings to the required torque</li> <li>- applying gaskets and sealant/adhesives</li> <li>- replenishing system fluids</li> <li>- replenishing oils and greases.</li> </ul> <p>1.9 replace a range of components, involving the disconnection and reconnection of eight of the following:</p> <ul style="list-style-type: none"> <li>- mechanical units</li> <li>- brake units</li> <li>- quick release fasteners</li> <li>- pipes and unions</li> <li>- panels</li> <li>- filters</li> <li>- threaded fasteners</li> <li>- actuating mechanisms</li> <li>- clamps</li> <li>- springs</li> <li>- chains and sprockets</li> <li>- cables and pulleys</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- levers and linkages</li> <li>- shims and packing</li> <li>- valves</li> <li>- microswitches and stops</li> <li>- control rods</li> <li>- free electrical connectors</li> <li>- cylinders/actuators</li> <li>- seals and gaskets</li> <li>- other specific components</li> </ul> <p>1.10 report any instances where the servicing or maintenance activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>1.11 carry out maintenance work which complies with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> <li>- manufacturer's specifications</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.12 complete relevant maintenance records accurately, to include one from the following and pass them on to the appropriate person:</p> <ul style="list-style-type: none"> <li>- maintenance schedule/log</li> <li>- job cards</li> <li>- aircraft service/flight log</li> </ul> <p>1.13 dispose of waste materials in accordance with safe working practices and approved procedures.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to carry out maintenance on aircraft mechanical systems by component replacement</p>	<p>2.1 describe specific safety precautions and procedures to be observed whilst carrying out the aircraft maintenance (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area in which they are carrying out the aircraft maintenance activities, and the responsibility these requirements place on them</p> <p>2.3 explain the authorisation they require to commence work on the aircraft</p> <p>2.4 describe the hazards associated with working on aircraft systems (such as fuel, oxygen and oils), and how they can be minimised</p> <p>2.5 describe the protective equipment that they need to use for both personal protection and protection of the aircraft</p> <p>2.6 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</p> <p>2.7 describe the components to be replaced, and the method of replacement</p> <p>2.8 explain the electrical bonding specifications, and their importance</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 explain how to identify the components to be used, and how to ensure that systems are not contaminated</p> <p>2.10 explain the quality control procedures to be followed during the maintenance procedures</p> <p>2.11 describe how to conduct any necessary checks to ensure the system integrity and functionality.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to carry out maintenance on aircraft mechanical systems by component replacement (continued)</p>	<p>2.12 explain the problems that can occur with the aircraft maintenance activities, and how these can be overcome</p> <p>2.13 explain the importance of correct securing and locking of connections</p> <p>2.14 explain the importance of tool control, and company tool control procedures</p> <p>2.15 describe the methods and equipment used to maintain aircraft systems</p> <p>2.16 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures</p> <p>2.17 explain the importance of ensuring that, when the maintenance is completed, the aircraft is free from dirt, swarf and foreign objects</p> <p>2.18 describe the disposal methods for waste oil, fuel, other liquids and waste</p> <p>2.19 describe the problems with the maintenance procedures, and the importance of informing appropriate people of defects</p> <p>2.20 explain the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

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Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

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(if sampled)



## **Unit 8: Carrying out maintenance on aircraft electrical/electronic systems by component replacement**

**Unit reference number:** M/601/4246

**QCF level:** 2

**Credit value:** 45

**Guided learning hours:** 126

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out electronic component replacement on commercial, military or light aircraft, both fixed wing and rotary, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the maintenance activities to be carried out, and to check that they are in a safe and serviceable condition. The learner will be required to prepare the aircraft for work, and this will involve obtaining permission to work on the aircraft, ensuring that all safety pins and warning notices are in place, and ensuring that the relevant systems are in a suitable condition for work to be undertaken. The maintenance activities will involve the replacement of a number of electrical, electronic or avionic modules or components from the following systems: power and distribution, lighting, engine control and indication, flight control, pitot static, radar equipment, navigational equipment, communication equipment, defensive aids, undercarriage, and cabin equipment such as for catering and entertainment.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Carrying out maintenance on aircraft electrical/electronic systems by component replacement</p>	<p>1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines</p> <p>1.2 carry out all of the following during the aircraft electrical, electronic or avionic maintenance activities:</p> <ul style="list-style-type: none"> <li>- use the correct issue of the aircraft servicing or maintenance schedule</li> <li>- use copies of relevant COSHH sheets, risk assessment and aircraft standards</li> <li>- check the calibration dates of tools and equipment to be used</li> <li>- return all tools and equipment to the correct location</li> <li>- leave the work area in a safe and tidy condition</li> </ul> <p>1.3 prepare the aircraft for work by carrying out all of the following:</p> <ul style="list-style-type: none"> <li>- obtain clearance to work on the aircraft, and observe the power isolation and safety procedures</li> <li>- identify defects for maintenance and ensure the aircraft is fit for maintenance from the aircraft documentation</li> <li>- ensure that relevant safety warnings are in place</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- ensure that appropriate safety locks/pins are in place</li> <li>- check that the relevant systems are in a condition for work, and for component replacement to take place</li> </ul> <p>1.4 follow the relevant maintenance schedules to carry out the required work</p> <p>1.5 carry out the maintenance activities within the limits of your personal authority</p> <p>1.6 carry out the maintenance activities in the specified sequence and in an agreed timescale</p> <p>1.7 carry out component replacements on three of the following aircraft electrical, electronic or avionic systems:</p> <ul style="list-style-type: none"> <li>- aircraft power and distribution</li> <li>- lighting</li> <li>- engine control and indication</li> <li>- flight control</li> <li>- pitot static</li> <li>- cabin equipment (such as catering entertainment)</li> <li>- radar</li> <li>- navigation</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Carrying out maintenance on aircraft electrical/electronic systems by component replacement (continued)</p>	<p>1.8</p> <ul style="list-style-type: none"> <li>- communication</li> <li>- defensive aids</li> <li>- undercarriage.</li> </ul> <p>carry out ten of the following maintenance techniques, as applicable to the equipment being maintained:</p> <ul style="list-style-type: none"> <li>- isolating power</li> <li>- dismantling equipment to unit/component level</li> <li>- proof-marking/labelling of components/units</li> <li>- replacing all damaged or defective units/components</li> <li>- replacing damaged wires or cables</li> <li>- replacing damaged or defective connectors</li> <li>- checking the integrity of all connections</li> <li>- checking the integrity and security of earth bonding</li> <li>- tuning or making routine adjustments to components</li> <li>- securing components using mechanical fasteners and applying bolt locking methods</li> <li>- making electrical connections (such as soldering, splicing and crimping)</li> <li>- making static or functional checks of completed systems</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- removing excessive dirt and grime</li> <li>- use of special-to-type tools</li> <li>- depressurisation of the system</li> <li>- reassembly of the equipment/system</li> <li>- reconnecting electrical connections</li> <li>- making fluid connections to components</li> <li>- looming</li> <li>- inspecting and cleaning sensors</li> <li>- servicing battery systems</li> </ul>			
	<p>1.9 replace a range of electrical, electronic or avionics modules/components, involving the disconnection and reconnection of eight of the following:</p> <ul style="list-style-type: none"> <li>- mechanical units</li> <li>- quick release fasteners</li> <li>- electrical connectors (such as terminal blocks, male to female plug-in connectors)</li> <li>- backplate connectors</li> <li>- Pitot/static connectors</li> <li>- radio frequency (RF) connectors</li> <li>- fluid system connectors (such as pipes, unions, hoses)</li> <li>- switches (such as micro, pressure)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- avionics units</li> <li>- earth and bonding leads</li> <li>- mechanical controls (such as actuating mechanisms, brackets)</li> <li>- other specific components</li> </ul> <p>1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>1.11 carry out maintenance work which complies with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> <li>- manufacturer's specifications</li> </ul> <p>1.12 complete relevant maintenance records accurately and pass them on to the appropriate person</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- maintenance schedule/log</li> <li>- job cards</li> <li>- aircraft service/flight log</li> </ul> <p>1.14 dispose of waste materials in accordance with safe working practices and approved procedures.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to carry out maintenance on aircraft electrical/electronic systems by component replacement</p>	<p>2.1 explain the specific safety precautions and procedures to be observed whilst carrying out the aircraft maintenance activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 describe the health and safety requirements of the work area in which they are carrying out the maintenance activities, and the responsibility these requirements place on them</p> <p>2.3 explain the authorisation they require to commence work on the aircraft</p> <p>2.4 describe the hazards associated with working on aircraft systems (such as electrical power, release of stored pressure, oil and fuel, gaseous substances), and how they can be minimised</p> <p>2.5 describe the protective equipment that they need to use for both personal protection and protection of the aircraft</p> <p>2.6 describe the maintenance schedules and servicing specifications that are used during servicing and maintenance, and the importance of following the procedures listed in these documents</p> <p>2.7 explain the basic principle of operation of the equipment/circuits being maintained, and the purpose of individual components within the circuit</p> <p>2.8 describe the electrical components to be replaced, and the methods of replacement</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 explain electrical bonding specifications, and their importance</p> <p>2.10 explain the application and use of a range of electrical components (such as module blocks, terminal blocks, multi-pin plugs/sockets, tray-mounted sockets, earth bonding points)</p> <p>2.11 explain the adjustments/corrections/tuning required to the components that have been removed/replaced</p> <p>2.12 explain how to check that the replacement components meet the required specification/operating conditions</p> <p>2.13 explain how to identify the components to be used, and how to ensure that systems are not contaminated.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to carry out maintenance on aircraft electrical/electronic systems by component replacement (continued)</p>	<p>2.14 explain the quality control procedures to be followed during the maintenance procedures</p> <p>2.15 explain how to conduct any necessary checks to ensure the system integrity and functionality</p> <p>2.16 describe the problems that can occur with the servicing and maintenance activities, and how these can be overcome</p> <p>2.17 explain the importance of correct securing and locking of connections</p> <p>2.18 explain the importance of tool control, and company tool control procedures</p> <p>2.19 describe the methods and equipment used to maintain aircraft systems, and how to check that the equipment is within its current certification dates</p> <p>2.20 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures</p> <p>2.21 explain the importance of ensuring that, when the maintenance is completed, the aircraft is free from dirt, swarf and foreign objects</p> <p>2.22 describe the disposal methods for waste oil, fuel, other liquids and waste</p> <p>2.23 explain the problems with the maintenance procedures, and the importance of informing appropriate people of defects</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.24 describe the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.25 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

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(if sampled)



## **Unit 9: Servicing aircrew protective helmets and electrical headsets**

**Unit reference number:** R/601/4269

**QCF level:** 2

**Credit value:** 20

**Guided learning hours:** 42

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out servicing activities on aircrew protective helmets and electrical headsets, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the servicing activities to be carried out, and to check that they are in a safe and serviceable condition. The servicing activities to be carried out will involve dismantling the helmet to the appropriate level, and cleaning the various parts using suitable solutions. The learner will carry out a thorough examination of the protective shell and associated parts, in line with the relevant schedule, identifying and replacing any 'lifer' items, damaged, worn or defective parts. The learner will then reassemble the helmet and headset, make any required adjustments and where appropriate, check and test the equipment operation and performance.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Servicing aircrew protective helmets and electrical headsets</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the servicing of the aircrew protective helmets and electrical headsets</p> <ul style="list-style-type: none"> <li>- use the correct issue of the servicing or maintenance schedule</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- check the calibration dates of tools and equipment to be used</li> <li>- use approved servicing techniques and procedures at all times</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe and tidy condition</li> </ul> <p>1.3 follow the relevant maintenance schedules to carry out the required work</p> <p>1.4 carry out the maintenance activities within the limits of your personal authority</p> <p>1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.6 carry out all of the following servicing activities, using appropriate methods and techniques:</p> <ul style="list-style-type: none"> <li>- dismantling equipment to an appropriate level (such as removal of oxygen mask, visor cover and fabric covers)</li> <li>- cleaning the equipment (such as visor, protective shell and headsets), using appropriate solutions</li> <li>- monitoring the condition/deterioration of components</li> </ul> <p>plus three more from the following:</p> <ul style="list-style-type: none"> <li>- replacing all 'lived' components</li> <li>- replacing all damaged or defective components</li> <li>- reassembling the equipment</li> <li>- carrying out any required modifications to the equipment</li> <li>- carrying out adjustments to components and connections (such as friction settings, tuning and adjusting microphones)</li> <li>- checking the equipment operation and performance</li> <li>- testing equipment in accordance with the relevant air publication (AP)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 carry out a thorough examination of the helmet and headset, to include checking all of the following:</p> <ul style="list-style-type: none"> <li>- the protective shell for damage and softness of shell</li> <li>- all of the protective shell for screws/fasteners for security</li> <li>- visors for scratches, abrasions and cracks</li> <li>- visor hinge mechanism for corrosion, damage, security, and adjust friction settings as required</li> <li>- ear capsules for damage, wear, hardening, discoloration and security</li> <li>- 'Mic/Tel' leads for deterioration or fraying</li> <li>- chin and neck strap for wear, damage, fraying and deterioration</li> <li>- oxygen mask hooks for damage, security and bending/distortion</li> <li>- electrical headsets for signs of damage and deterioration</li> <li>- ear pads and headbands for hardening or cracking</li> <li>- ear shells for free movement in their stirrups</li> <li>- the microphone switch moves freely, and adjustable parts move freely without undue slackness</li> <li>- boom microphone (if fitted) for insecurity and damage.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Servicing aircrew protective helmets and electrical headsets (continued)	1.8 replace a range of components, to include four of the following: <ul style="list-style-type: none"> <li>- visor (clear or tinted)</li> <li>- side arm (outer and inner)</li> <li>- base assembly oxygen mask hook</li> <li>- strap assembly cable retaining</li> <li>- strap assembly (chin or neck)</li> <li>- headset electrical</li> <li>- ear capsule</li> <li>- down lead assembly</li> <li>- lining assembly (brow or neck)</li> <li>- visor cover assembly</li> <li>- 'Mic/Tel' lead (down lead and jack plug connector)</li> <li>- pads (such as crown, brow or neck)</li> <li>- elastic straps</li> <li>- ear capsule tensioning webbing</li> <li>- transducer</li> <li>- microphone switch</li> <li>- microphone boom</li> <li>- earphone</li> <li>- fabric cover</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- headband</li> <li>- earphone shell</li> </ul> <p>1.9 carry out servicing requirements, in accordance with one of the following types of instructions:</p> <ul style="list-style-type: none"> <li>- Urgent Technical Instructions (UTI)</li> <li>- Routine Technical Instructions (RTI)</li> <li>- Maintenance Instructions (MI)</li> <li>- Preliminary Warning Instructions (PWI)</li> <li>- Serious Defect Signals</li> </ul> <p>1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>1.11 carry out servicing work which complies with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 standards and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.12 complete relevant maintenance records accurately, to include one from the following and pass them on to the appropriate person:</p> <ul style="list-style-type: none"> <li>- maintenance schedule/log</li> <li>- job cards</li> <li>- aircraft service/flight log</li> </ul> <p>1.13 dispose of waste materials in accordance with safe working practices and approved procedures.</p>			
<p>2a Know how to service aircrew protective helmets and electrical headsets</p>	<p>2.1 explain the specific safety precautions and procedures to be observed whilst carrying out the servicing of the aircrew protective helmets and headsets (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 describe the health and safety requirements of the work area in which they are carrying out the servicing activities, and the responsibility these requirements place on them</p> <p>2.3 describe the hazards associated with servicing aircrew protective helmets and electrical headsets, and how they can be minimised</p> <p>2.4 describe the personal protective equipment that they need to use during the servicing activities, and where it can be obtained</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.5 explain the servicing/maintenance schedules and specifications that are used during the servicing activities, and the importance of following the procedures listed in these documents (to include Urgent Technical Instructions (UTI), satisfying Routine Technical Instructions (RTI), Maintenance Instructions (MI), Preliminary Warning Instructions (PWI) and Serious Defect Signals)</p> <p>2.6 describe the types of faults, defects or wear characteristics that are likely to occur with the aircrew protective helmets and electrical sets</p> <p>2.7 explain how to determine when components require adjustment, repair or replacement</p> <p>2.8 describe the components to be replaced in the protective helmets and headsets, and the method of replacement.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to service aircrew protective helmets and electrical headsets (continued)</p>	<p>2.9 explain the importance of the correct securing and locking of connections</p> <p>2.10 explain how to identify the components to be used for the various types of protective helmets and headsets being serviced</p> <p>2.11 explain the quality control procedures to be followed during the servicing procedures</p> <p>2.12 explain how to conduct any necessary checks to ensure that the equipment functions to specification</p> <p>2.13 describe the problems that can occur with the servicing procedures, and the importance of informing appropriate people of any defects</p> <p>2.14 explain the importance of tool control, and the organisational tool control procedures to be used</p> <p>2.15 describe the tools and equipment used in the servicing activities, and their calibration/care and control procedures</p> <p>2.16 explain the importance of ensuring that, when the servicing is completed, the equipment is free from dirt, swarf and foreign objects</p> <p>2.17 explain the disposal methods for waste and petrol, oil and lubricants (POL)</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.18 explain the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.19 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

Learner signature: \_\_\_\_\_ Date: \_\_\_\_\_

Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

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*(if sampled)*

**Unit 10: Servicing aircrew nuclear, biological and chemical (NBC) respirators and equipment**

**Unit reference number:** D/601/4274

**QCF level:** 2

**Credit value:** 22

**Guided learning hours:** 42

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out servicing activities on aircrew nuclear, biological and chemical (NBC) respirators and equipment, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the servicing activities to be carried out, and to check that they are in a safe and serviceable condition. The servicing activities to be carried out will involve dismantling the equipment to the appropriate level, and cleaning the various parts using suitable solutions. The learner will carry out a thorough examination of the NBC equipment and associated parts, in line with the relevant schedule, identifying and replacing any 'lifer' items, damaged, worn or defective parts. The learner will then reassemble the NBC equipment, make any required adjustments and, where appropriate, check and test the equipment operation and performance.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Servicing aircrew nuclear, biological and chemical (NBC) respirators and equipment</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the servicing of the aircrew NBC equipment:</p> <ul style="list-style-type: none"> <li>- use the correct issue of the servicing or maintenance schedule</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- check the calibration dates of tools and equipment to be used</li> <li>- use approved servicing and maintenance techniques at all times</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe and tidy condition</li> </ul> <p>1.3 follow the relevant maintenance schedules to carry out the required work</p> <p>1.4 carry out the maintenance activities within the limits of your personal authority</p> <p>1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.6 carry out all of the following servicing activities, using appropriate methods and techniques:</p> <ul style="list-style-type: none"> <li>- dismantling equipment to an appropriate level (such as removal of velveteen cover and valves, ice guard, cover and filtration canisters)</li> <li>- cleaning the equipment (such as respirator assembly and valves, drinking facility) using appropriate solutions</li> <li>- monitoring the condition/deterioration of components</li> </ul> <p>plus three more from the following:</p> <ul style="list-style-type: none"> <li>- replacing all 'lived' components</li> <li>- replacing all damaged or defective components</li> <li>- reassembling the equipment</li> <li>- carrying out any required modifications to the equipment</li> <li>- carrying out adjustments to components and connections</li> <li>- checking equipment operation and performance</li> <li>- testing equipment in accordance with the relevant air publication (AP)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 examine thoroughly the aircrew respirator/portable ventilator, to include checking all of the following:</p> <ul style="list-style-type: none"> <li>- mask support and deflector plate, mask face-piece and mask tubing, for damage deterioration and security of attachment</li> <li>- faceplate for abrasion, crazing at ports and housings, optical areas for blemish, faceplate sealing for security of bonding, and faceplate rip facility for bonded joints and security of rip release toggle</li> <li>- all screws, nuts and fasteners for security of attachment</li> <li>- nose occluder assembly, drinking facility for damage, puncture, cut or abrasion or deterioration of rubber</li> <li>- chain toggle harness and chain harness - examine all links for damage and security of attachment</li> <li>- inspiratory valve, ice guard filter, stepped expiratory valve, for deterioration and damage</li> <li>- apron, neck seal, bellows and cowl for damage, deterioration and security of bonded joints</li> <li>- manifold assembly, hoses and connectors for wear, damage, deterioration and security of attachment</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- microphone lead assembly for damage, deterioration or fraying</li> <li>- microphone switch for free movement without slackness</li> <li>- portable ventilator case, cover, carrying strap and hose socket, for damage, wear and security of attachment, and electrical wiring for signs of overheating, dry/broken soldered joints and condition of battery</li> <li>- canisters, canister mount seals, emergency inlet valve, and pressure relief valve for damage, deterioration, freedom of movement and security of attachment.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Servicing aircrew nuclear, biological and chemical (NBC) respirators and equipment (continued)	1.8 replace a range of NBC equipment components, to include four of the following: <ul style="list-style-type: none"> <li>- ice guard</li> <li>- inspiratory valve</li> <li>- compensated expiratory valve</li> <li>- stepped expiratory valve</li> <li>- velveteen cover</li> <li>- microphone lead assembly</li> <li>- mask</li> <li>- hood outlet and shut-off valve</li> <li>- hood inlet adapter</li> <li>- angled inlet adapter</li> <li>- hood tube</li> <li>- mask tube</li> <li>- chain toggle harness</li> <li>- manifold</li> <li>- protective sleeves</li> <li>- canister</li> <li>- canister mount seals</li> <li>- battery</li> <li>- case</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- cover</li> <li>- nut connecting cover</li> </ul> <p>1.9 carry out servicing requirements, in accordance with one of the following types of instructions:</p> <ul style="list-style-type: none"> <li>- Urgent Technical Instructions (UTI)</li> <li>- Satisfying Routine Technical Instructions (RTI)</li> <li>- Maintenance Instructions (MI)</li> <li>- Preliminary Warning Instructions (PWI)</li> <li>- Serious Defect Signals</li> </ul> <p>1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>1.11 carry out servicing work which complies with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 standards and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.12 complete relevant maintenance records accurately, to include one from the following and pass them on to the appropriate person</p> <ul style="list-style-type: none"> <li>- maintenance schedule/log</li> <li>- job cards</li> <li>- aircraft service/flight log</li> </ul> <p>1.13 dispose of waste materials in accordance with safe working practices and approved procedures.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to service aircrew nuclear, biological and chemical (NBC) respirators and equipment</p>	<p>2.1 describe specific safety precautions and procedures to be observed whilst carrying out the servicing of the aircrew NBC equipment (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area in which they are carrying out the servicing activities, and the responsibility these requirements place on them</p> <p>2.3 describe the hazards associated with servicing aircrew NBC equipment, and how they can be minimised</p> <p>2.4 describe the personal protective equipment that they need to use during the servicing activities, and where it can be obtained</p> <p>2.5 explain the servicing/maintenance schedules and specifications that are used during the servicing, and the importance of following the procedures listed in these documents (to include Urgent Technical Instructions (UTI), Satisfying Routine Technical Instructions (RTI), Maintenance Instructions (MI), Preliminary Warning Instructions (PWI) and Serious Defect Signals)</p> <p>2.6 describe the types of faults, defects or wear characteristics that are likely to occur with the NBC equipment</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to determine when components require adjustment, repair or replacement 2.8 describe the components to be replaced in the NBC equipment, and the method of replacement.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to service aircrew nuclear, biological and chemical (NBC) Respirators and equipment (continued)</p>	<p>2.9 explain the importance of the correct securing and locking of connections</p> <p>2.10 explain how to identify the components to be used for the NBC equipment being maintained</p> <p>2.11 explain the quality control procedures to be followed during the servicing activities</p> <p>2.12 explain how to conduct any necessary checks to ensure that the equipment functions to specification</p> <p>2.13 explain the problems that can occur with the servicing of the NBC equipment, and the importance of informing appropriate people of any defects</p> <p>2.14 explain the importance of tool control, and the organisational tool control procedures to be used</p> <p>2.15 describe the tools and equipment used in the servicing activities, and their calibration/care and control procedures</p> <p>2.16 explain the importance of ensuring that, when the servicing is completed, the equipment is free from dirt, swarf and foreign objects</p> <p>2.17 explain the disposal methods for waste and petrol, oil and lubricants (POL)</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.18 explain the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.19 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

Learner signature: \_\_\_\_\_ Date: \_\_\_\_\_

Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Internal verifier signature: \_\_\_\_\_ Date: \_\_\_\_\_  
*(if sampled)*

## **Unit 11: Servicing aircrew life preserver equipment**

**Unit reference number:** H/601/4275

**QCF level:** 2

**Credit value:** 22

**Guided learning hours:** 42

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out servicing activities on aircrew life preserver equipment, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the servicing activities to be carried out, and to check that they are in a safe and serviceable condition. The servicing activities will include dismantling the equipment to the appropriate level, and cleaning the various parts using suitable solutions. The learner will carry out a thorough examination of the life preserver equipment and associated parts, in line with the relevant schedule, identifying and replacing any 'lifer' items, damaged, worn or defective parts. The learner will then reassemble the life preserver equipment, make any required adjustments, and check and test the equipment operation and performance.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Service aircrew life preserver equipment</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the servicing of the aircrew life preserver equipment:</p> <ul style="list-style-type: none"> <li>- use the correct issue of the servicing or maintenance schedule</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- check the calibration dates of tools and equipment to be used</li> <li>- use approved servicing techniques and procedures at all times</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe and tidy condition</li> </ul> <p>1.3 follow the relevant maintenance schedules to carry out the required work</p> <p>1.4 carry out the maintenance activities within the limits of your personal authority</p> <p>1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.6 carry out all of the following servicing activities, using appropriate methods and techniques:</p> <ul style="list-style-type: none"> <li>- dismantling equipment to an appropriate level (such as removal of personal locator beacon (PLB) and CO2 cylinder)</li> <li>- cleaning the equipment using appropriate solutions</li> <li>- monitoring the condition/deterioration of components</li> </ul> <p>plus three more from the following:</p> <ul style="list-style-type: none"> <li>- replacing all 'lived' components</li> <li>- replacing all damaged or defective components</li> <li>- reassembling the equipment</li> <li>- carrying out any required modifications to the equipment</li> <li>- carrying out adjustments to components and connections</li> <li>- checking equipment operation and performance</li> <li>- testing the equipment in accordance with the relevant air publication (AP)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 carry out a thorough examination of the life preserver, to include checking all of the following:</p> <ul style="list-style-type: none"> <li>- waistcoat front closure plate for damage, wear and insecurity</li> <li>- waist adjustment straps and buckles for damage and correct locking action</li> <li>- all internal and external stowage pockets for damage, wear and security</li> <li>- inflation valves and oral tubes for damage and deterioration</li> <li>- stole pouch and peripheral slide fastener for damage and wear - check the operation</li> <li>- cylinder pocket and operating knob housing for security of water ingress, eyelets and snap fasteners</li> <li>- all fasteners and eyelets for damage, wear and insecurity</li> <li>- webbing tape hinges and tape touch-and-close for damage, wear and security</li> <li>- stole lacing loops, webbing loops and lifting beackets for damage, wear and security</li> <li>- life line and toggle, whistle and lanyard, heliograph - examine for correct length and security of knots</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- water activated battery and lamp assembly, for damage, length of lanyard and security of knots</li> <li>- pyrotechnic signal kit for damage and integrity of seals</li> <li>- 'Mic/Tel' flap and D-ring for damage and wear</li> <li>- CO2 cylinder for corrosion, dents, damage and integrity of gas seal and screw threads.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Service aircrew life Preserver equipment (continued)</p>	<p>1.8 replace a range of life preserver equipment components, to include four of the following:</p> <ul style="list-style-type: none"> <li>- inflatable stole</li> <li>- personal locator beacon (PLB)</li> <li>- personal locator beacon battery</li> <li>- personal locator beacon aerial</li> <li>- CO2 cylinder</li> <li>- water activated battery and lamp</li> <li>- first aid kit</li> <li>- waistcoat</li> <li>- pyrotechnic signal kit</li> <li>- drinking water</li> <li>- heliograph</li> <li>- automatic life preserver inflation unit (ALPIU)</li> <li>- 'Halkey Roberts' manual inflator</li> </ul> <p>1.9 carry out servicing requirements, in accordance with one of the following types of instructions:</p> <ul style="list-style-type: none"> <li>- Urgent Technical Instructions (UTI)</li> <li>- Satisfying Routine Technical Instructions (RTI)</li> <li>- Maintenance Instructions (MI)</li> <li>- Preliminary Warning Instructions (PWI)</li> <li>- Serious Defect Signals</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>1.11 carry out servicing work which complies with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 standards and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.12 complete relevant maintenance records accurately, to include one from the following and pass them on to the appropriate person</p> <ul style="list-style-type: none"> <li>- maintenance schedule/log</li> <li>- job cards</li> <li>- aircraft service/flight log</li> </ul> <p>1.13 dispose of waste materials in accordance with safe working practices and approved procedures.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to service aircrew life preserver equipment</p>	<p>2.1 describe the specific safety precautions and procedures to be observed whilst carrying out the servicing of the aircrew life preserver equipment (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 describe the health and safety requirements of the work area in which they are carrying out the servicing activities, and the responsibility these requirements place on them</p> <p>2.3 describe the hazards associated with servicing aircrew life preserver equipment, and how they can be minimised</p> <p>2.4 describe the personal protective equipment that they need to use during the servicing activities, and where it can be obtained</p> <p>2.5 explain the servicing/maintenance schedules and specifications that are used during the servicing activities, and the importance of following the procedures listed in these documents (to include Urgent Technical Instructions (UTI), Satisfying Routine Technical Instructions (RTI), Maintenance Instructions (MI), Preliminary Warning Instructions (PWI) and Serious Defect Signals)</p> <p>2.6 describe the types of faults, defects or wear characteristics that are likely to occur with the aircrew life preserver equipment</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.7 explain how to determine when components require adjustment, repair or replacement</p> <p>2.8 describe the components to be replaced in the aircrew life preserver equipment, and the method of replacement</p> <p>2.9 explain the importance of the correct securing and locking of connections</p> <p>2.10 describe how to identify the components to be used for the life preserver equipment being serviced.</p>			
2b Know how to service aircrew life preserver equipment (continued)	<p>2.11 explain the quality control procedures to be followed during the servicing procedures</p> <p>2.12 explain how to conduct any necessary checks to ensure that the equipment functions to specification</p> <p>2.13 describe the problems that can occur with the servicing of the life preserver equipment, and the importance of informing appropriate people of any defects</p> <p>2.14 explain the importance of tool control, and the organisational tool control procedures to be used</p> <p>2.15 describe the tools and equipment used in the servicing activities, and their calibration/care and control procedures</p> <p>2.16 explain the importance of ensuring that, when the servicing is completed, the equipment is free from dirt, swarf and foreign objects</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.17 explain the disposal methods for waste and petrol, oil and lubricants (POL)</p> <p>2.18 explain the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.19 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

Learner signature: \_\_\_\_\_ Date: \_\_\_\_\_

Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Internal verifier signature: \_\_\_\_\_ Date: \_\_\_\_\_  
*(if sampled)*

## **Unit 12: Servicing parachute assemblies**

**Unit reference number:** K/601/4293

**QCF level:** 2

**Credit value:** 22

**Guided learning hours:** 42

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out servicing activities on parachute assemblies, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the servicing activities to be carried out, and to check that they are in a safe and serviceable condition. The servicing activities to be carried out will involve dismantling the equipment to the appropriate level, and cleaning the various parts using suitable solutions. The learner will carry out a thorough examination of the parachute and associated parts, in line with the relevant schedule, identifying and replacing any 'lived' items, damaged, worn or defective parts. The learner will then reassemble the parachute, make any required adjustments and, where appropriate, check and test the equipment.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Service parachute assemblies</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the servicing and maintenance of the parachute assemblies</p> <ul style="list-style-type: none"> <li>- use the correct issue of the servicing or maintenance schedule</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- check the calibration dates of tools and equipment to be used</li> <li>- use approved servicing and maintenance techniques at all times</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe and tidy condition</li> </ul> <p>1.3 follow the relevant maintenance schedules to carry out the required work</p> <p>1.4 carry out the maintenance activities within the limits of your personal authority</p> <p>1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.6 carry out all of the following servicing activities, using appropriate methods and techniques:</p> <ul style="list-style-type: none"> <li>- dismantling the equipment to an appropriate level (such as removal of harness, pack elastics)</li> <li>- cleaning the equipment (such as rigid pack, metallic components) using appropriate solutions</li> <li>- monitoring the condition/deterioration of components</li> </ul> <p>plus three more from the following:</p> <ul style="list-style-type: none"> <li>- replacing all 'lived' components</li> <li>- replacing all damaged or defective components</li> <li>- reassembling the equipment</li> <li>- carrying out any required modifications to the equipment, where applicable</li> <li>- carrying out adjustments to components and connections</li> <li>- checking equipment operation and performance</li> <li>- testing the equipment, in accordance with the relevant air publication (AP)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 carry out a thorough examination of the parachute, to include checking/examining all of the following:</p> <ul style="list-style-type: none"> <li>- the parachute canopy, rigging lines, vent control lines, for correct sequence of attachment, damage, deterioration, contamination and security of attachment</li> <li>- main and controller drogue - all rigging lines, anti-squid line and connecting strop for damage, security of attachment, and assembled in the correct sequence</li> <li>- harness assembly for damage, deterioration and correct assembly</li> <li>- PSP connector, screws and fasteners, for correct operation and security of attachment</li> <li>- rigid pack and containers for damage, dents, cracks, freedom from loose particles, burrs and sharp edges</li> <li>- mechanical lock and metallic labels for damage, corrosion, security of attachment</li> <li>- inner and outer closure flaps, stowage trays, for damage and security of attachment</li> <li>- drogue withdrawal line for damage and 'in-use life'</li> <li>- all grommets, screws and fasteners for security of attachment</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Service parachute assemblies (continued)</p>	<ul style="list-style-type: none"> <li>- all shackles and screwed couplings, for damage and security of attachment.</li> </ul> <p>1.8 replace a range of parachute components, to include four of the following:</p> <ul style="list-style-type: none"> <li>- back pad assembly</li> <li>- padded apron</li> <li>- canopy withdrawal line</li> <li>- quick release connector</li> <li>- lap strap sub-assembly</li> <li>- harness yoke</li> <li>- front lift webs</li> <li>- rivets</li> <li>- rubber band</li> <li>- rigid pack</li> <li>- mechanical lock assembly</li> <li>- drogue withdrawal line</li> <li>- controller drogue anti-squid line</li> <li>- drogue connecting strop</li> <li>- extender strap</li> <li>- drogue-to-parachute attachment line</li> <li>- parachute withdrawal line (seat portion)</li> <li>- head support panel grommets</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- auxiliary parachute connecting strop</li> <li>- rigid pack outer closure flaps</li> <li>- rigid pack inner closure flaps</li> <li>- split pin</li> <li>- castellated nut</li> <li>- auxiliary parachute</li> <li>- rigging lines and stowage flap</li> <li>- attachment gaiter</li> <li>- strap and pack sub-assembly</li> <li>- assembly pin, transit and flag</li> <li>- container</li> </ul>			
	<p>1.9 carry out servicing requirements, in accordance with one of the following types of instructions:</p> <ul style="list-style-type: none"> <li>- Urgent Technical Instructions (UTI)</li> <li>- Satisfying Routine Technical Instructions (RTI)</li> <li>- Maintenance Instructions (MI)</li> <li>- Preliminary Warning Instructions (PWI)</li> <li>- Serious Defect Signals</li> </ul>			
	<p>1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.11 carry out servicing work which complies with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 standards and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.12 complete relevant maintenance records accurately, to include one from the following and pass them on to the appropriate person</p> <ul style="list-style-type: none"> <li>- maintenance schedule/log</li> <li>- job cards</li> <li>- aircraft service/flight log</li> </ul> <p>1.13 dispose of waste materials in accordance with safe working practices and approved procedures.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to service parachute assemblies</p>	<p>2.1 explain the specific safety precautions and procedures to be observed whilst carrying out the servicing of the parachute assemblies (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 describe the health and safety requirements of the work area in which they are carrying out the servicing activities, and the responsibility these requirements place on them</p> <p>2.3 explain the hazards associated with servicing parachute assemblies, and how they can be minimised</p> <p>2.4 describe the personal protective equipment that they need to use during the servicing activities, and where it can be obtained</p> <p>2.5 explain the servicing/maintenance schedules and specifications that are used during the servicing, and the importance of following the procedures listed in these documents (to include Urgent Technical Instructions (UTI), Satisfying Routine Technical Instructions (RTI), Maintenance Instructions (MI), Preliminary Warning Instructions (PWI) and Serious Defect Signals)</p> <p>2.6 describe the types of faults, defects or wear characteristics that are likely to occur with the parachute assemblies</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.7 describe how to determine when components require adjustment, repair or replacement</p> <p>2.8 describe the components to be replaced in the parachute assemblies, and the method of replacement</p> <p>2.9 explain the importance of the correct securing and locking of connections.</p>			
<p>2b Know how to service parachute assemblies (continued)</p>	<p>2.10 describe how to identify the components to be used for the various types of parachute assemblies being serviced</p> <p>2.11 explain the quality control procedures to be followed during the servicing procedures</p> <p>2.12 explain how to conduct any necessary checks to ensure that the parachute assemblies function to specification</p> <p>2.13 describe the problems that can occur with the servicing of parachute assemblies, and the importance of informing appropriate people of any defects</p> <p>2.14 explain the importance of tool control, and the organisational tool control procedures to be used</p> <p>2.15 explain the tools and equipment used in the servicing activities, and their calibration/care and control procedures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.16 explain the importance of ensuring that, when the servicing is completed, the parachute assembly is free from dirt and foreign objects</p> <p>2.17 explain the disposal methods for waste and petrol, oil and lubricants (POL)</p> <p>2.18 explain the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.19 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

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*(if sampled)*

## **Unit 13: Drilling and finishing holes in aircraft components**

**Unit reference number:** L/601/4299

**QCF level:** 2

**Credit value:** 33

**Guided learning hours:** 77

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to drill and finish holes in aircraft components, in accordance with approved procedures. The activities carried out will include the use of drilling machines and portable drills, using a range of cutters, as applicable to the type of hole and finish required. This will involve marking out using templates, marking out instruments and the appropriate workholding arrangements. The drilling activities will include the production and finishing of a range of holes, and checking that the finished holes are to the correct specification.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Drill and finish holes in aircraft components</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the drilling and finishing activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the drilling/finishing activities (such as drawings, instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- ensure that all tools and equipment used are within current calibration dates</li> <li>- maintain safe access and working arrangements for the area in which the drilling/finishing will take place</li> <li>- deal with defects in materials, components and equipment, in accordance with specified procedures</li> <li>- dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- return all tools and equipment to the correct location, on completion of the activities</li> </ul> <p>1.3 confirm that the machine is set up and ready for the machining activities to be carried out</p> <p>1.4 use four of the following types of marking-out/setting equipment:</p> <ul style="list-style-type: none"> <li>- marking tools</li> <li>- rules/tapes</li> <li>- squares</li> <li>- protractors</li> <li>- dividers/compasses</li> <li>- vernier gauges</li> <li>- templates</li> </ul> <p>1.5 use a range of workholding/guiding devices, to include three of the following:</p> <ul style="list-style-type: none"> <li>- jigs/fixtures</li> <li>- drill bars</li> <li>- drill blocks</li> <li>- slave bolts</li> <li>- dowels</li> <li>- clamps</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- gripping pins</li> <li>- jig pins</li> <li>- ream blocks</li> <li>- profile boards</li> </ul> <p>1.6 produce and finish holes in aircraft components, using three of the following:</p> <ul style="list-style-type: none"> <li>- bench/pedestal drill</li> <li>- portable drill</li> <li>- 'spacematic' drill</li> <li>- rackfeed drill</li> <li>- cold working pack (such as split sleeve and split mandrel)</li> <li>- pecker drill</li> <li>- radial arm drill</li> <li>- pistol pneumatic drill</li> <li>- straight pneumatic drill</li> <li>- angled pneumatic drill</li> <li>- positive feed drill</li> <li>- dooler</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 produce holes in aircraft components, using two of the following types of drill bits:</p> <ul style="list-style-type: none"> <li>- twist</li> <li>- diamond coated</li> <li>- cobalt</li> <li>- core</li> <li>- piloted core</li> </ul> <p>1.8 manipulate the machine tool controls safely and correctly in line with operational procedures</p> <p>1.9 produce components to the required quality and within the specified dimensional accuracy.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Drill and finish holes in aircraft components (continued)</p>	<p>1.10 produce and finish holes in two of the following materials:</p> <ul style="list-style-type: none"> <li>- aluminium alloys</li> <li>- titanium</li> <li>- composites</li> <li>- other specific ferrous, non-ferrous or non-metallic material</li> </ul> <p>1.11 carry out all of the following during the production and finishing of the holes:</p> <ul style="list-style-type: none"> <li>- mark out, position and secure the item to be drilled, in accordance with company procedures</li> <li>- use the specified techniques and procedures to produce and finish the holes</li> <li>- select and use the correct cutting feeds and speeds</li> <li>- use appropriate and adequate lubrication/coolant</li> <li>- check that positional accuracy complies to specifications</li> <li>- ensure that machined features are free from tool marks, burrs and sharp edges</li> <li>- apply surface protection/coatings to finished holes on completion of the drilling activity (where appropriate)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.12 produce and finish (including de-burring) holes in aircraft components, to include four of the following types of hole:</p> <ul style="list-style-type: none"> <li>- through</li> <li>- blind</li> <li>- stepped</li> <li>- reamed</li> <li>- counterbored</li> <li>- threaded (insert)</li> <li>- countersunk</li> <li>- spot faced</li> <li>- tapered</li> <li>- bored</li> <li>- dimpled</li> <li>- holes with formed edges (such as radii)</li> </ul> <p>1.13 carry out quality sampling checks at suitable intervals</p> <p>1.14 check that finished holes meet the required specification, using four of following:</p> <ul style="list-style-type: none"> <li>- plug gauges</li> <li>- hole gauges</li> <li>- vernier gauges</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- countersink check bolts</li> <li>- down-size dummy check bolts</li> <li>- depth gauges</li> <li>- de-burring/chamfer gauge</li> <li>- dial test indicators</li> <li>- surface comparator plates</li> <li>- company specific gauges</li> </ul> <p>1.15 produce finished holes which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series procedures</li> <li>- company standards and procedures</li> <li>- customer standards and requirements</li> </ul> <p>1.16 deal promptly and effectively with problems within your control and report those that cannot be solved</p> <p>1.17 shut down the equipment to a safe condition on conclusion of the machining activities.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to drill and finish holes in aircraft components</p>	<p>2.1 explain the health and safety requirements of the area in which they are carrying out the drilling and hole finishing</p> <p>2.2 explain the importance of wearing protective clothing and equipment, and of keeping the work area safe and tidy</p> <p>2.3 describe the specific health and safety precautions to be followed whilst producing and finishing holes</p> <p>2.4 describe the hazards associated with carrying out drilling and hole finishing activities on aircraft components, and how they can be minimised</p> <p>2.5 explain the safety mechanisms on the equipment used, and the procedure for checking that they function correctly</p> <p>2.6 describe how to stop the equipment in both normal and emergency situations, and the procedure for restarting after the equipment has been stopped in an emergency</p> <p>2.7 explain how to obtain and interpret drawings, standards, quality control procedures and specifications used for the drilling and finishing of holes (including BS and ISO standards, symbols and terminology and other documents needed)</p> <p>2.8 explain the importance of producing holes to the correct surface finish values, and the methods used to achieve this</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 describe the methods, techniques and equipment used to mark out and position components, prior to drilling and finishing the holes</p> <p>2.10 explain the different types and applications of drilling equipment (such as bench/pedestal, portable, 'spacematic', rackfeed, pneumatic, pecker and positive feed)</p> <p>2.11 explain the different types and application of hole cutting and finishing tools (such as drills, reamers, counterbore, countersink and spot-face cutters).</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to drill and finish holes in aircraft components (continued)</p>	<p>2.12 describe how to handle and store drills and finishing tools, safely and correctly</p> <p>2.13 explain the effects of clamping the workpiece in a jig/workholding device, and how this can cause distortion in the finished components/structures</p> <p>2.14 describe the different types and application of cutting fluids/compounds</p> <p>2.15 explain the cutting characteristics of different materials, and how this affects the type of tool used, cutting speeds, lubrication and surface finish</p> <p>2.16 explain the principles and effects of cold working when finishing holes in aircraft components</p> <p>2.17 describe the methods used to prevent corrosion on completion of drilling and finishing operations</p> <p>2.18 explain the quality control procedures used, inspection checks to be carried out on finished holes, and the equipment to be used</p> <p>2.19 explain the action to be taken in the event that holes fail to meet specification</p> <p>2.20 describe the problems that can occur with the drilling and finishing activities, and how these can be overcome</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.21 explain the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.22 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

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*(if sampled)*

## **Unit 14: Installing aircraft mechanical fasteners**

**Unit reference number:** A/601/4301

**QCF level:** 2

**Credit value:** 35

**Guided learning hours:** 77

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to install aircraft mechanical fasteners, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the type of mechanical fasteners to be installed. The mechanical fasteners to be installed will include hollow and solid rivets, threaded fasteners, anchor nuts, pins and other locking devices. The learner will need to use a range of techniques to prepare, install and check that the mechanical fasteners are installed to the required specification.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Install aircraft mechanical fasteners</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following activities during the installation:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the installation of the fasteners (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- ensure that all tools and equipment used are within current calibration dates</li> <li>- maintain safe access and working arrangements for the area in which the activities take place</li> <li>- deal with defects in fasteners, components and equipment, in accordance with specified procedures</li> <li>- dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul> <p>1.3 follow all relevant drawings and specifications for the installation being carried out</p> <p>1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition</p> <p>1.5 install, position and secure the equipment and components in accordance with the specification</p> <p>1.6 install mechanical fasteners, to include four of the following:</p> <ul style="list-style-type: none"> <li>- hollow rivets</li> <li>- solid rivets</li> <li>- collared fasteners</li> <li>- threaded fasteners</li> <li>- split-pins</li> <li>- NAPP pins</li> <li>- pin clips</li> <li>- PIT pins</li> <li>- wire locks</li> <li>- anchor nuts</li> <li>- other locking devices</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 ensure that all necessary connections to the equipment are complete.</p>			
<p>1b Install aircraft mechanical fasteners (continued)</p>	<p>1.8 use four types of equipment from the following:</p> <ul style="list-style-type: none"> <li>- gauges for intrusions</li> <li>- riveting guns (appropriate to rivet type)</li> <li>- drills and tools with attachments</li> <li>- redline templates</li> <li>- jigs</li> <li>- gripping pins and location dowels</li> <li>- clamps</li> </ul> <p>1.9 use four of the following installation methods and techniques:</p> <ul style="list-style-type: none"> <li>- countersinking</li> <li>- milling rivets</li> <li>- wire locking</li> <li>- solid riveting (single and double handed)</li> <li>- blind riveting</li> <li>- through hole</li> </ul> <p>1.10 make two types of connection from:</p> <ul style="list-style-type: none"> <li>- wet assembly</li> <li>- dry assembly</li> <li>- panels</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- skins</li> <li>- structures</li> <li>- repairs</li> </ul> <p>1.11 install fasteners in compliance with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.12 deal promptly and effectively with problems within your control and report those that cannot be solved</p> <p>1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- build records</li> <li>- log cards</li> <li>- job cards</li> <li>- aircraft log</li> </ul> <p>1.14 check that the installation is complete and that all components are free from damage.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2a Know how to install aircraft mechanical fasteners	<p>2.1 explain the specific safety precautions to be taken whilst installing the mechanical fasteners (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area in which they are carrying out the installation activities, and the responsibility these requirements place on them</p> <p>2.3 describe the hazards associated with installing mechanical fasteners, and with the tools and equipment used, and how they can be minimised</p> <p>2.4 describe the protective equipment that they need to wear for both personal protection and protection of the aircraft</p> <p>2.5 explain the importance of working to the installation instructions and appropriate specifications</p> <p>2.6 explain why they must obtain design approval before removing and replacing any faulty fasteners</p> <p>2.7 explain the purpose and use of joint sealing agents and anti-electrolysis barriers, and the precautions to be taken when using them</p> <p>2.8 explain the regulations concerning electrical bonding and anti-electrolysis barriers</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 describe the various types and ranges of screwed fasteners used on aircraft fittings, and the methods of installing them</p> <p>2.10 describe the types and applications of aircraft rivets, and the advantages of hollow rivets over solid rivets</p> <p>2.11 explain the reasons for using screw fastenings rather than rivets.</p>			
<p>2b Know how to install aircraft mechanical fasteners (continued)</p>	<p>2.12 explain the purpose and use of a countersink cage</p> <p>2.13 describe the various locking devices used with fastenings</p> <p>2.14 explain the purpose and use of locating dowels, gripping pins and gauges, when carrying out fastening operations</p> <p>2.15 explain the procedures to be adopted when removing rivets and other fasteners</p> <p>2.16 explain the term 'quilting', its occurrence and avoidance</p> <p>2.17 describe 'bolt break offs' and where they occur</p> <p>2.18 describe how to check that riveting guns, power tools and attachments are in a safe and usable condition, and the action to be taken in the event of identifying defective equipment</p> <p>2.19 describe the types of gauges used to measure angles, depths, countersinks and torque</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.20 explain how and why tools are calibrated, and how to check that the tools you are using are within calibration dates</p> <p>2.21 explain the recording documentation to be completed for the installation activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.22 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

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(if sampled)

## **Unit 15: Assembling aircraft airframe ancillary components**

**Unit reference number:** L/601/4304

**QCF level:** 2

**Credit value:** 45

**Guided learning hours:** 98

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to assemble aircraft airframe ancillary components, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the assembly operations required, and to check that they are in a safe and usable condition. In carrying out the assembly operations, the learner will be required to follow laid-down procedures and specific assembly techniques, in order to assemble the various components into detail assemblies. Typical assemblies to be produced will include trunking and ducting, box sections, stringers, frames, panels, trays, skins, ribs, tanks, galleys, avionic cabinets, mission consoles and other small assemblies, as appropriate.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Assemble aircraft airframe ancillary components</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the assembly activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the assembly operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- ensure that all tools and equipment used are within current calibration dates</li> <li>- maintain safe access and working arrangements for the area in which the assembly activities take place</li> <li>- dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 follow the relevant instructions, assembly drawings and any other specifications</p> <p>1.4 ensure that the specified components are available and that they are in a usable condition</p> <p>1.5 use the appropriate methods and techniques to assemble the components in their correct positions</p> <p>1.6 produce aircraft airframe ancillary component assemblies, which include three of the following:</p> <ul style="list-style-type: none"> <li>- trunking/ducting</li> <li>- box sections</li> <li>- skins</li> <li>- stringers</li> <li>- frames</li> <li>- panels</li> <li>- ribs</li> <li>- trays</li> <li>- galley components</li> <li>- avionics cabinets</li> <li>- mission consoles</li> <li>- stairs</li> <li>- tanks</li> <li>- other small assemblies, as applicable</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 apply all of the following assembly methods and techniques:</p> <ul style="list-style-type: none"> <li>- ensuring that correct part numbers are used</li> <li>- ensuring that the correct hand of components is used (left or right handed)</li> <li>- positioning and aligning components for cosmetic appearance and skin lines</li> <li>- applying sealants/adhesives</li> <li>- electrical bonding of components</li> <li>- securing components, using mechanical fasteners (such as threaded devices, rivets)</li> <li>- applying bolt locking methods (split-pins, wire locking, lock nuts, stiff nuts).</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Assemble aircraft airframe ancillary components (continued)</p>	<p>1.8 secure the components using the specified connectors and securing devices</p> <p>1.9 assemble components which include four of the following:</p> <ul style="list-style-type: none"> <li>- detail components</li> <li>- cleats</li> <li>- brackets</li> <li>- angles</li> <li>- frames</li> <li>- spars</li> <li>- skins</li> <li>- stringers</li> <li>- ribs</li> <li>- pipes, unions and joints</li> <li>- jumper braids, bonding clips, earthing straps</li> <li>- aircraft general supplies</li> </ul> <p>1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification</p> <p>1.11 carry out quality and accuracy checks, including three from the following:</p> <ul style="list-style-type: none"> <li>- cosmetic appearance</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- accuracy of skin lines</li> <li>- freedom from damage</li> <li>- torque loading checks</li> <li>- electrical bonding and continuity</li> </ul> <p>1.12 produce assemblies which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- build records</li> <li>- log cards</li> <li>- job cards</li> <li>- aircraft log</li> </ul> <p>1.14 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to assemble aircraft airframe ancillary components</p>	<p>2.1 explain the specific safety precautions to be taken whilst carrying out the assembly operations (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area in which they are carrying out the assembly activities, and the responsibility these requirements place on them</p> <p>2.3 describe the personal protective equipment and protective clothing to be worn during the assembly activities</p> <p>2.4 explain the hazards associated with producing aircraft assemblies, and with the tools and equipment used, and how they can be minimised</p> <p>2.5 describe how to identify the components to be used; component identification systems; codes used and component orientation indicators</p> <p>2.6 describe the preparations to be undertaken on the components, prior to fitting them into the assembly</p> <p>2.7 describe the assembly methods and procedures to be used, and the importance of adhering to these procedures</p> <p>2.8 describe how the components are to be aligned and positioned, and the tools and equipment that are to be used, including jigs and fixtures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 explain the methods used to hold the components in their correct position, prior to securing them with the appropriate fasteners</p> <p>2.10 describe the various mechanical fasteners that will be used, and their method of installation (including open and blind rivets, threaded fasteners, special securing devices)</p> <p>2.11 explain the importance of using the specified fasteners for the particular assembly, and why they must not use substitutes.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to assemble aircraft airframe ancillary components (continued)</p>	<p>2.12 explain what to do if the components or fastening devices are not assembled correctly, are damaged, or have other faults</p> <p>2.13 explain the application of sealants and adhesives within the assembly activities, and the precautions that must be taken when working with various adhesives and sealants</p> <p>2.14 explain the quality control procedures to be followed during the assembly operations</p> <p>2.15 describe how to conduct any necessary checks to ensure the accuracy and quality of the assemblies produced</p> <p>2.16 describe how to check that the tools and equipment to be used are correctly calibrated, and are in a safe and useable condition</p> <p>2.17 explain the importance of using all tools in the correct manner, and within their permitted operating range</p> <p>2.18 explain the importance of ensuring that the completed assembly is free from dirt, swarf and foreign objects</p> <p>2.19 describe the problems that can occur with the assembly operations, and how these can be overcome</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.20 explain the recording documentation to be completed for the assembly activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.21 explain the extent of their own authority within the assembly activities, and whom to report to if they have problems that they cannot resolve.</p>			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

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Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Internal verifier signature: \_\_\_\_\_ Date: \_\_\_\_\_  
*(if sampled)*

## **Unit 16: Producing aircraft cableforms and looms**

**Unit reference number:** R/601/4305

**QCF level:** 2

**Credit value:** 40

**Guided learning hours:** 98

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to produce aircraft cableforms and looms, in accordance with approved procedures. The learner will be required to use appropriate drawings, wiring loom layout/templates, methods of manufacture, standards and specifications, to produce the various cableforms and looms. The learner will be expected to cut the appropriate cables to the required lengths, form and secure the loom assemblies, strip the appropriate amount of cable insulation, and solder and crimp the appropriate connectors to the cable ends, in the correct location, using the specified or appropriate techniques and fastening devices.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Producing aircraft cableforms and looms</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the production activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the cable production operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- ensure that all tools and equipment used are within current calibration dates</li> <li>- maintain safe access and working arrangements for the area in which the production activities take place</li> <li>- dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 follow the relevant instructions, assembly drawings and any other specifications</p> <p>1.4 ensure that the specified components are available and that they are in a usable condition</p> <p>1.5 use the appropriate methods and techniques to assemble the components in their correct positions</p> <p>1.6 assemble four of the following types of aircraft cableforms/looms:</p> <ul style="list-style-type: none"> <li>- coaxial cable assemblies</li> <li>- heavy duty cable assemblies</li> <li>- aircraft system cable assemblies</li> <li>- secure speech cables assemblies</li> <li>- general aircraft cable assemblies</li> <li>- aircraft lighting cable assemblies</li> <li>- AFCS cable assemblies</li> <li>- headset leads (Mic/Tel leads)</li> <li>- other appropriate cable assembly</li> </ul> <p>1.7 secure the components using the specified connectors and securing devices.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Producing aircraft cableforms and looms (continued)</p>	<p>1.8 use four of the following types of cables when producing the cableforms/looms:</p> <ul style="list-style-type: none"> <li>- single core</li> <li>- multicore</li> <li>- PVC twin and earth</li> <li>- flexible (such as cotton or rubber covered)</li> <li>- mineral insulated</li> <li>- armoured</li> <li>- data/communication</li> <li>- fibre-optics</li> <li>- screened</li> <li>- coaxial</li> <li>- ribbon cables</li> <li>- wiring loom/harness</li> </ul> <p>1.9 carry out all of the following cableform/loom production activities:</p> <ul style="list-style-type: none"> <li>- determining the correct type, size, colour/coding and lengths of cables required</li> <li>- cutting cables to the required length (with allowance for termination)</li> <li>- laying cables on the template/layout board</li> <li>- ensuring that the correct cables break out at the required points</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- securing cableforms/looms (such as cable ties/clips or plastic strapping, lacing, harnessing)</li> <li>- attaching suitable cable identification</li> </ul> <p>1.10 carry out seven of the following cable termination activities:</p> <ul style="list-style-type: none"> <li>- stripping the outer coating without damage to conductors or insulation</li> <li>- stripping off an appropriate length of cable conductor insulation/protection</li> <li>- making mechanical/screwed/clamped cable end connections</li> <li>- making crimped cable end connections (such as spade end, loops, tags and pins)</li> <li>- making snap/push on cable end connections</li> <li>- making soldered cable end connections</li> <li>- making an unscreened plug and socket assembly</li> <li>- making a screened plug and socket assembly</li> <li>- making coaxial cable connections</li> <li>- applying heat shrinking (devices and boots)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.11 produce cableforms/looms which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.12 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification</p> <p>1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- build records</li> <li>- job cards</li> <li>- aircraft log</li> </ul> <p>1.14 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to produce aircraft cableforms and looms</p>	<p>2.1 explain the specific safety precautions to be taken whilst carrying out the cableform/loom production activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area in which they are carrying out the cableform/loom production activities, and the responsibility these requirements place on them</p> <p>2.3 describe the personal protective equipment and clothing to be worn during the production activities</p> <p>2.4 describe the hazards associated with producing aircraft cableforms/looms, and with the tools and equipment used, and how they can be minimised</p> <p>2.5 explain the different types of drawing and specification that are used during the production activities, and how to interpret the various symbols and abbreviations</p> <p>2.6 explain how to identify cables and the cable end fittings to be used; and associated identification systems (such as cable/component markers)</p> <p>2.7 describe the preparations to be undertaken on the cable and cable end fittings, prior to assembly (such as loom forming and soldering preparation)</p> <p>2.8 describe the cable end fitting assembly methods and techniques used (to include soldering, crimping, heat shrinking and cableforming)</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 describe the assembly of screened and unscreened plugs and sockets, and the difference between composite and metal plugs and sockets</p> <p>2.10 describe the different types of cable protection, and reasons for each type</p> <p>2.11 explain how to deal with cables/components that are incorrectly assembled, damaged or have other faults.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to produce aircraft cableforms and looms (continued)	<p>2.12 explain the quality control procedures to be followed during the production of the cableforms/looms</p> <p>2.13 explain how to conduct any necessary checks to ensure the accuracy and quality of the assemblies produced</p> <p>2.14 explain how to take electrostatic discharge (ESD) precautions, and why are they needed</p> <p>2.15 explain the procedure for handling long lengths of cable</p> <p>2.16 describe the precautions needed when handling completed looms</p> <p>2.17 explain the importance of checking that the tools and equipment to be used are correctly calibrated, and are in a safe and serviceable condition</p> <p>2.18 explain the importance of ensuring that all tools are used correctly and within their permitted operating range</p> <p>2.19 describe the problems with the assembly operations, and the importance of informing appropriate people of any non-conformances</p> <p>2.20 explain the recording documentation to be completed for the production activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

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Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

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(if sampled)

## **Unit 17: Assembling aircraft electrical components**

**Unit reference number:** Y/601/4306

**QCF level:** 2

**Credit value:** 45

**Guided learning hours:** 98

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to assemble electrical components to produce aircraft electrical sub-assemblies, in accordance with approved procedures. The learner will be required to use appropriate drawings, methods of assembly, standards and specifications to produce the various electrical sub-assemblies and panels. The equipment to be assembled will include circuit breaker panels, control/relay panels, power generation and control, power supply, lighting and instrumentation panels.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Assembling aircraft electrical components</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following activities during the assembly activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the electrical assembly operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- ensure that all tools and equipment used are within current calibration dates</li> <li>- ensure that correct part numbers are used (including, where appropriate, left or right handed parts)</li> <li>- maintain safe access and working arrangements for the area in which the assembly activities take place</li> <li>- dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul> <p>1.3 follow the relevant instructions, assembly drawings and any other specifications</p> <p>1.4 ensure that the specified components are available and that they are in a usable condition</p> <p>1.5 assemble two of the following types of aircraft electrical sub-assemblies:</p> <ul style="list-style-type: none"> <li>- circuit breaker panels</li> <li>- control/relay panels</li> <li>- power generation and control</li> <li>- power supplies</li> <li>- lighting equipment</li> <li>- instrument panels</li> </ul> <p>1.6 use the appropriate methods and techniques to assemble the components in their correct positions.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Assembling aircraft electrical components (continued)	1.7 secure the components using the specified connectors and securing devices  1.8 carry out eight of the following activities during the assembly of the electrical components: <ul style="list-style-type: none"> <li>- positioning and aligning components</li> <li>- securing components using mechanical fasteners/threaded devices</li> <li>- setting working clearance/air gaps on contactors</li> <li>- making clamped connections</li> <li>- making crimped connections</li> <li>- adding cable protection (such as sleeving or grommets)</li> <li>- making soldered connections</li> <li>- earth bonding</li> <li>- torque setting of fasteners</li> <li>- applying sealants/adhesives</li> <li>- component marking</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.9 use ten of the following components:</p> <ul style="list-style-type: none"> <li>- isolator switches</li> <li>- power supplies</li> <li>- transformers/chokes</li> <li>- circuit boards</li> <li>- solenoids</li> <li>- plug-in modules/devices</li> <li>- ring tongue terminals</li> <li>- discrete components</li> <li>- heat shrink devices</li> <li>- connectors (multi-contact)</li> <li>- connectors (coaxial)</li> <li>- contacts (crimped)</li> <li>- contacts (soldered)</li> <li>- cable ties</li> <li>- lacing cord</li> <li>- terminal blocks</li> <li>- contactors</li> <li>- trunking</li> <li>- meters/instruments</li> <li>- earth bonding devices</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- card racks</li> <li>- module blocks</li> <li>- panels (bare)</li> <li>- circuit breakers</li> <li>- indicators (lamps, LEDs)</li> <li>- bonding leads</li> <li>- switches (push button, toggle)</li> <li>- sensors</li> <li>- luminaries</li> <li>- fuses</li> <li>- relays</li> <li>- lamps</li> <li>- busbars</li> <li>- cables</li> <li>- p-clips</li> <li>- other specific components</li> </ul> <p>1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.11 carry out quality checks, to include all of the following:</p> <ul style="list-style-type: none"> <li>- positional accuracy of all components</li> <li>- correct orientation</li> <li>- correct alignment</li> <li>- component security</li> <li>- ensuring enclosure is free of debris (such as cable offcuts/insulation, enclosure breakouts)</li> <li>- continuity of cable/wiring connections (such as battery and lamp checks)</li> <li>- correct termination of all wires to components</li> <li>- security of all terminations</li> <li>- completeness</li> <li>- ensuring freedom from damage</li> </ul> <p>1.12 produce aircraft electrical assemblies which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 deal promptly and effectively with problems within your control and report those that cannot be solved</p> <p>1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- build records</li> <li>- job cards.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to assemble aircraft electrical components</p>	<p>2.1 explain the specific safety precautions to be taken whilst carrying out the assembly activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area in which they are carrying out the electrical assembly activities, and the responsibility these requirements place on them</p> <p>2.3 describe the personal protective equipment and clothing to be worn during the electrical assembly activities</p> <p>2.4 explain the hazards associated with producing aircraft electrical assemblies, and with the tools and equipment used, and how they can be minimised</p> <p>2.5 explain the various types of drawing and specifications that are used during the electrical assembly activities, and how to interpret the various symbols and abbreviations</p> <p>2.6 describe the types of components and sub-assemblies that are used in the electrical assembly activities (such as contactors, relays, circuit breakers/fuses, solenoids, switches, transformers, terminal blocks, sub-assemblies)</p> <p>2.7 explain how to identify components to be used, and associated identification systems (such as component markers)</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 explain the visual checks and preparation requirements for components to be used in the electrical assembly activities</p> <p>2.9 describe the assembly methods and techniques to be used when mounting the electrical equipment, switchgear or control systems (such as soldering, crimping, heat shrinking, lacing/strapping of wires)</p> <p>2.10 explain how the components are to be aligned and positioned prior to securing, and the tools and equipment that are used</p> <p>2.11 describe how to recognise and identify any orientation requirements for all electrical equipment, switchgear or control system components used in the assembly activities.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to assemble aircraft electrical components (continued)</p>	<p>2.12 describe the methods of mounting and securing the components on the panels or enclosures, and the type of fastening devices that are used</p> <p>2.13 describe the methods of attaching identification markers/labels during the electrical assembly activities</p> <p>2.14 explain how to deal with components incorrectly assembled, damaged or having other faults</p> <p>2.15 explain the quality control procedures to be followed during the electrical assembly operations</p> <p>2.16 explain how to conduct any necessary checks to ensure the accuracy and quality of the assembly produced</p> <p>2.17 explain how to take electrostatic discharge (ESD) precautions, and why are they needed</p> <p>2.18 explain how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose</p> <p>2.19 describe the importance of ensuring that all tools are used correctly and within their permitted operating range</p> <p>2.20 describe the typical problems that can occur with the assembly operations, and the importance of informing appropriate people of any non-conformances</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.21 explain the recording documentation to be completed for the assembly activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.22 explain the extent of your own responsibility, and whom you should report to if you have problems that you cannot resolve.</p>			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

Learner signature: \_\_\_\_\_ Date: \_\_\_\_\_

Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Internal verifier signature: \_\_\_\_\_ Date: \_\_\_\_\_  
*(if sampled)*

## **Unit 18: Making modifications to aircraft cableforms and looms**

**Unit reference number:** D/601/4310

**QCF level:** 2

**Credit value:** 35

**Guided learning hours:** 77

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to modify aircraft cableforms and looms, in accordance with approved procedures. The learner will be required to change, modify and update cableforms and looms, in accordance with modification leaflets, latest issue drawings and standards. The learner will be expected to remove and replace cables, add cables, change breakout points, and change the routing of cables. This will involve cutting the appropriate cables to the required lengths, stripping the appropriate amount of cable insulation, and soldering and crimping the appropriate connectors to the cable ends, using the specified or appropriate techniques and fastening devices.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Making modifications to aircraft cableforms and looms</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the modification activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the cableform/loom modification operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- ensure that all tools and equipment used are within current calibration dates</li> <li>- maintain safe access and working arrangements for the area in which the modification activities take place</li> <li>- dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 obtain and follow the relevant modification specifications and job instructions</p> <p>1.4 confirm and agree what modifications are to be carried out to meet the specification</p> <p>1.5 prepare the cableforms and looms for the required modification</p> <p>1.6 carry out modifications to cableforms/looms for two of the following aircraft electrical systems:</p> <ul style="list-style-type: none"> <li>- coaxial cable assemblies</li> <li>- heavy duty cable assemblies</li> <li>- aircraft system cable assemblies</li> <li>- secure speech cables assemblies</li> <li>- general aircraft cable assemblies</li> <li>- aircraft lighting cable assemblies</li> <li>- AFCS cable assemblies</li> <li>- headset leads (Mic/Tel leads)</li> <li>- other appropriate cable assembly.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Making modifications to aircraft cableforms and looms (continued)</p>	<p>1.7 carry out four of the following modifications:</p> <ul style="list-style-type: none"> <li>- replacing cables of different type or length</li> <li>- changing the position or angle of breakout points</li> <li>- changes to component/connector on end of cable</li> <li>- changing the routeing of cables</li> <li>- making changes to looms</li> <li>- adding looms</li> <li>- removing cables</li> <li>- adding cables</li> </ul> <p>1.8 carry out seven of the following cable end termination processes:</p> <ul style="list-style-type: none"> <li>- stripping the outer coating without damage to conductor insulation</li> <li>- stripping off an appropriate length of cable conductor insulation/protection</li> <li>- removing and replacing mechanical/screwed/clamped cable end connections</li> <li>- removing and replacing crimped cable end connections (such as spade end, loops, tags and pins)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- removing and replacing snap/push on cable end connections</li> <li>- soldering and de-soldering cable end connections</li> <li>- removing and remaking an unscreened plug and socket assembly</li> <li>- removing and remaking a screened plug and socket assembly</li> <li>- removing and remaking a coaxial cable connection</li> <li>- removing and reapplying heat shrink devices/boots</li> <li>- removing and replacing cable protection</li> </ul> <p>1.9 carry out the modification using approved materials methods and procedures</p> <p>1.10 carry out modifications in compliance with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.11 complete the modification within the agreed timescale</p> <p>1.12 ensure that the modified cableforms and looms meet the specified operating conditions</p> <p>1.13 produce accurate and complete records of all modification work carried out</p> <p>1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- build records</li> <li>- log cards</li> <li>- job cards</li> <li>- aircraft flight log</li> </ul> <p>1.15 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to make modifications to aircraft cableforms and looms</p>	<p>2.1 explain the specific safety precautions and procedures to be observed whilst carrying out the modifications to the cableforms and looms (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area in which they are carrying out the modification activities, and the responsibility these requirements place on them</p> <p>2.3 describe the hazards associated with modifying aircraft cableforms and looms, and how they can be minimised</p> <p>2.4 describe the personal protective equipment and clothing to be worn during the modification activities</p> <p>2.5 explain the various types of drawing and specifications that are used during the cableform and loom modification</p> <p>2.6 explain how to identify the components to be used; component identification systems (such as codes and component orientation indicators)</p> <p>2.7 describe the preparations to be undertaken on the cableform/loom, prior to modification</p> <p>2.8 explain the methods and techniques to be used for soldering and de-soldering, and the importance of adhering to them</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.9 explain the methods and techniques to be used for crimping and heat shrinking, and the importance of adhering to them</p> <p>2.10 explain the methods and techniques to be used for the assembly of screened and unscreened plugs and sockets.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to make modifications to aircraft cableforms and looms (continued)</p>	<p>2.11 explain how to identify the difference between composite and metal plugs and sockets</p> <p>2.12 describe the different types of cable protection, the reasons why each type would be used, and when</p> <p>2.13 explain the importance of using the specified cables and cable end fittings for the modification, and why they must not use substitutes</p> <p>2.14 explain the quality control procedures to be followed during the cableform/loom modification operations</p> <p>2.15 explain how to conduct the necessary checks to ensure the accuracy and quality of the modification</p> <p>2.16 explain the importance of ensuring that the completed and modified cableform/loom is free from damage</p> <p>2.17 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</p> <p>2.18 describe the problems that can occur with the modification operations, and how these can be overcome</p> <p>2.19 explain the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the extent of your own responsibility, and whom you should report to if you have problems that you cannot resolve.			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

Learner signature: \_\_\_\_\_ Date: \_\_\_\_\_

Assessor signature: \_\_\_\_\_ Date: \_\_\_\_\_

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(if sampled)

## **Unit 19: Producing aircraft components using wet lay-up techniques**

**Unit reference number:** H/601/4311

**QCF level:** 2

**Credit value:** 42

**Guided learning hours:** 151

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to produce aircraft composite mouldings by using wet lay-up techniques, in accordance with approved procedures. The learner will be required to follow the appropriate instructions, drawings, specifications and documentation to produce the composite mouldings, using the correct wet lay-up production techniques. The learner will produce a range of composite mouldings, incorporating a variety of features and using a range of techniques and processes. Mouldings produced will include laminates and sandwich structures, using a range of resin, fibre and core materials.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Producing aircraft components using wet lay-up techniques</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the wet lay-up moulding activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the wet-lay up production operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- use the correct tools and equipment for the activity, and ensure that they are safe to use</li> <li>- use the correct materials and consumables, as specified in the production documentation</li> <li>- apply safe and appropriate working practices and procedures at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 prepare moulds and materials for the production activities, to include carrying out all of the following:</p> <ul style="list-style-type: none"> <li>- checking that the tooling is correct and complete</li> <li>- cleaning of tooling and removal of resin build-ups</li> <li>- checking the tooling for surface defects</li> <li>- correctly applying sealants/release agents</li> <li>- obtaining correct materials for the activity</li> <li>- identifying and protecting materials in the work area</li> <li>- dispensing and applying the correct measure and mix of resin/catalyst</li> </ul> <p>1.4 follow the correct component drawing or any other related specifications for the component to be produced</p> <p>1.5 determine what has to be done and how this will be achieved</p> <p>1.6 obtain and prepare the appropriate tools, equipment and materials</p> <p>1.7 carry out the moulding or laying-up activities using the correct methods and techniques</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.8 produce a range of mouldings, using two of the following application techniques:</p> <ul style="list-style-type: none"> <li>- spray application of fibre/resin</li> <li>- application of a gel coat</li> <li>- brush application of fibre/resin</li> <li>- roller application of fibre/resin</li> <li>- removal of voids and air pockets</li> <li>- use of vacuum bagging</li> <li>- use of bleed plies.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Producing aircraft components using wet lay-up techniques (continued)	1.9 produce a range of mouldings, incorporating one of the following in the lay-up: <ul style="list-style-type: none"> <li>- feathered joins</li> <li>- overlap joins</li> <li>- orientated plies</li> <li>- inserts</li> <li>- fixtures</li> <li>- butt joins</li> </ul> 1.10 produce a range of mouldings, incorporating two of the following shape features: <ul style="list-style-type: none"> <li>- internal corner</li> <li>- external corner</li> <li>- double curvature</li> <li>- concave surface</li> <li>- convex surface</li> <li>- vertical surface</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.11 produce a range of mouldings, using all of the following:</p> <ul style="list-style-type: none"> <li>- resin (such as polyester, epoxy, phenolic, vinyl ester)</li> <li>- fibre (such as glass, carbon, polyethylene, aramid)</li> <li>- reinforcement (such as braids, roving, tapes, chopped strand, continuous filament, woven)</li> <li>- core material (such as wood, coremat, structural foam, honeycomb)</li> </ul> <p>1.12 produce a range of mouldings which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.13 check that all the required operations have been completed to specification</p> <p>1.14 produce components to the required specifications</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.15 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- records of equipment settings</li> <li>- other specific records</li> </ul> <p>1.16 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to produce aircraft components using wet lay-up techniques</p>	<p>2.1 explain the health and safety precautions to be taken, and procedures used in the specific work area, when working with composite materials, consumables, tools and equipment</p> <p>2.2 explain the hazards associated with carrying out wet lay-up laminating and moulding activities, and with the composite materials, consumables, tools and equipment, and how to minimise these hazards in the work area</p> <p>2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others</p> <p>2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables</p> <p>2.5 describe the specific workshop environmental conditions that must be observed when producing aircraft composite mouldings (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)</p> <p>2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.7 explain how to interpret and use imperial and metric systems of measurement</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 explain the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and how to complete such documents</p> <p>2.9 explain the conventions and terminology used for wet lay-up techniques (including resin and fibre weights/volumes, material orientation, material identification, material tailoring, mixing ratios, gel times, exotherm, bleed plies)</p> <p>2.10 describe the types of resin, fibre and reinforcement used, and their applications</p> <p>2.11 describe the visual identification of both raw and finished composite materials</p> <p>2.12 explain the methods of preparation for patterns, moulds and tooling (including the correct use of surface sealers and release agents)</p> <p>2.13 explain the mixing ratios for gel coats, resins additives and catalysts, and their associated working times.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to produce aircraft components using wet lay-up techniques (continued)</p>	<p>2.14 explain the methods used in the application of the resin/fibre during the lay-up activity</p> <p>2.15 describe the tools and equipment used in the lay-up activities, and their care, preparation and control procedures</p> <p>2.16 explain how to recognise faults that can occur during the lay-up process</p> <p>2.17 describe the identification of defects in the composite moulding (such as de-lamination, voids, contaminants)</p> <p>2.18 explain how defects can be overcome during the lay-up activity</p> <p>2.19 explain the procedures and methods used for removing mouldings from production tooling</p> <p>2.20 explain the methods and techniques used to trim mouldings, prior to release</p> <p>2.21 describe the care and safe handling of production tooling and composite mouldings throughout the production cycle</p> <p>2.22 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</p> <p>2.23 explain the procedure for the safe disposal of waste materials</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.24 explain the recording documentation to be completed for the wet lay-up activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.25 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

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*(if sampled)*



## **Unit 20: Producing aircraft components using pre-preg laminating techniques**

**Unit reference number:** K/601/4312

**QCF level:** 2

**Credit value:** 42

**Guided learning hours:** 151

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to produce aircraft composite mouldings by using pre-preg laminating techniques, in accordance with approved procedures. The learner will be required to follow the appropriate instructions, drawings, specifications and documentation to produce the composite mouldings, using the correct pre-preg laminating production techniques. The learner will produce a range of composite mouldings, incorporating a variety of features and using a range of techniques and processes. Mouldings produced will include laminates and sandwich structures, using a range of resin, fibre and core materials.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Producing aircraft components using pre-preg laminating techniques</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the pre-preg laminating activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the pre-preg laminating operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- use the correct tools and equipment for the activity, and ensure that they are safe to use</li> <li>- use the correct materials and consumables, as specified in the production documentation</li> <li>- apply safe and appropriate working practices and procedures at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 follow the correct component drawing or any other related specifications for the component to be produced</p> <p>1.4 determine what has to be done and how this will be achieved</p> <p>1.5 obtain and prepare the appropriate tools, equipment and materials</p> <p>1.6 prepare moulds and materials for the production activities, to include carrying out all of the following:</p> <ul style="list-style-type: none"> <li>- checking that the tooling is correct and complete</li> <li>- cleaning the tooling and removing resin build-ups</li> <li>- checking the tooling for surface defects</li> <li>- applying sealants/release agents correctly</li> <li>- obtaining correct materials for the activity, and checking that they are fit for purpose and 'in life'</li> <li>- identifying and protecting materials in the work area</li> <li>- cutting materials to the correct shape and orientation (where applicable)</li> </ul> <p>1.7 carry out the moulding or laying-up activities using the correct methods and techniques</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.8 produce a range of mouldings, using techniques for two of the following types of production tool:</p> <ul style="list-style-type: none"> <li>- metal</li> <li>- wet lay-up</li> <li>- glass pre-preg</li> <li>- tooling block</li> <li>- carbon pre-preg</li> <li>- female tooling</li> <li>- male tooling</li> <li>- multi-part tools</li> <li>- matched tooling</li> <li>- closed tooling.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Producing aircraft components using pre-preg laminating techniques (continued)	1.9 produce composite mouldings incorporating one of the following in the lay-up: <ul style="list-style-type: none"> <li>- butt joins</li> <li>- overlap joins</li> <li>- staggered joins</li> <li>- orientated plies</li> <li>- inverted plies</li> <li>- inserts</li> </ul> 1.10 produce composite mouldings incorporating three of the following features: <ul style="list-style-type: none"> <li>- internal corners</li> <li>- external corners</li> <li>- flanges</li> <li>- double curvature</li> <li>- concave surface</li> <li>- convex surfaces</li> <li>- return surfaces</li> <li>- joggle details</li> <li>- nett edges</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.11 use all of the following in the laying-up activities:</p> <ul style="list-style-type: none"> <li>- resin (such as polyester, epoxy, phenolic, vinyl ester, bismaleimide, cyanate ester, acrylic)</li> <li>- fibre (such as glass, polyethylene, aramid, carbon, hybrid)</li> <li>- reinforcement (such as braids, roving, tapes, chopped strand, continuous filament, woven, uni-directional, knitted, multi-axis)</li> <li>- core materials (such as solid timber, end grain balsa, expanding core, syntactic core, coremat, structural foam, honeycomb)</li> </ul> <p>1.12 use one of the following for applying temperature during the cure cycle:</p> <ul style="list-style-type: none"> <li>- oven</li> <li>- heated tools/moulds</li> <li>- autoclave</li> <li>- heated press</li> </ul> <p>1.13 use one of the following for applying pressure during the cure cycle:</p> <ul style="list-style-type: none"> <li>- pressure bags</li> <li>- vacuum bags</li> <li>- thermal mould expansion</li> <li>- fibre tensioning</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.14 check that all the required operations have been completed to specification</p> <p>1.15 produce components to the required specifications</p> <p>1.16 produce a range of mouldings in compliance with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.17 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- records of equipment settings</li> <li>- other specific records</li> </ul> <p>1.18 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to produce aircraft components using pre-preg laminating techniques</p>	<p>2.1 explain the health and safety precautions to be taken, and procedures used in the specific work area, when working with composite materials, consumables, tools and equipment</p> <p>2.2 explain the hazards associated with carrying out pre-preg laminating activities, and with the composite materials, consumables, tools and equipment, and how to minimise these hazards in the work area</p> <p>2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others</p> <p>2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables</p> <p>2.5 describe the specific workshop environmental conditions that must be observed when producing aircraft composite mouldings (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)</p> <p>2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.7 explain how to interpret imperial and metric systems of measurement</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 describe the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and how to complete such documents</p> <p>2.9 describe the conventions and terminology used for pre-preg laminating techniques (to include material orientation, material identification, material templates, ply lay-up, pressure plates, vacuum bagging, cure cycles, exotherm)</p> <p>2.10 describe the different types of resin systems, fibres, reinforcements, and their applications</p> <p>2.11 explain how to build up laminates (including orientation and balance of plies to minimise spring and distortion in composite mouldings)</p> <p>2.12 describe the different core, insert and filler materials used, and their applications</p> <p>2.13 describe the visual identification of both raw and finished composite materials, and the identification of materials by product codes</p> <p>2.14 explain the methods of preparation for patterns, moulds and tooling (including the correct selection and use of surface sealers and release agents).</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to produce aircraft components using pre-preg laminating techniques (continued)</p>	<p>2.15 describe the correct methods of storage, thawing and handling of pre-preg materials (including monitoring temperature, storage life and 'out-life')</p> <p>2.16 explain the methods used in the application of pre-preg materials to tooling surfaces (including methods of tailoring and cutting)</p> <p>2.17 explain the mixing ratios for resins and catalysts, and the associated working times for two-part resin systems</p> <p>2.18 describe the correct methods of storage and handling of ancillary and consumable materials</p> <p>2.19 explain the tools and equipment used in the pre-preg laminating activities, and their care, preparation and control procedures</p> <p>2.20 explain how to recognise faults that can occur during the moulding process</p> <p>2.21 explain the cure cycles (including temperature and pressure ramps and dwell times for pre-catalysed resin films), and the importance of adhering to the cure cycle</p> <p>2.22 explain the need for monitoring the cure cycle, using thermocouples, probes, chart recorders, thermometers and data logs</p> <p>2.23 explain the procedures and methods used for removing mouldings from production tooling</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.24 explain the care and safe handling of production tooling and composite mouldings throughout the production cycle</p> <p>2.25 explain the procedure for the safe disposal of waste materials</p> <p>2.26 explain the recording documentation to be completed for the pre-preg laminating activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.27 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.</p>			

Learner name: \_\_\_\_\_ Date: \_\_\_\_\_

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*(if sampled)*



## **Unit 21: Producing aircraft components using resin infusion techniques**

**Unit reference number:** T/601/4314

**QCF level:** 2

**Credit value:** 42

**Guided learning hours:** 151

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to produce aircraft composite mouldings by using resin infusion techniques, in accordance with approved procedures. The learner will be required to follow the appropriate instructions, drawings, specifications and documentation to produce the composite mouldings, using the correct resin infusion production techniques. The learner will produce a range of composite mouldings, incorporating a variety of features and using a range of techniques and processes. Mouldings produced will include laminates and sandwich structures, using a range of resin, fibre and core materials.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Producing aircraft components using resin infusion techniques</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following activities during the resin infusion laminating activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the resin infusion production operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- use the correct tools and equipment for the activity, and ensure that they are safe to use</li> <li>- use the correct materials and consumables, as specified in the production documentation</li> <li>- apply safe and appropriate working practices and procedures at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>- return all tools and equipment to the correct location on completion of the activities</p> <p>- leave the work area in a safe condition and free from foreign object debris</p> <p>1.3 prepare moulds and materials for the production activities, to include carrying out all of the following:</p> <ul style="list-style-type: none"> <li>- checking that the tooling is correct and complete</li> <li>- cleaning of tooling and removal of resin build-ups</li> <li>- checking the tooling for surface defects</li> <li>- correctly applying sealants/release agents</li> <li>- obtaining the correct materials for the activity, and checking that materials are fit for purpose and 'in life'</li> <li>- obtaining the correct infusion media and layout for the activity</li> <li>- cutting materials to the correct shape and orientation (where applicable)</li> <li>- identifying and protecting materials in the work area</li> <li>- dispensing and applying the correct measure and mix of resin/catalyst</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.4 follow the correct component drawing or any other related specifications for the component to be produced</p> <p>1.5 determine what has to be done and how this will be achieved</p> <p>1.6 obtain and prepare the appropriate tools, equipment and materials</p> <p>1.7 carry out the moulding or laying-up activities using the correct methods and techniques</p> <p>1.8 produce composite mouldings, using two of the following resin infusion methods:</p> <ul style="list-style-type: none"> <li>- interlaminar distribution</li> <li>- core channel distribution</li> <li>- surface distribution</li> <li>- pre-catalysed resin films</li> </ul> <p>and applying two of the following techniques:</p> <ul style="list-style-type: none"> <li>- trial runs/tracking</li> <li>- full scale runs</li> <li>- repairs</li> <li>- dry area rectification</li> <li>- vacuum regulation</li> <li>- resin flow regulation</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 produce composite mouldings, incorporating two of the following in the lay-up: <ul style="list-style-type: none"> <li>- feathered joins</li> <li>- butt joins</li> <li>- overlap joins</li> <li>- staggered joins</li> <li>- orientated plies</li> <li>- inverted plies</li> <li>- inserts</li> <li>- fixtures.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Producing aircraft components using resin infusion techniques (continued)</p>	<p>1.10 produce composite mouldings, incorporating three of the following shape features:</p> <ul style="list-style-type: none"> <li>- internal corners</li> <li>- external corners</li> <li>- double curvature</li> <li>- concave surface</li> <li>- convex surfaces</li> <li>- return surfaces</li> <li>- joggle details</li> <li>- nett edges</li> <li>- flanges</li> </ul> <p>1.11 produce a range of mouldings using all of the following:</p> <ul style="list-style-type: none"> <li>- resin (such as polyester, epoxy, phenolic, vinyl ester, bismaleimide, cyanate ester, acrylic)</li> <li>- fibre (such as glass, carbon, polyethylene, aramid, hybrid)</li> <li>- reinforcement (such as braids, roving, tapes, chopped strand, continuous filament, woven, uni-directional, knitted, multi-axis)</li> <li>- core material (such as solid timber, end grain balsa, expanding core, syntactic core, coremat, structural foam, honeycomb)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.12 produce composite mouldings, using techniques for three types of resin distribution media:</p> <ul style="list-style-type: none"> <li>- interlaminar</li> <li>- channelled core</li> <li>- meshes</li> <li>- mats/fabrics</li> <li>- peel ply</li> <li>- perforated hose</li> <li>- spiral wrap</li> <li>- braid</li> <li>- flow channels</li> <li>- manifolds</li> <li>- networks</li> <li>- bleed plies</li> <li>- breather fabric</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 use three of the following vacuum bagging processes/methods:</p> <ul style="list-style-type: none"> <li>- check vacuum integrity</li> <li>- use of vacuum fittings</li> <li>- surface bagging</li> <li>- envelope bagging</li> <li>- internal bagging</li> <li>- pleats and trucks</li> <li>- reusable bagging</li> <li>- leak detection</li> <li>- leak rectification</li> <li>- catch pots/tanks</li> <li>- localised resin injection</li> <li>- release and breather plies</li> </ul> <p>1.14 produce a range of mouldings in compliance with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.15 check that all the required operations have been completed to specification</p> <p>1.16 produce components to the required specifications</p> <p>1.17 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- records of equipment settings</li> <li>- other specific records</li> </ul> <p>1.18 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to produce aircraft components using resin infusion techniques</p>	<p>2.1 explain the health and safety precautions to be taken, and procedures used in the specific work area, when working with composite materials, consumables, tools and equipment</p> <p>2.2 explain the hazards associated with carrying out resin infusion moulding activities, and with the composite materials, consumables, tools and equipment, and how to minimise these hazards in the work area</p> <p>2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others</p> <p>2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables</p> <p>2.5 describe the specific workshop environmental conditions that must be observed when producing aircraft composite mouldings (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)</p> <p>2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.7 explain how to interpret imperial and metric systems of measurement</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 describe the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and how to complete such documents</p> <p>2.9 explain the conventions and terminology used for resin infusion laminating techniques (such as material orientation, material identification, distribution media, resin viscosity, flow paths, ply lay-up, vacuum bagging, resin and fibre weights/volumes, gel times, exotherm, bleed plies, etc)</p> <p>2.10 describe the different types of resin systems, fibres, reinforcements, and their applications</p> <p>2.11 describe the building up laminates (including orientation and balance of plies to minimise spring and distortion in composite mouldings)</p> <p>2.12 explain the different core, insert and filler materials used, and their applications</p> <p>2.13 describe the visual identification of both raw and finished composite materials, and the identification of materials by product codes</p> <p>2.14 explain the methods of preparation for patterns, moulds and tooling (including the correct selection and use of surface sealers and release agents).</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to produce aircraft components using resin infusion techniques (continued)</p>	<p>2.15 explain the correct methods of storage, thawing and handling of composite materials (including monitoring temperature, storage life and 'out-life')</p> <p>2.16 explain the methods used in the application of composite materials to tooling surfaces (including methods of tailoring and cutting)</p> <p>2.17 explain the methods for handling, preparation and application of the reinforcing fibres and fabrics</p> <p>2.18 explain the different types of resin distribution media, and the methods used in the positioning and application of the resin distribution media</p> <p>2.19 explain the mixing ratios for resins and catalysts, and the associated working times for two-part resin systems</p> <p>2.20 explain the cure cycles (including temperature and pressure ramps and dwell times for pre-catalysed resin films), and the importance of adhering to the cure cycle</p> <p>2.21 explain the need for monitoring the cure cycle, using thermocouples, probes, chart recorders, thermometers and data logs</p> <p>2.22 describe the tools and equipment used in the resin infusion laminating activities, and their care, preparation and control procedures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.23 explain the problems that can occur during the resin infusion process (including defects such as contamination, incomplete wet out, vacuum leaks, flow restrictions, etc)</p> <p>2.24 describe the procedures and methods used for removing mouldings from production tooling</p> <p>2.25 explain the care and safe handling of production tooling and composite mouldings throughout the production cycle</p> <p>2.26 explain the procedure for the safe disposal of waste materials</p> <p>2.27 explain the recording documentation to be completed for the resin infusion activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.28 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.</p>			

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## **Unit 22: Producing aircraft components by acrylic moulding**

**Unit reference number:** A/601/4315

**QCF level:** 2

**Credit value:** 32

**Guided learning hours:** 130

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to produce aircraft components by using acrylic moulding techniques, in accordance with approved procedures. The learner will be required to follow the appropriate instructions, drawings, specifications and documentation to produce the various types of acrylic components, using the specified moulding process and techniques. This will involve using equipment such as air circulating ovens, presses, trimming and automated cutting equipment. The components produced will include deep drawn, double curvature, convex and concave shapes.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Producing aircraft components by acrylic moulding</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the acrylic moulding activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the acrylic moulding operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- use the correct tools and equipment for the activity, and ensure that they are safe to use</li> <li>- use the correct materials and consumables, as specified in the production documentation</li> <li>- apply safe and appropriate working practices and procedures at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 follow the correct component drawing or any other related specifications for the component to be produced</p> <p>1.4 determine what has to be done and how this will be achieved</p> <p>1.5 obtain and prepare the appropriate tools, equipment and materials</p> <p>1.6 carry out the moulding or laying-up activities using the correct methods and techniques</p> <p>1.7 carry out one of the following acrylic moulding techniques:</p> <ul style="list-style-type: none"> <li>- vacuum moulding</li> <li>- deep drawing</li> <li>- shape clamping</li> <li>- positive pressure shaping</li> <li>- stress relieving.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Producing aircraft components by acrylic moulding (continued)	1.8 carry out four of the following operations during the moulding process: <ul style="list-style-type: none"> <li>- tool/equipment preparation</li> <li>- sheet preparation</li> <li>- trimming</li> <li>- setting and controlling temperatures</li> <li>- stress relieving</li> <li>- sheet forming</li> <li>- de-moulding</li> </ul> 1.9 produce a range of aircraft acrylic components with two of the following features: <ul style="list-style-type: none"> <li>- box sections</li> <li>- cylindrical section</li> <li>- convex shapes</li> <li>- concave shapes</li> <li>- single curvatures</li> <li>- double curvatures</li> </ul> 1.10 check that all the required operations have been completed to specification           1.11 produce components to the required specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.12 produce a range of acrylic mouldings which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- records of machine settings</li> <li>- other specific records</li> </ul> <p>1.14 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to produce aircraft components by acrylic moulding</p>	<p>2.1 explain the specific safety practices and procedures that you need to observe when working with acrylics (including any specific legislation, regulations/codes of practice for the activities, equipment or materials used)</p> <p>2.2 explain the health and safety requirements of the work area where they are carrying out the activities, and the responsibility these requirements place on them</p> <p>2.3 describe the protective equipment that they need to use for both personal protection and, where appropriate, the protection of others</p> <p>2.4 describe the hazards associated with moulding acrylic materials, and with the tools and equipment used, and how these hazards can be minimised</p> <p>2.5 explain the application of COSHH regulations in relation to the storage, use and disposal of materials and consumables used in the acrylic moulding process</p> <p>2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.7 explain how to interpret imperial and metric systems of measurement</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 explain the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and how to complete such documents</p> <p>2.9 describe the supply of acrylic sheet (such as colour, thickness, sheet size, surface texture, material protection)</p> <p>2.10 explain the sheet profiling procedures, and material trimming methods/procedures</p> <p>2.11 describe the methods of sheet trimming and sheet cleaning prior to moulding</p> <p>2.12 describe the material cleaning methods and procedures to be applied.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to produce aircraft components by acrylic moulding (continued)</p>	<p>2.13 explain the principles of deep drawing, concave/convex moulding, positive pressure moulding and stress relieving</p> <p>2.14 explain the different methods of heating acrylic materials, and the temperature control methods</p> <p>2.15 explain the use of forming aids</p> <p>2.16 explain the preparation methods and procedures applied to the moulding surface</p> <p>2.17 explain the methods and techniques for lifting, handling and supporting the components/equipment/materials during the moulding activities</p> <p>2.18 explain how to recognise moulding defects (such as misalignment, distortion, damage, contamination and surface defects)</p> <p>2.19 describe the tools and equipment used in the moulding activities, and their calibration, care, preparation and control procedures</p> <p>2.20 describe the problems that can occur with the moulding operations, and how these can be overcome</p> <p>2.21 describe the care and safe handling of production tooling and acrylic mouldings throughout the production cycle</p> <p>2.22 explain the procedure for the safe disposal of waste materials</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.23 explain the recording documentation to be completed for the acrylic moulding activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.24 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.</p>			

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*(if sampled)*



## **Unit 23: Producing aircraft components by vacuum forming**

**Unit reference number:** J/601/4317

**QCF level:** 2

**Credit value:** 32

**Guided learning hours:** 130

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to produce aircraft components by vacuum forming, in accordance with approved procedures. The learner will be required to follow the appropriate instructions, drawings and specifications to produce the various types of components from thermoplastic sheet, fibre-reinforced thermoplastic sheet and structural foam. This will require them to use a range of air circulating ovens, vacuum forming machines, trimming equipment and various types of tooling. The components produced will have a range of features, including male shapes, female shapes, double curvatures and stiffened mouldings.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Producing aircraft components by vacuum forming	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the vacuum forming activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the vacuum forming operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- use the correct tools and equipment for the activity, and ensure that they are safe to use</li> <li>- use the correct materials and consumables, as specified in the production documentation (such as colour, size, composition)</li> <li>- apply safe and appropriate working practices and procedures at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul> <p>1.3 confirm that the equipment is set up correctly and is ready for use</p> <p>1.4 use two of the following types of equipment:</p> <ul style="list-style-type: none"> <li>- air circulating ovens</li> <li>- vacuum forming machines</li> <li>- Tufnol tooling</li> <li>- metal tooling</li> <li>- wood tooling</li> <li>- trimming equipment</li> <li>- composite tooling</li> </ul> <p>1.5 manipulate the machine controls safely and correctly in line with operational procedures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.6 carry out three of the following operations:</p> <ul style="list-style-type: none"> <li>- bubble blowing to minimise webbing</li> <li>- positioning of robbers</li> <li>- cleaning of tooling</li> <li>- temperature control</li> <li>- trimming techniques</li> <li>- drying of sheet</li> <li>- use of intensifiers</li> <li>- sheet cleaning</li> </ul> <p>1.7 produce a range of components with two of the following features:</p> <ul style="list-style-type: none"> <li>- double curvatures</li> <li>- male shapes</li> <li>- female shapes</li> <li>- stiffened mouldings.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Producing aircraft components by vacuum forming (continued)</p>	<p>1.8 produce a range of components using one the following materials:</p> <ul style="list-style-type: none"> <li>- thermoplastic sheet (such as polycarbonate, polysulphone, acrylic, polyvinyl chloride (PVC), ABS)</li> <li>- fibre-reinforced thermoplastic sheet</li> <li>- structural foams (such as polyvinyl chloride (PVC), polymethate (Rohacell))</li> </ul> <p>1.9 carry out quality sampling checks at suitable intervals</p> <p>1.10 produce components to the required specification</p> <p>1.11 deal promptly and effectively with problems within your control and report those that cannot be solved</p> <p>1.12 shut down the equipment to a safe condition on conclusion of the machining activities</p> <p>1.13 produce aircraft components which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- records of machine settings</li> <li>- other specific records.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to produce aircraft components by vacuum forming</p>	<p>2.1 describe specific safety practices and procedures that they need to observe when working with vacuum forming equipment (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)</p> <p>2.2 explain the health and safety requirements of the work area where they are carrying out the activities, and the responsibility these requirements place on them</p> <p>2.3 describe the protective equipment that they need to use for both personal protection and, where appropriate, the protection of others</p> <p>2.4 explain the hazards associated with carrying out vacuum forming activities, and with the tools and equipment used, and how these hazards can be minimised</p> <p>2.5 explain the application of COSHH regulations in relation to the storage, use and disposal of materials and consumables used in the vacuum forming process</p> <p>2.6 explain how to extract information from engineering drawings, and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to the work undertaken</p> <p>2.7 explain how to interpret imperial and metric systems of measurement</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 explain the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and how to complete such documents</p> <p>2.9 explain the supply of material in sheet form (such as colour, thickness, sheet size, surface texture, material protection)</p> <p>2.10 explain the sheet profiling procedures, and material trimming methods/procedures</p> <p>2.11 describe the methods of sheet cleaning, prior to forming</p> <p>2.12 describe the preparation methods and procedures applied to the moulding surface.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to produce aircraft components by vacuum forming (continued)</p>	<p>2.13 explain the identification of the correct male/female mould tooling</p> <p>2.14 explain the methods and techniques of loading and aligning materials into the mould tooling</p> <p>2.15 explain the methods and techniques for carrying out the de-moulding procedures</p> <p>2.16 explain how to recognise vacuum forming defects (such as misalignment, distortion, damage, contamination and surface defects)</p> <p>2.17 explain the importance of adhering to the vacuum forming cycle</p> <p>2.18 explain the quality control procedures to be followed during the vacuum forming operations</p> <p>2.19 describe the tools and equipment used in the vacuum forming activities, and their care, preparation and control procedures</p> <p>2.20 describe the problems that can occur with the vacuum forming operations, and how these can be overcome</p> <p>2.21 explain the procedure for the safe disposal of waste materials</p> <p>2.22 explain the recording documentation to be completed for the vacuum forming activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.23 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.			

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## **Unit 24: Producing aircraft components by injection moulding**

**Unit reference number:** R/601/4319

**QCF level:** 2

**Credit value:** 32

**Guided learning hours:** 130

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to produce aircraft components by injection moulding, in accordance with approved procedures. The learner will be required to check that the injection-moulding machine is ready for the operations to be performed, and that all the required materials and consumables are available. The learner will be expected to check that the mould tools are free from damage, which could impair the quality of the mouldings produced, and that all services required to operate the machine are fully operational.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Producing aircraft components by injection moulding</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 follow the correct component drawing or any other related specifications for the component to be produced</p> <p>1.3 determine what has to be done and how this will be achieved</p> <p>1.4 obtain and prepare the appropriate tools, equipment and materials</p> <p>1.5 prepare for the plastic injection-moulding operations, to include carrying out all of the following:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the injection-moulding operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- use the correct tools and equipment for the activity, and ensure that they are safe to use</li> <li>- check that there are sufficient raw materials available, and that they meet the component specification</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- apply safe and appropriate working practices and procedures at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul> <p>1.6 check the injection-moulding machine, to include carrying out all of the following:</p> <ul style="list-style-type: none"> <li>- checking that the correct mould tool is located in the machine and is complete, clean and free from damage</li> <li>- ensuring that mould surfaces are clean and free from damage</li> <li>- checking that secondary mould tool components are clean and free from damage</li> <li>- checking that all moulding parameters have been set correctly (such as temperature, pressure, speed/time, distance)</li> <li>- checking that component delivery/collection mechanisms are working correctly (such as robots, conveyors, separators and collection chutes)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- ensuring that all guards, screens and safety mechanisms are in place and in good working order</li> <li>- checking that all services are connected, and that all connections are in good order (such as water, electrical, pneumatic, hydraulic)</li> <li>- checking that all machine controls are operational</li> </ul> <p>1.7 carry out the moulding or laying-up activities using the correct methods and techniques.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Producing aircraft components by injection moulding (continued)	1.8 produce plastic injection mouldings, using two of the following types of mould tools: <ul style="list-style-type: none"> <li>- two-plate tools</li> <li>- three-plate tools</li> <li>- combination/composite tools</li> <li>- split tools</li> <li>- unscrewing tools</li> </ul> 1.9 produce injection mouldings from two of the following types of material: <ul style="list-style-type: none"> <li>- acrylonitrile-butadiene-styrene (ABS)</li> <li>- nylon</li> <li>- polyethyleneketone</li> <li>- polyarylene sulphide</li> <li>- short fibre reinforced polymers up to 30 % by volume</li> <li>- polycarbonate</li> <li>- polypropylene</li> <li>- polystyrene</li> <li>- polyethylene</li> <li>- acetal</li> <li>- other specific material</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.10 produce a range of components with two of the following features:</p> <ul style="list-style-type: none"> <li>- flat planks/test pieces</li> <li>- double curvatures</li> <li>- female shapes</li> <li>- multi-faceted</li> <li>- internal cavities</li> <li>- male shapes</li> <li>- other specific features</li> </ul> <p>1.11 check that all the required operations have been completed to specification</p> <p>1.12 carry out a visual inspection and segregation of the mouldings, according to company procedures, to include two of the following:</p> <ul style="list-style-type: none"> <li>- mouldings which meet the required specification</li> <li>- mouldings which have defects</li> <li>- mouldings that require further investigation</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 monitor the moulding operations, and make adjustments to the machine settings to deal with two of the following:</p> <ul style="list-style-type: none"> <li>- flashing</li> <li>- short shot</li> <li>- distortion</li> <li>- burning</li> <li>- colour deviation</li> </ul> <p>1.14 produce components to the required specification</p> <p>1.15 complete the relevant documentation, to include two of the following:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- records of machine settings</li> <li>- other specific records</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.16 produce plastic injection mouldings which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.17 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to produce aircraft components by injection moulding</p>	<p>2.1 describe the hazards and specific safety precautions to be taken when operating injection-moulding machines and associated delivery and collection systems, and how the hazards can be minimised</p> <p>2.2 explain the emergency procedures that are in place to deal with a machine malfunction when operating injection-moulding machines</p> <p>2.3 describe the safety mechanisms on the machine, and the procedure for checking that they function correctly</p> <p>2.4 explain the operation of the machine controls in both hand and power modes, and how to stop the machine in an emergency</p> <p>2.5 explain the COSHH regulations relating to the materials used in the injection-moulding activities (such as mould sprays, mould lubricants and moulding materials)</p> <p>2.6 describe the personal protective equipment (PPE) that should be used during the injection-moulding activities, and how to obtain it</p> <p>2.7 explain how to obtain the necessary job instructions for the production operations, and how to interpret the information</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 describe the basic parts and functions of plastic injection-moulding machines and moulds (to include mould location points; mould heating/cooling arrangements; machine controls; hydraulic, pneumatic and electricity supplies; material delivery and collection systems; guards and other safety devices)</p> <p>2.9 explain the various types of mould tools that are used, and their typical applications</p> <p>2.10 explain why it is important to check the moulds for damage or other non-conformance, prior to starting up the injection-moulding machine</p> <p>2.11 describe the different types of component delivery/collection systems that are used on plastic injection-moulding machines</p> <p>2.12 describe the various machine operating parameters that may require adjusting during the injection-moulding activities (such as temperature, pressure, speed/timings and distance), and how these are achieved</p> <p>2.13 explain the effects that changes to these settings will have on the quality of the components produced.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to produce aircraft components by injection moulding (continued)</p>	<p>2.14 describe the different types of materials used in the plastic injection-moulding process</p> <p>2.15 describe the preparations to be carried out on the materials in order to ensure that the completed components meet the required specification</p> <p>2.16 explain the temperature range of the material being moulded and the mould being used</p> <p>2.17 explain the methods of checking the finished mouldings to ensure that they are to the required specification</p> <p>2.18 describe the identification of moulding defects, their causes, and methods of prevention</p> <p>2.19 explain how to make adjustments to machine settings to deal with such things as flashing, short shot, distortion and colour problems</p> <p>2.20 describe the quality control procedures used and inspection checks to be carried out on the mouldings produced, and the equipment that will need to be used</p> <p>2.21 describe the problems that can occur with the injection-moulding activities, and how these can be overcome</p> <p>2.22 explain why it is important to keep the injection-moulding equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.23 explain the procedure for the safe disposal of waste materials</p> <p>2.24 explain the production documentation to be completed for the injection-moulding activities undertaken</p> <p>2.25 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve when operating injection-moulding machines.</p>			

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*(if sampled)*

## **Unit 25: Assembling aircraft composite components**

**Unit reference number:** Y/601/4323

**QCF level:** 2

**Credit value:** 42

**Guided learning hours:** 151

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to produce aircraft composite assemblies from composite and non-composite components, in accordance with approved procedures. The learner will be required to work to instructions, specifications and documentation to produce the composite assemblies, using the correct techniques. The assemblies will include double-curvature assemblies and stiffened assemblies. The assemblies will be built from components made from glass fibre mouldings, carbon fibre mouldings, acrylic mouldings, double-curvature mouldings, and foam/honeycomb stiffened mouldings, and will be assembled using a variety of joining methods, to include positive pressure bonding, structural bonding, contact bonding, riveting and bolting.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Assembling aircraft composite components</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 follow the relevant instructions, assembly drawings and any other specifications</p> <p>1.3 carry out all of the following during the aircraft composite assembly activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the assembly operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- use the correct tools and equipment for the activity, and ensure that they are safe to use</li> <li>- ensure that components to be used are of the correct type, and that all mouldings are free from defects</li> <li>- apply safe and appropriate assembly practices and procedures at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul> <p>1.4 ensure that the specified components are available and that they are in a usable condition</p> <p>1.5 use the appropriate methods and techniques to assemble the components in their correct positions</p> <p>1.6 produce one of the following types of composite assembly:</p> <ul style="list-style-type: none"> <li>- one-off assemblies</li> <li>- batch assemblies</li> <li>- assembly line</li> </ul> <p>1.7 produce aircraft composite assemblies that incorporate two of the following features:</p> <ul style="list-style-type: none"> <li>- loose fit tolerances</li> <li>- close fit tolerances</li> <li>- non-permanent fixing</li> <li>- shape location</li> <li>- joggle joins</li> <li>- permanent fixing</li> <li>- return joins</li> <li>- overlap joins</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce aircraft composite assemblies that require two of the following methods to be used: <ul style="list-style-type: none"> <li>- fettling</li> <li>- pinning</li> <li>- clamping</li> <li>- trial fitting</li> <li>- aligning</li> <li>- assembly jigs.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Assembling aircraft composite components (continued)</p>	<p>1.9 produce aircraft composite assemblies that use one of the following joining methods:</p> <ul style="list-style-type: none"> <li>- thread inserts</li> <li>- quick-release fasteners</li> <li>- rivets</li> <li>- mechanical fasteners</li> <li>- anchor nuts</li> <li>- adhesives</li> </ul> <p>1.10 assemble aircraft composite components which include two of the following:</p> <ul style="list-style-type: none"> <li>- trim</li> <li>- closing panels</li> <li>- housings</li> <li>- consoles</li> <li>- core materials</li> <li>- casings and covers</li> <li>- aerodynamic components</li> <li>- tubes</li> <li>- sections</li> <li>- inserts</li> <li>- sandwich panels</li> <li>- structural</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- galley units</li> <li>- airframe components</li> <li>- moulds</li> <li>- jigs</li> <li>- tanks</li> <li>- other specific components</li> </ul> <p>1.11 secure the components using the specified connectors and securing devices</p> <p>1.12 produce assemblies which include one of the following non-composite components</p> <ul style="list-style-type: none"> <li>- brackets</li> <li>- fixtures</li> <li>- fittings</li> <li>- trim</li> <li>- tapes</li> <li>- memory foam</li> <li>- films</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 carry out quality and accuracy checks during assembly, which include all of the following:</p> <ul style="list-style-type: none"> <li>- cosmetic appearance</li> <li>- component orientation</li> <li>- security of joints</li> <li>- accuracy of joint lines</li> <li>- excess adhesives</li> <li>- freedom from damage</li> </ul> <p>1.14 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification</p> <p>1.15 produce assemblies which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.16 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- build records</li> <li>- other specific records</li> </ul> <p>1.17 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to assemble aircraft composite components</p>	<p>2.1 describe the health and safety precautions to be taken and procedures used in the specific work area, when working with composite materials, consumables, tools and equipment</p> <p>2.2 explain the hazards associated with assembling composite materials, and with the consumables, tools and equipment used, and how to minimise these hazards in the work area</p> <p>2.3 describe the protective equipment that they need to use for both personal protection and, where appropriate, protection of others</p> <p>2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables</p> <p>2.5 describe the specific workshop environmental conditions that must be observed when producing aircraft composite assemblies (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)</p> <p>2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.7 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 explain the use of and conventions/terminology used in composite assembly</p> <p>2.9 explain the types of component trimming/cutting methods and preparation methods available</p> <p>2.10 explain the methods of achieving consolidation at joining/laying-up points</p> <p>2.11 explain the methods of assembling composite components using mechanical methods (such as screw fasteners, rivets, special purpose fittings).</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to assemble aircraft composite components (continued)</p>	<p>2.12 explain the procedures for selecting the correct type of adhesive, and the pre-treatment requirements</p> <p>2.13 explain the procedures for composite riveting/drilling, and the effect of using percussion or squeeze riveting</p> <p>2.14 explain the methods and techniques for lifting, handling and supporting the components/equipment/materials during the assembly activities</p> <p>2.15 explain the quality control procedures to be followed during the assembly operations</p> <p>2.16 describe the recognition of jointing defects (such as misalignment, distortion, foreign object damage, contamination and surface defects)</p> <p>2.17 describe the tools and equipment used in assembly activities, and their care, preparation and control procedures</p> <p>2.18 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</p> <p>2.19 describe the things that can go wrong with the assembly activities, and how they can be avoided</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.20 explain the recording documentation to be completed for the assembly activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.21 explain the procedure for the safe disposal and correct separation of waste materials</p> <p>2.22 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.</p>			

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(if sampled)

## **Unit 26: Carrying out trimming operations on aircraft composite components**

**Unit reference number:** D/601/4324

**QCF level:** 2

**Credit value:** 32

**Guided learning hours:** 130

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to trim aircraft composite mouldings using hand and power tools, in accordance with approved procedures. The learner will be required to follow the appropriate instructions, drawings, specifications and documentation to trim the various composite mouldings, using the correct trimming techniques. The learner will be expected to select and use the correct tools and equipment for the trimming activity. The learner will trim a range of composite mouldings, incorporating a variety of features, by using cutting, sanding, drilling and polishing techniques and processes. Mouldings to be trimmed will include a range of resin and fibre materials.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Carrying out trimming operations on aircraft composite components</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the composite trimming activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the composite trimming operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- use the correct tools and equipment for the activity, and ensure that they are in a safe and usable condition</li> <li>- apply safe and appropriate working practices and procedures at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul> <p>1.3 follow relevant specifications for the component to be produced</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition</p> <p>1.5 carry out all of the following when preparing for the trimming activity:</p> <ul style="list-style-type: none"> <li>- check that the moulding is correct and complete</li> <li>- check for any defects in the moulding</li> <li>- identify and protect the moulding in the work area</li> </ul> <p>1.6 shape the materials using appropriate methods and techniques</p> <p>1.7 mark out mouldings, using four of the following methods:</p> <ul style="list-style-type: none"> <li>- scribe</li> <li>- height gauge</li> <li>- moulded scribe lines</li> <li>- centre punch</li> <li>- trimming templates</li> </ul> <p>1.8 trim mouldings, using one the following methods:</p> <ul style="list-style-type: none"> <li>- cutting wheels/discs</li> <li>- saws</li> <li>- routers</li> <li>- trim jigs</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 sand mouldings, using two of the following methods: <ul style="list-style-type: none"> <li>- rubbing blocks</li> <li>- diamond files</li> <li>- pencil grinders</li> <li>- disc sanders</li> <li>- belt sanders.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Carrying out trimming operations on aircraft composite components (continued)</p>	<p>1.10 use a hand drill or pedestal drill to drill mouldings, using two of the following:</p> <ul style="list-style-type: none"> <li>- drill jigs</li> <li>- ole saws</li> <li>- counterbore tools</li> <li>- countersink tools</li> <li>- drill bits</li> </ul> <p>1.11 polish mouldings, using three of the following methods:</p> <ul style="list-style-type: none"> <li>- wet sanding</li> <li>- cutting compound</li> <li>- polishing compound</li> <li>- rubbing block</li> <li>- orbital sander</li> <li>- polisher</li> </ul> <p>1.12 trim mouldings, using appropriate techniques for both of the following:</p> <ul style="list-style-type: none"> <li>- resins (such as polyester, vinyl ester, epoxy, phenolic, bismaleimide, cyanate ester, acrylic)</li> <li>- fibres (such as polyethylene, glass, aramid, carbon, hybrid)</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 trim mouldings that require, or incorporate, five of the following features:</p> <ul style="list-style-type: none"> <li>- straight edges</li> <li>- curved edges</li> <li>- flat surfaces</li> <li>- polished surfaces</li> <li>- shaped surfaces</li> <li>- radius corners</li> <li>- returns</li> <li>- nett edges</li> <li>- joggle details</li> <li>- removal of join lines</li> <li>- holes</li> <li>- multiple hole sizes</li> <li>- countersinks</li> <li>- counterbores</li> <li>- further lay-up stages</li> <li>- inserts to be drilled</li> <li>- inserts to be tapped</li> <li>- solid cores</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- honeycomb cores</li> <li>- edge filling</li> </ul> <p>1.14 check that all the required shaping operations have been completed to the required specification</p> <p>1.15 ensure that trimmed mouldings comply with one of the following quality and accuracy standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.16 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- build records</li> <li>- other specific records</li> </ul> <p>1.17 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to carry out trimming operations on aircraft composite components</p>	<p>2.1 describe the health and safety precautions to be taken and procedures used when working with composite materials, consumables, tools and equipment in the specific work area</p> <p>2.2 describe the hazards associated with trimming composite materials, and with the consumables, tools and equipment used, and how to minimise these hazards in the work area</p> <p>2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others</p> <p>2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables</p> <p>2.5 describe the specific workshop environmental conditions that must be observed when trimming aircraft composite mouldings (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)</p> <p>2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.7 explain how to interpret drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 explain how to prepare for the trimming activities, and how to mark out the mouldings for the material to be removed</p> <p>2.9 explain the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification, etc)</p> <p>2.10 explain the conventions and terminology used for trimming activities (such as scribe lines, sanding grades, types of cutting tools, speeds).</p>			
2b Know how to carry out trimming operations on aircraft composite components (continued)	<p>2.11 describe the visual identification of cured composite materials</p> <p>2.12 explain how to identify defects in composite mouldings</p> <p>2.13 describe the methods used in the trimming of composite mouldings</p> <p>2.14 describe the different types of manual and power tools used in composite trimming operations</p> <p>2.15 describe the different types of cutting tools and abrasives used in trimming composite materials, and their application</p> <p>2.16 describe the procedure for the safe disposal of waste materials</p> <p>2.17 explain the care and safe handling of composite mouldings throughout the trimming cycle</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.18 explain the recording documentation to be completed for the trimming activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.19 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.</p>			

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*(if sampled)*

## **Unit 27: Carrying out bonding operations on aircraft composite components**

**Unit reference number:** T/601/4328

**QCF level:** 2

**Credit value:** 23

**Guided learning hours:** 95

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out bonding activities on aircraft composite mouldings, in accordance with approved procedures. The learner will be required to follow the appropriate instructions, drawings, specifications and documentation to bond aircraft composite materials, using the correct techniques and procedures. The learner will produce a range of bonded composite mouldings, incorporating a variety of features and using a range of techniques and processes. Bonded mouldings produced will include a range of resin, fibre and adhesive materials.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Carrying out bonding operations on aircraft composite components</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the composite bonding activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the bonding operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- check that mouldings are of the correct type, complete and free from defects</li> <li>- correctly prepare the materials for bonding</li> <li>- check that the surfaces to be bonded mate properly to make a sound joint possible</li> <li>- ensure that the joint is rigidly secured during the curing period</li> <li>- remove any surplus material, and clean up at the appropriate time</li> <li>- identify and protect the moulding and bonding materials in the work area</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul> <p>1.3 follow the relevant bonding procedure specification and job instructions</p> <p>1.4 check that the materials to be bonded and bonding agents comply with the specification</p> <p>1.5 prepare the surfaces to be bonded, using three of the following methods:</p> <ul style="list-style-type: none"> <li>- peel plies</li> <li>- templates</li> <li>- abrading</li> <li>- bead blasting</li> <li>- water cleaning</li> <li>- solvent cleaning</li> <li>- dry fitting</li> <li>- acid etching</li> <li>- priming</li> <li>- surface masks</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.6 correctly prepare the parent materials and bonding agents in line with the bonding specification</p> <p>1.7 carry out the bonding operations using the specified processes and techniques to position and bond the materials in their correct locations</p> <p>1.8 bond composite mouldings, using techniques for two of the following:</p> <ul style="list-style-type: none"> <li>- one-part pastes</li> <li>- two-part pastes</li> <li>- contact two-part adhesives</li> <li>- film adhesives</li> <li>- acrylics</li> <li>- syntactic films</li> </ul> <p>1.9 use two of the following methods when bonding the composite mouldings:</p> <ul style="list-style-type: none"> <li>- dry fitting</li> <li>- bonding sequences</li> <li>- shimmed materials</li> <li>- mixing adhesives</li> <li>- wetting-out by brush</li> <li>- applicator gun</li> <li>- laying film adhesives</li> <li>- spraying equipment.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Carrying out bonding operations on aircraft composite components (continued)</p>	<p>1.10 use one of the following to retain the bond during the curing process:</p> <ul style="list-style-type: none"> <li>- weighting down</li> <li>- bonding jigs</li> <li>- pinning joints</li> <li>- lamping</li> <li>- press</li> <li>- vacuum bagging</li> <li>- pressure bagging</li> </ul> <p>1.11 ensure that any equipment used to maintain surface contact during the bonding activities is set up and used correctly</p> <p>1.12 use one of the following to aid the curing process:</p> <ul style="list-style-type: none"> <li>- oven</li> <li>- self-heating tooling</li> <li>- infra-red lamps</li> <li>- heated presses</li> <li>- autoclaves</li> <li>- controlled heating mats</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 bond composite mouldings, using techniques for one of the following:</p> <ul style="list-style-type: none"> <li>- sandwich panels</li> <li>- butt joints</li> <li>- overlap joints</li> <li>- joggle joints</li> <li>- return joints</li> </ul> <p>1.14 bond composite mouldings, using techniques for two of the following:</p> <ul style="list-style-type: none"> <li>- flat surfaces</li> <li>- convex/concave shapes</li> <li>- double curvatures</li> <li>- internal surfaces</li> <li>- external surfaces</li> </ul> <p>1.15 use appropriate techniques for bonding one of the following materials to the composite moulding:</p> <ul style="list-style-type: none"> <li>- other composites</li> <li>- metals</li> <li>- ceramics</li> <li>- plastics</li> <li>- wood-based materials</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.16 bond composite mouldings, using adhesives suitable for both of the following:</p> <ul style="list-style-type: none"> <li>- resins (such as polyester, epoxy, phenolic, bismaleimide, cyanate ester, vinyl ester, acrylic)</li> <li>- fibres (such as polyethylene, glass, aramid, carbon, hybrid, other specific types)</li> </ul> <p>1.17 achieve bonds of the required quality and within the specified dimensional accuracy</p> <p>1.18 bond a range of mouldings, in compliance with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.19 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- build records</li> <li>- other specific records</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2a Know how to carry out bonding operations on aircraft composite components	<p>1.20 deal promptly and effectively with problems within your control and report those that cannot be solved.</p> <p>2.1 describe the specific safety practices and procedures that they need to observe when working with composite materials, bonding materials, consumables and associated tools and equipment</p> <p>2.2 describe the hazards associated with bonding composite materials and consumables, and with the tools and equipment used, and how to minimise these hazards in the work area</p> <p>2.3 explain the importance of good workshop practice and housekeeping; ventilation and fume control equipment; first aid procedures and actions</p> <p>2.4 describe the personal protective clothing and equipment to be worn when carrying out bonding activities (gloves, eye protection, respiratory protection, etc) and, where appropriate, for the protection of others</p> <p>2.5 explain the application of COSHH regulations in relation to the storage, use and disposal of bonding/composite materials and consumables</p> <p>2.6 describe the specific workshop environmental conditions that must be observed when bonding aircraft composite materials (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.7 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.8 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing</p> <p>2.9 explain the conventions and terminology used for bonding (such as gel points, cure times, bond thickness, bond strength, peel strength)</p> <p>2.10 explain the methods of preparing components and producing a keying surface (water and solvent cleaning, degreasing, abrading, acid etching, priming)</p> <p>2.11 explain the importance of working to organisational and bonding agent manufacturer's instructions whilst carrying out the bonding activities</p> <p>2.12 explain the effects of the environment on the bonding process (such as temperature, humidity, cleanliness)</p> <p>2.13 describe the methods and techniques used for bonding the materials (such as gluing, impact, chemical and thermal reaction techniques, bagging and positive pressure techniques)</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.14 explain the procedures for selecting the correct type of adhesive, and the pre-treatment requirements, setting or curing requirements; and time, strength and appearance</p> <p>2.15 describe the use and precautions to be taken when using adhesives and solvents, and the correct methods of storage and handling of bonding agents.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to carry out bonding operations on aircraft composite components (continued)</p>	<p>2.16 explain the bonding agent equipment (holding vessels, brushes, stirrers and spatulas, scrapers, knives, clamps and weights)</p> <p>2.17 describe the methods of application for different bonding agents</p> <p>2.18 explain the reasons for checking that components are assembled in the correct sequence, are positioned dimensionally accurately and to the correct orientation, in accordance with the specifications, prior to bonding</p> <p>2.19 explain how to check that completed joints are firm, sound and fit for purpose (types of failure mode, effect of poor pressure application, the effect of inadequate curing)</p> <p>2.20 describe the procedures for applying bonding pressures to the joints during the curing cycle</p> <p>2.21 describe the procedures for cleaning off surplus adhesive and tidying up the appearance of joints</p> <p>2.22 describe the procedures when temperature cure is used, and the need for thermocouples on temperature control</p> <p>2.23 describe the common causes of defects associated with the bonding processes, and how to avoid them</p> <p>2.24 describe the tools and equipment used in bonding activities, and their care, preparation and control procedures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.25 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</p> <p>2.26 explain the quality control procedures to be followed during the bonding operations</p> <p>2.27 explain the procedure for the safe disposal and correct separation of waste materials</p> <p>2.28 describe the recording documentation to be completed for the bonding activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.29 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.</p>			

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## **Unit 28: Carrying out repairs to aircraft composite mouldings**

**Unit reference number:** A/601/4332

**QCF level:** 2

**Credit value:** 42

**Guided learning hours:** 151

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to carry out repairs to aircraft composite mouldings (such as cured panels, moulds, components and jigs), in accordance with approved procedures. The learner will be required to use appropriate specifications and documentation for the repair of the composite materials, and to use the correct techniques. The learner will be required to obtain all relevant and current documentation relating to the repair, to obtain the tools and equipment required for the repair operations, and to check that they are in a safe and usable condition. In carrying out the repair, they will be required to follow company procedures and specified repair techniques. The learner will repair a range of composite mouldings with various defects, using a range of methods. Mouldings repaired will include a range of resin and fibre materials.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Carrying out repairs to aircraft composite mouldings</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the composite repair activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the repair operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- obtain the correct tools and equipment for the activity, and check that they are in a safe and usable condition</li> <li>- identify what needs to be repaired, and the method of repair to be used</li> <li>- correctly prepare the materials for the repair activities</li> <li>- apply appropriate and safe repair techniques at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul> <p>1.3 follow the relevant specifications for the component to be repaired</p> <p>1.4 repair defects in three of the following types of aircraft composite mouldings:</p> <ul style="list-style-type: none"> <li>- trim</li> <li>- closing panels</li> <li>- housings</li> <li>- consoles</li> <li>- casings and covers</li> <li>- aerodynamic components</li> <li>- tubes</li> <li>- sections</li> <li>- sandwich panels</li> <li>- structural</li> <li>- galley units</li> <li>- tanks</li> <li>- moulds</li> <li>- jigs</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- airframe components</li> <li>- other specific components</li> </ul> <p>1.5 prepare the component for repair</p> <p>1.6 repair defects in aircraft composite mouldings, using three of the following methods:</p> <ul style="list-style-type: none"> <li>- localised curing</li> <li>- fettling</li> <li>- surface filling</li> <li>- colour matching</li> <li>- relieving distortion</li> <li>- separation of bonds</li> <li>- bonding</li> <li>- polishing</li> <li>- resin injection</li> <li>- wet-lay patching</li> <li>- pre-preg patching</li> <li>- osmosis</li> <li>- core patching</li> <li>- insert/core potting</li> <li>- repair patches/kits</li> <li>- laminating.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Carrying out repairs to aircraft composite mouldings (continued)</p>	<p>1.7 repair defects in aircraft composite mouldings, using techniques and materials applicable to both of the following:</p> <ul style="list-style-type: none"> <li>- resins (such as polyester, vinyl ester, epoxy, phenolic, bismaleimide, cyanate ester, acrylic)</li> <li>- fibres (such as polyethylene, glass, aramid, carbon, hybrid materials)</li> </ul> <p>1.8 repair five of the following types of defect in aircraft composite mouldings:</p> <ul style="list-style-type: none"> <li>- incomplete curing</li> <li>- dimensional</li> <li>- surface finish</li> <li>- distortion</li> <li>- cosmetic (can be filled)</li> <li>- hole damage (access from both sides)</li> <li>- blisters</li> <li>- bridging</li> <li>- de-lamination</li> <li>- broken fibres</li> <li>- fractures</li> <li>- voids</li> <li>- dis-bonds</li> <li>- dents or 'dings'</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- excessive adhesive</li> <li>- gouges</li> <li>- hole damage (external access only)</li> <li>- damaged cores</li> <li>- wrong inserts</li> <li>- incorrect insert positions</li> <li>- impact damage</li> <li>- abrasion/erosion</li> </ul> <p>1.9 carry out the repairs within agreed timescale using approved materials and components and methods and procedures</p> <p>1.10 carry out repairs to composite mouldings, which comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA )</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.11 ensure that the repaired component meets the specified operating conditions</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.12 produce accurate and complete records of all repair work carried out</p> <p>1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- repair documentation</li> <li>- quality control documentation</li> <li>- build records</li> <li>- other specific records.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to carry out repairs to aircraft composite mouldings</p>	<p>2.1 describe the health and safety precautions to be taken and procedures used when working with composite materials, consumables, tools and equipment in the specific work area</p> <p>2.2 describe the hazards associated with carrying out repairs to composite materials, consumables, tools and equipment, and how to minimise these hazards in the work area</p> <p>2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others</p> <p>2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables</p> <p>2.5 describe the specific workshop environmental conditions that must be observed when bonding aircraft composite materials (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)</p> <p>2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.7 explain how to carry out currency/issue checks of the specifications you are working with</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2b Know how to carry out repairs to aircraft composite mouldings (continued)</p>	<p>2.8 explain the quality procedures used in the workplace to ensure that repairs are carried out satisfactorily</p> <p>2.9 explain the conventions and terminology used when repairing composite mouldings (such as dis-bonds, de-lamination, resin injection, resin voids, core potting, repair patches).</p> <p>2.10 describe the different types of composite resin systems, fibres and reinforcements, and the repair techniques that can be used</p> <p>2.11 describe the methods of preparing the mouldings for the repair to be carried out (such as cleaning, abrading, priming)</p> <p>2.12 describe the various bonding agents and methods used</p> <p>2.13 explain the correct methods for storage and handling of composite materials</p> <p>2.14 describe the tools and equipment used for the various activities associated with repairing composite mouldings</p> <p>2.15 explain the procedure for the safe disposal and correct separation of waste materials</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.16 explain the recording documentation to be completed for the repair activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.17 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.</p>			

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*(if sampled)*



## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Checking aircraft composite mouldings for defects</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 carry out all of the following during the inspection activities:</p> <ul style="list-style-type: none"> <li>- ensure that you have the correct documentation for the checking operations (such as drawings, job instructions, aircraft standards)</li> <li>- adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations</li> <li>- obtain the correct tools and equipment for the activity, and check that they are in a safe and usable condition</li> <li>- apply appropriate and safe inspection techniques at all times</li> <li>- dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures</li> <li>- return all tools and equipment to the correct location on completion of the activities</li> <li>- leave the work area in a safe condition and free from foreign object debris</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 identify defects with regard to the product or asset specification</p> <p>1.4 check for defects in composite mouldings, using four of the following methods:</p> <ul style="list-style-type: none"> <li>- touch</li> <li>- sound</li> <li>- visual</li> <li>- measurement</li> <li>- mechanical tests</li> <li>- stage inspection</li> <li>- NDT (non-destructive testing)</li> <li>- CMM (co-ordinate measuring methods)</li> </ul> <p>1.5 identify defects in six of the following types of composite mouldings:</p> <ul style="list-style-type: none"> <li>- trim</li> <li>- closing panels</li> <li>- housings</li> <li>- consoles</li> <li>- casings and covers</li> <li>- aerodynamic components</li> <li>- tubes</li> <li>- sections</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- sandwich panels</li> <li>- structural</li> <li>- galley units</li> <li>- airframe components</li> <li>- moulds</li> <li>- jigs</li> <li>- tanks</li> <li>- other specific components</li> </ul>			
	<p>1.6 identify defects applicable to two of the following resin types:</p> <ul style="list-style-type: none"> <li>- polyester</li> <li>- vinyl ester</li> <li>- epoxy</li> <li>- phenolic</li> <li>- bismaleimide</li> <li>- cyanate ester</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.7 identify defects applicable to two of the following fibre types:</p> <ul style="list-style-type: none"> <li>- polyethylene</li> <li>- glass</li> <li>- aramid</li> <li>- carbon</li> <li>- hybrid.</li> </ul>			
<p>1b Checking aircraft composite mouldings for defects (continued)</p>	<p>1.8 identify eight of the following types of defect in composite mouldings:</p> <ul style="list-style-type: none"> <li>- incomplete curing</li> <li>- dimensional</li> <li>- tolerances</li> <li>- ply orientation</li> <li>- wrong join type</li> <li>- surface finish</li> <li>- distortion</li> <li>- blisters</li> <li>- bridging</li> <li>- de-lamination</li> <li>- wrinkles</li> <li>- broken fibres</li> <li>- splintering</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- voids</li> <li>- dents or `dings`</li> <li>- dis-bonds</li> <li>- resin rich areas</li> <li>- incorrect material</li> <li>- excessive adhesive</li> <li>- damaged cores</li> <li>- wrong inserts</li> <li>- insert positions</li> <li>- impact damage</li> </ul> <p>1.9 assess the defects and determine action required to return the products and assets to specified condition</p> <p>1.10 record details of defects in accordance with quality assurance and control systems and procedures</p> <p>1.11 report recommendations for action to the appropriate people promptly and in accordance with organisational procedures</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.12 inspect mouldings to ensure that they comply with one of the following standards:</p> <ul style="list-style-type: none"> <li>- Civil Aviation Authority (CAA)</li> <li>- Ministry of Defence (MOD)</li> <li>- Federal Aviation Authority (FAA)</li> <li>- ISO 9000 series and procedures</li> <li>- customer standards and requirements</li> <li>- company standards and procedures</li> </ul> <p>1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:</p> <ul style="list-style-type: none"> <li>- production documentation</li> <li>- quality control documentation</li> <li>- build records</li> <li>- other specific records.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to check aircraft composite mouldings for defects</p>	<p>2.1 describe the health and safety precautions to be taken and procedures used when working with composite materials, consumables, tools and equipment in the specific work area</p> <p>2.2 describe the hazards associated with working with composite materials, consumables, tools and equipment, and how to minimise these hazards in the work area</p> <p>2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others</p> <p>2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables</p> <p>2.5 describe the specific workshop environmental conditions that must be observed when working with aircraft composite materials (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)</p> <p>2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken</p> <p>2.7 explain how to carry out currency/issue checks of the specifications they are working with</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.8 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing</p> <p>2.9 explain the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification, etc), and how to complete the appropriate documents.</p>			
<p>2b Know how to check aircraft composite mouldings for defects (continued)</p>	<p>2.10 explain the conventions and terminology used when identifying and rectifying defects (such as dis-bonds, de-lamination, resin injection, resin voids, core potting, repair patches)</p> <p>2.11 describe the different types of composite resin systems, fibres and reinforcements, and the types of defects that may be present</p> <p>2.12 explain the failure modes for various composite mouldings, and what can contribute to these</p> <p>2.13 explain the correct methods of storage and handling of composite materials</p> <p>2.14 describe the tools and equipment used for checking the various composite mouldings</p> <p>2.15 explain the procedure for the safe disposal and correct separation of waste materials</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.16 explain the recording documentation to be completed for the repair activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation</p> <p>2.17 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.</p>			

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*(if sampled)*



## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Setting up and preparing loads for moving</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 establish the weight of the load to be moved</p> <p>1.3 determine the method and select suitable equipment to move the load</p> <p>1.4 check that the equipment to be used is capable of moving the load safely</p> <p>1.5 ensure that the equipment to be used is suitable for the loads being lifted, and is in a safe and usable condition, by checking all of the following:</p> <ul style="list-style-type: none"> <li>- the equipment is certified and is compliant, within current test dates</li> <li>- all slings are free from obvious defects</li> <li>- the moving equipment selected is suitable and has a sufficient safe working load (SWL) for the application</li> <li>- the identification number and safe working load (SWL), are clearly marked on the equipment selected</li> <li>- the equipment selected is suitable for the environment of the operation</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.6 obtain the safe working load (SWL) and centre of gravity of the load to be moved, by using two of the following:</p> <ul style="list-style-type: none"> <li>- load documentation</li> <li>- third party</li> <li>- estimation</li> <li>- moving load documentation/moving procedure sheet</li> </ul> <p>1.7 establish the position of lifting points for three of the following:</p> <ul style="list-style-type: none"> <li>- single-legged sling</li> <li>- double-legged sling</li> <li>- four-legged sling</li> <li>- multi-legged sling</li> <li>- lifting beams</li> <li>- spreaders</li> </ul> <p>whilst taking into account all of the following:</p> <ul style="list-style-type: none"> <li>- safe working load (SWL)</li> <li>- tension</li> <li>- angles</li> <li>- sling length.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Setting up and preparing loads for moving (continued)	1.8 plan the moving of various types of load, to include three of the following: <ul style="list-style-type: none"> <li>- sheet materials</li> <li>- other stock materials</li> <li>- aircraft sub-assemblies</li> <li>- access structures</li> <li>- loads with evenly distributed weight</li> <li>- aircraft major assemblies</li> <li>- liquid containers (such as drums)</li> <li>- awkward shapes</li> <li>- fragile components</li> <li>- hot/radiant/toxic/corrosive</li> <li>- plant/machinery</li> <li>- test equipment</li> <li>- other specific loads</li> <li>- loads with unevenly distributed weight</li> </ul> 1.9 determine a suitable route for moving the load minimising risk to people and property			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.10 plan the moving route and the final destination of the load, to include three of the following:</p> <ul style="list-style-type: none"> <li>- differing elevations</li> <li>- along same elevation</li> <li>- transferring a load</li> <li>- turning a load</li> <li>- as part of an assembly operation</li> <li>- move to store as unit/part assembly</li> </ul> <p>1.11 ensure that the load is secured and protected before moving operations start</p> <p>1.12 identify and set up suitable securing devices to ensure that the load is moved safely, using three of the following:</p> <ul style="list-style-type: none"> <li>- shackles</li> <li>- guide ropes</li> <li>- holding devices</li> <li>- stiffeners</li> <li>- protection materials</li> <li>- chains/wires</li> <li>- bottle screws/stays</li> <li>- seatings/fasteners</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.13 deal promptly and effectively with problems within your control and report those that cannot be solved</p> <p>1.14 complete the relevant documentation for recording the load moving activity, to include one of the following:</p> <ul style="list-style-type: none"> <li>- lifting procedure sheet (Competent Person ID)</li> <li>- drawings for the moving operation</li> <li>- inspection records/defect reports</li> <li>- risks assessments.</li> </ul>			
2a Know how to set up and prepare loads for moving	<p>2.1 describe the specific safety precautions to be taken when preparing loads for moving in an aircraft environment, and the need for ensuring load security (such as general workshop and site safety, appropriate protective equipment, protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)</p> <p>2.2 describe the hazards associated with preparing loads for moving, and how they can be minimised</p> <p>2.3 explain and understand the Approved Code of Practice (ACOP) for preparing loads for moving, and Lifting Operation and Lifting Equipment Regulations (LOLER)</p> <p>2.4 describe the specific requirements for the marking of moving equipment, and the specific method used in the organisation in which you are working</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.5 describe the range of equipment to be used for moving the load(s) (such as cranes, low loaders, fork-lift trucks)</p> <p>2.6 describe the lifting equipment accessories to be used (such as slings, chains, wire ropes, eye bolts)</p> <p>2.7 explain how to establish the weight of the load (such as by using documentation, calculation from drawings, and by estimation)</p> <p>2.8 explain how to establish the position of lifting points in relation to the slinging arrangements</p> <p>2.9 explain the factors which affect the selection of the moving equipment and lifting accessories (such as weight, type of load operating environment).</p>			
2b Know how to set up and prepare loads for moving (continued)	<p>2.10 explain how to check that the lifting equipment is capable of lifting the load to be moved</p> <p>2.11 describe the checks that should be made on the lifting equipment prior to use, and things that they should look for that could render them unsafe to use</p> <p>2.12 explain how to carry out visual in-service inspections of the equipment, and what to do should any defective equipment be identified</p> <p>2.13 explain how to plan and prepare a route for moving loads, and the things that they will need to take into account</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.14 explain the specific requirements for the organisation of moving equipment</p> <p>2.15 explain the signalling techniques used to communicate with crane drivers (to include both hand signals and verbal commands)</p> <p>2.16 explain how moving equipment should be handled and stored</p> <p>2.17 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

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## **Unit 31: Moving materials and components in an aircraft environment**

**Unit reference number:** J/601/4351

**QCF level:** 2

**Credit value:** 15

**Guided learning hours:** 56

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to move loads in an aircraft environment by slinging and lifting, in accordance with approved procedures. The learner will be required to use correctly specified items of lifting gear, which will include hand and/or power operated cranes and winches, and associated lifting accessories. The learner must check that the lifting equipment is within current authorisation dates, is undamaged and within the permitted safe working load (SWL). The learner will be expected to establish the weight of the load to be moved and attach the appropriate slings to suitable or designated lifting points on the load, in order to achieve a safe and balanced lift. The learner must check the area that the load will move through, to ensure that it is free from obstructions and is safe for the load to be moved. The learner will also be expected to give the correct hand and verbal signals during the lifting activities.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Moving materials and components in an aircraft environment</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 ensure that the equipment to be used is suitable for the materials, machinery or components being lifted, and is in a safe and usable condition, by establishing all of the following:</p> <ul style="list-style-type: none"> <li>- that the equipment is certified and is compliant, within current test dates (such as LOLER regulations and health and safety requirements)</li> <li>- that all slings are free from obvious defects</li> <li>- that the lifting equipment selected is suitable and has a sufficient SWL for the application</li> <li>- that the identification number and SWL are clearly marked on the equipment selected</li> <li>- that, where applicable, the equipment is correctly colour coded</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.3 before slinging, lifting or moving the load, ensure that all of the following, have been established/checked:</p> <ul style="list-style-type: none"> <li>- weight of the load</li> <li>- route of the load is clear</li> <li>- those affected have been informed</li> <li>- landing/storage area is clear</li> <li>- agreed code of verbal/hand signals</li> <li>- precautions are in place in case of spillage</li> <li>- arrangements are made for securing/storing in landing place</li> </ul> <p>1.4 position the moving equipment so that the weight of the load is evenly distributed</p> <p>1.5 attach the appropriate handling equipment securely to the load, using approved methods to eliminate slippage</p> <p>1.6 confirm that the load is secure before moving.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Moving materials and components in an aircraft environment (continued)</p>	<p>1.7 use two of the following lifting and moving methods and techniques:</p> <ul style="list-style-type: none"> <li>- crane</li> <li>- winch</li> <li>- powered lifting equipment</li> <li>- lifting appliances</li> <li>- pulling appliances</li> <li>- low loaders</li> <li>- hand operated lifting equipment</li> <li>- jacks, skates and trolleys</li> </ul> <p>1.8 use two of the following slinging methods:</p> <ul style="list-style-type: none"> <li>- single-leg slings</li> <li>- spreaders</li> <li>- two-leg slings</li> <li>- three- and four-leg slings</li> <li>- lifting beams</li> </ul> <p>1.9 move the load over the selected, suitable route</p> <p>1.10 move two of the following types of load:</p> <ul style="list-style-type: none"> <li>- sheet materials</li> <li>- other stock materials</li> <li>- aircraft sub-assemblies</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<ul style="list-style-type: none"> <li>- access structures</li> <li>- liquid containers (such as drums)</li> <li>- fragile components</li> <li>- hot/radiant/toxic/corrosive</li> <li>- aircraft major assemblies</li> <li>- plant/machinery</li> <li>- test equipment</li> <li>- loads with evenly distributed weight</li> <li>- loads with unevenly distributed weight</li> <li>- awkward shapes</li> <li>- other specific loads</li> </ul> <p>1.11 move loads safely and correctly, and reposition in two of the following conditions:</p> <ul style="list-style-type: none"> <li>- in the same elevation</li> <li>- to differing elevations</li> <li>- as part of an assembly operation</li> <li>- turning a load</li> <li>- transferring a load</li> <li>- move to store as unit/part assembly</li> </ul> <p>1.12 position and release the load safely in its intended final location.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to move materials and components in an aircraft environment</p>	<p>2.1 describe the specific safety precautions to be taken when slinging and lifting loads in an aircraft environment, and the need for ensuring load security (such as general workshop and site safety, appropriate personal protective equipment, protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)</p> <p>2.2 describe the hazards associated with slinging and lifting of loads, and how they can be minimised</p> <p>2.3 explain and understand the Approved Code of Practice (ACOP) for safe use of lifting equipment, and Lifting Operation and Lifting Equipment Regulations (LOLER)</p> <p>2.4 describe the specific requirements for the marking of lifting equipment, and the specific method used by the organisation in which you are working</p> <p>2.5 describe the range of equipment to be used for the lifting operations (such as hand and power operated cranes, winches, pulling equipment)</p> <p>2.6 describe the lifting equipment accessories to be used (such as slings, chains, wire ropes, eye bolts)</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.7 describe the checks that should be made on the lifting equipment prior to use, and things that you should look for</p> <p>2.8 explain how to carry out visual in-service inspections of the equipment, and what to do should any defective equipment be identified.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to move materials and components in an aircraft environment (continued)	2.9 explain the factors which affect the selection of the lifting equipment and lifting accessories (such as weight, type of load, operating environment) 2.10 explain how to check that the lifting equipment is capable of lifting the load to be moved 2.11 explain how to plan and prepare a route for moving loads, and the things that they will need to take into account 2.12 explain the specific requirements for the organisation of lifting operations 2.13 describe the signalling techniques used to communicate with crane drivers (to include hand signals and verbal commands) 2.14 explain how lifting equipment should be stored and handled 2.15 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.			

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## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Positioning and securing aircraft access structures</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 ensure that the access structure, lifting and securing components are in a usable condition, by checking all of the following:</p> <ul style="list-style-type: none"> <li>- the access structure being used is compliant with health and safety requirements (LOLER)</li> <li>- all wires/slings are free from defect</li> <li>- the lifting equipment is inspected and checked for sufficient SWL (safe working load) for the operation</li> <li>- the identification number and SWL are clearly marked and tagged on the structure and equipment selected</li> <li>- the access structure and securing equipment is suitable for the activity and environment of the work</li> </ul> <p>1.3 identify the most appropriate location for the access structure and prepare the site for the installation</p> <p>1.4 select the most appropriate access structures to ensure that safety regulations will be met</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.5 set up and install the access structure components in the correct sequence</p> <p>1.6 position four of the following types of access structures, using the correct sequence:</p> <ul style="list-style-type: none"> <li>- walkways</li> <li>- fixed platform systems</li> <li>- fixed gantry systems</li> <li>- moveable staging/towers</li> <li>- fixed access steps/stairs</li> <li>- mobile steps/stairs</li> <li>- access ladders</li> <li>- other specific access structures</li> </ul> <p>1.7 use four of the following lifting and moving techniques to position the access structure:</p> <ul style="list-style-type: none"> <li>- cranes</li> <li>- winches</li> <li>- powered lifting equipment</li> <li>- hydraulic jacks/skids</li> <li>- lifting appliances</li> <li>- pulling appliances</li> <li>- adjustable props/supports</li> <li>- other specific equipment.</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1b Positioning and securing aircraft access structures (continued)</p>	<p>1.8 prepare and position the access structures, to include carrying out all of the following:</p> <ul style="list-style-type: none"> <li>- preparing the area in which the access structures are to be erected (such as clear of obstructions, level and stable surface)</li> <li>- checking all components/sub-assemblies for defects prior to erecting them</li> <li>- determining suitable positions for all major components (such as vertical supports, access stairs/ladders)</li> <li>- positioning all components/sub-assemblies, stays and stiffeners of the access structures</li> <li>- checking and ensuring correct horizontal and vertical levels and alignments</li> <li>- securing the various components, using appropriate mechanical fastening devices (such as nuts and bolts, proprietary fasteners, wire or fibre ropes)</li> <li>- checking the stability of the final erected structure</li> <li>- checking that the completed structure meets the work requirements</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.9 use two of the following securing methods during the erection of the access structures:</p> <ul style="list-style-type: none"> <li>- bolting</li> <li>- clamping</li> <li>- wedging</li> <li>- welding</li> <li>- lashing</li> </ul> <p>1.10 check that the erected structures are safe, secure, stable and ready for use</p> <p>1.11 deal promptly and effectively with problems within your control and report those that cannot be solved</p> <p>1.12 complete the relevant documentation for recording the setting up of the access structures, to include one of the following:</p> <ul style="list-style-type: none"> <li>- lifting procedure sheet (Competent Person ID)</li> <li>- equipment inspection records/defect reports</li> <li>- risks assessments</li> <li>- job documentation</li> </ul> <p>1.13 inform the appropriate people when the installation is completed and ready for use.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to position and secure aircraft access structures</p>	<p>2.1 describe the specific safety precautions to be taken when positioning and securing access structures in an aircraft environment, and the need for ensuring the load security (such as general workshop and site safety, appropriate personal protective equipment, protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)</p> <p>2.2 describe the hazards associated with positioning and securing access structures, and how they can be minimised</p> <p>2.3 explain and understand the Approved Code of Practice (ACOP) for safe use of lifting equipment, and Lifting Operation and Lifting Equipment Regulations (LOLER)</p> <p>2.4 describe the specific requirements for the marking of lifting equipment, and the specific method used by the organisation in which you are working</p> <p>2.5 describe the various types of access structures used in the aircraft environment (such as walkways, fixed platforms/staging, moveable staging/towers, access steps/stairs, access ladders)</p> <p>2.6 explain the methods of assembling the access structures, and the equipment that is used</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.7 describe the range of equipment to be used for lifting the access structures (such as hand and power operated cranes, winches, pulling equipment)</p> <p>2.8 describe the lifting equipment accessories to be used (such as slings, chains, wire ropes, eye bolts)</p> <p>2.9 explain the checks to be made on the lifting equipment prior to use, and the things that they should look for</p> <p>2.10 explain what to do should any defective equipment be identified.</p>			
2b Know how to position and secure aircraft access structures (continued)	<p>2.11 explain how to determine the approximate weight of the load to be moved</p> <p>2.12 describe the factors which affect the selection of the lifting equipment and lifting accessories (such as weight, type of load, operating environment)</p> <p>2.13 explain how to check that the lifting equipment is capable of lifting the load to be moved</p> <p>2.14 explain how to determine the centre of gravity of the load, and how to determine suitable slings and lifting points</p> <p>2.15 explain how to locate and position the access structures, and the range of equipment that can be used</p> <p>2.16 explain the need to ensure that the structures are level and securely held in position</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.17 explain how to secure the access structures, and the equipment that can be used</p> <p>2.18 explain the things that can go wrong with the positioning and securing operations, and how they can be avoided</p> <p>2.19 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

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(if sampled)

## **Unit 33: Dismantling and removing aircraft access structures**

**Unit reference number:** R/601/4353

**QCF level:** 2

**Credit value:** 30

**Guided learning hours:** 70

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### **Unit summary**

This unit covers the skills and knowledge needed to prove the competences required to dismantle and remove aircraft access structures, in accordance with approved procedures. The learner will be required to dismantle and remove the access structures in accordance with health and safety requirements and Lifting Operations and Lifting Equipment Regulations (LOLER). The access structures to be dismantled and removed will include such things as walkways, fixed platforms/staging, access steps/stairs, access ladders and moveable staging/towers. The learner will be expected to use safe and appropriate techniques to remove access structure securings, to dismantle them and remove them, without causing damage to the access structures or to surrounding structures.

### **Assessment requirements/evidence requirements**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

### **Assessment recording**

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

## Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>1a Dismantling and removing aircraft access structures</p>	<p>1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>1.2 ensure that the equipment to be used is suitable for the task involved, and is in a safe and usable condition, by checking all of the following:</p> <ul style="list-style-type: none"> <li>- that all equipment is certified and compliant, within test dates (LOLER)</li> <li>- that all slings/wires are free from defects</li> <li>- that the removal equipment selected is suitable and has a sufficient SWL (safe working load) for the application</li> <li>- that the method of removal is appropriate to the surrounding environment</li> <li>- that the identification number and SWL are clearly marked on the equipment to be used</li> <li>- that an appropriate storage area for removed components is available</li> </ul> <p>1.3 establish, and where necessary, support components before removal of securing devices</p> <p>1.4 remove components in the correct sequence using approved techniques</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.5 use the correct sequence to dismantle and remove four of the following types of access structures:</p> <ul style="list-style-type: none"> <li>- walkways</li> <li>- fixed platform systems</li> <li>- fixed gantry systems</li> <li>- moveable staging/towers</li> <li>- fixed access steps/stairs</li> <li>- mobile steps/stairs</li> <li>- access ladders</li> <li>- other specific access structures</li> </ul> <p>1.6 use four of the following lifting and moving techniques to remove the access structure:</p> <ul style="list-style-type: none"> <li>- cranes</li> <li>- winches</li> <li>- powered lifting equipment</li> <li>- hydraulic jacks/skids</li> <li>- lifting appliances</li> <li>- pulling appliances</li> <li>- adjustable props/supports</li> <li>- other specific equipment</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 identify and attend to damage and defects in the components or structures in line with organisational requirements.			
1b Dismantling and removing aircraft access structures (continued)	1.8 dismantle and remove the access structures, to include carrying out all of the following: <ul style="list-style-type: none"> <li>- ensuring that the area around the structures is clear of obstructions that may affect the removal operations</li> <li>- preparing a suitable area in which to store the removed items</li> <li>- determining a suitable and safe dismantling sequence</li> <li>- removing steps/stairs or ladder systems</li> <li>- removing all components/sub-assemblies, stays and stiffeners of the access structures</li> <li>- storing all mechanical fastening devices safely and correctly (such as nuts and bolts, proprietary fasteners, wire or fibre ropes)</li> <li>- storing all structure component parts safely and correctly</li> <li>- using approved lifting and moving equipment and techniques at all times</li> </ul>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>1.9 use two of the following dismantling methods during the removal of the access structures:</p> <ul style="list-style-type: none"> <li>- unbolting</li> <li>- removal of clamps</li> <li>- grinding/abrasive disc cutting</li> <li>- oxy-fuel cutting</li> <li>- removal of lashings</li> </ul> <p>1.10 store the removed components safely in an appropriate location</p> <p>1.11 tidy up the site and leave it in a safe condition</p> <p>1.12 deal promptly and effectively with problems within your control and report those that cannot be solved</p> <p>1.13 complete the relevant documentation for the removal of the access structures, to include one of the following:</p> <ul style="list-style-type: none"> <li>- lifting procedure sheet (Competent Person ID)</li> <li>- equipment inspection records/defect reports</li> <li>- risks assessments</li> <li>- job documentation</li> </ul> <p>1.14 inform the appropriate people when the dismantling is completed.</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
<p>2a Know how to dismantle and remove aircraft access structures</p>	<p>2.1 describe the specific safety precautions to be taken when dismantling and removing aircraft access structures, and the need for ensuring load security (such as general workshop and site safety, appropriate personal protective equipment, protecting other workers during the lifting operations, accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)</p> <p>2.2 describe the hazards associated with dismantling and removing aircraft access structures, and how they can be minimised</p> <p>2.3 describe the various types of access structures used in the aircraft environment (such as walkways, fixed platforms/staging, moveable staging/towers, access steps/stairs, access ladders)</p> <p>2.4 explain how to dismantle the access structures, and the range of equipment that can be used (such as hand and power operated cranes, winches, pulling equipment)</p> <p>2.5 explain and understand the Approved Code of Practice (ACOP) for safe use of lifting equipment, and Lifting Operation and Lifting Equipment Regulations (LOLER)</p> <p>2.6 explain the specific requirements for the marking of lifting equipment, and the specific method used by the organisation in which you are working</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.7 describe the lifting equipment accessories to be used (such as slings, chains, wire ropes, eye bolts)</p> <p>2.8 explain the checks to be made on the lifting equipment prior to use, and the things that you should look for</p> <p>2.9 explain how to determine the approximate weight of the access structure/load to be moved.</p>			
<p>2b Know how to dismantle and remove aircraft access structures (continued)</p>	<p>2.10 explain how to check that the lifting equipment is capable of lifting the access structure/load to be moved</p> <p>2.11 explain how to determine the centre of gravity of the access structure/load, and how to determine suitable slinging and lifting points</p> <p>2.12 explain how to plan and prepare a route for moving access structures/loads, and the things that you will need to take into account</p> <p>2.13 describe the specific requirements for the organisation of dismantling and removing access structures</p> <p>2.14 explain the sequence in which the access structure must be dismantled to ensure a safe and stable structure at all times</p> <p>2.15 describe the signalling techniques used to communicate with crane drivers (to include hand signals and verbal commands)</p>			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	<p>2.16 explain how access structures should be stored, handled and maintained</p> <p>2.17 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.</p>			

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## Further information

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Our customer service numbers are:

BTEC and NVQ	0844 576 0026
GCSE	0844 576 0027
GCE	0844 576 0025
The Diploma	0844 576 0028
DiDA and other qualifications	0844 576 0031

Calls may be recorded for training purposes.

## Useful publications

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Related information and publications include:

- *Centre Handbook for Edexcel QCF NVQs and Competence-based Qualifications* published annually
- functional skills publications – specifications, tutor support materials and question papers
- *Regulatory Arrangements for the Qualification and Credit Framework* (published by Ofqual, August 2008)
- the current Edexcel publications catalogue and update catalogue.

Edexcel publications concerning the Quality Assurance System and the internal and standards verification of vocationally-related programmes can be found on the Edexcel website.

NB: Some of our publications are priced. There is also a charge for postage and packing. Please check the cost when you order.

### How to obtain National Occupational Standards

To obtain the National Occupational Standards go to [www.ukstandards.org.uk](http://www.ukstandards.org.uk).

## Professional development and training

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Edexcel supports UK and international customers with training related to NVQ and BTEC qualifications. This support is available through a choice of training options offered in our published training directory or through customised training at your centre.

The support we offer focuses on a range of issues including:

- planning for the delivery of a new programme
- planning for assessment and grading
- developing effective assignments
- building your team and teamwork skills
- developing student-centred learning and teaching approaches
- building functional skills into your programme
- building effective and efficient quality assurance systems.

The national programme of training we offer can be viewed on our website ([www.edexcel.com/training](http://www.edexcel.com/training)). You can request customised training through the website or by contacting one of our advisers in the Training from Edexcel team via Customer Services to discuss your training needs.

The training we provide:

- is active
- is designed to be supportive and thought provoking
- builds on best practice
- may be suitable for those seeking evidence for their continuing professional development.

## Annexe A: Progression pathways

### The Edexcel qualification framework for the engineering sector

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/professional	NVQ/competence
8					
7					
6					We have too many qualifications to list in this space. Please refer to <a href="http://www.edexcel.com">www.edexcel.com</a> for further information.

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/professional	NVQ/competence
5			<p>Edexcel BTEC Level 5 HND Diploma in Manufacturing Engineering</p> <p>Edexcel BTEC Level 5 HND Diploma in Mechanical Engineering</p> <p>Edexcel BTEC Level 5 HND Diploma in Operations Engineering</p> <p>Edexcel BTEC Level 5 HND Diploma in Electrical/Electronic Engineering</p> <p>Edexcel BTEC Level 5 HND Diploma in General Engineering</p> <p>Edexcel BTEC Level 5 HND Diploma in Automotive Engineering</p> <p>Edexcel BTEC Level 5 HND Diploma in Aeronautical Engineering</p>		<p>We have too many qualifications to list in this space. Please refer to <a href="http://www.edexcel.com">www.edexcel.com</a> for further information.</p>

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/professional	NVQ/competence
4			<p>Edexcel BTEC Level 4 HNC Diploma in Manufacturing Engineering</p> <p>Edexcel BTEC Level 4 HNC Diploma in Mechanical Engineering</p> <p>Edexcel BTEC Level 4 HNC Diploma in Operations Engineering</p> <p>Edexcel BTEC Level 4 HNC Diploma in Electrical/Electronic Engineering</p> <p>Edexcel BTEC Level 4 HNC Diploma in General Engineering</p> <p>Edexcel BTEC Level 4 HNC Diploma in Automotive Engineering</p> <p>Edexcel BTEC Level 4 HNC Diploma in Aeronautical Engineering</p>		<p>We have too many qualifications to list in this space. Please refer to <a href="http://www.edexcel.com">www.edexcel.com</a> for further information.</p>

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/professional	NVQ/competence
<b>3</b>		Edexcel Level 3 Diploma in Engineering	<p>Edexcel Level 3 BTEC Certificate, Subsidiary Diploma, Diploma and Extended Diploma in Engineering</p> <p>Edexcel Level 3 BTEC Diploma and Extended Diploma in Mechanical Engineering</p> <p>Edexcel Level 3 BTEC Diploma and Extended Diploma in Manufacturing Engineering</p> <p>Edexcel Level 3 BTEC Diploma and Extended Diploma in Operations and Maintenance Engineering</p> <p>Edexcel Level 3 BTEC Diploma and Extended Diploma in Electrical/Electronic Engineering</p> <p>Edexcel Level 3 BTEC Diploma and Extended Diploma in Aeronautical Engineering</p>		We have too many qualifications to list in this space. Please refer to <a href="http://www.edexcel.com">www.edexcel.com</a> for further information.

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/professional	NVQ/competence
<b>2</b>	GCSE Engineering GCSE Manufacturing	Edexcel Level 2 Diploma in Engineering	Edexcel Level 2 BTEC Certificate, Extended Certificate and Diploma in Engineering		We have too many qualifications to list in this space. Please refer to <a href="http://www.edexcel.com">www.edexcel.com</a> for further information.
<b>1</b>		Edexcel Level 1 Diploma in Engineering	Edexcel BTEC Level 1 Award, Certificate and Diploma in Engineering		We have too many qualifications to list in this space. Please refer to <a href="http://www.edexcel.com">www.edexcel.com</a> for further information.
<b>Entry</b>					



# Annexe B: Quality assurance

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## Key principles of quality assurance

- A centre delivering Edexcel qualifications must be an Edexcel recognised centre and must have approval for qualifications that it is offering.
- The centre agrees, as part of gaining recognition, to abide by specific terms and conditions relating to the effective delivery and quality assurance of assessment. The centre must abide by these conditions throughout the period of delivery.
- Edexcel makes available to approved centres a range of materials and opportunities to exemplify the processes required for effective assessment and provide examples of effective standards. Approved centres must use the guidance on assessment to ensure that staff who are delivering Edexcel qualifications are applying consistent standards.
- An approved centre must follow agreed protocols for: standardisation of assessors; planning, monitoring and recording of assessment processes; internal verification and recording of internal verification processes and dealing with special circumstances, appeals and malpractice.

## Quality assurance processes

The approach to quality assured assessment is made through a partnership between a recognised centre and Edexcel. Edexcel is committed to ensuring that it follows best practice and employs appropriate technology to support quality assurance processes where practicable. The specific arrangements for working with centres will vary. Edexcel seeks to ensure that the quality assurance processes it uses do not inflict undue bureaucratic processes on centres, and works to support them in providing robust quality assurance processes.

The learning outcomes and assessment criteria in each unit within this specification set out the standard to be achieved by each learner in order to gain each qualification. Edexcel operates a quality assurance process, designed to ensure that these standards are maintained by all assessors and verifiers.

For the purposes of quality assurance, all individual qualifications and units are considered as a whole. Centres offering these qualifications must be committed to ensuring the quality of the units and qualifications they offer, through effective standardisation of assessors and internal verification of assessor decisions. Centre quality assurance and assessment processes are monitored by Edexcel.

The Edexcel quality assurance processes will involve:

- gaining centre recognition and qualification approval if a centre is not currently approved to offer Edexcel qualifications
- annual visits to centres by Edexcel for quality review and development of overarching processes and quality standards. Quality review and development visits will be conducted by an Edexcel quality development reviewer
- annual visits by occupationally competent and qualified Edexcel Standards Verifiers for sampling of internal verification and assessor decisions for the occupational sector
- the provision of support, advice and guidance towards the achievement of National Occupational Standards.

Centres are required to declare their commitment to ensuring quality and appropriate opportunities for learners that lead to valid and accurate assessment outcomes. In addition, centres will commit to undertaking defined training and online standardisation activities.

## Annexe C: Centre certification and registration

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Edexcel Standards Verifiers will provide support, advice and guidance to centres to achieve Direct Claims Status (DCS). Edexcel will maintain the integrity of Edexcel QCF NVQs through ensuring that the awarding of these qualifications is secure. Where there are quality issues identified in the delivery of programmes, Edexcel will exercise the right to:

- direct centres to take action
- limit or suspend certification
- suspend registration.

The approach of Edexcel in such circumstances is to work with the centre to overcome the problems identified. If additional training is required, Edexcel will aim to secure the appropriate expertise to provide this.

### **What are the access arrangements and special considerations for the qualification in this specification?**

Centres are required to recruit learners to Edexcel qualifications with integrity.

Appropriate steps should be taken to assess each applicant's potential and a professional judgement should be made about their ability to successfully complete the programme of study and achieve the qualification. This assessment will need to take account of the support available to the learner within the centre during their programme of study and any specific support that might be necessary to allow the learner to access the assessment for the qualification. Centres should consult Edexcel's policy on learners with particular requirements.

Edexcel's policy on access arrangements and special considerations for Edexcel qualifications aims to enhance access to the qualifications for learners with disabilities and other difficulties (as defined by the 1995 Disability Discrimination Act and the amendments to the Act) without compromising the assessment of skills, knowledge, understanding or competence. Please refer to *Access Arrangements and Special Considerations for BTEC and Edexcel NVQ Qualifications* for further details. [www.edexcel.com](http://www.edexcel.com).





**Semta**

**Engineering**

**NVQ Level 2, 3 and 4**

**QCF Unit Assessment Strategy**

**Version 1. 16<sup>th</sup> March 2010**

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## **Introduction**

Semta, the Sector Skills Council for the Science Engineering Manufacturing Technologies Sector, has produced this QCF Unit Assessment Strategy to:

- assist Assessors, Internal Verifiers and External Verifiers
- encourage and promote consistent assessment of NVQ units
- promote cost effective assessment plans.

This document also provides definitions for:

- the qualifications and experience required for Assessors and Verifiers
- the assessment environment and notes on simulation/replication.
- access to units.

and requirements relating to:

- carrying out assessments
- performance evidence
- assessing knowledge and understanding.

The importance and value in which employers and learners place on undertaking NVQ units will provide a key measure of Semta's success with this unit assessment strategy. Another key success factor will be Semta's partnership with the relevant Awarding Organisations.

## **Assessor Requirements to Demonstrate Effective Assessment Practice**

Assessment must be carried out by competent Assessors who hold, or are working towards, the nationally recognised Assessor units A1 and/or A2 as appropriate to the assessment being carried out. Assessors that hold units D32 and/or D33 must demonstrate that they are applying the assessment principles and practices set down in A1 and/or A2 as appropriate to the assessment being carried out.

### **Assessor Technical Requirements**

Assessors must be able to demonstrate that they have verifiable, relevant and sufficient technical competence to evaluate and judge performance and knowledge evidence requirements as set out in the relevant QCF unit learning outcomes and associated assessment criteria.

This will be demonstrated either by holding a relevant technical qualification or by proven industrial experience of the technical areas to be assessed. The assessor's competence must, at the very least, be at the same level as that required of the learner(s) in the units being assessed.

Assessors must also be:

Fully conversant with the Awarding Organisation's assessment recording documentation used for the QCF NVQ units against which the assessments and verification are to be carried out, other relevant documentation and system and procedures to support the QA process.

### **Verifier Requirements**

Internal Verifiers must hold, or be working towards, the nationally recognised Internal Verifier unit V1 and would be expected to be familiar with, and preferably hold, the nationally recognised Assessor units. Internal Verifiers that hold unit D34 must demonstrate that they are applying the verification principles and practices set down in V1.

External Verifiers must hold, or be working towards, the nationally recognised External Verifier unit V2 and would be expected to be familiar with, and preferably hold, the nationally recognised Assessor units, and Internal Verifier unit. External Verifiers that hold unit D35 must demonstrate that they are applying the verification principles and practices set down in V2.

Verifiers, both Internal and External, will also be expected to be fully conversant with the terminology used in the QCF NVQ units against which the assessments and verification are to be carried out, the appropriate Regulatory Body's systems and procedures and the relevant Awarding Organisation's documentation, systems and procedures within which the assessment and verification is taking place.

## Specific technical requirements for internal and external verifiers

Internal and external verifiers of this qualification must be able to demonstrate that they have verifiable, sufficient and relevant industrial experience, and must have a working knowledge of the processes, techniques and procedures that are used in the relevant sector/occupation.

The tables on the following page show the recommended levels of technical competence for assessors, internal verifiers, and external verifiers.

### Technical Requirements for Assessors and Verifiers

Position	Prime activity requirements	Support activity requirements	Technical requirements (see notes)
Assessor	Assessment Skills	IV Systems	Technical <i>competence</i> in the areas covered by the QCF units being assessed
Internal Verifier	Verification Skills	Assessment Knowledge	Technical <i>understanding</i> of the areas covered by the qualifications
External Verifier	Verification skills	Assessment Understanding	Technical <i>awareness</i> of the areas covered by the qualifications

### Notes

- 1 Technical *competence* is defined here as a combination of practical skills, knowledge, and the ability to apply both of these, in familiar and new situations, within a real working environment.
- 2 Technical *understanding* is defined here as having a good understanding of the technical activities being assessed, together with knowledge of relevant Health & Safety implications and requirements of the assessments.
- 3 Technical *awareness* is defined here as a general overview of the subject area, sufficient to ensure that assessment and portfolio evidence are reliable, and that relevant Health and Safety requirements have been complied with.
- 4 The competence required by the assessor, internal verifier and external verifier, in the occupational area being assessed, is likely to exist at three levels as indicated by the shaded zones in the following table.

Technical Competence required by:	An ability to <i>discuss</i> the general principles of the competences being assessed	An ability to <i>describe</i> the practical aspects of the competence being assessed	An ability to <i>demonstrate</i> the practical competences being assessed
Assessor			
Internal Verifier			
External Verifier			

### Assessment Environment

The evidence put forward for this unit can only be regarded valid, reliable, sufficient and authentic if achieved and obtained in the working environment and be clearly attributable to the learner. However, in certain circumstances, simulation/replication of work activities may be acceptable.

- The use of high quality, realistic simulations/replication, which impose pressures which are consistent with workplace expectations, should only be used in relation to the assessment of the following:
  - rare or dangerous occurrences, such as those associated with health, safety and the environment issues, emergency scenarios and rare operations at work
  - the response to faults and problems for which no opportunity has presented for the use of naturally occurring workplace evidence of learners competence
  - aspects of working relationships and communications for which no opportunity has presented for the use of naturally occurring workplace evidence of learners competence.
- Simulations/replications will require prior approval from the specific Awarding Organisation and should be designed in relation to the following parameters:
  - the environment in which simulations take place must be designed to match the characteristics of the working environment
  - competencies achieved via simulation/replication must be transferable to the working environment
  - simulations which are designed to assess competence in dealing with emergencies, accidents and incidents must be verified as complying with relevant health, safety and environmental legislation by a competent health and safety/environmental control officer before being used
  - simulated activities should place learners under the same pressures of time, access to resources and access to information as would be expected if the activity was real

- simulated activities should require learners to demonstrate their competence using plant and/or equipment used in the working environment
- simulated activities which require interaction with colleagues and contacts should require the learner to use the communication media that would be expected at the workplace
- for health and safety reasons, simulations need not involve the use of genuine substances/materials. Any simulations which require the learner to handle or otherwise deal with materials/ substances should ensure that the substitute takes the same form as in the workplace.

### **Access to Assessment**

There are no entry qualifications or age limits required by learners to undertake the NVQ units unless this is a legal requirement of the process or the environment. Assessment is open to any learner who has the potential to achieve the assessment criteria set out in the 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 Assessment**

The NVQ units were specifically developed to cover a wide range of activities. The evidence produced for the units will, therefore, depend on the learners choice of 'bulleted items' listed in the unit assessment criteria.

Where the assessment criteria gives a choice of bulleted items (for example 'any three from five'), assessors should note that learners do not need to provide evidence of the other items to complete the unit (in this example, two) items, particularly where these additional items may relate to other activities or methods that are not part of the learners normal workplace activity or area of expertise.

### **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 3 different examples of performance must be provided, and must be sufficient to show that the assessment criteria have been achieved to the prescribed standards. It is possible that some of the bulleted items in the assessment criteria may be covered more than once. The assessor and learner need to devise an assessment plan to ensure that performance evidence is sufficient to cover all the specified assessment criteria and which maximises the opportunities to gather evidence. Where applicable, performance evidence maybe used for more than one unit.

The most effective way of assessing competence, is through direct observation of the learner. Assessors must make sure that the evidence provided reflects the learner's competence and not just the achievement of a training programme.

Evidence that has been produced from team activities, for example, maintenance or installation activities is only valid when it clearly relates to the learners specific and individual contribution to the activity, and not to the general outcome(s).

Each example of performance evidence will often contain features that apply to more than one unit, and can be used as evidence in any unit where appropriate.

Performance evidence must be a combination of:

- outputs of the learner's work, such as items that have been manufactured, installed, maintained, designed, planned or quality assured, and documents produced as part of a work activity.

together with:

- evidence of the way the learner carried out the activities such as witness testimonies, assessor observations or authenticated learner reports, records or photographs of the work/activity carried out, etc.

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

If there is any doubt as to what constitutes valid, authentic and reliable evidence, the internal and/or external verifier should be consulted.

### **Assessing knowledge and understanding**

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 learners knowledge and understanding (and the handling of contingency situations) 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. Semta expects oral questioning and practical demonstrations to be used, as these are considered the most appropriate for these units.

Assessors should ask enough questions to make sure that the learner has an appropriate level of knowledge and understanding, as required by the unit. Awarding Organisations may choose other methods, which must be supported by a suitable rationale.

Evidence of knowledge and understanding will **not** be required for those bulleted items in the assessment criteria that have not been selected by the learner.

The achievement of the specific knowledge and understanding requirements of the units cannot simply be inferred by the results of tests or assignments from other units, qualifications or training programmes. Where evidence is submitted from these sources, the assessor must, as with any assessment, make sure the evidence is valid, reliable, authentic, directly attributable to the learner, and meets the full knowledge and understanding requirements of the unit.

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

Awarding Organisations may choose other methods, which must be supported by a suitable rationale.

### **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 learner. This could be a team leader, supervisor, mentor or line manager who may be regarded as a suitable witness to the learners 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 learner. It will be the responsibility of the assessor to make sure that any witness testimonies accepted as evidence of the learner's competency are reliable, auditable and technically valid.

## **Quality Control of Assessment**

### **General**

There are two major points where an Awarding Organisation interacts with the Centre in relation to the External Quality Control of Assessment for a qualification and these are:

- Approval - when a Centre take on new qualifications the Awarding Organisation, normally through an External Verifier (EV), ensures that the Centre is suitably equipped and prepared to deliver the new qualification
- Monitoring - throughout the ongoing delivery of the qualification the Awarding Organisation, through EV monitoring and other mechanisms, must maintain and the quality and consistency of assessment of the qualification.

## **Approval**

In granting Approval, the Awarding Organisation, normally through its External Verifiers (EV), must ensure that the prospective Centre:

- meets any procedural requirements specified by the Awarding Organisation
- has sufficient and appropriate physical and staff resources
- meets relevant health and safety and/or equality and access requirements
- has a robust plan for the delivery, assessment and QA for the qualifications.

Awarding Organisation's may decide to visit the Centre to view the evidence provided.

The Awarding Organisation must have a clear rationale for the method(s) deployed.

## **Monitoring**

The Awarding Organisation, through EV monitoring and other mechanisms' must ensure:

- that a strategy is developed and deployed for the ongoing Awarding Organisation monitoring of the Centre. This strategy must be based on an active risk assessment of the Centre. In particular the strategy must identify the learner, assessor and IV sampling strategy to be deployed and the rationale behind this
- that the Centre's internal quality assurance processes are effective in learner assessment
- that sanctions are applied to a Centre where necessary and that corrective actions are taken by the Centre and monitored by the Awarding Organisation/EV
- that reviews of Awarding Organisation's external auditing arrangements are undertaken.

Awarding Organisations are required to provide to SEMTA, on request, details of the strategies, rationales and reviews detailed above.

**Additional Notes:**

It is recognised that some Awarding Organisations provide supplementary guidance and documentation to centres to support the quality of assessment and verification practice of N/SVQs.



## **Annexe E: Additional requirement for qualifications that use the term 'NVQ' in a QCF qualification title**

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For information please go to: [www.ofqual.gov.uk](http://www.ofqual.gov.uk) to access the document *Operating rules for using the term 'NVQ' in a QCF qualification title*.

Ofqual  
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Registered Office: One90 High Holborn, London WC1V 7BH. VAT Reg No 780 0898 07

