

# City & Guilds Level 2 NVQ Diploma in Aeronautical Engineering (1789-21)

April 2022 Version 2.0





## Qualification at a glance

<b>Subject area</b>	Aeronautical Engineering
<b>City &amp; Guilds number</b>	1789
<b>Age group approved</b>	16-18, 19+
<b>Entry requirements</b>	Level 2
<b>Assessment</b>	Portfolio
<b>Fast track</b>	Available
<b>Support materials</b>	Centre handbook
<b>Registration and certification</b>	Consult the Walled Garden/Online Catalogue for last dates

<b>Title and level</b>	<b>GLH</b>	<b>TQT</b>	<b>City &amp; Guilds number</b>	<b>Accreditation number</b>
Level 2 Diploma in Aeronautical Engineering	215	470	1789-21	600/1074/5

<b>Version and date</b>	<b>Change detail</b>	<b>Section</b>
August 2011 v1.0	Document creation	
April 2022 v2.0	GLH and TQT clarified and highlighted	Qualification at a glance



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# 1 Introduction

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

Area	Description
Who is the qualification for?	It is for candidates who work or want to work in the aeronautical engineering sector
What does the qualification cover?	It allows candidates to learn, develop and practise the skills required for employment and/or career progression in the aeronautical engineering sector.
Is the qualification part of a framework or initiative?	This qualification is recognised as the competency element of the engineering manufacture intermediate apprenticeship framework.
What opportunities for progression are there?	It allows candidates to progress into employment or to the following City & Guilds qualifications: <ul style="list-style-type: none"> <li>• Level 2 Diploma in Aircraft Engineering (City &amp; Guilds 2675)</li> <li>• Level 3 Diploma in Aircraft Engineering (City &amp; Guilds 2675)</li> <li>• Level 3 Certificate/Diploma in Aircraft Manufacturing (City &amp; Guilds 4597)</li> <li>• Level 3 Diploma in Survival Equipment (City &amp; Guilds 5412)</li> </ul>

## Structure

To achieve the **Level 2 NVQ Diploma in Aeronautical Engineering**, learners must achieve **20** credits from the mandatory unit group. Learners must then select the relevant pathway and achieve the necessary minimum credits to gain the qualification.

Unit accreditation number	City & Guilds unit	Unit title	Credit value
<b>Mandatory</b>			
A/601/5013	001	Complying with statutory regulations and organisational safety requirements	5
Y/601/5102	002	Using and interpreting engineering drawings and documents	5
Y/601/5052	003	Working efficiently and effectively in engineering	5
Y/601/4242	004	Reinstating the work area on completion of activities	5

## Pathway 1 – Aircraft Systems Maintenance

Learners must achieve an additional **102** credits, a minimum of **90** credits from the Mandatory group and a minimum of **12** credits from Optional group.

<b>Unit accreditation number</b>	<b>City &amp; Guilds unit</b>	<b>Unit title</b>	<b>Credit value</b>
<b>Mandatory</b>			
K/601/4245	007	Carry out maintenance on aircraft mechanical systems by component replacement	45
M/601/4246	008	Carrying out maintenance on aircraft electrical/electronic systems by component replacement	45
<b>Optional</b>			
R/601/4241	005	Carrying out aircraft handling operations	12
H/601/4244	006	Carrying out aircraft routine servicing	15

## Pathway 2 – Survival Equipment Maintenance

Learners must achieve a minimum of **64** credits from the Optional group.

<b>Unit accreditation number</b>	<b>City &amp; Guilds unit</b>	<b>Unit title</b>	<b>Credit value</b>
<b>Optional</b>			
R/601/4269	009	Servicing aircrew protective helmets and electrical headsets	20
D/601/4274	010	Servicing aircrew nuclear, biological and chemical (NBC) respirators and equipment	22
H/601/4275	011	Servicing aircrew life preserver equipment	22
K/601/4293	012	Servicing parachute assemblies	22

### Pathway 3 – Aircraft Component Assembly

Learners must achieve a minimum of **68** credits from the Optional group.

<b>Unit accreditation number</b>	<b>City &amp; Guilds unit</b>	<b>Unit title</b>	<b>Credit value</b>
<b>Optional</b>			
L/601/4299	013	Drilling and finishing holes in aircraft components	33
A/601/4301	014	Installing aircraft mechanical fasteners	35
L/601/4304	015	Assembling aircraft airframe ancillary components	45

### Pathway 4 – Electrical and Electronic

Learners must achieve a minimum of **75** credits from the Optional group.

<b>Unit accreditation number</b>	<b>City &amp; Guilds unit</b>	<b>Unit title</b>	<b>Credit value</b>
<b>Optional</b>			
R/601/4305	016	Producing aircraft cableforms and looms	40
Y/601/4306	017	Assembling aircraft electrical components	45
D/601/4310	018	Making modifications to aircraft cableforms and looms	35

## Pathway 5 – Composite Manufacture

Learners must achieve a minimum of **32** credits from Optional Group A or a minimum of **46** credits from Optional Group B.

Unit accreditation number	City & Guilds unit	Unit title	Credit value
<b>Optional</b>	<b>Group A</b>		
H/601/4311	019	Producing aircraft components using wet lay-up techniques	42
K/601/4312	020	Producing aircraft components using pre-preg laminating techniques	42
T/601/4314	021	Producing aircraft components using resin infusion techniques	42
A/601/4315	022	Producing aircraft components by acrylic moulding	32
J/601/4317	023	Producing aircraft components by vacuum forming	32
R/601/4319	024	Producing aircraft components by injection moulding	32
Y/601/4323	025	Assembling aircraft composite components	42
<b>Optional</b>	<b>Group B</b>		
D/601/4324	026	Carrying out trimming operations on aircraft composite components	32
T/601/4328	027	Carrying out bonding operations on aircraft composite components	23
A/601/4332	028	Carrying out repairs to aircraft composite mouldings	42
F/601/4333	029	Checking aircraft composite mouldings for defects	23

## Pathway 6 – Lifting and Moving loads

Learners must achieve a minimum of **27** credits from the Optional group.

<b>Unit accreditation number</b>	<b>City &amp; Guilds unit</b>	<b>Unit title</b>	<b>Credit value</b>
<b>Optional</b>			
F/601/4350	038	Setting up and preparing loads for moving	12
J/601/4351	039	Moving materials and components in an aircraft environment	15
L/601/4352	040	Positioning and securing aircraft access structures	30
R/601/4353	041	Dismantling and removing aircraft access structures	30



## 2 Centre requirements

### Approval

Centres currently offering the City & Guilds NVQ in Aeronautical Engineering (1689) will be automatically approved to run this new qualification.

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

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

### Resource requirements

#### Physical resources and site agreements

Centres can use specially designated areas within a centre to assess, for example, the installation of specialised electrical systems, alignment and setting up of electric motors and driven devices (pumps, compressors, generators). The equipment, systems and machinery must meet industrial standards and be capable of being used under normal working conditions, for example electric motors must have a method of applying sufficient power and not be connected up to show movement.

#### Centre staffing

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

- be occupationally competent or technically knowledgeable in the area(s) for which they are delivering training and/or have experience of providing training. This knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

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

#### Assessors and internal verifier

##### Assessor requirements to demonstrate effective assessment practice

Assessment must be carried out by competent Assessors that as a minimum must hold Level 3 Award in Assessing Competence in the Work Environment. Current and operational assessors that hold units

D32 and/or D33 or A1 and/or A2 as appropriate for the assessment requirements set out in this Unit Assessment Strategy. However, they will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace assessment to the most up to date National Occupational Standards (NOS).

#### **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 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 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 and external)**

Internal quality assurance (Internal Verification) must be carried out by competent Verifiers that as a minimum must hold Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practices. Current and operational Internal Verifiers that hold internal verification units V1 or D34 will not be required to achieve Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or Level 3 Award in Assessing Competence in the Work Environment.

External quality assurance (**External Verification**) must be carried out by competent External Verifiers that as a minimum must hold Level 4 Award in the External Quality Assurance of Assessment Processes and Practices. Current and operational External Verifiers that hold external verification units V2 or D35 will not be required to achieve Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or the Level 3 Award in Assessing Competence in the Work Environment.

External and Internal Verifiers will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace Quality Assurance (verification) of Assessment Processes and Practices to the most up to date National Occupational Standards (NOS) Verifiers, both Internal and External, will also be expected to be fully conversant with the terminology used in the 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.

### **Continuing professional development (CPD)**

Centres must support their staff to ensure that they have current knowledge of the occupational area, that delivery, mentoring, training, assessment and verification is in line with best practice, and that it takes account of any national or legislative developments.

### **Candidate entry requirements**

City & Guilds does not set entry requirements for this qualification. However, centres must ensure that candidates have the potential and opportunity to gain the qualification successfully so should have the opportunity to gather work based evidence.

The SEMTA Engineering Manufacture apprenticeship framework suggests that:

- Employers would be interested in candidates that:
  - Are keen and motivated to work in an engineering environment
  - Are willing to undertake a course of training both on-the-job and off-the-job and apply this learning in the workplace
  - Have previous work experience or employment in the sector
  - Have completed a 14 to 19 Diploma in Engineering or Manufacturing
  - Have completed a Young Apprenticeship in Engineering or other related area
  - Have GCSEs in English, Maths and Science
  - Have completed tests in basic numeracy, literacy and communication skills and have spatial awareness.

As a guide, the Engineering Manufacturing framework is suitable for applicants who have five GCSEs grades D to E in English, Maths and Science. The selection process on behalf of employers may include initial assessment where applicants will be asked if they have any qualifications or experience that can be accredited against the requirements of the apprenticeship. They may also be required to take tests in basic numeracy and literacy, communications skills and spatial awareness. There may also be an interview to ensure applicants have selected the right occupational sector and are motivated to become an apprentice, as undertaking an apprenticeship is a major commitment for both the individual and the employer.'

### **Assessment Environment** (extract from SEMTA Unit Assessment Strategy 1 January 2011)

The evidence put forward for this qualification 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 centres City & Guilds external verifier/qualification consultant 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 reason 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 take the same form as in the workplace

### **Age restrictions**

There is no age restriction for this qualification unless this is a legal requirement of the process or the environment.



### 3 Delivering the qualification

#### Initial assessment and induction

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

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

We recommend that centres provide an induction programme so the candidate fully understands the requirements of the qualification], their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

#### Support materials

The following resources are available for these qualifications

Description	How to access
Personal Learning and Thinking skills (required for apprenticeship)	<a href="http://www.cityandguilds.com">www.cityandguilds.com</a> , 1789 product documentation pages
Centre approval forms	<a href="http://www.cityandguilds.com">www.cityandguilds.com</a>
SEMTA Assessment Strategy	<a href="http://www.cityandguilds.com">www.cityandguilds.com</a>
Unit assessment guidance	<a href="http://www.cityandguilds.com">www.cityandguilds.com</a> , 1789 product documentation pages

#### Recording documents

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

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

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

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



## 4 Assessment

**Assessment of the qualification** (extract from SEMTA Unit Assessment Strategy 1 January 2011)

### **Carrying out assessments**

The NVQ units were specifically developed to cover a wide range of activities. The evidence produced for the units will, therefore, depend on the learner's 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.

### **Minimum 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 may be 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 (qualifications consultant) 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 learner's 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 (the Sector Skills Council) 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.

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.

### **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 learner's competency. However, the

witness must be technically competent in the process or skills that they are providing testimony for, to at least the same level of expertise as that required of the 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.

### **Recognition of prior learning (RPL)**

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

RPL is allowed and is also sector specific.



## 5 Units

### Availability of units

Below is a list of the learning outcomes for all the units. If you want to download a complete set of units, go to [www.cityandguilds.com](http://www.cityandguilds.com)

### Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- unit aim
- relationship to NOS, other qualifications and frameworks
- endorsement by a sector or other appropriate body
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

## Unit 001

# Complying with statutory regulations and organisational safety requirements

<b>UAN:</b>	A/601/5013
<b>Level:</b>	2
<b>Credit value:</b>	5
<b>GLH:</b>	35
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard: Complying with statutory regulations and organisational safety requirements (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta, the Sector Skills Council for science, engineering and manufacturing
<b>Aim:</b>	<p>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. 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.</p> <p>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</p>

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lifting and carrying techniques.

The learner's responsibilities will require them to comply with all relevant statutory and organisational policy and procedures for health and safety in the workplace. The learner must act in a responsible and safe manner at all times, and present themselves in the workplace suitably prepared for the activities to be undertaken. The learner will be expected to report any problems with health and safety issues, to the relevant authority.

The learner's knowledge will provide a good understanding of the relevant statutory regulations and organisational requirements associated with their work, and will provide an informed approach to the procedures used.

The learner will need to understand their organisation's health and safety requirements and their application, in adequate depth to provide a sound basis for carrying out their activities in a safe and competent manner.

<b>Learning outcome</b>
The learner will: 1. Be able to comply with statutory regulations and organisational safety requirements
<b>Assessment criteria</b>
The learner can: 1.1 comply with their duties and obligations as defined in the Health and Safety at Work Act 1.2 demonstrate their understanding of their duties and obligations to health and safety by: <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</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> 1.3 present themselves in the workplace suitably prepared for the activities to be undertaken 1.4 follow organisational accident and emergency procedures 1.5 comply with emergency requirements, to include: <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</li></ul>

	<p>evacuation of premises</p> <ul style="list-style-type: none"> <li>• identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment</li> </ul>
1.6	recognise and control hazards in the workplace
1.7	Identify the hazards and risks that are associated with the following: <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>
1.8	use correct manual lifting and carrying techniques
1.9	demonstrate one of the following methods of manual lifting and carrying: <ul style="list-style-type: none"> <li>• lifting alone</li> <li>• with assistance of others</li> <li>• with mechanical assistance</li> </ul>
1.10	apply safe working practices and procedures to include: <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>

<b>Learning outcome</b>	
The learner will:	
2. Know how to comply with statutory regulations and organisational safety requirements	
<b>Assessment criteria</b>	
The learner can:	
2.1	describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act, and other current legislation
2.2	describe the specific regulations and safe working practices and procedures that apply to their work activities
2.3	describe the warning signs for the seven main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances Regulations
2.4	explain how to locate relevant health and safety information for their tasks, and the sources of expert assistance when help is needed
2.5	explain what constitutes a hazard in the workplace
2.6	describe their responsibilities for identifying and dealing with hazards and reducing risks in the workplace
2.7	describe the risks associated with their working environment
2.8	describe the processes and procedures that are used to identify and rate the level of risk
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

- 2.10 explain what constitute dangerous occurrences and hazardous malfunctions, and why these must be reported even if no-one is injured
- 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
- 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
- 2.13 describe the protective clothing and equipment that is available for their areas of activity
- 2.14 explain how to safely lift and carry loads, and the manual and mechanical aids available
- 2.15 explain how to prepare and maintain safe working areas; the standards and procedures to ensure good housekeeping
- 2.16 describe the importance of safe storage of tools, equipment, materials and products
- 2.17 describe the extent of their own authority, and to whom they should report in the event of problems that they cannot resolve.

# **Unit 001                      Complying with statutory regulations and organisational safety requirements**

## **Supporting information**

### **Guidance**

2.1 (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)

2.5 (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)

2.7 (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)

2.8 (such as safety inspections, the use of hazard checklists, carrying out risk assessments, COSHH assessments)

## Unit 002

## Using and interpreting engineering data and documentation

<b>UAN:</b>	Y/601/5102
<b>Level:</b>	2
<b>Credit value:</b>	5
<b>GLH:</b>	25
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard: Using and interpreting engineering data and documentation (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta, the Sector Skills Council for science, engineering and manufacturing
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. They will be expected to report any problems with the use and interpretation of the documents that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions if necessary, with an appropriate level of supervision or as a member of a team, and take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.</p> <p>The learner's underpinning knowledge will provide a good understanding of the types of documentation used, and will provide an</p>

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informed approach to applying instructions and procedures. They will be able to read and interpret the documentation used and will know about the conventions, symbols and abbreviations, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

<b>Learning outcome</b>
The learner will: 1. Be able to use and interpret engineering data and documentation
<b>Assessment criteria</b>
The learner can: 1.1 use the approved source to obtain the required data and documentation 1.2 use the data and documentation and carry out all of the following: <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> 1.3 correctly identify, interpret and extract the required information 1.4 extract information that includes three of the following: <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>• time scales</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></ul>

- repair/service methods
  - method of manufacture
  - weld type and size
  - operations required
  - connections to be made
  - surface finish required
  - shape or profiles
  - fault finding procedures
  - safety/risk factors
  - environmental controls
  - specific data (such as component data, maintenance data, electrical data, fluid data)
  - resources (such as tools, equipment, personnel)
  - utility supply details (such as electricity, water, gas, air)
  - location of services, including standby and emergency backup systems
  - circuit characteristics (such as pressure, flow, current, voltage, speed)
  - protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment)
  - other specific related information
- 1.5 use the information obtained to ensure that work output meets the specification
- 1.6 use information extracted from documents to include one from the following:
- drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings)
  - diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams)
  - manufacturers manuals/drawings
  - approved sketches
  - technical illustrations
  - photographic representations
  - visual display screen information
  - technical sales/marketing documentation
  - contractual documentation
  - other specific drawings/documents
- 1.7 use information extracted from related documentation, to include two from the following:
- instructions (such as job instructions, drawing instructions, manufacturers instructions)
  - specifications (such as material, finish, process, contractual, calibration)
  - reference materials (such as manuals, tables, charts, guides, notes)
  - schedules

<ul style="list-style-type: none"> <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>
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<b>Learning outcome</b>
The learner will:
2. Know how to use and interpret engineering data and documentation
<b>Assessment criteria</b>
The learner can:
2.1 explain what information sources are used for the data and documentation that they use in their work activities
2.2 explain how documents are obtained, and how to check that they are current and valid
2.3 explain the basic principles of confidentiality (including what information should be available and to whom)
2.4 describe the different ways/formats that data and documentation can be presented
2.5 explain how to use other sources of information to support the data
2.6 describe the importance of differentiating fact from opinion when reviewing data and documentation
2.7 describe the importance of analysing all available data and documentation before decisions are made
2.8 describe the different ways of storing and organising data and documentation to ensure easy access
2.9 describe the procedures for reporting discrepancies in the data or documentation, and for reporting lost or damaged documents
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
2.11 explain the care and control procedures for the documents, and how damage or graffiti on documents can lead to scrapped work
2.12 explain the importance of returning documents to the designated location on completion of the work activities
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)
2.14 explain what types of documentation are used and how they interrelate
2.15 explain the imperial and metric systems of measurement; tolerancing and fixed reference points

- 2.16 describe the meaning of the different symbols and abbreviations found on the documents that they use
- 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.

## **Unit 002                      Using and interpreting engineering data and documentation**

### **Supporting information**

#### **Guidance**

2.4 (such as such as drawings, job instructions product data sheets, manufacturers' manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information)

2.5 (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)

2.14 (such as production drawings, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)

2.16 (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics)

## Unit 003

## Working efficiently and effectively in engineering

<b>UAN:</b>	Y/601/5052
<b>Level:</b>	2
<b>Credit value:</b>	5
<b>GLH:</b>	25
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard: Working efficiently and effectively in engineering (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing
<b>Aim:</b>	<p>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 that any tools, equipment, materials and other resources required are available and in a safe and usable condition. On completion of the engineering activity, the learner will be required to return their immediate work area to an acceptable condition before recommencing further work requirements. This may involve placing completed work in the correct location, returning and/or storing any tools and equipment in the correct area, identifying any waste and/or scrapped materials and arranging for their disposal, and reporting any defects or damage to tools and equipment used. In order to be efficient and effective in the workplace, the learner will also be required to demonstrate that they can create and maintain effective working relationships with colleagues and line management. The learner will also be expected to review objectives and targets for their personal development and make recommendations to, and</p>

communicate any opportunities for, improvements that could be made to working practices and procedures.

The learner's responsibilities will require them to comply with organisational policy and procedures for the engineering activities undertaken, and to report any problems with the activities, or the tools and equipment that are used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

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

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

<b>Learning outcome</b>
The learner will: 1. Be able to work efficiently and effectively in engineering
<b>Assessment criteria</b>
The learner can: 1.1 Work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 Prepare the work area to carry out the engineering activity 1.3 Prepare to carry out the engineering activity, taking into consideration all of the following, as applicable to the work to be undertaken: <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</li></ul>

- documentation is obtained
  - job instructions are obtained and understood
  - the correct materials or components are obtained
  - storage arrangements for work are appropriate
  - appropriate authorisation to carry out the work is obtained
- 1.4 Check that there are sufficient supplies of materials and/or consumables and that they meet work requirements
- 1.5 Ensure completed products or resources are stored in the appropriate location on completion of the activities
- 1.6 Complete work activities, to include all of the following:
- returning tools and equipment
  - returning drawings and work instructions
  - completing all necessary documentation accurately and legibly
  - identifying, where appropriate, any unusable tools, equipment and components
  - arranging for the safe disposal of waste materials
- 1.7 Tidy up the work area on completion of the engineering activity
- 1.8 Deal promptly and effectively with problems within their control and report those that cannot be resolved
- 1.9 Deal with problems affecting the engineering process, to include two of the following:
- materials
  - tools and equipment
  - drawings
  - job specification
  - quality
  - people
  - timescales
  - safety
  - activities or procedures
- 1.10 Contribute to organisational procedures for identifying opportunities for improvement to one of the following:
- working practices
  - working methods
  - quality
  - safety
  - tools and equipment
  - supplier relationships
  - internal communication
  - customer service
  - training and development
  - teamwork
  - other
- 1.11 Maintain effective working relationships with colleagues to include two of the following:
- colleagues within their own working group
  - people outside their normal working group

<ul style="list-style-type: none"> <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>
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<b>Learning outcome</b>
The learner will:
2. Know how to work efficiently and effectively in engineering
<b>Assessment criteria</b>
The learner can:
2.1 Describe the safe working practices and procedures to be followed whilst preparing and tidying up their work environment
2.2 Describe the correct use of any equipment to protect the health and safety of themselves and their colleagues
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
2.4 Describe the action that should be taken if documentation received is incomplete and/or incorrect
2.5 Describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity
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
2.7 Describe the action that should be taken if tools and equipment are not in full working order
2.8 Describe the checks to be carried out to ensure that all required materials are correct and complete, prior to undertaking the activity
2.9 Describe the action that should be taken if materials do not meet the requirements of the activity
2.10 Explain whom to inform when the work activity has been completed
2.11 Describe the information and/or documentation that others will require to confirm that the activity has been completed
2.12 Explain what materials, equipment and tools can be re-used
2.13 Explain how any waste materials and/or products are transferred, stored and disposed of
2.14 Explain where tools and equipment should be stored and located
2.15 Describe the importance of maintaining effective working relationships within the workplace
2.16 Describe the procedures for dealing with and reporting any problems that can affect working relationships
2.17 Describe the importance of making a contribution to improving

working practices

- 2.18 Describe the procedure and format for making suggestions for improvements
- 2.19 Describe the benefits for the work area if improvements can be identified
- 2.20 Describe the difficulties that can occur in working relationships
- 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)
- 2.22 Describe the benefits of continuous personal development
- 2.23 Describe the training opportunities that are available in the workplace
- 2.24 Describe the importance of reviewing their training and development
- 2.25 Explain with whom to discuss training and development issues
- 2.26 Describe the extent of their own authority and to whom they should report if they have any problems that they cannot resolve.

## Unit 004

# Reinstating the work area on completion of aircraft engineering activities

<b>UAN:</b>	Y/601/4242
<b>Level:</b>	2
<b>Credit value:</b>	5
<b>GLH:</b>	25
<b>Relationship to NOS:</b>	This unit is linked to the Aeronautical Engineering Unit No 4: Reinstating the work area on completion of aircraft engineering activities (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>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.</p> <p>The learner's knowledge will be sufficient to provide a good understanding of their work, and will provide an informed approach to applying the required procedures. The learner will understand the need for reinstating the work areas, and will know about the storage requirements of the products, equipment, materials, documentation and consumables, in adequate depth to provide a sound basis for carrying out the activities to the required standard and ensuring that the work area is reinstated satisfactorily.</p> <p>The learner's responsibilities will require them to comply with organisational policy and</p>

procedures for the reinstatement activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will be expected to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner will understand the safety precautions required when reinstating the work area. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to reinstate the work area on completion of aircraft engineering activities
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines. 1.2 carry out all of the following during the work area reinstatement activities: <ul style="list-style-type: none"> <li>• work to current schedules</li> <li>• use copies of relevant cosh 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> 1.3 carry out reinstatement activities on two work areas from: <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> 1.4 separate equipment, components, and materials for re-use from waste items and materials. 1.5 store reusable materials and equipment in an appropriate location. 1.6 correctly label and store four of the following: <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> </ul>

<ul style="list-style-type: none"> <li>• drawings and documentation.</li> </ul>
1.7 dispose of waste materials in line with organisational and environmental safe procedures.
1.8 deal with waste materials, in line with company and environmental regulations, to include all the following: <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>
1.9 restore the work areas to a safe condition in accordance with agreed requirements and schedules.
1.10 deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will:
2. Know how to reinstate the work area on completion of aircraft engineering activities
<b>Assessment criteria</b>
The learner can:
2.1 explain the specific safety practices and procedures that they need to observe when reinstating the work area.
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.
2.3 describe the hazards associated with reinstating the work area, and how they can be minimised.
2.4 explain the safe working practices and procedures to be followed when carrying out the various activities.
2.5 describe the personal protective clothing and equipment to be worn, and where this can be obtained.
2.6 explain why work areas need to be restored to a set standard, and what these requirements are.
2.7 describe the types of work area that will need to be restored.
2.8 explain the importance of tool control, and why this is critical within the aerospace industry.
2.9 explain the meaning of 'foreign object debris', and why it is vital to ensure that this does not occur or is removed.
2.10 explain the stores procedures for tools and equipment, documentation and surplus or waste materials.
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.
2.12 explain how the various disposal bins can be identified.
2.13 describe the procedures for disposing of hazardous materials
2.14 explain the documentation to be used on completion of the reinstatement activities.
2.15 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## **Unit 004**

# **Reinstating the work area on completion of aircraft engineering activities**

### **Guidance**

2.1 (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)

2.4 (such as lifting and handling techniques)

2.7 (such as workshops, test areas, stages and platforms, aircraft areas such as wing, tank, fuselage and airside section areas)

2.12 (such as colour coded, labelled)

2.13 (such as chemicals and adhesives)

## Unit 005

## Carrying out aircraft handling operations

<b>UAN:</b>	R/601/4241
<b>Level:</b>	2
<b>Credit value:</b>	12
<b>GLH:</b>	35
<b>Relationship to NOS:</b>	This unit has been derived from National Occupational Standard Aeronautical Engineering Unit No 5: Carrying out aircraft handling operations (Suite 2)
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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. The learner's responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision and as part of a team, communicating using hand signals and other communication devices. The learner must demonstrate a significant personal contribution during the team activities, in order to satisfy the requirements of this standard, and competency in all the areas required by the standard must be</p>

demonstrated. The learner will be expected to take personal responsibility for their own actions, their contribution to the team, and for the quality and accuracy of the work that they carry out. The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying aircraft handling techniques and procedures. The learner will have an understanding of the preparations to be carried out on the aircraft, prior to moving it, in adequate depth to provide a sound basis for carrying out the activities safely and correctly. The learner will understand the safety precautions required when carrying out the aircraft handling operations. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to carry out aircraft handling operations
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines. 1.2 carry out all of the following during the aircraft handling activities: <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> 1.3 prepare the aircraft and work area for the handling activities to be undertaken. 1.4 prepare the aircraft for towing, by carrying out four of the following. <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> 1.5 assist in carrying out all of the following during the preparation for flight operations:

	<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>
1.6	carry out the activities within the limits of your personal authority
1.7	carry out the activities in the specified sequence and in an agreed timescale
1.8	during aircraft towing, complete aircraft moves, including two of the following: <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>
1.9	plus, undertake three roles from the following: <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>
1.10	carry out all of the following during recovery from flight operations: <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>
1.11	carry out aircraft handling operations which comply with one of the following standards: <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>
1.12	report any instances where the activities cannot be fully met or where defects are identified.
1.13	check the aircraft and work area are left in a safe and secure condition on completion of the activities.

<b>Learning outcome</b>
The learner will: 2. Know how to carry out aircraft handling operations
<b>Assessment criteria</b>
The learner can: 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).
- 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.
  - 2.3 explain the authorisation they require to commence work on the aircraft.
  - 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.
  - 2.5 describe the hazards associated with engine start and running, and explain how they can be minimised.
  - 2.6 explain the importance of aircraft husbandry and of ensuring that, throughout the activity, the aircraft and area are free from foreign objects.
  - 2.7 explain what protective equipment they need to use for both personal protection and protection of the aircraft.
  - 2.8 describe the specifications used during aircraft handling, and the importance of following the procedures listed in these documents.
  - 2.9 explain the process and procedures for preparing an aircraft for flight operations (including engine start and 'see off').
  - 2.10 explain the process and procedures for recovering an aircraft from flight operations ('see in').
  - 2.11 describe the standard signals used when marshalling and handling aircraft.
  - 2.12 explain the importance of correct electrical bonding specifications.
  - 2.13 explain the quality standards that they must work to during the activities.
  - 2.14 describe the problems that can occur with the aircraft handling activities, and explain how these can be overcome.
  - 2.15 explain the importance of correct securing of the aircraft, and of fitting blanks, bungs and locking/safety devices.
  - 2.16 explain the importance of tool control, and company tool control procedures.
  - 2.17 explain what methods and equipment are used to manoeuvre aircraft, and how to check that the equipment is in a usable condition.
  - 2.18 describe the tools and equipment used in the aircraft handling activities, and explain any calibration/care and control procedures.
  - 2.19 describe how to deal with problems with aircraft handling process or procedures, and explain the importance of informing appropriate people of defects.
  - 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.

## Unit 006

## Carrying out aircraft routine servicing

<b>UAN:</b>	H/601/4244
<b>Level:</b>	2
<b>Credit value:</b>	15
<b>GLH:</b>	49
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 6: Carrying out aircraft routine servicing (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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 de-fuelling, refuelling and replenishing gaseous systems, replenishing oil systems, checking undercarriages and wheels/skids, and completing servicing records.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the servicing activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner must demonstrate a significant personal contribution during the team activities, in order to satisfy the requirements of this standard, and competency in all the areas required by the standard must be demonstrated.</p>

The learner's knowledge will be sufficient to provide a good understanding of their work, and will provide an informed approach to applying the appropriate aircraft servicing techniques and procedures. The learner will understand the systems being serviced, and their application, and will know about the replenishment equipment and fastening devices, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the aircraft servicing operations. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to carry out aircraft routine servicing
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines. 1.2 follow the relevant maintenance schedules to carry out the required work. 1.3 carry out all of the following during the aircraft servicing activities: <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> 1.4 carry out the maintenance activities within the limits of your personal authority. 1.5 assist in the re-fuelling or de-fuelling of the aircraft, to include carrying out three of the following: <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>• re-fuel or de-fuel to the correct fuel load and distribution.</li> </ul> 1.6 carry out the maintenance activities in the specified sequence and in an agreed timescale. 1.7 carry out all of the following during replenishment of gaseous systems: <ul style="list-style-type: none"> <li>• apply appropriate safety precautions to prevent oil or grease</li> </ul>

- contamination
  - ensure the electrical earth bonding of gaseous supply equipment
  - monitor flow rates and storage pressures during the replenishment.
- 1.8 carry out both of the following during replenishment of oil/hydraulic systems:
  - check/replace filters
  - drain and replace oil, or top up oil reservoirs, as appropriate.
- 1.9 visually inspect undercarriages and wheels/skids, by carrying out five of the following checks:
  - tyre impact damage
  - tyre inflation pressures
  - tyre creep
  - floatation gear security
  - corrosion
  - hydraulic leaks
  - shock absorber extension
  - fastener security
  - split-pin security
  - skid damage.
- 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.
- 1.11 complete relevant maintenance records accurately and pass them on to the appropriate person.
- 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.
- 1.13 carry out servicing work which complies with one of the following standards:
  - Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - manufacturers' specifications
  - ISO 9000 series procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
  - service schedule/log
  - job cards
  - aircraft service/flight log.

<b>Learning outcome</b>
The learner will: 2. Know how to carry out aircraft routine servicing
<b>Assessment criteria</b>
The learner can: 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). 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. 2.3 explain the authorisation they require to commence work on the aircraft. 2.4 describe the hazards associated with servicing the aircraft, and how they can be minimised. 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. 2.6 explain the protective equipment that they need to use for both personal protection and protection of the aircraft. 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. 2.8 explain the replenishments to be made, and the methods of replenishment. 2.9 explain the electrical bonding specifications, and their importance. 2.10 describe how to identify the fuels, lubricants and gases to be used, and how to ensure that systems are not contaminated. 2.11 explain the procedures for checking undercarriages and wheels. 2.12 explain the quality control procedures to be followed during the servicing procedures. 2.13 describe how to conduct any necessary checks to ensure the system integrity and functionality. 2.14 describe the problems that can occur with the servicing and maintenance activities, and how these can be overcome. 2.15 explain the importance of correct securing and locking of connections. 2.16 explain the importance of tool control, and company tool control procedures. 2.17 describe how replenishment equipment is cared for, connected, operated and controlled. 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. 2.19 explain the tools and equipment used in the servicing activities, and their calibration/care and control procedures. 2.20 explain the importance of ensuring that, when the servicing is completed, the aircraft is free from dirt, swarf and foreign objects. 2.21 explain the disposal methods for waste oil, fuel, other liquids and waste.

- 2.22 describe how to deal with problems with the servicing procedures, and the importance of informing appropriate people of defects.
- 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.
- 2.24 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## Unit 007

# Carrying out maintenance on aircraft mechanical systems by component replacement

<b>UAN:</b>	K/601/4245
<b>Level:</b>	2
<b>Credit value:</b>	45
<b>GLH:</b>	126
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 7: Carry out maintenance on aircraft mechanical systems by component replacement (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.

**Aim:** 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.

The learner's responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be

expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner must demonstrate a significant personal contribution during the team activities, in order to satisfy the requirements of this standard, and competency in all the areas required by the standard must be demonstrated.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate mechanical maintenance techniques and procedures. The learner will have a basic understanding of the systems being maintained, and their application, and will know about the maintenance equipment and fastening devices, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the aircraft maintenance operations, especially those for isolating and depressurising equipment, and for protecting themselves and others from injury. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to carry out maintenance on aircraft mechanical systems by component replacement
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines. 1.2 carry out all of the following during the aircraft maintenance activities: <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> 1.3 follow the relevant maintenance schedules to carry out the required work. 1.4 carry out the maintenance activities within the limits of your personal authority. 1.5 prepare the aircraft for work, by carrying out all of the following:

- obtain clearance to work on the aircraft, and observe the power isolation and safety procedures
  - identify defects for maintenance and ensure the aircraft is fit for maintenance from the aircraft documentation
  - ensure that relevant safety warnings are in place
  - ensure that appropriate safety locks/pins are in place
  - check that the relevant systems are in a condition for work and for component replacement to take place.
- 1.6 carry out the maintenance activities in the specified sequence and in an agreed timescale.
- 1.7 carry out component replacements on three of the following aircraft systems:
- engine change unit
  - oxygen supply
  - undercarriage
  - hydraulic
  - pneumatic
  - de-icing
  - fuel/oil
  - transmission
  - flying control surfaces
  - mechanical controls
  - environmental control.
- 1.8 carry out ten of the following maintenance techniques, as applicable to the equipment being maintained:
- removing excessive dirt and grime
  - isolating and/or de-pressurising system
  - draining system fluids
  - dismantling equipment to unit/sub-assembly level
  - dismantling units to component level
  - monitoring component condition/deterioration
  - proof-marking/labelling of components/units
  - replacing 'lified' items (such as seals, bearings, gaskets)
  - replacing all damaged or defective units/components
  - securing components using mechanical fasteners and threaded devices
  - applying bolt locking methods (such as split pins, wire locking, lock nuts, stiff nuts, swage nuts)
  - making static, functional or operational checks of the completed system
  - re-assembling the equipment/system
  - making all required pipe connections
  - carrying out leak checks on all connections
  - setting and adjusting replaced components
  - re-connecting electrical connections
  - tightening fastenings to the required torque
  - applying gaskets and sealant/adhesives

- replenishing system fluids
  - replenishing oils and greases.
- 1.9 replace a range of components, involving the disconnection and reconnection of eight of the following:
- mechanical units
  - brake units
  - quick release fasteners
  - pipes and unions
  - panels
  - filters
  - threaded fasteners
  - actuating mechanisms
  - clamps
  - springs
  - chains and sprockets
  - cables and pulleys
  - levers and linkages
  - shims and packing
  - valves
  - microswitches and stops
  - control rods
  - free electrical connectors
  - cylinders/actuators
  - seals and gaskets
  - other specific components.
- 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.
- 1.11 carry out maintenance work which complies with one or more of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series procedures
  - customer standards and requirements
  - company standards and procedures
  - manufacturers' specifications.
- 1.12 complete relevant maintenance records accurately, to include one from the following and pass them on to the appropriate person:
- maintenance schedule/log
  - job cards
  - aircraft service/flight log.
- 1.13 dispose of waste materials in accordance with safe working practices and approved procedures.

<b>Learning outcome</b>
The learner will: 2. Know how to carry out maintenance on aircraft mechanical systems by component replacement
<b>Assessment criteria</b>
The learner can: 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). 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 2.3 explain the authorisation they require to commence work on the aircraft. 2.4 describe the hazards associated with working on aircraft systems (such as fuel, oxygen and oils), and how they can be minimised. 2.5 describe the protective equipment that they need to use for both personal protection and protection of the aircraft. 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. 2.7 describe the components to be replaced, and the method of replacement. 2.8 explain the electrical bonding specifications, and their importance. 2.9 explain how to identify the components to be used, and how to ensure that systems are not contaminated. 2.10 explain the quality control procedures to be followed during the maintenance procedures. 2.11 describe how to conduct any necessary checks to ensure the system integrity and functionality. 2.12 explain the problems that can occur with the aircraft maintenance activities, and how these can be overcome. 2.13 explain the importance of correct securing and locking of connections. 2.14 explain the importance of tool control, and company tool control procedures. 2.15 describe the methods and equipment used to maintain aircraft systems. 2.16 describe the tools and equipment used in the maintenance activities, and their calibration/care and control procedures. 2.17 explain importance of ensuring that, when the maintenance is completed, the aircraft is free from dirt, swarf and foreign objects. 2.18 describe the disposal methods for waste oil, fuel, other liquids and waste. 2.19 describe the problems with the maintenance procedures, and the importance of informing appropriate people of defects. 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. 2.21 describe the extent of their own responsibility, and whom they

should report to if they have problems that they cannot resolve.

## Unit 008

## Carry out maintenance on aircraft electrical/electronic systems by component replacement

<b>UAN:</b>	M/601/4246
<b>Level:</b>	2
<b>Credit value:</b>	45
<b>GLH:</b>	126
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 8: Carrying out maintenance on aircraft electrical/electronic systems by component replacement (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and</p>

procedures for the maintenance activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner must demonstrate a significant personal contribution during the team activities, in order to satisfy the requirements of this standard, and competency in all the areas required by the standard must be demonstrated.

The learner's underpinning knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate maintenance techniques and procedures. The learner will have a basic understanding of the systems being maintained, and their application, and will know about the maintenance equipment and fastening devices, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the aircraft maintenance operations, especially those for isolating and depressurising equipment, and for protecting themselves and others from injury. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to carry out maintenance on aircraft electrical/ electronic systems by component replacement
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines. 1.2 carry out all of the following during the aircraft electrical, electronic or avionic maintenance activities: <ul style="list-style-type: none"><li>• use the correct issue of the aircraft servicing or maintenance schedule</li><li>• use copies of relevant cosh 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> 1.3 prepare the aircraft for work by carrying out all of the following:

- obtain clearance to work on the aircraft, and observe the power isolation and safety procedures
  - identify defects for maintenance and ensure the aircraft is fit for maintenance from the aircraft documentation
  - ensure that relevant safety warnings are in place
  - ensure that appropriate safety locks/pins are in place
  - check that the relevant systems are in a condition for work, and for component replacement to take place.
- 1.4 follow the relevant maintenance schedules to carry out the required work.
- 1.5 carry out the maintenance activities within the limits of your personal authority.
- 1.6 carry out the maintenance activities in the specified sequence and in an agreed time scale.
- 1.7 carry out component replacements on three of the following aircraft electrical, electronic or avionic systems:
- aircraft power and distribution
  - lighting
  - engine control and indication
  - flight control
  - pitot static
  - cabin equipment (such as catering, entertainment)
  - radar
  - navigation
  - communication
  - defensive aids
  - undercarriage.
- 1.8 carry out ten of the following maintenance techniques, as applicable to the equipment being maintained:
- isolating power
  - dismantling equipment to unit/component level
  - proof-marking/labelling of components/units
  - replacing all damaged or defective units/components
  - replacing damaged wires or cables
  - replacing damaged or defective connectors
  - checking the integrity of all connections
  - checking the integrity and security of earth bonding
  - tuning or making routine adjustments to components
  - securing components using mechanical fasteners and applying bolt locking methods
  - making electrical connections (such as soldering, splicing and crimping)
  - making static or functional checks of completed systems
  - removing excessive dirt and grime
  - use of special-to-type tools
  - de-pressurisation of the system
  - reassembly of the equipment/system
  - reconnecting electrical connections

- making fluid connections to components
  - looming
  - inspecting and cleaning sensors
  - servicing battery systems.
- 1.9 replace a range of electrical, electronic or avionic modules/components, involving the disconnection and reconnection of eight of the following:
- mechanical units
  - quick release fasteners
  - electrical connectors (such as terminal blocks, male to female plug-in connectors)
  - backplate connectors
  - pitot/static connectors
  - radio frequency (rf) connectors
  - fluid system connectors (such as pipes, unions, hoses)
  - switches (such as micro, pressure)
  - avionic units
  - earth and bonding leads
  - mechanical controls (such as actuating mechanisms, brackets)
  - other specific components.
- 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule.
- 1.11 Carry out maintenance work which complies with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series procedures
  - customer standards and requirements
  - company standards and procedures
  - manufacturers' specifications.
- 1.12 complete relevant maintenance records accurately and pass them on to the appropriate person.
- 1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- maintenance schedule/log
  - job cards
  - aircraft service/flight log.
- 1.14 dispose of waste materials in accordance with safe working practices and approved procedures.

<b>Learning outcome</b>
<p>The learner will:</p> <p>2. Know how to carry out maintenance on aircraft electrical/electronic systems by component replacement</p>
<b>Assessment criteria</b>
<p>The learner can:</p> <p>2.1 explain the specific safety precautions and procedures to be observed whilst carrying out the aircraft maintenance activities.</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, 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> <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.</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> <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</p>

waste.

- 2.23 explain the problems with the maintenance procedures, and the importance of informing appropriate people of defects.
- 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.
- 2.25 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## **Unit 008**

# **Carry out maintenance on aircraft electrical/electronic systems by component replacement**

## Supporting information

### **Guidance**

2.1 (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)

2.4 (such as electrical power, release of stored pressure, oil and fuel, gaseous substances)

2.10 (such as module blocks, terminal blocks, multi-pin plugs/sockets, tray-mounted sockets, earth bonding points)

## Unit 009

## Servicing aircrew protective helmets and electrical headsets

<b>UAN:</b>	R/601/4269
<b>Level:</b>	2
<b>Credit value:</b>	20
<b>GLH:</b>	42
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 9: Servicing Aircrew protective helmets and electrical headsets (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the servicing activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their</p>

own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's underpinning knowledge will provide a sound basis for their work, and will provide an informed approach to applying the appropriate servicing techniques and procedures. The learner will have a basic understanding of the equipment being serviced, and its application, and will know about the servicing requirements and equipment used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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

<b>Learning outcome</b>
The learner will:
1. Be able to service aircrew protective helmets and electrical headsets
<b>Assessment criteria</b>
The learner can:
1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines.
1.2 carry out all of the following during the servicing of the aircrew protective helmets and electrical headsets:
<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>
1.3 follow the relevant maintenance schedules to carry out the required work.
1.4 carry out the maintenance activities within the limits of your personal authority.
1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale.
1.6 carry out all of the following servicing activities, using appropriate

methods and techniques:

- dismantling equipment to an appropriate level (such as removal of oxygen mask, visor cover and fabric covers)
- cleaning the equipment (such as visor, protective shell and headsets), using appropriate solutions
- monitoring the condition/deterioration of components

plus three more from the following:

- replacing all 'lived' components
- replacing all damaged or defective components
- reassembling the equipment
- carrying out any required modifications to the equipment
- carrying out adjustments to components and connections (such as friction settings, tuning and adjusting microphones)
- checking the equipment operation and performance
- testing equipment in accordance with the relevant air publication (AP).

1.7 carry out a thorough examination of the helmet and headset, to include checking all of the following:

- the protective shell for damage and softness of shell
- all of the protective shell for screws/fasteners for security
- visors for scratches, abrasions and cracks
- visor hinge mechanism for corrosion, damage, security, and adjust friction settings as required
- ear capsules for damage, wear, hardening, discoloration and security
- 'Mic/Tel' leads for deterioration or fraying
- chin and neck strap for wear, damage, fraying and deterioration
- oxygen mask hooks for damage, security and bending/distortion
- electrical headsets for signs of damage and deterioration
- ear pads and headbands for hardening or cracking
- ear shells for free movement in their stirrups
- the microphone switch moves freely, and adjustable parts move freely without undue slackness
- boom microphone (if fitted) for insecurity and damage.

1.8 replace a range of components, to include four of the following:

- visor (clear or tinted)
- side arm (outer and inner)
- base assembly oxygen mask hook
- strap assembly cable retaining
- strap assembly (chin or neck)
- headset electrical
- ear capsule
- down lead assembly
- lining assembly (brow or neck)
- visor cover assembly
- 'Mic/Tel' lead (down lead and jack plug connector)
- pads (such as crown, brow or neck)

<ul style="list-style-type: none"> <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> <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>• 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> <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>
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<p><b>Learning outcome</b></p> <p>The learner will:</p> <p>2. Know how to service aircrew protective helmets and electrical headsets</p>
<p><b>Assessment criteria</b></p> <p>The learner can:</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</p>

- responsibility these requirements place on them.
- 2.3 describe the hazards associated with servicing aircrew protective helmets and electrical headsets, and how they can be minimised.
  - 2.4 describe the personal protective equipment that they need to use during the servicing activities, and where it can be obtained.
  - 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).
  - 2.6 describe the types of faults, defects or wear characteristics that are likely to occur with the aircrew protective helmets and electrical sets.
  - 2.7 explain how to determine when components require adjustment, repair or replacement.
  - 2.8 describe the components to be replaced in the protective helmets and headsets, and the method of replacement.
  - 2.9 explain the importance of the correct securing and locking of connections.
  - 2.10 explain how to identify the components to be used for the various types of protective helmets and headsets being serviced.
  - 2.11 explain the quality control procedures to be followed during the servicing procedures.
  - 2.12 explain how to conduct any necessary checks to ensure that the equipment functions to specification.
  - 2.13 describe the problems that can occur with the servicing procedures, and the importance of informing appropriate people of any defects.
  - 2.14 explain the importance of tool control, and the organisational tool control procedures to be used.
  - 2.15 describe the tools and equipment used in the servicing activities, and their calibration/care and control procedures.
  - 2.16 explain the importance of ensuring that, when the servicing is completed, the equipment is free from dirt, swarf and foreign objects.
  - 2.17 explain the disposal methods for waste and petrol, oil and lubricants (POL).
  - 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.
  - 2.19 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## Unit 010

## Servicing aircrew nuclear, biological and chemical (NBC) respirators and equipment

<b>UAN:</b>	D/601/4274
<b>Level:</b>	2
<b>Credit value:</b>	22
<b>GLH:</b>	42
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 10: Servicing aircrew nuclear, biological and chemical (NBC) respirators and equipment (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the servicing activities undertaken, and to report any problems with these activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level</p>

of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and demonstrate competence in all the areas required by the standard.

The learner's knowledge will provide a sound basis for their work, and will provide an informed approach to applying the appropriate servicing techniques and procedures. The learner will have an understanding of the equipment being serviced, and its application, and will know about the servicing requirements and equipment used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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

<b>Learning outcome</b>
The learner will: 1. Be able to service aircrew nuclear, biological and chemical (NBC) respirators and equipment
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guideline. 1.2 carry out all of the following during the servicing of the aircrew NBC equipment: <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> 1.3 follow the relevant maintenance schedules to carry out the required work. 1.4 carry out the maintenance activities within the limits of your personal authority. 1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale.

- 1.6 carry out all of the following servicing activities, using appropriate methods and techniques:
- dismantling equipment to an appropriate level (such as removal of velveteen cover and valves, ice guard, cover and filtration canisters)
  - cleaning the equipment (such as respirator assembly and valves, drinking facility) using appropriate solutions
  - monitoring the condition/deterioration of components
  - plus three more from the following:
  - replacing all 'lified' components
  - replacing all damaged or defective components
  - reassembling the equipment
  - carrying out any required modifications to the equipment
  - carrying out adjustments to components and connections
  - checking equipment operation and performance
  - testing equipment in accordance with the relevant air publication (AP).
- 1.7 examine thoroughly the aircrew respirator/portable ventilator, to include checking all of the following:
- mask support and deflector plate, mask face-piece and mask tubing, for damage deterioration and security of attachment
  - 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
  - all screws, nuts and fasteners for security of attachment
  - nose occluder assembly, drinking facility for damage, puncture, cut or abrasion or deterioration of rubber
  - chain toggle harness and chain harness - examine all links for damage and security of attachment
  - inspiratory valve, ice guard filter, stepped expiratory valve, for deterioration and damage
  - apron, neck seal, bellows and cowl for damage, deterioration and security of bonded joints
  - manifold assembly, hoses and connectors for wear, damage, deterioration and security of attachment
  - microphone lead assembly for damage, deterioration or fraying
  - microphone switch for free movement without slackness
  - 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
  - canisters, canister mount seals, emergency inlet valve, and pressure relief valve for damage, deterioration, freedom of movement and security of attachment.
- 1.8 replace a range of NBC equipment components, to include four of the following:
- ice guard
  - inspiratory valve

- compensated expiratory valve
- stepped expiratory valve
- velveteen cover
- microphone lead assembly
- mask
- hood outlet and shut-off valve
- hood inlet adapter
- angled inlet adapter
- hood tube
- mask tube
- chain toggle harness
- manifold
- protective sleeves
- canister
- canister mount seals
- battery
- case
- cover
- nut connecting cover.

1.9 carry out servicing requirements, in accordance with one of the following types of instructions:

- Urgent Technical Instructions (UTI)
- Satisfying Routine Technical Instructions (RTI)
- Maintenance Instructions (MI)
- Preliminary Warning Instructions (PWI)
- Serious Defect Signals.

1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule.

1.11 carry out servicing work which complies with one of the following standards:

- Civil Aviation Authority (CAA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- ISO 9000 Standards and procedures
- customer standards and requirements
- company standards and procedures.

1.12 complete relevant maintenance records accurately, to include one from the following and pass them on to the appropriate person

- maintenance schedule/log
- job cards
- aircraft service/flight log.

1.13 dispose of waste materials in accordance with safe working practices and approved procedures.

<b>Learning outcome</b>
The learner will: 2. Know how to service aircrew protective helmets and electrical headsets
<b>Assessment criteria</b>
The learner can: 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). 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. 2.3 describe the hazards associated with servicing aircrew NBC equipment, and how they can be minimised. 2.4 describe the personal protective equipment that they need to use during the servicing activities, and where it can be obtained. 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). 2.6 describe the types of faults, defects or wear characteristics that are likely to occur with the NBC equipment. 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. 2.9 explain the importance of the correct securing and locking of connections. 2.10 explain how to identify the components to be used for the NBC equipment being maintained. 2.11 explain the quality control procedures to be followed during the servicing activities. 2.12 explain how to conduct any necessary checks to ensure that the equipment functions to specification. 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. 2.14 explain the importance of tool control, and the organisational tool control procedures to be used. 2.15 describe the tools and equipment used in the servicing activities, and their calibration/care and control procedures. 2.16 explain the importance of ensuring that, when the servicing is completed, the equipment is free from dirt, swarf and foreign objects. 2.17 explain the disposal methods for waste and petrol, oil and lubricants (POL).

- 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.
- 2.19 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## Unit 011

## Servicing aircrew life preserver equipment

<b>UAN:</b>	H/601/4275
<b>Level:</b>	2
<b>Credit value:</b>	22
<b>GLH:</b>	42
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 11: Servicing aircrew life preserver equipment (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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 'lified' 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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the servicing activities undertaken, and to report any problems with these activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of</p>

the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will provide a sound basis for their work, and will provide an informed approach to applying the appropriate servicing techniques and procedures. The learner will have a basic understanding of the equipment being serviced, and its application, and will know about the servicing requirements and equipment used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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

<b>Learning outcome</b>
The learner will: 1. Be able to service aircrew life preserver equipment
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the servicing of the aircrew life preserver equipment: <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> 1.3 follow the relevant maintenance schedules to carry out the required work. 1.4 carry out the maintenance activities within the limits of your personal authority. 1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale. 1.6 carry out all of the following servicing activities, using appropriate methods and techniques: <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> </ul>

- monitoring the condition/deterioration of components.

Plus three more from the following:

- replacing all 'lifer' components
- replacing all damaged or defective components
- reassembling the equipment
- carrying out any required modifications to the equipment
- carrying out adjustments to components and connections
- checking equipment operation and performance
- testing the equipment in accordance with the relevant air publication (AP).

1.7 carry out a thorough examination of the life preserver, to include checking all of the following:

- waistcoat front closure plate for damage, wear and insecurity
- waist adjustment straps and buckles for damage and correct locking action
- all internal and external stowage pockets for damage, wear and security
- inflation valves and oral tubes for damage and deterioration
- stole pouch and peripheral slide fastener for damage and wear - check the operation
- cylinder pocket and operating knob housing for security of water ingress, eyelets and snap fasteners
- all fasteners and eyelets for damage, wear and insecurity
- webbing tape hinges and tape touch-and-close for damage, wear and security
- stole lacing loops, webbing loops and lifting beackets for damage, wear and security
- life line and toggle, whistle and lanyard, heliograph - examine for correct length and security of knots
- water activated battery and lamp assembly, for damage, length of lanyard and security of knots
- pyrotechnic signal kit for damage and integrity of seals
- 'Mic/Tel' flap and D-ring for damage and wear
- CO2 cylinder for corrosion, dents, damage and integrity of gas seal and screw threads.

1.8 Replace a range of life preserver equipment components, to include four of the following:

- inflatable stole
- personal locator beacon (PLB)
- personal locator beacon battery
- personal locator beacon aerial
- CO2 cylinder
- water activated battery and lamp
- first aid kit
- waistcoat
- pyrotechnic signal kit
- drinking water
- heliograph

	<ul style="list-style-type: none"> <li>• automatic life preserver inflation unit (ALPIU)</li> <li>• 'Halkey Roberts' manual inflator.</li> </ul>
1.9	<p>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>
1.10	<p>report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule.</p>
1.11	<p>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>
1.12	<p>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>
1.13	<p>dispose of waste materials in accordance with safe working practices and approved procedures</p>

<b>Learning outcome</b>	
The learner will:	
2. Know how to service aircrew life preserver equipment	
<b>Assessment criteria</b>	
The learner can:	
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).
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.
2.3	describe the hazards associated with servicing aircrew life preserver equipment, and how they can be minimised.
2.4	describe the personal protective equipment that they need to use during the servicing activities, and where it can be obtained.
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).

- 2.6 describe the types of faults, defects or wear characteristics that are likely to occur with the aircrew life preserver equipment.
- 2.7 explain how to determine when components require adjustment, repair or replacement.
- 2.8 describe the components to be replaced in the aircrew life preserver equipment, and the method of replacement.
- 2.9 explain the importance of the correct securing and locking of connections.
- 2.10 describe how to identify the components to be used for the life preserver equipment being serviced.
- 2.11 explain the quality control procedures to be followed during the servicing procedures.
- 2.12 explain how to conduct any necessary checks to ensure that the equipment functions to specification.
- 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.
- 2.14 explain the importance of tool control, and the organisational tool control procedures to be used.
- 2.15 describe the tools and equipment used in the servicing activities, and their calibration/care and control procedures.
- 2.16 explain the importance of ensuring that, when the servicing is completed, the equipment is free from dirt, swarf and foreign objects.
- 2.17 explain the disposal methods for waste and petrol, oil and lubricants (POL).
- 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.
- 2.19 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## Unit 012

## Servicing parachute assemblies

<b>UAN:</b>	K/601/4293
<b>Level:</b>	2
<b>Credit value:</b>	22
<b>GLH:</b>	42
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 12: Servicing parachute assemblies (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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 'lifer' 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. The learner's responsibilities will require them to comply with organisational policy and procedures for the servicing activities undertaken, and to report any problems with these activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and you will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team</p>

working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will provide a sound basis for their work, and will provide an informed approach to applying the appropriate servicing techniques and procedures. The learner will have an understanding of the type of parachute being serviced, and its application, and will know about the servicing requirements and equipment used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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

<b>Learning outcome</b>
The learner will: 1. Be able to service parachute assemblies
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the servicing and maintenance of the parachute assemblies: <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> 1.3 follow the relevant maintenance schedules to carry out the required work. 1.4 carry out the maintenance activities within the limits of your personal authority. 1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale. 1.6 carry out all of the following servicing activities, using appropriate methods and techniques: <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</li> </ul>

components) using appropriate solutions

- monitoring the condition/deterioration of components

plus three more from the following:

- replacing all 'lifer' components
- replacing all damaged or defective components
- reassembling the equipment
- carrying out any required modifications to the equipment, where applicable
- carrying out adjustments to components and connections
- checking equipment operation and performance
- testing the equipment, in accordance with the relevant air publication (AP).

1.7 carry out a thorough examination of the parachute, to include checking/examining all of the following:

- the parachute canopy, rigging lines, vent control lines, for correct sequence of attachment, damage, deterioration, contamination and security of attachment
- main and controller drogue - all rigging lines, anti-squid line and connecting strop for damage, security of attachment, and assembled in the correct sequence
- harness assembly for damage, deterioration and correct assembly
- PSP connector, screws and fasteners, for correct operation and security of attachment
- rigid pack and containers for damage, dents, cracks, freedom from loose particles, burrs and sharp edges
- mechanical lock and metallic labels for damage, corrosion, security of attachment
- inner and outer closure flaps, stowage trays, for damage and security of attachment
- drogue withdrawal line for damage and 'in-use life'
- all grommets, screws and fasteners for security of attachment
- all shackles and screwed couplings, for damage and security of attachment.

1.8 replace a range of parachute components, to include four of the following:

- back pad assembly
- padded apron
- canopy withdrawal line
- quick release connector
- lap strap sub-assembly
- harness yoke
- front lift webs
- rivets
- rubber band
- rigid pack
- mechanical lock assembly
- drogue withdrawal line
- controller drogue anti-squid line

- drogue connecting strop
- extender strap
- drogue-to-parachute attachment line
- parachute withdrawal line (seat portion)
- head support panel grommets
- auxiliary parachute connecting strop
- rigid pack outer closure flaps
- rigid pack inner closure flaps
- split pin
- castellated nut
- auxiliary parachute
- rigging lines and stowage flap
- attachment gaiter
- strap and pack sub-assembly
- assembly pin, transit and flag
- container.

1.9 carry out servicing requirements, in accordance with one of the following types of instructions:

- Urgent Technical Instructions (UTI)
- Satisfying Routine Technical Instructions (RTI)
- Maintenance Instructions (MI)
- Preliminary Warning Instructions (PWI)
- Serious Defect Signals.

1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule

1.11 carry out servicing work which complies with one of the following standards:

- Civil Aviation Authority (CAA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- ISO 9000 Standards and procedures
- customer standards and requirements
- company standards and procedures.

1.12 complete relevant maintenance records accurately, to include one from the following and pass them on to the appropriate person:

- maintenance schedule/log
- job cards
- aircraft service/flight log.

1.13 dispose of waste materials in accordance with safe working practices and approved procedures

<b>Learning outcome</b>
The learner will: 2. Know how to service parachute assemblies
<b>Assessment criteria</b>
The learner can: 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). 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. 2.3 explain the hazards associated with servicing parachute assemblies, and how they can be minimised. 2.4 describe the personal protective equipment that they need to use during the servicing activities, and where it can be obtained. 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). 2.6 describe the types of faults, defects or wear characteristics that are likely to occur with the parachute assemblies. 2.7 describe how to determine when components require adjustment, repair or replacement. 2.8 describe the components to be replaced in the parachute assemblies, and the method of replacement. 2.9 explain the importance of the correct securing and locking of connections. 2.10 describe how to identify the components to be used for the various types of parachute assemblies being serviced. 2.11 explain the quality control procedures to be followed during the servicing procedures. 2.12 explain how to conduct any necessary checks to ensure that the parachute assemblies function to specification. 2.13 describe the problems that can occur with the servicing of parachute assemblies, and the importance of informing appropriate people of any defects. 2.14 explain the importance of tool control, and the organisational tool control procedures to be used. 2.15 explain the tools and equipment used in the servicing activities, and their calibration/care and control procedures. 2.16 explain the importance of ensuring that, when the servicing is completed, the parachute assembly is free from dirt and foreign objects. 2.17 explain the disposal methods for waste and petrol, oil and lubricants (POL). 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.

2.19 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## Unit 013

## Drilling and finishing holes in aircraft components

<b>UAN:</b>	L/601/4299
<b>Level:</b>	2
<b>Credit value:</b>	33
<b>GLH:</b>	77
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 13: Drilling and finishing holes in aircraft components (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the drilling and hole finishing activities undertaken, and to report any problems with the activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the</p>

standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to producing and finishing holes in aircraft components. The learner will understand the drilling and hole finishing processes used, and their application, and will know about the tooling and ancillary equipment, materials and consumables, in adequate depth to provide a sound basis for carrying out the drilling and hole finishing activities, and for ensuring that the completed components are to the required specification.

The learner will understand the safety precautions required when working with drilling machines, and with their associated tools and equipment, especially those for isolating the machine during tool mounting and setting, and when handling cutting tools and equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to drill and finish holes in aircraft components
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the drilling and finishing activities: <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><li>• return all tools and equipment to the correct location, on completion of the activities.</li></ul> 1.3 confirm that the machine is set up and ready for the machining activities to be carried out 1.4 use four of the following types of marking-out/setting equipment:

- marking tools
  - rules/tapes
  - squares
  - protractors
  - dividers/compasses
  - vernier gauges
  - templates.
- 1.5 use a range of workholding/guiding devices, to include three of the following:
- jigs/fixtures
  - drill bars
  - drill blocks
  - slave bolts
  - dowels
  - clamps
  - gripping pins
  - jig pins
  - ream blocks
  - profile boards.
- 1.6 produce and finish holes in aircraft components, using three of the following:
- bench/pedestal drill
  - portable drill
  - 'spacematic' drill
  - rackfeed drill
  - cold working pack (such as split sleeve and split mandrel)
  - pecker drill
  - radial arm drill
  - pistol pneumatic drill
  - straight pneumatic drill
  - angled pneumatic drill
  - positive feed drill
  - doler.
- 1.7 produce holes in aircraft components, using two of the following types of drill bits:
- twist
  - diamond coated
  - cobalt
  - core
  - piloted core
- 1.8 manipulate the machine tool controls safely and correctly in line with operational procedures.
- 1.9 produce components to the required quality and within the specified dimensional accuracy.
- 1.10 produce and finish holes in two of the following materials:
- aluminium alloys
  - titanium

- composites
  - other specific ferrous, non-ferrous or non-metallic material.
- 1.11 carry out all of the following during the production and finishing of the holes:
- mark out, position and secure the item to be drilled, in accordance with company procedures
  - use the specified techniques and procedures to produce and finish the holes
  - select and use the correct cutting feeds and speeds
  - use appropriate and adequate lubrication/coolant
  - check that positional accuracy complies to specifications
  - ensure that machined features are free from tool marks, burrs and sharp edges
  - apply surface protection/coatings to finished holes on completion of the drilling activity, where appropriate.
- 1.12 produce and finish (including de-burring) holes in aircraft components, to include four of the following types of hole:
- through
  - blind
  - stepped
  - reamed
  - counterbored
  - threaded (insert)
  - countersunk
  - spot faced
  - tapered
  - bored
  - dimpled
  - holes with formed edges (such as radii).
- 1.13 carry out quality sampling checks at suitable intervals.
- 1.14 check that finished holes meet the required specification, using four of following:
- plug gauges
  - hole gauges
  - vernier gauges
  - countersink check bolts
  - down-size dummy check bolts
  - depth gauges
  - de-burring/chamfer gauge
  - dial test indicators
  - surface comparator plates
  - company specific gauges.
- 1.15 produce finished holes which comply with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)

- ISO 9000 series procedures
- company standards and procedures
- customer standards and requirements.

1.16 deal promptly and effectively with problems within your control and report those that cannot be solved.

1.17 shut down the equipment to a safe condition on conclusion of the machining activities

### **Learning outcome**

The learner will:

2. Know how to drill and finish holes in aircraft components

### **Assessment criteria**

The learner can:

- 2.1 explain the health and safety requirements of the area in which they are carrying out the drilling and hole finishing.
- 2.2 explain the importance of wearing protective clothing and equipment, and of keeping the work area safe and tidy.
- 2.3 describe the specific health and safety precautions to be followed whilst producing and finishing holes.
- 2.4 describe the hazards associated with carrying out drilling and hole finishing activities on aircraft components, and how they can be minimised.
- 2.5 explain the safety mechanisms on the equipment used, and the procedure for checking that they function correctly.
- 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.
- 2.7 explain how to obtain and interpret drawings, standards, quality control procedures and specifications used for the drilling and finishing of holes.
- 2.8 explain the importance of producing holes to the correct surface finish values, and the methods used to achieve this.
- 2.9 describe the methods, techniques and equipment used to mark out and position components, prior to drilling and finishing the holes.
- 2.10 explain the different types and applications of drilling equipment.
- 2.11 explain the different types and application of hole cutting and finishing tools.
- 2.12 describe how to handle and store drills and finishing tools, safely and correctly.
- 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.
- 2.14 describe the different types and application of cutting fluids/compounds.
- 2.15 explain the cutting characteristics of different materials, and how this affects the type of tool used, cutting speeds, lubrication and surface finish.
- 2.16 explain the principles and effects of cold working when finishing holes in aircraft components.
- 2.17 describe the methods used to prevent corrosion on completion of drilling and finishing operations.
- 2.18 explain the quality control procedures used, inspection checks to

be carried out on finished holes, and the equipment to be used.

- 2.19 explain the action to be taken in the event that holes fail to meet specification.
- 2.20 describe the problems that can occur with the drilling and finishing activities, and how these can be overcome.
- 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.
- 2.22 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## **Unit 013**

## **Drilling and finishing holes in aircraft components**

### **Guidance**

2.7 (including BS and ISO Standards, symbols and terminology and other documents needed)

2.10 (such as bench/pedestal, portable, 'spacematic', rackfeed, pneumatic, pecker and positive feed)

2.11 (such as drills, reamers, counterbore, countersink and spot-face cutters)

## Unit 014

## Installing aircraft mechanical fasteners

<b>UAN:</b>	A/601/4301
<b>Level:</b>	2
<b>Credit value:</b>	35
<b>GLH:</b>	77
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 14: Installing aircraft mechanical fasteners (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the installation activities undertaken, and to report any problems with the activities, materials or equipment used that they cannot personally resolve, or are outside your permitted authority, to the relevant people. The learner will also be required to seek approval, where appropriate, to rectify any faults in the installation of the fasteners.</p> <p>The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution</p>

during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying installation techniques and procedures. The learner will understand the mechanical fasteners being installed, and their application, and will know about the tooling and ancillary equipment, materials and consumables, in adequate depth to provide a sound basis for carrying out the activities and for ensuring that the fasteners are installed to the required specification.

The learner will understand the safety precautions required when installing the fasteners, and when using the installation equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

**Learning outcome**

The learner will:

- 1. Be able to install aircraft mechanical fasteners

**Assessment criteria**

The learner can:

- 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines.
- 1.2 carry out all of the following activities during the installation:
  - ensure that you have the correct documentation for the installation of the fasteners (such as drawings, job instructions, aircraft standards)
  - adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
  - ensure that all tools and equipment used are within current calibration dates
  - maintain safe access and working arrangements for the area in which the activities take place
  - deal with defects in fasteners, components and equipment, in accordance with specified procedures
  - dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures
  - return all tools and equipment to the correct location on completion of the activities
  - leave the work area in a safe condition and free from foreign object debris.
- 1.3 follow all relevant drawings and specifications for the installation being carried out.
- 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition.

- 1.5 install, position and secure the equipment and components in accordance with the specification.
- 1.6 install mechanical fasteners, to include four of the following:
- hollow rivets
  - solid rivets
  - collared fasteners
  - threaded fasteners
  - split pins
  - NAPP pins
  - pin clips
  - PIT pins
  - wire locks
  - anchor nuts
  - other locking devices.
- 1.7 ensure that all necessary connections to the equipment are complete.
- 1.8 use four types of equipment from the following:
- gauges for intrusions
  - riveting guns (appropriate to rivet type)
  - drills and tools with attachments
  - redline templates
  - jigs
  - gripping pins and location dowels
  - clamps.
- 1.9 use four of the following installation methods and techniques:
- countersinking
  - milling rivets
  - wire locking
  - solid riveting (single and double handed)
  - blind riveting
  - through hole.
- 1.10 make two types of connection from:
- wet assembly
  - dry assembly
  - panels
  - skins
  - structures
  - repairs.
- 1.11 install fasteners in compliance with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.12 deal promptly and effectively with problems within your control and report those that cannot be solved.

- 1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- build records
  - log cards
  - job cards
  - aircraft log.
- 1.14 check that the installation is complete and that all components are free from damage.

<b>Learning outcome</b>
The learner will: 2. Know how to Modify Airframes
<b>Assessment criteria</b>
The learner can: 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). 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 2.3 describe the hazards associated with installing mechanical fasteners, and with the tools and equipment used, and how they can be minimised. 2.4 describe the protective equipment that they need to wear for both personal protection and protection of the aircraft. 2.5 explain the importance of working to the installation instructions and appropriate specifications. 2.6 explain why they must obtain design approval before removing and replacing any faulty fasteners. 2.7 explain the purpose and use of joint sealing agents and anti-electrolysis barriers, and the precautions to be taken when using them. 2.8 explain the regulations concerning electrical bonding and anti-electrolysis barriers. 2.9 describe the various types and ranges of screwed fasteners used on aircraft fittings, and the methods of installing them. 2.10 describe the types and applications of aircraft rivets, and the advantages of hollow rivets over solid rivets. 2.11 explain the reasons for using screw fastenings rather than rivets. 2.12 explain the purpose and use of a countersink cage. 2.13 describe the various locking devices used with fastenings. 2.14 explain the purpose and use of locating dowels, gripping pins and gauges, when carrying out fastening operations. 2.15 explain the procedures to be adopted when removing rivets and other fasteners. 2.16 explain the term 'quilting', its occurrence and avoidance. 2.17 describe 'bolt break offs' and where they occur. 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.

- 2.19 describe the types of gauges used to measure angles, depths, countersinks and torque.
- 2.20 explain how and why tools are calibrated, and how to check that the tools you are using are within calibration dates.
- 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.
- 2.22 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## Unit 015

## Assembling aircraft airframe ancillary components

<b>UAN:</b>	L/601/4304
<b>Level:</b>	2
<b>Credit value:</b>	45
<b>GLH:</b>	98
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 15: Assembling aircraft airframe ancillary components (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the assembly activities, materials or equipment used that they cannot personally resolve, or are outside your permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the assembly are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p>

The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying assembly techniques and procedures. The learner will understand the components being assembled, and their application, and will know about the relevant materials and fastening devices, in adequate depth to provide a sound basis for carrying out the activities and for ensuring that the work is to the required specification.

The learner will understand the safety precautions required when carrying out the assembly activities. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

**Learning outcome**

The learner will:

1. Be able to assemble aircraft airframe ancillary components

**Assessment criteria**

The learner can:

- 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines.
- 1.2 carry out all of the following during the assembly activities:
  - ensure that you have the correct documentation for the assembly operations (such as drawings, job instructions, aircraft standards)
  - adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
  - ensure that all tools and equipment used are within current calibration dates
  - maintain safe access and working arrangements for the area in which the assembly activities take place
  - dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures
  - return all tools and equipment to the correct location on completion of the activities
  - leave the work area in a safe condition and free from foreign object debris.
- 1.3 follow the relevant instructions, assembly drawings and any other specifications.
- 1.4 ensure that the specified components are available and that they are in a usable condition.
- 1.5 use the appropriate methods and techniques to assemble the components in their correct positions.
- 1.6 produce aircraft airframe ancillary component assemblies, which include three of the following:
  - trunking/ducting
  - box sections
  - skins
  - stringers
  - frames
  - panels
  - ribs
  - trays
  - galley components
  - avionic cabinets
  - mission consoles
  - stairs
  - tanks
  - other small assemblies, as applicable.

- 1.7 apply all of the following assembly methods and techniques:
- ensuring that correct part numbers are used
  - ensuring that the correct hand of components is used (left or right handed)
  - positioning and aligning components for cosmetic appearance and skin lines
  - applying sealants/adhesives
  - electrical bonding of components
  - securing components, using mechanical fasteners (such as threaded devices, rivets)
  - applying bolt locking methods (split pins, wire locking, lock nuts, stiff nuts).
- 1.8 secure the components using the specified connectors and securing devices.
- 1.9 assemble components which include four of the following:
- detail components
  - cleats
  - brackets
  - angles
  - frames
  - spars
  - skins
  - stringers
  - ribs
  - pipes, unions and joints
  - jumper braids, bonding clips, earthing straps
  - aircraft general supplies.
- 1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification.
- 1.11 carry out quality and accuracy checks, including three from the following:
- cosmetic appearance
  - accuracy of skin lines
  - freedom from damage
  - torque loading checks
  - electrical bonding and continuity.
- 1.12 produce assemblies which comply with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- build records
  - log cards

- job cards
- aircraft log.

1.14 deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to assemble aircraft airframe ancillary components
<b>Assessment criteria</b>
The learner can: 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). 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. 2.3 describe the personal protective equipment and protective clothing to be worn during the assembly activities. 2.4 explain the hazards associated with producing aircraft assemblies, and with the tools and equipment used, and how they can be minimised. 2.5 describe how to identify the components to be used; component identification systems; codes used and component orientation indicators. 2.6 describe the preparations to be undertaken on the components, prior to fitting them into the assembly. 2.7 describe the assembly methods and procedures to be used, and the importance of adhering to these procedures. 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. 2.9 explain the methods used to hold the components in their correct position, prior to securing them with the appropriate fasteners. 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). 2.11 explain the importance of using the specified fasteners for the particular assembly, and why they must not use substitutes. 2.12 explain what to do if the components or fastening devices are not assembled correctly, are damaged, or have other faults. 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. 2.14 explain the quality control procedures to be followed during the assembly operations. 2.15 describe how to conduct any necessary checks to ensure the accuracy and quality of the assemblies produced.

- 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.
- 2.17 explain the importance of using all tools in the correct manner, and within their permitted operating range.
- 2.18 explain the importance of ensuring that the completed assembly is free from dirt, swarf and foreign objects.
- 2.19 describe the problems that can occur with the assembly operations, and how these can be overcome.
- 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.
- 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.

## Unit 016

## Producing aircraft cableforms and looms

<b>UAN:</b>	R/601/4305
<b>Level:</b>	2
<b>Credit value:</b>	40
<b>GLH:</b>	98
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 16: Producing aircraft cableforms and looms (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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. The equipment will include co-axial cable assemblies, heavy duty cable assemblies, aircraft system cable assemblies, secure speech cable assemblies, aircraft lighting assemblies, automatic flying control systems (AFCS) cable assemblies, and headset leads (mic-tel leads).</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the production activities undertaken, and to report any problems with the activities, materials or equipment used that they cannot personally resolve, or are outside your permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the</p>

production of the cableforms are correctly accounted for on completion of the activities, and the learner must complete all necessary job/task documentation accurately and legibly. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the cableform production techniques and procedures. The learner will understand the procedures and techniques for producing the aircraft cableforms and looms, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the cableform/loom production activities. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to produce aircraft cableforms and looms
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the production activities: <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> 1.3 follow the relevant instructions, assembly drawings and any other specifications. 1.4 ensure that the specified components are available and that they are in a usable condition. 1.5 use the appropriate methods and techniques to assemble the components in their correct positions. 1.6 assemble four of the following types of aircraft cableforms/looms: <ul style="list-style-type: none"> <li>• co-axial 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> 1.7 secure the components using the specified connectors and securing devices.

- 1.8 use four of the following types of cables when producing the cableforms/looms:
- single core
  - multicore
  - PVC twin and earth
  - flexible (such as cotton or rubber covered)
  - mineral insulated
  - armoured
  - data/communication
  - fibre-optics
  - screened
  - coaxial
  - ribbon cables
  - wiring loom/harness.
- 1.9 carry out all of the following cableform/loom production activities:
- determining the correct type, size, colour/coding and lengths of cables required
  - cutting cables to the required length (with allowance for termination)
  - laying cables on the template/layout board
  - ensuring that the correct cables break out at the required points
  - securing cable forms/looms (such as cable ties/clips or plastic strapping, lacing, harnessing)
  - attaching suitable cable identification.
- 1.10 carry out seven of the following cable termination activities:
- stripping the outer coating without damage to conductors or insulation
  - stripping off an appropriate length of cable conductor insulation/protection
  - making mechanical/screwed/clamped cable end connections
  - making crimped cable end connections (such as spade end, loops, tags and pins)
  - making snap/push on cable end connections
  - making soldered cable end connections
  - making an unscreened plug and socket assembly
  - making a screened plug and socket assembly
  - making co-axial cable connections
  - applying heat shrinking (devices and boots).
- 1.11 produce cableforms/looms which comply with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.

- 1.12 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification.
- 1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
  - build records
  - job cards
  - aircraft log.
- 1.14 deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to produce aircraft cableforms and looms
<b>Assessment criteria</b>
The learner can: 2.1 explain the specific safety precautions to be taken whilst carrying out the cableform/loom production activities. 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. 2.3 describe the personal protective equipment and clothing to be worn during the production activities. 2.4 describe the hazards associated with producing aircraft cableforms/looms, and with the tools and equipment used, and how they can be minimised. 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. 2.6 explain how to identify cables and the cable end fittings to be used; and associated identification systems. 2.7 describe the preparations to be undertaken on the cable and cable end fittings, prior to assembly. 2.8 describe the cable end fitting assembly methods and techniques used. 2.9 describe the assembly of screened and unscreened plugs and sockets, and the difference between composite and metal plugs and sockets. 2.10 describe the different types of cable protection, and reasons for each type. 2.11 explain how to deal with cables/components that are incorrectly assembled, damaged or have other faults. 2.12 explain the quality control procedures to be followed during the production of the cableforms/looms. 2.13 explain how to conduct any necessary checks to ensure the accuracy and quality of the assemblies produced. 2.14 explain how to take electrostatic discharge (ESD) precautions, and why are they needed. 2.15 explain the procedure for handling long lengths of cable.

- 2.16 describe the precautions needed when handling completed looms.
- 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.
- 2.18 explain the importance of ensuring that all tools are used correctly and within their permitted operating range.
- 2.19 describe the problems with the assembly operations, and the importance of informing appropriate people of any non-conformances.
- 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.
- 2.21 explain the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

# **Unit 016                      Producing aircraft cableforms and looms**

## **Supporting information**

### **Guidance**

2.1 (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)

2.6 (such as cable/component markers)

2.7 (such as loom forming and soldering preparation)

2.8 (to include soldering, crimping, heat shrinking and cable forming)

## Unit 017

## Assembling aircraft electrical components

<b>UAN:</b>	Y/601/4306
<b>Level:</b>	2
<b>Credit value:</b>	45
<b>GLH:</b>	98
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit No 17: Assembling aircraft electrical components (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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. The activities will include the assembly of a range of electrical components, such as isolator switches, fuses and circuit breakers, contactors and relays, bases for plug-in modules/devices, rail-mounted terminal blocks, trunking, earth bonding arrangements, instruments, luminaires, and sub-assemblies such as power supplies, card racks and process controller units. This will involve using a range of tools and equipment along with soldering techniques and anti-static protection techniques. The assembly activities will also include making all necessary checks and adjustments to ensure that components are free from damage, correctly positioned and secured, are terminated correctly and pass the required continuity and/or test rig checks.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with</p>

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the activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the assembly are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.

The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate electrical assembly techniques and procedures. The learner will understand the procedures and techniques used for assembling the various components, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the electrical assembly activities. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to assemble aircraft electrical components
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following activities during the assembly activities: <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></ul>

- ensure that all tools and equipment used are within current calibration dates
  - ensure that correct part numbers are used (including, where appropriate, left or right handed parts)
  - maintain safe access and working arrangements for the area in which the assembly activities take place
  - dispose of waste items in a safe and environmentally acceptable manner, in line with company procedures
  - return all tools and equipment to the correct location on completion of the activities
  - leave the work area in a safe condition and free from foreign object debris.
- 1.3 follow the relevant instructions, assembly drawings and any other specifications.
- 1.4 ensure that the specified components are available and that they are in a usable condition.
- 1.5 assemble two of the following types of aircraft electrical sub-assemblies:
- circuit breaker panels
  - control/relay panels
  - power generation and control
  - power supplies
  - lighting equipment
  - instrument panels.
- 1.6 use the appropriate methods and techniques to assemble the components in their correct positions.
- 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:
- positioning and aligning components
  - securing components using mechanical fasteners/threaded devices
  - setting working clearance/air gaps on contactors
  - making clamped connections
  - making crimped connections
  - adding cable protection (such as sleeving or grommets)
  - making soldered connections
  - earth bonding
  - torque setting of fasteners
  - applying sealants/adhesives
  - component marking.
- 1.9 use ten of the following components:
- isolator switches
  - power supplies
  - transformers/chokes
  - circuit boards
  - solenoids
  - plug-in modules/devices

- ring tongue terminals
- discrete components
- heat shrink devices
- connectors (multi-contact)
- connectors (co-axial)
- contacts (crimped)
- contacts (soldered)
- cable ties
- lacing cord
- terminal blocks
- contactors
- trunking
- meters/instruments
- earth bonding devices
- card racks
- module blocks
- panels (bare)
- circuit breakers
- indicators (lamps, LEDs)
- bonding leads
- switches (push button, toggle)
- sensors
- luminaires
- fuses
- relays
- lamps
- busbars
- cables
- p-clips
- other specific components.

1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification.

1.11 carry out quality checks, to include all of the following:

- positional accuracy of all components
- correct orientation
- correct alignment
- component security
- ensuring enclosure is free of debris (such as cable offcuts/insulation, enclosure breakouts)
- continuity of cable/wiring connections (such as battery and lamp checks)
- correct termination of all wires to components
- security of all terminations
- completeness
- ensuring freedom from damage.

- 1.12 produce aircraft electrical assemblies which comply with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.13 deal promptly and effectively with problems within your control and report those that cannot be solved.
- 1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- build records
  - job cards.

**Learning outcome**

The learner will:

2. Know how to assemble aircraft electrical components

**Assessment criteria**

The learner can:

- 2.1 explain the specific safety precautions to be taken whilst carrying out the assembly activities.
- 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.
- 2.3 describe the personal protective equipment and clothing to be worn during the electrical assembly activities.
- 2.4 explain the hazards associated with producing aircraft electrical assemblies, and with the tools and equipment used, and how they can be minimised.
- 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.
- 2.6 describe the types of components and sub-assemblies that are used in the electrical assembly activities.
- 2.7 explain how to identify components to be used, and associated identification systems.
- 2.8 explain the visual checks and preparation requirements for components to be used in the electrical assembly activities.
- 2.9 describe the assembly methods and techniques to be used when mounting the electrical equipment, switchgear or control systems.
- 2.10 explain how the components are to be aligned and positioned prior to securing, and the tools and equipment that are used.
- 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.
- 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.
- 2.13 describe the methods of attaching identification markers/labels during the electrical assembly activities.

- 2.14 explain how to deal with components incorrectly assembled, damaged or having other faults.
- 2.15 explain the quality control procedures to be followed during the electrical assembly operations.
- 2.16 explain how to conduct any necessary checks to ensure the accuracy and quality of the assembly produced.
- 2.17 explain how to take electrostatic discharge (ESD) precautions, and why are they needed.
- 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.
- 2.19 describe the importance of ensuring that all tools are used correctly and within their permitted operating range.
- 2.20 describe the typical problems that can occur with the assembly operations, and the importance of informing appropriate people of any non-conformances.
- 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.
- 2.22 explain the extent of your own responsibility, and whom you should report to if you have problems that you cannot resolve.

# **Unit 017                    Assembling aircraft electrical components**

## **Supporting information**

### **Guidance**

2.1 (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)

2.6 (such as contactors, relays, circuit breakers/fuses, solenoids, switches, transformers, terminal blocks, sub-assemblies)

2.7 (such as component markers)

2.9 (such as soldering, crimping, heat shrinking, lacing/strapping of wires)

## Unit 018

## Making modifications to aircraft cableforms and looms

<b>UAN:</b>	D/601/4310
<b>Level:</b>	2
<b>Credit value:</b>	35
<b>GLH:</b>	77
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 18: Making modifications to aircraft cableforms and looms (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The cableforms and looms will include co-axial cable assemblies, heavy duty cable assemblies, aircraft system cable assemblies, secure speech cable assemblies, aircraft lighting assemblies, automatic flying control systems (AFCS) cable assemblies, and headset leads (mic-tel leads).</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the cableform/loom modification activities undertaken, and to report any problems with the activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials</p>

used in the modification of the cableforms are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.

The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate cableform modification techniques and procedures. The learner will understand the procedures and techniques for modifying the aircraft cableforms and looms, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the cableform/loom modification activities. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to make modifications to aircraft cableforms and looms
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the modification activities: <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> 1.3 obtain and follow the relevant modification specifications and job instructions. 1.4 confirm and agree what modifications are to be carried out to meet the specification. 1.5 prepare the cableforms and looms for the required modification. 1.6 carry out modifications to cableforms/looms for two of the following aircraft electrical systems: <ul style="list-style-type: none"> <li>• co-axial 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> 1.7 carry out four of the following modifications: <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> </ul>

<ul style="list-style-type: none"> <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> <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 co-axial 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>
<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>1.10 deal promptly and effectively with problems within your control and report those that cannot be solved.</p>

<b>Learning outcome</b>
The learner will:
2. Know how to make modifications to aircraft cableforms and looms
<b>Assessment criteria</b>

The learner can:

- 2.1 explain the specific safety precautions and procedures to be observed whilst carrying out the modifications to the cableforms and looms.
- 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.
- 2.3 describe the hazards associated with modifying aircraft cableforms and looms, and how they can be minimised.
- 2.4 describe the personal protective equipment and clothing to be worn during the modification activities.
- 2.5 explain the various types of drawing and specifications that are used during the cableform and loom modification.
- 2.6 explain how to identify the components to be used; component identification systems.
- 2.7 describe the preparations to be undertaken on the cableform/loom, prior to modification.
- 2.8 explain the methods and techniques to be used for soldering and de-soldering, and the importance of adhering to them.
- 2.9 explain the methods and techniques to be used for crimping and heat shrinking, and the importance of adhering to them.
- 2.10 explain the methods and techniques to be used for the assembly of screened and unscreened plugs and sockets.
- 2.11 explain how to identify the difference between composite and metal plugs and sockets.
- 2.12 describe the different types of cable protection, the reasons why each type would be used, and when.
- 2.13 explain the importance of using the specified cables and cable end fittings for the modification, and why they must not use substitutes.
- 2.14 explain the quality control procedures to be followed during the cableform/loom modification operations.
- 2.15 explain how to conduct the necessary checks to ensure the accuracy and quality of the modification.
- 2.16 explain the importance of ensuring that the completed and modified cableform/loom is free from damage.
- 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.
- 2.18 describe the problems that can occur with the modification operations, and how these can be overcome.
- 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.
- 2.20 describe the extent of your own responsibility, and whom you should report to if you have problems that you cannot resolve.

## **Unit 018**                      **Making modifications to aircraft cableforms and looms**

### Supporting information

#### **Guidance**

2.1 (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)

2.6 (such as codes and component orientation indicators)

## Unit 019

## Producing aircraft components using wet lay-up techniques

<b>UAN:</b>	H/601/4311
<b>Level:</b>	2
<b>Credit value:</b>	42
<b>GLH:</b>	151
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 19: Producing aircraft components using wet lay-up techniques (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the composite moulding activities undertaken, and to report any problems with the moulding activities, equipment or materials that they cannot personally resolve, or are outside your permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the moulding process are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p> <p>The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility</p>

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for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, you must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate wet lay-up techniques and procedures. The learner will understand the production procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the wet lay-up moulding activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to produce aircraft components using wet lay-up techniques
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the wet lay-up moulding activities: <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></ul>

- return all tools and equipment to the correct location on completion of the activities
  - leave the work area in a safe condition and free from foreign object debris.
- 1.3 prepare moulds and materials for the production activities, to include carrying out all of the following:
- checking that the tooling is correct and complete
  - cleaning of tooling and removal of resin build-ups
  - checking the tooling for surface defects
  - correctly applying sealants/release agents
  - obtaining correct materials for the activity
  - identifying and protecting materials in the work area
  - dispensing and applying the correct measure and mix of resin/catalyst.
- 1.4 follow the correct component drawing or any other related specifications for the component to be produced.
- 1.5 determine what has to be done and how this will be achieved.
- 1.6 obtain and prepare the appropriate tools, equipment and materials.
- 1.7 carry out the moulding or laying-up activities using the correct methods and techniques.
- 1.8 produce a range of mouldings, using two of the following application techniques:
- spray application of fibre/resin
  - application of a gel coat
  - brush application of fibre/resin
  - roller application of fibre/resin
  - removal of voids and air pockets
  - use of vacuum bagging
  - use of bleed plies.
- 1.9 produce a range of mouldings, incorporating one of the following in the lay-up:
- feathered joints
  - overlap joints
  - orientated plies
  - inserts
  - fixtures
  - butt joins.
- 1.10 produce a range of mouldings, incorporating two of the following shape features:
- internal corner
  - external corner
  - double curvature
  - concave surface
  - convex surface
  - vertical surface.
- 1.11 produce a range of mouldings, using all of the following:
- resin (such as polyester, epoxy, phenolic, vinyl ester)
  - fibre (such as glass, carbon, polyethylene, aramid)

<ul style="list-style-type: none"> <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> <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>
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<p><b>Learning outcome</b></p> <p>The learner will:</p> <p>2. Know how to produce aircraft components using wet lay-up techniques</p>
<p><b>Assessment criteria</b></p> <p>The learner can:</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.</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> <p>2.8 explain the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting</p>

- specification), and how to complete such documents.
- 2.9 explain the conventions and terminology used for wet lay-up techniques.
  - 2.10 describe the types of resin, fibre and reinforcement used, and their applications.
  - 2.11 describe the visual identification of both raw and finished composite materials.
  - 2.12 explain the methods of preparation for patterns, moulds and tooling.
  - 2.13 explain the mixing ratios for gel coats, resins additives and catalysts, and their associated working times.
  - 2.14 explain the methods used in the application of the resin/fibre during the lay-up activity.
  - 2.15 describe the tools and equipment used in the lay-up activities, and their care, preparation and control procedures.
  - 2.16 explain how to recognise faults that can occur during the lay-up process.
  - 2.17 describe the identification of defects in the composite moulding.
  - 2.18 explain how defects can be overcome during the lay-up activity.
  - 2.19 explain the procedures and methods used for removing mouldings from production tooling.
  - 2.20 explain the methods and techniques used to trim mouldings, prior to release.
  - 2.21 describe the care and safe handling of production tooling and composite mouldings throughout the production cycle.
  - 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.
  - 2.23 explain the procedure for the safe disposal of waste materials.
  - 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.
  - 2.25 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

## **Unit 019                      Producing aircraft components    using wet lay-up techniques**

### **Supporting information**

#### **Guidance**

2.5 (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)

2.9 (including resin and fibre weights/volumes, material orientation, material identification, material tailoring, mixing ratios, gel times, exotherm, bleed plies)

2.12 (including the correct use of surface sealers and release agents)

2.17 (such as de-lamination, voids, contaminants)

## Unit 020

## Producing aircraft components using pre-preg laminating techniques

<b>UAN:</b>	K/601/4312
<b>Level:</b>	2
<b>Credit value:</b>	42
<b>GLH:</b>	151
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 20: Producing aircraft components using pre-preg laminating techniques (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the pre-preg laminating activities undertaken, and to report any problems with the moulding activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people.</p> <p>The learner will need to ensure that all tools, equipment and materials used in the moulding process are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p>

The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate pre-preg laminating techniques and procedures. The learner will understand the production procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the pre-preg laminating activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to produce aircraft components using pre-preg laminating techniques
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the pre-preg laminating activities: <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 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> 1.3 follow the correct component drawing or any other related specifications for the component to be produced. 1.4 determine what has to be done and how this will be achieved. 1.5 obtain and prepare the appropriate tools, equipment and materials. 1.6 prepare moulds and materials for the production activities, to include carrying out all of the following: <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>

- 1.7 carry out the moulding or laying-up activities using the correct methods and techniques.
- 1.8 produce a range of mouldings, using techniques for two of the following types of production tool:
- metal
  - wet lay-up
  - glass pre-preg
  - tooling block
  - carbon pre-preg
  - female tooling
  - male tooling
  - multi-part tools
  - matched tooling
  - closed tooling.
- 1.9 produce composite mouldings incorporating one of the following in the lay-up:
- butt joins
  - overlap joins
  - staggered joins
  - orientated plies
  - inverted plies
  - inserts.
- 1.10 produce composite mouldings incorporating three of the following features:
- internal corners
  - external corners
  - flanges
  - double curvature
  - concave surface
  - convex surfaces
  - return surfaces
  - joggle details
  - nett edges.
- 1.11 use all of the following in the laying-up activities:
- resin (such as polyester, epoxy, phenolic, vinyl ester, bismaleimide, cyanate ester, acrylic)
  - fibre (such as glass, polyethylene, aramid, carbon, hybrid)
  - reinforcement (such as braids, roving, tapes, chopped strand, continuous filament, woven, uni-directional, knitted, multi-axis)
  - core materials (such as solid timber, end grain balsa, expanding core, syntactic core, coremat, structural foam, honeycomb).
- 1.12 use one of the following for applying temperature during the cure cycle:
- oven
  - heated tools/moulds
  - autoclave
  - heated press.

- 1.13 use one of the following for applying pressure during the cure cycle:
- pressure bags
  - vacuum bags
  - thermal mould expansion
  - fibre tensioning.
- 1.14 check that all the required operations have been completed to specification.
- 1.15 produce components to the required specifications.
- 1.16 produce a range of mouldings in compliance with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.17 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- production documentation
  - quality control documentation
  - records of equipment settings
  - other specific records.
- 1.18 deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to produce aircraft components using pre-preg laminating techniques
<b>Assessment criteria</b>
The learner can: 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. 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. 2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others. 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables. 2.5 describe the specific workshop environmental conditions that must be observed when producing aircraft composite mouldings. 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. 2.7 explain how to interpret imperial and metric systems of measurement. 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. 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). 2.10 describe the different types of resin systems, fibres, reinforcements, and their applications. 2.11 explain how to build up laminates (including orientation and balance of plies to minimise spring and distortion in composite mouldings). 2.12 describe the different core, insert and filler materials used, and their applications. 2.13 describe the visual identification of both raw and finished composite materials, and the identification of materials by product codes. 2.14 explain the methods of preparation for patterns, moulds and tooling. 2.15 describe the correct methods of storage, thawing and handling of pre-preg materials. 2.16 explain the methods used in the application of pre-preg materials to tooling surfaces. 2.17 explain the mixing ratios for resins and catalysts, and the associated working times for two-part resin systems. 2.18 describe the correct methods of storage and handling of ancillary

and consumable materials.

- 2.19 explain the tools and equipment used in the pre-preg laminating activities, and their care, preparation and control procedures.
- 2.20 explain how to recognise faults that can occur during the moulding process.
- 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.
- 2.22 explain the need for monitoring the cure cycle, using thermocouples, probes, chart recorders, thermometers and data logs.
- 2.23 explain the procedures and methods used for removing mouldings from production tooling.
- 2.24 explain the care and safe handling of production tooling and composite mouldings throughout the production cycle.
- 2.25 explain the procedure for the safe disposal of waste materials.
- 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.
- 2.27 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

## **Unit 020                    Producing aircraft components    using pre-preg laminating    techniques**

### **Supporting information**

#### **Guidance**

2.5 (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)

2.14 (including the correct selection and use of surface sealers and release agents)

2.15 (including monitoring temperature, storage life and 'out-life')

2.16 (including methods of tailoring and cutting)

## Unit 021

## Producing aircraft components using resin infusion techniques

<b>UAN:</b>	T/601/4314
<b>Level:</b>	2
<b>Credit value:</b>	42
<b>GLH:</b>	151
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 21: Producing aircraft components using resin infusion techniques (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the resin infusion moulding activities undertaken, and to report any problems with the moulding activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the moulding process are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p>

The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate resin infusion techniques and procedures. The learner will understand the production procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the resin infusion moulding activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to produce aircraft components using resin infusion techniques
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following activities during the resin infusion laminating activities: <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 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> 1.3 prepare moulds and materials for the production activities, to include carrying out all of the following: <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>

- 1.4 follow the correct component drawing or any other related specifications for the component to be produced.
- 1.5 determine what has to be done and how this will be achieved.
- 1.6 obtain and prepare the appropriate tools, equipment and materials.
- 1.7 carry out the moulding or laying-up activities using the correct methods and techniques.
- 1.8 produce composite mouldings, using two of the following resin infusion methods:
  - interlaminar distribution
  - core channel distribution
  - surface distribution
  - pre-catalysed resin films
- 1.9 and applying two of the following techniques:
  - trial runs/tracking
  - full scale runs
  - repairs
  - dry area rectification
  - vacuum regulation
  - resin flow regulation.
- 1.10 produce composite mouldings, incorporating two of the following in the lay-up:
  - feathered joins
  - butt joins
  - overlap joins
  - staggered joins
  - orientated plies
  - inverted plies
  - inserts
  - fixtures.
- 1.11 produce composite mouldings, incorporating three of the following shape features:
  - internal corners
  - external corners
  - double curvature
  - concave surface
  - convex surfaces
  - return surfaces
  - joggle details
  - nett edges
  - flanges.
- 1.12 produce a range of mouldings using all of the following:
  - resin (such as polyester, epoxy, phenolic, vinyl ester, bismaleimide, cyanate ester, acrylic)
  - fibre (such as glass, carbon, polyethylene, aramid, hybrid)
  - reinforcement (such as braids, roving, tapes, chopped strand, continuous filament, woven, uni-directional, knitted, multi-axis)
  - core material (such as solid timber, end grain balsa, expanding core, syntactic core, coremat, structural foam, honeycomb).
  -

1.13 produce composite mouldings, using techniques for three types of resin distribution media:

- interlaminar
- channelled core
- meshes
- mats/fabrics
- peel ply
- perforated hose
- spiral wrap
- braid
- flow channels
- manifolds
- networks
- bleed plies
- breather fabric.

1.14 use three of the following vacuum bagging processes/methods:

- check vacuum integrity
- use of vacuum fittings
- surface bagging
- envelope bagging
- internal bagging
- pleats and trucks
- reusable bagging
- leak detection
- leak rectification
- catch pots/tanks
- localised resin injection
- release and breather plies.

1.15 produce a range of mouldings in compliance with one of the following standards:

- Civil Aviation Authority (CAA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- ISO 9000 series and procedures
- customer standards and requirements
- company standards and procedures.

1.16 check that all the required operations have been completed to specification.

1.17 produce components to the required specifications.

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

- production documentation
- quality control documentation
- records of equipment settings
- other specific records.

1.19 deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to produce aircraft components using resin infusion techniques
<b>Assessment criteria</b>
The learner can: 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. 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. 2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others. 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables. 2.5 describe the specific workshop environmental conditions that must be observed when producing aircraft composite mouldings. 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. 2.7 explain how to interpret imperial and metric systems of measurement. 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. 2.9 explain the conventions and terminology used for resin infusion laminating techniques. describe the different types of resin systems, fibres, reinforcements, and their applications. 2.11 describe the building up laminates. 2.12 explain the different core, insert and filler materials used, and their applications. 2.13 describe the visual identification of both raw and finished composite materials, and the identification of materials by product codes. 2.14 explain the methods of preparation for patterns, moulds and tooling. 2.15 explain the correct methods of storage, thawing and handling of composite materials. 2.16 explain the methods used in the application of composite materials to tooling surfaces. 2.17 explain the methods for handling, preparation and application of the reinforcing fibres and fabrics. 2.18 explain the different types of resin distribution media, and the methods used in the positioning and application of the resin distribution media. 2.19 explain the mixing ratios for resins and catalysts, and the associated working times for two-part resin systems.

- 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.
- 2.21 explain the need for monitoring the cure cycle, using thermocouples, probes, chart recorders, thermometers and data logs.
- 2.22 describe the tools and equipment used in the resin infusion laminating activities, and their care, preparation and control procedures.
- 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).
- 2.24 describe the procedures and methods used for removing mouldings from production tooling.
- 2.25 explain the care and safe handling of production tooling and composite mouldings throughout the production cycle.
- 2.26 explain the procedure for the safe disposal of waste materials.
- 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.
- 2.28 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

## **Unit 021                      Producing aircraft    components using resin    infusion techniques**

### **Supporting information**

#### **Guidance**

2.5 (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)

2.9 (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)

2.11 (including orientation and balance of plies to minimise spring and distortion in composite mouldings)

2.14 (including the correct selection and use of surface sealers and release agents)

2.15 (including monitoring temperature, storage life and 'out-life')

2.16 (including methods of tailoring and cutting)

## Unit 022

## Producing aircraft components by acrylic moulding

<b>UAN:</b>	A/601/4315
<b>Level:</b>	2
<b>Credit value:</b>	32
<b>GLH:</b>	130
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 22: Producing aircraft components by acrylic moulding (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the acrylic moulding activities undertaken, and to report any problems with the moulding activities, equipment or materials that they cannot personally resolve, or are outside your permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the moulding process are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p> <p>The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and</p>

accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate acrylic moulding techniques and procedures. The learner will understand the production procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the acrylic moulding activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to produce aircraft components by acrylic moulding
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the acrylic moulding activities: <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> 1.3 follow the correct component drawing or any other related specifications for the component to be produced. 1.4 determine what has to be done and how this will be achieved. 1.5 obtain and prepare the appropriate tools, equipment and materials. 1.6 carry out the moulding or laying-up activities using the correct methods and techniques. 1.7 carry out one of the following acrylic moulding techniques: <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> 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:
- box sections
  - cylindrical section
  - convex shapes
  - concave shapes
  - single curvatures
  - double curvatures.
- 1.10 check that all the required operations have been completed to specification.
- 1.11 produce components to the required specification.
- 1.12 produce a range of acrylic mouldings which comply with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- production documentation
  - quality control documentation
  - records of machine settings
  - other specific records.
- 1.14 deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to produce aircraft components by acrylic moulding
<b>Assessment criteria</b>
The learner can: 2.1 explain the specific safety practices and procedures that you need to observe when working with acrylics. 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. 2.3 describe the protective equipment that they need to use for both personal protection and, where appropriate, the protection of others. 2.4 describe the hazards associated with moulding acrylic materials, and with the tools and equipment used, and how these hazards can be minimised. 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. 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. 2.7 explain how to interpret imperial and metric systems of measurement. 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. 2.9 describe the supply of acrylic sheet. 2.10 explain the sheet profiling procedures, and material trimming methods/procedures. 2.11 describe the methods of sheet trimming and sheet cleaning prior to moulding. 2.12 describe the material cleaning methods and procedures to be applied. 2.13 explain the principles of deep drawing, concave/convex moulding, positive pressure moulding and stress relieving. 2.14 explain the different methods of heating acrylic materials, and the temperature control methods. 2.15 explain the use of forming aids. 2.16 explain the preparation methods and procedures applied to the moulding surface. 2.17 explain the methods and techniques for lifting, handling and supporting the components/equipment/materials during the moulding activities. 2.18 explain how to recognise moulding defects. 2.19 describe the tools and equipment used in the moulding activities, and their calibration, care, preparation and control procedures. 2.20 describe the problems that can occur with the moulding operations, and how these can be overcome. 2.21 describe the care and safe handling of production tooling and

- acrylic mouldings throughout the production cycle.
- 2.22 explain the procedure for the safe disposal of waste materials.
  - 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.
  - 2.24 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

## **Unit 022                      Producing aircraft    components by acrylic    moulding**

### **Supporting information**

#### **Guidance**

2.1 (including any specific legislation, regulations/codes of practice for the activities, equipment or materials used)

2.9 (such as colour, thickness, sheet size, surface texture, material protection)

2.18 (such as misalignment, distortion, damage, contamination and surface defects)

## Unit 023

## Producing aircraft components by vacuum forming

<b>UAN:</b>	J/601/4317
<b>Level:</b>	2
<b>Credit value:</b>	32
<b>GLH:</b>	130
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 23: Producing aircraft components by vacuum forming (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the vacuum forming activities undertaken, and to report any problems with the forming activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the forming are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p> <p>The learner will be expected to work either with a high level of supervision or as a member of a</p>

team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate vacuum forming techniques and procedures. The learner will understand the production procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the vacuum forming activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to produce aircraft components by vacuum forming
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the vacuum forming activities: <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> <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> 1.3 confirm that the equipment is set up correctly and is ready for use. 1.4 use two of the following types of equipment: <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> 1.5 manipulate the machine controls safely and correctly in line with operational procedures. 1.6 carry out three of the following operations: <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>

- 1.7 produce a range of components with two of the following features:
  - double curvatures
  - male shapes
  - female shapes
  - stiffened mouldings.
- 1.8 produce a range of components using one the following materials:
  - thermoplastic sheet (such as polycarbonate, polysulphone, acrylic, polyvinyl chloride (PVC), ABS)
  - fibre-reinforced thermoplastic sheet
  - structural foams (such as polyvinyl chloride (PVC), polymethate (Rohacell)).
- 1.9 carry out quality sampling checks at suitable intervals.
- 1.10 produce components to the required specification.
- 1.11 deal promptly and effectively with problems within your control and report those that cannot be solved.
- 1.12 shut down the equipment to a safe condition on conclusion of the machining activities.
- 1.13 produce aircraft components which comply with one of the following standards:
  - Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
  - production documentation
  - quality control documentation
  - records of machine settings
  - other specific records.

<b>Learning outcome</b>
The learner will: 2. Know how to produce aircraft components by vacuum forming
<b>Assessment criteria</b>
The learner can: 2.1 describe specific safety practices and procedures that they need to observe when working with vacuum forming equipment. 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. 2.3 describe the protective equipment that they need to use for both personal protection and, where appropriate, the protection of others. 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. 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. 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. 2.7 explain how to interpret imperial and metric systems of measurement. 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. 2.9 explain the supply of material in sheet form. 2.10 explain the sheet profiling procedures, and material trimming methods/procedures. 2.11 describe the methods of sheet cleaning, prior to forming. 2.12 describe the preparation methods and procedures applied to the moulding surface. 2.13 explain the identification of the correct male/female mould tooling. 2.14 explain the methods and techniques of loading and aligning materials into the mould tooling. 2.15 explain the methods and techniques for carrying out the de-moulding procedures. 2.16 explain how to recognise vacuum forming defects. 2.17 explain the importance of adhering to the vacuum forming cycle. 2.18 explain the quality control procedures to be followed during the vacuum forming operations. 2.19 describe the tools and equipment used in the vacuum forming activities, and their care, preparation and control procedures.

- 2.20 describe the problems that can occur with the vacuum forming operations, and how these can be overcome.
- 2.21 explain the procedure for the safe disposal of waste materials.
- 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.
- 2.23 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

**Unit 023**                      **Producing aircraft  
components by vacuum  
forming**

Supporting information

**Guidance**

2.1 (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)

2.9 (such as colour, thickness, sheet size, surface texture, material protection)

2.16 (such as misalignment, distortion, damage, contamination and surface defects)

## Unit 024

## Producing aircraft components by injection moulding

<b>UAN:</b>	R/601/4319
<b>Level:</b>	2
<b>Credit value:</b>	32
<b>GLH:</b>	130
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 24: Producing aircraft components by injection moulding (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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. The learner will be required to operate the injection moulding machine, in line with safe working practices and approved procedures, and to continuously monitor the moulding operations, making any necessary adjustments to settings in order to ensure that the work output is to the required quality and accuracy.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the injection moulding activities undertaken, and to report any problems with the moulding activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the moulding process are correctly accounted for on completion of the activities, and they</p>

must complete all necessary job/task documentation accurately and legibly.

The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate injection moulding techniques and procedures. The learner will understand the moulding procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the injection moulding activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

Setting up of the plastic injection-moulding machine, its tooling and associated delivery/collection mechanisms, is the subject of another unit.

<b>Learning outcome</b>
The learner will: 1. Be able to produce aircraft components by injection moulding
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 follow the correct component drawing or any other related specifications for the component to be produced. 1.3 determine what has to be done and how this will be achieved. 1.4 obtain and prepare the appropriate tools, equipment and materials. 1.5 prepare for the plastic injection moulding operations, to include carrying out all of the following: <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) 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> <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> 1.6 check the injection moulding machine, to include carrying out all of the following: <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> <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> </ul>

- checking that all machine controls are operational.
- 1.7 carry out the moulding or laying-up activities using the correct methods and techniques.
- 1.8 produce plastic injection mouldings, using two of the following types of mould tools:
- two-plate tools
  - three-plate tools
  - combination/composite tools
  - split tools
  - unscrewing tools.
- 1.9 produce injection mouldings from two of the following types of material:
- acrylonitrile-butadiene-styrene (ABS)
  - nylon
  - polyethylethylketone
  - polyarylene sulphide
  - short fibre reinforced polymers up to 30% by volume
  - polycarbonate
  - polypropylene
  - polystyrene
  - polyethylene
  - acetal
  - other specific material.
- 1.10 produce a range of components with two of the following features:
- flat planks/test pieces
  - double curvatures
  - female shapes
  - multi faceted
  - internal cavities
  - male shapes
  - other specific features.
- 1.11 check that all the required operations have been completed to specification.
- 1.12 carry out a visual inspection and segregation of the mouldings, according to company procedures, to include two of the following:
- mouldings which meet the required specification
  - mouldings which have defects
  - mouldings that require further investigation.
- 1.13 monitor the moulding operations, and make adjustments to the machine settings to deal with two of the following:
- flashing
  - short shot
  - distortion
  - burning
  - colour deviation.
- 1.14 produce components to the required specification.
- 1.15 complete the relevant documentation, to include two of the following:
- production documentation

- quality control documentation
- records of machine settings
- other specific records.

1.16 produce plastic injection mouldings which comply with one of the following standards:

- Civil Aviation Authority (CAA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- ISO 9000 series and procedures
- customer standards and requirements
- company standards and procedures.

1.17 deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to produce aircraft components by injection moulding
<b>Assessment criteria</b>
The learner can: 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. 2.2 explain the emergency procedures that are in place to deal with a machine malfunction when operating injection moulding machines. 2.3 describe the safety mechanisms on the machine, and the procedure for checking that they function correctly. 2.4 explain the operation of the machine controls in both hand and power modes, and how to stop the machine in an emergency. 2.5 explain the COSHH regulations relating to the materials used in the injection moulding activities. 2.6 describe the personal protective equipment (PPE) that should be used during the injection moulding activities, and how to obtain it. 2.7 explain how to obtain the necessary job instructions for the production operations, and how to interpret the information. 2.8 describe the basic parts and functions of plastic injection moulding machines and moulds. 2.9 explain the various types of mould tools that are used, and their typical applications. 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. 2.11 describe the different types of component delivery/collection systems that are used on plastic injection moulding machines. 2.12 describe the various machine operating parameters that may require adjusting during the injection moulding activities, and how these are achieved. 2.13 explain the effects that changes to these settings will have on the quality of the components produced. 2.14 describe the different types of materials used in the plastic injection moulding process. 2.15 describe the preparations to be carried out on the materials in order to ensure that the completed components meet the required specification. 2.16 explain the temperature range of the material being moulded and the mould being used. 2.17 explain the methods of checking the finished mouldings to ensure that they are to the required specification. 2.18 describe the identification of moulding defects, their causes, and methods of prevention. 2.19 explain how to make adjustments to machine settings to deal with such things as flashing, short shot, distortion and colour problems. 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.

- 2.21 describe the problems that can occur with the injection moulding activities, and how these can be overcome.
- 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.
- 2.23 explain the procedure for the safe disposal of waste materials.
- 2.24 explain the production documentation to be completed for the injection moulding activities undertaken.
- 2.22 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.

**Unit 024**                      **Producing aircraft  
components by injection  
moulding**

Supporting information

**Guidance**

2.5 (such as mould sprays, mould lubricants and moulding materials)

2.8 (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)

2.12 (such as temperature, pressure, speed/timings and distance)

## Unit 025

## Assembling aircraft composite components

<b>UAN:</b>	Y/601/4323
<b>Level:</b>	2
<b>Credit value:</b>	42
<b>GLH:</b>	151
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 25: Assembling aircraft composite components (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the composite assembly activities undertaken, and to report any problems with the assembly activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the assembly are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p> <p>The learner will be expected to work either with</p>

a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate composite assembly techniques and procedures. The learner will understand the assembly procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the composite assembly activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to assemble aircraft composite components
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 follow the relevant instructions, assembly drawings and any other specifications. 1.3 carry out all of the following during the aircraft composite assembly activities: <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> <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> 1.4 ensure that the specified components are available and that they are in a usable condition. 1.5 use the appropriate methods and techniques to assemble the components in their correct positions. 1.6 produce one of the following types of composite assembly: <ul style="list-style-type: none"> <li>• one-off assemblies</li> <li>• batch assemblies</li> <li>• assembly line.</li> </ul> 1.7 produce aircraft composite assemblies that incorporate two of the following features: <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>

- 1.8 produce aircraft composite assemblies that require two of the following methods to be used:
- fettling
  - pinning
  - clamping
  - trial fitting
  - aligning
  - assembly jigs.
- 1.9 produce aircraft composite assemblies that use one of the following joining methods:
- thread inserts
  - quick-release fasteners
  - rivets
  - mechanical fasteners
  - anchor nuts
  - adhesives.
- 1.10 assemble aircraft composite components which include two of the following:
- trim
  - closing panels
  - housings
  - consoles
  - core materials
  - casings and covers
  - aerodynamic components
  - tubes
  - sections
  - inserts
  - sandwich panels
  - structural
  - galley units
  - airframe components
  - moulds
  - jigs
  - tanks
  - other specific components.
- 1.11 secure the components using the specified connectors and securing devices.
- 1.12 produce assemblies which include one of the following non-composite components:
- brackets
  - fixtures
  - fittings
  - trim
  - tapes
  - memory foam
  - films.

- 1.13 carry out quality and accuracy checks during assembly, which include all of the following:
- cosmetic appearance
  - component orientation
  - security of joints
  - accuracy of joint lines
  - excess adhesives
  - freedom from damage.
- 1.14 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification.
- 1.15 produce assemblies which comply with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.16 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- production documentation
  - quality control documentation
  - build records
  - other specific records.
- 1.17 Deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to assemble aircraft composite components
<b>Assessment criteria</b>
The learner can: 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. 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. 2.3 describe the protective equipment that they need to use for both personal protection and, where appropriate, protection of others. 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables. 2.5 describe the specific workshop environmental conditions that must be observed when producing aircraft composite assemblies. 2.6 explain how to use and extract information from engineering drawings and related specifications, in relation to work undertaken. 2.7 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing. 2.8 explain the use of and conventions/terminology used in composite assembly. 2.9 explain the types of component trimming/cutting methods and preparation methods available. 2.10 explain the methods of achieving consolidation at joining/laying-up points. 2.11 explain the methods of assembling composite components using mechanical methods. 2.12 explain the procedures for selecting the correct type of adhesive, and the pre-treatment requirements. 2.13 explain the procedures for composite riveting/drilling, and the effect of using percussion or squeeze riveting. 2.14 explain the methods and techniques for lifting, handling and supporting the components/equipment/materials during the assembly activities. 2.15 explain the quality control procedures to be followed during the assembly operations. 2.16 describe the recognition of jointing defects. 2.17 describe the tools and equipment used in assembly activities, and their care, preparation and control procedures. 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. 2.19 describe the things that can go wrong with the assembly activities, and how they can be avoided. 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.

2.21 explain the procedure for the safe disposal and correct separation of waste materials.

2.22 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

# **Unit 025                    Assembling aircraft composite components**

## **Supporting information**

### **Guidance**

2.5 (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)

2.6 (to include symbols and conventions to appropriate BS or ISO Standards)

2.11 (such as screw fasteners, rivets, special purpose fittings)

2.16 (such as misalignment, distortion, foreign object damage, contamination and surface defects)

## Unit 026

## Carrying out trimming operations on aircraft composite components

<b>UAN:</b>	D/601/4324
<b>Level:</b>	2
<b>Credit value:</b>	32
<b>GLH:</b>	130
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 26: Carrying out trimming operations on aircraft composite components (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the composite trimming activities undertaken, and to report any problems with the trimming activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the trimming are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p>

The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate composite trimming techniques and procedures. The learner will understand the trimming procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the composite trimming activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to carry out trimming operations on aircraft composite components
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the composite trimming activities: <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 dispose of waste items and materials in a safe and</li> </ul>

- environmentally acceptable manner, in line with company procedures
- return all tools and equipment to the correct location on completion of the activities
  - leave the work area in a safe condition and free from foreign object debris.
- 1.3 follow relevant specifications for the component to be produced.
- 1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition.
- 1.5 carry out all of the following when preparing for the trimming activity:
- check that the moulding is correct and complete
  - check for any defects in the moulding
  - identify and protect the moulding in the work area.
- 1.6 shape the materials using appropriate methods and techniques.
- 1.7 mark out mouldings, using four of the following methods:
- scriber
  - height gauge
  - moulded scribe lines
  - centre punch
  - trimming templates.
- 1.8 trim mouldings, using one the following methods:
- cutting wheels/discs
  - saws
  - routers
  - trim jigs.
- 1.9 sand mouldings, using two of the following methods:
- rubbing blocks
  - diamond files
  - pencil grinders
  - disc sanders
  - belt sanders.
- 1.10 use a hand drill or pedestal drill to drill mouldings, using two of the following:
- drill jigs
  - hole saws
  - counterbore tools
  - countersink tools
  - drill bits.
- 1.11 polish mouldings, using three of the following methods:
- wet sanding
  - cutting compound
  - polishing compound
  - rubbing block
  - orbital sander
  - polisher.
  -

- 1.12 trim mouldings, using appropriate techniques for both of the following:
- resins (such as polyester, vinyl ester, epoxy, phenolic, bismaleimide, cyanate ester, acrylic)
  - fibres (such as polyethylene, glass, aramid, carbon, hybrid).
- 1.13 trim mouldings that require, or incorporate, five of the following features:
- straight edges
  - curved edges
  - flat surfaces
  - polished surfaces
  - shaped surfaces
  - radius corners
  - returns
  - nett edges
  - joggle details
  - removal of join lines
  - holes
  - multiple hole sizes
  - countersinks
  - counterbores
  - further lay-up stages
  - inserts to be drilled
  - inserts to be tapped
  - solid cores
  - honeycomb cores
  - edge filling.
- 1.14 check that all the required shaping operations have been completed to the required specification.
- 1.15 ensure that trimmed mouldings comply with one of the following quality and accuracy standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.16 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- production documentation
  - quality control documentation
  - build records
  - other specific records.
  - deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to carry out trimming operations on aircraft composite components
<b>Assessment criteria</b>
The learner can: 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. 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. 2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others. 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables. 2.5 describe the specific workshop environmental conditions that must be observed when trimming aircraft composite mouldings. 2.6 explain how to use and extract information from engineering drawings and related specifications, in relation to work undertaken. 2.7 explain how to interpret drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing. 2.8 explain how to prepare for the trimming activities, and how to mark out the mouldings for the material to be removed. 2.9 explain the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification, etc). 2.10 explain the conventions and terminology used for trimming activities. 2.11 describe the visual identification of cured composite materials. 2.12 explain how to identify defects in composite mouldings. 2.13 describe the methods used in the trimming of composite mouldings. 2.14 describe the different types of manual and power tools used in composite trimming operations. 2.15 describe the different types of cutting tools and abrasives used in trimming composite materials, and their application. 2.16 describe the procedure for the safe disposal of waste materials. 2.17 explain the care and safe handling of composite mouldings throughout the trimming cycle. 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. 2.19 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

## **Unit 026**

# **Carrying out trimming operations on aircraft composite components**

## Supporting information

### **Guidance**

2.5 (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)

2.6 (to include symbols and conventions to appropriate BS or ISO Standards)

2.10 (such as scribe lines, sanding grades, types of cutting tools, speeds)

## Unit 027

## Carrying out bonding operations on aircraft composite components

<b>UAN:</b>	T/601/4328
<b>Level:</b>	2
<b>Credit value:</b>	23
<b>GLH:</b>	95
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 27: Carrying out bonding operations on aircraft composite components (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the composite bonding activities undertaken, and to report any problems with the bonding activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner need to ensure that all tools, equipment and materials used in the bonding process are correctly accounted for on completion of the activities, and their must complete all necessary job/task documentation accurately and legibly.</p>

The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate composite bonding techniques and procedures. The learner will understand the bonding procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the composite bonding activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to carry out bonding operations on aircraft composite components
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the composite bonding activities: <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 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> <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> 1.3 follow the relevant bonding procedure specification and job instructions. 1.4 check that the materials to be bonded and bonding agents comply with the specification. 1.5 prepare the surfaces to be bonded, using three of the following methods: <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>

- 1.6 correctly prepare the parent materials and bonding agents in line with the bonding specification.
- 1.7 carry out the bonding operations using the specified processes and techniques to position and bond the materials in their correct locations.
- 1.8 bond composite mouldings, using techniques for two of the following:
  - one-part pastes
  - two-part pastes
  - contact two-part adhesives
  - film adhesives
  - acrylics
  - syntactic films.
- 1.9 use two of the following methods when bonding the composite mouldings:
  - dry fitting
  - bonding sequences
  - shimming materials
  - mixing adhesives
  - wetting-out by brush
  - applicator gun
  - laying film adhesives
  - spraying equipment.
- 1.10 use one of the following to retain the bond during the curing process:
  - weighting down
  - bonding jigs
  - pinning joints
  - clamping
  - press
  - vacuum bagging
  - pressure bagging.
- 1.11 ensure that any equipment used to maintain surface contact during the bonding activities is set up and used correctly.
- 1.12 use one of the following to aid the curing process:
  - oven
  - self-heating tooling
  - infra-red lamps
  - heated presses
  - autoclaves
  - controlled heating mats.
- 1.13 bond composite mouldings, using techniques for one of the following:
  - sandwich panels
  - butt joins
  - overlap joins
  - joggle joins
  - return joins.

- 1.14 bond composite mouldings, using techniques for two of the following:
- flat surfaces
  - convex/concave shapes
  - double curvatures
  - internal surfaces
  - external surfaces.
- 1.15 use appropriate techniques for bonding one of the following materials to the composite moulding:
- other composites
  - metals
  - ceramics
  - plastics
  - wood-based materials.
- 1.16 bond composite mouldings, using adhesives suitable for both of the following:
- resins (such as polyester, epoxy, phenolic, bismaleimide, cyanate ester, vinyl ester, acrylic)
  - fibres (such as polyethylene, glass, aramid, carbon, hybrid, other specific types).
- 1.17 achieve bonds of the required quality and within the specified dimensional accuracy.  
bond a range of mouldings, in compliance with one of the following standards:
- Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.19 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- production documentation
  - quality control documentation
  - build records
  - other specific records.
- 1.20 deal promptly and effectively with problems within your control and report those that cannot be solved.

<b>Learning outcome</b>
The learner will: 2. Know how to carry out bonding operations on aircraft composite components
<b>Assessment criteria</b>
The learner can: 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. 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. 2.3 explain the importance of good workshop practice and house keeping; ventilation and fume control equipment; first aid procedures and actions. 2.4 describe the personal protective clothing and equipment to be worn when carrying out bonding activities and, where appropriate, for the protection of others. 2.5 explain the application of COSHH regulations in relation to the storage, use and disposal of bonding/composite materials and consumables. 2.6 describe the specific workshop environmental conditions that must be observed when bonding aircraft composite materials. 2.7 explain how to use and extract information from engineering drawings and related specifications, in relation to work undertaken. 2.8 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing. 2.9 explain the conventions and terminology used for bonding. 2.10 explain the methods of preparing components and producing a keying surface. 2.11 explain the importance of working to organisational and bonding agent manufacturers' instructions whilst carrying out the bonding activities. 2.12 explain the effects of the environment on the bonding process. describe the methods and techniques used for bonding the materials. 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. 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. 2.16 explain the bonding agent equipment. 2.17 describe the methods of application for different bonding agents. 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. 2.19 explain how to check that completed joints are firm, sound and fit for purpose. 2.20 describe the procedures for applying bonding pressures to the joints during the curing cycle.

- 2.21 describe the procedures for cleaning off surplus adhesive and tidying up the appearance of joints.
- 2.22 describe the procedures when temperature cure is used, and the need for thermocouples on temperature control.
- 2.23 describe the common causes of defects associated with the bonding processes, and how to avoid them.
- 2.24 describe the tools and equipment used in bonding activities, and their care, preparation and control procedures.
- 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.
- 2.26 explain the quality control procedures to be followed during the bonding operations.
- 2.27 explain the procedure for the safe disposal and correct separation of waste materials.
- 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.
- 2.29 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

## Unit 027

# Carrying out bonding operations on aircraft composite components

## Supporting information

### Guidance

2.4 (such as gloves, eye protection, respiratory protection, etc)

2.6 (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)

2.7 (to include symbols and conventions to appropriate BS or ISO standards)

2.9 (such as gel points, cure times, bond thickness, bond strength, peel strength)

2.10 (such as water and solvent cleaning, degreasing, abrading, acid etching, priming)

2.12 (such as temperature, humidity, cleanliness)

2.13 (such as gluing, impact, chemical and thermal reaction techniques, bagging and positive pressure techniques)

2.16 (such as holding vessels, brushes, stirrers and spatulas, scrapers, knives, clamps and weights)

2.19 (such as types of failure mode, effect of poor pressure application, the effect of inadequate curing)

## Unit 028

## Carrying out repairs to aircraft composite mouldings

<b>UAN:</b>	A/601/4332
<b>Level:</b>	2
<b>Credit value:</b>	42
<b>GLH:</b>	151
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 28: Carrying out repairs to aircraft composite mouldings (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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. The learner's responsibilities will require them to comply with organisational policy and procedures for the composite repair activities undertaken, and to report any problems with the repair activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the repair are correctly accounted for on completion of the activities, and they must</p>

complete all necessary job/task documentation accurately and legibly. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate composite repair techniques and procedures. The learner will understand the repair procedures and techniques used, and will know about the tools and techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the composite repair activities, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

**Learning outcome**

The learner will:

- 1. Be able to carry out repairs to aircraft composite mouldings

**Assessment criteria**

The learner can:

- 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines.
- 1.2 carry out all of the following during the composite repair activities:
  - ensure that you have the correct documentation for the repair operations (such as drawings, job instructions, aircraft standards)
  - adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
  - obtain the correct tools and equipment for the activity, and check that they are in a safe and usable condition
  - identify what needs to be repaired, and the method of repair to be used
  - correctly prepare the materials for the repair activities
  - apply appropriate and safe repair techniques at all times dispose of waste items and materials in a safe and environmentally acceptable manner, in line with company procedures
  - return all tools and equipment to the correct location on completion of the activities
  - leave the work area in a safe condition and free from foreign object debris.
- 1.3 follow the relevant specifications for the component to be repaired.
- 1.4 repair defects in three of the following types of aircraft composite mouldings:
  - trim
  - closing panels
  - housings
  - consoles
  - casings and covers
  - aerodynamic components
  - tubes
  - sections
  - sandwich panels
  - structural
  - galley units
  - tanks
  - moulds
  - jigs
  - airframe components
  - other specific components.

- 1.5 prepare the component for repair.
- 1.6 repair defects in aircraft composite mouldings, using three of the following methods:
- localised curing
  - fettling
  - surface filling
  - colour matching
  - relieving distortion
  - separation of bonds
  - bonding
  - polishing
  - resin injection
  - wet-lay patching
  - pre-preg patching
  - osmosis
  - core patching
  - insert/core potting
  - repair patches/kits
  - laminating.
- 1.7 repair defects in aircraft composite mouldings, using techniques and materials applicable to both of the following:
- resins (such as polyester, vinyl ester, epoxy, phenolic, bismaleimide, cyanate ester, acrylic)
  - fibres (such as polyethylene, glass, aramid, carbon, hybrid materials).
- 1.8 repair five of the following types of defect in aircraft composite mouldings:
- incomplete curing
  - dimensional
  - surface finish
  - distortion
  - cosmetic can be filled
  - hole damage (access from both sides)
  - blisters
  - bridging
  - de-lamination
  - broken fibres
  - fractures
  - voids
  - dis-bonds
  - dents or 'dings'
  - excessive adhesive
  - gouges
  - hole damage (external access only)
  - damaged cores
  - wrong inserts
  - incorrect insert positions
  - impact damage

- abrasion/erosion.
- 1.9 carry out the repairs within agreed timescale using approved materials and components and methods and procedures.
- 1.10 carry out repairs to composite mouldings, which comply with one of the following standards:
- Civil Aviation Authority (CAA )
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.11 ensure that the repaired component meets the specified operating conditions.
- 1.12 produce accurate and complete records of all repair work carried out.
- 1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
- repair documentation
  - quality control documentation
  - build records
  - other specific records.

<b>Learning outcome</b>
The learner will: 2. Know how to carry out repairs to aircraft composite mouldings
<b>Assessment criteria</b>
The learner can: 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. 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. 2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others. 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables. 2.5 describe the specific workshop environmental conditions that must be observed when bonding aircraft composite materials. 2.6 explain how to use and extract information from engineering drawings and related specifications, in relation to work undertaken. 2.7 explain how to carry out currency/issue checks of the specifications you are working with 2.8 explain the quality procedures used in the workplace to ensure that repairs are carried out satisfactorily. 2.9 explain the conventions and terminology used when repairing composite mouldings. 2.10 describe the different types of composite resin systems, fibres and reinforcements, and the repair techniques that can be used. 2.11 describe the methods of preparing the mouldings for the repair to be carried out. 2.12 describe the various bonding agents and methods used. 2.13 explain the correct methods for storage and handling of composite materials. 2.14 describe the tools and equipment used for the various activities associated with repairing composite mouldings. 2.15 explain the procedure for the safe disposal and correct separation of waste materials. 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. 2.17 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

## **Unit 028**

## **Carrying out repairs to aircraft composite mouldings**

### **Supporting information**

#### **Guidance**

2.5 (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)

2.6 (to include symbols and conventions to appropriate BS or ISO standards)

2.9 (such as dis-bonds, de-lamination, resin injection, resin voids, core potting, repair patches)

2.11 (such as cleaning, abrading, priming)

## Unit 029

## Checking aircraft composite mouldings for defects

<b>UAN:</b>	F/601/4333
<b>Level:</b>	2
<b>Credit value:</b>	23
<b>GLH:</b>	95
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 29: Checking aircraft composite mouldings for defects (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to check aircraft composite mouldings (such as panels, components, jigs), and to identify and deal with any defects found, in accordance with approved procedures. The learner will be required to follow appropriate drawings, specifications and documentation in order to carry out the checks of the mouldings, which will include visual and sensory checks as well as the use of measuring instruments and non-destructive testing methods. The learner will be expected to be able to identify a range of defects in a variety of resin and fibre materials, and to take appropriate action to deal with them.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the checking activities, inspection equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will need to ensure that all tools, equipment and materials used in the checking are correctly accounted for on completion of the activities, and they must complete all necessary job/task documentation accurately and legibly.</p> <p>The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility</p>

for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, you must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to identifying defects in composite mouldings. The learner will understand the composite materials, and their application, and will know about the associated defects, in adequate depth to provide a sound basis for identifying the defects in line with organisation practice and procedures.

The learner will understand the safety precautions required when working with the composite mouldings, and when using the associated tools and equipment. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to check aircraft composite mouldings for defects
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 1.2 carry out all of the following during the inspection activities: <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> 1.3 identify defects with regard to the product or asset specification. check for defects in composite mouldings, using four of the following methods: <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> 1.5 identify defects in six of the following types of composite mouldings: <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> </ul>

- galley units
  - airframe components
  - moulds
  - jigs
  - tanks
  - other specific components.
- 1.6 identify defects applicable to two of the following resin types:
- polyester
  - vinyl ester
  - epoxy
  - phenolic
  - bismaleimide
  - cyanate ester.
- 1.7 identify defects applicable to two of the following fibre types:
- polyethylene
  - glass
  - aramid
  - carbon
  - hybrid.
- 1.8 identify eight of the following types of defect in composite mouldings:
- incomplete curing
  - dimensional
  - tolerances
  - ply orientation
  - wrong join type
  - surface finish
  - distortion
  - blisters
  - bridging
  - de-lamination
  - wrinkles
  - broken fibres
  - splintering
  - voids
  - dents or 'dings'
  - dis-bonds
  - resin rich areas
  - incorrect material
  - excessive adhesive
  - damaged cores
  - wrong inserts
  - insert positions
  - impact damage.
- 1.9 assess the defects and determine action required to return the products and assets to specified condition.
- 1.10 record details of defects in accordance with quality assurance and control systems and procedures.

- 1.11 report recommendations for action to the appropriate people promptly and in accordance with organisational procedures.
- 1.12 inspect mouldings to ensure that they comply with one of the following standards:
  - Civil Aviation Authority (CAA)
  - Ministry of Defence (MoD)
  - Federal Aviation Authority (FAA)
  - ISO 9000 series and procedures
  - customer standards and requirements
  - company standards and procedures.
- 1.13 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people:
  - production documentation
  - quality control documentation
  - build records
  - other specific records.

<b>Learning outcome</b>
The learner will:
2. Know how to check aircraft composite mouldings for defects
<b>Assessment criteria</b>
The learner can:
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.
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.
2.3 describe the protective equipment that is needed for personal protection and, where required, the protection of others.
2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables.
2.5 describe the specific workshop environmental conditions that must be observed when working with aircraft composite materials.
2.6 explain how to use and extract information from engineering drawings and related specifications, in relation to work undertaken.
2.7 explain how to carry out currency/issue checks of the specifications they are working with.
2.8 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing.
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.
2.10 explain the conventions and terminology used when identifying and rectifying defects.
2.11 describe the different types of composite resin systems, fibres and reinforcements, and the types of defects that may be present.
2.12 explain the failure modes for various composite mouldings, and what can contribute to these.

- 2.13 explain the correct methods of storage and handling of composite materials.
- 2.14 describe the tools and equipment used for checking the various composite mouldings.
- 2.15 explain the procedure for the safe disposal and correct separation of waste materials.
- 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.
- 2.17 describe the extent of their own authority, and whom they should report to if they have problems that they cannot resolve.

## **Unit 029                      Checking aircraft composite    mouldings for defects**

### **Supporting information**

#### **Guidance**

2.5 (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)

2.6 (to include symbols and conventions to appropriate BS or ISO standards)

2.10 (such as dis-bonds, de-lamination, resin injection, resin voids, core potting, repair patches)

## Unit 038

## Setting up and preparing loads for moving

<b>UAN:</b>	F/601/4350
<b>Level:</b>	2
<b>Credit value:</b>	12
<b>GLH:</b>	49
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 38: Setting up and preparing loads for moving (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to set up and prepare loads for moving in an aircraft environment, in accordance with approved procedures. The learner will be required to access the appropriate documentation in order to assess the weight of the load to be moved, and to determine the most suitable method of moving the load and the type of equipment required. The learner will be expected to select the appropriate equipment, and to check that it is within current certification requirements and is in a safe and usable condition. The learner will be expected to prepare for moving a variety of loads, such as stock materials, sub-assemblies, major assemblies, liquid containers, corrosive and fragile materials. This will involve planning a safe route for moving the load, and ensuring that the final designated destination of the load is in a fit state to receive it.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the preparation of the moving activities, and to report any problems with the preparation activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a</p>

team, and they will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities, in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the preparation of loads for moving. The learner will have an understanding of the preparation process, and its application, and will know about the preparation requirements, equipment and materials to be used, in sufficient depth to provide a sound basis for carrying out the activities to the required standards.

The learner will understand the safety precautions required when carrying out the setting up and preparation activities. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

**Learning outcome**

The learner will:

1. Be able to set up and prepare loads for moving

**Assessment criteria**

The learner can:

- 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines.
- 1.2 establish the weight of the load to be moved.
- 1.3 determine the method and select suitable equipment to move the load.
- 1.4 check that the equipment to be used is capable of moving the load safely.
- 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:
  - the equipment is certified and is compliant, within current test dates
  - all slings are free from obvious defects
  - the moving equipment selected is suitable and has a sufficient safe working load (SWL) for the application
  - the identification number and safe working load (SWL), are clearly marked on the equipment selected
  - the equipment selected is suitable for the environment of the operation.
- 1.6 obtain the safe working load (SWL) and centre of gravity of the load to be moved, by using two of the following:
  - load documentation
  - third party
  - estimation
  - moving load documentation/moving procedure sheet.
- 1.7 establish the position of lifting points for three of the following:
  - single legged sling
  - double legged sling
  - four legged sling
  - multi-legged sling
  - lifting beams
  - spreaders.
- 1.8 whilst taking into account all of the following:
  - safe working load (SWL)
  - tension
  - angles
  - sling length.
- 1.9 plan the moving of various types of load, to include three of the following:
  - sheet materials
  - other stock materials
  - aircraft sub-assemblies
  - access structures

- loads with evenly distributed weight
  - aircraft major assemblies
  - liquid containers (such as drums)
  - awkward shapes
  - fragile components
  - hot/radiant/toxic/corrosive
  - plant/machinery
  - test equipment
  - other specific loads
  - loads with unevenly distributed weight.
- 1.7 determine a suitable route for moving the load minimising risk to people and property.
- 1.8 plan the moving route and the final destination of the load, to include three of the following:
- differing elevations
  - along same elevation
  - transferring a load
  - turning a load
  - as part of an assembly operation
  - move to store as unit/part assembly.
- 1.9 ensure that the load is secured and protected before moving operations start.  
identify and set up suitable securing devices to ensure that the load is moved safely, using three of the following:
- shackles
  - guide ropes
  - holding devices
  - stiffeners
  - protection materials
  - chains/wires
  - bottle screws/stays
  - seatings/fasteners.
- 1.14 deal promptly and effectively with problems within your control and report those that cannot be solved.
- 1.15 complete the relevant documentation for recording the load moving activity, to include one of the following:
- lifting procedure sheet (Competent Person ID)
  - drawings for the moving operation
  - inspection records/defect reports
  - risks assessments.

<b>Learning outcome</b>
The learner will: 2. Know how to set up and preparing loads for moving
<b>Assessment criteria</b>
The learner can: 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 2.2 Describe the hazards associated with preparing loads for moving, and how they can be minimised 2.3 Explain and understand the Approved Code of Practice (ACOP) for preparing loads for moving, and Lifting Operation and Lifting Equipment Regulations (LOLER) 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 2.5 Describe the range of equipment to be used for moving the load(s) 2.6 Describe the lifting equipment accessories to be used 2.7 Explain how to establish the weight of the load 2.8 Explain how to establish the position of lifting points in relation to the slinging arrangements 2.9 Explain the factors which affect the selection of the moving equipment and lifting accessories 2.10 Explain how to check that the lifting equipment is capable of lifting the load to be moved 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 2.12 Explain how to carry out visual in-service inspections of the equipment, and what to do should any defective equipment be identified Explain how to plan and prepare a route for moving loads, and the things that they will need to take into account 2.13 Explain the specific requirements for the organisation of moving equipment 2.14 Explain the signalling techniques used to communicate with crane drivers 2.15 Explain how moving equipment should be handled and stored 2.16 Describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve



## Unit 039

## Moving materials and components in an aircraft environment

<b>UAN:</b>	J/601/4351
<b>Level:</b>	2
<b>Credit value:</b>	15
<b>GLH:</b>	56
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 39: Moving materials and components in an aircraft environment (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the slinging, signalling and lifting activities undertaken, and to report any problems with the slinging and lifting equipment or activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal</p>

responsibility for their own actions and the safety and integrity of the materials or items being moved. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying slinging, signalling and lifting procedures within an aircraft environment. The learner will have an understanding of the slinging, signalling and lifting techniques used, and their application, and will know about the lifting equipment and accessories for lifting, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

The learner will understand the safety precautions required when slinging and lifting materials and components, and the safeguards that are necessary for undertaking the activities. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will:
1. Be able to move materials and components in an aircraft environment
<b>Assessment criteria</b>
The learner can:
1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines.
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:
<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>
1.3 before slinging, lifting or moving the load, ensure that all of the following, have been established/checked:
<ul style="list-style-type: none"> <li>• weight of the load</li> <li>• route of the load is clear</li> </ul>

- those affected have been informed
  - landing/storage area is clear
  - agreed code of verbal/hand signals
  - precautions are in place in case of spillage
  - arrangements are made for securing/storing in landing place.
- 1.4 position the moving equipment so that the weight of the load is evenly distributed.
- 1.5 attach the appropriate handling equipment securely to the load, using approved methods to eliminate slippage.
- 1.6 confirm that the load is secure before moving.
- 1.7 use two of the following lifting and moving methods and technique:
- crane
  - winch
  - powered lifting equipment
  - lifting appliances
  - pulling appliances
  - low loaders
  - hand operated lifting equipment
  - jacks, skates and trolleys.
- 1.8 use two of the following slinging methods:
- single leg slings
  - spreaders
  - two-leg slings
  - three- and four-leg slings
  - lifting beams.
- 1.9 move the load over the selected, suitable route.
- 1.10 move two of the following types of load:
- sheet materials
  - other stock materials
  - aircraft sub-assemblies
  - access structures
  - liquid containers (such as drums)
  - fragile components
  - hot/radiant/toxic/corrosive
  - aircraft major assemblies
  - plant/machinery
  - test equipment
  - loads with evenly distributed weight
  - loads with unevenly distributed weight
  - awkward shapes
  - other specific loads.
- 1.11 move loads safely and correctly, and re-position in two of the following conditions:
- in the same elevation
  - to differing elevations
  - as part of an assembly operation
  - turning a load

- transferring a load
- move to store as unit/part assembly.

1.12 position and release the load safely in its intended final location.

### **Learning outcome**

The learner will:

2. Know how to move materials and components in an aircraft environment

### **Assessment criteria**

The learner can:

- 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.
- 2.2 describe the hazards associated with slinging and lifting of loads, and how they can be minimised.
- 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).
- 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.
- 2.5 describe the range of equipment to be used for the lifting operations.
- 2.6 describe the lifting equipment accessories to be used.
- 2.7 describe the checks that should be made on the lifting equipment prior to use, and things that you should look for.
- 2.8 explain how to carry out visual in-service inspections of the equipment, and what to do should any defective equipment be identified.
- 2.9 explain the factors which affect the selection of the lifting equipment and lifting accessories.
- 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.
- 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.

## **Unit 039**

# **Moving materials and components in an aircraft environment**

## Supporting information

### **Guidance**

2.1 (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)

2.5 (such as hand and power operated cranes, winches pulling equipment)

2.6 (such as slings, chains, wire ropes, eye bolts)

2.9 (such as weight, type of load, operating environment)

2.13 (to include hand signals and verbal commands)

## Unit 040

## Positioning and securing aircraft access structures

<b>UAN:</b>	L/601/4352
<b>Level:</b>	2
<b>Credit value:</b>	30
<b>GLH:</b>	70
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 40: Positioning and securing aircraft access structures (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to position and secure aircraft access structures, in accordance with approved procedures. The learner will be required to position and secure the access structures, in compliance with health and safety requirements and Lifting Operations and Lifting Equipment Regulations (LOLER). The access structures to be set up 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 set up, position, level, align and secure the structures in position.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the setting up of the access structures, and to report any problems with the positioning and securing activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the safety and integrity of the structures erected. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas</p>

required by the standard. The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the required positioning and securing procedures to aircraft access structures. The learner will have an understanding of the positioning and securing procedures used, and their application, and will know about the positioning and securing requirements, equipment and materials to be used, in sufficient depth to provide a sound basis for carrying out the activities to the required standards.

The learner will understand the safety precautions required when carrying out the positioning and securing operations, and the safeguards that are necessary for undertaking the activities. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will:
1. Be able to position and secure aircraft access structures
<b>Assessment criteria</b>
The learner can:
1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines.
1.2 ensure that the access structure, lifting and securing components are in a usable condition, by checking all of the following:
<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 safe working load (SWL) 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>
1.3 identify the most appropriate location for the access structure and prepare the site for the installation.
1.4 select the most appropriate access structures to ensure that safety regulations will be met.
1.5 set up and install the access structure components in the correct sequence.
1.6 position four of the following types of access structures, using the correct sequence:
<ul style="list-style-type: none"> <li>• walkways</li> <li>• fixed platform systems</li> </ul>

- fixed gantry systems
  - moveable staging/towers
  - fixed access steps/stairs
  - mobile steps/stairs
  - access ladders
  - other specific access structures.
- 1.7 use four of the following lifting and moving techniques to position the access structure:
- cranes
  - winches
  - powered lifting equipment
  - hydraulic jacks/skids
  - lifting appliances
  - pulling appliances
  - adjustable props/supports
  - other specific equipment.
- 1.8 prepare and position the access structures, to include carrying out all of the following:
- preparing the area in which the access structures are to be erected (such as clear of obstructions, level and stable surface)
  - checking all components/sub-assemblies for defects prior to erecting them
  - determining suitable positions for all major components (such as vertical supports, access stairs/ladders)
  - positioning all components/sub-assemblies, stays and stiffeners of the access structures
  - checking and ensuring correct horizontal and vertical levels and alignments
  - securing the various components, using appropriate mechanical fastening devices (such as nuts and bolts, proprietary fasteners, wire or fibre ropes)
  - checking the stability of the final erected structure
  - checking that the completed structure meets the work requirements.
- 1.9 use two of the following securing methods during the erection of the access structures:
- bolting
  - clamping
  - wedging
  - welding
  - lashing.
- 1.10 check that the erected structures are safe, secure, stable and ready for use.
- 1.11 deal promptly and effectively with problems within your control and report those that cannot be solved.
- 1.12 complete the relevant documentation for recording the setting up of the access structures, to include one of the following:
- lifting procedure sheet (Competent Person ID)

- equipment inspection records/defect reports
- risks assessments
- job documentation.

1.13 inform the appropriate people when the installation is completed and ready for use.

### Learning outcome

The learner will:

2. Know how to position and secure aircraft access structures

### Assessment criteria

The learner can:

- 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.
- 2.2 describe the hazards associated with positioning and securing access structures, and how they can be minimised.
- 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).
- 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.
- 2.5 describe the various types of access structures used in the aircraft environment.
- 2.6 explain the methods of assembling the access structures, and the equipment that is used.
- 2.7 describe the range of equipment to be used for lifting the access structures.
- 2.8 describe the lifting equipment accessories to be used
- 2.9 explain the checks to be made on the lifting equipment prior to use, and the things that they should look for.
- 2.10 explain what to do should any defective equipment be identified.
- 2.11 explain how to determine the approximate weight of the load to be moved.
- 2.12 describe the factors which affect the selection of the lifting equipment and lifting accessories.
- 2.13 explain how to check that the lifting equipment is capable of lifting the load to be moved.
- 2.14 explain how to determine the centre of gravity of the load, and how to determine suitable slings and lifting points.
- 2.15 explain how to locate and position the access structures, and the range of equipment that can be used.
- 2.16 explain the need to ensure that the structures are level and securely held in position.
- 2.17 explain how to secure the access structures, and the equipment that can be used.
- 2.18 explain the things that can go wrong with the positioning and securing operations, and how they can be avoided.
- 2.19 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

**Supporting information****Guidance**

2.1 (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)

2.5 (such as walkways, fixed platforms/staging, moveable staging/towers, access steps/stairs, access ladders)

2.7 (such as hand and power operated cranes, winches, pulling equipment)

2.8 (such as slings, chains, wire ropes, eye bolts)

2.12 (such as weight, type of load operating environment)

## Unit 041

## Dismantling and removing aircraft access structures

<b>UAN:</b>	R/601/4353
<b>Level:</b>	2
<b>Credit value:</b>	30
<b>GLH:</b>	70
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Aeronautical Engineering Unit 41: Dismantling and removing aircraft access structures (Suite 2).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta the Sector Skills Council for science, engineering and manufacturing.
<b>Aim:</b>	<p>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.</p> <p>The learner responsibilities will require them to comply with organisational policy and procedures for the dismantling and removal of the access structures, and to report any problems with the removal activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work either with a high level of supervision or as a member of a team, and they will take personal responsibility for their own actions and for the safety and integrity of the structures. Where team working is involved, they must demonstrate a significant personal contribution during the team activities</p>

in order to satisfy the requirements of this standard, and they must demonstrate competence in all the areas required by the standard.

The learner's knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the required dismantling and removal procedures for aircraft access structures. The learner will have an understanding of the dismantling procedures used, and their application, and will know about the dismantling and removal requirements, equipment and materials to be used, in sufficient depth to provide a sound basis for carrying out the activities to the required standards.

The learner will understand the safety precautions required when carrying out the dismantling and removal operations, and the safeguards that are necessary for undertaking the activities. The learner will be required to demonstrate safe working practices throughout. The learner will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

<b>Learning outcome</b>
The learner will: 1. Be able to dismantle and remove aircraft access structures
<b>Assessment criteria</b>
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. 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: <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 safe working load (SWL) 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> 1.3 establish and where necessary support components before removal of securing devices. 1.4 remove components in the correct sequence using approved techniques. 1.5 use the correct sequence to dismantle and remove four of the following types of access structures:

- walkways
  - fixed platform systems
  - fixed gantry systems
  - moveable staging/towers
  - fixed access steps/stairs
  - mobile steps/stairs
  - access ladders
  - other specific access structure.
- 1.6 use four of the following lifting and moving techniques to remove the access structure:
- cranes
  - winches
  - powered lifting equipment
  - hydraulic jacks/skids
  - lifting appliances
  - pulling appliances
  - adjustable props/supports
  - other specific equipment.
- 1.7 identify and attend to damage and defects in the components or structures in line with organisational requirements.
- 1.8 dismantle and remove the access structures, to include carrying out all of the following:
- ensuring that the area around the structures is clear of obstructions that may affect the removal operations
  - preparing a suitable area in which to store the removed items
  - determining a suitable and safe dismantling sequence
  - removing steps/stairs or ladder systems
  - removing all components/subassemblies, stays and stiffeners of the access structures
  - storing all mechanical fastening devices safely and correctly (such as nuts and bolts, proprietary fasteners, wire or fibre ropes)
  - storing all structure component parts safely and correctly
  - using approved lifting and moving equipment and techniques at all times.
- 1.9 use two of the following dismantling methods during the removal of the access structures:
- unbolting
  - removal of clamps
  - grinding/abrasive disc cutting
  - oxy-fuel cutting
  - removal of lashings.
- 1.10 store the removed components safely in an appropriate location.
- 1.11 tidy up the site and leave it in a safe condition.
- 1.12 deal promptly and effectively with problems within your control and report those that cannot be solved.
- 1.13 complete the relevant documentation for the removal of the access structures, to include one of the following:

- lifting procedure sheet (Competent Person ID)
- equipment inspection records/defect reports
- risks assessments
- job documentation.

1.14 inform the appropriate people when the dismantling is completed.

### **Learning outcome**

The learner will:

2. Know how to dismantle and remove aircraft access structures

### **Assessment criteria**

The learner can:

- 2.1 describe the specific safety precautions to be taken when dismantling and removing aircraft access structures, and the need for ensuring load security.
- 2.2 describe the hazards associated with dismantling and removing aircraft access structures, and how they can be minimised.
- 2.3 describe the various types of access structures used in the aircraft environment.
- 2.4 explain how to dismantle the access structures, and the range of equipment that can be used.
- 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).
- 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.
- 2.7 describe the lifting equipment accessories to be used.
- 2.8 explain the checks to be made on the lifting equipment prior to use, and the things that you should look for.
- 2.9 explain how to determine the approximate weight of the access structure/load to be moved.
- 2.10 explain how to check that the lifting equipment is capable of lifting the access structure/load to be moved.
- 2.11 explain how to determine the centre of gravity of the access structure/load, and how to determine suitable slinging and lifting points.
- 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.
- 2.13 describe the specific requirements for the organisation of dismantling and removing access structures.
- 2.14 explain the sequence in which the access structure must be dismantled to ensure a safe and stable structure at all times.
- 2.15 describe the signalling techniques used to communicate with crane drivers.
- 2.16 explain how access structures should be stored, handled and maintained.
- 2.17 describe the extent of their own responsibility, and whom they should report to if they have problems that they cannot resolve.

# **Unit 041                    Dismantling and removing aircraft access structures**

## **Supporting information**

### **Guidance**

2.1 (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)

2.3 (such as walkways, fixed platforms/staging, moveable staging/towers, access steps/stairs, access ladders)

2.4 (such as hand and power operated cranes, winches, pulling equipment)

2.7 (such as slings, chains, wire ropes, eye bolts)

2.15 (to include hand signals and verbal commands)



## Appendix 1 Relationships to other qualifications

### Literacy, language, numeracy and ICT skills development

This qualification can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see [www.cityandguilds.com/functionalskills](http://www.cityandguilds.com/functionalskills)
- Essential Skills (Northern Ireland) – see [www.cityandguilds.com/essentialskillsni](http://www.cityandguilds.com/essentialskillsni)
- Essential Skills Wales – see [www.cityandguilds.com/esw](http://www.cityandguilds.com/esw)



## Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on [www.cityandguilds.com](http://www.cityandguilds.com).

***Centre Manual - Supporting Customer Excellence*** contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

***Our Quality Assurance Requirements*** encompasses all of the relevant requirements of key regulatory documents such as:

- Regulatory Arrangements for the Qualifications and Credit Framework (2008)
- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

***Access to Assessment & Qualifications*** provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden:** how to register and certificate candidates on line
- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for e-assessments.

***Centre Guide – Delivering International Qualifications*** contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve ‘approved centre’ status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

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## Useful contacts

<b>UK learners</b> General qualification information	T: +44 (0)844 543 0033 E: <a href="mailto:learnersupport@cityandguilds.com">learnersupport@cityandguilds.com</a>
<b>International learners</b> General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: <a href="mailto:intcg@cityandguilds.com">intcg@cityandguilds.com</a>
<b>Centres</b> Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: <a href="mailto:centresupport@cityandguilds.com">centresupport@cityandguilds.com</a>
<b>Single subject qualifications</b> Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: <a href="mailto:singlesubjects@cityandguilds.com">singlesubjects@cityandguilds.com</a>
<b>International awards</b> Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: <a href="mailto:intops@cityandguilds.com">intops@cityandguilds.com</a>
<b>Walled Garden</b> Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: <a href="mailto:walledgarden@cityandguilds.com">walledgarden@cityandguilds.com</a>
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<b>Publications</b> Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

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