QUALIFICATION HANDBOOK

Level 3 NVQ Diploma in Aeronautical Engineering (Aircraft Technical Design and Development) (1789-31)

September 2018 version 1.2

City & Guilds

Qualification at a glance

Subject area	**Engineering**
City & Guilds number	1789
Age group approved	16-18, 19+
Entry requirements	Level 3
Assessment	Portfolio
Fast track	Available
Support materials	Centre handbook
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Accreditation number
Level 3 NVQ Diploma in Aeronautical Engineering (Aircraft Technical Design and Development)	1789-31	600/1575/5

Version and date	Change detail	Section
1.1 November 2012	• Formatting (not allowing sentences to split between two pages) • Amended the wording for learning outcome one • Formatting (amended words to lower case) • Amended numbering of assessment criteria for learning outcome one	• Units 001, 403, 404 • Unit 587 • Units 589, 593 and 596 • Unit 592
1.2 September 2018	• Changed from a seven to nine	• Unit 001 assessment criteria 2.3

Contents

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 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 engineering sector.
Is the qualification part of a framework or initiative?	It serves as a technical certificate, in the engineering Apprenticeship framework.

Structure

To achieve the **Level 3 Diploma in Aeronautical Engineering (Aircraft Technical Design and Development)**, learners must achieve **20** credits from the mandatory units and a minimum of **203** credits from Optional Group A and **160** credits from Optional Group B.

Unit accreditation number	City & Guilds unit	Unit title	Credit value
Mandatory			
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
K/601/5055	403	Working efficiently and effectively in engineering	5
K/601/4228	404	Reinstating the work area on completion of activities	5
Optional		**Group A**	
Y/601/5150	583	Producing aeronautical electrical engineering drawings using computer aided techniques	150
H/601/5152	584	Producing aeronautical electronic engineering drawings using computer aided techniques	150
K/601/5153	585	Producing aeronautical mechanical engineering drawings using computer aided techniques	150

Unit accreditation number	City & Guilds unit	Unit title	Credit value
M/601/5154	586	Producing aeronautical mechanical engineering drawings using computer aided techniques	150
T/601/5155	587	Producing aeronautical engineering drawings/models using 3D computer aided techniques	53
Optional		**Group B**	
A/601/5156	588	Monitoring aeronautical engineering activities	40
F/601/5157	589	Planning aeronautical engineering activities	40
J/601/5158	590	Producing technical details for aeronautical engineering activities	40
L/601/5159	591	obtaining resources for aeronautical engineering activities	40
L/601/5162	592	Implementing aeronautical engineering activities	40
Y/601/5164	593	Implementing quality assurance systems in an aeronautical engineering environment	40
H/601/5166	594	Rectifying aeronautical engineering problems	40
T/601/5169	595	Providing technical guidance on Aeronautical engineering activities	40
K/601/5170	596	Carrying out project management of aeronautical engineering activities	40
M/601/5171	597	Applying continuous improvement techniques to aeronautical engineering activities (not used in qual)	0

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 and 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 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 the QCF 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 QCF unit learning outcomes and associated assessment criteria.

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

Assessors must also be:

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

Verifier requirements (internal and external)

Internal quality assurance (Internal Verification) must be carried out by competent Verifiers that as a minimum must hold the QCF 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 the QCF 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 QCF 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 the QCF 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 the QCF 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 QCF 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 QCF NVQ units against which the assessments and verification are to be carried out, the appropriate

Regulatory Body's systems and procedures and the relevant Awarding Organisation's documentation.

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 QCF 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 qualification.
- any units they have already completed, or credit they have accumulated which is relevant to the qualification.
- 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 this these qualifications

Description	How to access
Personal Learning and Thinking skills (required for apprenticeship)	**www.cityandguilds.com**, 1789 product documentation pages
Centre approval forms	**www.cityandguilds.com**
Semta QCF Assessment Strategy	**www.cityandguilds.com**
Unit assessment guidance	**www.cityandguilds.com**, 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**.

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 QCF 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**

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

UAN:	**A/601/5013**
Level:	2
Credit value:	5
GLH:	35
Relationship to NOS:	This unit has been derived from national occupational standard: Complying with statutory regulations and organisational safety requirements (Suite 2).
Endorsement by a sector or regulatory body:	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 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. The learner will also be required to identify the hazards and risks that are associated with their job. Typically, these will focus on their working environment, the tools and equipment that they use, the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual

lifting and carrying techniques.

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.

Learning outcome
The learner will: 1. Be able to comply with statutory regulations and organisational safety requirements
Assessment criteria
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: • applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act • identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as: o eye protection and personal protective equipment (PPE) o COSHH regulations o Risk assessments • identifying the warning signs and labels of the main groups of hazardous or dangerous substances • complying with the appropriate statutory regulations at all times 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: • identifying the appropriate qualified first aiders and the location of first aid facilities • identifying the procedures to be followed in the event of injury to themselves or others

- following organisational procedures in the event of fire and the evacuation of premises
- identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment

1.6 recognise and control hazards in the workplace

1.7 Identify the hazards and risks that are associated with the following:

- their working environment
- the equipment that they use
- materials and substances (where appropriate) that they use
- working practices that do not follow laid-down procedures

1.8 use correct manual lifting and carrying techniques

1.9 demonstrate one of the following methods of manual lifting and carrying:

- lifting alone
- with assistance of others
- with mechanical assistance

1.10 apply safe working practices and procedures to include:

- maintaining a tidy workplace, with exits and gangways free from obstruction
- using equipment safely and only for the purpose intended
- observing organisational safety rules, signs and hazard warnings
- taking measures to protect others from any harm resulting from the work that they are carrying out.

Learning outcome
The learner will: 2. Know how to comply with statutory regulations and organisational safety requirements
Assessment criteria
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 nine 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

UAN:	**Y/601/5102**
Level:	2
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from national occupational standard: Using and interpreting engineering data and documentation (Suite 2).
Endorsement by a sector or regulatory body:	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 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. 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. The learner's underpinning knowledge will provide a good understanding of the types of documentation used, and will provide an

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.

Learning outcome
The learner will: 1. be able to use and interpret engineering data and documentation
Assessment criteria
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: • check the currency and validity of the data and documentation used • exercise care and control over the documents at all times • correctly extract all necessary data in order to carry out the required tasks • seek out additional information where there are gaps or deficiencies in the information obtained • deal with or report any problems found with the data and documentation • make valid decisions based on the evaluation of the engineering information extracted from the documents • return all documents to the approved location on completion of the work • complete all necessary work related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation 1.3 correctly identify, interpret and extract the required information 1.4 extract information that includes three of the following: • materials or components required • dimensions • tolerances • build quality • installation requirements • customer requirements • time scales • financial information • operating parameters • surface texture requirements • location/orientation of parts • process or treatments required • dismantling/assembly sequence • inspection/testing requirements • number/volumes required

- 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

- operation sheets
- service/test information
- planning documentation
- quality control documents
- company specific technical instructions
- national, international and organisational standards
- health and safety standards relating to the activity (such as COSHH)
- other specific related documentation

1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved

1.9 report any inaccuracies or discrepancies in documentation and specifications.

Learning outcome
The learner will: 2. Know how to use and interpret engineering data and documentation
Assessment criteria
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 403 Working efficiently and effectively in engineering

UAN:	**K/601/5055**
Level:	3
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from national occupational standard: working efficiently and effectively in engineering (Suite 3).
Endorsement by a sector or regulatory body:	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 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 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.

Learning outcome
The learner will: 1. Be able to work efficiently and effectively in engineering
Assessment criteria
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: • the work area is free from hazards and is suitably prepared for the activities to be undertaken • any required safety procedures are implemented • any necessary personal protection equipment is obtained and is in a usable condition

- tools and equipment required are obtained and checked that they are in a safe and useable condition
- all necessary drawings, specifications and associated 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 that 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:

- completing all necessary documentation accurately and legibly
- returning tools and equipment
- returning drawings and work instructions
- identifying, where appropriate, any unusable tools, equipment or components
- arranging for 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 and communicate opportunities for improvement to working practices and procedures

1.11 make recommendations for improving to two of the following:

- working practices
- working methods
- quality
- safety
- tools and equipment
- supplier relationships
- internal communication
- customer service
- training and development
- teamwork
- other

1.12 maintain effective working relationships with colleagues to include two of the following:
- colleagues within own working group
- colleagues outside normal working group
- line management
- external contacts

1.13 review personal training and development as appropriate to the job role

1.14 review personal development objectives and targets to include one of the following:
- dual or multi-skilling
- training on new equipment / technology
- increased responsibility
- understanding of company working practices, procedures, plans and policies
- other specific requirements.

Learning outcome
The learner will: 2. Know how to work efficiently and effectively in engineering
Assessment criteria
The learner can: 2.1 describe the safe working practices and procedures to be followed whilst preparing and tidying up their work area 2.2 describe the correct use of any equipment used 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 materials required 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 required to confirm that the activity has been completed 2.12 explain what materials, equipment and tools can be reused 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 making recommendations for improving working practices
2.16	describe the procedure and format for making suggestions for improvements
2.17	describe the benefits to organisations if improvements can be identified
2.18	describe the importance of maintaining effective working relationships within the workplace
2.19	describe the procedures to deal with and report any problems that can affect working relationships
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
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 responsibility and to whom they should report if they have any problems that they cannot resolve.

Unit 403 Working efficiently and effectively in engineering

Supporting information

Guidance

2.21 (such as Equal Opportunities Act, Race and Sex Discrimination, working Time Directive)

Unit 404 Reinstating the work area on completion of activities

UAN:	**K/601/4228**
Level:	3
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 004: Reinstating the work Area on completion of activities (Suite 3).
Endorsement by a sector or regulatory body:	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 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 and separate all waste materials and ensure that they are removed to their designated locations. The learner will also need to ensure that all tools, equipment and documents used are accounted for and returned to the appropriate places. Tidying of the work area will be of prime importance and includes office and clean working area environments, workshops, staging and platforms, internal areas of aircraft such as wings, tanks and fuselage sections, and areas that are airside. 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 reinstatement activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality of the work they carry out. The learner's knowledge will provide a good understanding of their work, and 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. 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.

Learning outcome
The learner will: 1. Be able to reinstate the work area on completion of activities
Assessment criteria
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 activities during reinstatement of the work area: • work to current schedules • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • report any loss or damage to equipment • report any identified hazards within the work area • return all consumables and materials to their correct location • complete any documentation as required 1.3 separate equipment, components, and materials for re-use from waste items and materials 1.4 store reusable materials and equipment in an appropriate location 1.5 correctly label and store four the following resources: • finished products/components • components requiring overhaul/repair • surplus materials/components • tooling, jigs, fixtures or other equipment used • drawings requiring actioning/adjusting • scrap components • measuring and test instruments • finished drawings • finished documentation • documentation requiring actioning/adjusting 1.6 dispose of waste materials in line with organisational and environmental safe procedures

1.7 deal with waste materials, in line with company and environmental regulations, to include two of the following:
- correctly segregating waste materials
- correctly dispose of waste materials
- disposing of joining compounds, sealants and adhesives
- disposing of other chemical products
- removing non-hazardous materials
- disposing of fluid waste (such as oil, hydraulic fluids, fuel)

1.8 restore the work areas to a safe condition in accordance with agreed requirements and schedules

1.9 carry out reinstatement activities on two work areas from:
- workshops/hangers
- airside
- areas at height (such as platforms, staging, lifts)
- internal areas of aircraft (such as wings, tanks, fuselage sections)
- office environment
- computer aided design (CAD) environment
- technical/clean room environment
- other appropriate environment

1.10 deal promptly and effectively with problems within their control and report those that cannot be solved.

Learning outcome

The learner will:

2. know how to reinstate the work area on completion of activities

Assessment criteria

The learner can:

2.1 explain the specific safety practices and procedures 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 explain how to minimise them and reduce any risks

2.4 explain the safe working practices and procedures to be followed when carrying out the various activities

2.5 explain what personal protective clothing and equipment needs 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 Exp[lain the importance of tool and equipment 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 describe the stores procedures for tools and equipment, documentation and surplus or waste materials

2.11 explain what materials 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	explain the procedures for disposing of hazardous materials
2.14	explain what documentation needs to be used on completion of the reinstatement activities
2.15	describe the extent of their own responsibility and explain to whom they should report if they have problems that they cannot resolve.

Unit 404 Reinstating the work area on completion of activities

Supporting information

Guidance

2.1 (such as 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 office environments, computer aided design (CAD) environment, technical/clean room environment, workshops, test areas, stages and platforms and aircraft areas such as wing, tank, fuselage, airside section areas)

2.12 (such as colour coded, labelled)

2.13 (such as chemicals, adhesives, oil, hydraulic fluids, fuel

Unit 583 Producing aeronautical electrical engineering drawings using computer aided techniques

UAN:	**Y/601/5150**
Level:	3
Credit value:	150
GLH:	329
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 183: Producing aeronautical electrical engineering drawings using computer aided techniques (Suite 3).
Endorsement by a sector or regulatory body:	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 set up and operate a computer aided drawing system to produce detailed drawings for aeronautical electrical engineering activities, in accordance with approved procedures. The type of drawing produced will include circuit and wiring diagrams, block diagrams, schematics, electrical cabling/routing, installation, assembly of panels and sub-assemblies and system design/modification. The learner will be given a detailed drawing brief or a request for change/modification order, and they will be required to access these requirements and to extract all necessary information in order to carry out the drawing operations. The learner will need to select the appropriate equipment and drawing software to use, based on the type and complexity of the drawing functions to be carried out. The learner will be expected to use current British, European, International and company standards to produce a drawing template for a range of paper sizes, and must include the drawing title, scale used, date of drawing, and other relevant information. The learner will then be expected to produce fully detailed drawings, to enable the electrical circuits to be assembled, installed, maintained, commissioned or modified. The learner's responsibilities will require them

to comply with organisational policy and procedures for working in the drawing office or CAD suite. The learner will be required to report any problems with the computer hardware, software or drawing procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draught specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying computer aided drawing procedures to the creation of aeronautical electrical engineering drawings. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to produce the drawings, 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 working with the computer drawing system. 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.

Learning outcome
The learner will: 1. Be able to produce aeronautical electrical engineering drawings using computer aided techniques
Assessment criteria
The learner can: 1.1 prepare the CAD system for operation by carrying out all of the following: • check that all the equipment is correctly connected and in a safe and usable working condition (cables undamaged, correctly connected, safely routed) • power up the equipment and activate the drawing software • set up the drawing system to produce the drawing to the appropriate scale • set up and check that all peripheral devices are connected and correctly operating (such as keyboard, mouse, light pen, digitiser/tablet, scanner, printer, plotter) • set the drawing datum at a convenient point (where applicable) • set up drawing parameters (to include layers, lines type, colour, text styles) to company procedures or to suit the

drawing produced
- create a drawing template to the required standards, and include all necessary detail (such as title, drawing number, scale, material, date)

1.2 use three of the following to obtain the necessary data to produce the required drawings:
- drawing brief/request
- change order/modification request
- manuals
- calculations (such as Ohm's Law)
- sketches
- specifications
- aircraft electrical regulations
- previous drawings/designs
- aircraft standards
- other available data
- standards reference documents (such as current carrying capacity of cables, component catalogues)
- notes from meetings/discussions

1.3 take into account eight of the following design features, as appropriate to the drawing being produced:
- function
- operating environment
- tolerances
- physical space
- operating voltages
- cost
- interfaces
- power supplies
- ergonomics
- lifetime of the product
- aesthetics
- safety
- types of electrical component available
- position of circuit elements/components
- connections between components
- method of installation (such as conduit, trunking, traywork)
- types of cable (such as PVC, mineral insulated)

1.4 carry out all of the following before producing the engineering drawing:
- ensure that data and information is complete and accurate
- review the data and information to identify the drawing requirements
- recognise and deal with problems (such as information based, technical)

1.5 produce electrical engineering drawings for three of the following aircraft electrical/avionics systems:
- electrical power generation and distribution

- lighting (internal or external)
- indication and gauging
- pitot static
- communication
- navigational
- armament equipment and systems
- passive warning and electronic countermeasure systems
- infra-red and optical systems
- radar systems
- flight guidance and control systems
- other electrical circuits

1.6 produce three of the following types of electrical engineering drawing:

- circuit diagrams
- wiring diagrams
- block diagrams
- schematics
- system/distribution drawings
- panel assembly
- cable and routing
- installation/commissioning
- manufacture of cable looms
- fault diagnostics (such as flow diagrams)
- modifications to electrical equipment/systems (such as cable looms, cable routeing and clipping, panels/sub-assemblies, installation of electrical systems)

1.7 produce drawings that are sufficiently and clearly detailed

1.8 produce aeronautical electrical drawings which include ten of the following:

- straight lines
- dimensions
- angled lines
- text
- insertion of standard electrical components
- type and size of cables
- connection/termination details
- electrical symbols and abbreviations
- curved/contour lines
- circles or ellipses
- hidden detail
- colour/component coding
- parts lists
- other specific electrical detail

1.9 produce drawings in the required formats

1.10 use codes and other references that follow the required conventions

1.11 make sure that drawings are checked and approved within agreed

timescales by authorised people

1.12 produce drawings in compliance with one of the following:

- CAD software standards
- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN standards and procedures
- customer standards and requirements
- company standards and procedures
- aircraft manufacturer's requirements

1.13 check that the drawings are properly registered and stored securely

1.14 save and store drawings in appropriate locations, to include carrying out all of the following:

- ensure that their drawing has been checked and approved by the appropriate person/s
- check that the drawing is correctly titled and referenced
- save the drawing to an appropriate storage medium
- create a separate backup copy and place it in safe storage
- produce a hard copy printout of the drawing for file purposes
- register and store the drawings in the appropriate company information system
- where appropriate, record and store any changes to the drawings in the appropriate company information system check that the changes are completed as required by organisational procedures

Learning outcome
The learner will: 2. Know how to produce aeronautical electrical engineering drawings using computer aided techniques
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with computer systems 2.2 explain the need for good housekeeping arrangements 2.3 describe the basic set-up and operation of the computer systems, and the peripheral devices that are used 2.4 explain the correct startup and shutdown procedures to be used for the computer systems; how to access the specific computer drawing software to be used, and the use of software manuals and related documents to aid efficient operation of the relevant drawing system; the use of access codes for personal files 2.5 explain how to deal with system problems 2.6 explain what documentation is required for particular applications 2.7 describe the types of electrical drawing that may be produced by the software 2.8 explain what national, international and organisational standards and conventions are to be used for the drawings

2.9	explain how to set up the drawing template parameters
2.10	explain the application and use of drawing tools
2.11	explain how to access, recognise and use a wide range of standard electrical component symbol libraries from the CAD equipment
2.12	describe the factors to be taken into account when producing electrical drawings
2.13	explain their understanding of the aeronautical electrical equipment and circuits being worked on, and the function of the individual components within the circuits
2.14	explain the selection of the various components and cables being used
2.15	explain the use of specific regulations and standard reference tables when selecting components and cables
2.16	explain how power cables might affect/corrupt signal transmission, and the need to consider this in siting and routeing cables
2.17	describe the basic calculations that may be required to be carried out to verify the acceptability of components and circuits
2.18	explain the constraints laid down by existing national and international legislation, statutory and non-statutory regulations, industry and national standards, industry guidelines and professional codes that regulate electrical drawing/design activities
2.19	explain the need for document control
2.20	explain the procedures for drawing change notes, trial changes, up-issuing of drawings, modifications, and miscellaneous amendments to drawings
2.21	describe the extent of their own responsibility, and explain to whom they should report if they have problems that they cannot resolve when producing the drawings

Unit 583 Producing aeronautical electrical engineering drawings using computer aided techniques

Supporting information

Guidance

2.1 (to include such things as safety guidance relating to the use of visual display unit (VDU) equipment and work station environment (such as lighting, seating, positioning of equipment), repetitive strain injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)

2.2 (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 (such as mouse, light pens, digitisers and tablets, printers or plotters, and scanners)

2.5 (such as error messages received, peripherals which do not respond as expected, obvious faults with the equipment or connecting leads)

2.6 (such as drawing briefs, specification sheets, request for change orders)

2.7 (such as circuit and wiring diagrams, block and schematic diagrams, assembly and installation drawings)

2.9 (such as layers of drawings, scale, paper size, colour set-up, line types, dimension system and text styles)

2.10 (such as for straight lines, curves and circles; how to add dimensions and text to drawings, producing layers of drawings)

2.12 (such as safety requirements, operating parameters of components, position of components in relation to other sources or circuits, possibility of external interference)

2.14 (with regard to their operating ranges and current carrying capacity)

2.17 (such as Ohm's Law)

2.19 (such as ensuring that completed drawings are approved, labelled and stored on a suitable storage medium, the need to create backup copies and to file them in a separate and safe location away from electromagnetic sources, filing and storing hard copies for use in production

Unit 584 Producing aeronautical electronic engineering drawings using computer aided techniques

UAN:	**H/601/5152**
Level:	3
Credit value:	150
GLH:	329
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 184: Producing aeronautical electronic engineering drawings using computer aided techniques (Suite 3).
Endorsement by a sector or regulatory body:	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 set up and operate a computer aided drawing system to produce detailed drawings for aeronautical electronic engineering activities, in accordance with approved procedures. The type of drawing produced will include circuit and wiring diagrams, block diagrams, schematics, printed circuit board layouts, assembly and installation drawings, and system design/modification drawings. The learner will be given a detailed drawing brief or a request for change/modification order, and they will be expected to access these requirements and to extract all necessary information in order to carry out the drawing operations. The learner will need to select the appropriate equipment and drawing software to use, based on the type and complexity of the drawing functions to be carried out. The learner will be expected to use current British, European, International and company standards to produce a drawing template for a range of paper sizes, and must include the drawing title, scale used, date of drawing, and other relevant information. The learner will then be expected to produce fully detailed drawings to enable the electronic circuits to be assembled, installed, maintained, commissioned or modified. The learner's responsibilities will require them

to comply with organisational policy and procedures for working in the drawing office or CAD suite. The learner will be required to report any problems with the computer hardware, software or drawing procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draught specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying computer aided drawing procedures for the creation of aeronautical electronic engineering drawings. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to produce the drawings, 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 working with the computer drawing system. 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

Learning outcome
The learner will: 1. Be able to produce aeronautical electronic engineering drawings using computer aided techniques
Assessment criteria
The learner can: 1.1 prepare the CAD system for operation by carrying out all of the following: • check that all the equipment is correctly connected and in a safe and usable working condition (cables undamaged, correctly connected, safely routed) • power up the equipment and activate the drawing software • set up the drawing system to be able to produce the drawing to the appropriate scale • set up and check that all peripheral devices are connected and correctly operating (such as keyboard, mouse, light pen, digitiser/tablet, scanner, printer, plotter) • set the drawing datum at a convenient point (where applicable) • set up drawing parameters (to include layers, lines type, colour, text styles) to company procedures or to suit the

drawing produced

- create a drawing template to the required standards, which includes all necessary detail (such as title, drawing number, scale, material, date)

1.2 use three of the following to obtain the necessary data to produce the required drawings:

- drawing brief/request
- change order/modification request
- manuals
- calculations (such as Ohm's Law)
- sketches
- specifications
- aircraft electrical/electronic regulations
- previous drawings/designs
- other available data
- standards reference documents (such as current carrying capacity of cables, electronic component catalogues)
- notes from meetings/discussions

1.3 take into account eight of the following design features, as appropriate to the drawing being produced:

- physical dimensions of the circuit
- operating environment
- position of circuit elements/components
- function
- connectors/test points access
- connections between components
- types of component to be used
- component orientation
- special labels (such as orientation reference points)
- cost
- lifetime of the product
- tolerances
- aesthetics
- interfaces
- safety
- power supplies
- ergonomics
- appropriate type of circuit (such as digital, analogue, hybrid)
- appropriate technology of circuit design (such as single sided, double sided, multi-layer, flexi-rigid)
- meets signal integrity parameters (such as capacitance, inductance, resistance, insulation voltages)
- meets specified operating conditions (such as temperature, humidity, shock and vibration)
- any assembly/manufacturing schedule constraints (such as high profile components mounted after low profile SMT ones)

1.4 carry out all of the following before producing the engineering drawing:

- ensure that data and information are complete and accurate
- review the data and information to identify the drawing requirements
- recognise and deal with problems (information based and technical)

1.5 produce electronic engineering drawings for three of the following aircraft electrical/avionics systems:

- electrical power generation and distribution
- lighting (internal or external)
- indication and gauging
- pitot static
- communication
- navigational
- armament equipment and systems
- passive warning and electronic countermeasure systems
- infra-red and optical systems
- radar systems
- flight guidance and control systems
- other electrical circuits

1.6 produce three of the following types of electronic engineering drawing:

- circuit diagrams
- wiring diagrams
- block diagrams
- schematics
- system drawings
- circuit board assembly
- circuit board layout
- general assembly drawings
- manufacture of cable looms
- fault diagnostics (such as flow diagrams)
- modifications to electronic equipment/systems (such as circuit board layout, cable looms, cable routeing and clipping, panels/sub-assemblies, installation of electronic systems)

1.7 produce drawings that are sufficiently and clearly detailed

1.8 produce electronic engineering drawings which include ten of the following:

- straight lines
- dimensions
- angled lines
- text
- insertion of electronic components
- type and size of cables
- connection/termination details
- electrical/electronic symbols and abbreviations
- curved/contour lines
- circles or ellipses

- parts lists
- test points
- colour/component coding
- fault diagnosis (such as flow diagrams)
- other specific electronic detail

1.9 produce drawings in the required formats

1.10 use codes and other references that follow the required conventions

1.11 make sure that drawings are checked and approved within agreed timescales by authorised people

1.12 produce drawings in compliance with one of the following:

- CAD software standards
- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN standards and procedures
- customer standards and requirements
- company standards and procedures
- aircraft manufacturer's requirements

1.13 check that the drawings are properly registered and stored securely

1.14 save and store drawings in appropriate locations, to include carrying out all of the following:

- ensure that their drawing has been checked and approved by the appropriate person/s
- check that the drawing is correctly titled and referenced
- save the drawing to an appropriate storage medium
- create a separate backup copy and place it in safe storage
- produce a hard copy printout of the drawing for file purposes
- register and store the drawings in the appropriate company information system
- where appropriate, record and store any changes to the drawings in the appropriate company information system check that the changes are completed as required by organisational procedures

Learning outcome
The learner will: 2. Know how to produce aeronautical electronic engineering drawings using computer aided techniques
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with computer systems 2.2 explain the need for good housekeeping arrangements 2.3 describe the basic set-up and operation of the computer systems, and the peripheral devices that are used 2.4 explain the correct startup and shutdown procedures to be used

	for the computer systems
2.5	explain how to access the specific computer drawing software to be used, and the use of software manuals and related documents to aid efficient operation of the relevant drawing system; the use of access codes for personal files
2.6	explain how to deal with system problems
2.7	explain what documentation is required for particular applications
2.8	describe the types of electronic drawing that may be produced by the software
2.9	explain the difficulties that can emerge in manufacturing processes because of poor drawings/design
2.10	explain what national, international and organisational standards and conventions are to be used for the drawings
2.11	explain how to set up the drawing template parameters
2.12	explain the application and use of drawing tools
2.13	explain how to access, recognise and use a wide range of standard electronic component symbol libraries from the CAD equipment
2.14	describe the factors to be taken into account when producing electronic drawings
2.15	explain their understanding of the aeronautical electronic equipment and circuits being drawn, and the function of the individual components within the circuits
2.16	explain the selection of the various components and cables being used
2.17	explain the use of specific regulations and standard reference tables when selecting electronic components and cables
2.18	describe the basic calculations that may be required to be carried out to verify the acceptability of components and circuits
2.19	explain how power cables might affect/corrupt electronic components, and the need to consider this when producing the drawing
2.20	explain their basic understanding of the manufacturing processes used for populating circuits with components
2.21	explain the constraints laid down by existing national and international legislation, statutory and non-statutory regulations, industry and national standards, industry guidelines and professional codes that regulate electronic design activities
2.22	explain the need for document control
2.23	explain the procedures for drawing change notes, trial changes, up-issuing of drawings, modifications, and miscellaneous amendments to drawings
2.24	describe the extent of their own responsibility, and explain to whom they should report if they have problems that they cannot resolve when producing the drawings

Unit 584 Producing aeronautical electronic engineering drawings using computer aided techniques

Supporting information

Guidance

2.1 to include such things as safety guidance relating to the use of visual display unit (VDU) equipment and work station environment (such as lighting, seating, positioning of equipment), repetitive strain injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)

2.2 (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 (such as mouse, light pens, digitisers and tablets, printers or plotters, and scanners)

2.6 (such as error messages received, peripherals which do not respond as expected, obvious faults with the equipment or connecting leads)

2.7 (such as drawing briefs, specification sheets, request for change orders)

2.8 (such as circuit and wiring diagrams, block and schematic diagrams, assembly and installation drawings, circuit board layouts and circuit board assembly)

2.11 (such as layers of drawings, scale, paper size, colour set-up, line types, dimension system and text styles)

2.12 (such as for straight lines, curves and circles; how to add dimensions and text to drawings, producing layers of drawings)

2.14 (such as safety requirements, operating parameters of components, position of components in relation to other sources or circuits, possibility of external interference)

2.16 (with regard to their operating ranges and current carrying capacity)

2.18 (such as Ohm's Law)

2.19 (such as the positioning, siting and routeing of electrical cables and wires)

2.22 (such as ensuring that completed drawings are approved, labelled and stored on a suitable storage medium, the need to create backup copies and to file them in a separate and safe location away from electromagnetic sources, filing and storing hard copies for use in production)

Unit 585 Producing aeronautical mechanical engineering drawings using computer aided techniques

UAN:	**K/601/5153**
Level:	3
Credit value:	150
GLH:	329
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 185: Producing aeronautical mechanical engineering drawings using computer aided techniques (Suite 3).
Endorsement by a sector or regulatory body:	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 set up and operate a computer aided drawing system to produce detailed drawings for aeronautical mechanical engineering activities, in accordance with approved procedures. The drawings produced will include detail component drawings for manufacturing, aircraft assembly and sub-assembly drawings, equipment installation drawings, fault location aids such as flow diagrams, and modification drawings. The learner will be given a detailed drawing brief or a request for change/modification order, and they will be expected to access these requirements and to extract all necessary information in order to carry out the drawing operations. The learner will need to select the appropriate equipment and drawing software to use, based on the type and complexity of the drawing functions to be carried out. The learner will be expected to use current British, European and company standards to produce a drawing template for a range of paper sizes, and must include the drawing title, scale used, date of drawing, material to be used and other relevant information. The learner will then be expected to produce fully detailed drawings to enable the manufacture, assembly, installation or modification of the product to take place.

The learner's responsibilities will require them to comply with organisational policy and procedures for working in the drawing office or CAD suite. The learner will be required to report any problems with the computer hardware, software or drawing procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draught specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying computer aided drawing procedures for the creation of aeronautical mechanical engineering drawings. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to produce the drawings, 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 working with the computer drawing system. 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.

Learning outcome
The learner will: 1. Be able to produce aeronautical mechanical engineering drawings using computer aided techniques
Assessment criteria
The learner can: 1.1 prepare the CAD system for operation by carrying out all of the following: • check that all the equipment is correctly connected and in a safe and usable working condition (cables undamaged, correctly connected, safely routed) • power up the equipment and activate the drawing software • set up the drawing system to be able to produce the drawing to the appropriate scale • set up and check that all peripheral devices are connected and correctly operating (such as keyboard, mouse, light pen, digitiser/tablet, scanner, printer, plotter) • set the drawing datum at a convenient point (where applicable) • set up drawing parameters (to include layers, lines type,

colour, text styles) to company procedures or to suit the drawing produced
- create a drawing template to the required standards, which includes all necessary detail (such as title, drawing number, scale, material, date)

1.2 use three of the following to obtain the necessary data to produce the required drawings:
- drawing brief/request
- change order/modification request
- manuals
- calculations
- sketches
- notes from meetings/discussions
- specifications
- regulations
- sample component
- previous drawings/designs
- other available data
- standards reference documents (such as limits and fits, tapping drill charts, rivet dimensions)

1.3 take into account six of the following design features, as appropriate to the drawing being produced:
- function
- quality
- manufacturing method
- ergonomics
- materials
- cost
- lifetime of the product
- tolerances
- clearance
- aesthetics
- physical space
- operating environment
- interfaces
- safety

1.4 carry out all of the following before producing the engineering drawing:
- ensure that data and information are complete and accurate
- review the data and information to identify the drawing requirements
- recognise and deal with problems (information based and technical)

1.5 produce mechanical engineering drawings for three of the following:
- flaps
- under-floor structures
- side structures

- front fuselage section
- centre fuselage section
- rear fuselage section
- mechanical components
- windows
- galleys
- bulkheads
- avionics cabinets
- floor
- cockpit/cabin
- wing
- mission consoles
- hatches
- doors
- cabin roof
- fin
- nose
- side structures
- stairs
- trunking/ducting
- engine nacelle
- box sections
- tail plane
- ailerons
- structural repairs
- aircraft detail assemblies (such as stringers, frames, ribs, trays, skins, panels, tanks, brackets)
- fluid power circuits/pipe layouts

1.6 interpret and produce drawings using two of the following methods of projection:

- first angle orthographic projections
- isometric/oblique projections
- third angle orthographic projections

1.7 produce two of the following:

- detail drawings
- general arrangement drawings
- sub-assembly drawings

1.8 produce drawings that are sufficiently and clearly detailed

1.9 produce mechanical engineering drawings which include ten of the following:

- straight lines
- dimensions
- angled lines
- text
- insertion of standard components
- symbols and abbreviations

- curved/contour lines
- circles or ellipses
- geometrical tolerancing
- hidden detail
- sectional detail
- parts lists
- other specific detail

1.10 produce drawings in the required formats

1.11 use codes and other references that follow the required conventions

1.12 make sure that drawings are checked and approved within agreed timescales by authorised people

1.13 produce drawings in compliance with one of the following:

- CAD software standards
- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN standards and procedures
- customer standards and requirements
- company standards and procedures
- aircraft manufacturer's requirements

1.14 check that the drawings are properly registered and stored securely

1.15 save and store drawings in appropriate locations, to include carrying out all of the following:

- ensure that their drawing has been checked and approved by the appropriate person/s
- check that the drawing is correctly titled and referenced
- save the drawing to an appropriate storage medium
- create a separate backup copy and place it in safe storage
- produce a hard copy printout of the drawing for file purposes
- register and store the drawings in the appropriate company information system
- where appropriate, record and store any changes to the drawings in the appropriate company information system check that the changes are completed as required by organisational procedures

Learning outcome
The learner will: 2. Know how to produce aeronautical mechanical engineering drawings using computer aided techniques
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with computer systems equipment and work station environment 2.2 explain the need for good housekeeping arrangements

2.3	describe the basic set-up and operation of the computer systems, and the peripheral devices that are used
2.4	explain the correct startup and shutdown procedures to be used for the computer systems
2.5	explain how to access the specific computer drawing software to be used, and the use of software manuals and related documents to aid efficient operation of the relevant drawing system; the use of access codes for personal files
2.6	explain how to deal with system problems
2.7	explain what documentation is required for particular applications
2.8	describe the types of drawing that may be produced by the software
2.9	explain how to set up the viewing screen to show multiple views to help with drawing creation
2.10	explain what national, international and organisational standards and conventions are to be used for the drawings
2.11	explain how to set up the drawing template parameters
2.12	explain the application and use of drawing tools
2.13	explain how to access, recognise and use a wide range of standard components and symbol libraries from the CAD equipment
2.14	describe the difficulties that can emerge in manufacturing processes because of poor drawings/design
2.15	explain their understanding of the aeronautical mechanical equipment and structures being drawn, and the function of the individual components within the equipment/structure
2.16	explain their basic understanding of the manufacturing processes used for producing the components being drawn
2.17	explain the use of specific regulations and standard reference tables when selecting mechanical components
2.18	explain the need for document control
2.19	explain the procedures for drawing change notes, trial changes, up-issuing of drawings, modifications, and miscellaneous amendments to drawings
2.20	explain the relevant sources and methods for obtaining any required technical information relevant to the drawing being produced
2.21	explain the constraints laid down by existing national and international legislation, statutory and non-statutory regulations, industry and national standards, industry guidelines and professional codes that regulate mechanical design activities
2.22	describe the basic principles of engineering manufacturing operations, assembly and installation methods and limitations of the equipment/processes that are used to produce the drawn item and how these can influence the way they present the drawing
2.23	describe the functionality of the component, and its interrelationship with other components and assemblies
2.24	describe the extent of their own responsibility, and explain to whom they should report if they have problems that they cannot resolve when producing the drawings

Unit 585 Producing aeronautical mechanical engineering drawings using computer aided techniques

Supporting information

Guidance

2.1 (to include such things as safety guidance relating to the use of visual display unit (VDU) (such as lighting, seating, positioning of equipment), repetitive strain injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)

2.2 (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 (such as mouse, light pens, digitisers and tablets, printers or plotters, and scanners)

2.6 (such as error messages received, peripherals which do not respond as expected, obvious faults with the equipment or connecting leads)

2.7 (such as drawing briefs, specification sheets, request for change orders)

2.8 (such as first and third angle drawings, sectional elevations, isometric or oblique drawings)

2.9 (to include isometric front and side elevations)

2.11 (such as layers of drawings, scale, paper size, colour set-up, line types, dimension system and text styles)

2.12 (such as for straight lines, curves and circles; how to create hatching and shading on drawings; how to add dimensions and text to drawings, producing layers of drawings)

2.17 (such as rivets, mechanical fasteners, securing and locking devices)

2.18 (such as ensuring that completed drawings are approved, labelled and stored on a suitable storage medium, the need to create backup copies and to file them in a separate and safe location away from electromagnetic sources, filing and storing hard copies for use in production)

2.20 (such as limits and fits, contraction allowances, bearing selection, surface finish)

2.22 (such as machining methods, joining processes, fabrication, casting and forging)

Unit 586 Producing aeronautical engineering drawings/models using 3D computer aided techniques

UAN:	**M/601/5154**
Level:	3
Credit value:	150
GLH:	329
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 186: Producing aeronautical engineering drawings/models using 3D computer aided techniques (Suite 3).
Endorsement by a sector or regulatory body:	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 set up and operate a computer aided drawing system to produce three-dimensional aeronautical engineering drawings, in accordance with approved procedures. The learner will be given a detailed drawing brief or a request for change/modification order, and they will be expected to access these requirements and to extract all necessary information in order to carry out the drawing operations. The learner will need to select the appropriate equipment and drawing software to use, based on the type and complexity of the drawing functions to be carried out. The learner will be expected to set up co-ordinate systems in 3D space, set up the screen into split views to show true 3D (isometric) and plan views. The learner will then be expected to produce both surface and solid models and understand their differences and applications. The learner will use boundary modelling techniques as well as graphic primitives to produce their models, and will apply Boolean operators to construct the solid models. The learner's responsibilities will require them to comply with organisational policy and procedures for working in the drawing office or CAD suite. The learner will be required to report any problems with the computer hardware,

software or drawing procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal or written instructions and draught specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying computer aided drawing procedures. The learner will understand the 3D CAD system and software used, and its application, and will know about the various tools and techniques used to produce the drawings, 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 working with the CAD drawing system. 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.

Learning outcome
The learner will: 1. Be able to produce aeronautical engineering drawings/models using 3D computer aided techniques
Assessment criteria
The learner can: 1.1 prepare the CAD system for operation by carrying out all of the following: • check that all the equipment is correctly connected and in a safe and usable working condition (cables undamaged, correctly connected, safely routed) • power up the equipment and activate the drawing software • set up the drawing system to be able to produce the drawing to the appropriate scale • set up and check that all peripheral devices are connected and correctly operating (such as keyboard, mouse, light pen, digitiser/tablet, scanner, printer, plotter) • set up the viewing screen to show multiple views of the components (this will involve isometric, front and side elevations) • set the drawing datum at a convenient point (where applicable) • set up drawing parameters (to include layers, lines type, colour, text styles) to company procedures or to suit the drawing produced • create a drawing template to the required standards, which

includes all necessary detail (such as title, drawing number, scale, material, date)

1.2 use three of the following to obtain the necessary data to produce the required drawings:

- drawing brief/request
- change order/modification request
- manuals
- calculations
- sketches
- notes from meetings/discussions
- specifications
- regulations
- sample component
- previous drawings/designs
- other available data
- standards reference documents (such as limits and fits, tapping drill charts, rivet dimensions)

1.3 take into account eight of the following, as appropriate to the drawing being produced:

- function
- quality
- manufacturing method
- ergonomics
- materials
- cost
- lifetime of the product
- tolerances
- clearance
- aesthetics
- physical space
- operating environment
- interfaces
- safety

1.4 carry out all of the following before producing the engineering model:

- ensure that data and information are complete and accurate
- review the data and information to identify the drawing requirements
- recognise and deal with problems (information based and technical)

1.5 use two of the following 3D modelling tools:

- surface modelling
- solid modelling
- wire frame modelling

1.6 use two of the following co-ordinate measurements to produce 3D models:

- Cartesian

- Cylindrical
- spherical

1.7 produce and modify 3D engineering drawings, using two of the following tools and techniques:

- graphic primitives
- boundary techniques
- surface modifying tools
- Boolean operators

1.8 produce engineering drawings using two of the following methods of projection:

- isometric
- oblique
- orthographic
- perspective
- planometric

1.9 produce 3D engineering drawings for three of the following:

- detailed structural/airframe components (such as stringers, frames, ribs, trays, skins, panels, tanks, brackets)
- sub-assemblies (such as flaps, ailerons, under-floor structures, side structures, cabin roof, avionics cabinets, mission consoles, engine nacelle, windows, galleys, hatches, doors, stairs, trunking/ducting, and bulkheads)
- major assemblies (such as front, rear and centre fuselage sections; floors, wings, fin and tail sections, nose sections, cabins or cockpits)
- mechanical components
- mechanical controls/systems (such as chains and sprockets; cables, pulleys and turnbuckles; levers and linkages; control rods; pivots and bell cranks; struts and stays; locks and jacks; servo actuators; tie rods, torque tubes and trim wheels)
- fluid power equipment/systems (such as hydraulic, vacuum, pneumatic)
- avionic/electrical equipment/systems (such as avionic cabinets, mission consoles, VDU display units)
- development models

1.10 produce drawings that are sufficiently and clearly detailed

1.11 produce drawings which include nine of the following:

- straight lines
- dimensions
- angular surfaces
- text
- insertion of standard components
- symbols and abbreviations
- curved surfaces
- circles or ellipses
- hidden detail
- hatching and shading
- parts lists

- other specific detail

1.12 produce drawings in the required formats

1.13 use codes and other references that follow the required conventions

1.14 make sure that drawings are checked and approved within agreed timescales by authorised people

1.15 produce drawings in compliance with one of the following:

- CAD software standards
- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN standards and procedures
- customer standards and requirements
- company standards and procedures
- aircraft manufacturer's requirements

1.16 check that the drawings are properly registered and stored securely

1.17 save and store drawings in appropriate locations, to include carrying out all of the following:

- ensure that the drawing has been checked and approved by the appropriate person/s
- check that the drawing is correctly titled and referenced
- save the drawing to an appropriate storage medium
- create a separate backup copy and place it in safe storage
- produce a hard copy printout of the drawing for file purposes
- register and store the drawings in the appropriate company information system
- record and store any changes to the drawings in the appropriate company information system check that the changes are completed as required by organisational procedures

Learning outcome
The learner will: 2. Know how to produce aeronautical engineering drawings/models using 3D computer aided techniques
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with computer systems (equipment and work station environment 2.2 explain the need for good housekeeping arrangements 2.3 describe the basic set-up and operation of the 3D drawing systems, and the peripheral devices that are used 2.4 explain the correct startup and shutdown procedures to be used for the computer systems 2.5 explain how to access the specific computer drawing software to be used, and the use of software manuals and related documents to aid efficient operation of the relevant drawing system

2.6	explain how to deal with system problems
2.7	explain what documentation is required for particular applications
2.8	describe the types of drawing that may be produced by the software
2.9	explain how to set up the viewing screen to show multiple views of the component to help with drawing
2.10	explain what national, international and organisational standards and conventions are to be used for the drawings
2.11	explain how to set up the drawing template parameters
2.12	explain the application and use of drawing tools
2.13	explain how to access, recognise and use a wide range of standard components and symbol libraries from the CAD equipment
2.14	describe the applications of different 3D modelling programmes
2.15	explain the different projections used to create 3D drawings
2.16	explain the application of different co-ordinate measurements used to create 3D drawings
2.17	explain the display views that can be used on 3D drawings (such as view co-ordinate geometry and object co-ordinate geometry
2.18	explain the application and use of drawing tools for surface or solid modelling; how to modify drawings using surface modelling tools or Boolean operators: how to add dimensions and text to drawings
2.19	explain the need for document control
2.20	explain the procedures for drawing change notes, trial changes, up-issuing of drawings, modifications, and miscellaneous amendments to drawings
2.21	explain the relevant sources and methods for obtaining any required technical information relevant to the drawing being produced
2.22	explain what documentation is required for the release/issue of drawing/models
2.23	describe the basic principles of engineering manufacturing operations, assembly and installation methods and limitations of the equipment/processes that are used to produce the drawn item and how these can influence the way they present the drawing
2.24	explain the functionality of the component, and its interrelationship with other components and assemblies
2.25	describe the extent of their own responsibility, and explain to whom they should report if they have problems that they cannot resolve when producing the drawings

Unit 586 Producing aeronautical engineering drawings/models using 3D computer aided techniques

Supporting information

Guidance

2.1 (to include such things as safety guidance relating to the use of visual display unit (VDU) (such as lighting, seating, positioning of equipment), repetitive strain injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)

2.2 (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 (such as mouse, light pens, digitisers and tablets, printers or plotters, and scanners)

2.6 (such as error messages received, peripherals which do not respond as expected, obvious faults with the equipment or connecting leads)

2.7 (such as design briefs, specification sheets, request for change orders)

2.9 (to include isometric front and side elevations)

2.11 (such as layers of drawings, scale, paper size, colour set-up, line types, dimension system and text styles)

2.12 (such as for straight lines, curves and circles; how to create hatching and shading on drawings; how to add dimensions and text to drawings, producing layers of drawings)

2.14 (such as surface, solid and wire frame)

2.15 (such as isometric, oblique, orthographic, perspective and planometric)

2.16 (such as Cartesian, spherical and cylindrical)

2.19 (such as ensuring that completed drawings are approved, labelled and stored on a suitable storage medium, the need to create backup copies and to file them in a separate and safe location away from electromagnetic sources, filing and storing hard copies for use in production)

2.21 (such as limits and fits, contraction allowances, bearing selection, surface finish)

2.23 (such as machining methods, joining processes, fabrication, casting and forging)

Unit 587 Development testing aeronautical electronic equipment

UAN:	**T/601/5155**
Level:	3
Credit value:	53
GLH:	105
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 187: Development testing aeronautical electronic equipment (Suite 3).
Endorsement by a sector or regulatory body:	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 development tests on aeronautical electronic equipment, in accordance with approved procedures. The learner will be required to carry out tests on a range of aeronautical electronic equipment, such as power supplies, motor control equipment, sensors and actuators, digital systems, AFCS system, displays/indication and gauging, communication, navigation, radar, armament, flight guidance and control, computing and pitot static equipment, to establish that they functioning at optimal level and to specification. The learner will be required to carry out tests which will include voltage and current levels, resistance values, waveform, clock/timer switching, pulse width/rise time, open/short circuit, logic state, frequency modulation/demodulation, and signal-to-noise ratio/interference levels. The learner's responsibilities will require them to comply with organisational policy and procedures for carrying out the testing activities, 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 with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good

understanding of the procedures for carrying out the required tests, and will provide an informed approach to applying the necessary test procedures. The learner will understand the aeronautical equipment being worked on, the test equipment being used, and the various testing procedures and their application, in adequate depth to provide a sound basis for carrying out the activities to the required specification. In addition, the learner will be expected to review the outcome of the tests, compare the results with appropriate specifications, determine the action required, and to record/report the results in the appropriate format.

The learner will understand the safety precautions required when carrying out the testing activities, especially those for isolating the equipment, and taking the necessary safeguards to protect themselves and others against direct and indirect electric shock. 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.

Learning outcome
The learner will: 1. Be able to develop test aeronautical electronic equipment
Assessment criteria
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 testing activities: • obtain and use the appropriate documentation (such as job instructions, aircraft electronic equipment test procedures, quality control documentation, aircraft standards and specifications) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • provide and maintain a safe working environment for the testing activities • obtain the correct tools and equipment for the activity, and check that they are in a safe and usable condition and within current calibration date • obtain clearance to work on the aircraft, and observe all relevant isolation and safety procedures • ensure that safe working distance procedures are set up (where appropriate) • where appropriate, apply electrostatic discharge (ESD) protection procedures

- carry out the tests using the specified techniques and procedures
- make any permitted adjustments to components and equipment, to bring the system to the specification requirements
- return all tools and equipment to the correct location on completion of the testing activities
- leave the aircraft and equipment in a safe and appropriate condition, free from foreign object debris on completion of the activities

1.3 follow the appropriate procedures for use of tools and equipment to carry out the required tests

1.4 carry out tests using a range of tools and test equipment, to include four of the following:

- oscilloscope
- ammeter
- logic analyser
- logic probe
- signal tracer
- signal generator
- multimeter
- automatic test equipment
- computer-aided diagnostic equipment
- special purpose testing equipment
- temperature measuring devices

1.5 set up and carry out the tests using the correct procedures and within agreed timescales

1.6 carry out tests on four of the following types of electronic equipment:

- power supplies (such as switched mode, series regulation)
- motor control systems (such as closed loop servo, proportional control, inverter control)
- sensor/actuator circuit (such as linear, rotational, temperature, photo-optic, flow, level, pressure)
- digital circuit (such as process control, microprocessor, logic devices, display devices)
- signal processing circuit (such as frequency modulating/demodulating, amplifiers, filters)
- automatic flight control systems (AFCS)
- displays/indication and gauging
- passive warning and optical/surveillance
- navigation
- computing
- armament
- radar
- communication

1.7 carry out ten of the following tests/measurements, as applicable to the equipment being tested:

- logic states

- dc voltage/current levels
- ac voltage/current levels
- pulse width/rise time
- signal-to-noise ratio
- open/short circuit
- resistance
- heat dissipation
- performance of circuit
- VSWR
- frequency modulation/demodulation
- condition of assemblies and components
- signal noise/interference levels
- electro-magnetic compatibility (EMC)
- power output

1.8 carry out all of the following checks to ensure the accuracy and quality of the tests performed:

- the test equipment is correctly calibrated
- test equipment used is appropriate for the tests being carried out
- ESD precautions and procedures are applied
- test procedures to be used are up to date and follow laid-down procedures
- test equipment is operated within its specified range

1.9 carry out development testing activities in compliance with relevant regulations and guidelines, from all of the following, as is appropriate:

- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN standards and procedures
- company policy and procedures
- customer policy and procedures
- aircraft manufacturer's requirements

1.10 record the results of the tests in the appropriate format

1.11 provide a record/report of the test outcomes, using one of the following:

- written or typed report
- specific company documentation
- specific test report
- electronic mail
- computer based presentation

1.12 review the results and carry out further tests if necessary

Learning outcome
The learner will: 2. Know how to development test aeronautical electronic equipment
Assessment criteria
The learner can: 2.1 explain the health and safety requirements of the area in which the testing activity is to take place, and the responsibility these requirements place on them 2.2 explain their responsibilities under regulations relevant to the electronic testing activities being undertaken 2.3 explain the permit-to-work procedure that applies to the testing activities, and placing of warning notices 2.4 explain the specific safety precautions to be taken when carrying out testing of electronic equipment 2.5 describe the hazards associated with testing electronic equipment and circuits, and with the equipment that is used, and explain how to minimise them and reduce any risks 2.6 explain the importance of wearing protective clothing and other appropriate safety equipment during the testing activities 2.7 explain the importance of keeping the work area clean, tidy and free from waste or surplus materials 2.8 explain how the testing activities may affect the work of others, and the procedure for informing them of the work to be carried out 2.9 explain the procedures and precautions to be adopted to eliminate/protect against electro-static discharge (ESD) 2.10 explain how to obtain and interpret drawings, Boolean algebra, truth tables, logic symbols, circuit diagrams, specifications, manufacturers' manuals, test procedures and documents needed to carry out the tests 2.11 describe the basic principles of how the electronic circuit functions, its operating sequence, the function/purpose of individual units/components, and how they interact 2.12 explain how to determine the most suitable test points within the circuit 2.13 explain how to set up and apply the appropriate test equipment 2.14 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 their intended purpose 2.15 explain how to check that the test equipment is correctly calibrated 2.16 describe the various testing methods and procedures, and explain how to apply them to different operating conditions 2.17 explain how to analyse test results, and how to use comparison and sequential techniques 2.18 explain the environmental control requirements and company operating procedures relating to functional testing 2.19 explain what documentation is required, and the procedures to be followed, at the conclusion of the tests 2.20 describe the extent of their own authority and explain to whom they should report if they have problems that they cannot resolve

Unit 588 Monitoring aeronautical engineering activities

UAN:	**A/601/5156**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 188: Monitoring aeronautical engineering activities (Suite 3).
Endorsement by a sector or regulatory body:	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 monitor aeronautical engineering activities, in accordance with approved procedures. The learner will be required to monitor engineering processes, and the supply and use of resources, both within the company and with external suppliers, at suitable intervals. During the monitoring process, the learner will be required to confirm that the engineering methods used are appropriate, and that the outputs and materials used are within the required specification. The learner's responsibilities will require them to comply with organisational policy and procedures for the engineering activities being monitored, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with minimal supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will include knowledge of both organisational procedures and discipline-specific engineering principles and processes within their area of responsibility. This will provide a good understanding of their work, and will provide an informed approach to applying monitoring procedures. The learner will be conversant with relevant organisational and quality assurance procedures within their area of responsibility. The learner will also have an underpinning knowledge of resource management principles, quality assurance

principles and problem solving techniques, in adequate depth to provide a sound basis for carrying out the monitoring activities to the required standards.

The learner will be aware of any company/aeronautical, legislative or regulatory health, safety and environmental requirements applicable to the engineering activities being monitored. 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.

Learning outcome
The learner will: 1. Be able to monitor aeronautical engineering activities
Assessment criteria
The learner can: 1.1 carry out all of the following during the monitoring activities: • obtain the required specifications and documents required for the monitoring process • obtain approval to carry out the monitoring activities • ensure that all appropriate personnel are fully informed of their intended activities • use appropriate personal protective equipment for the area in which they are carrying out the monitoring • activities • apply safe working practices and procedures at all times • follow the defined monitoring procedures at all times 1.2 obtain the appropriate authorisation, and select one aeronautical engineering activity to monitor from the following: • manufacturing activities (such as machining, detail fitting, fabrication of components, moulding) • material processing activities (such as heat treatment, annealing) • finishing activities (such as stripping finishes, painting, plating, anodising) • assembly activities (such as mechanical, structural, fluid power, electrical/electronic) • installation activities (such as, mechanical equipment installation, electrical/avionic installation) • modification and repair activities • operational activities (such as quality systems and audit, scheduled safety audits and risk assessments) • equipment capability/performance measurement • commissioning/decommissioning • lifting and moving large components/assemblies (including transportation/delivery) • materials handling (such as movement of materials, materials storage, removal of waste)

- plant and equipment (such as plant layout, equipment changeover, equipment replacement)
- research and development
- maintenance activities
- testing and trialling

1.3 obtain relevant process specifications from the appropriate sources, to include two of the following:

- documentation (such as work orders, contracts, memos, plans/designs, purchase orders)
- standard operating procedures (such as process control sheets/charts, quality standards, drawings)
- equipment or materials supplier information
- schedules

1.4 carry out all of the following during the monitoring activity:

- ensure the effective supply and use of resources
- verify that materials to be used are within specification
- record any deviations from agreed plans and schedules
- ensure that any problems which occur during the monitoring process are reported
- measure the outputs of the engineering process and compare these with specifications
- confirm that all relevant regulations and guidelines are complied with

1.5 monitor the engineering process at suitable opportunities

1.6 use all of the following during the monitoring activity:

- observation
- sampling
- data collection
- interviews

1.7 monitor the engineering activity using one of the following techniques:

- scheduled
- formal
- random
- reactive

1.8 monitor the supply and use of resources to ensure that they are effectively used

1.9 monitor the supply and use of resources, to include one of the following:

- equipment
- people
- facilities
- materials

1.10 confirm that the materials used during the engineering process comply with specifications

1.11 confirm that suitable engineering methods and procedures have been used

1.12 identify any variations from agreed plans and schedules

1.13 ensure that any problems with the engineering process are

identified

1.14 check that the outputs of the engineering process comply with specifications

1.15 check that the engineering process complies with all relevant regulations and guidelines

1.16 check that the process is monitored in compliance with relevant regulations, standards and guidelines from all of the following, as appropriate to the activity carried out:

- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- BS, ISO or BSEN procedures
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- customer standards and requirements
- company standards and procedures
- aircraft manufacturer's requirements

1.17 communicate the outcomes of the monitoring activity to the relevant people, using the following methods:

- verbal report

plus one more method from the following:

- electronic mail
- computer-based presentation
- written or typed report
- specific company form

Learning outcome
The learner will: 2. Know how to monitor aeronautical engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be monitored 2.2 explain the specific regulations and guidelines that are relevant to the activities being monitored 2.3 explain the specific safety precautions to be taken when carrying out the monitoring and associated activities 2.4 explain what personal protective equipment to be worn in the specific work area, and where this can be obtained 2.5 explain the implications of not taking account of legislation, regulations, standards and guidelines when carrying out the monitoring activities 2.6 explain the organisational procedures for determining when monitoring should occur and how it should be undertaken 2.7 describe the monitoring methods and procedures that should be used for the types of engineering activity within their area of responsibility 2.8 describe the potential variations from plans and schedules that might occur during monitoring 2.9 explain their working knowledge of the processes and specifications of the activity being monitored

2.10	describe the quality assurance systems that are being used
2.11	describe the types of problem that could occur with the monitoring process, and the organisational methods and explain the procedures for resolving them
2.12	explain the importance of solving problems quickly
2.13	explain how to check the outputs of the monitoring process against the specified inputs
2.14	explain the procedures for obtaining information on resources
2.15	explain how to assess the need for resources
2.16	explain how to verify that resources are suitable, and available within or to the organisation
2.17	explain the importance of maintaining records of the monitoring activities
2.18	explain what type of information is to be recorded, and the amount of detail that is required
2.19	explain where the records are kept and the procedure for obtaining them
2.20	explain the importance of ensuring that any records that they use are correctly updated and returned to the appropriate location
2.21	explain the different ways of presenting information to different people
2.22	explain the organisational reporting processes and lines of communication
2.23	describe the extent of their own responsibility and explain to whom they should report if they have problems that they cannot resolve
2.24	explain the sources of technical expertise if they have problems that they cannot resolve

Unit 589 Planning aeronautical engineering activities

UAN:	**F/601/5157**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 189: Planning aeronautical engineering activities (Suite 3).
Endorsement by a sector or regulatory body:	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 plan aeronautical engineering activities, in accordance with approved procedures. The scope of the unit requires the learner to produce plans for significant engineering activities, requiring multiple stages in their execution, and will cover such things as detail component manufacturing, assembly activities, installation, materials processing and finishing, testing and trialling, commissioning, planned maintenance, lifting, moving and transporting of goods or materials, and plans for capability studies or equipment replacement programs. The learner will also be required to establish the activities that must be carried out, the methods and resources to be used, and to produce a detailed plan of operation. The learner will be required to complete the work within agreed timescales, whilst ensuring that the activities within their control conform to organisational and legal requirements. The learner's responsibilities will require them to comply with organisational policy and procedures for planning the engineering activities. The learner will report any problems with the activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good

understanding of their work, and will provide an informed approach to planning aeronautical engineering activities. The learner will understand the aeronautical engineering processes within their area of responsibility, including the availability of resources, in adequate depth to provide a sound basis for carrying out their activities to the required standard. The learner will understand their organisation's methods of operation in sufficient detail to enable them to make informed decisions.

The learner will be aware of any health, safety and environmental requirements applicable to their area of responsibility. 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.

Learning outcome
The learner will: 1. Be able to plan aeronautical engineering activities
Assessment criteria
The learner can: 1.1 collect the information needed to prepare the plan 1.2 carry out all of the following when determining and producing the engineering plans: • use the correct issue of company information • check that all essential information and data needed to produce the plans is available • collect relevant information on the engineering requirements, operations, methods and resources • determine the availability of the resources required • ensure that health and safety regulations and safe working practices are taken into account • ensure that the influence of working conditions are recognised and included in the plans • present the engineering plans in the appropriate formats 1.3 identify health and safety issues and safe working practices and procedures that must be followed 1.4 identify the operations to be carried out and determine their sequence 1.5 establish which methods are required and what resources are to be used 1.6 identify any special requirements and incorporate them in the plan 1.7 estimate timescales required 1.8 prepare and record the plan 1.9 produce engineering plans for two of the following: • manufacturing activities (such as machining, detail fitting, fabrication of components, moulding) • material processing activities (such as heat treatment,

annealing)
- finishing activities (such as stripping finishes, painting, plating, anodising)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic)
- installation activities (such as, mechanical equipment installation, electrical/avionic installation)
- modification and repair activities
- operational activities (such as movement of materials, quality systems and audit, scheduled safety audits and risk assessments)
- equipment capability/performance measurement
- commissioning/decommissioning
- lifting and moving large components/assemblies (including transportation/delivery)
- materials handling (such as movement of materials, materials storage, removal of waste)
- plant and equipment (such as plant layout, equipment changeover, equipment replacement)
- research and development
- maintenance activities
- testing and trialling
- capability studies

1.10 prepare plans that use four of the following resources:
- people with the necessary skills
- materials
- equipment
- facilities
- space
- utilities
- support services
- financial
- transportation

1.11 prepare plans that include all of the following:
- description of the activities to be carried out
- the sequence in which the activities will take place
- the documentation to be used (such as drawings, specifications, quality assurance)
- tooling requirements (such as jigs, fixtures, cutting tools, moulds)
- resources required
- the timescales to be met
- any special requirements that must be met
- details of health and safety issues

1.12 check that the plans comply with relevant regulations, standards and guidelines from all of the following, as appropriate:
- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)

- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN procedures
- company policy and procedures
- customer policy and procedures
- aircraft manufacturer's requirements

1.13 inform the appropriate people when the plan is completed

1.14 record and present the plans to the appropriate people using the following methods:

- verbal report

plus one more method from the following:

- written or typed report
- specific company documentation
- electronic mail
- computer based presentation

1.15 deal effectively with problems within their control and report those that cannot be solved

Learning outcome
The learner will: 2. Know how to plan aeronautical engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be used and plans being produced 2.2 explain the implications of not taking account of legislation, regulations, standards and guidelines when producing the engineering plans 2.3 explain how to obtain information on the engineering requirements, and the type of information that is available 2.4 explain how to access and use the appropriate information and documentation systems 2.5 describe the types of data that should be included in the engineering plans 2.6 explain how to extract information from engineering drawings and related specifications in relation to work being planned 2.7 explain the materials, formats, codes and conventions that are used in preparing the plans 2.8 explain the main planning methods and techniques in use, and what problems could occur in them 2.9 describe the factors to be taken into account when preparing the plans, especially those covering working conditions and safety 2.10 describe the main types of resource involved with different types of engineering activity, and the typical timescales for providing them 2.11 describe the obvious (and hidden) costs of resources/activities 2.12 explain the normal timescales for carrying out specific engineering activities, and how and why they vary 2.13 describe the products (or assets) involved in the activity being planned, and their availability

2.14	describe the engineering activities associated with these products/assets, and the types of data relevant to them
2.15	explain the development of the engineering plans
2.16	explain how to prepare the plans to include the structure, style, clarity and compliance with relevant standards
2.17	describe the process used in the organisation to validate the engineering plans produced
2.18	explain the control procedure for ensuring that the plans are maintained up to date
2.19	explain the procedures for changing the plans, and why control procedures are used
2.20	explain the importance of maintaining records, what needs to be recorded and where records are kept
2.21	explain why contingency plans need to be drawn up
2.22	explain whom to inform about the plans
2.23	describe the different ways of presenting information to different people
2.24	explain the importance of providing right information at the right time
2.25	describe the roles and responsibilities of key personnel in their organisation
2.26	describe the types of problem that can occur during the implementation of the plan, and explain how these problems can be rectified
2.27	describe the extent of their own authority and explain to whom they should report in the event of problems that they cannot resolve
2.28	explain the sources of technical expertise if they have problems that they cannot resolve
2.29	describe the organisational procedures for providing information to different people

Unit 589 Planning aeronautical engineering activities

Supporting information

Guidance

2.3 (such as customer order requirements and instructions, quality control requirements, product specification, manufacturing methods)

2.5 (such as activities to be carried out, sequence in which they must be carried out, timescales, resource requirements, health and safety issues)

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

2.15 (to include both master documents and working instructions, along with their purpose, content and status)

Unit 590 Producing technical details for aeronautical engineering activities

UAN:	**J/601/5158**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 190: Producing technical details for aeronautical engineering activities (Suite 3).
Endorsement by a sector or regulatory body:	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 produce technical details for aeronautical engineering activities, in accordance with approved procedures. The scope of the unit requires the learner to produce technical details in the correct form for engineering activities to take place, and to pass them on to the appropriate people within agreed timescales, whilst ensuring that the activities within their control conform to organisational and legal requirements. The learner's responsibilities will require them to comply with organisational policy and procedures for producing the technical details. The learner will report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to gathering appropriate information, determining the technical information required and presenting the required details in the required formats. The learner will understand their organisation's methods of operation in sufficient detail to enable them to make informed decisions. The learner will be aware of any health, safety

and environmental requirements applicable to their area of responsibility. 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.

Learning outcome
The learner will: 1. Be able to produce technical details for aeronautical engineering activities
Assessment criteria
The learner can: 1.1 carry out all of the following when determining and producing the technical details: • use the correct issue of company information • check that all essential information and data needed, to identify the technical requirements and to derive the technical details, are available • ensure that health and safety regulations and safe working practices are taken into account • ensure that the influence of working conditions on technical performance is recognised and included in the technical details • present the technical details in the appropriate formats • resolve any problems as they occur, within their level of responsibility 1.2 produce technical details that contain all the relevant and necessary data for the engineering activity to be carried out 1.3 produce technical details for three of the following aeronautical engineering activities: • machining activities (such as milling, turning, grinding, pressing) • assembly activities (such as mechanical, airframe, fluid power, electrical/electronic) • fabrication activities (such as sheet metal, welding, riveting) • composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding) • material processing activities (such as melting and casting, heat treatment, annealing) • finishing activities (such as stripping finishes, painting, plating, anodising) • installation activities (such as mechanical equipment installation, electrical/avionic installation) • modification and repair activities • operational activities (such as movement of materials, quality systems and audit, scheduled safety audits and risk assessments) • equipment capability/performance measurement • commissioning/decommissioning

- lifting and moving large components/assemblies (including transportation/delivery)
- materials handling (such as movement of materials, materials storage, removal of waste)
- plant and equipment (such as plant layout, site preparation, equipment changeover, equipment replacement)
- research and development
- maintenance activities (such as preventative maintenance requirements)
- testing and trialling (such as test schedules)
- inspection and quality control
- resource usage (such as materials required, contracted services)

1.4 include five of the following in the technical detail:

- equipment operating detail (function)
- equipment performance parameters
- physical characteristics (dimensions, weight)
- environmental considerations/operating conditions
- manufacturing methods
- manufacturing detail
- processing requirements
- work instructions or procedures
- resource requirements
- interfacing
- specific or specialist equipment required
- materials required/used
- timing/delivery details
- cost/budget estimation/details
- training required
- safety requirements
- number/volume required

1.5 check that the technical details comply with all of the following, as appropriate:

- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN procedures
- company policy and procedures
- customer policy and procedures
- aircraft manufacturer's requirements

1.6 present the technical details in the appropriate formats

1.7 make sure that codes and other references used in the technical details follow agreed conventions

1.8 take account of applicable local and national standards and conventions when producing the technical details, to include five of the following:

- terminology

- nomenclature
- colour codes
- symbols and abbreviations
- company instructions
- referencing and indexing
- geometric tolerancing
- document format and layout
- safe working practice and procedures
- military specifications

1.9 pass on the technical details to the appropriate people within agreed timescales

1.10 present the technical detail using the following method:

- verbally

plus one more method from the following:

- written or typed report
- specific company documentation
- electronic mail
- computer based presentation

1.11 record technical details and store them securely in accordance with organisational requirements

1.12 undertake changes to technical details within agreed control procedures

Learning outcome
The learner will: 2. Know how to produce technical details for aeronautical engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the technical detail being produced 2.2 explain the implications of not taking account of legislation, regulations, standards and guidelines when specifying the technical details 2.3 explain how to obtain information on the engineering requirements, and the type of information that is available 2.4 explain how to extract information from engineering drawings and related specifications in relation to work undertaken 2.5 explain the materials, formats, codes and conventions that are used in presenting the technical details 2.6 describe the types of data that should be included in the technical details they are producing 2.7 describe the factors to be taken into account when determining the technical details, especially those covering working conditions and safety 2.8 explain the development of the technical details 2.9 explain how to prepare the technical details 2.10 explain the process used in the organisation to validate the technical details produced 2.11 explain the control procedure for ensuring that the technical details

	are maintained up to date
2.12	explain the procedures for changing technical details, and why control procedures are used
2.13	explain the importance of maintaining records, what needs to be recorded and where records are kept
2.14	explain how to access and use the appropriate information and documentation systems
2.15	describe the different ways of presenting information to different people
2.16	explain the importance of providing the right information at the right time
2.17	describe the problems that can occur with specifying technical details for engineering requirements, and explain how they can be minimised
2.18	describe the extent of their own authority and explain to whom they should report in the event of problems that they cannot resolve
2.19	explain the sources of technical expertise if they have problems that they cannot resolve
2.20	explain the organisational procedures for providing information to different people

Unit 590 Producing technical details for aeronautical engineering activities

Supporting information

Guidance

2.3 (such as customer order requirements and instructions, quality control requirements and the product specification)

2.4 (to include symbols and conventions to appropriate BS, ISO or BSEN standards)

2.8 (to include both master documents and working instructions, along with their purpose, content and status)

2.9 (to include the structure, style, clarity and compliance with relevant standards)

Unit 591 Obtaining resources for aeronautical engineering activities

UAN:	**L/601/5159**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 191: obtaining resources for aeronautical engineering activities (Suite 3).
Endorsement by a sector or regulatory body:	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 obtain resources such as materials, drawings, people, equipment and documentation for the implementation of aeronautical engineering activities, in accordance with approved procedures. The learner will be required to apply appropriate methods and approaches for specifying and obtaining the resources. The learner will also be required to highlight any deviations from agreed schedules to the relevant people. The learner's responsibilities will require them to comply with organisational policy and procedures for obtaining resources for the aeronautical engineering activities, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner will be expected to have underpinning knowledge that will include methods for assessing and evaluating the operational requirements. The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to obtaining resources for the specified aeronautical engineering activities. The learner will understand the engineering

processes within their area of responsibility, including quality assurance, resource management and problem solving principles and procedures, in adequate depth to provide a sound basis for carrying out their activities to the required standard.

The learner will be aware of any company, legislative or regulatory health, safety and environmental requirements applicable to the engineering activities for which the resources are being obtained. 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.

Learning outcome
The learner will: 1. Be able to obtain resources for aeronautical engineering activities
Assessment criteria
The learner can: 1.1 carry out all of the following when determining and obtaining the required resources: • use the correct issue of company information • select the engineering activities for which resources are required • check that all essential information and data needed to determine the resources are available • collect relevant information on the engineering requirements, operations and methods • use the information collected to determine the resources required • identify potential problems which may influence the provision of the resources • check that the appropriate resources will be available at the time they are required • ensure that health and safety regulations and safe working practices are taken into account • ensure that the influence of working conditions is recognised and included in the plans • present the resource requirements in the appropriate formats 1.2 assess the engineering requirements and any factors that could affect them 1.3 obtain relevant information from the appropriate company information source, including two of the following: • specifications • works orders • purchase orders • planning documentation • contracts • memos

- standard operating procedures

1.4 determine and obtain resources for two of the following aeronautical engineering activities:
- manufacturing activities (such as machining, detail fitting, fabrication of components, moulding)
- material processing activities (such as heat treatment, annealing)
- finishing activities (such as stripping finishes, painting, plating, anodising)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic)
- installation activities (such as mechanical equipment installation, electrical/avionic installation)
- modification and repair activities
- operational activities (such as movement of materials, quality systems and audit, scheduled safety audits and risk assessments)
- equipment capability/performance measurement
- commissioning/decommissioning
- lifting and moving large components/assemblies (including transportation/delivery)
- materials handling (such as movement of materials, materials storage, removal of waste)
- plant and equipment (such as plant layout, equipment changeover, equipment replacement)
- research and development
- maintenance activities (such as planned preventive maintenance (PPM), part or sub-assembly exchange, line setting)
- testing and trialling

1.5 specify clearly the resources required

1.6 define the resources required, including all of the following, and check their availability and suitability:
- drawings and documentation
- people with the necessary skills
- materials
- plant and equipment
- safety equipment
- facilities
- space
- lifting and handling equipment
- utilities
- support services
- financial
- transportation

1.7 consult with all relevant people on the resources that are available

1.8 use appropriate organisational procedures to obtain the required resources

1.9 obtain the resources and resolve any supply issues, using two of

the following organisational procedures:

- ordering procedures
- authorisation procedures
- company communication systems
- hierarchy of control
- company procurement procedure

1.10 resolve any issues relating to the resources in the appropriate manner

1.11 record information on the resources in the appropriate information systems

1.12 record the resource details in the appropriate information systems, and inform the appropriate people that the required resources are available, using the following methods:

- verbal report

plus one more method from the following:

- electronic mail
- written or typed report
- specific company documentation
- computer based presentation

Learning outcome
The learner will: 2. Know how to obtain resources for aeronautical engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be used and resources required 2.2 explain the implications of not taking account of legislation, regulations, standards and guidelines when determining resource requirements 2.3 explain how to obtain information on the engineering activities and resource requirements, and the type of information that is available 2.4 explain how to check the validity of documentation used in the resource planning activities 2.5 explain the organisational procedures that should be used when obtaining resources 2.6 explain how to access and use the appropriate information and documentation systems 2.7 explain the company procedures for access to purchase orders and other relevant technical documentation 2.8 describe the types of resource to be determined and obtained for the planned aeronautical engineering activities 2.9 explain how to assess the need for resources 2.10 describe the main types of resource involved with different types of engineering activity, and the typical timescales for providing them 2.11 describe the factors to be taken into account when determining resources, especially those covering working conditions and safety 2.12 explain how to verify that the resources identified are suitable and available within or to the organisation

2.13	describe the issues that could occur when obtaining resources, and explain how to resolve them
2.14	describe the obvious (and hidden) costs of obtaining resources, especially those that have to be contracted out
2.15	explain the development of the resource documentation
2.16	explain how to prepare the resource plans
2.17	explain the process used in the organisation to validate the resource plans produced
2.18	explain the procedures for changing the resource requirements, and why control procedures are used
2.19	explain the importance of maintaining records on resource requirements, what needs to be recorded and where records are kept
2.20	describe the different ways of presenting information to different people
2.21	explain the importance of providing the right information at the right time
2.22	describe the roles and responsibilities of key personnel in their organisation
2.23	describe the problems that can occur when obtaining resources and explain how these problems can be overcome
2.24	describe the extent of their own authority and explain to whom they should report in the event of problems that they cannot resolve
2.25	explain the sources of technical expertise if they have problems that they cannot resolve
2.26	explain the organisational procedures for providing information to different people

Unit 591 Obtaining resources for aeronautical engineering activities

Supporting information

Guidance

2.3 (such as customer order requirements and instructions, quality control requirements, product specification, manufacturing methods)

2.8 (such as people with the right skills, materials, equipment, documentation, space required, support services, utilities, safety equipment, transportation)

2.15 (such as both master documents and working instructions, along with their purpose, content and status)

2.16 (to include the structure, style, clarity and compliance with relevant organisational standards)

Unit 592 Implementing aeronautical engineering activities

UAN:	**L/601/5162**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 192: Implementing aeronautical engineering activities (Suite 3).
Endorsement by a sector or regulatory body:	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 implement aeronautical engineering activities, in accordance with approved procedures. The learner will be required to apply appropriate methods and procedures to ensure that the resources and systems available to them are used effectively and efficiently. The learner will also be required to identify any opportunities to improve the engineering processes during implementation, such as a new or changed assembly process which involves activities and resources from design office or production engineering. The learner's responsibilities will require them to comply with organisational policy and procedures for the implementation of the aeronautical engineering activities, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner will be expected to have underpinning knowledge that will include resource management principles. The learner's knowledge will provide a good understanding of their work and will provide an informed approach to implementing aeronautical engineering activities. The learner will understand their organisation's methods of

operation and quality assurance systems in sufficient detail to enable them to make informed decisions and to carry out the implementation activities to the required standard.

The learner will be aware of any company, legislative or regulatory health, safety and environmental requirements applicable to the engineering activity being implemented. 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.

Learning outcome
The learner will: 1. Be able to implement aeronautical engineering activities
Assessment criteria
The learner can: 1.1 confirm that conditions are suitable to implement engineering methods and procedures 1.2 carry out all of the following when implementing the aeronautical engineering activities: • use the correct issue of company information • check that all essential information and data needed to implement the engineering activity are available • collect relevant information on the engineering requirements, operations and methods • use the information collected to determine an implementation plan • identify potential problems which may influence the implementation of the engineering activity • check that the appropriate resources will be available at the time they are required • ensure that health and safety regulations and safe working practices are taken into account • ensure that the influence of working conditions is recognised and included in the implementation plans 1.3 provide clear and accurate instructions/information to all the relevant people using the following methods: • verbal report plus one more method from the following: • written instructions • demonstration • written or typed report • specific company documentation • electronic mail • computer based presentation 1.4 obtain accurate information on the engineering activities being undertaken

1.5 obtain details of activities and resources from two of the following:

- design office
- quality engineering
- plant engineering
- operations office
- production engineering
- industrial engineering
- process engineering
- other specific

1.6 Implement two aeronautical engineering activities from the following:

- manufacturing activities (such as machining, detail fitting, fabrication of components, moulding)
- material processing activities (such as heat treatment, annealing)
- finishing activities (such as stripping finishes, painting, plating, anodising)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic)
- installation activities (such as mechanical equipment installation, electrical/avionic installation)
- modification and repair activities
- operational activities (such as movement of materials, quality systems and audit, scheduled safety audits and risk assessments)
- equipment capability/performance measurement
- commissioning/decommissioning
- lifting and moving large components/assemblies (including transportation/delivery)
- materials handling (such as movement of materials, materials storage, removal of waste)
- plant and equipment (such as plant layout, equipment changeover, equipment replacement)
- research and development
- maintenance activities
- testing and trialling
- capability studies

1.7 confirm that they have the appropriate authorisation for implementing the aeronautical engineering activities, and that all of the following conditions are suitable:

- appropriate plant and equipment is available
- materials and components are ready for use
- required resources are available
- time scales for undertaking the activities are as planned
- health and safety requirements can be met
- environmental conditions are suitable
- work area/site is suitably prepared

1.8 ensure that quality assurance systems are correctly implemented

1.9 ensure that engineering support systems are operating correctly,

including one of the following:

- resource supply (such as materials, equipment and people)
- transport
- logistics
- procurement
- utilities

1.10 control the use of resources to achieve the most effective results

1.11 identify opportunities to improve the engineering methods and procedures

1.12 prepare and present a report on the implementation activities, including all of the following, using appropriate formats, to the relevant people:

- a record of the implementation process
- suggested improvements to their process of implementation (if required)
- recommendations for improvements or changes to the engineering process that was implemented
- an appraisal of the support and quality assurance systems

1.13 check that the implementation of engineering methods and procedures complies with all relevant regulations and guidelines, from all of the following, as appropriate:

- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN standards and procedures
- company policy and procedures
- customer policy and procedures
- aircraft manufacturer's requirements

Learning outcome
The learner will: 2. Know how to implement aeronautical engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be implemented 2.2 explain the implications of not taking account of legislation, regulations, standards and guidelines when implementing the engineering processes 2.3 explain what personal protective equipment is required for the work area and process being implemented 2.4 explain how to obtain information on the engineering requirements, and the type of information that is available 2.5 explain how to access and use the appropriate information and documentation systems 2.6 explain what engineering methods and procedures that could be used for different types of engineering activity 2.7 explain how to identify if conditions are suitable, or not suitable, for

different types of engineering activities

2.8 explain how and where to obtain details of the engineering activities being undertaken

2.9 describe the types of data that they will require to implement the engineering activity

2.10 explain how to extract information from engineering drawings and related specifications in relation to work being planned

2.11 explain the materials, formats, codes and conventions that are used in the drawings and plans

2.12 describe the factors to be taken into account when implementing the engineering activity, especially those covering working conditions and safety

2.13 describe the main types of resource involved with different types of engineering activity, and the typical timescales for providing them

2.14 explain how to verify that resources are suitable, and available within or to the organisation

2.15 explain the timescales for carrying out specific engineering activities, and why they must be adhered too

2.16 explain the use of the engineering plans

2.17 explain the procedures for changing the plans to take account of changed circumstances or improvements in the process

2.18 explain how to present observations and recommendations in the appropriate formats

2.19 explain the importance of maintaining records, what needs to be recorded and where records are kept

2.20 describe the quality assurance systems that are being used

2.21 describe the engineering support systems that are available

2.22 explain why contingency plans need to be drawn up

2.23 explain whom to inform about the plans

2.24 explain the different ways of presenting information to different people

2.25 explain the importance of providing the right information at the right time

2.26 describe the roles and responsibilities of key personnel in their organisation

2.27 describe the problems that can occur during the implementation of the engineering activity, and explain how these problems can be rectified

2.28 describe the extent of their own authority and explain to whom they should report in the event of problems that they cannot resolve

2.29 explain the sources of technical expertise if they have problems that they cannot resolve

Unit 592 Implementing aeronautical engineering activities

Supporting information

Guidance

2.4 (such as customer order requirements and instructions, quality control requirements, product specification, manufacturing methods)

2.9 (such as activities to be carried out, sequence in which they must be carried out, time scales, resource requirements, health and safety issues)

2.10 (to include symbols and conventions to appropriate BS, ISO or BSN standards)

2.16 (such as both master documents and working instructions, along with their purpose, content and status)

Unit 593 Implementing quality assurance systems in an aeronautical engineering environment

UAN:	**Y/601/5164**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 193: Implementing Quality Assurance Systems in an aeronautical engineering Environment (Suite 3).
Endorsement by a sector or regulatory body:	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 implement quality assurance systems in an aeronautical engineering environment, in accordance with approved procedures. The learner will be required to establish precise criteria to enable them to assess the quality of engineering products or processes, such as component manufacturing, assembly activities, materials processing and finishing, installation activities, repair and modifications, maintenance, commissioning and de-commissioning. The learner will also be expected to decide and communicate the quality assurance recommendations to all relevant people. The learner's responsibilities will require them to comply with organisational policy and procedures for the quality assurance of engineering products or processes, and to report any problems that they cannot personally resolve, or are that outside their permitted authority, to the relevant people. The learner will be expected to work with minimal supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will enable

them to have an informed approach to the implementation of quality assurance systems. The learner will understand their organisation's methods of operation and quality assurance systems, in sufficient detail to enable them to make informed decisions and to carry out the implementation to the required standard.

The learner will be aware of any health, safety and environmental requirements applicable to the quality assurance 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.

Learning outcome
The learner will: 1. Be able to implement quality assurance systems in an aeronautical engineering environment
Assessment criteria
The learner can: 1.1 establish clear and precise criteria for assuring the quality of engineering products or processes 1.2 carry out all of the following in preparation for the quality assurance activity: • identify the product or process requiring quality assurance • establish the clear criteria of the quality assurance process • collect information from appropriate sources • identify suitable quality assurance methods, techniques and procedures • demonstrate and recommend the quality assurance process to the appropriate people 1.3 carry out all of the following during the quality assurance activities: • obtain the required quality control specifications and related documents required for the process • obtain approval to carry out the quality assurance activities • ensure that all appropriate personnel are fully informed of their intended activities • use appropriate personal protective equipment for the area in which they are carrying out the quality assurance activities • apply safe working practices and procedures at all times 1.4 obtain suitable information about the product or process requiring quality assurance, from two of the following: • quality control staff • manufacturers' manuals/specifications • engineering drawings • product specifications • regulations and guidelines • international/national standards

1.5 identify suitable quality assurance methods and procedures, to include two of the following:

- production process inspection
- maintenance procedures
- dimensional checks
- customer contracts
- product performance attributes
- electrical checks
- material checks
- contractor guidelines
- incoming inspection
- other specific

1.6 implement quality assurance procedures for two of the following aeronautical engineering activities:

- manufacturing activities (such as machining, detail fitting, fabrication of components, moulding)
- material processing activities (such as heat treatment, annealing)
- finishing activities (such as stripping finishes, painting, plating, anodising)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic)
- installation activities (such as mechanical equipment installation, electrical/avionic installation)
- modification and repair activities
- operational activities (such as movement of materials, quality systems and audit, scheduled safety audits and risk assessments)
- equipment capability/performance measurement
- commissioning/decommissioning
- lifting and moving large components/assemblies (including transportation/delivery)
- materials handling (such as movement of materials, materials storage, removal of waste)
- plant and equipment (such as plant layout, equipment changeover, equipment replacement)
- research and development
- maintenance activities
- testing and trialling
- capability studies

1.7 check that the quality assurance recommendations comply with relevant regulations, standards and guidelines from all of the following, as appropriate:

- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN standards and procedures
- company policy and procedures

- customer policy and procedures
- aircraft manufacturer's requirements

1.8 check that the specified quality assurance methods and procedures are implemented correctly

1.9 obtain accurate information from valid sources on the engineering product or process being quality assured

1.10 assess accurately and realistically the quality of the engineering products or processes

1.11 specify clearly the quality of engineering products or processes

1.12 ensure that information on quality is provided to the appropriate people

1.13 demonstrate and recommend quality assurance processes to the relevant people, using the following methods:

- verbal report

plus one more method from the following:

- electronic mail
- computer-based presentation
- written or typed report
- specific company form

1.14 recommend improvements to quality to the appropriate people

Learning outcome
The learner will: 2. Know how to implement quality assurance systems in an aeronautical engineering environment
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be quality assured 2.2 explain the specific regulations and guidelines that are relevant to the activities being quality assured 2.3 explain the specific safety precautions to be taken when carrying out the quality assurance and associated activities 2.4 explain what personal protective equipment needs to be worn in the specific work area that the quality assurance activities are taking place 2.5 explain where the required personal protective equipment can be obtained 2.6 explain the implications of not taking account of legislation, regulations, standards and guidelines when carrying out the quality assurance activities 2.7 explain the organisational procedures for determining when quality assurance activities should occur, and how they should be undertaken 2.8 explain their working knowledge of the processes and specifications of the activity being quality assured 2.9 explain how to obtain the quality criteria that could be used for different types of engineering products or processes 2.10 describe the current quality assurance methods that are in use

2.11 explain the methods for obtaining information on the engineering products or processes that are to be quality assured

2.12 describe the relevant sources of information on engineering products or processes

2.13 explain what people should be involved in the quality assurance process

2.14 explain the type of impact that quality assurance methods have on the organisation

2.15 explain what people require information on quality assurance, and the procedures for informing them

2.16 explain what types of recommendation could emerge from the quality assurance process

2.17 explain how to present the quality recommendations and the formats that are used

2.18 explain how to ensure that recommendations are followed up

2.19 explain the importance of making sure that all information used is accurate

2.20 explain the importance of maintaining quality assurance records

2.21 explain what information is to be recorded, and the amount of detail that is required

2.22 explain where quality assurance records are kept, and the procedure for obtaining them

2.23 explain the importance of ensuring that any records that they use are correctly updated and returned to the appropriate location

2.24 describe the types of problem that could occur with the quality assurance process, and explain the organisational methods and procedures for resolving them

2.25 explain the importance of solving problems quickly

2.26 describe the organisational reporting processes and lines of communication

2.27 describe the extent of their own authority and explain to whom they should report in the event of problems that they cannot resolve

2.28 explain the sources of technical expertise if they have problems that they cannot resolve

Unit 594 Rectifying aeronautical engineering problems

UAN:	**H/601/5166**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 194: rectifying aeronautical engineering Problems (Suite 3).
Endorsement by a sector or regulatory body:	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 rectify aeronautical engineering problems, in accordance with approved procedures. The learner will be required to investigate the problems, obtaining all the necessary information from the relevant sources to enable them to establish a clear picture of the situation, to identify and evaluate potential corrective actions, and to select the most appropriate and effective solution. The learner's proposed solution will take into account the effects on both the aeronautical engineering process and on the people involved. The learner's responsibilities will require them to comply with organisational policy and procedures during the rectification of the aeronautical engineering problems, and to report any aspects that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying problem solving techniques and procedures to aeronautical engineering situations. The learner will understand the relevant engineering process and will know about the company procedures and systems of operation, in adequate depth to provide a sound basis for carrying out the

activities to the required standard.

The learner will be aware of any company, legislative or regulatory health, safety and environmental requirements applicable to the aeronautical engineering activities being investigated. The learner will understand the specific safety precautions required when carrying out the investigation, especially those for isolating the equipment. The learner will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

Learning outcome
The learner will: 1. Be able to rectify aeronautical engineering problems
Assessment criteria
The learner can: 1.1 take prompt action to solve engineering problems and keep all relevant people informed of progress 1.2 carry out all of the following during the problem solving activity: • discuss/consult with the relevant people about the extent of the problem and its impact on the engineering activity • gather all appropriate information to help identify or clarify the problem • evaluate possible solutions, considering temporary, short term and long term solutions • select the most appropriate solution to rectify the problem • communicate the proposed solution to the relevant people, obtaining feedback where appropriate • prepare a plan of action for implementation of the agreed solution • ensure that the agreed solution is implemented correctly and promptly • monitor outcomes of the rectification activity and make any necessary revisions to the plan of action • ensure that the problem is rectified to the agreed level of acceptability • ensure that all information is documented to provide an audit trail • identify the root cause of the problem using a standard technique • implement preventive measures where applicable to insure no reoccurrence 1.3 obtain all relevant information relating to the engineering problems 1.4 resolve engineering problems from within two of the following engineering disciplines: • manufacturing activities (such as machining, detail fitting, fabrication of components, moulding)

- material processing activities (such as heat treatment, annealing)
- finishing activities (such as stripping finishes, painting, plating, anodising)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic)
- installation activities (such as mechanical equipment installation, electrical/avionic installation)
- modification and repair activities
- operational activities (such as movement of materials, quality systems and audit, scheduled safety audits and risk assessments)
- equipment capability/performance measurement
- commissioning/decommissioning
- lifting and moving large components/assemblies (including transportation/delivery)
- materials handling (such as movement of materials, materials storage, removal of waste)
- plant and equipment (such as plant layout, equipment changeover, equipment replacement)
- maintenance activities
- research and development
- testing and trialling
- business improvement

1.5 rectify engineering problems arising from three of the following:

- component/assembly
- deviation from component/product specification
- equipment malfunction
- scheduling
- safety related
- product over budget
- lack of resources/materials
- environmental /compatibility
- design related
- deviation from departmental procedure(s)
- product/service over lead time
- other specific

1.6 use information obtained from three of the following sources to help evaluate the problem:

- statistical data
- historical records
- quality audits
- external sources
- feedback from user
- operational procedures/manufacturing manuals
- health and safety information
- environmental documents
- development tests

- manufacturer's data

1.7 identify correctly the nature and extent of any engineering problems that arise

1.8 evaluate all realistic engineering solutions to solve the engineering problems

1.9 identify the most effective engineering solution for solving the engineering problems

1.10 check that the engineering solutions are implemented correctly and promptly

1.11 obtain consent to implement the agreed solution, considering two of the following:

- temporary (interim solution)
- short term (will require further action)
- long term (permanent solution)

1.12 check that solutions to engineering problems comply with all relevant regulations, standards and guidelines from all of the following, as appropriate:

- Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
- Ministry of Defence (MoD)
- Federal Aviation Authority (FAA)
- BS, ISO or BSEN procedures
- company policy and procedures
- customer policy and procedures
- aircraft manufacturer's requirements

1.13 communicate the solution to appropriate people using the following methods:

- verbal report

plus one more from the following:

- electronic mail
- computer-based presentation
- written or typed report
- specific company form

Learning outcome
The learner will: 2. Know how to rectify aeronautical engineering problems
Assessment criteria
The learner can: 2.1 explain how and where to obtain the appropriate legislative and regulatory documentation 2.2 explain how to access information on health and safety regulations and guidelines relating to the engineering activities or work area in which the problem exists 2.3 explain the health, safety and environmental requirements of the area in which the problem exists 2.4 explain the implications of not taking account of legislation, regulations, standards and guidelines when determining solutions to the engineering problem

2.5 explain how to obtain information on the engineering requirements, and the type of information that is available

2.6 explain how to access and use the appropriate information and documentation systems

2.7 explain how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports and other documents needed in the problem solving process

2.8 explain the aeronautical engineering processes and operating procedures of the area in which the problem exists

2.9 explain the business need for problem identification and rectification

2.10 explain the effects of engineering problems on associated activities

2.11 explain what communication techniques are used to obtain information

2.12 describe the main problem solving methods and techniques in use, and explain how to apply them

2.13 describe the benefits of adopting a formalised problem solving process

2.14 explain how to establish and select the team to be used, and what will be their roles and responsibilities

2.15 explain why there must be clearly defined roles within the team, and what these roles are

2.16 explain how to establish a problem profile, and the involvement of the customer in the problem solving process

2.17 describe containment action planning

2.18 explain how to define and verify the root cause of a problem

2.19 describe the factors to be taken into account when resolving problems and determining suitable solutions, especially those covering working conditions and safety

2.20 explain the methods and techniques used for evaluating information

2.21 explain how to determine and select permanent corrective actions

2.22 describe the process used in the organisation to validate the solution to the engineering problem

2.23 explain how to implement the permanent corrective actions identified

2.24 explain how to prevent recurrence of the problems

2.25 explain the importance of maintaining records of the problem solving activities, what needs to be recorded and where records are kept

2.26 describe the company procedures that apply to the rectification of problems

2.27 describe the company reporting procedures, documentation and their application

2.28 explain the different ways in which the solutions can be reported back

2.29 explain who should be informed of actions taken, and by what means

2.30 describe the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve

2.31 explain the sources of technical expertise if they have problems that they cannot resolve

Unit 594 Rectifying aeronautical engineering problems

Supporting information

Guidance

2.5 (such as customer order requirements and instructions, quality control requirements, product specification, manufacturing methods)

2.15 (such as facilitator, scribe, time keeper)

2.17 (to include process risk, action planning, testing decisions, determining time-scales and protecting the customer)

2.18 (such as the use of brainstorming)

2.21 (such as decision making, identifying criteria for givens and wants, assessing the criteria and determining the risks, generating alternatives)

2.23 (to include implementation planning, protecting the plan, contingency planning, process monitoring and formalising changes)

2.24 (such as changes to management systems, operating systems and procedures and identification of opportunities for improvements)

Unit 595 Providing technical guidance on aeronautical engineering activities

UAN:	**T/601/5169**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 195: Providing technical guidance on aeronautical engineering activities (Suite 3).
Endorsement by a sector or regulatory body:	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 guide others in work related aeronautical engineering technical matters, in accordance with approved procedures. The learner will be expected to provide technical guidance to others involved in aeronautical engineering activities, such as drawing/design, production, operational support activities, maintenance, or equipment capability/performance measurement. The learner will be required to identify suitable opportunities for offering technical guidance, to plan and apply appropriate methods in such guidance, and to keep their methods under review so that they can modify their approach when necessary. The learner's responsibilities will require them to comply with organisational policy and procedures when providing the technical guidance 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 with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the guidance that they give. The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to the methods, techniques and procedures for providing technical guidance. The learner will understand the aeronautical drawing/design and/or

manufacturing processes used, and their application, and will know about them in adequate depth to provide a sound basis for giving the technical advice.

The learner will understand the safety precautions required in the workplace where they provide technical guidance. 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.

Learning outcome
The learner will: 1. Be able to provide technical guidance on aeronautical engineering activities
Assessment criteria
The learner can: 1.1 work safely in accordance with the regulations for their work environment 1.2 assess work methods and procedures for their suitability and technical feasibility 1.3 provide technical guidance for one of the following aeronautical activities: • drawing/design activities (such as electronic components, printed circuit boards, thick, thin or flexible film circuits) • manufacturing activities (such as machining, detail fitting, fabrication of components, moulding) • mechanical assembly activities (such as mechanical, structural, fluid power) • electrical/electronic assembly activities (such as avionic) • installation activities (such as mechanical equipment installation, electrical/avionic installation) • lifting and moving large components/assemblies (including transportation/delivery) • finishing activities (such as stripping finishes, painting, plating, anodising) • material processing activities (such as heat treatment, annealing) • modifications and repair activities (such as airframe, systems, avionics) • materials handling (such as movement of materials, materials storage, removal of waste) • operational activities (such as quality systems and audit, scheduled safety audits and risk assessments) • maintenance activities (such as planned preventive maintenance, part/sub-assembly exchange, breakdown response, maintenance records systems, line setting) • equipment capability/performance measurement • plant and equipment (such as plant layout, equipment changeover, equipment replacement)

- testing and trialling
- commissioning/decommissioning
- research and development
- business improvement

1.4 anticipate potential problems and choose which action to take to deal with them

1.5 deal accordingly with all of the following:

- reporting problems found during the monitoring process
- recording deviations from agreed plans and schedules

1.6 provide colleagues with valid and up-to-date information, advice and guidance as necessary

1.7 provide technical guidance to one of the following groups of people:

- colleagues in the same work group
- those in associated work teams
- others working on related technical activity areas

1.8 provide technical guidance for all of the following:

- ensuring the supply and use of resources
- verifying that materials used in the activities are within specification requirements
- clarifying technical details for the activities with others when required
- monitoring outputs of the engineering process, and comparing these with the specifications
- confirming that all relevant regulations and guidelines are complied with

1.9 provide technical guidance by the following method:

- verbally

plus by one other method from the following:

- electronic mail
- computer based presentation
- written/typed report

1.10 analyse problems in full and choose effective solutions that will maintain the quality and progress of the work

Learning outcome
The learner will: 2. Know how to provide technical guidance on aeronautical engineering activities
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken in the work areas where technical guidance is being given to others 2.2 explain the importance of wearing protective clothing and other appropriate safety equipment in hazardous or clean area environments when giving technical guidance 2.3 explain how to obtain the relevant personal protective equipment (PPE), and how to check that it is in a safe and usable condition 2.4 describe the regulations and guidelines that are relevant to the

	workplace activity
2.5	explain how to obtain information on regulations and guidelines
2.6	explain how to obtain and interpret drawings, charts, specifications and other documents that can be used when giving technical guidance
2.7	explain their understanding of the activities in which the technical guidance is being given
2.8	explain how to identify opportunities for giving technical guidance and support
2.9	explain how to plan and prepare for providing technical guidance
2.10	describe the methods and techniques involved in problem solving
2.11	explain how to review and adjust approaches to the provision of technical guidance in the light of experience gained
2.12	describe the techniques that can be used for offering and providing technical guidance
2.13	explain how to use a variety of presentation methods in appropriate combination
2.14	describe the organisational reporting processes and procedures to be observed
2.15	describe the extent of their own responsibility and explain to whom they should report if they have problems that they cannot resolve

Unit 595 Providing technical guidance on aeronautical engineering activities

Supporting information

Guidance

2.11 (such as offering written summaries of guidance)

2.12 (such as verbally, one to one, one to many, in written form, using diagrams, drawings or other technical information)

2.13 (such as verbal, verbal/written combinations)

Unit 596 Carrying out project management of aeronautical engineering activities

UAN:	**K/601/5170**
Level:	3
Credit value:	40
GLH:	91
Relationship to NOS:	This unit has been derived from national occupational standard aeronautical engineering Unit 196: carrying out project management of aeronautical engineering activities (Suite 3).
Endorsement by a sector or regulatory body:	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 project manage aeronautical engineering activities, time and resources, in accordance with approved procedures. The learner will be required to ensure that the project management activities are capable of meeting the aeronautical engineering requirements, and that the plans effectively integrate with existing processes. The scope of the unit requires the learner to produce project plans for significant aeronautical engineering processes with complex requirements having multiple operations and resources, and will cover such things as component/product manufacturing, installation and commissioning, testing and trialling, planned maintenance, and plans for capability studies or equipment replacement programs. The learner's responsibilities will require them to comply with organisational policy and procedures for project managing the engineering activities. The learner will report any problems with the activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will provide an

informed approach to applying project planning procedures to aeronautical engineering activities. The learner will understand the project planning process and its application, and will know about the aeronautical engineering activities within their organisation, in adequate depth to provide a sound basis for carrying out the project planning activities to the required standard. The learner will understand their organisation's methods of operation in sufficient detail to enable them to make informed decisions.

The learner will be aware of any health, safety and environmental requirements applicable to the aeronautical engineering activities being project managed. 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.

Learning outcome
The learner will: 1. Be able to carry out project management of aeronautical engineering activities
Assessment criteria
The learner can: 1.1 confirm the operational activities that are required to achieve the operational methods and procedures 1.2 carry out all of the following when producing the project plans: • use the correct issue of company information • collect relevant information on the engineering requirements, operations, methods and resources • determine the availability of resources required • ensure that health and safety regulations and safe working practices are taken into account • ensure that the influence of working conditions is recognised and included in the schedules • present the engineering schedules in the appropriate formats 1.3 produce project plans, and carry out project management of two of the following: • drawing/design activities (such as electronic components, printed circuit boards, thick, thin or flexible film circuits) • manufacturing activities (such as machining, detail fitting, fabrication of components, moulding) • mechanical assembly activities (such as mechanical, structural, fluid power) • electrical/electronic assembly activities (such as avionic) • installation activities (such as mechanical equipment installation, electrical/avionic installation) • lifting and moving large components/assemblies (including transportation/delivery)

- finishing activities (such as stripping finishes, painting, plating, anodising)
- material processing activities (such as heat treatment, annealing)
- modifications and repair activities (such as airframe, systems, avionics)
- materials handling (such as movement of materials, materials storage, removal of waste)
- operational activities (such as quality systems and audit, scheduled safety audits and risk assessments)
- maintenance activities (such as planned preventive maintenance, part/sub assembly exchange, breakdown response, maintenance records systems, line setting)
- equipment capability/performance measurement
- plant and equipment (such as plant layout, equipment changeover, equipment replacement)
- testing and trialling
- commissioning/decommissioning
- research and development

1.4 obtain accurate details of activities and resources from two of the following people or departments:

- management/directors
- client/customer
- quality engineering
- sales
- design office
- suppliers
- plant engineering
- production engineering
- industrial engineering
- process engineering
- purchasing
- safety engineering

1.5 identify the most suitable sequence of operational activities

1.6 schedule the time and resources available for undertaking the operational activities

1.7 prepare and review plans of resources, to include five of the following:

- people with the necessary skills
- materials
- equipment
- facilities
- space
- support services
- financial

1.8 check that operational schedules are capable of meeting all relevant requirements

1.9 incorporate new operational schedules into the operational process with minimum disruption

1.10 identify potential difficulties and produce appropriate contingency plans

1.11 identify any difficulties and produce a contingency plan detailing one of the following actions, to ensure that the project plans meet requirements:

- agree revised requirements with management/client
- change timescales in agreement with management/clients
- reschedule
- obtain additional/alternative resources
- recommend a change to the process
- other specific actions

1.12 check that operational schedules comply with all relevant regulations and guidelines

1.13 specify clearly the operational schedules and record them in the appropriate information systems

1.14 record and present the project plans to the appropriate people, by the following methods:

- verbally

plus by one other method from the following:

- written or typed report
- specific company documentation
- electronic mail
- computer-based presentation

1.15 include all of the following in the report:

- graphs
- Gantt charts
- critical path analysis

Learning outcome
The learner will: 2. Know how to carry out project management of aeronautical engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be project managed 2.2 explain the implications of not taking account of legislation, regulations, standards and guidelines when producing the project plans 2.3 explain how to obtain information on the activity to be planned, and the type of information that is available 2.4 explain how to access and use the appropriate information and documentation systems 2.5 explain how to interpret engineering schedules, and the techniques used for project management and planning activities 2.6 describe the types of data that should be included in the project plans 2.7 describe the document formats, codes and conventions that are used in preparing the project management plans

2.8	describe the factors to be taken into account when preparing the project management plans, especially those covering working conditions and safety
2.9	explain how to assess resource requirements, and the main types of resources involved with different types of engineering activity and the typical timescales for providing them
2.10	explain how to plan resources
2.11	describe the obvious (and hidden) costs of resources/activities
2.12	explain the normal timescales for carrying out specific engineering activities, and how and why they vary
2.13	describe the methods and techniques used for capacity planning
2.14	explain what products (or assets) are involved in the activity being planned, and their availability
2.15	describe the development of the project management plans
2.16	explain how to prepare the project management plans
2.17	explain the process used in the organisation to validate the project management plans produced
2.18	describe the control procedure for ensuring that the project management plans are maintained up to date
2.19	explain the procedures for changing the project management plans, and why control procedures are used
2.20	explain the importance of maintaining records, what needs to be recorded and where records are kept
2.21	explain why contingency plans need to be drawn up, and how to develop them
2.22	explain whom to inform about the project management plans
2.23	describe the different ways of presenting information to different people
2.24	explain the importance of providing the right information at the right time
2.25	describe the roles and responsibilities of key personnel in their organisation
2.26	describe the problems that can occur during the implementation of the project management plans, and explain how these problems can be rectified
2.27	describe the extent of their own authority and to whom they should report in the event of problems that they cannot resolve
2.28	explain the sources of technical expertise if they have problems that they cannot resolve
2.29	describe the organisational procedures for providing information to different people

Unit 596 Carrying out project management of aeronautical engineering activities

Supporting information

Guidance

2.3 (such as customer order requirements and instructions, quality control requirements, product specification, manufacturing methods)

2.6 (such as time scales, resource requirements, health and safety issues)

2.15 (to include both master documents and working instructions, along with their purpose, content and status)

2.16 (to include the structure, style, clarity and compliance with relevant standards)

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**
- Essential Skills (Northern Ireland) – see **www.cityandguilds.com/essentialskillsni**
- Essential Skills Wales – see **www.cityandguilds.com/esw**

Appendix 2 Sources of general information

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

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

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

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

- 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
- **Qualifications and Credit Framework (QCF)**: general guidance about the QCF and how qualifications will change, as well as information on the IT systems needed and FAQs
- **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.

Useful contacts

UK learners **General qualification information**	**T: +44 (0)844 543 0033** **E: learnersupport@cityandguilds.com**
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: **intcg@cityandguilds.com**
Centres Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **centresupport@cityandguilds.com**
Single subject qualifications Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: **singlesubjects@cityandguilds.com**
International awards Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **intops@cityandguilds.com**
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **walledgarden@cityandguilds.com**
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: **business@cityandguilds.com**
Publications Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: feedbackandcomplaints@cityandguilds.com

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group operates from three major hubs: London (servicing Europe, the Caribbean and Americas), Johannesburg (servicing Africa), and Singapore (servicing Asia, Australia and New Zealand). The Group also includes the Institute of Leadership & Management (management and leadership qualifications), City & Guilds Land Based Services (land-based qualifications), the Centre for Skills Development (CSD works to improve the policy and practice of vocational education and training worldwide) and Learning Assistant (an online e-portfolio).

Published by City & Guilds, a registered charity established to promote education and training

City & Guilds
1 Giltspur Street
London EC1A 9DD
T +44 (0)844 543 0000
F +44 (0)20 7294 2413
www.cityandguilds.com