

Higher National Unit Specification

General information for centres

Unit title: Aircraft Electrical and Electronic Skills

Unit code: DR0D 33

Unit purpose: This Unit is designed to give candidates an introduction to a variety of electronic skills and techniques that will help to provide a practical approach to aviation maintenance. This Unit is of particular value to candidates whom are looking to develop an understanding of an aircraft's avionic systems. This unit also provides some of the underpinning knowledge components for the EASA Part 66 Module 7, Chapter 7.7.

This Unit is to be delivered whilst adhering to all current health and safety regulations and the candidate should be made aware of these issues as they arise during the Unit.

On completion of the Unit the candidate should be able to:

- 1 Interpret electronic schematic diagrams.
- 2 Use electronic test equipment.
- 3 Assemble a Printed Circuit Board.
- 4 Terminate a variety of cables.

Credit points and level: 1 HN Credit at SCQF level 6 (8 SCQF credit points at SCQF level 6*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit will be at the discretion of the centre. The Unit has no mandatory prerequisites, however it is recommended that the candidates have completed Units DR06 34 Electrical Fundamentals for Aviation and DR07 34 Electronic Fundamentals for Aviation before commencing this Unit.

Core skills: There may be opportunities in this Unit to gather evidence towards the Core Skills of Problem Solving and Working with Others at Higher Level, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: This Skills Unit should be assessed outcome by outcome in the order they appear in the Unit. Outcome 1 should be a restricted response/short answer paper whilst the other three Outcomes should be assessed utilising performance evidence. Outcomes 2 – 4 should comprise a

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variety of individual tasks to allow the candidate to demonstrate the range of skills and knowledge covered in the outcome. Assessment should be carried out under supervised, controlled conditions. The assessment instruments used should follow the general guidelines offered by the Scottish Qualification Authority (SQA) assessment model and an integrative approach to assessment is encouraged.

Accurate records should be made of the assessment instruments used showing how evidence is generated for each assessment/examination, giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

Higher National Unit specification: statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standard set out in this part of the specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the SQA.

Candidates should not know in advance the items on which they will be assessed and different questions used on each assessment occasion.

Assessments for this Unit are to be carried out under closed-book supervised conditions and any notes made by the candidates during assessment should be handed in at the end.

Outcome 1

Interpret electronic schematic diagrams.

Knowledge and/or skills

- ◆ analogue electronics circuit diagram with a minimum of 5 components
- ◆ digital electronics circuit diagram with a minimum of 5 components
- ◆ circuit diagram that has more than one sheet associated with it.

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided by an open-book examination taken at a single assessment event lasting 60 minutes and carried out under supervised, controlled conditions. In any assessment of this Outcome all of the knowledge and/or skills items should be tested.

Assessment guidelines

Assessments for this Outcome should employ a variety of short answer questions to demonstrate the candidates understanding of the material in the knowledge and/or skills section of this Outcome. This should take the form of a series of questions involving a multi-sheet (minimum of two sheets) schematic involving both analogue and digital elements. All of the knowledge and skills section should be assessed.

The assessment instruments used for assessing this Unit should follow the general guidelines offered by the Scottish Qualification Authority (SQA) assessment model. Each centre should make a model answer as a marking guide for each question asked and candidates awarded marks for key points and presentation of answers.

Candidates can supplement written answer with sketches and diagrams to clarify points.

Higher National Unit specification: statement of standards (cont)

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Outcome 2

Use electronic test equipment.

Knowledge and/or skills

- ◆ a voltmeter, ammeter
- ◆ a multimeter
- ◆ a continuity tester
- ◆ an oscilloscope
- ◆ conductivity testing

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided by a series of practical tests employing all of the instruments detailed in the knowledge and/or skills section. The test, which can be open-book should be of one hours duration. In any assessment of this Outcome all of the knowledge and/or skills items should be tested.

Assessment guidelines

Assessments for this Outcome should employ a variety of practical activities to demonstrate the candidates understanding of the material in the knowledge and/or skills section of this Outcome. Typically this could involve taking a number of readings from a pre-prepared analog printed circuit board of the complexity level of a function generator or switched mode power supply Unit. All of the knowledge and skills section should be tested.

The assessment instruments used for assessing this Unit should follow the general guidelines offered by the Scottish Qualification Authority (SQA) assessment model. Each centre should make a model answer as a marking guide for each question asked and candidates awarded marks for key points and presentation of answers.

Outcome 3

Assemble a Printed Circuit Board.

Knowledge and/or skills

- ◆ soldering a variety of passive components into a pre-prepared printed circuit board (PCB)
- ◆ soldering a variety of discrete active devices into a pre-prepared PCB
- ◆ soldering an Integrated Circuit (IC) into a pre-prepared PCB
- ◆ removing an IC from a circuit board
- ◆ handling precautions for static sensitive devices

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided by a variety of practical activities, conducted under supervised, controlled conditions. This open book assessment should be of one and a half hours duration. A short answer paper can also be utilised to test the candidates.

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understanding of the tooling used and handling precautions for static sensitive devices. Alternatively the candidate can give performance evidence to indicate they understand the handling precautions relating to static sensitive devices. In any assessment of this Outcome all of the knowledge and/or skills items should be tested.

Assessment guidelines

Assessments for this Outcome should employ a variety of practical activities to demonstrate the candidates understanding of the material in the knowledge and/or skills section of this outcome. Typically, the pre-prepared printed circuit board should utilise a minimum of five components incorporation one digital IC, a transistor and a range of passive devices. In addition a short answer paper should be prepared to test the understanding of tooling and static handling precautions relating to this Outcome. All of the knowledge and skills section should be tested.

The assessment instruments used for assessing this Unit should follow the general guidelines offered by the Scottish Qualification Authority (SQA) assessment model. Each centre should make a model answer as a marking guide for each question asked and candidates awarded marks for key points and presentation of answers.

Outcome 4

Terminate a variety of cables.

Knowledge and/or skills

- ◆ use of Crimp tools
- ◆ testing crimp joints
- ◆ inserting and removing a connector pin
- ◆ terminating a coaxial cable into a BNC connector

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided by provided by a variety of practical activities, carried out under supervised, controlled conditions. The open-book assessment should be of one hours' duration. In any assessment of this Outcome all of the knowledge and/or skills items should be tested.

The assessment instruments used for assessing this Unit should follow the general guidelines offered by the Scottish Qualification Authority (SQA) assessment model. Each centre should make a model answer as a marking guide for each question asked and candidates awarded marks for key points and presentation of answers. Candidates can supplement written answer with sketches and diagrams to clarify points and be allowed to use scientific calculators to carry out any calculation.

Higher National Unit specification: statement of standards (cont)

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Assessment guidelines

Assessments for this Outcome should employ a variety of practical activities to demonstrate the candidates understanding of the material in the knowledge and/or skills section of this Outcome. All of the knowledge and skills section should be tested.

The assessment instruments used for assessing this Unit should follow the general guidelines offered by the Scottish Qualification Authority (SQA) assessment model. Each centre should make a model answer as a marking guide for each question asked and candidates awarded marks for key points and presentation of answers.

Administrative Information

Unit code:	DR0D 33
Unit title:	Aircraft Electrical and Electronic Skills
Superclass category:	XP
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Higher National Unit specification: support notes

Unit title: Aircraft Electrical and Electronic Skills

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This is an optional Unit devised for the principals and technology section of the HNC/HND Aircraft Engineering Group Award. The Unit is intended to give candidates an in-depth knowledge of:

- ◆ schematic diagrams
- ◆ test instrumentation
- ◆ printed circuit boards
- ◆ cable terminations

Whilst many approaches can be utilised for the delivery of the above material, it is desirable to set them in the context of the aviation technician. Wherever possible the delivery of the curriculum material in this Unit should utilise examples of materials/circuitry/schematic diagrams that may be found on an aircraft.

Content/context corresponding to outcomes

- 1 The candidate should be given a variety of schematic diagrams. These diagrams should introduce the candidate to a range of electronic component symbols. It would be useful if the candidate could also see physical examples of these components at the same time. Initially candidates should look at single technology systems ie wholly analog circuits and wholly digital circuits. Finally they should be used to seeing mixed mode circuits on the same schematic and be conversant with the idea that schematics often run to more than one sheet.
- 2 Candidates should be given a brief theoretical grounding in the operation of each of the test instruments detailed in the Outcome. The emphasis though is the use of these instruments and the acquisition of how they can be used to assist in fault diagnosis and rectification.
- 3 Candidates should be given a variety of pre-prepared printed circuit boards that require population. Each of the circuit boards should consist of a minimum of five components these typically should include at least one digital IC, a transistor and variety of passive devices. The candidates should also be made aware of the handling precautions expected when dealing with electrostatic sensitive devices.
- 4 Candidates should be given a variety of cables and connectors found on an aircraft system. The candidate should be given the opportunity to crimp a variety of different gauges of cable utilising both hand and hydraulic crimping tools. The candidate should be shown how to remove and insert a connecting pin from a circuit board and how to terminate a coaxial cable into a BN type connector.

Higher National Unit specification: support notes (cont)

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Guidance on the delivery and assessment of this Unit

This Unit is designed to provide candidates with professional knowledge and skills for the specific occupational area of aircraft engineering. It is logical to deliver this Unit sequentially by Outcome, with Outcome 1 being assessed by means of a restricted response/short answer paper, the remaining Outcomes (2-4) should utilise performance evidence tasks to demonstrate the candidates knowledge and understanding of the themes being covered by those Outcomes.

Assessment of this Unit is to be carried out by centres using the assessment instruments they consider most appropriate, although assessment instruments used should follow the general guidelines offered by the Scottish Qualification Authority (SQA). All assessments should be carried out under controlled condition and candidates should not be allowed to bring in textbooks, handouts or other prepared material.

Opportunities for developing Core Skills

There are no opportunities to develop Core Skills in this Unit.

Open learning

The Unit would be suitable for open and distance learning. The mode of delivery would be the same as other distance-learning Units by a range of self-study and tutor based assignments. Candidates would have to attend an approved centre for assessment events.

Candidates with additional support needs

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on the SQA website **www.sqa.org.uk**.

General information for candidates

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The Unit is intended for those who are interested in aircraft engineering and is offered as an optional Unit in the HNC/HND Aircraft Engineering Group Award.

This Unit is also designed to provide part coverage of EASA Module 7.

The Unit is heavily biased towards you developing the range of practical electronic skills necessary to work in an aviation environment.

The Unit has four main areas, each area covered by a separate Outcome. The four main areas the Unit covers are:

- 1 Interpret electronic schematic diagrams.
- 2 Use electronic test equipment.
- 3 Assemble a Printed Circuit Board.
- 4 Terminate a variety of cables.

Assessment of the Unit will be undertaken on an outcome by outcome basis. Outcome 1 is assessed using a series of short answer/restricted response questions whilst the Outcomes 2 – 4 are assessed practically.

All examinations for this Unit are carried out under closed-book conditions. You will not therefore be permitted to bring textbooks, handouts or other material into the assessment event.