Higher National Unit Specification

General information for centres

Unit title: Aircraft Hydraulics and Pneumatic Systems

Unit code: DR02 34

Unit purpose: This Unit is designed to give candidates an introduction to the pneumatic and hydraulic systems found on an aircraft. This Unit also provides some of the underpinning knowledge components for the EASA Part 66 Module 11, Chapters 11.11, 11.16.

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

1 Explain the principles and generation of hydraulic power.
2 Describe the operation of an aircraft hydraulic power system.
3 Analyse the requirements for an aircraft pneumatic system.
4 Explain the warning and indication systems incorporated in an aircraft's hydraulic and pneumatic systems.

Credit points and level: 1 HN Credit at SCQF level 7 (8 SCQF credit points at SCQF level 7*).

**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 a suitable NC Unit — Pneumatic Systems prior to commencing this Unit.

Core skills: There are opportunities for candidates in this Unit to gather evidence towards the Core Skills of Communication, Numeracy both at Higher level and IT at Intermediate 2 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: Candidates can be assessed on an outcome by outcome basis or by a single assessment combining all four Outcomes. The assessments could be composed of an appropriate balance of short answer, restricted response and structured questions, it is recommended that outcome 3 is assessed as an investigation or case study. Assessment should be carried out under supervised, controlled conditions with the exception of Outcome 3, which may be conducted in the candidates' own time.

General information for centres (cont)

Unit title: Aircraft Hydraulics and Pneumatic Systems

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

Unit title: Aircraft Hydraulics and Pneumatic Systems

Unit code: DR02 34

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 items should be sampled 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

Explain the principles and generation of hydraulic power.

Knowledge and/or skills

- hydraulic fluids
- hydraulic power generation
- emergency generation of hydraulic power
- force; pressure; area; differential areas; bramah's press
- fluid requirements: properties; types; identification; hazards
- power generation methods — main system; emergency standby system

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided by a closed-book examination taken at a single assessment lasting 45 minutes and carried out under supervised, controlled conditions. The evidence may be presented in responses to specific questions. In any assessment of this Outcome all of the knowledge and/or skills items should be tested.

Assessment guidelines

Questions used to elicit candidate evidence may take the form of an appropriate balance of short answer, restricted response and structured questions.

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.

For candidates who fail to achieve the minimum evidence requirement for each assessment, centres may allow candidates to re-sit the assessments at an appropriate time using different questions.

The assessment of this Outcome can be combined with the Outcomes 2 and 4 to form a single assessment paper, details of which are given at the end of this section.

Higher National Unit specification: statement of standards (cont)

Unit title: Aircraft Hydraulics and Pneumatic Systems

Outcome 2

Describe the operation of an aircraft hydraulic power system.

Knowledge and/or skills

- layout
- hydraulic system components – input systems, output systems
- the operation of a typical aircraft hydraulic power system
- the operation and interfacing of an emergency standby system

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided by a closed-book examination taken at a single assessment event lasting 45 minutes and carried out under supervised, controlled conditions. The evidence may be presented in responses to specific questions. In any assessment of this Outcome all of the knowledge and/or skills items should be tested.

Assessment guidelines

Questions used to elicit candidate evidence may take the form of an appropriate balance of short answer, restricted response and structured questions.

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.

For candidates who fail to achieve the minimum evidence requirement for each assessment, centres may allow candidates to re-sit the assessments at an appropriate time using different questions.

The assessment of this Outcome can be combined with the Outcomes 1 and 4 to form a single assessment paper, details of which are given at the end of this section.

Outcome 3

Analyse the requirements for an aircraft pneumatic system.

Knowledge and/or skills

- lay-out of an aircraft pneumatic system
- the sources of supply to the aircraft pneumatic system – ground and aircraft
- the operation of an aircraft pneumatic system – main and standby
- the pressure and temperature control
- safety systems

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided by an individual research project or case study conducted in the candidates own time. In any assessment of this Outcome all of the knowledge and/or skills items should be tested.

Assessment guidelines

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 the assessment and candidates awarded marks for key points and presentation of answers.

For candidates who fail to achieve the minimum evidence requirement for each assessment, centres may allow candidates to re-sit the assessments at an appropriate time using a different case study/research project.

Outcome 4

Explain the warning and indication systems incorporated in an aircraft's hydraulic and pneumatic systems.

Knowledge and/or skills

- warning systems for hydraulic systems
- indication systems for hydraulic
- warning systems for pneumatic systems
- indication systems for pneumatic systems

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided by a closed-book examination taken at a single assessment event lasting 30 minutes and carried out under supervised, controlled conditions. The evidence may be presented in responses to specific questions. In any assessment of this Outcome all of the knowledge and/or skills items should be tested.

Assessment guidelines

Questions used to elicit candidate evidence may take the form of an appropriate balance of short answer, restricted response and structured questions.

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)

Unit title: Aircraft Hydraulics and Pneumatic Systems

For candidates who fail to achieve the minimum evidence requirement for each assessment, centres may allow candidates to re-sit the assessments at an appropriate time using different questions.

The assessment of this Outcome can be combined with Outcomes 1 and 2 to form a single closed-book assessment paper, details of which are given below.

If it is decided to use a single holistic assessment for Outcomes 1, 2 and 4, then the single assessment paper could be taken at a single assessment event lasting two hours and carried out under supervised, controlled conditions. Evidence for the knowledge and/or skills for Outcomes 1, 2 and 4 will be provided by an examination. The evidence may be presented in responses to specific questions. In any assessment of this Unit all of the knowledge and/or skills items should be tested.

In order to ensure that candidates will not be able to foresee the exact form of the assessment, a different examination is required each time the outcomes are assessed.
Such a paper could be composed of an appropriate balance of short answer, restricted response and structured questions. Candidates should be allowed to use a non-programmable scientific calculator to enable them to carry out calculations.

Administrative Information

Unit code: DR02 34

Unit title: Aircraft Hydraulics and Pneumatic Systems

Superclass category: XP

Date of publication: August 2005

Version: 01

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: Aircraft Hydraulics and Pneumatic Systems

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 a Mandatory 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 the Hydraulic and Pneumatic Systems together with their control and indicator systems encountered on an aircraft. The Unit provides partial coverage of EASA 66 Module 11, Chapters 11.11, 11.16.

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 practical examples of where the concepts may be found on an aircraft.

Wherever possible you should endeavour to provide the learner with practical examples to work with. Where this is not practicable or possible simulation software should be used to confirm/visualise concepts and results.

Content/context corresponding to outcomes

1 Candidates should be introduced to the concepts of pneumatic and hydraulic principles. This should include the types of hydraulic fluid used on aircraft, principles of power generation and the underlying physic involved in pneumatic and hydraulic systems. Candidates should be made aware of the safety implications of working with both pneumatic and hydraulic systems and they should include coverage of both main ad standby systems as appropriate.

2 Candidates should be introduced to the lay-out of a simple hydraulic system. They should become familiar with the schematic symbols and see the real components that are referred to. Candidates should be familiarised with typical circuits found in aircraft and be able to explain the operation of some of these systems. In addition, they should be able to explain the operation and interfacing of an emergency standby system.

3 Candidates should be able explain the lay-out of an aircraft pneumatic system. They should be introduced to the sources of supply to the aircraft pneumatic system both on the ground and onboard the aircraft. Candidates should then become familiar with the operation of an aircraft pneumatic system (both main and standby). In addition they should be aware of how the pressure and temperatures with in the system are controlled and monitored. Candidates should also be introduced to the safety systems utilised in aircraft pneumatic circuitry.

4 Candidates should be introduced to the warning and indication systems found on aircraft that pertain to the hydraulic and pneumatic systems. It would be useful if candidates could see typical circuits utilised on aircraft.

Higher National Unit specification: support notes (cont)

Unit title: Aircraft Hydraulics and Pneumatic Systems

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 a mixture of assignments, exercises and case studies. Having access to relevant publications is recommended and course work and assignment reports must be the work of individuals.

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

Unit title: Aircraft Hydraulics and Pneumatic Systems

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

This Unit provides partial coverage of EASA 66 Module 11, Chapters 11.11, 11.16.

The Unit introduces you to the range of hydraulic and pneumatic systems found on an aircraft. It includes the underlying physics that allow pneumatics and hydraulics to work together with the controls and safety systems utilised on an aircraft.

The Unit has four main areas, each area covered by a separate Outcome. At the end of the unit you will be able to:

1 Explain the principles and generation of hydraulic power.

2 Describe the operation of an aircraft hydraulic power system.

3 Analyse the requirements for an aircraft pneumatic system.

4 Explain the warning and indication systems incorporated in an aircraft's hydraulic and pneumatic systems.

Assessment of the Unit will be on an outcome by outcome basis or by end of module examination. The exception to this is Outcome 3. This will be assessed as a case study or research assignment — you would present your findings as a report.

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.

You are permitted to bring a non-programmable scientific calculator into the examinations for this Unit.