

Higher National Unit Specification

General information for centres

Unit title: Aircraft Environmental Systems: Cabin Conditioning and Pressurisation

Unit code: FOM5 35

Unit purpose: This Unit is designed to explain the operation and necessity of aircraft environmental systems. The candidate will also gain knowledge of the inter-relationship between cabin pressurisation and cabin conditioning. This Unit also provides partial coverage of EASA 66 Module 11.

On completion of this Unit the candidate will be able to:

- 1 Describe how the air conditioning system maintains and distributes suitable cabin air.
- 2 Analyse the function of cabin pressurisation control systems.
- 3 Evaluate the operation of various oxygen systems.

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

**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 is at the discretion of the centre. The Unit has no pre-requisites, however, it would be beneficial if the candidate has a basic knowledge of aircraft and/or engineering theory. This may be evidenced by possession of the HNC Aircraft Engineering certificate.

Core Skills: There are opportunities to develop the Core Skill of Communication (Reading) at SCQF level 5 in this Unit, 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.

General information for centres (cont)

Assessment: Candidates can be assessed either by three 45-minute assessments or by a single two-and-a-quarter-hour assessment. If three 45-minute assessments are used, the first assessment covers Outcome 1, the second assessment covers Outcome 2, and the third assessment covers Outcome 3. If a single two-and-a-quarter-hour assessment is used, the assessment will cover all three Outcomes.

The assessment paper/s can be carried out on a sampling basis composed of a number of short answers, restricted response and/or multi-choice questions under supervised, closed-book, controlled conditions.

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 Environmental Systems: Cabin Conditioning and Pressurisation

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe how the air conditioning system maintains and distributes suitable cabin air

Knowledge and/or skills

- ◆ Ventilation
- ◆ Temperature
- ◆ Humidity control
- ◆ Unpressurised aircraft cabin conditioning
- ◆ Pressurised aircraft air conditioning system

Evidence Requirements

Evidence for the knowledge and/or skills items in Outcome 1 should be provided on a sample basis. The evidence may be presented in response to specific questions. Each candidate will need evidence to show that she/he can, describe how either a pressurised or unpressurised aircraft maintains suitable cabin air, based on a sample of the five knowledge items above.

To ensure that candidates will not be able to foresee which items they will be questioned about, a different sample of three of the five knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to all three items. Where an item is sampled, a candidate's response can be judged satisfactory where the evidence shows that the candidate can:

- ◆ define and explain the requirements for aircraft ventilation
- ◆ define and explain the requirements for aircraft temperature control
- ◆ define and explain the requirements for aircraft humidity control
- ◆ describe unpressurised aircraft cabin conditioning — to include the principle of exhaust heat exchange; gas turbine exhaust heat exchanger; and the principle of combustion heating
- ◆ describe a basic pressurised aircraft air conditioning system — to include the air supply or charge air; system components; the use of ram air; temperature control and air cycling; humidity control; filtration; distribution and zones

The assessment for this Outcome is by a closed-book assessment.

Higher National Unit specification: statement of standards (cont)

Unit title: Aircraft Environmental Systems: Cabin Conditioning and Pressurisation

Outcome 2

Analyse the function of cabin pressurisation control systems

Knowledge and/or skills

- ◆ The requirements for cabin pressurisation
- ◆ How aircraft pressure is controlled
- ◆ Methods of cabin sealing and pressure testing

Evidence Requirements

Evidence for the knowledge and/or skills items in Outcome 2 should be provided on a sample basis. The evidence may be presented in response to specific questions. Each candidate will need evidence to show that she/he can explain the methods of cabin pressurisation and control systems based on a sample of the three knowledge items above.

To ensure that candidates will not be able to foresee which items they will be questioned about, a different sample of two of the three knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to both items. Where an item is sampled, a candidate's response can be judged satisfactory where the evidence shows that the candidate can:

- ◆ analyse the requirement for cabin pressurisation - to include the physiological effects of altitude; differential altitude and aircraft structural limitations; and identification of standards of pressurisation
- ◆ explain how aircraft pressure is controlled using one of the following methods; mechanical; electrical and/or computer controlled
- ◆ explain various methods of cabin sealing and pressure testing

The assessment for this Outcome is by a closed-book assessment.

Outcome 3

Evaluate the operation of various oxygen systems

Knowledge and/or skills

- ◆ Methods of oxygen supply
- ◆ Testing and servicing
- ◆ Safety precautions

Evidence Requirements

Evidence for the knowledge and/or skills items in Outcome 3 should be provided on a sample basis. The evidence may be presented in response to specific questions. Each candidate will need evidence to show that she/he can evaluate at least one method of oxygen supply based on a sample of the three knowledge items above.

Higher National Unit specification: statement of standards (cont)

Unit title: Aircraft Environmental Systems: Cabin Conditioning and Pressurisation

To ensure that candidates will not be able to foresee which items they will be questioned about, a different sample of two of the three knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to both items. Where an item is sampled, a candidate's response can be judged satisfactory where the evidence shows that the candidate can:

- ◆ analyse one of the various methods of oxygen supply — to include the continuous flow oxygen system; pressure demand oxygen system; gaseous; chemical; liquid and/or sieve
- ◆ explain the testing and servicing of one oxygen system to include pressure, leak testing and charging of the oxygen system
- ◆ identify safety precautions during the servicing of one oxygen system — to include fire prevention and system contamination

The assessment for this Outcome is by a closed-book assessment.

Assessment guidelines for the Unit

Evidence for this Unit can be generated through assessment events. Candidates can be assessed either by three 45-minute assessments or by a single two-and-a-quarter-hour assessment. If three 45-minute assessments are used, the first assessment covers Outcome 1, the second assessment covers Outcome 2, and the third assessment covers Outcome 3. If a single two-and-a-quarter-hour assessment is used, the assessment will cover all three Outcomes.

The assessments should logically follow the instruction for each Outcome or after all Outcomes have been delivered. The number of assessments is at the discretion of the centre.

The assessment/s will cover all Outcomes and be carried out on a sampling basis of the knowledge and/or skills requirements of each Outcome, all of which the must be taught and available for assessment.

The assessment/s should be composed of short answers, restricted response and/or multi-choice questions. Candidates should not know in advance the questions on which they will be assessed and different questions should be set on each assessment occasion. This assessment must be carried out under closed-book supervised conditions. In order to gain an assessment pass, candidates will need to demonstrate that they can achieve the minimum requirements for this Unit.

Administrative Information

Unit code: F0M5 35

Unit title: Aircraft Environmental Systems: Cabin Conditioning and Pressurisation

Superclass category: XP

Original date of publication: August 2006

Version: 01

History of Changes:

| Version | Description of change | Date |
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Higher National Unit specification: support notes

Unit title: Aircraft Environmental Systems: Cabin Conditioning and Pressurisation

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 Unit is designed to explain the operation and necessity of Aircraft Environmental Systems. The candidate will also gain knowledge of the inter-relationship between cabin pressurisation and cabin conditioning.

The Unit will also provide partial knowledge requirement to meet EASA IR Part 66 Aircraft Maintenance License (Module 11) Air Conditioning and Cabin Pressurisation.

Content/context corresponding to Outcomes

The list of topics is given below for each Outcome to offer lecturers guidance on the level of coverage for each Outcome.

Outcome 1:

Describe how the air conditioning system maintains and distributes suitable cabin air.

- ◆ Explain ventilation, temperature, and humidity control:
 - Define each of the above
 - Explain the requirement for each of the above

- ◆ Analyse unpressurised aircraft cabin conditioning:
 - Analyse the principle of exhaust heat exchange
 - Analyse gas turbine exhaust heat exchanger
 - Describe the principle of combustion heating

- ◆ Describe a basic pressurised aircraft air conditioning system:
 - Air supply or charge air
 - System components
 - The use of ram air
 - Temperature control and air cycling
 - Humidity control
 - Filtration
 - Distribution and zones

Higher National Unit specification: support notes

Unit title: Aircraft Environmental Systems: Cabin Conditioning and Pressurisation

Guidance on the content and context for this Unit

Outcome 2:

Analyse the function of cabin pressurisation control systems.

- ◆ Analyse the requirement for cabin pressurisation:
 - Explain the physiological effects of altitude
 - Explain differential altitude and aircraft structural limitations
 - Identify standards of pressurisation

- ◆ Explain how aircraft pressure is controlled:
 - Mechanical
 - Electrical
 - Computer controlled

- ◆ Explain various methods of cabin sealing and pressure testing:
 - Doors
 - Windows
 - Flight controls
 - Functional tests and leak rate tests

Outcome 3:

Describe the operation of various oxygen systems.

- ◆ Analyse the various methods of oxygen supply:
 - Continuous flow oxygen system
 - Pressure demand oxygen system
 - Gaseous
 - Chemical
 - Liquid
 - Sieve

- ◆ Testing, servicing, and safety of oxygen systems:
 - Pressure and leak testing
 - Charging of oxygen systems

- ◆ Identify safety precautions during servicing of oxygen systems:
 - Fire Prevention
 - System contamination

Higher National Unit specification: support notes (cont)

Unit title: Aircraft Environmental Systems: Cabin Conditioning and Pressurisation

Guidance on the delivery and assessment of this Unit

It is logical to deliver this Unit sequentially by Outcome, with assignments following each Outcome. The number of assessments is at the discretion of the centre.

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). For assessments that are carried out under controlled condition, candidates should not be allowed to bring into assessment events textbooks, handouts or other prepared material.

Opportunities for developing Core Skills

Candidates will have opportunities to develop the Core Skill component of Communication (Reading) throughout all Outcomes. This could be achieved through an accurate account of the important ideas or significant information from the aircraft maintenance manuals or schematics then making a basic evaluation of the communication supported by evidence.

Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of on-line support. However, with regard to assessment, planning would be required by the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangement would be required to be put in place to ensure that the assessment papers for all Outcomes were conducted under controlled, supervised conditions.

For information on normal open learning arrangements, please refer to the SQA guide *Assessment and Quality Assurance of Open and Distance Learning* (SQA 2000).

Higher National Unit specification: support notes (cont)

Unit title: Aircraft Environmental Systems: Cabin Conditioning and Pressurisation

Candidates with disabilities and/or additional support needs

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 Alternative Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on SQA's website: www.sqa.org.uk.

General information for candidates

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This Unit is designed to explain the operation and necessity of Aircraft Environmental Systems. You will also gain knowledge of the inter-relationship between cabin pressurisation and cabin conditioning. This Unit also provides partial coverage of EASA 66 Module 11.

On completion of this Unit you will be able to:

- 1 Explain how the air conditioning system maintains and distributes suitable cabin air.
- 2 Explain the function of cabin pressurisation control systems.
- 3 Explain the requirement, and operation of oxygen systems.

You will be assessed on a sampling basis where two-thirds of each Outcome will be assessed under closed-book supervised conditions. In order to gain an assessment pass, you will need to demonstrate that you can achieve the minimum requirements for this Unit.

The Unit may be of particular interest if you are interested in pursuing a career in aircraft maintenance engineering as it partially covers the knowledge requirements for module 11 (Air Conditioning and Cabin Pressurisation) of EASA IR part 66 aircraft licensing requirements for both mechanical and avionics engineers.