



National Unit Specification: general information

UNIT Aircraft Power Plant (SCQF level 6)

CODE F5GX 12

SUMMARY

This Unit may form part of a National Qualification Group Award but may also be offered on a free-standing basis.

This Unit is designed to allow candidates to gain knowledge and understanding of the construction and operation of power plant used in aircraft and helicopters. During delivery of the Unit candidates will learn to describe the construction and operation of gas turbine and four stroke piston engines. They will also develop the knowledge and understanding to identify accessories fitted to different types of engines and describes the function of these accessories. Candidates will also learn about components and functions of aircraft fuel systems.

The Unit is suitable for candidates who:

- ◆ are undertaking the study of this subject for the first time
- ◆ wish to gain a basic knowledge of aircraft power plant
- ◆ are considering a career in the aviation industry and wish to gain a basic knowledge and understanding of the subject

OUTCOMES

- 1 Identify the component parts and describe the operation of a gas turbine engine.
- 2 Identify the component parts and describe the operation of a four-stroke piston engine.
- 3 Describe the types and functions of accessories fitted to different types of engines.
- 4 Describe the components and function of an aircraft fuel system.

Administrative Information

Superclass: XP

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National Unit Specification: general information (cont)

RECOMMENDED ENTRY

While entry is at the discretion of the centre, it would be beneficial if candidates had attained one of the following, or equivalent:

- ◆ Standard Grade Physics (Credit level)
- ◆ Intermediate 2 Physics
- ◆ *Aeronautical Engineering Fundamentals (SCQF level 6)*

CREDIT VALUE

1 credit at SCQF level 6 (6 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.*

CORE SKILLS

There is no automatic certification of Core Skills in this Unit.

This Unit provides opportunities for candidates to develop aspects of the following Core Skills:

Communication (SCQF level 6)

Numeracy (SCQF level 6)

These opportunities are highlighted in the Support Notes of this Unit Specification.

National Unit Specification: statement of standards

UNIT Aircraft Power Plant (SCQF level 6)

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

OUTCOME 1

Identify the component parts and describe the operation of a gas turbine engine.

Performance Criteria

- (a) Identify accurately the main components in a gas turbine engine.
- (b) Describe correctly the layout and operation of a gas turbine engine.
- (c) Describe correctly the working cycle of a gas turbine engine.

OUTCOME 2

Identify the component parts and describe the operation of a four-stroke piston engine.

Performance Criteria

- (a) Identify accurately the main components of a four-stroke piston engine.
- (b) Describe correctly the layout and operation of a four-stroke piston engine.
- (c) Describe correctly the working cycle of a four-stroke piston engine.

OUTCOME 3

Describe the types and functions of accessories fitted to different types of engines.

Performance Criteria

- (a) Identify accurately the main accessories fitted to a gas turbine and piston engine.
- (b) Describe correctly the functions of different types of engine accessories.

OUTCOME 4

Describe the components and function of an aircraft fuel system.

Performance Criteria

- (a) Describe correctly the properties of fuels used in a gas turbine and piston engine.
- (b) Identify accurately the main components in an aircraft fuel system.
- (c) Describe correctly how the components in an aircraft fuel system interrelate to operate the system.

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Written and/or recorded oral evidence should be produced to demonstrate that candidates have achieved all the Outcomes and Performance Criteria.

Outcomes may be assessed on an individual basis, as a combination of Outcomes or as a single, holistic assessment covering all four Outcomes. Assessment(s) must be conducted under supervised, closed-book conditions in which candidates may use reference materials provided by the centre but are not allowed to bring their own notes, handouts, textbooks or other materials into the assessment. The total time set aside for assessments should not exceed 3 hours.

With regard to Outcome 2

- ◆ Candidates should identify a minimum of six main components of a four-stroke piston engine

With regard to Outcome 3

- ◆ Candidates should identify a minimum of three accessories associated with a gas turbine and three accessories associated with a petrol engine
- ◆ Candidates should describe the function of a minimum of two accessories associated with a gas turbine and two accessories associated with a petrol engine

With regard to Outcome 4

- ◆ Candidates should identify a minimum of three main components in an aircraft fuel system

The Assessment Support Pack for this Unit provides sample assessment material. Centres wishing to develop their own assessments should refer to the Assessment Support Pack to ensure a comparable standard.

National Unit Specification: support notes

UNIT Aircraft Power Plant (SCQF level 6)

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 forms part of the National Qualification Group Award in Aeronautical Engineering at SCQF level 6, but may also be offered on a free-standing basis.

This Unit is designed to allow candidates to gain knowledge and understanding of the construction and operation of power plant used in aircraft and helicopters. On successful completion of the Unit candidates will be able to describe the construction and operation of gas turbine and four stroke piston engines. They will also have the knowledge and understandings to identify accessories fitted to different types of engines and describe the function of these accessories. Candidates will also be capable of describing the components and functions of aircraft fuel systems.

It is strongly recommended that the Unit *Aeronautical Engineering: Fundamentals* at SCQF level 6 is delivered to candidates before this Unit.

The Unit may also provide part of the knowledge and understanding required to satisfy specialist aircraft engineering awards.

The following subjects may be covered during delivery of the Unit.

Outcome 1

Identify the main components used in an aircraft or helicopter gas turbine engines such as the compressor rotor and stators, combustion assembly, nozzle guide vane, turbine assemblies and exhaust section. Describe, with the aid of diagrams, the constructional layout of a gas turbine, turbo-prop and turbo shaft engine and describe the working cycle of the engine by sketching the Brayton cycle highlighting each part of this working cycle.

Outcome 2

Identify the main components used in an aircraft or helicopter four-stroke piston engine such as the engine cylinders, pistons and rings, inlet and outlet valves and their mechanisms, crankshaft and describe, with the aid of a diagram, the constructional arrangement of the engine to drive a gearbox or propeller. Sketch the modified Otto cycle for a four-stroke engine and describe each part of this working cycle.

Outcome 3

Identify the main accessories fitted to a gas turbine such as fuel and oil pumps, and indication and control and describe their functions. Likewise identify the main accessories fitted to a piston engine such as a fuel and oil pumps, timing and ignition units and describe their function.

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Outcome 4

Describe the properties of fuels used in a gas turbine and piston engine. Identify the main components used in an engine fuel system such as fuel pumps, fuel valves, fuel control units including electronic control and fuel metering systems (FADEC), fuel filters, coolers and burner units in a gas turbine or carburettors/injectors in a piston engine. Demonstrate how components interrelate in a fuel system by sketching or using simple fuel system diagrams to highlight the connections between components in the system.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

It is recommended that the Unit is delivered in the same sequence the Outcomes are presented in the National Unit Specification: statement of standards section of this Unit. The Unit may be delivered by a combination of lectures, tutorial work, investigations, computer simulations, external visits and practical work. While the majority of the Unit may be delivered in a classroom it is recommended that candidates undertake some investigative work (eg using the Internet and/or computer simulation software to examine the construction and operation of engines, engine accessories and fuel systems) and practical work (eg stripping down petrol engines and their accessories) to confirm and reinforce the theory taught in the Unit.

It is recommended that practical engine parts, wall charts and DVDs/videos are used extensively to assist learning

It is essential that candidates are inducted into current Health and Safety practices and procedures at the start of delivering of the Unit and that these are reinforced throughout Unit delivery.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Candidates should be encouraged to undertake some investigative work, accessing and evaluating technical data on the construction and operation of engines, engine accessories and fuel systems. Practical work such as stripping down petrol engines and their accessories would confirm and reinforce the theory taught in the Unit and develop oral communication skills in a work related context. *Numeracy* skills should be naturally enhanced, as candidates interpret technical information from charts and diagrams and develop accuracy and confidence in translating and applying graphic information in a work related context.

Guidance should be given on the style and format expected in written descriptions, which should be accurate, clearly expressed and supported by clearly annotated diagrams and sketches. Examples of technical writing could be provided to indicate acceptable standards.

National Unit Specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by information and communications technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Centres are encouraged to use formative assessment extensively as it plays a particularly important role in allowing candidates to develop a sound knowledge and understanding of aircraft engines, engine accessories and fuel systems.

Where summative assessment is carried out on an individual Outcome basis the assessment papers may consist of short answer and restricted-response questions, or objective questions (eg multi-choice questions), or a mixture of both. Individual assessment events may last no longer than 45 minutes. It is recommended that each assessment event is carried out after the completion of the delivery of the corresponding Outcome. Assessment papers may be suitable for on-line delivery.

Where Outcomes are assessed using a single, holistic assessment the assessment paper may consist of short answer and restricted response questions, or objective questions or a combination of both. The assessment paper may be suitable for on-line delivery.

DISABLED CANDIDATES AND/OR THOSE WITH ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements